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Introduction

In 1989, the NRC issued Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," to all licensees of BWRs with Mark I containments to encourage licensees to voluntarily install a hardened wetwell vent. In response, licensees installed a hardened vent pipe from the wetwell to some point outside the secondary containment envelope (usually outside the reactor building). Some licensees also installed a hardened vent branch line from the drywell.

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 (SA) 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.

The Plant venting actions for the EA-13-109 severe accident capable venting scenario can be summarized by the following**:**

- The HCVS will be initiated via manual action from the Main Control Room (MCR) or Remote Operating Station (ROS) at the appropriate time based on procedural guidance in response to the Plant observed or derived symptoms.
- The vent will utilize Containment Parameters of Pressure, Level and Temperature from the MCR instrumentation to monitor effectiveness of the venting actions.
- The vent operation will be monitored by HCVS valve position, temperature, pressure and effluent radiation levels.
- The HCVS motive force will be monitored and have the capacity to operate for 24 hours with installed equipment. Replenishment of the motive force will be by use of portable equipment once the installed motive force is exhausted.
- Venting actions will be capable of being maintained for a sustained period of up to 7 days or a shorter time if justified.

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]* {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]

Deleted: by the startup from the second refueling outage that begins

[Describe and justify any alternative approaches to the guidelines in JLD-ISG-2013-02]

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

The following extreme external hazards screen-in for {Site Name}

- Seismic, External Flooding, Extreme Cold, High Wind, Extreme High Temperature (only list those that screen-in)

The following extreme external hazards screen out for {Site Name}

- External Flooding, Extreme Cold, High Wind, Extreme High Temperature (only list those that screen out)

Key Site assumptions to implement NEI 13-02 HCVS Actions.

Provide key assumptions associated with implementation of HCVS Phase 1 Actions

Ref: NEI 13-02 Section 1

Mark I/II Generic HCVS Related Assumptions:

Applicable EA-12-049 assumptions:

049-1. Assumed initial plant conditions are as identified in NEI 12-06 section 3.2.1.2 items 1 and 2

049-2. Assumed initial conditions are as identified in NEI 12-06 section 3.2.1.3 items 1, 2, 4, 5, 6 and 8

049-3. Assumed reactor transient boundary conditions are as identified in NEI 12-06 section 3.2.1.4

Part 1: General Integrated Plan Elements and Assumptions

items 1, 2, 3 and 4

049-4. No additional events or failures are assumed to occur immediately prior to or during the event, including security events except for failure of RCIC or HPCI. (Reference NEI 12-06, section 3.2.1.3 item 9)

049-5. At Time=0 the event is initiated and all rods insert and no other event beyond a common site ELAP is occurring at any or all of the units. (NEI 12-06, section 3.2.1.3 item 9 and 3.2.1.4 item 1-4)

049-6. At {48 minutes} (time critical at a time greater than {1 hour}) an ELAP is declared and actions begin as defined in EA-12-049 compliance

049-7. DC power and distribution can be credited for the duration determined per the EA-12-049 (FLEX) methodology for battery usage, (greater than {12} hours with a calculation limiting value of {14.5} hrs.) (NEI 12-06, section 3.2.1.3 item 8)

049-8. Deployment resources are assumed to begin arriving at hour 6 and fully staffed by 24 hours

049-9. All activities associated with plant specific EA-12-049 FLEX strategies that are not specific to implementation of the HCVS (i.e., HCVS valves, instruments and motive force) can be credited as having been accomplished.

Applicable EA-13-109 generic assumptions:

109-1. Site response activities associated with EA-13-109 actions are considered to have no limitations associated with radiological impacts up to the time that the RPV level is below 2/3 core height (core damage is imminent) when access becomes restricted. For actions that take place after the core is uncovered, evaluations will only be required for elevations above the water level in the RPV or Containment.

109-2. Portable equipment can supplement the installed equipment after 24 hours provided the portable equipment credited meets the criteria applicable to the HCVS. An example is use of FLEX portable air supply equipment that is credited to recharge air lines for HCVS components after 24 hours. The FLEX portable air supply used must be demonstrated to meet the “SA Capable” criteria that are defined in NEI 13-02 Section 4.2.4.2 and Appendix D Section D.1.

109-3. SFP Level is maintained with either on-site or off-site resources such that the SFP does not contribute to the analyzed source term (Reference FAQ HCVS-07)

109-4. 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 (reference FAQ HCVS-05 and NEI 13-02 section 6.2.2).

109-5. Classical design basis evaluations and assumptions are not required when assessing the operation of the HCVS. The reason this is not required is that the order postulates an unsuccessful mitigation of an event such that an ELAP progresses to a severe accident with ex-vessel core debris which classical design basis evaluations are intended to prevent. (Reference NEI 13-02 section 2.3.1).

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109-6. HCVS manual actions that require minimal operator steps and can be performed in the postulated thermal and radiological environment at the location of the step(s) (e.g., load stripping, control switch manipulation, valving-in nitrogen bottles) are acceptable to obtain HCVS venting dedicated functionality. (reference FAQ HCVS-01)

109-7. HCVS dedicated equipment is defined as vent process elements that are required for the

Part 1: General Integrated Plan Elements and Assumptions

HCVS to function in an ELAP event that progresses to core melt ex-vessel. (reference FAQ HCVS-02 and White Paper HCVS-WP-01)

109-8. Use of MAAP Version 4 or higher provides adequate assurance of the plant conditions (e.g., RPV water level, temperatures, etc.) assumed for Order EA-13-109 BDBEE and SA HCVS operation. (reference FLEX MAAP Endorsement ML13190A201) Additional analysis using RELAP5/MOD 3, GOTHIC, PCFLUD, LOCADOSE and SHIELD are acceptable methods for evaluating environmental conditions in areas of the plant provided the specific version utilized is documented in the analysis.

109-9. Utilization of NRC Published Accident evaluations (e.g. SOARCA, SECY-12-0157, and NUREG 1465) as related to Order EA-13-109 conditions are acceptable as references. (reference NEI 13-02 section 8)

109-10. Permanent modifications installed per EA-12-049 are assumed implemented and may be credited for use in EA-13-109 Order response.

109-11. This Overall Integrated Plan is based on Emergency Operating Procedure changes consistent with EPG/SAGs Revision 3 as incorporated per the sites EOP/SAMG procedure change process.

Under the postulated scenarios of order EA-13-109 the Control room is adequately protected from excessive radiation dose per General Design Criterion (GDC) 19 in 10CFR50 Appendix A and no further evaluation of its use as the preferred HCVS control location is required. (reference FAQ HCVS-01) In addition, adequate protective clothing is available if required to address contamination issues.

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Plant Specific HCVS Related Assumptions/Characteristics:

[Plant specific assumptions, particularly related to plant configuration or special design attributes]

PLT-1. {The main stack at Plant PLT can handle the HCVS flow from both units simultaneously. Once outside the reactor building, effluent lines slope downward toward main stack.

PLT-2. All load stripping is accomplished within one hour and fifteen minutes of event initiation and will occur below the core area at locations not impacted by a radiological event.

PLT-3. The rupture disk will be manually breeched within 7.3 hours of event initiation}

Part 2: Boundary Conditions for Wet Well Vent

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

HCVS Actions 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, action to open vent valves).

HCVS Actions that have an environmental constraint (e.g. actions in areas of High Thermal stress or High Dose areas) should be evaluated per guidance.

Describe in detail in this section the technical basis for the constraints identified on the sequence of events timeline attachment.

See attached sequence of events timeline (Attachment 2)

Ref: EA-13-109 Section 1.1.1, 1.1.2, 1.1.3 / NEI 13-02 Section 4.2.5, 4.2.6, 6.1.1

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 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). A HCVS Extended Loss of AC Power (ELAP) Failure Evaluation table, which shows alternate actions that can be performed, is included in Attachment 4.

Table 2-1 HCVS Remote Manual Actions

Primary Action	Primary Location / Component	Notes
1. Isolate Standby Gas Treatment System (SGTS) by closing inlet valve 1/2T48-F081 and outlet isolation valves 1T46-F005 & 2T46-F002A & F002B	Hand switches located in the MCR	or at the Remote Operating Station (ROS), depending on where operator of HCVS is stationed
2. Disable PCIV interlocks by Installing electrical jumpers for PCIVs (ref. Procedures 31EO-EOP-101-1 and 31EO-EOP-101-2	Panels in MCR containing PCIV interlocks	
3.		
4. Confirm closed HCVS condensate drain valve 2T48-F085	Hand switch located in the MCR for condensate drain valve	Unit 2 only. Unit 1 N/A And at ROS panel
5. Breach the rupture disk by opening the argon cylinder valve & valve 1/2T48-F407	Manual hand wheels for valves at the argon bottle and at the piping at the argon bottle station	Not required during SA event Only required if performing early venting for FLEX
6. Close argon cylinder valve &	Manual hand wheels for valves	Not required during

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Deleted: or at the Remote Operating Station (ROS), depending on where operator of HCVS is stationed

Deleted: Open HCVS condensate drain valve 2T48-F085 to remove condensate from the HCVS piping.

Deleted: Hand switch located in the MCR and at Remote Operating Station (ROS) panel for condensate drain valve

Deleted: Unit 2 only.¶
Unit 1 N/A¶

Deleted: and ROS panel

Part 2: Boundary Conditions for Wet Well Vent

valve ½T48-F407	at the argon bottle and at the piping at the argon bottle station	SA event Only required if performing early venting for FLEX
7. Open Wetwell PCIVs 1/2T48-F318 & ½T48-F326	Hand switches located in the MCR panel	And at ROS
8. Open HCVS vent control valve ½T48-F082	Hand switch for valve in the MCR	And at ROS
9. Align power supplies for all valves and instruments via Inverters 1/2R44-S006 & ½R44-S007.	Instruments and controls located in the MCR	Prior to depletion of station batteries, actions will be required to swap to dedicated HCVS power supply. And at ROS
10. Replenish pneumatics with replaceable nitrogen bottles	Nitrogen bottles will be located in an area that is accessible to operators, preferable near the ROS.	Prior to depletion of the pneumatic sources actions will be required to connect back-up sources at a time greater than 24 hours.
11. Re-align power supplies for all valves and instruments via Inverters ½R44-S006 & ½R44-S007.	Instruments and controls located in the MCR	Prior to depletion of the installed power sources actions will be required to connect back-up sources at a time greater than 24 hours. And at ROS

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A timeline was developed to identify required operator response times and potential environmental constraints. This timeline is based upon the following three cases:

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1. Case 1 is a based upon the action response times developed for FLEX when utilizing anticipatory venting in a BDBEE without core damage.
2. Case 2 is based on a SECY-12-0157 long term station blackout (LTSBO) (or ELAP) with failure of RCIC after a black start where failure occurs because of subjectively assuming over injection.
3. Case 3 is based on NUREG-1935 (SOARCA) results for a prolonged SBO (or ELAP) with the loss of RCIC case without black start.

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Discussion of time constraints identified in Attachment 2 for the 3 timeline cases identified above

Part 2: Boundary Conditions for Wet Well Vent

- XX Hours, Initiate use of Hardened Containment Vent System (HCVS) per site procedures to maintain containment parameters below design limits and within the limits that allow continued use of RCIC - The reliable operation of HCVS will be met because HCVS meets the seismic requirements identified in NEI 13-02 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 Diesel Generator (DG) can provide power before battery life is exhausted. Thus initiation of the HCVS from the MCR or the Remote Operating Station within XX hours is acceptable because the actions can be performed any time after declaration of an ELAP until the venting is needed at XX hours for BDBEE venting. This action can also be performed for SA HCVS operation which occur at a time further removed from an ELAP declaration as shown in Attachment 2.
- 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. This can be performed at any time prior to 24 hours to ensure adequate capacity is maintained so this time constraint is not limiting.
- 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 - Time critical after ZZ hours. Current battery durations are calculated to last greater than 24 hours. DG will be staged beginning at approximately {8-10 hour time frame (Reference FLEX OIP). 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. DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards. Modifications to will be implemented to facilitate the connections and operational actions required to supply power within {XX} hours which is acceptable because the actions can be performed any time after declaration of an ELAP until the repowering is needed at greater than 24 hours.
- *[Site Specific actions that are time critical for HCVS initiation]*

Discussion of radiological and temperature constraints identified in Attachment 2

- {XX Hours, Operators override the ……
- At ZZ hours, based on battery depletion, power supply will be swapped from station batteries to dedicated HCVS batteries to ensure power to the inverters. Access to the transfer switch will be in the control building.}
- At >24 hours, {installed nitrogen bottles will be valved-in to supplement the} air {accumulator} supply as stated for the related time constraint item. {Nitrogen bottles will be located in an area that is accessible to operators, preferable near the ROS.}

Part 2: Boundary Conditions for Wet Well Vent

- At >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 - Time critical after {XX} 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 Y). Within Two (2) hours of deployment 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. The connections, location of the DG and access for refueling will be located in an area that is accessible to operators {in the Control Building or in the yard area because the HCVS vent pipe is underground once it leaves the Reactor Building.}

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, Primary Containment Pressure Limit (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 pressurization capacity, 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 and any shielding that would be required in the area. This can be a qualitative assessment based on criteria in NEI 13-02.

Hydrogen (EA-13-109 Section 1.2.10, 1.2.11, 1.2.12 / NEI 13-02 Section 2.3,2.4, 4.1.1, 4.1.6, 4.1.7, 5.1, &

Part 2: Boundary Conditions for Wet Well Vent

Appendix H)
State which approach or combination of approaches the plant will 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 limit leakage through interfacing valves or Appendix J type testing features?

Prevention of Inadvertent Actuation (EA-13-109 Section 1.2.7/NEI 13-02 Section 4.2.1)
The HCVS shall include means to prevent inadvertent actuation

Component Qualifications (EA-13-109 Section 2.1 / NEI 13-02 Section 5.1, 5.3)
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/NEI 13-02 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. Power for an instrument will require the intrinsically safe equipment installed as part of the power sourcing

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

Part 2: Boundary Conditions for Wet Well Vent

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 greater *{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.]* *[If not CLTP then add]* *{The thermal power assumes a power uprate of XX% above the currently licensed thermal power of YYYY MWt.}* 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 provides adequate capacity to meet or exceed the Order criteria.

Vent Capacity

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

{[Open Item -1:] Confirm suppression pool heat capacity}

Vent Path and Discharge

{Existing} HCVS vent path at {Plant Name will consist(s)} of a {wetwell and drywell vent on each unit. The drywell vent exits the Primary Containment into the Reactor Building and proceeds down to the torus bay. Wetwell and drywell vent piping merges into a common header in the torus bay. Vent path for both wetwell and drywell exits the reactor building through an underground pipe. This pipe travels approximately 500 feet from both units and combines in a mixing chamber at the base of the main stack. All effluents exit out the main stack.}

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 *[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*

Part 2: Boundary Conditions for Wet Well Vent

methods in the calculations. Examples could be specific details from the sites FSAR.](reference FAQ HCVS-04)

Power and Pneumatic Supply Sources

All electrical power required for operation of HCVS components will be routed through {two Inverters, one for each electrical division. These inverters will be sized at 7.5 kW each and will convert DC power from installed batteries into AC power for the end users (instruments, solenoid valves, etc.).} Battery power will be provided by {the existing station service batteries for the first 12 hours following the ELAP event. At about 12 hours, power will be transferred to dedicated batteries that will supply power for an additional 12 hours.} At 24 hours, power will transfer {back to the station batteries, at which time it is expected that FLEX generators will be in service to recharge station batteries.} Pneumatic power is normally provided by {the non-interruptible air system with backup nitrogen provided from installed nitrogen supply tanks. Following an ELAP event, station air system is lost, and normal backup from installed nitrogen supply tanks is isolated. Therefore, for the first 24 hours, pneumatic force will be supplied from newly installed air accumulator tanks. These tanks will supply the required motive force to those HCVS valves needed to maintain flow through the HCVS effluent piping.}

1. The HCVS flow path valves are *{air-operated valves (AOV) with air-to-open and spring-to-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 *{XX}* valve operating cycles for the HCVS valves for the first 24-hours
2. An assessment of temperature and radiological conditions *{has been / will be}* performed to ensure that operating personnel can safely access and operate controls at the {Remote Operating Station} based on time constraints listed in Attachment 2. *[controls not in the MCR]*
3. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during an ELAP (i.e., electric power, N2/air) [*are / will be*] located in areas reasonably protected from defined hazards listed in Part 1 of this report.
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 hand wheel, reach–rod or similar means that requires close proximity to the valve (reference FAQ HCVS-03). *[Describe how you are ensuring accessibility for radiological and environmental 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.

   [If the design provides any additional design features, add the information.]
6. {Following the initial 24 hour period, additional motive force will be supplied from nitrogen bottles that will be staged at a gas cylinder rack located (near the ROS in the control building or outside) such that radiological impacts are not an issue. Additional bottles can be brought

Part 2: Boundary Conditions for Wet Well Vent

in as needed.}

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-01 in the response].*

Hydrogen

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

[Response if dedicated containment isolation valves are used] {The HCVS uses 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. A containment isolation signal will automatically de-energize the SOV causing the AOVs to shut. 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.}

{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. An 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. Specifically:

- *The Containment Purge System control circuit will be used during all "design basis" operating modes including all design basis transients and accidents.*
- *Cross flow exist between the HCVS and the Standby Gas Treatment System (SGTS). Resolution involves evaluation of SGTS isolation valve leakage for both inlet and outlet valves, as both interface with the HCVS. If necessary, these valves will be replaced with leak-tight valves. Testing and maintenance will be performed to ensure that the valves remain leak-tight.*
- *An addition cross-flow avenue exists between the HCVS of the two units at the mixing chamber in the shared Main Stack. With the Main Stack being open to the atmosphere, there is no motive force to push effluent from the mixing chamber back to the plant, thus it is assumed this avenue of cross flow is not a reasonable assumption.*

Prevention of Inadvertent Actuation

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

Part 2: Boundary Conditions for Wet Well Vent

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.]*

- The features that prevent inadvertent actuation at all times are *[site specific list]* {two PCIV's in series powered from different division, a rupture dis key lock switches. 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. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error.}

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]*. HCVS components that directly interface with the pressure boundary will be considered safety related, as the existing system is safety related. The containment system limits the leakage or release of radioactive materials to the environment to prevent offsite exposures from exceeding the guidelines of 10CFR100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material.

Likewise, any electrical or controls component which interfaces with Class 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. Newly installed piping and valves will be seismically qualified to handle the forces associated with the seismic margin earthquake (SME) back to their isolation boundaries. Electrical and controls components will be seismically qualified and will include the ability to handle harsh environmental conditions (although they will not be considered part of the site Environmental Qualification (EQ) program).

HCVS instrumentation accuracy qualifications need only be gross values since relative accuracy is not required. HCVS instrumentation performance will be governed by similar plant installed equipment. HCVS performance and accuracy qualifications will utilize ISA Industry standards for types of instruments chosen,

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

Part 2: Boundary Conditions for Wet Well Vent

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]*

Monitoring of HCVS

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

The wetwell HCVS will include means to monitor the status of the vent system in both the MCR and the ROS. {Included in the current design of the reliable hardened vent (RHV) are control switches in the MCR with valve position indication. The existing RHV controls currently meet the environmental and seismic requirements of the Order for the plant severe accident and will be upgraded to address ELAP. The ability to open/close these valves multiple times during the event's first 24 hours will be provided by air accumulator tanks and station service batteries, supplemented by installed backup battery power sources.} Beyond the first 24 hours, the ability to maintain these valves open or closed will be provided with {replaceable nitrogen bottles and FLEX generators.}

The wetwell HCVS will include indications for vent pipe pressure, temperature, and effluent radiation levels at {both the MCR and ROS}. Other important information on the status of supporting systems, {such as power source status and pneumatic supply pressure, will also be included in the design and located to support HCVS operation.} The wetwell HCVS includes existing containment pressure and wetwell level indication in the MCR to monitor vent operation. This monitoring instrumentation provides the indication from the MCR as per Requirement 1.2.4 and will be designed for sustained operation during an ELAP event.

Deleted: 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:¶
- <#>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.¶
- <#>Demonstration of seismic reliability via methods that predict performance described in IEEE 344-2004¶
- <#>Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified. ¶

¶
Instrument ...

Part 2: Boundary Conditions for Wet Well Vent

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.

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

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

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

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

- demonstration of seismic motion will be consistent with that of existing design basis loads at the installed location;
- substantial history of operational reliability in environments with significant vibration with a design envelope inclusive of the effects of seismic motion imparted to the instruments proposed at the location;
- adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations*, (Reference xxx) or a substantially similar industrial standard;
- demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
- seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

Part 2 Boundary Conditions for WW Vent: **BDBEE Venting**
Determine venting capability for BDBEE Venting, such as may be used in an ELAP scenario to mitigate core damage. **Ref: EA-13-109 Section 1.1.4 / NEI 13-02 Section 2.2**
First 24 Hour Coping Detail *Provide a general description of the venting actions for first 24 hours using installed equipment including station modifications that are proposed.* **Ref: EA-13-109 Section 1.2.6 / NEI 13-02 Section 2.5, 4.2.2**

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 part 1 of this OIP. Immediate operator actions can be completed by Operators from the HCVS control station(s) and include remote-manual initiation. The operator actions required to open a vent path are as described in table 2-1.

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 the guiding procedural protocol.

The HCVS {has been / will be} designed to allow initiation, control, and monitoring of venting from {the Main Control Room (MCR) / or specify the alternate location}. This location minimizes plant operators' exposure to adverse temperature and radiological conditions and is protected from hazards assumed in Part 1 of this report.

Permanently installed power and motive air/gas capability will be available to support operation and monitoring of the HCVS for {24 / x} hours. Permanently installed equipment will supply air and power to HCVS for 24 hours.

System control:

i. Active: {Control valves and/or PCIVs} are operated in accordance with EOPs/SOPs to control containment pressure. The HCVS {will be / is} designed for {#} open/close cycles under ELAP conditions over the first 24 hours following an ELAP. Controlled venting will be permitted in the revised EPG {add specific site details if available} {e.g., jumpers will be used to override the containment isolation circuit on the PCIVs needed to vent containment.}

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}

Part 2 Boundary Conditions for WW Vent**: BDBEE Venting**
Greater Than 24 Hour Coping Detail *Provide a general description of the venting actions for greater than 24 hours using portable and installed equipment including station modifications that are proposed.* **Ref: EA-13-109 Section 1.2.4, 1.2.8 / NEI 13-02 Section 4.2.2**
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 for HCVS initiation and operation. 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.]* 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.
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Primary Containment Control Flowchart exists to direct operations in protection and control of containment integrity, {including use of the existing Hardened Vent System}. Other site procedures for venting containment using the HCVS include: {31EO-TSG-001-0, Technical Support Guidelines; 31EO-EOP-101-1/2, Emergency Containment Venting; 31EO-EOP-104-1/2, Primary Containment Venting for Hydrogen and Oxygen Control.}
Identify modifications*:* *List modifications and describe how they support the HCVS Actions.*
EA-12-049 Modifications • DCPs SNC467474 and SNC476661 will provide the Inverters that will convert station battery DC power into AC power for use by the end-users needed for HCVS operation. • DCPs SNC440278 and SNC539300 will provide both the air accumulators and the nitrogen bottles needed for pneumatic support of the HCVS air actuators for the first 72 hours following an ELAP event. It will install the means to manually burst the rupture disk in the HCVS header to allow for flow. • DCP SNC469007 will provide forced ventilation to MCR for operator habitability and HCVS equipment controls and instrumentation functionality. EA-13-109 Modifications • A modification will be required to install the dedicated batteries and the disconnect switches

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

needed to supply power to HCVS for the second 12 hours following the ELAP event once station batteries have been depleted.

- A modification will be required to install a Remote Operation Station for both units.
- A modification will be required to install a HCVS Rad Monitor and power supply on each unit.
- A modification will be required for installation of required HCVS instrumentation and controls in the MCR and ROS for both units. Some of this will be completed under FLEX DCPs SNC440278 and SNC539300.
- Additional modifications may be required to system isolation valves, rupture disk/assembly, and existing HCVS piping.

Key Venting Parameters:

List instrumentation credited for this venting actions. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)

Initiation, operation and monitoring of the HCVS venting will rely on the following key parameters and indicators:

Key Parameter	Component Identifier	Indication Location
HCVS Effluent temperature	TBD	MCR/ROS
HCVS Pneumatic supply pressure	TBD	MCR/ROS
HCVS valve position indication	TBD	MCR/ROS
HCVS system pressure indication	TBD	MCR/ROS
Rupture Disc Pressure	1T48-N030/2T48-N030)	Reactor Building

Initiation, operation and monitoring of the HCVS system will rely on several existing Main Control Room key parameters and indicators which are qualified or evaluated to Reg Guide 1.97 per the existing plant design:

Key Parameter	Component Identifier	Indication Location
Drywell pressure	1/2T48-N023A/B	MCR
Torus pressure		MCR
Torus water temperature		MCR
Torus level	1/2T48-N021A/B	MCR
Reactor pressure		MCR
Drywell radiation		MCR

HCVS indications for HCVS valve position indication, HCVS pneumatic supply pressure, HCVS effluent temperature, and HCVS system pressure will be installed in the MCR to comply with EA-13-109. {All of the indications listed above will be installed at the Remote Operating Station.}

Notes:

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

Part 2 Boundary Conditions for WW Vent: **Severe Accident Venting**

Determine venting capability for Severe Accident Venting, such as may be used in an ELAP scenario to mitigate core damage.

Ref: EA-13-109 Section 1.2.10 / NEI 13-02 Section 2.3

First 24 Hour Coping Detail

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

Ref: EA-13-109 Section 1.2.6 / NEI 13-02 Section 2.5, 4.2.2

The operation of the HCVS will be designed to minimize the reliance on operator actions for response to an ELAP and severe accident events. Severe accident event assumes that specific core cooling actions from the FLEX strategies identified in the response to Order EA-12-049 were not successfully initiated. Access to the reactor building will be restricted as determined by the RPV water level and core damage conditions. Immediate actions will be completed by Operators in the Main Control Room (MCR) or at the HCVS Remote Operating Station (ROS) and will include remote-manual actions {from a local gas cylinder station}. The operator actions required to open a vent path were previously listed in the BDBEE Venting Part 2 section of this report (Table 2-1).

Permanently installed power and motive air/gas capable will be available to support operation and monitoring of the HCVS for 24 hours. Specifics are the same as for BDBEE Venting Part 2.

System control:

i. Active: Same as for BDBEE Venting Part 2.

ii. Passive: Same as for BDBEE Venting Part 2, except {the rupture disk has a burst set pressure which has been determined to be above the maximum inlet header pressure expected during a design basis event. In a severe accident scenario, the pressure from the wet well will be able to burst the rupture disk unassisted, as it will be above the pressure expected during the worst case design basis event.}

Greater Than 24 Hour Coping Detail

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

Ref: EA-13-109 Section 1.2.4, 1.2.8 / NEI 13-02 Section 4.2.2

Specifics are the same as for BDBEE Venting Part 2 except {the location and refueling actions for the FLEX DG and replacement Nitrogen Bottles} will be evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway.

{[OPEN ITEM]: Perform SA Evaluation for FLEX DG use for post 24 hour actions}

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.

Part 2 Boundary Conditions for WW Vent: **Severe Accident Venting**
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
The operation of the HCVS is governed the same for SA conditions as for BDBEE conditions. Existing guidance in the SAMGs directs the plant staff to consider changing radiological conditions in a severe accident.
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
The same as for BDBEE Venting Part 2 {except ….}
Key Venting Parameters: *List instrumentation credited for the HCVS Actions. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
The same as for BDBEE Venting Part 2 {except ….}
Notes:

Part 2 Boundary Conditions for WW Vent: **HCVS Support Equipment Functions**
Determine venting capability support functions needed **Ref: EA-13-109 Section 1.2.8, 1.2.9 / NEI 13-02 Section 2.5, 4.2.4, 6.1.2**
BDBEE Venting *Provide a general description of the BDBEE Venting actions support functions. Identify methods and strategy(ies) utilized to achieve venting results.* **Ref: EA-13-109 Section 1.2.9 / NEI 13-02 Section 2.5, 4.2.2, 4.2.4, 6.1.2**
Containment integrity is initially maintained by permanently installed equipment. All containment venting functions will be performed from the MCR or ROS {except for breaching of the rupture disc for anticipatory venting.} Venting will require support from DC power as well as instrument air systems as detailed in the response to Order EA-12-049. Existing safety related station batteries will provide sufficient electrical power for HCVS operation for greater than {XX} hours. Before station batteries are depleted, portable FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the station batteries and maintain DC bus voltage after {XX} hours. Newly installed accumulator tanks with back-up portable N2 bottles will provide sufficient motive force for all HCVS valve operation and will provide for multiple operations of the {1/2T48-F082} vent valve.
Severe Accident Venting *Provide a general description of the Severe Accident Venting actions support functions. Identify methods and strategy(ies) utilized to achieve venting results.* **Ref: EA-13-109 Section 1.2.8, 1.2.9 / NEI 13-02 Section 2.5, 4.2.2, 4.2.4, 6.1.2**
The same support functions that are used in the BDBEE scenario would be used for severe accident venting. {To ensure power for the 12 to 24 hours, a set of dedicated HCVS batteries will be available to feed HCVS loads via a manual transfer switch.} At 24 hours, power will be {switched back to the station service batteries, which at that point will be backed up by FLEX generators evaluated for SA capability. Nitrogen bottles that will be located outside of the reactor building and in the immediate area of the ROS} will be available to tie-in supplemental pneumatic sources.
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Most of the equipment used in the HCVS is permanently installed. The key portable items are the {SA Capable/FLEX DGs, argon bottles needed to burst the rupture disk and the nitrogen bottles} needed to supplement the air supply to the AOVs after 24 hours. These will be staged in position for the duration of the event.
Identify modifications*:* *List modifications and describe how they support the HCVS Actions.*
Flex modifications applicable to HCVS operation: {main control room vestibule to provide air flow pathway to main control rooms for operator habitability; add connection points and cabling at the control building wall and turbine building (SW Corner) to connect FLEX 600VAC diesel generators to

Part 2 Boundary Conditions for WW Vent: **HCVS Support Equipment Functions**
the 600 VAC Bus C and Bus D to provide power to the battery chargers and critical AC components after 24 hours.} HCVS modification: {add piping and connection points at a suitable location in the control building or outside to connect portable N2 bottles for motive force to HCVS components after 24 hours.}HCVS connections required for portable equipment will be protected from all applicable screened-in hazards and located such that operator exposure to radiation and occupational hazards will be minimized. Structures to provide protection of the HCVS connections will be constructed to meet the requirements identified in NEI-12-06 section 11 for screened in hazards.
Key Support Equipment Parameters: *List instrumentation credited for the support equipment utilized in the venting operation. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
Local control features of the FLEX DG electrical load and fuel supply. Pressure gauge on supplemental Nitrogen bottles.
Notes:

Part 2 Boundary Conditions for WW Vent: **HCVS Venting Portable Equipment Deployment**		
Provide a general description of the venting actions using portable equipment including modifications that are proposed to maintain and/or support safety functions. **Ref: EA-13-109 Section 3.1 / NEI 13-02 Section 6.1.2, D.1.3.1**		
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.		
Details:		
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*		
Operation of the portable equipment is the same as for compliance with Order EA-12-049 thus they are acceptable without further evaluation		
HCVS Actions	**Modifications**	**Protection of connections**
Identify Actions including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Per compliance with Order EA-12-049 (FLEX)	N/A	Per compliance with Order EA-12-049 (FLEX)
Notes:		

Part 3: Boundary Conditions for Dry Well Vent

Provide a sequence of events and identify any time constraint required for success including the basis for the time constraint.
HCVS Actions 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 venting capability for Severe Accident Venting, such as may be used in an ELAP 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 actions 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 actions 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 / Guidelines:
Confirm that procedure/guidance exists or will be developed to support implementation.

Identify modifications*:*
List modifications and describe how they support the HCVS Actions.

Part 3: Boundary Conditions for Dry Well Vent
Key Venting Parameters: *List instrumentation credited for the venting HCVS Actions.*
Notes:

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 3.1, 3.2 / NEI 13-02 Section 6.1.2, 6.1.3, 6.2

Program Controls:

The HCVS venting actions will include:

- Site procedures and programs are being developed in accordance with NEI 13-02 to address use and storage of portable equipment relative to the Severe Accident defined in NRC Order EA-13-109 and the hazards applicable to the site per Part 1 of this OIP.
- Routes for transporting portable equipment from storage location(s) to deployment areas will be developed as the response details are identified and finalized. The identified paths and deployment areas will be accessible during all modes of operation and during Severe Accidents.

Procedures:

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

The HCVS procedures will be developed and implemented following the 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 ECCS pump(s) 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 *{Site Specific control document}*:

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

- If for up to 90 consecutive days, the primary or alternate means of HCVS operation are 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,

Part 4: Programmatic Controls, Training, Drills and Maintenance

- 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

Describe training plan

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

Ref: EA-13-109 Section 3.2 / NEI 13-02 Section 6.1.3

Personnel expected to perform direct execution of the HVCS will receive necessary training in the use of plant procedures for system operations when normal and backup power is available and during ELAP conditions. The training will be refreshed on a periodic basis and as any changes occur to the HCVS. Training content and frequency will be established using the Systematic Approach to Training (SAT) process.

In addition, (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 of the HCVS system in drills, tabletops, or exercises 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 3.1 / NEI 13-02 Section 6.1.3

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, expected use and manufacturer's recommendations (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.

Part 4: Programmatic Controls, Training, Drills and Maintenance

- 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 1.2.13 / NEI 13-02 Section 5.4, 6.2

The site will utilize the standard EPRI 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.

{Site Name} will implement the following operation, testing and inspection requirements for the HCVS to ensure reliable operation of the system.

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

Notes:

Part 5: Milestone Schedule

Provide a milestone schedule. This schedule should include:

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

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 D.1, D.3 / NEI 13-02 Section 7.2.1

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	Jun, 2014	Complete	
Submit Overall Integrated Implementation Plan	Jun 2014	Complete	
Submit 6 Month Status Report	Dec. 2014		
Submit 6 Month Status Report	Jun. 2015		
Submit 6 Month Status Report	Dec. 2015		Simultaneous with Phase 2 OIP
U2 Design Engineering On-site/Complete	Mar, 2016		
Submit 6 Month Status Report	Jun. 2016		
Operations Procedure Changes Developed	Dec, 2016		
Site Specific Maintenance Procedure Developed	Dec, 2016		
Submit 6 Month Status Report	Dec. 2016		
Training Complete	Dec, 2016		
U2 Implementation Outage	Feb, 2017		
Procedure Changes Active	Mar, 2017		
U2 Walk Through Demonstration/Functional Test	Mar, 2017		
U1 Design Engineering On-site/Complete	Mar, 2017		
Submit 6 Month Status Report	Jun. 2017		
Submit 6 Month Status Report	Dec. 2017		
U1 Implementation Outage	Feb, 2018		
U1 Walk Through Demonstration/Functional Test	Mar, 2018		
Submit Completion Report	May, 2018		

Attachment 1: HCVS Portable Equipment

List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*
Argon Cylinders	**X**		**N/A**	**Check periodically for pressure, replace or replenish as needed**
Nitrogen Cylinders	**X**	**X**	**TBD**	**Check periodically for pressure, replace or replenish as needed**
FLEX DG	**X**	**X**	**TBD**	**Per Response to EA-12-049**

Attachment 2: Sequence of Events Timeline

{insert site specific time line to support submittal}

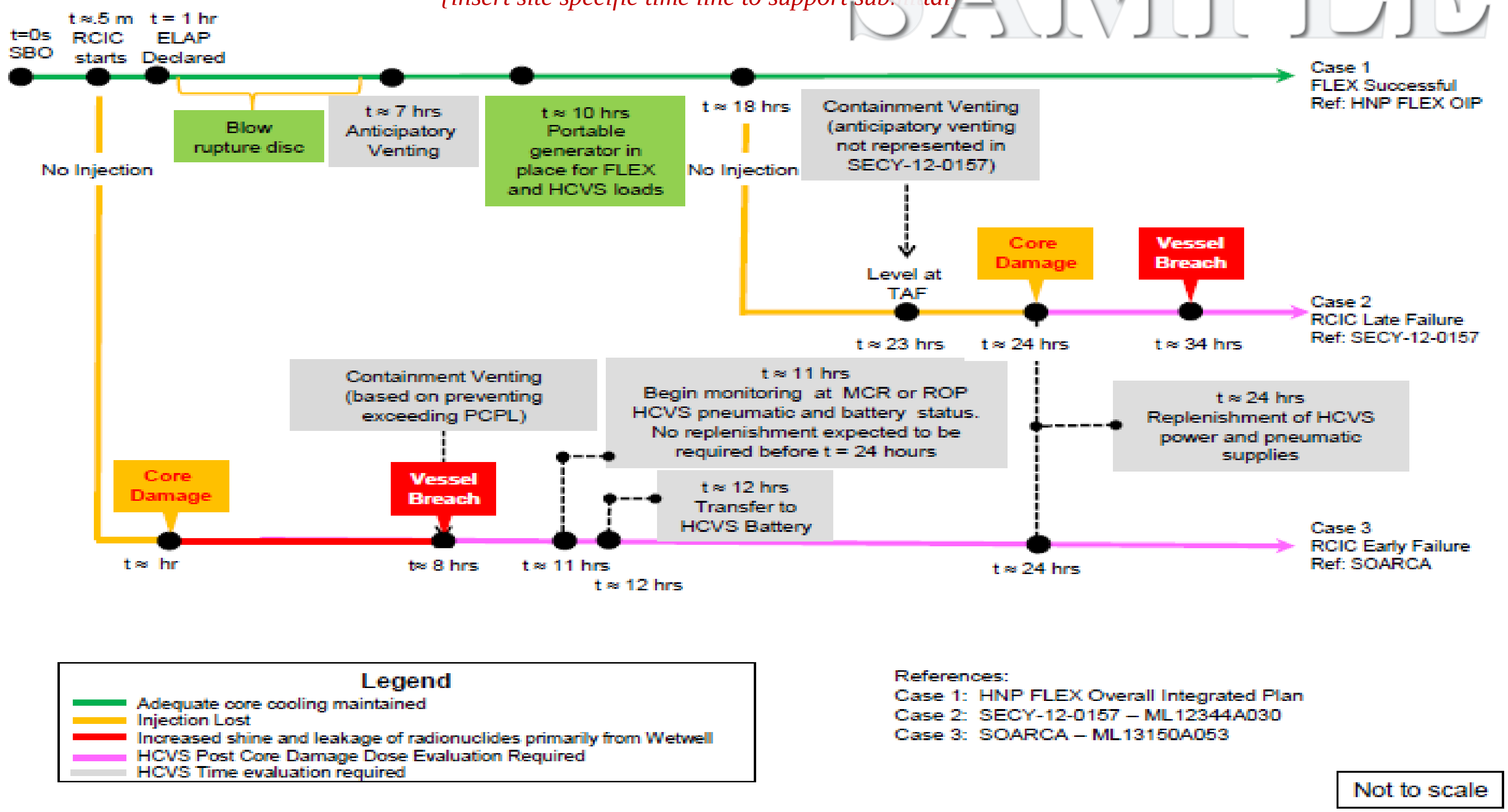


Table 2A: Wet Well HCVS Timeline

Attachment 3: Conceptual Sketches

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

- 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.
-

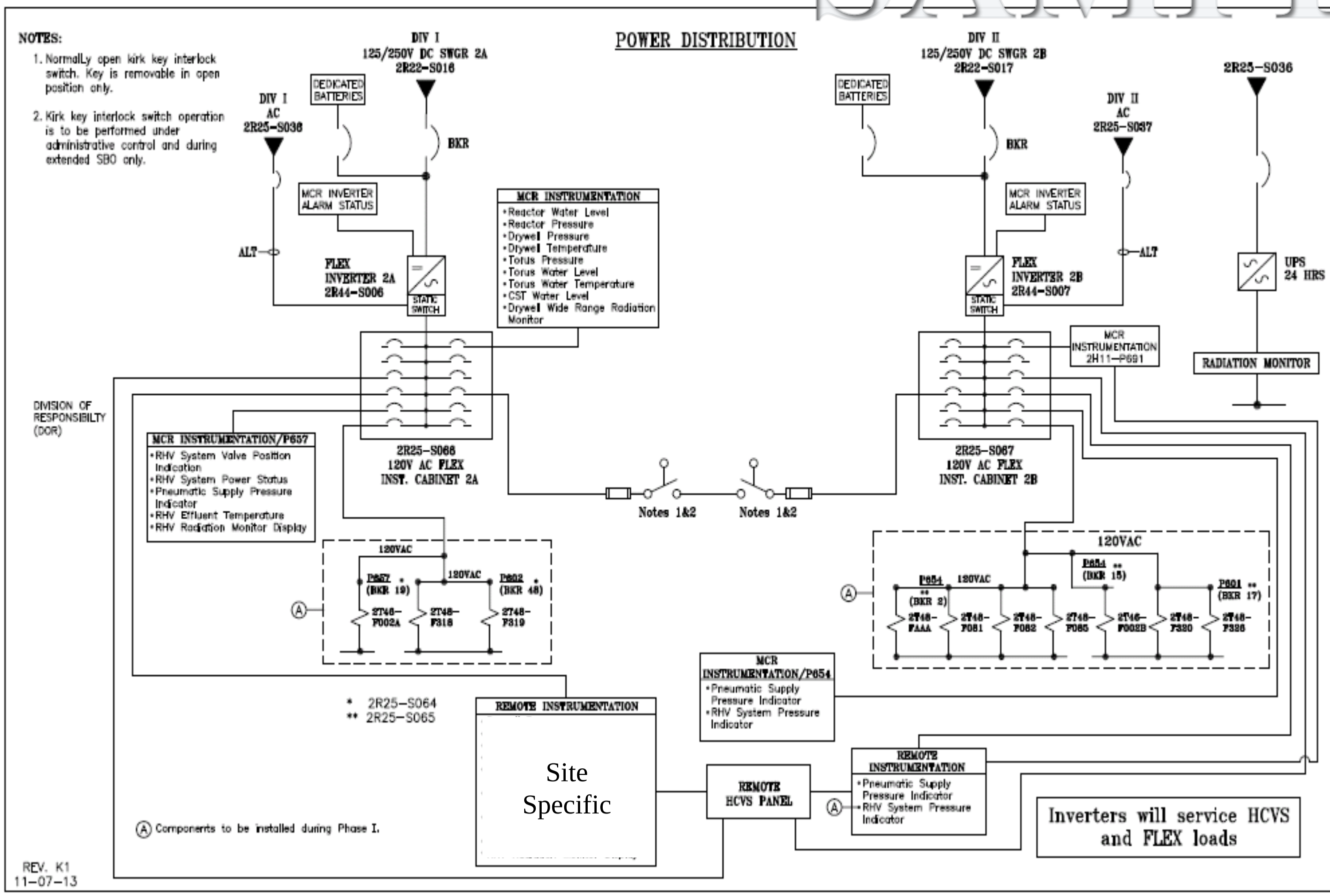
Sketch 1: Electrical Layout of System *(preliminary)*

Sketch 2: P&ID Layout of HCVS *(preliminary)*

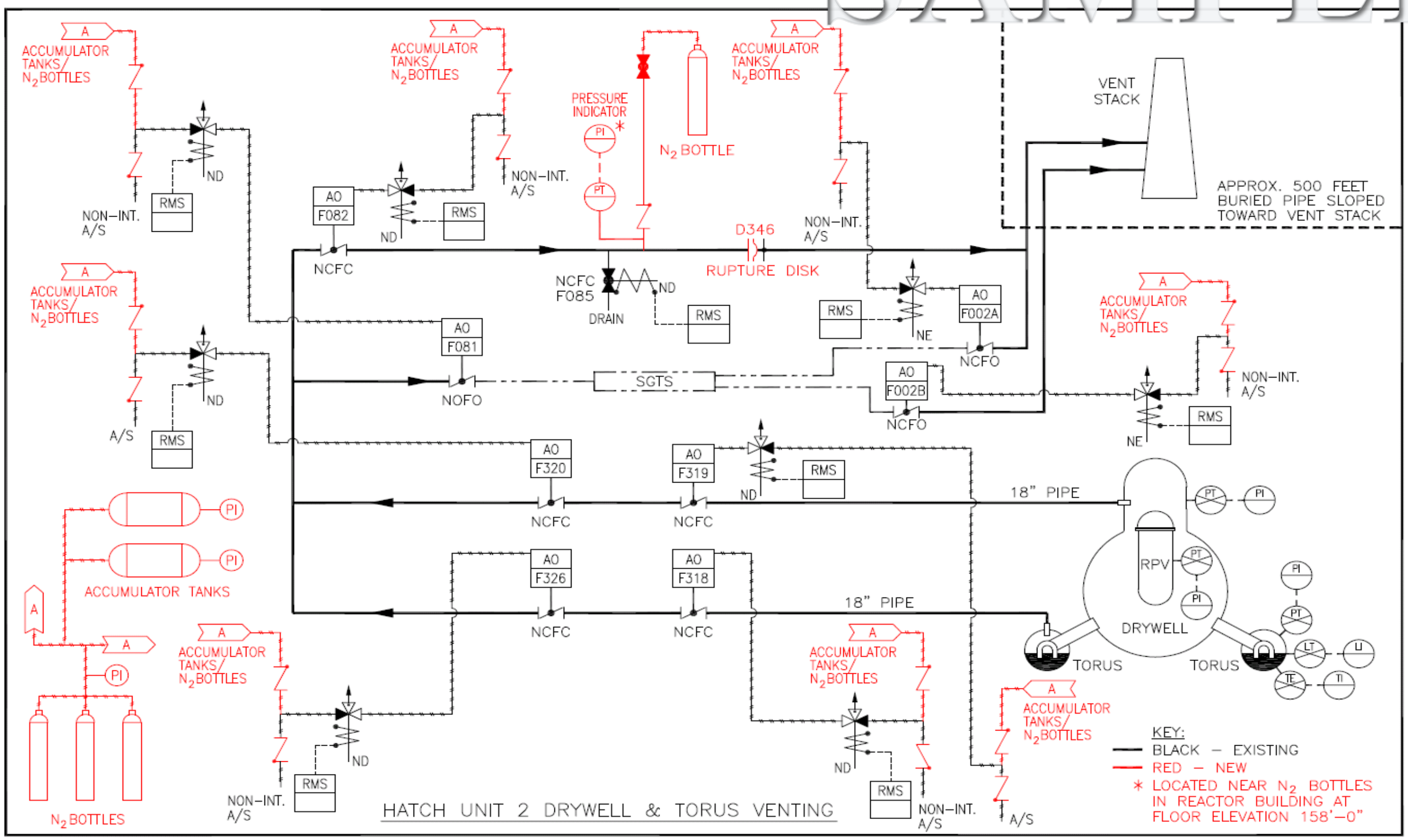
- **Piping routing for vent path**
- **Demarcate the valves (in the vent piping) between the currently existing and new ones**
- **HCVS Instrumentation Process Flow Diagram**

Sketch 3: Plant Layout *(later)*

- **Egress and Ingress Pathways to ROS, Battery Transfer Switch, DG Connections and Deployment location**



Sketch 1: Electrical Layout of System (Unit 2, Unit 1 similar)



Sketch 2: Layout of current HCVS, Unit 2 (Unit 1 similar)

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?
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal AC power	No action needed, power is already tied into station service battery via inverter for minimum 12 hours	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of alternate AC power (long term)	Connect dedicated batteries to inverter via transfer switch for minimum 12 hours	No
Failure of Vent to Open on Demand	Valves fail to open/close due to complete loss of batteries (long term)	Recharge station service batteries with FLEX provided generators, considering severe accident conditions	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal pneumatic air supply	No action needed, air can be supplied by accumulator tanks, which is sufficient for at least 12 cycles of F082 valve over first 24 hours.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of alternate pneumatic air supply (long term)	Tie-in nitrogen cylinders to air system supporting HCVS valves, replace bottles as needed.	No

Failure of Vent to Open on Demand	Valves fail to open/close due to SOV failure	Heroic action needed	Yes

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Attachment 5: References

1. Generic Letter 89-16, Installation of a Hardened Wetwell Vent, dated September 1, 1989
2. Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
3. Order EA-12-050, Reliable Hardened Containment Vents, dated March 12, 2012
4. Order EA-12-051, Reliable SFP Level Instrumentation, dated March 12, 2012
5. Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated June 6, 2013
6. JLD-ISG-2012-01, Compliance with Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated August 29, 2012
7. JLD-ISG-2012-02, Compliance with Order EA-12-050, Reliable Hardened Containment Vents, dated August 29, 2012
8. JLD-ISG-2013-02, Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated November 14, 2013
9. 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
10. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 1, dated August 2012
11. NEI 13-02, Industry Guidance for Compliance with Order EA–13–109, Revision 0, Dated November 2013
12. NEI 13-06, Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents and Events, Revision 0, dated March 2014
13. NEI 14-01, Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents, Revision 0, dated March 2014
14. NEI FAQ HCVS-01, HCVS Primary Controls and Alternate Controls and Monitoring Locations
15. NEI FAQ HCVS-02, HCVS Dedicated Equipment
16. NEI FAQ HCVS-03, HCVS Alternate Control Operating Mechanisms
17. NEI FAQ HCVS-04, HCVS Release Point
18. NEI FAQ HCVS-05, HCVS Control and ‘Boundary Valves’
19. NEI FAQ HCVS-06, FLEX Assumptions/HCVS Generic Assumptions
20. NEI FAQ HCVS-07, Consideration of Release from Spent Fuel Pool Anomalies
21. NEI FAQ HCVS-08, HCVS Instrument Qualifications
22. NEI FAQ HCVS-09, Use of Toolbox Actions for Personnel
23. NEI White Paper HCVS-WP-01, HCVS Dedicated Power and Motive Force
24. NEI White Paper HCVS-WP-02, HCVS Cyclic Operations Approach
25. NEI White Paper HCVS-WP-03, Hydrogen/CO Control Measures

26. NEI White Paper HCVS-WP-04, FLEX/HCVS Interactions

27. IEEE Standard 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power *Generating Stations*,

28. {Plant Site} EA-12-049 (FLEX) Overall Integrated Implementation Plan, Rev 0, February 2013
29. {Plant Site} EA-12-050 (HCVS) Overall Integrated Implementation Plan, Rev 0, February 2013
30. {Plant Site} EA-12-051 (SFP LI) Overall Integrated Implementation Plan, Rev 0, February 2013
31.

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

Attachment 7: List of Overall Integrated Plan Open Items

Open Item	Action	Comment
1	Confirm suppression pool heat capacity	
2	Evaluate location of Portable DG for accessibility under Severe Accident HCVS use	Confirmatory action