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Introduction

On March 19, 2013, the Nuclear Regulatory Commission (NRC) Commissioners directed the staff per Staff Requirements Memorandum (SRM) for SECY -12-0157 to require 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." In response, the NRC issued Order EA-13-109, *Issuance of Order to Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accidents*, June 6, 2013. The Order (EA-13-109) requires that licensees of BWR facilities with Mark I and Mark II containment designs ensure that these facilities have a reliable hardened vent to remove decay heat from the containment, and maintain control of containment pressure within acceptable limits following events that result in the loss of active containment heat removal capability while maintaining the capability to operate under severe accident conditions resulting from an Extended Loss of AC Power (ELAP).

The Order requirements are applied in a phased approach where:

- “Phase 1 involves upgrading the venting capabilities from the containment wetwell to provide reliable, severe accident capable hardened vents to assist in preventing core damage and, if necessary, to provide venting capability during severe accident conditions.” (Completed “no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first.”)
- “Phase 2 involves providing additional protections for severe accident conditions through installation of a reliable, severe accident capable drywell vent system or the development of a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions.” (Completed “no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first.”)

The NRC provided an acceptable approach for complying with Order EA-13-109 through Interim Staff Guidance (JLD-ISG-2013-02) issued in November 2013. The ISG endorses the compliance approach presented in NEI 13-02 Revision 0, *Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents*, with clarifications. Except in those cases in which a licensee proposes an acceptable alternative method for complying with Order EA-13-109, the NRC staff will use the methods described in this ISG (NEI 13-02) to evaluate licensee compliance as presented in submittals required in Order EA-13-109.

The Order also requires submittal of an overall integrated plan which will provide a description of how the requirements of the Order will be achieved. This document provides the Overall Integrated Plan (OIP) for complying with Order EA-13-109 using the methods described in NEI 13-02 and endorsed by NRC JLD-ISG-2013-02. Six month progress reports will be provided consistent with the requirements of Order EA-13-109.

Part 1: General Integrated Plan Elements and Assumptions

Extent to which the guidance, JLD-ISG-2013-02 and NEI 13-02, are being followed. Identify any deviations.
Include a description of any alternatives to the guidance. A technical justification and basis for the alternative needs to be provided. This will likely require a pre-meeting with the NRC to review the alternative.

Ref: JLD-ISG-2013-02

Compliance will be attained for {Site Name} 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 {Quarter and Year}
- Phase 2: Later *[you may want to enter your dates for drywell]* {by the startup from the second refueling outage that begins no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first. . Currently scheduled for {Quarter and Year}}
  [may need to add more bullets for multi-unit sites]

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

State Applicable Extreme External Hazard from NEI 12-06, Section 4.0-9.0
List resultant determination of screened in hazards from the EA-12-049 Compliance.

Ref: NEI 13-02 Section 5.2.3 and D.1.2

Seismic Hazard screens in for {Site Name}
External Flooding Hazard screens {in/out} for {Site Name}
Extreme Cold Hazard screens {in/out} for {Site Name}
High Wind Hazard screens {in/out} for {Site Name}
Extreme High Temperature Hazard screens {in/out} for {Site Name}

Key Site assumptions to implement NEI 13-02 strategies.
Provide key assumptions associated with implementation of HCVS Phase 1Strategies

Ref: NEI 13-02 Section 1

Mark I/II Generic HCVS Related Assumptions:

Applicable EA-12-049 assumptions:

- Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours
- Qualified and appropriately located portable equipment can supplement the installed equipment after 24 hours
- At Time=0 the event is initiated and all rods insert and no other event beyond a common site ELAP leading to core damage occurring at any or all of the units
- All Operator Actions utilized in Order EA-12-049 can be credited for Order EA-13-109 until access

to the plant becomes limited by core uncovery

- At {1 hour /or as defined in the sites EA-12-049 submittal} an ELAP is declared and actions begin as defined in EA-12-049 compliance
- DC power and distribution can be credited for the duration determined per the EA-12-049 (FLEX) methodology for battery usage is {XX hours, *insert battery duration number from FLEX submittal}*

<u>Applicable EA-13-109 generic assumptions:</u>

- Recharging from “FLEX only” actions cannot be credited for SA HCVS functions, where “FLEX only” is defined as having no additional evaluations beyond compliance with order EA-12-049.
- Recharging HCVS components after 24 hours with “SA Capable” actions is assumed successful, where “SA Capable” is defined as requiring an evaluation for SA conditions.
- SFP Level is maintained above EA-12-051 Level 2 with either on-site or off-site resources such that the SFP does not contribute to the analyzed source term
- Existing containment components design and testing values are governed by existing plant containment criteria (e.g., Appendix J) and are not subject to the testing criteria from NEI 13-02
- Operation of the HCVS is not bounded by the Technical Specifications because of the nature of the order criteria of assuming an ELAP and progression to a severe accident with ex-vessel core debris. Therefore, the design and implementation of the HCVS does not create an un-reviewed safety change.
- Routinely performed operator actions (e.g., load stripping, control switch manipulation, valving in nitrogen bottles) are acceptable to obtain HCVS venting dedicated functionality. HCVS dedicated equipment is defined as vent process elements that are required for the HCVS to function in an ELAP event that progresses to core melt ex-vessel. (reference FAQ HCVS-02)
- Use of MAAP Version 4 or higher provides adequate assurance of the plant conditions assumed for Order EA-13-109 BDBEE and SA HCVS operation. Additional analysis using {Gothic, etc. version XX} is an acceptable method for evaluating environmental conditions in other portions of the plant.
- Utilization of NRC Published Accident evaluations is acceptable, e.g. SOARCA, SECY-12-0157
- This Overall Integrated Plan is based on Emergency Procedure Changes consistent with EPG/SAGs Revision 3 as incorporated per the sites EOP/SAMG procedure change process

Plant Specific HCVS Related Assumptions:

- *{Plant specific assumptions, particularly related to plant configuration or special design attributes}*

Part 2: Boundary Conditions for WW Vent

Provide a sequence of events and identify any time or environmental constraint required for success including the basis for the constraint.

Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment). See attached sequence of events timeline (Attachment 2)

Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment. Sequences are for the assumed times when RPV injection is stopped and not available until core damage occurs.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

Operator action constraints timeline is determined based on the following sequences:

1. Sequence 1 is a FLEX run with Venting in a BDBEE without core damage.
2. Sequence 2 is based on SOARCA results for a prolonged SBO (ELAP) with the loss of RCIC case without black start.
3. Sequence 3 is based on SOARCA results for a prolonged SBO (ELAP) with failure of RCIC after a black start where failure occurs because of over injection.

Discussion of time constraints identified in Attachment 2

- XX Hours, Initiate use of Hardened Containment Vent System (HCVS) per EOPs to maintain containment parameters below design limits and within the limits that allow continued use of RCIC (table item AA) - The reliable operation of HCVS will be met because HCVS is seismic and will be powered by DC buses with motive force supplied to HCVS valves from installed accumulators and portable nitrogen storage bottles. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the MCR or a Remote Operating Station on each unit. The DC power for HCVS will be available as long as the HCVS is required. Station batteries will provide power for greater than 12 hours, HCVS battery capacity will be available to extend past 24 hours. In addition, when available Phase 2 FLEX DG can provide power before battery life is exhausted.
- XX Hours {greater than 24 hours}, installed nitrogen bottles will be valved-in to supplement the Nitrogen tank supply. The Nitrogen bottles can be replenished one at a time leaving the other 2 supplying the HCVS.
- XX Hours {greater than 24 hours}, temporary generators will be installed and connected to the pigtail to power up battery chargers using a portable DG to supply power to HCVS critical components/instruments (table item BB) - Time critical after ZZ hours. Current battery durations are calculated to last greater than GG hours (Reference X). DG will be staged beginning at approximately 8-10 hour time frame (Reference 4). Within Two (2) hours later the DG will be in service. Thus the DGs will be available to be placed in service at any point after 24 hours as required to supply power to HCVS critical components/instruments. A DG will be maintained in on-site FLEX storage buildings (Reference Y). DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards (Reference Z). Modifications to will be implemented to facilitate the connections and operational actions required to supply

power. Programs and training will be implemented to support operation of DGs.

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Discussion of radiological and temperature constraints identified in Attachment 2

- XX Hours, Operators override the ……..
- XX Hours {greater than 24 hours}, installed nitrogen bottles will be valved-in to supplement the Nitrogen tank supply as stated for time constraint sequence 1.
- XX Hours {greater than 24 hours}, temporary generators will be installed and connected to the pigtail for the HCVS critical components/instruments as stated for time constraint sequence 1

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

Primary Action	Location / Component	Notes
1. Align power supplies for all valves and instruments	Hand switches located near the switchgear in the Control or Reactor Building	From Essential AC to power inverters powered from the DC station service batteries
2. Disable PCIV interlocks by Installing electrical jumpers for PCIVs	Panels in MCR and Remote Panel containing PCIV interlocks	
3. Open HCVS condensate drain valve to remove condensate from the HCVS piping.	Hand switch located in the MCR and Remote Panel for condensate drain valve	
4. Close HCVS condensate drain valve	Hand switch located in the MCR and Remote Panel for condensate drain valve	
5. Breach the rupture disk by opening the pneumatic supply valve	Hand switch for valve at the Remote Panel	**Only required if performing early venting**
6. Close pneumatic supply valve	Hand switch for valve at the Remote Panel	**Only required if performing early venting**
7. Open Wetwell PCIVs	Hand switches located in the MCR and Remote Panel	
8. Open HCVS vent control valve	Hand switch for valve in the MCR and Remote Panel	
9. Monitor electrical power status, pneumatic pressure and containment / HCVS conditions	Instrument indicators located in the MCR and Remote Panel	Prior to depletion of the installed power or pneumatic sources actions will be required to connect back-up sources at a time greater than 24 hours.

Provide Details on the Vent characteristics

Vent Size and Basis (EA-13-109 Section 1.2.1 / NEI 13-02 Section 4.1.1)
What is the plants licensed power? Discuss any plans for possible increases in licensed power (e.g. MUR, EPU).
What is the nominal diameter of the vent pipe in inches/ Is the basis determined by venting at containment design pressure, PCPL, or some other criteria (e.g. anticipatory venting)?

Vent Capacity (EA-13-109 Section 1.2.1 / NEI 13-02 Section 4.1.1)
Indicate any exceptions to the 1% decay heat removal criteria, including reasons for the exception. Provide the heat capacity of the suppression pool in terms of time versus saturation, assuming suppression pool is the injection source.

Vent Path and Discharge (EA-13-109 Section 1.1.4, 1.2.2 / NEI 13-02 Section 4.1.3, 4.1.5 and Appendix F/G)
Provides a description of Vent path, release path, and impact of vent path on other vent element items.

Power and Pneumatic Supply Sources (EA-13-109 Section 1.2.5 & 1.2.6 / NEI 13-02 Section 4.2.3, 2.5, 4.2.2, 4.2.6, 6.1)
Provide a discussion of electrical power requirements, including a description of dedicated 24 hour power supply from permanently installed sources. Include a similar discussion as above for the valve motive force requirements. Indicate the area in the plant from where the installed/dedicated power and pneumatic supply sources are coming

Indicate the areas where portable equipment will be staged after the 24 hour period, the dose fields in the area, and any shielding that would be necessary in that area. Any shielding that would be provided in those areas

Location of Control Panels (EA-13-109 Section 1.1.1, 1.1.2, 1.1.3, 1.1.4, 1.2.4, 1.2.5 / NEI 13-02 Section 4.1.3, 4.2.2, 4.2.3, 4.2.5, 4.2.6, 6.1.1. And Appendix F/G)
Indicate the location of the panels, and the dose fields in the area during severe accidents Any shielding that would be required in the area

Hydrogen (EA-13-109 Section 1.2.10, &1.2.11, and 1.2.12 / NEI 13-02 Section 2.3,2.4, 4.1.1, 4.1.6, 4.1.7, 5.1, & Appendix H)
State which approach or combination of approaches will the plant take to address the control of flammable gases, clearly demarcating the segments of vent system to which an approach applies

Unintended Cross Flow of Vented Fluids (EA-13-109 Section 1.2.3, 1.2.12 / NEI 13-02 Section 4.1.2, 4.1.4, 4.1.6 and Appendix H)
Provide a description to eliminate/minimize unintended cross flow of vented fluids with emphasis on interfacing ventilation systems (e.g. SGTS). What design features are being included to prevent leakage through interfacing valves?

Component Qualifications (EA-13-109 Section 2.1 / NEI 13-02 Section 5.1)
State qualification criteria based on use of a combination of safety related and augmented quality dependent on the location, function and interconnected system requirements

Monitoring of HCVS (Order Elements 1.1.4, 1.2.8, 1.2.9/ISG 4.1.3, 4.2.2, 4.2.4, and Appendix F/G)
Provides a description of instruments used to monitor HCVS operation and effluent.

Component reliable and rugged performance (EA-13-109 Section 2.2 / NEI 13-02 Section 5.2, 5.3)
HCVS components including instrumentation should be designed, as a minimum, to meet the seismic design requirements of the plant.
Components including instrumentation that are not required to be seismically designed by the design basis of the plant should be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. (reference ISG-JLD-2012-01 and ISG-JLD-2012-03 for seismic details.)
The components including instrumentation external to a seismic category 1 (or equivalent building or enclosure should be designed to meet the external hazards that screen in for the plant as defined in guidance NEI 12-06 as endorsed by JLD-ISG-12-01 for Order EA-12-049.

Use of instruments and supporting components with known operating principles that are supplied by manufacturers with commercial quality assurance programs, such as ISO9001. The procurement specifications shall include the seismic requirements and/or instrument design requirements, and specify the need for commercial design standards and testing under seismic loadings consistent with design basis values at the instrument locations.
Demonstration of the seismic reliability of the instrumentation through methods that predict performance by analysis, qualification testing under simulated seismic conditions, a combination of testing and analysis, or the use of experience data. Guidance for these is based on 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," or a substantially similar industrial standard could be used.
Demonstration that the instrumentation is substantially similar in design to instrumentation that has been previously tested to seismic loading levels in accordance with the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges). Such testing and analysis should be similar to that performed for the plant licensing basis.

Vent Size and Basis

The HCVS wetwell path is designed for venting steam/energy at a nominal capacity of 1% *[or another value of <1%, include the analysis basis of the selected value*] of [*CLTP or Projected Power Uprate at time of implementation*] MWt thermal power at pressure of *[YY]* psig. {*Insert any clarification statements of this power level if it is not the current licensed power level.}* _ This pressure is the lower of the containment design pressure and the PCPL value. The size of the wetwell portion of the HCVS of [XX] inches in diameter [until combines with the common HCVS piping sized at YY inches] which meets or exceeds the Order criteria. *{If not CLTP then add}* *[The thermal power assumes a power uprate of XX% above the currently licensed thermal power of YYYY MWt.]*

Vent Capacity

The 1% *[or another value of <1%]* value assumes that the suppression pool pressure suppression capacity is sufficient to absorb the decay heat generated during the first 3 hours. The vent would then be able to prevent containment pressure from increasing above the containment design pressure. As part of the detailed design, the duration of suppression pool decay heat absorption [*has been / will be*] confirmed.

Vent Path and Discharge

The HCVS discharge path uses the plant stack.

- Or –

The HCVS discharge path *[will be / is]* routed to a point above any adjacent structure *[state any exceptions, for example: The cooling towers have a higher elevation but they are not adjacent to the Reactor Building. The Station's chimney is an adjacent structure, but it is impractical to raise the HCVS above the chimney.]* This discharge point is *[just above that unit's Reactor Building]* *such that* the release point will vent away from emergency ventilation system intake and exhaust openings, main control room location, location of HCVS portable equipment, access routes required following a ELAP and BDBEE, and emergency response facilities; however, these must be considered in conjunction with other design criteria (e.g., flow capacity) and pipe routing limitations, to the degree practical. *{If the vent line is mounted to the side of the reactor building plenum, a demonstration should evaluate the possibility of any cross flow back into the plant via the exhaust plenum. Refer to the NRC Responses to Public Comments document}{Describe basis for routing that does not avoid these areas, i.e., current routing, best position considering all items}*

The detailed design *[will / addresses]* missile protection to a maximum height of 30 feet from ground elevation, from external events as defined by NEI 12-06 for the outside portions of the selected release stack or structure. *{this should be a design element using reasonable protection features for the screened in hazards from NEI 12-06, engineering should use design basis missile hazards methods in the calculations. Examples could be specific details from the sites FSAR.}*

Power and Pneumatic Supply Sources

1. The HCVS flow path valves are [*air-operated valves (AOV) with air-to-open and spring-to-shut. Opening the valves requires energizing an AC powered solenoid operated valve (SOV) and providing motive air/gas. The detailed design will provide a permanently installed power source and motive air/gas supply]* adequate for the first 24 hours *{state if you are crediting FLEX to sustain DC power for >24 hours (If that option is selected during the detailed design, state the capability under the FLEX effort to maintain the DC source is still applicable under the EA-13-109 Order Elements)}.* The initial stored motive air/gas will allow for a minimum of *{three}* valve operating cycles; however, the detailed design will determine the number of required valve cycles for the first 24-hours *[and, the initial stored motive air/gas will support the required number of valve cycles. Each of the valves that must be opened will be provided with two SOVs arranged such that energizing either SOV from the dedicated DC power supply can open the valve. The SOVs are the only electrical component required for valve functionality that is located inside the area considered not-accessible following an ELAP. The AOVs do not require torque switches or limit switches.]*
2. An assessment of temperature and radiological conditions that operating personnel may encounter both in transit and locally at the controls *{controls not in the MCR}* *[has been / will be]* performed.
3. All permanently installed HCVS equipment, including any connections required to supplement

the HCVS operation during a ELAP (electric power, N2/air) [*are / will be*] located in areas reasonably protected from defined hazards from NEI 12-06.

4. All valves required to open the flow path *[will be / are]* designed for remote manual operation following a ELAP, such that the primary means of valve manipulation does not rely on use of a handwheel, reach–rod or similar means that requires close proximity to the valve (reference FAQ HCVS-XX). *{Describe how you are ensuring accessibility for radiolocial and environmentsal conditions, such as use of ice vests or shielding}* 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. *{If the design provides any additional design features, add the information.}* To address a failure of a HCVS valve to open due to a failure of a DC circuit (SOV, etc), the design will provide a contingency for remotely operating the HCVS valve by [energizing a back-up SOV from an accessible location / supplying an independent air supply / or site specific description].

Location of Control Panels

The HCVS design allows initiating and then operating and monitoring the HCVS from the Main Control Room (MCR) and [*specify the alternate location*]. The MCR location is protected from adverse natural phenomena and the normal control point for Plant Emergency Response actions. *{Address dose and temperature items for the non-MCR location, Utilize FAQ HCVS-XX in the response}*.

Hydrogen

LATER: *State which approach or combination of approaches will the plant take to address the control of flammable gases, clearly demarcating the segments of vent system to which an approach applies*

Unintended Cross Flow of Vented Fluids

The features that prevent inadvertent actuation are [*site specific list, example two CIV's in series powered from different division, a rupture disk, or key lock switches*].

{Response if dedicated containment isolation valves are used} [*The HCVS containment isolation valves are normally closed AOVs that are air-to-open and spring-to-shut. The DC SOV must be energized to allow the motive air to open the valve. The MCR switch for each of the two in-series valves will have a key-locked switch. Although the same DC and motive air source will be used, separate control circuits including switches will be used for the two redundant valves to address single point vulnerabilities that may cause the flow path to inadvertently open.*]

{Response if "shared" containment isolation valves are used} [*The HCVS uses the Containment Purge System containment isolation valves for containment isolation. These containment isolation valves are AOVs and they are air-to-open and spring-to-shut. A DC SOV must be energized to allow the motive air to open the valve. Although these valves are shared between the Containment Purge System and the HCVS, separate control circuits are provided to each valve for each function. This can be done by providing a second SOV which is electrically independent of the first SOV and arranging the SOVs so that energizing either SOV will open the valve. Specifically:*

- *The Containment Purge System control circuit will be used during all "design basis" operating modes including all design basis transients and accidents. The containment isolation signal will automatically de-energize the SOV on this circuit causing the AOVs to shut.*
- *A second, independent circuit will be used to operate these valves but only following an event*

that requires operating the HCVS. This circuit will not have any automatic controls including high containment pressure isolation signal, but the HCVS control circuit will have a key-locked switch for each of the two in-series valves to address inadvertent operation. Turning the switch to "open" will energize the second SOV opening the valve. Both valves will use the same DC for opening in the HCVS function, separate control circuits including switches will be used for the two redundant valves to address single point vulnerabilities that may cause the flow path to inadvertently open.]

EOP/ERG 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/will be*] designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error such that any credited containment accident pressure (CAP) that would provide net positive suction head to the emergency core cooling system (ECCS) pumps will be available (inclusive of a design basis loss-of-coolant accident (DBLOCA)). However the ECCS pumps will not have normal power available because of the starting boundary conditions of an ELAP. *{If the unit credits CAP, state specific CAP requirement that is maintained, otherwise state your site does not rely on CAP to maintain NPSH for ECCS pumps.}*

Component Qualifications

The HCVS components downstream of the second containment isolation valve *[and components that interface with the HCVS]* are routed in seismically qualified structures *[except for components x, y, z. For those components, the structure [has been / will be] analyzed for seismic ruggedness to ensure that any potential failure would not adversely impact the function of the HCVS or other safety related structures or components {i.e. seismic category II over category I criteria}]*.

Monitoring of HCVS

The HCVS instruments, including valve position indication, process instrumentation, radiation monitoring, and support system monitoring, will be qualified by using one of the three methods described in the ISG, which includes:

1. Purchase of instruments and supporting components with known operating principles from manufacturers with commercial quality assurance programs (e.g., ISO9001) where the procurement specifications include the applicable seismic requirements, design requirements, and applicable testing.
2. Demonstration of seismic reliability via methods that predict performance described in IEEE 344-2004
3. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	**Qualification Method***
HCVS Process Temperature	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Pressure	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Valve Position	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Electrical Power Supply Availability	ISO9001 / IEEE 344-2004 / Demonstration

* The specific qualification method used for each required HCVS instrument will be reported in future 6 month status reports. *{include the specific qualification method used for each instrument if available}*

Component reliable and rugged performance

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

Part 2 Boundary Conditions for WW Vent**: BDBEE Venting**

Determine Baseline venting capability for BDBEE Venting, such as may be used in a ELAP or 50.54(hh) scenario to mitigate core damage.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

First 24 Hour Coping Detail

Provide a general description of the venting strategies for first 24 hours using installed equipment including station modifications that are proposed.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

The operation of the HCVS *[has been / will be]* designed to minimize the reliance on operator actions for response to a ELAP and BDBEE hazards identified in NEI 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*. Immediate operator actions can be completed by Reactor Operators and include remote-manual initiation from the HCVS control station. The operator actions required to open a vent path are:

Operator Actions Necessary to Vent the Containment during an SBO	
Vent containment with containment pressure ***above*** *the rupture disc rupture pressure*	*Vent containment with containment pressure* ***below*** *the rupture disc rupture pressure*
1. Open 1st containment Isolation Valves from MCR	*1. Open valve to pressurize area between rupture disc and closed valve from MCR*
2. Open 2nd containment Isolation Valves from MCR	*2. Shut valve to pressurize area between rupture disc and closed valve from MCR*
3. Open HCVS control valve from MCR	*3. Open 1st containment Isolation Valves from MCR*
	4. Open 2nd containment Isolation Valves from MCR
	5. Open HCVS control valve from MCR

Remote-manual is defined in this report as a non-automatic power operation of a component and does not require the operator to be at or in close proximity to the component. No other operator actions are required to initiate venting under primary procedural protocol.

The HCVS *[has been / will be]* designed to allow initiation, control, and monitoring of venting from *[the Main Control Room (MRC) / or specify the alternate location]*. This location minimizes plant operators' exposure to adverse temperature and radiological conditions and is protected from hazards assumed in NEI 12-06.

Permanently installed power and motive air/gas capable will be available to support operation and monitoring of the HCVS for *[24 / x]* hours. Permanently installed equipment will supply air and power to HCVS for 24 hours.

System control:

i. Active: *[Control valves and/or CIVs]* are operated in accordance with EOPs to control containment pressure. The HCVS *[will be / is]* designed for *[#]* open/close cycles under ELAP conditions. Controlled venting at *[#]* psig will be permitted in the revised EPGs. *{add specific site details if available} [e.g., Separate control circuits are provided for the valves that are shared between the Containment Purge System and HCVS for each function. The Containment Purge System control circuit will be used during all design basis operating modes and maintains the ability of the valves to operate (open) for normal operation or automatically close when a containment isolation signal is received. A second, independent, circuit without any automatic controls will allow the containment isolation valves to be opened regardless of existing containment isolation signals.]*

ii. Passive: Inadvertent actuation protection is provided by *{describe the feature credited for protection of inadvertent actuation}*

[Rupture disk(s) are provided in the vent line downstream of the CIVs. Rupture disks can be intentionally breached from the [Main Control Room / alternate control location] as directed by applicable procedures. The CIVs must be open to permit vent flow.

- OR –

Key lock switches located in the [Main Control Room / alternate control location] as directed by applicable procedures.

- OR –

Other]

Greater Than 24 Hour Coping Detail

Provide a general description of the venting strategies for greater than 24 hours using portable and installed equipment including station modifications that are proposed.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

After *[24 / x]* hours, available personnel will be able to connect supplemental motive air/gas to the HCVS. Connections for supplementing electrical power and motive air/gas required for HCVS *[will be / are]* located in accessible areas with reasonable protection per NEI 12-06 that minimize personnel exposure to adverse conditions following a ELAP and venting. Connections *[will be / are]* pre-engineered quick disconnects to minimize manpower resources. *{State if you are crediting FLEX to sustain power for a BDBEE ELAP. If so, state that the response to NRC EA-12-049 will demonstrate the capability for FLEX efforts to maintain the power source.}*

Details:

Provide a brief description of Procedures / Strategies / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Identify modifications: *List modifications and describe how they support the strategy.*
Key Venting Parameters: *List instrumentation credited for this venting strategy. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
Notes: **[Note: On-going discussions on source of analysis, adequacy of analysis to provide reasonable assurance, and method of documentation to reach a milestone]**

Part 2 Boundary Conditions for WW Vent: **Severe Accident Venting**
Determine Baseline venting capability for Severe Accident Venting, such as may be used in a ELAP or 50.54(hh) scenario to mitigate core damage. **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
First 24 Hour Coping Detail *Provide a general description of the venting strategies for first 24 hours using installed equipment including station modifications that are proposed.* **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
Greater Than 24 Hour Coping Detail *Provide a general description of the venting strategies for greater than 24 hours using portable and installed equipment including station modifications that are proposed.* **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
Details:
Provide a brief description of Procedures / Strategies / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Identify modifications: *List modifications and describe how they support the strategy.*
Key Venting Parameters: *List instrumentation credited for this venting strategy. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
Notes: **[Note: On-going discussions on source of analysis, adequacy of analysis to provide reasonable assurance, and method of documentation to reach a milestone]**

Part 2 Boundary Conditions for WW Vent**: Support Equipment Functions**
Determine Baseline venting capability support functions needed **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
BDBEE Venting *Provide a general description of the BDBEE Venting strategies support functions. Identify methods and strategy(ies) utilized to achieve venting results.* **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
Severe Accident Venting *Provide a general description of the Severe Accident Venting strategies support functions. Identify methods and strategy(ies) utilized to achieve venting results.* **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**
Details:
Provide a brief description of Procedures / Strategies / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Identify modifications*:* *List modifications and describe how they support the strategy.*
Key Venting Parameters: *List instrumentation credited for this venting strategy. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
Notes:

Part 2 Boundary Conditions for WW Vent**: Venting Portable Equipment Deployment**		
Provide a general description of the venting strategies using portable equipment including modifications that are proposed to maintain and/or support safety functions. **Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x**		
Details:		
Provide a brief description of Procedures / Strategies / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*		
Strategy	**Modifications**	**Protection of connections**
Identify Strategy including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Notes:		

Part 3: Boundary Conditions for DW Vent

Provide a sequence of events and identify any time constraint required for success including the basis for the time constraint.
Strategies that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walk through of deployment).

Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 2B

See attached sequence of events timeline (Attachment 2B).

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

Severe Accident Venting

Determine Baseline venting capability for Severe Accident Venting, such as may be used in a ELAP or 50.54(hh) scenario to mitigate core damage.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

First 24 Hour Coping Detail
Provide a general description of the venting strategies for first 24 hours using installed equipment including station modifications that are proposed.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

Greater Than 24 Hour Coping Detail
Provide a general description of the venting strategies for greater than 24 hours using portable and installed equipment including station modifications that are proposed.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

Details:

Provide a brief description of Procedures / Strategies / Guidelines:
Confirm that procedure/guidance exists or will be developed to support implementation.

Identify modifications: *List modifications and describe how they support the strategy.*
Key Venting Parameters: *List instrumentation credited for this venting strategy.*
Notes: **[Note: On-going discussions on source of analysis, adequacy of analysis to provide reasonable assurance, and method of documentation to reach a milestone]**

Part 4: Programmatic Controls, Training, Drills and Maintenance

Identify how the programmatic controls will be met.

Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality addressing the impact of temperature and environment

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

Program Controls:

The HCVS venting strategy will be included within an administrative program.

- Site procedures and programs are being developed in accordance with NEI 13-02 to address use and storage of portable equipment relative to the a Severe Accident defined in NRC Order EA-13-109 and the hazards applicable to the site per NEI 12-06.
- Routes for transporting portable equipment from storage location(s) to deployment areas will be developed as the response details are identified and finalized.
- The identified paths and deployment areas will be accessible during all modes of operation and during Severe Accidents.

Procedures:

Procedures will be established for system operations when normal and backup power is available, and during ELAP conditions.

The HCVS procedures will be developed and implemented following the plants 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

[{If the plant utilizes CAP for ECCS pump NPSH} The procedures will state the impact on and ECCS pumps NPSH (loss of CAP) during a DBLOCA due to an inadvertent opening of the vent.]

Licensees will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in the *[Technical Requirements Manual (TRM) / similar document]*:

- The allowed unavailability time for the HCVS shall not exceed 30 days during modes 1, 2, and 3.
- If the unavailability time exceeds 30 days

- The condition will entered into the corrective action system,
- The HCVS availability will be restored in a manner consistent with plant procedures,
- A cause assessment will be performed to prevent future unavailability for similar causes.

Describe training plan

List training plans for affected organizations or describe the plan for training development

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

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

In addition, (reference NEI 12-06) all personnel on-site will be available to supplement trained personnel.

Identify how the drills and exercise parameters will be met.

Alignment with NEI 13-06 and 14-01as codified in NTTF Recommendation 8 and 9 rulemaking

The Licensee should demonstrate use in drills, tabletops, or exercises for HCVS operation as follows:

- Hardened containment vent operation on normal power sources (no ELAP).
- During FLEX demonstrations (as required by EA-12-049: Hardened containment vent operation on backup power and from primary or alternate location during conditions of ELAP/loss of UHS with no core damage. System use is for containment heat removal AND containment pressure control.
- HCVS operation on backup power and from primary or alternate location during conditions of ELAP/loss of UHS with core damage. System use is for containment heat removal AND containment pressure control with potential for combustible gases (Demonstration may be in conjunction with SAG change).

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

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.

Describe maintenance plan:

- The HCVS maintenance program should ensure that the HCVS equipment reliability is being achieved in a manner similar to that required for FLEX equipment. Standard industry templates (e.g., EPRI) and associated bases may be developed to define specific maintenance and testing.
  - Periodic testing and frequency should be determined based on equipment type and expected use (further details are provided in Section 6 of this document).
  - Testing should be done to verify design requirements and/or basis. The basis should be documented and deviations from vendor recommendations and applicable standards should be justified.
  - Preventive maintenance should be determined based on equipment type and expected use. The basis should be documented and deviations from vendor recommendations and applicable standards should be justified.
  - Existing work control processes may be used to control maintenance and testing.
- HCVS permanent installed equipment should be maintained in a manner that is consistent with assuring that it performs

its function when required.

- HCVS permanently installed equipment should be subject to maintenance and testing guidance provided to verify proper function.

- HCVS non-installed equipment should be stored and maintained in a manner that is consistent with assuring that it does not degrade over long periods of storage and that it is accessible for periodic maintenance and testing.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

The site will utilize the standard EPRI industry PM process (Similar to the Preventive Maintenance Basis Database) for establishing the maintenance and testing actions for HCVS components. The administrative program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

Notes:

Part 5: Milestone Schedule

Provide a milestone schedule. This schedule should include:

- **Modifications timeline**
- **Procedure guidance development complete**
  - **Strategies**
  - **Maintenance**
- **Storage plan (reasonable protection)**
- **Staffing analysis completion**
- **Long term use equipment acquisition timeline**
- **Training completion for the strategies**

The dates specifically required by the order are obligated or committed dates. Other dates are planned dates subject to change. Updates will be provided in the periodic (six month) status reports.

Ref: EA-13-109 Section X.X.X / NEI 13-02 Section X.X.x

The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Hold preliminary/conceptual design meeting	TBD	Complete	
Submit Overall Integrated Implementation Plan	Jun 2014	Complete	
Submit 6 Month Status Report	Dec. 2014		
Submit 6 Month Status Report	Jun. 2015		
U1 Design Engineering On-site			
Submit 6 Month Status Report	Dec. 2015		
Create Site Specific Operations Procedure Changes			
Submit 6 Month Status Report	Jun. 2016		
Create Site Specific Maintenance Procedure Changes			
Procedure Changes Active			
Training Complete			
U1 Implementation Outage			
U1 Walk Through Demonstration/Functional Test			
Submit 6 Month Status Report	Dec. 2016		
U2 Design Engineering On-site			
U2 Implementation Outage			
U2 Walk Through Demonstration/Functional Test			
Submit Completion Report			

Attachment 1: HCVS Portable Equipment

List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*

Attachment 2: Sequence of Events Timeline

{insert site specific time line to support submittal}

Table 2A: Wet Well HCVS Timeline

Seq 1 T=	Seq 2 T=	Seq 3 T=	Action	Time Constraint Y/N [1]	Rad/Temp Constraint Y/N [2]	Remarks / Applicability
0 m	0 m	0 m	Extended Loss of AC Power (ELAP) occurs	N	N	Plant @100% power
<1 m	<1 m	<1 m	Reactor scrams, SRVs open and initiate low-low set, main steam line isolation valves (MSIVs) close	N	N	
< 2 m	< 2 m	< 2 m	Reactor Core Isolation Cooling (RCIC) manually initiated by operators in accordance with EOPs.	N	N	
< 15 m	< 15 m	< 15 m	High Pressure Coolant Injection (HPCI) automatically initiates due to high drywell pressure	N	N	
20 m	20 m	N/A	HPCI is secured	N	N	
			Operators reduce pressure by opening one SRV and maintain reactor pressure vessel (RPV) pressure between 400 – 600 psi		N	
			Operators reduce pressure by opening one SRV and maintain RPV pressure between 200 – 400 psi to stay within the HCTL curve limit		N	
6.5 Hr			CST is depleted, RCIC suction swapped to torus			
7.3 Hr			SRVTLL curve limit reaches limit based on torus water level			
7.3 Hr	9 Hr	12 Hr	HCVS Operation			
N/A	2 min	3.4 Hr	RCIC trips and no injection sources are available.			
N/A	1.1 Hr	4.2 Hr	Core uncovered		Y	
N/A			Core melt begins		Y	
N/A			Vessel failed by ejection of control rod drive (CRD) tubes, corium in the pedestal		Y	
			Installed nitrogen bottles will be valved-in to supplement the Nitrogen tank supply	Y	Y	
			Temporary generators will be installed and connected to the pigtail for the HCVS critical components/instruments	Y	Y	

[1] Instructions: This is a Time Constraint as related to the HCVS operation. Provide justification if No or NA is selected in the remark column; If yes include technical basis discussion

[2] Instructions: This is a Radiological and Temperature Environmental Constraint as related to the HCVS operation. Provide justification if No or NA is selected in the remark column; If yes include technical basis discussion

Attachment 3: Conceptual Sketches

(Conceptual sketches, as necessary to indicate equipment which is installed or equipment hookups necessary for the strategies.)

- Plant layout with egress and ingress pathways
- Piping routing for vent path
- Instrumentation Process Flow
- Electrical Connections
- Include a piping and instrumentation diagram of the vent system. Demarcate the valves (in the vent piping) between the currently existing and new ones.
-

Attachment 4: Failure Evaluation Table

Table 4A: Wet Well HCVS Failure Evaluation Table

Functional Failure Mode	**Failure Cause**	**Alternate Action**	**Failure with Alternate Action Impact on Containment Venting?**

Attachment 5: References

Generic Letter 89-16, Installation of a Hardened Wetwell Vent, dated September 1, 1989

Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012

Order EA-12-050, Reliable Hardened Containment Vents, dated March 12, 2012

Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated June 6, 2013

JLD-ISG-2012-02, Compliance with Order EA-12-050, Reliable Hardened Containment Vents, dated August 29, 2012

JLD-ISG-2013-02, Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated November 14, 2013

NRC Responses to Public Comments, Japan Lessons-Learned Project Directorate Interim Staff Guidance JLD-ISG-2012-02: Compliance with Order EA-12-050, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents, ADAMS Accession No. ML12229A477, dated August 29, 2012

NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 1, dated August 2012

NEI 13-02, Industry Guidance for Compliance with Order EA–13–109, Revision 0, Dated November 2013

NEI 13-06,

NEI 14-01,

Attachment 6: Changes/Updates to this Overall Integrated Implementation Plan

Any significant changes to this plan will be communicated to the NRC staff in the 6 Month Status Reports