NEXTera ENERGY DUANE ARNOLD

June 25, 2014

NG-14-0151

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

Duane Arnold Energy Center
Docket No. 50-331
Renewed Facility Operating License No. DPR-49

NextEra Energy Duane Arnold, LLC's Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109

References:
1. NRC Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," dated September 1, 1989 (ML031140220)
2. Order EA-12-050, "Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents," dated March 12, 2012 (ML12056A043)
3. Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 6, 2013 (ML13130A067)
4. NRC Interim Staff Guidance JLD-ISG-2013-02, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated November 14, 2013 (ML13304B836)
5. Letter, D. Skeen (NRC) to J. Pollock (NEI), NRC Acknowledgement of NEI 13-02 Phase 1 OIP Template, dated May 14, 2014
6. NEI 13-02, "Industry Guidance for Compliance with Order EA–13–109, Revision 0," dated November 2013

On June 6, 2013, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 3) to NextEra Energy Duane Arnold, LLC. Reference 3 was immediately effective and directs NextEra Energy Duane Arnold, LLC (hereafter NextEra Energy Duane Arnold) to take certain actions to ensure there is a hardened containment vent system (HCVS) 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

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Loss of AC Power (ELAP). Specific requirements are outlined in Attachment 2 of Reference 3.

Reference 3 requires submission of an Overall Integrated Plan (OIP) by June 30, 2014 for Phase 1 of the order. The interim staff guidance (Reference 4), issued November 14, 2013, provides direction regarding the content of this OIP. The purpose of this letter is to provide the OIP for Phase 1 of the Order pursuant to Section IV, Condition D.1, of Reference 3. This letter confirms NextEra Energy Duane Arnold has received Reference 4 and has a Phase 1 OIP complying with the guidance for the purpose of ensuring the functionality of a HCVS 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 SA conditions resulting from an ELAP as described in Attachment 2 of Reference 3.

Reference 6, Section 7.0 contains the specific reporting requirements for the OIP. The information in the enclosure provides the Phase 1 OIP for the Duane Arnold Energy Center pursuant to Section 7.0 of Reference 6 by use of the Phase 1 OIP Template per Reference 5.

For the purposes of compliance with Phase 1 of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, NextEra Energy Duane Arnold plans to install a severe accident capable wetwell vent.

Compliance with the requirements of Reference 3 will supersede any and all actions or commitments associated with References 1 and 2. Any actions or commitments made relative to References 1 or 2 are rescinded and not binding by submittal of the Reference 3 Phase 1 OIP via this letter.

This letter contains no new regulatory commitments. If you have any questions or require additional information, please contact Ken Putnam at 319-851-7238.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on June 25, 2014.

Richard L. Anderson

Richard L. Anderson
Vice President, Duane Arnold Energy Center
NextEra Energy Duane Arnold, LLC

Enclosure

cc: Director, Office of Nuclear Reactor Regulation
USNRC Regional Administrator Region III
USNRC Project Manager, Duane Arnold Energy Center
USNRC Resident Inspector, Duane Arnold Energy Center

Attachment to NG-14-0151

NextEra Energy Duane Arnold, LLC's Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)

43 pages follow

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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 Accident Conditions*, 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 (HCVS) 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 provides 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 are provided consistent with the requirements of Order EA-13-109.

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 plant conditions from observed or derived symptoms.
- The vent will utilize Containment Parameters of Pressure and Level from the MCR instrumentation to monitor effectiveness of the venting actions.
- The vent operation will be monitored by HCVS valve position, temperature, 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 Duane Arnold Energy Center (DAEC) 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 4th Quarter 2016.
- Phase 2: Later

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 Duane Arnold Energy Center

- Seismic, External Flooding, Storms with High Winds, Snow, Ice, Low Temperatures, Extreme High Temperatures

The following extreme external hazards screen out for Duane Arnold Energy Center

- None

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 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 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. (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 an ELAP is occurring. (NEI 12-06, section 3.2.1.3 item 9 and 3.2.1.4 item 1- 4)

Part 1: General Integrated Plan Elements and Assumptions

049-6. At approximately one 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 (NEI 12-06, section 3.2.1.3 item 8)

049-8. Deployment resources (augmented staff) are assumed to begin arriving at hour 6 and the site is accessible by offsite portable equipment within 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, SFP level and makeup, security response, opening doors for cooling, and initiating conditions for the event, can be credited as previously evaluated for FLEX.

Applicable EA-13-109 generic assumptions:

109-1. Site response activities associated with EA-13-109 actions are considered to have no access limitations associated with radiological impacts while 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 "SA Capable" criteria that are defined in NEI 13-02 Section 4.2.4.2 and Appendix D Section D.1.3.

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 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 HCVS-FAQ-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).

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 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 HCVS-FAQ-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.

Part 1: General Integrated Plan Elements and Assumptions

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.

109-12. 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 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 rupture disk, if retained, in the final design will be manually breeched if desired for anticipatory venting to allow establishing a containment vent path when containment pressure is approximately 10 PSIG (Approximately 3.3 hours) Reference 32.

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. Confirm Standby Gas Treatment System (SGTS) and associated ductwork is isolated from the HCVS by verifying or closing CV-4301.	Hand switches located in the MCR.	By design CV-4301 automatically isolates on high drywell pressure signal or loss of power.
2. If rupture disk is retained in final design, breach the rupture disk by opening compressed gas cylinder valve (new feature to be added if rupture disc is retained in final design).	Manual valves at the ROS in the Control Building 1A4 Switchgear Room.	Not required during SA event. Only required if performing early venting for FLEX.
3. Close compressed gas cylinder valve.	Manual valves at the ROS in the Control Building 1A4 Switchgear Room.	Not required during SA event. Only required if performing early venting for FLEX.
4. Place handswitch HS-4300A in override position to override isolation signal to CV-4300.	Keylock handswitches located in the MCR.	Remote operation can be done in 1A4 Switchgear Room.

Part 2: Boundary Conditions for Wet Well Vent

Primary Action	Primary Location / Component	Notes
5. Open CV-4300 and CV-4357.	Keylock handswitches located in the MCR.	Remote operation can be done at the ROS.
6. Replenish pneumatics with replaceable compressed gas bottles.	Compressed gas bottles will be located in an area that is accessible to operators.	Prior to depletion of the pneumatic sources actions will be required to connect back-up sources after 24 hours.
7. Re-align power supplies for all valves and instruments to portable source or restore normal power supplies.	Control Building 1A4 Switchgear Room.	Prior to depletion of the alternate dedicated power sources actions will be required to connect back-up sources after 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 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.
3. Case 3 is based on NUREG-1935 (SOARCA) results for a prolonged SBO (or ELAP) with the loss of RCIC.

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

- At approximately 3.3 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 compressed gas storage bottles. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the MCR or a Remote Operating Station. The power for HCVS will be available as long as the HCVS is required. HCVS uninterruptable power supply 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,

Part 2: Boundary Conditions for Wet Well Vent

initiation of the HCVS from the MCR or the Remote Operating Station within approximately 3.3 hours is acceptable because the actions can be performed any time after declaration of an ELAP and prior to reaching containment pressure limits. For purposes of analysis a containment pressure of 10 PSIG was selected for initiation of venting and initiation after 10 PSIG but prior to reaching containment pressures of 53 PSIG (greater than 7 hours) is also acceptable 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.

- At approximately 24 hours, compressed gas bottles will be valved-in to supplement the air tank supply. This can be performed at any time prior to 24 hours to ensure adequate capacity is maintained so this time constraint is not limiting.
- Under the FLEX program, one of two portable diesel generators can be connected to station 480 Volt electrical distribution at MCC 1B32. From this motor control center, electrical power can be supplied to the planned uninterruptable power supply (UPS) for HCVS prior to depletion of the UPS batteries. For purposes of compliance with order EA-13-109 no credit is taken for this action until after 24 hours. 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. Connection points will be installed to facilitate the connections and operational actions required to supply power for days 2-7 of the ELAP.

<u>Discussion of radiological and temperature constraints identified in Attachment 2</u>

- All actions required in the first 24 hours to vent the containment can be performed from the main control room.
- At approximately 24 hours, compressed gas bottles will be valved-in to supplement the air accumulator supply as stated for the related time constraint item. Compressed gas bottles will be located in an area that is accessible to operators. Connection points and valves will be located in the control building 1A4 essential switchgear room.
- At approximately 24 hours, portable generators will have been moved to a location in or adjacent to the Turbine Building and connected to MCC 1B32 to allow supply of power to the HCVS UPS. The connections are located in the control building 1A3 essential switchgear room and the location of the DG and access for refueling will be located in the turbine building or outside yard area. These areas are expected to be accessible as the HCVS pipe routing is entirely within the Reactor Building until it exits the Reactor Building roof.

Provide Details on the Vent characteristics

<u>Vent Size and Basis (EA-13-109 Section 1.2.1 / NEI 13-02 Section 4.1.1)</u>

What is the plant's 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

Part 2: Boundary Conditions for Wet Well Vent

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

Part 2: Boundary Conditions for Wet Well Vent

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 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.

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Vent Size and Basis

The HCVS wetwell path will be designed for venting steam/energy at a nominal capacity of 1% or greater of the current licensed thermal power (CLTP) of 1912 MWth at a containment pressure of 53 psig (PCPL). No additional Power Uprates are currently planned. This pressure is the lower of the containment design pressure (56 psig) and the PCPL value (53 psig). The nominal size of the wetwell portion of the HCVS will be 10 inches in diameter which provides adequate capacity to meet or exceed the Order criteria.

Vent Capacity

The 1% value at DAEC 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. It was verified in the GE Safety Analysis Report for DAEC Extended Power Uprate Analysis (EPU) that the drywell and suppression pool temperatures remain below the design temperatures.

Vent Path and Discharge

The planned HCVS vent path at DAEC for the wetwell will utilize the existing containment penetration that supports normal venting to the Standby Gas Treatment system. It exits the Primary Containment into the Reactor Building in the Northeast Corner room. This pipe will extend through the Reactor Building to the roof.

The HCVS discharge path will be routed to a point above any adjacent structure (excludes off gas stack) This discharge point is just above the Reactor Building roof 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. Since pipe routing will be within the Class 1 structure of the Reactor Building until it exits the building through the roof, no tornado missile protection is expected to be required above a height of 30 feet from ground elevation. Protection from external events as defined by NEI 12-06 for the outside portions of the selected release stack or structure is warranted. Evaluation of potential tornado missile effects on portions of HCVS located above the protected area of the Reactor Building will be performed (See Attachment 7, Open Item 3).

Power and Pneumatic Supply Sources

All electrical power required for operation of dedicated HCVS components will be routed through an uninterruptible power supply with batteries sufficient for 24 hours of service.
Pneumatic power is normally provided by safety related air compressors with local accumulators at the valves. Following an ELAP event the air compressors will not be available. Existing accumulators are not sized for the number of venting cycles anticipated and therefore the accumulators will be upgraded or alternate supplies provided to ensure the required operating cycles for the first 24 hours are maintained.

1. The HCVS flow path valves are air-operated valves (AOV) with air-to-open and spring-to-shut. Opening the valves requires energizing a solenoid operated valve (SOV) and providing

Part 2: Boundary Conditions for Wet Well Vent

motive air/gas. The detailed design will provide a permanently installed power source and motive air/gas supply adequate for the first 24 hours. The initial stored motive air/gas will allow for a minimum of eight valve operating cycles for the HCVS valves for the first 24-hours.

2. An assessment of temperature and radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the Remote Operating Station based on time constraints listed in Attachment 7 (Action Item 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 required to open the flow path or valves that require manual operation to be closed to prevent diversion or cross-flow into other systems 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). Any supplemental connections will be pre-engineered to minimize man-power resources and address environmental concerns. Required portable equipment will be reasonably protected from screened in hazards listed in Part 1 of this OIP.
5. Access to the locations described above will not require temporary ladders or scaffolding.
6. Following the initial 24 hour period, additional motive force will be supplied from compressed gas bottles that will be connected near the ROS in the control building essential switchgear room such that radiological impacts are minimized.

Location of Control Panels

The HCVS design allows initiating and then operating and monitoring the HCVS from the Main Control Room (MCR). A remote control station will be established in the 1A4 essential Switchgear Room, but use of this remote control station is not required in the first 24 hours. The MCR and the essential switchgear location are protected from adverse natural phenomena and are the normal control points for Plant Emergency Response actions.

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).
An evaluation will be performed of the system design for hydrogen/carbon monoxide control measures (See Attachment 7, Open Item 4).

Unintended Cross Flow of Vented Fluids

The HCVS will use the Containment Purge System containment isolation valves (CV-4300, CV-4301 and CV-4309) for containment isolation along with hardened vent valve CV-4357. These containment

Part 2: Boundary Conditions for Wet Well Vent

isolation valves are AOVs and they are air-to-open and spring-to-shut. CV-4300 and CV-4357 must be open to establish the vent path and CV-4301 must be closed to isolate the purge path from unintended flow when using the HCVS. An SOV must be energized to allow the motive air to open the valve. Although CV-4300 is shared between the Containment Purge System and the HCVS, separate solenoid power control circuits will be provided for each function. Specifically:

- The Containment Purge System control circuit is AC powered and will be used during normal operating modes.
- DC powered control circuits supply the solenoids that control opening of CV-4300 and CV-4357 when using the HCVS.
- Loss of power or primary containment isolation signals ensure CV-4301 is closed under conditions associated with HCVS use.

Prevention of Inadvertent Actuation

For design bases accidents and transients, containment cooling is available and EOP guidance would not require use of the HCVS. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error such that any credited containment accident pressure (CAP) that would provide net positive suction head to the emergency core cooling system (ECCS) pumps will be available (inclusive of a design basis loss-of-coolant accident (DBLOCA)). DAEC credits containment over pressure for DBLOCA as described in UFSAR Section 5.4 and shown in UFSAR figures 5.4-15 sheet 1 and 5.4-15 sheet 2. However, for conditions assumed by Order EA-13-109 the ECCS pumps will not have normal power available because of the starting boundary conditions of an ELAP.

The features that prevent inadvertent actuation are two PCIVs in series with key lock switches. The current plant design includes a rupture disc set at approximately 50 PSIG. It is anticipated that final design of the HCVS system will eliminate this rupture disc to simplify venting operations provided any leakage that bypasses secondary containment for design bases events is confirmed to be acceptable.

- Confirm secondary containment bypass leakage is acceptable without an installed rupture disk or retain an appropriate disk (See Attachment 7, Open Item 1).

Component Qualifications

The HCVS components downstream of the second containment isolation valve and components that interface with the HCVS will be routed in seismically qualified structures. 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 10CFR50.67. 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

Part 2: Boundary Conditions for Wet Well Vent

will be seismically qualified to handle the forces associated with the seismic margin earthquake (SME) back to their isolation boundaries. Electrical and controls components will be seismically qualified and will include the ability to handle harsh environmental conditions (although they will not be considered part of the site Environmental Qualification (EQ) program).

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

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.
3. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	Qualification Method*
HCVS System Effluent Temperature	ISO9001 / IEEE 344-1975 / Demonstration
HCVS System Radiation Monitor	ISO9001 / IEEE 344-1975 / Demonstration
HCVS System Valve Position Indication	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Electrical Power Supply Availability	ISO9001 / IEEE 344-1975 / Demonstration

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

Monitoring of HCVS

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

Part 2: Boundary Conditions for Wet Well Vent

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 hardened vent (HV) are control switches in the MCR with valve position indication. The existing HV 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 the HCVS uninterruptible power supply. Beyond the first 24 hours, the ability to open these valves will be ensured with replaceable compressed gas bottles and FLEX generators. Prevention of inadvertent operation of HCVS from the ROS will be accomplished by other positive physical control (e.g., locked valve separated from air tank to not inadvertently pressurize).

The wetwell HCVS will include indications for vent pipe temperature and system effluent radiation levels in 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 wetwell HCVS will include 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 consistent with FLEX key parameter indication.

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 (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 .

Conduit design will be installed to Seismic Class 1 criteria. Conduit will be located inside a seismically qualified structure. Augmented quality requirements, will be applied to the components

Part 2: Boundary Conditions for Wet Well Vent

installed in response to this Order.

If the instruments are purchased as commercial-grade equipment, they will be qualified to operate under severe accident environment as required by NRC Order EA-13-109 and the guidance of NEI 13-02. These qualifications will be bounding conditions for DAEC.

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 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 will be designed to minimize the reliance on operator actions for response to an ELAP and BDBEE hazards identified in Part 1 of this OIP. Immediate operator actions can be completed by Operators from the HCVS control station 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 will be designed to allow initiation, control, and monitoring of venting from the Main Control Room (MCR). 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 hours.

System control:

Active: Control valves and/or PCIVs are operated in accordance with EOPs/SAGs to control containment pressure. The HCVS will be designed for eight open/close cycles under ELAP conditions over the first 24 hours following an ELAP. Controlled venting will be permitted in the revised EPGs and associated implementing EOPs. The containment isolation signal can be over ridden using an existing hand switch in the main control room HS-4300A, "CV-4300 HARD PIPE VENT ALT PWR/PCIS".

Passive: Inadvertent actuation protection is provided by redundant valves with key lock switches located in the Main Control Room and as directed by applicable procedures.

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 electrical power and motive air/gas required for HCVS will be located in accessible areas with reasonable protection per NEI 12-06 that minimize personnel exposure to

Part 2 Boundary Conditions for WW Vent: **BDBEE Venting**
adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources. Electrical power will be supplemented consistent with NRC Order EA-12-049. These actions provide long term support for HCVS operation for the period beyond 24 hours to 7 days (sustained operation time period) because on-site and off-site personnel and resources will have access to the unit(s) to provide needed action and supplies.
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
EOP 2 Primary Containment Control flowchart exists to direct operations in protection and control of containment integrity, including use of the existing containment vent system. Other site procedures for venting containment using the HCVS will include: TSG-Appendix C, Technical Support Guidelines "Containment Venting Guidelines" and SEP 301.3 "Torus Vent via Hardpipe Vent".
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
<u>EA-12-049 Modifications</u> • EC 280488 will construct storage facilities for portable equipment storage to protect it from external hazards. • EC 280490 will add connection points for the 480 volt portable FLEX generator to connect to Motor Control Center 1B32. This will allow restoring power to the HCVS uninterruptible power supply. <u>EA-13-109 Modifications</u> One or more plant design modification package(s) will be developed for the following changes to the plant: • A modification will be required to install the dedicated UPS and the disconnect switches needed to supply power to HCVS. • A modification will be required to install a Remote Operation Station including connection points for compressed gas bottles to supplement HCVS pneumatics. • A modification will be required to install HCVS process instrumentation. • A modification will be required to replace CV-4357 and install new piping upstream and downstream of CV-4357 to the reactor building roof and eliminate the current rupture disk if appropriate. • A modification to upgrade pneumatic accumulators capacity for CV-4300 and CV-4357 to ensure capacity for eight vent cycles.

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

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 System Effluent Temperature	New	MCR
HCVS Pneumatic Supply Pressure	New	ROS
HCVS System Valve Position Indication	ZS-4300 and ZS-4357	MCR
HCVS System Radiation Monitor	New	MCR
HCVS UPS Status Indication	New	ROS

Initiation, operation and monitoring of the HCVS system will rely on existing Main Control Room key parameters and indicators which are qualified per the existing plant design (Ref: NEI 13-02 Section 4.2.2.1.9):

Key Parameter	Component Identifier	Indication Location
Drywell pressure	PR4385 A/B	MCR
Torus level	LI4397A/B	MCR

HCVS indications for HCVS valve position indication, HCVS pneumatic supply pressure and HCVS system effluent temperature will be installed in the MCR to comply with EA-13-109.

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 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. The operator actions required to open a vent path were previously listed in the BDBEE Venting 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.

System control:

Active: Same as for BDBEE Venting

Passive: Same as for BDBEE Venting, If a rupture disk is retained in the final design it will automatically burst prior to exceeding containment design pressures.

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 except the location and refueling actions for the FLEX DG and replacement compressed gas bottles will be evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway.

Perform SA Evaluation for FLEX DG and replacement compressed gas bottles use for post 24 hour actions (See Attachment 7, Open Item 2).

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

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 will be governed in the same manner for SA conditions as for BDBEE conditions. Existing guidance in the Technical Support Guidelines Appendix C 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 (Page 19)
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 (Page 20)
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 require support from a newly installed uninterruptable power supply. Before the dedicated UPS is depleted, portable FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the UPS. Improved pneumatic accumulator tanks with back-up portable compressed gas bottles will provide sufficient motive force for all HCVS valve operation and will provide for multiple operations of CV-4300 or CV-4357 vent valves.
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 24 hours, a dedicated HCVS uninterruptable power supply will be available to feed HCVS loads. At 24 hours, power will be backed up by FLEX generators evaluated for SA accessibility. Hydrogen mitigation strategies will be evaluated (See Attachment 7, Open Item 4). Compressed gas bottles 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 will be permanently installed. The key portable items will be the FLEX DGs and the compressed gas 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.*
Same as Part 2 (Page 19).

Part 2 Boundary Conditions for WW Vent: **HCVS Support Equipment Functions**
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)*
Pressure gauge on supplemental compressed gas bottles (NEW). UPS Status Indication (NEW).
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 2).

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

In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 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

In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 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

In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 2015.

Details:

Provide a brief description of Procedures / Guidelines:

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

In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 2015.

Part 3: Boundary Conditions for Dry Well Vent
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 2015.
Key Venting Parameters: *List instrumentation credited for the venting HCVS Actions.*
In accordance with Order EA-13-109 Phase 2 Integrated Plan information will be provided by December 31, 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

For design bases events, DAEC credits containment overpressure to support NPSH for AC powered emergency core cooling system pumps as shown in UFSAR figures 5.4-15 sheet 1 and 5.4-15 sheet 2. The AC powered pumps are not available during an ELAP. Procedures for operation of the containment vent will address potential impacts on NPSH.

Provisions for out-of-service requirements will be established for the HCVS and compensatory measures. The following provisions will be documented in site administrative controls:

- The provisions for out-of-service requirements will be established for the 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

Part 4: Programmatic Controls, Training, Drills and Maintenance

compensatory actions are necessary.

- If the out of service times exceed 30 or 90 days as described above, the following actions will be performed:
    - The condition will be entered into the corrective action system,
    - The HCVS functionality will be restored in a manner consistent with plant procedures,
    - A cause assessment will be performed to prevent future loss of function for similar causes.
    - Initiate action to implement appropriate compensatory actions

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.

Part 4: Programmatic Controls, Training, Drills and Maintenance

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.

DAEC 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

Part 4: Programmatic Controls, Training, Drills and Maintenance

	(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) – See EA-13-049 OIP
- Staffing analysis completion – See EA-12-049 OIP
- 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. The milestones listed are for Phase 1 implementation and will be supplemented as necessary to reflect Phase 2 upon submittal of the Phase 2 Integrated Plan if required. Milestones related to portable equipment, storage, and staffing are addressed in the Integrated Plan for Order EA-12-049 and will not be repeated here as the schedule for Order EA-12-049 and Phase 1 for Order EA-13-109 are equivalent.

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Issue preliminary/conceptual design Report	Jun, 2014	Complete	
Submit Overall Integrated Implementation Plan	Jun 2014	Complete	
Initial Outage for Phase 1 Planning	Nov, 2014		
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
Design Complete Phase 1	Mar. 2016		
Submit 6 Month Status Report	Jun. 2016		
Operations Procedure Changes Developed Phase 1	Oct. 2016		
Site Specific Maintenance and Testing Procedures Developed Phase 1	Oct. 2016		
Training Complete Phase 1	Oct. 2016		
Implementation Outage Phase 1	End of RFO25		

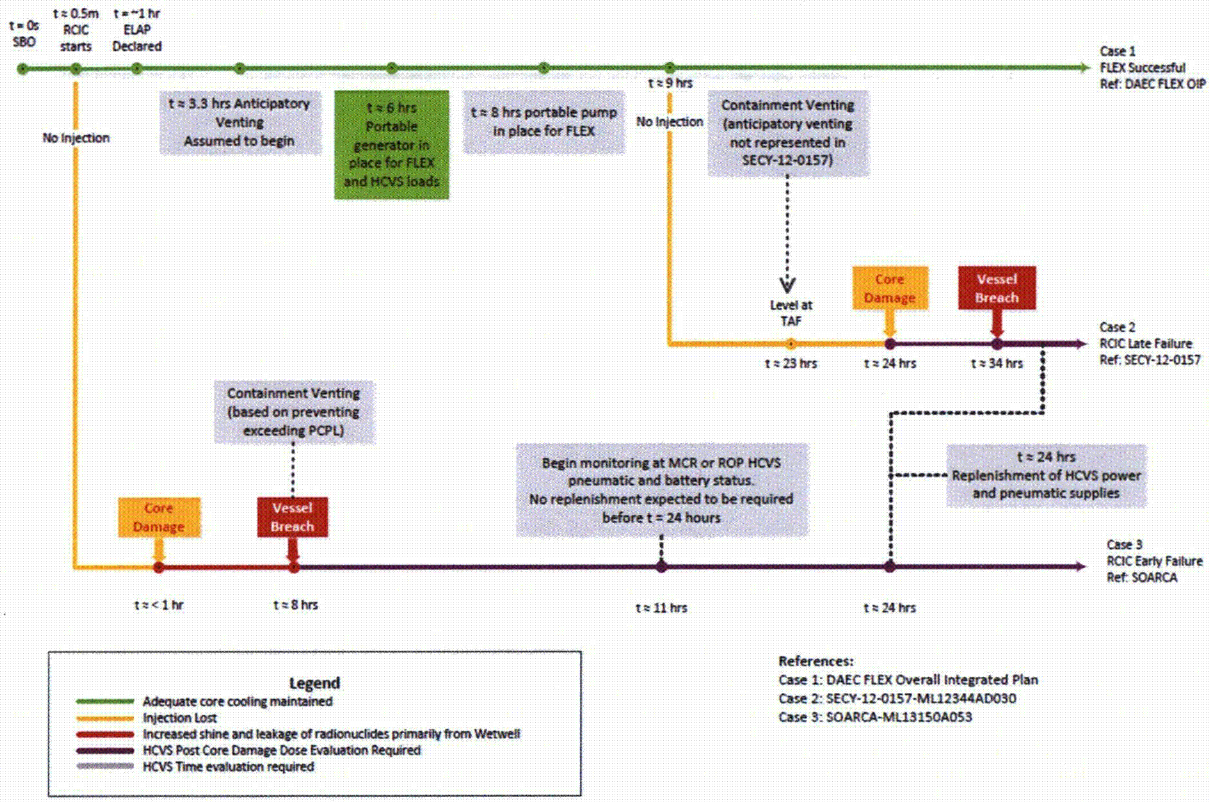
Part 5: Milestone Schedule

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Procedure Changes Active Phase 1	End of RFO25		
Walk Through Demonstration/Functional Test Phase 1	End of RFO25		
Submit Completion Report Phase 1	60 days after RFO25		

Attachment 1: HCVS Portable Equipment

List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*
Compressed Gas Cylinders	X	X	Capable of operating vent valves. Can be periodically replaced if needed	Check periodically for pressure, replace or replenish as needed
FLEX DG	X	X	Sized to power UPS	Per Response to EA-12-049

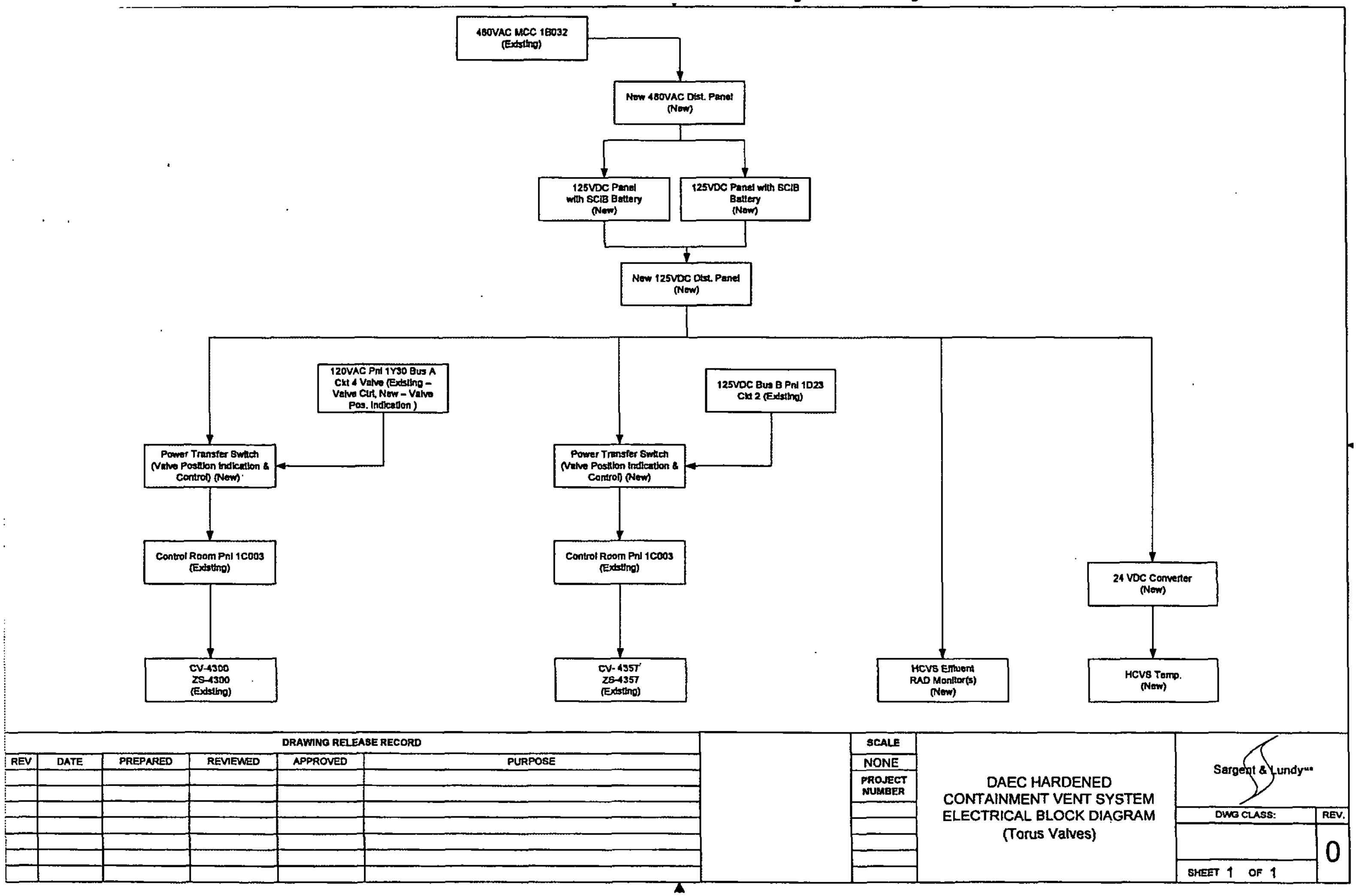
Attachment 2: Sequence of Events Timeline



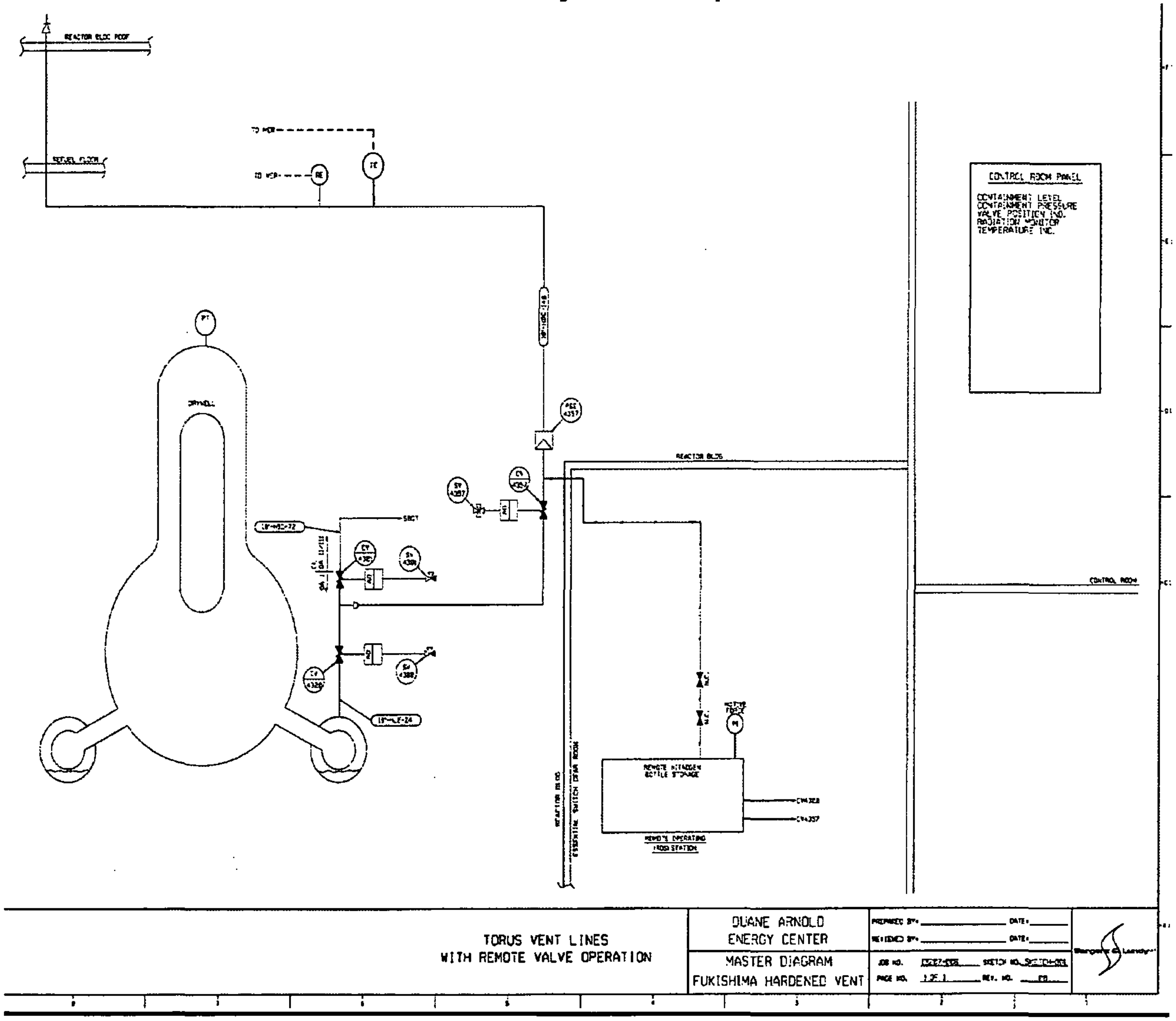
Attachment 3: Conceptual Sketches

Sketch 1: Electrical Layout of System (preliminary)
Sketch 2: Layout of Proposed HCVS (preliminary)

Sketch 1: Electrical Layout of System



Sketch 2: Layout of Proposed HCVS



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, DC powered solenoid for opening under severe accident conditions.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of DC power (long term)	ROS will include provision for opening valves independent of DC power.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal pneumatic air supply	ROS will include provision for opening valves.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to SOV failure	ROS will include provision for opening valves.	No
Failure of Vent to Open on Demand	Mechanical failure of CV unrelated to pneumatic or control power.	Alternate vent path that is not hardened.	Yes. Vent location would likely not be elevated.

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, Draft Revision 0, dated March 2014
13. NEI 14-01, Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents, Draft 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 (Draft)
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. DAEC EA-12-049 (FLEX) Overall Integrated Implementation Plan, Rev 0, February 28, 2013
29. DAEC EA-12-050 (HCVS) Overall Integrated Implementation Plan, Rev 0, February 28, 2013
30. DAEC EA-12-051 (SFP LI) Overall Integrated Implementation Plan, Rev 0, February 28, 2013
31. NEDC-32980P, GE Safety Analysis Report for Duane Arnold Energy Center Extended Power Uprate, Amendment 243
32. ERIN Report, Evaluation Report of DAEC Capabilities to Respond to Extended Loss of AC Power (ELAP), dated May 2014
33. NG-13-0084, NextEra Energy Duane Arnold, LLC's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)

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 secondary containment bypass leakage is acceptable without an installed rupture disk or retain an appropriate disk.	Action Request 1879998-10
2	Perform severe accident evaluation for FLEX DG and replacement compressed gas to confirm accessibility for use for post 24 hour actions	Action Request 1879998-11
3	Evaluate tornado/missile effects on HCVS components above the protected area of the Reactor Building.	Action Request 1879998-12
4	Evaluate the system design for H2/CO measures to be taken.	Action Request 1879998-13