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June 30, 2014
GO2-14-107

EA-13-109

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 ENERGY NORTHWEST'S PHASE 1 RESPONSE TO NRC ORDER EA-13-109 – OVERALL INTEGRATED PLAN FOR RELIABLE HARDENED CONTAINMENT VENTS UNDER SEVERE ACCIDENT CONDITIONS**

References:
1. NRC Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," March 12, 2012
2. NRC Order EA-13-109, "Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," June 6, 2013

Dear Sir or Madam,

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Order EA-12-050, (Reference 1) which directed Energy Northwest's Columbia Generating Station (Columbia) to have a reliable hardened vent to remove decay heat and maintain control of containment pressure within acceptable limits following events that result in the loss of active containment heat removal capability or prolonged Station Blackout.

On June 6, 2013, the NRC issued Order EA-13-109; (Reference 2) which rescinded the requirements imposed in Section IV and Attachment 2 of Order EA-12-050 and replaced them with the requirements contained in Section IV and Attachment 2 of Order EA-13-109. Order EA-13-109, Section IV, D.1 requires all licensees to submit an overall integrated plan (OIP) including a description of how compliance with the Phase 1 requirements described in Attachment 1 of the Order will be achieved.

For the purpose of compliance with Phase 1 of NRC Order EA-13-109, Energy Northwest plans to install a severe accident capable wetwell vent at Columbia.

~~SECURITY-RELATED INFORMATION - WITHHOLD FROM PUBLIC DISCLOSURE~~ IN ACCORDANCE WITH 10 CFR 2.390. ATTACHMENT 2 TO THIS LETTER CONTAINS SECURITY-RELATED INFORMATION. UPON REMOVAL OF ATTACHMENT 2, THIS LETTER AND ATTACHMENT 1 ARE UNCONTROLLED.

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The attachment to this letter contains Energy Northwest's current OIP for Columbia and a description of how the requirements described in Attachment 1 of the Order will be achieved. The Phase 2 plan is not discussed and will be submitted by December 31, 2015, as required by NRC Order EA-13-109.

Compliance with Reference 2 will supersede any and all actions or commitments associated with Reference 1. Any significant changes to the Phase 1 OIP will be communicated to the NRC staff in subsequent six-month status reports.

Energy Northwest has determined that this submittal contains some information that should not be made publicly available. Energy Northwest requests that Attachment 2 to this submittal be withheld from public disclosure in accordance with 10 CFR 2.390(d)(1).

There are no new or revised regulatory commitments contained in this letter. If you have any questions or require additional information, please contact Ms. L. L. Williams at (509) 377-8148.

On the date of this letter, I declare under penalty of perjury that the foregoing is true and correct.

Respectfully,

D. A. Swank
Assistant Vice President, Engineering

Attachments 1. Phase 1 Overall Integrated Plan for Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions (with redacted Sketch 2)
2. Sketch 2, Security Related Information - Withhold Under 10 CFR 2.390

cc: NRC Region IV Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
M. A. Jones – BPA/1399 (email)

ENERGY NORTHWEST

COLUMBIA GENERATING STATION
RICHLAND, WASHINGTON

Phase 1 Overall Integrated Plan for Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions

June 2014, Revision 0

Table of Contents:

Introduction

In 1989, the Nuclear Regulatory Commission (NRC) issued Generic Letter (GL) 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 (WW) vent. In response, licensees installed a hardened vent pipe from the WW 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 (DW). Columbia Generating Station's containment is a Mark II and was not affected by this GL.

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 (Reference 3) 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 (Reference 5). 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 WW 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) (Reference 8) 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 (OIP) which will provide a description of how the requirements of the Order will be achieved. This document provides the 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 Hardened Containment Vent System (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 plant conditions from 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 and effluent temperature, pressure, and 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 Columbia Generating Station (Columbia) with no known deviations to the guidelines in JLD-ISG-2013-02 and NEI 13-02 for each phase as follows:

- Phase 1 (WW): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for 2Q2017.
- Phase 2 (DW): Information to be added by December 30, 2015.

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 Columbia:

- Seismic, Extreme Cold, Extreme High Temperature, and Volcanic Hazards.

The following extreme external hazards screen out for Columbia:

- Tornados and Hurricanes - NEI 12-06 Section 7.2.1 contains a screening process to identify whether sites should address high wind hazards as a result of hurricanes and tornados. FSAR 2.1.1.1 states that the reactor is located at 46° 28' 18" North latitude and 119° 19' 58" West longitude. Using NEI 12-06 Figures 7-1 and 7-2, Columbia screens out for both hurricanes and tornados. However, NEI 12-06, Figure 7-2 also indicates the recommended tornado design wind speed for Columbia is 127 mph. NEI 12-06, Section 7.2.1 indicates that plants with tornado wind speeds of less than 130 mph do not need to address tornado hazards (e.g. missile impact) impacting FLEX deployment. Therefore, Columbia screens out for tornado missile impact.
- External Flooding - The current licensing basis identifies Columbia as a dry site. However, a flooding analysis incorporating updated dam failure and rainfall information is in progress and has not been completed.

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:

<u>Applicable EA-12-049 assumptions:</u>

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, and 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, and 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. (Reference 10, 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 site ELAP is occurring. (Reference 10, Section 3.2.1.3, Item 9 and Section 3.2.1.4, Items 1-4).

049-6. At 45 minutes an ELAP is declared and actions begin as defined in EA-12-049 compliance. Power for the HCVS is independent of the station batteries. Therefore, this is not time critical for the HCVS.

049-7. The HCVS is independent from the DC power and distribution that can be credited for the duration determined per the EA-12-049, *Diverse and Flexible Coping Strategies (FLEX)*, methodology for battery usage (Reference 10, Section 3.2.1.3, and 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, including such items as debris removal, communication, notifications, spent fuel pool (SFP) level and makeup, security response, opening doors for cooling, and initiating conditions for the event, can be credited as previously evaluated for FLEX.

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

109-1. Site response activities associated with EA-13-109 actions are considered to have no access limitations associated with radiological impacts while reactor pressure vessel (RPV) level is above 2/3 core height (core damage is not expected).

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 "Severe Accident Capable" criteria that are defined in NEI 13-02.

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 20, HCVS-FAQ-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 18, HCVS-FAQ-05 and Reference 11, 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 11, Section 2.3.1)

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 14, HCVS-FAQ-01)

109-7. 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 15, HCVS-FAQ-02 and Reference 23, 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, Beyond Design Bases External Event (BDBEE) and Severe Accident HCVS operation. (Reference 31, 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 11, 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 OIP is based on Emergency Operating Procedure (EOP) changes consistent with the implementing Boiling Water Reactor Owner's Group Emergency Procedure Guidelines (EPG)/Severe Accident Guidelines (SAG) Revision 3, in accordance with the EOP/SAG procedure change process.

109-12. Under the postulated scenarios of order EA-13-109, the MCR is adequately protected from excessive radiation dose per General Design Criterion (GDC) 19 in 10 CFR 50 Appendix A and no further evaluation of its use as the preferred HCVS control location is required. (Reference 14, HCVS-FAQ-01) In addition, adequate protective clothing and respiratory protection is available if required to address contamination issues.

Plant Specific HCVS Related Assumptions/Characteristics:

PLT-1. The following building descriptions are taken from Columbia's Final Safety Analysis Report (FSAR).

Section 1.1

The containment consists of primary and secondary containment systems. The primary containment structure is a free-standing steel pressure vessel which contains both a drywell and a suppression chamber (wetwell). The secondary containment structure is composed of the reactor building, which completely encloses primary containment.

2.2.3.1 Determination of Design Basis Events

Energy Northwest has investigated the resistance of plant structures to explosions. The reactor building is a reinforced-concrete structure up to the refueling floor and is designed to withstand the worst probable combination of wind velocity and associated pressure drop due to a design basis tornado. A differential pressure of 3 psi between the exterior and interior of the building is also considered in the design.

Section 3.2, Classification of Structures, Components, and Systems

Table 3.2-1 Equipment Classification

46. Buildings	Safety Class	Quality Class	Seismic Category	Notes
Reactor building	2	I	I	
Radwaste/control building	3/G	I, II	I/II	33
Diesel generator building	3	I	I	

Note 33. Those portions of the radwaste and control building that house systems or components necessary for safe shutdown of the reactor are designed to Quality Class I and Seismic Category I requirements. Those portions of the radwaste building housing equipment containing significant quantities of radioactive material are designed to Seismic Category I requirements.

Section 3.2.3.2.1 Definition of Safety Class 2

Safety Class 2 applies to those structures, systems, and components (SSC), other than service water systems, that are not Safety Class 1 but are necessary to accomplish the safety function of

a. Inserting negative reactivity to shut down the reactor,
b. Preventing rapid insertion of positive reactivity,
c. Maintaining core geometry appropriate to all plant process conditions,
d. Providing emergency core cooling,
e. Providing and maintaining containment, and
f. Removing residual heat from the reactor and reactor core.

Section 3.2.3.3.1 Definition of Safety Class 3

Safety Class 3 applies to those SSCs that are not Safety Class 1 nor Safety Class 2 that is relied upon to accomplish a nuclear safety function.

Section 3.2.3.4 General Class G, Structures, Systems, and Components

3.2.3.4.1 Definition of General Class Structures, Systems, and Components

A boiling water reactor (BWR) has a number of SSCs in the power conversion or other portions of the facility which have no direct safety function but which may be connected to or influenced by the equipment within the safety classes defined above. Such SSCs are designated as General Class G. For example, portions of the service water systems, the turbine generator auxiliaries, and portions of the heating, ventilating, and air conditioning (HVAC) systems are designated as having no safety classification.

Section 3.3.2 TORNADO LOADINGS

3.3.2.3 Additional Design Features

Except for the steel superstructure atop the refueling floor, the reactor building remains sealed through the tornado event and a differential pressure of 0.9 psi across the exterior and interior is bounded by the design. All other Seismic Category I structures are provided with adequate openings to relieve a differential pressure of 0.9 psi in 3 seconds or are designed to withstand an external pressure drop of 0.9 psi.

The structural steel frame superstructure atop the refueling floor of the reactor building is designed to withstand the design basis tornado. However, all the siding and roof decking enclosing the steel superstructure is designed for a maximum differential pressure of approximately 0.5 psi. The siding and girts are designed to blow off the steel frame when a differential pressure of approximately 0.5 psi is exceeded. The roof decking and roof purlins are designed to blow off the steel frame when a differential pressure of approximately 0.5 psi is exceeded. This value considers the dead weight loading from the roof membrane, roofing insulation, roof decking, and roof purlins. This is ensured by the use of controlled release type fasteners connecting the girts to the columns and roof purlins to the roof trusses.

The design of the reactor building crane and its support system considers tornado effects in addition to normal loads to eliminate the possibility of generating internal missiles which may endanger the primary and secondary containment structures.

Section 3.5.1.4.1

The reactor building exterior walls, up to the refueling floor at elevation 606 foot 10.5 inches are capable of withstanding the impact of the design basis tornado generated missiles. These exterior walls are constructed of 4 foot thick reinforced concrete to elevation 471 foot 0 inches which is 30 feet above plant finish grade. From elevation 471 foot 0 inches to the refueling floor at elevation 606 foot 10.5 inches, the exposed exterior walls are constructed of reinforced concrete, 18 inch minimum in thickness. The reactor building exterior wall thickness from plant grade to the refueling floor at elevation 606 foot 10.5 inches is adequate to prevent design basis missile penetration and spalling of concrete. The reactor building walls and roof above elevation 606 foot 10.5 inches are constructed of insulated metal siding and insulated metal roof decking erected on a superstructure consisting of a structural steel frame.

The radwaste and control building exposed exterior concrete walls and roofs are designed to withstand the effects of the design-basis tornado-generated missiles. The exterior walls that house safety-related equipment have a minimum thickness of 2 feet.

The diesel generator building is designed to withstand the effects of tornado-generated missiles. The exposed exterior walls of the structure are constructed of reinforced concrete with a minimum thickness of 2 foot 8 inches. The roof has a minimum thickness of 1 foot 6 inches.

The thicknesses of walls and roof are sufficient to withstand the effects of the design-basis tornado-generated missiles.

PLT-2. A Class 1E, 24-V battery system dedicated to the HCVS electrical loads consisting of batteries, a battery charger, 24-V dc distribution panels, wiring, cables and raceways will be installed. Sketch 1 shows the preliminary layout of this system. The batteries will be located in Room C215, the Division 2 Battery Room and the charger will be located in Room C213, the Reactor Protection System Room. Both are located in the radwaste (RW) building and connected to power panel E-PP-8A (Division 2). The battery sizing will sustain operation for a minimum of 24 hours with no operator action. After 24 hours, supplemental power will be available. The hydrogen generation as a result of the addition of these batteries will be addressed.

PLT-3. A dedicated nitrogen bottle rack located in diesel generator (DG) building room D113 will provide the motive force for the air operated valves. The nitrogen supply will sustain operation for a minimum of 24 hours with no operator action and have a provision for the connection of a back-up pneumatic source. After 24 hours, a portable air compressor can be set-up outside the DG building and connected by hose to a fitting in the HCVS nitrogen bottle rack.

PLT-4. Instrumentation equipment will be purchased as Augmented Quality. The equipment will be capable of operating in the thermal and radiological environment for the location of the equipment for at least 7 days without significant operator actions.

PLT-5. Sketch 3 shows the preliminary WW vent line. Valves HCV-V-1, 2 and 7 are pneumatically operated and are normally closed (NC), fail closed (FC) valves. These valves are primary and secondary containment isolation valves and categorized as locked closed (LC) valves. They will have a local hand wheel operator to be used during maintenance which will also be LC. As LC containment isolation valves, they are not required to receive automatic closure signals. The valves will be operated from the MCR using key locked manual switches (NEI 13-02, Section 4.2.1). The solenoid pilot valves (SPV) for these valves will be in a lockable cabinet or cage to control access and are part of the ROS.

The addition of this vent line introduces a potential for a secondary containment bypass leakage path. The resolution of this concern will be addressed in the first 6-month update of the HCVS OIP.

[OPEN ITEM 1:] Provide resolution of the potential secondary containment bypass leakage path in the first 6-month update of the HCVS OIP.

PLT-6. The HCVS batteries will be installed as Class 1E in a Seismic Category I battery rack.

PLT-7. WW piping will be sized to vent 1% of rated thermal power with a 2% uprate to a power of 3556 MWt. The piping will also be sized to support anticipatory venting and pass 80,000 lbm/hr at a maximum pressure of 10 psig in the WW.

PLT-8. The WW vent will exit the reactor building (RB) at approximately 166 feet above plant grade level near the southeast corner of the RB and terminate above the parapet wall. The vent pipe is independent from the existing vent path and is located away from any ventilation system intake and exhaust openings or emergency response facilities.

PLT-9. The Columbia OIP for Mitigating Strategies, Revision 1, dated February 28, 2014, Maintain Containment BWR Installed Equipment Phase 1, identifies that the following essential instrumentation will be available:

Drywell Pressure (CMS-PR-1)

Drywell Temperature (CMS-TI-5)

Suppression Pool (Wetwell) Pressure (CMS-PR-3)

Suppression Pool Level (CMS-LR-3)

Suppression Pool Temperature (SPTM-TI-5)

This section also states that loads on the station batteries will be available for at least 10 hours[1.]

PLT-10. The Columbia OIP for Mitigating Strategies, Revision 1, dated February 28, 2014, General Integrated Plan Elements states:

A MAPP analysis and resulting time line will establish the necessary actions that will be taken to protect containment. (OI-FLEX-09)

GOTHIC calculations will evaluate the effects of a loss of HVAC on the plant response. Areas of the plant requiring access by personnel will be evaluated to ensure conditions will support the actions (OI-FLEX-10)

PLT-11. Sketch 2, Plant Layout, shows the relationship of the venting equipment and pathways in regards to the ROS.

Notes:

1. The Columbia OIP for Mitigating Strategies, Revision 1, dated February 28, 2014, General Integrated Plan Elements Open Items – Sequence of Events states:

   The SBO/ELAP procedure will require all load shed actions to be completed in one-hour. These load shed actions will be validated to ensure they can be completed within this time limit. (OI-FLEX-12) (This OI has been changed because the existing one-hour procedural limit will be maintained. This OI has also been closed because the changed action has been completed.)

Part 2: Boundary Conditions for Wetwell 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. An HCVS 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. Line-up the nitrogen supply to the HCVS by opening valve (# TBD).	Near the ROS /Nitrogen bottle isolation valve.	
2. Open WW PCIVs HCV-V-1 and HCV-V-2.	MCR/Key locked hand switches	Or at ROS
3. Open/Close HCVS SCIV/control valve HCV-V-7 to control containment pressure.	MCR/Key locked hand switches	Or at ROS
4. Replenish pneumatics.	Near the ROS/Attach an airline from a portable air compressor to the installed fitting Replacement nitrogen bottles can be used if available	Prior to depletion of the pneumatic sources actions will be required to connect back-up sources at a time greater than 24 hours.

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

1. Case 1 is 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 (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.

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

Between 1-6 Hours, initiate use of the 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 a dedicated 24-V battery with motive force supplied to the HCVS valves from a separate dedicated nitrogen bottle rack. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the MCR or a ROS. The HCVS battery capacity will be designed for a minimum of 24 hours. In addition, when available, a Phase 2 FLEX Diesel Generator (DG) can provide power before battery life is exhausted. Thus initiation of the HCVS from the MCR or the ROS within 6 hours is acceptable because the actions can be performed any time after declaration of an ELAP until the venting is needed at approximately 6 hours for BDBEE venting.

- This action can also be performed for Severe Accident HCVS operation which occurs at a time further removed from an ELAP declaration as shown in Attachment 2.
- The system pneumatics is a dedicated system of nitrogen bottles secured in a seismically qualified rack. Operator action is required to make it available and contains sufficient volume for at least 24 hours. Providing a supplemental pneumatic supply using an air fitting installed in the nitrogen supply line can be accomplished prior to depletion so there is no time constraint.

Discussion of radiological and temperature constraints identified in Attachment 2

- At the start of the event, the nitrogen system is lined-up to supply to the HCVS valves. The nitrogen isolation will be located in the DG building near the ROS. All other valve manipulations can be accomplished in the MCR or at the ROS. The ROS is accessible from several different pathways outside the RB which will be evaluated for habitability and radiological conditions to ensure operating personnel can safely access and operate the controls at the ROS.

  [OPEN ITEM 2:] Evaluate the location of the ROS for accessibility.

- At >24 hours, a portable air compressor will be available to supplement the nitrogen supply as stated for the related time constraint item.

  [OPEN ITEM 3:] Determine the location of the portable air compressor and evaluate for accessibility under Severe Accident HCVS use.

- At >24 Hours, the system battery charger can be powered from a supplemental 480-V ac source.

  [OPEN ITEM 4:] Evaluate the location of the FLEX DGs for accessibility under Severe Accident HCVS use.

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, & 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 6, ISG-JLD-2012-01 and Reference 32, 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 following is based on the current design concept for the WW vent. Substantive changes in the current design will be included in future 6-month updates.

The HCVS WW path is designed for venting steam/energy at a nominal capacity of 1% of 3556 MWt which accounts for a potential 2% power uprate above the current licensed thermal power of 3486 MWt thermal power at pressure of 45 psig. This pressure is the lower of the containment design pressure and the PCPL value. The WW vent originates from a 12 inch penetration and is increased to a 16 inch pipe which provides adequate capacity to meet or exceed the Order criteria.

Vent Capacity

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

[Open Item 5:] Confirm suppression pool heat capacity.

Vent Path and Discharge

The HCVS WW vent will originate from 12 inch penetration X-58 at elevation 491foot-0 inches which will increase to a 16 inch diameter pipe for the remainder of the vent line. The flow path will have three air-operated valves (AOV) that are air-to-open and spring-to-shut. Two of these valves are primary containment isolation valves (PCIV) and the third valve is the secondary containment isolation valve (SCIV).

PCIVs will be installed as close to primary containment as possible. The line will be run in the abandoned stairwell in the southeast corner of the RB and exit the RB approximately 166 feet above plant grade level where it will penetrate through the RB, secondary containment, running up the south wall to release 3 feet above the parapet wall at approximately elevation 674 foot-2 inches. The vent release will be located near the southeast corner of the RB..

This discharge point is 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.

Sketch 2 shows the location of the HCVS components outside the MCR. A discussion of the construction of the buildings that contain these components is presented in PLT-1. The WW vent line exits the RB approximately 166 feet above plant grade level. As stated in PLT-1, the siding and girts of the upper portion of the RB are designed to blow off the steel frame when a differential pressure of approximately 0.5 psi is exceeded. The roof decking and roof purlins are designed to blow off the steel frame when a differential pressure of approximately 0.5 psi is exceeded.

The detailed design will address protection from external events as defined by NEI 12-06 and will address changes to this portion of the RB to assure the external portions of the vent line are protected from high wind hazards. (Reference 17, FAQ HCVS-04)

Power and Pneumatic Supply Sources

A Class 1E, 24-V dc system will include a battery, battery charger, distribution panels, and associated wiring, cables and raceways. The battery rack will be Seismic Category I. The battery sizing will sustain operation for a minimum of 24 hours with no operator action. Beyond the first 24 hours, FLEX generators will be used to maintain battery power to the HCVS components.

A dedicated nitrogen bottle rack, located in DG building room D113, will provide the pneumatic force for the air operated valves. An operator is required to line-up the system. The nitrogen supply will be sized to sustain operation for a minimum of 24 hours with no additional operator action. The initial stored motive gas will allow for a minimum of 12 valve operating cycles of the HCVS valves for the first 24 hours. Beyond 24 hours, FLEX portable air compressors will be used to supply pneumatics to the HCVS valves.

1. The HCVS flow path valves are AOVs which are air-to-open and spring-to-shut. Opening the valves requires energizing a SPV, powered from the dedicated 24-V dc system, to direct the pneumatics to the flow path valves.
2. An assessment of temperature and radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the ROS based on time constraints listed in Attachment 2.
3. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during an ELAP (i.e., electric power, N2/air) will be located in areas reasonably protected from defined hazards listed in Part 1 of this report.
4. All valves that are required to open the flow path are designed for remote manual operation following an ELAP, such that the primary means of valve manipulation does not rely on use of a hand wheel, reach–rod or similar means that requires close proximity to the valve. (Reference 16, FAQ HCVS-03) To support remote manual operation of these valves, pneumatics supplying the remote manual valves is required to be lined-up by an operator at the bottle rack in the DG building. 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.

Location of Control Panels

The HCVS design allows operating and monitoring the HCVS from the MCR or the ROS in the DG building, Room D113. The MCR location is protected from adverse natural phenomena and the normal control point for Plant Emergency Response actions. The ROS is located in the DG building which is separate from the RW building. As discussed in FAQ HCVS-01, DG building, Room D113, will be evaluated for accessibility, habitability (including environmental and radiological conditions) and communication capability. **[See OPEN ITEM 2]**

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).

NEI White Paper, HCVS-WP-03, Hydrogen/Carbon Monoxide Control Measures, (Reference 25) provides several options for the design of an HCVS to address the hazards of combustible gasses. Energy Northwest will adopt one of these options and provide the details of how the Columbia design meets Order Elements 1.2.10 and 1.2.11 in a future 6-month update.

Unintended Cross Flow of Vented Fluids

As seen in Sketch 3, the HCVS WW vent is designed as a stand-alone system which does not interface with other plant mechanical systems and is independent from the existing vent path. This design eliminates the concern of cross flow of vented fluids. The system will only be used in a BDBEE.

Prevention of Inadvertent Actuation

EOP/SAG operating procedures provide clear guidance that the HCVS is not to be used to defeat containment integrity during any design basis transients and accident. Columbia does not rely on containment accident pressure to maintain NPSH for the RCIC pump.

The features that prevent inadvertent actuation of the WW vent are the three vent path valves being operated by key lock switches in the MCR. The ROS, containing the SPVs, will have lockable covers/doors to limit access and inadvertent operation

Component Qualifications

The HCVS components downstream of the second containment isolation valve are routed in seismically qualified structures. HCVS components that directly interface with the containment pressure boundary will be considered 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 10 CFR 50.67. 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 up to and including appropriate isolation devices such as fuses or breakers, as their failure could adversely impact containment isolation and/or a safety-related power source. The remaining components will be considered Augmented Quality. Newly installed piping and valves will be seismically qualified to handle the forces associated with the safe shutdown earthquake 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 Equipment Qualification program).

HCVS instrumentation performance (e.g., accuracy and precision) need not exceed that of similar plant installed equipment. Additionally, radiation monitoring instrumentation accuracy and range will be sufficient to confirm flow of radionuclides through the HCVS.

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

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

<u>Instrument</u>	<u>Qualification Method*</u>
HCVS Process Temperature	To be added
HCVS Process Pressure	To be added
HCVS Process Radiation Monitor	To be added
HCVS Process Valve Position	To be added
HCVS Pneumatic Supply Pressure	To be added
HCVS Electrical Power Supply Availability	To be added

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

[OPEN ITEM 6:] Determine the method of qualification for each instrument listed.

<u>Monitoring of HCVS</u>

The HCVS WW vent will be capable of being manually operated during sustained operations from a control panel located in the MCR and will meet the requirements of Order element 1.2.4. The MCR is a readily accessible location with no further evaluation required. Control Room dose associated with HCVS operation conforms to GDC 19, Control Room/Alternative Source Term (AST). Additionally, to meet the intent for a secondary control location of Section 1.2.5 of the Order, a readily accessible 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, 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.

[OPEN ITEM 7:] Complete the evaluation to determine accessibility, habitability, staffing sufficiency, and communication capability of the ROS.

The HCVS WW vent will include means to monitor the status of the vent system in both the MCR and the ROS.

The HCVS WW vent will include indications for vent pipe pressure, temperature, and effluent radiation levels and valve position at the MCR. 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 HCVS WW vent includes existing containment pressure and WW 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.

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, will be designed/analyzed to conform to the requirements consistent with the applicable design codes for the plant and to ensure functionality following a design basis earthquake.

[OPEN ITEM 8:] Identify design codes after design is finalized.

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

[OPEN ITEM 9:] Equipment qualifications will include temperature, pressure, radiation level, and total integrated dose radiation from the effluent vent pipe at local and remote locations.

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 be electromagnetic compatible (RG 1.180). These qualifications will be consistent with the applicable design codes for Columbia.

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 27) 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: <u>Boundary Conditions for WW Vent: BDBEE Venting</u>

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 will be designed to minimize the reliance on operator actions for response to an ELAP and BDBEE hazards identified in Part 1 of this OIP. Immediate operator action is required to line-up pneumatics at the bottle rack. All other operator actions can be completed by Operators from the HCVS control stations which include remote-manual venting. 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.

Once the pneumatics is made available, the HCVS will be designed to allow initiation, control, and monitoring of venting from the MCR or ROS. These locations minimize plant operators' exposure to adverse temperature and radiological conditions and are protected from hazards assumed in Part 1 of this report.

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

System control:

i. Active: The HCVS will be operated in accordance with the EOPs to control containment pressure. The HCVS will be designed for 12 open/close cycles under ELAP conditions over the first 24 hours following an ELAP. Controlled venting is permitted in the current EOPs.

[OPEN ITEM 10:] Provide site-specific details of the EOPs when available.

ii. Passive: Inadvertent actuation protection is provided by key-locked switches in the MCR and locked covers/doors at the ROS. Manual operators will be secured to prevent inadvertent operation (i.e., chain locked).

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 hours, available personnel will be able to connect supplemental motive air/gas to the HCVS. Connections for supplementing motive air/gas required for HCVS will be located in accessible areas with reasonable protection per NEI 12-06 that minimize personnel exposure to adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources.

Columbia's response to NRC Order EA-12-049 will demonstrate the capability of FLEX efforts to establish an electrical power source which will be used to recharge the HCVS batteries.

These actions provide long term support for HCVS operation for the period beyond 24 hours to 7 days (sustained operation time period) because on-site and off-site personnel and resources will have access to the unit 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.

PPM 5.2.1, Primary Containment Control, provides direction for protection and control of containment integrity.

Other site procedures* for venting containment using the HCVS include:

PPM 5.5.14, Emergency Wewell Venting

PPM 5.6.1, Station Blackout (SBO/ELAP)

ABN-CONT-VENT, Containment Vent without AC and DC Power Available

*This list is not inclusive and the titles/numbers may change as the station develops its response.

Identify modifications:

List modifications and describe how they support the HCVS Actions.

EA-12-049 Modifications

- EC 12218, DG4 Separation Modification. Relocates DG4 from a trailer to inside a FLEX building.
- EC 12245, 480-V ac Alternate Connection Point. Adds an additional 480-V ac connection point for the alternate 480 V ac DG or an RRC 480-V ac generator.
- EC 12229, Connection Points for RCC 4.16 kV Generator. Adds two connection points for the RRC 4.16 kV generators to supply power to Division 1 or 2 loads.
- EC 12207, Change Power Source for RCIC-LS-11. Changes the power supply for RCIC barometric condenser level control so automatic level control is not lost during an ELAP.
- EC 12874, Backup Power for Radio Base Stations. Provides alternate power source to the current radio base station during an ELAP.
- EC 13041, Modify Pipe Support RCIC-967N, Changes support from rigid struts to snubbers.

EA-13-109 Modifications

- EC 13094, Addition of Wetwell Hardened Containment Vent. Adds the WW HCVS.
- EC 12511, Relocate Cables and Trays. Moves the electrical components to allow routing of WW vent 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 Valve Position Indication	HCV-V1, V-2, and V7	MCR
HCVS Effluent Radiation Level	TBD	MCR
HCVS Effluent Pressure	TBD	MCR
HCVS Effluent Temperature	TBD	MCR
HCVS Nitrogen Supply Pressure	TBD	Bottle Rack
HCVS Battery Voltage	TBD	Battery Charger
HCVS Battery Current	TBD	Battery Charger

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
Suppression Pool Pressure	CMS-PR-3	MCR
Suppression Pool level	CMS-LR-3	MCR
Suppression Pool Temperature	CPTM-TI-5	MCR
Suppression Pool Temperature	SPTM-TI-5	MCR
Drywell Temperature	CMS-TI-5	MCR
Drywell Pressure	CMS-PR-1	MCR

HCVS valve position indication, HCVS radiation level, HCVS effluent temperature, and HCVS system pressure will be installed in the MCR to comply with EA-13-109. Pneumatic supply pressure indication will be located near the ROS and the DC voltage and current indication will be located at the battery charger.

Notes:

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 RB will be restricted as determined by the RPV water level and core damage conditions. Immediate actions will be completed by Operators in the MCR and at the ROS and will include local and remote-manual actions. 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 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.

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 portable air compressor will be evaluated for severe accident environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway. **[See OPEN ITEM 3]**

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 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.

The operation of the HCVS is governed the same for severe accident 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.

These are the same as for BDBEE Venting Part 2.

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).

These are the same as for BDBEE Venting Part 2.

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. Venting will not require support from the station's DC power or instrument air systems. A new dedicated battery system will provide sufficient electrical power for HCVS operation for at least 24 hours. Before these batteries are depleted, portable FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the batteries and maintain HCVS DC bus voltage after 24 hours. A newly installed pneumatic system will provide sufficient motive force for all HCVS valve operation for at least 24 hours and will provide for at least 12 operations of the HCVS valves. Portable air compressors will be available to tie into a fitting at the nitrogen bottle rack and provide the supplemental pneumatic source.

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.

The HCVS loads are supplied by a dedicated battery and pneumatic supply sized to provide operation for at least 24 hours without additional support. Before these batteries require recharging, a FLEX generator is expected to have been connected to the power supply for the HCVS battery charger. Portable air compressors will be available to tie into a fitting at the nitrogen bottle rack and provide the supplemental pneumatic source.

Details:

Provide a brief description of Procedures / Guidelines:

Confirm that procedure/guidance exists or will be developed to support implementation.

The equipment used during the first 24 hours will be permanently installed. No additional procedures, other than those previously identified, are currently required.

The supplemental equipment, used after the first 24 hours, will have procedures for instillation, operation, and refueling.

Identify modifications:

List modifications and describe how they support the HCVS Actions.

As identified in Part 2, Boundary Conditions for WW Vent - BDBEE Venting, the following modifications are being made.

Flex modifications applicable to HCVS operation:

- EC 12218, DG4 Separation Modification. Relocates DG4 from a trailer to inside a FLEX building.
- EC 12245, 480-V ac Alternate Connection Point. Adds an additional 480-V ac connection point for the alternate 480-V ac DG or a RRC 480-V ac generator.
- EC 12229, Connection Points for RCC 4.16 kV Generator. Adds two connection points for the RRC 4.16 kV generators to supply power to Division 1 or 2 loads.

HCVS Modifications:

- EC 13094, Addition of Wetwell Hardened Containment Vent. Adds the dedicated battery and pneumatics which includes a fitting for connection of a supplemental pneumatic supply. Supplemental electrical power connections are provided by ECs 12218, 12245, and 12229.

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.

Local control features of the portable air compressor and fuel supply

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 RB or in the vicinity of the HCVS piping. Deployment in the areas around the RB 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 Drywell 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

The drywell vent information will be added in the 6-month update required by December 28, 2015.

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

The drywell vent information will be added in the 6-month update required by December 28, 2015.

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

The drywell vent information will be added in the 6-month update required by December 28, 2015.

Details:

Provide a brief description of Procedures / Guidelines:

Confirm that procedure/guidance exists or will be developed to support implementation.

The drywell vent information will be added in the 6-month update required by December 28, 2015.

Identify modifications:

List modifications and describe how they support the HCVS Actions.

The drywell vent information will be added in the 6-month update required by December 28, 2015.

Key Venting Parameters:

List instrumentation credited for the venting HCVS Actions.

The drywell vent information will be added in the 6-month update required by December 28, 2015.

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.

Licensees will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in the Licensee Controlled Specifications (LCS):

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,
  - 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, and
- Actions initiated 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 10) 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 (Reference 12) and 14-01(Reference 13) as 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.

- 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.

Columbia 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 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.	Prior to first declaring the system functional;
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

Part 5: Milestone Schedule

Provide a milestone schedule. This schedule should include:

- **Modifications timeline**
- **Procedure guidance development complete**
  - **HCVS Actions**
  - **Maintenance**
- **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

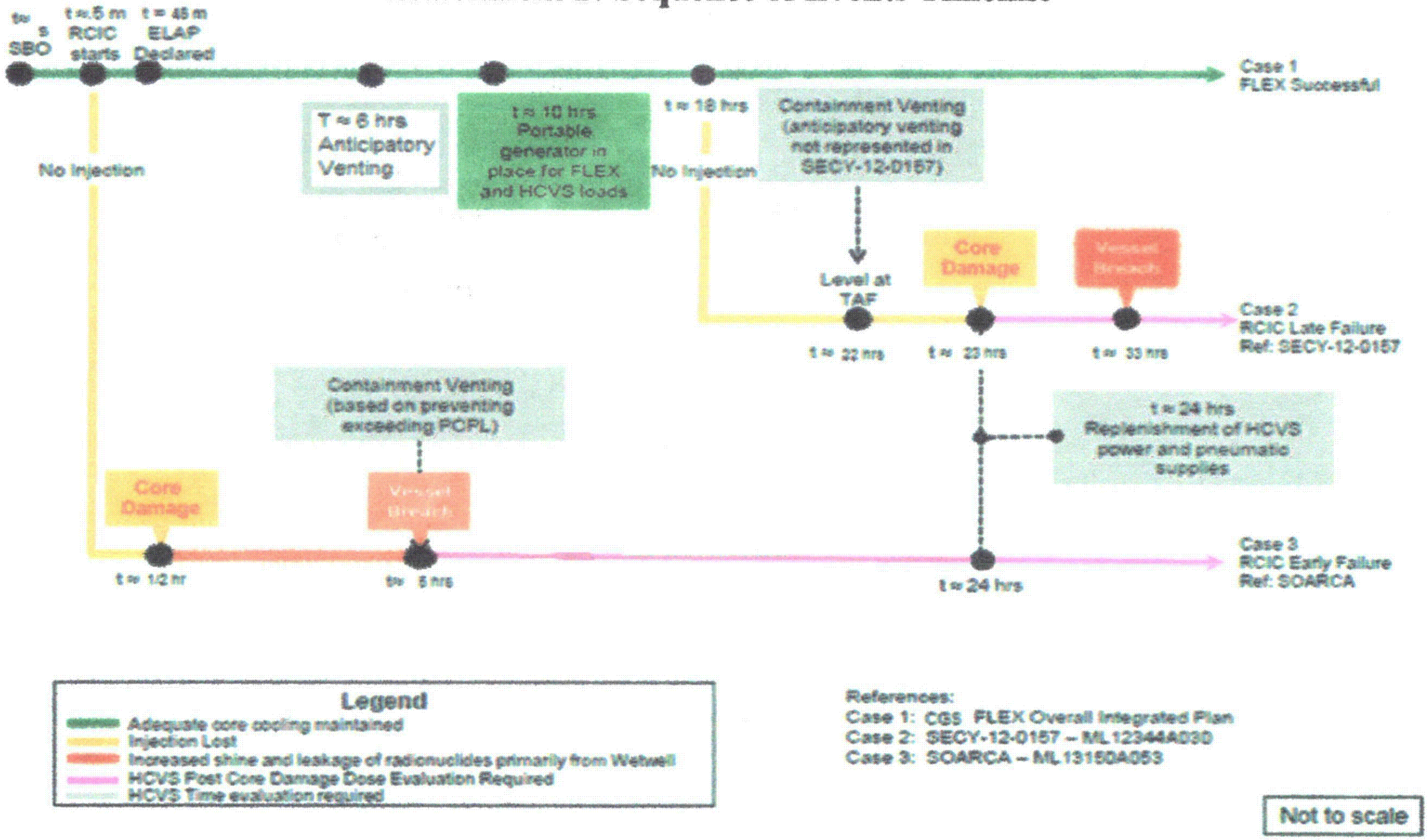
The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6-month status reports.

Milestone	Target Completion Date	Activity Status	Comments *(Include date changes in this column)*
Hold preliminary/conceptual design meeting	June 2014	Complete	
Submit Overall Integrated Implementation Plan	June 2014	Complete	
Submit 6-Month Status Report	Dec. 2014		
WW Design Engineering Complete	April 2015		
Submit 6-Month Status Report	June 2015		
Submit 6-Month Status Report	Dec. 2015		
WW Operation Procedure Changes Developed	June 2015		
Site Specific WW Maintenance Procedure Developed	June 2015		
Submit 6 Month Status Report	June 2016		
Submit 6-Month Status Report	Dec. 2016		
WW Training Complete	Mar. 2017		
WW Installation Complete	June 2017		
WW Procedure Changes Active	June 2017		
WW Walk Through Demonstration/Functional Test	June 2017		
Submit WW Completion Report	Aug, 2017		

Attachment 1: HCVS Portable Equipment

List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*
FLEX DG	**X**	**X**	**TBD**	**Per Response to EA-12-049**
Portable Air Compressor	**X**	**X**	**TBD**	**Per Response to EA-12-049**

Attachment 2: Sequence of Events Timeline



Attachment 3: Conceptual Sketches

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

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

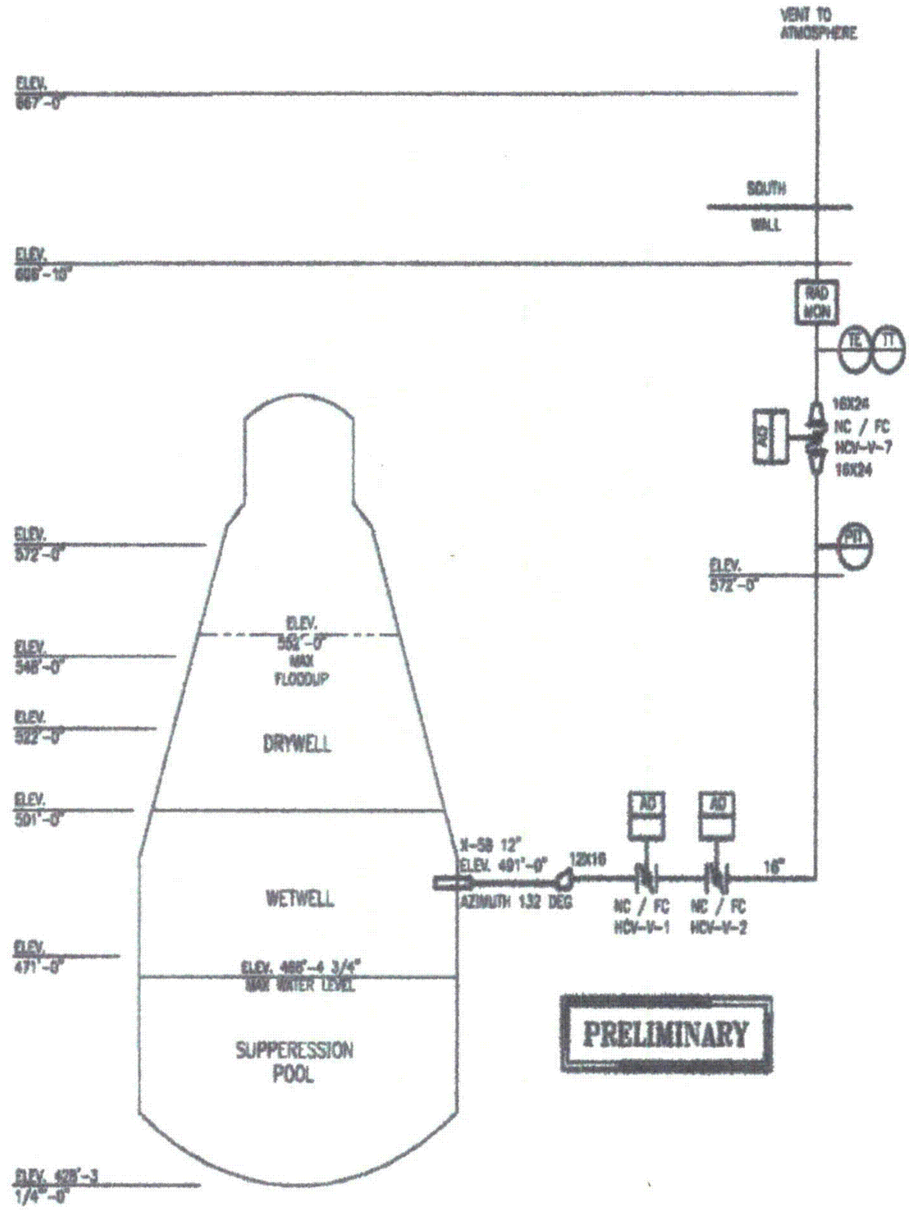
- **Egress and Ingress Pathways to ROS**
- **Site layout sketch to show location/routing of HCVS piping and associated components. This should include relative locations both horizontally and vertically**

Sketch 3: Flow Diagram *(preliminary)*

Sketch 1: Electrical Layout of System (preliminary)

REDACTED

Sketch 2: Layout of current HCVS, (preliminary)



SINGLE WETWELL 16"ø VENT LINE

Sketch 3 - Flow Diagram ***(preliminary)***

Attachment 4: HCVS Wetwell Failure Evaluation Table

Functional Failure Mode	Failure Cause	Alternate Action	Failure with Alternate Action Impact on Containment Venting?
Failure of Vent Valve to Open on Demand	Valves fail to open due to complete loss of batteries (long term)	Open valves by local manual operation of the latching SPV at the remote operating station (ROS). Recharge HCVS batteries with FLEX provided generators, considering severe accident conditions.	No
Failure of Vent Valve to Open on Demand	Valves fail to open due to loss of normal pneumatic air supply (short term)	No action needed, nitrogen is supplied by dedicated nitrogen bottles which is sufficient for at least 12 cycles each of valves HCV-V-1, 2 and 7 over first 24 hours.	No
Failure of Vent Valve to Open on Demand	Valves fail to open due to loss of normal pneumatic air supply (long term)	Replace bottles or provide pneumatic supply via FLEX portable air compressor. An air fitting is supplied for a FLEX air compressor connection.	No
Failure of Vent Valve to Open on Demand	Valves fail to open due to SPV electrical coil failure	Open valves by local manual operation of the latching SPV at the ROS.	No
Failure of Vent Valve to Open on Demand	Damaged air supply line to air operator.	Local manual (handwheel) operation if access to the valve is allowed by plant conditions	No
Failure of Vent Valve to Open on Demand	Mechanical binding or damage.	Local manual (handwheel) operation if access to the valve is allowed by plant conditions	No
Failure to stop venting on demand	All three valves in the vent flow path fail open	Not credible as there is no common mode failure that would prevent at least 1 of the 3 valves to close. Valves fail closed by spring action.	No

Functional Failure Mode	Failure Cause	Alternate Action	Failure with Alternate Action Impact on Containment Venting?
Spurious Opening of Vent Valves	Not credible as key locked switches prevent mis-positioning of the HCVS vent valves. Manual SPV operation is precluded by preventing access to the SPVs by key locked physical barrier.	N/A	No
Spurious Closure of Vent Valves	Valve fails to stay open due to failure of latching SPV electrical coil.	Reopen valves by local manual operation of the latching SPV at the ROS.	No
Spurious Vent Valve operation	Valve fails to stay open/closed due to complete loss of DC batteries (long term)	Not credible as SPVs latch in the open or closed position and do not require power to hold that position. SPV will remain in position for any length of time without DC power. No action required.	No
Spurious Vent Valve closure	Valve fails to stay open due to loss of pneumatic supply.	Replace bottles or provide pneumatic supply via FLEX portable air compressor.	No

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 0, 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. Columbia's EA-12-049 (FLEX) Overall Integrated Implementation Plan, Rev 1, February 2014
29. Columbia's EA-12-050 (HCVS) Overall Integrated Implementation Plan, Rev 0, February 2013
30. Columbia's EA-12-051 (SFP LI) Overall Integrated Implementation Plan, Rev 0, February 2013
31. ML13190A201, Use of Modular Accident Analysis Program (MAAP) in Support of Post-Fukushima Applications
32. JLD-ISG-2012-01, Revision 0, -Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Eventsl, Interim Staff Guidance, August 29, 2012 (ADAMS Accession No. ML 12229A174)

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	Provide resolution of the potential secondary containment bypass leakage path in the first 6-month update of the HCVS OIP	
2	Evaluate the location of the ROS for accessibility.	
3	Determine the location of the portable air compressor and evaluate for accessibility under SA HCVS use.	
4	Evaluate the location of the FLEX DGs for accessibility under Severe Accident HCVS use.	
5	Confirm suppression pool heat capacity	
6	Determine the method of qualification for each instrument listed	
7	Complete the evaluation to determine accessibility, habitability, staffing sufficiency, and communication capability of the ROS.	
8	Identify design codes after design is finalized.	
9	Equipment qualifications will include temperature, pressure, radiation level, and total integrated dose radiation from the effluent vent pipe at local and remote locations.	
10	Provide site-specific details of the EOPs when available.	

Attachment 8: List of Acronyms

AC	Alternating Current
ASME	The American Society of Mechanical Engineers
AST	Alternative Source Term
BDBEE	Beyond Design Bases External Event
BWR	Boiling Water Reactor
Columbia	Columbia Generating Station
DC	Direct Current
DG	Diesel Generator
DW	Drywell
EC	Engineering Change
ELAP	Extended Loss of AC Power
EOP	Emergency Operating Procedure
EPG	Emergency Procedure Guideline
FAQ	Frequently Asked Question
FAI	Fail As-Is
FC	Fail Closed
FLEX	Diverse and Flexible Coping Strategies
FO	Fail Open
GDC	General Design Criteria
HCVS	Hardened Containment Vent System
IEEE	The Institute of Electrical and Electronics Engineers, Inc.
ISG	Interim Staff Guidance
LC	Locked Closed
LED	Light Emitting Diode
MAAP	Modular Accident Analysis Program
MCR	Main Control Room
NC	Normally Closed
NEI	Nuclear Energy Institute
NEMA	The National Electrical Manufacturers Association
NO	Normally Open
NRC	Nuclear Regulatory Commission
NTTF	Near-Term Task Force
OIP	Overall Integrated Plan
PCIV	Primary Containment Isolation Valve
PCPL	Primary Containment Pressure Limit
RB	Reactor Building
RCIC	Reactor Core Isolation Cooling
RG	Regulatory Guide
ROS	Remote Operating Station
RPV	Reactor Pressure Vessel
RRC	Regional Response Center
RW	Radioactive Waste
SAG	Severe Accident Guidance
SBO	Station Blackout
SOP	System Operating Procedure
SOARCA	State-of-the-Art Reactor Consequence Analyses
SSC	Structures, Systems, and Components
WW	Wetwell