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10 CFR 50.54(f)

December 23, 2015
NRC-15-0105

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

References:
1) Fermi 2
   NRC Docket No. 50-341
   NRC License No. NPF-43

2) NRC Order EA-13-109, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" dated June 6, 2013 (Accession No. ML13130A067)

3) NRC Interim Staff Guidance JLD-ISG-2015-01, "Compliance with Phase 2 Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions", Revision 0, dated April 2015 (Accession No. ML15104A118)

4) NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109, BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," Revision 1, dated April 2015 (Accession No. ML15113B318)

5) DTE Electric Company letter, NRC-14-0043, "DTE Electric Company's Phase 1 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)," dated June 30, 2014 (Accession No. ML14182A203)

6) DTE Electric Company letter, NRC-14-0075, "DTE Electric Company's First Six Month Status Report 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)," dated December 18, 2014 (Accession No. ML14352A174)

7) DTE Electric Company letter, NRC-15-0070, "DTE Electric Company's Second Six-Month Status Report 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)," dated June 11, 2015 (Accession No. ML15162A729)

8) NRC Letter to DTE Electric Company, "Fermi Unit 2 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Phase 1 of Order EA-13-109 (Severe Accident Capable Hardened Vents)," dated April 1, 2015 (Accession No. ML15077A574)

Subject: DTE Electric Company's Phase 1 and Phase 2 Overall Integrated Plan for Implementation of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions

On June 6, 2013, the U.S. Nuclear Regulatory Commission (NRC) issued an order (Reference 2) to DTE Electric Company (DTE). Reference 2 was immediately effective and directed DTE to take certain actions to ensure that Fermi 2 Nuclear Power Plant has 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 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). Specific requirements are outlined in Attachment 2 of Reference 2.

Reference 2 requires submission of an Overall Integrated Plan (OIP) by June 30, 2014 for Phase 1 of the Order, and an OIP by December 31, 2015 for Phase 2 of the Order. The interim staff guidance (Reference 3) provides direction regarding the content of the OIP for Phase 1 and Phase 2. Reference 3 endorses industry guidance document NEI 13-02, Revision 1 (Reference 4) with certain clarifications and exceptions. Reference 5 provided the DTE Phase 1 OIP for Fermi 2. References 6 and 7 provided the first and second six-month status reports pursuant to Section IV, Condition D.3 of Reference 2 for Fermi 2.

The purpose of this letter is to provide both the third six-month update for Phase 1 of the Order pursuant to Section IV, Condition D.3, of Reference 2 and the OIP for Phase 2 of the Order pursuant to Section IV, Condition D.2 of Reference 2, for Fermi 2. The third six-month update for Phase 1 of the Order is incorporated into the HCVS Phase 1 and Phase 2 OIP document, which provides a complete updated Phase 1 OIP, a list of the Phase 1 OIP open items, and addresses the NRC Interim Staff Evaluation open items for Phase 1 contained in Reference 8. Future six-month status reports will provide the updates for both Phase 1 and Phase 2 OIP implementation in a single status report.

Reference 4, Section 7.0 contains the specific reporting requirements for the Phase 1 and Phase 2 OIP. The information in the Enclosure provides the Fermi 2 HCVS Phase 1 and Phase 2 OIP pursuant to Reference 3. The enclosed OIP is based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the Enclosure, will be provided in the six-month Phase 1 and Phase 2 OIP updates required by Section IV, Condition D.3, of Reference 2.

This letter contains no new regulatory commitments.

Should you have any questions or require additional information, please contact Mr. Alan I. Hassoun, Licensing Manager at (734) 586-4287.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 23, 2015

Michel A. Philippon
Director, Nuclear Production
For Vito A. Kaminskas

Enclosure: DTE Electric Company's Phase 1 and Phase 2 Overall Integrated Plan

cc: Director, Office of Nuclear Reactor Regulation
NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission,
Regulated Energy Division (kindschl@michigan.gov)

Enclosure to
NRC-15-0105

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

DTE Electric Company's Phase 1 and Phase 2
Overall Integrated Plan

Table of Contents

Introduction

In 1989, the NRC issued Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," for Boiling Water Reactors (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 suppression pool to some point outside the secondary containment envelope (usually outside the Reactor Building). Some licensees also installed a hardened vent branch line from the drywell.

On March 19, 2013, the Nuclear Regulatory Commission (NRC) Commissioners directed the staff per Staff Requirements Memorandum (SRM) for SECY-12-0157 to require licensees with Mark I and Mark II containments to "upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions." In response, the NRC issued Order EA-13-109, *Issuance of Order to Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accidents*, June 6, 2013. The Order (EA-13-109) requires that licensees of BWR facilities with Mark I and Mark II containment designs ensure that these facilities have a reliable hardened vent to remove decay heat from the containment and maintain control of containment pressure within acceptable limits following events that result in the loss of active containment heat removal capability while maintaining the capability to operate under severe accident (SA) conditions resulting from an Extended Loss of AC Power (ELAP).

The Order requirements are applied in a phased approach where:

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

The NRC provided an acceptable approach for complying with Order EA-13-109 through Interim Staff Guidance (ISG) (JLD-ISG-2013-02 issued in November 2013 and JLD-ISG-2015-01 issued in April 2015). The ISG endorses the compliance approach presented in Nuclear Energy Institute (NEI) 13-02 Revision 0 and 1, *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 the ISGs to evaluate licensee compliance as presented in submittals required in Order EA-13-109.

The Order also requires submittal of an overall integrated plan which will provide a description of how the requirements of the Order will be achieved. This document provides the Overall Integrated Plan (OIP) for complying with Order EA-13-109 using the methods described in NEI 13-02 and endorsed by NRC JLD-ISG-2013-02 and JLD-ISG-2015-01. Six month progress reports will be provided consistent with the requirements of Order EA13-109. The submittals required are:

- OIP for Phase 1 of EA-13-109 was required to be submitted by Licensees to the NRC by June 30, 2014. The NRC requires periodic (6 month) updates for the HCVS actions being taken. The first update for Phase 1 was due December 2014, with the second due June 2015.
- OIP for Phase 2 of EA-13-109 is required to be submitted by Licensees to the NRC by December 31, 2015. The December 2015 six month update for Phase 1 will be combined with the Phase 2 OIP submittal by means of a combined Phase 1 and 2 OIP.
- Thereafter, the 6 month updates will be for both the Phase 1 and Phase 2 actions until complete, consistent with the requirements of Order EA-13-109.

Fermi 2 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 HCVS Control Panel or Main Control Room (MCR) 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 HCVS Control Panel or 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.

The Phase 2 actions can be summarized as follows:

- Utilization of Severe Accident Water Addition (SAWA) to initially inject water into the Reactor Pressure Vessel (RPV) or Drywell.
- Utilization of Severe Accident Water Management (SAWM) to control injection and Suppression Pool level to ensure the HCVS (Phase 1) severe accident wetwell vent (SAWV) will remain functional for the removal of core decay heat.
- Ensure that the decay heat can be removed from the containment for 7 days using the HCVS.
- The SAWA and SAWM actions will be manually activated and controlled from areas that are accessible during severe accident conditions.

Parameters measured will be Drywell pressure, Suppression Pool level, SAWA flowrate, and the HCVS parameters listed above.

Part 1: General Integrated Plan Elements and Assumptions

Extent to which the guidance, JLD-ISG-2013-02, JLD-ISG-2015-01 and NEI 13-02 (Revision 1), 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, JLD-ISG-2015-01

Compliance will be attained for Fermi 2 with no known deviations to the guidelines in JLD-ISG-2013-02, JLD-ISG-2015-01, and NEI 13-02 for each phase as follows:

- Phase 1 (wetwell): by the startup from the second refueling outage (RF) that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for RF-18 planned for second quarter 2017.
- Phase 2 (alternative strategy): by the startup from the first refueling outage that begins after June 30, 2017 or June 30, 2019, whichever comes first. Currently scheduled for RF-19 planned for fourth quarter 2018.

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 Fermi 2:

- Seismic, External Flooding, Extreme Cold, High Wind, Extreme High Temperature

The following extreme external hazards screen out for Fermi 2:

- Hurricane

Key Site assumptions to implement NEI 13-02 HCVS Phase 1 and 2 Actions.

Provide key assumptions associated with implementation of HCVS Phase 1 and Phase 2 Actions

Ref: NEI 13-02, Revision 1, Section 2 NEI 12-06 Revision 0

Mark I/II Generic HCVS Related Assumptions:

Applicable EA-12-049 (FLEX) assumptions:

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

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

049-3. Assumed reactor transient boundary conditions are as identified in NEI 12-06 section 3.2.1.4 items 1, 2, 3 and 4

Part 1: General Integrated Plan Elements and Assumptions

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

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

049-6. At 45 minutes (time sensitive at a time greater than 75 minutes) an ELAP is declared and actions begin as defined in EA-12-049 compliance

049-7. DC power and distribution can be credited for the duration determined per the EA-12-049 (FLEX) methodology for battery usage (greater than 12 hours with a calculation limiting value of 12.3 hrs). (NEI 12-06, section 3.2.1.3 item 8). This assumption applies to the water addition capability under SAWA/SAWM. An additional dedicated HCVS battery will be installed at the HCVS primary control panel to provide the DC loading for the remainder of the first 24 hours after the event.

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, SFP level and makeup, security response, opening doors for cooling, and initiating conditions for the event, can be credited as previously evaluated for FLEX. (Refer to assumption 109-02 below for clarity on SAWA)(HCVS-FAQ-11)

<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). This is further addressed in HCVS-FAQ-12.

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. This assumption does not apply to Phase 2 SAWA/SAWM because SAWA equipment needs to be connected and placed in service within 8 hours from the time of the loss of RPV injection (reference HCVS-FAQ-12).

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 NEI 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 NEI 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

Part 1: General Integrated Plan Elements and Assumptions

HCVS venting dedicated functionality. (Reference NEI HCVS-FAQ-01) This assumption does not apply to Phase 2 SAWA/SAWM because SAWA equipment needs to be connected and placed in service within 8 hours from the time of the loss of RPV injection and will require more than minimal operator action.

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 NEI HCVS-FAQ-02 and White Paper HCVS-WP-01) This assumption does not apply to Phase 2 SAWA/SAWM because SAWA equipment is not dedicated to HCVS but shared to support FLEX functions. This is further addressed in HCVS-FAQ-11.

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. MAAP Version 5 was used to develop EPRI Technical Report 3002003301 to support drywell temperature response to SAWA under severe accident conditions. MAAP 4.07 was used to support BWR Owners' Group (BWROG) TP-2015-008 for Fermi 2 specific evaluation of HCVS SAWA/SAWM

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 (EOP) changes consistent with EPG/SAGs Revision 3 as incorporated per the sites EOP/Severe Accident Management Guidance (SAMG) procedure change process. This assumption does not apply to Phase 2 SAWM because SAWM is not part of revision 3 (refer to Attachment 2.1.D for SAWM SAMG Changes approved by the BWROG Emergency Procedures Committee).

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 provided that the HCVS routing is a sufficient distant away from the MCR or is shielded to minimize impact to the MCR dose. In addition, adequate protective clothing and respiratory protection is available if required to address contamination issues (reference HCVS-FAQ-01 and HCVS-FAQ-09).

109-13. The suppression pool/wetwell of a BWR Mark I/II containment is considered to be bounded by assuming a saturated environment for the duration of the event response because of the water/steam interactions.

109-14. RPV depressurization is directed by the Emergency Procedure Guidelines (EPGs) in all cases prior to entry into the Severe Accident Guidelines (SAGs) (Reference NEI 13-02 Rev 1, §I.1.3).

Part 1: General Integrated Plan Elements and Assumptions

Plant Specific HCVS Related Assumptions/Characteristics:

F2-1 The current Torus Hardened Vent stack on the Auxiliary Building (AB) roof has sufficient flow capacity for the HCVS flow.

F2-2 All load stripping is accomplished within one hour and fifteen minutes of event initiation and will occur at locations not impacted by a radiological event.

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. Initial 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. Energize the HCVS Control Panel at 2PB2-15 Circuit #5. Required to be done prior to operation of HCVS system (expected time is 8 hours based on severe accident timelines). If depletion of station battery occurs within 24 hours, operator action is required to transfer the HVCS load to the dedicated HCVS battery bank.	2PB2-15 is located in Division 2 Switchgear room at Grid H-10.5 on AB3 South.	Conducted as part of 45-75 minute 29.400.01 actions.
2. Brief and station Nuclear Operator at HCVS Control Panel. Required to be done prior to operation of the HCVS system.	HCVS Control Panel is located in Division 2 Switchgear Room at Grid G-9 on AB3 South.	Conducted either on indication of core damage (SAG entry) OR when Torus Temperature reaches 220ºF during FLEX response.
3. Align Containment Isolation signal override key-lock bypass switches for alternate HCVS Operation (keylock switches in Relay room).	Relay Room Panels (H11P617 and H11P618) located in AB2 North	Conducted as part of 45-75 minute 29.400.01 actions.

Part 2: Boundary Conditions for Wet Well Vent

4. Align Electrical supplies for alternate HCVS Operation (MPU #1 and MPU #2 startup for operation of AC solenoids from CR).	Division 1 and Division 2 Switchgear rooms for MPU #1 and MPU #2 respectively. Switchgear rooms located AB2 South and AB3 South respectively.	Conducted as part of 29.400.01 using FLEX Generators prior to 4 hours.
5. Align pneumatic supplies for alternate HCVS Operation (NIAS supplied from FLEX Compressor).	FLEX Compressor is in FLEX Building 1 in Yard North of AB1. Connection points to NIAS are in AB1 North and TB1.	Conducted as part of FLEX actions prior to 6 hours.
6. Align supplemental DC to HCVS Control Panel (if required) based on Voltage readings in Division 2 Battery area.	HCVS Control Panel located in Division 2 Switchgear Room at Grid G-9 on AB3 South.	Prior to depletion of station batteries.
7. Operate the HCVS System as directed from the HCVS Control Panel when required based on EOP/SAGs.	HCVS Control Panel located in Division 2 Switchgear Room at Grid G-9 on AB3 South.	Required as contingency action for beyond design bases external event (BDBEE) response when Torus Temperature exceeds 220ºF. Required for SAGs when DW Pressure exceeds Pressure Suppression Pressure (PSP) and prior to exceeding Primary Containment Pressure Limit (PCPL) values.

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. **Case 1 is not applicable to Fermi 2 as the primary method (credited) for FLEX response is Feed and Bleed of the Torus with expected Torus Temperature of < 200ºF. Operation of the HCVS system is a "Contingency Action" that takes place at 220ºF.**
2. Case 2 is based on a SECY-12-0157 long term station blackout (LTSBO) (or ELAP) with failure of RCIC after a black start where failure occurs because of subjectively assuming over injection.
3. Case 3 is based on NUREG-1935 (SOARCA) results for a prolonged SBO (or ELAP) with the loss of RCIC case without black start.

Part 2: Boundary Conditions for Wet Well Vent

The following is a discussion of time constraints identified in Attachment 2 for the three timeline cases identified above:

- Contingency Actions: Initiate use of Hardened Containment Vent System (HCVS) for BDBEE per site procedures is required at 220ºF (indicating Failure of FLEX Feed and Bleed strategy) to maintain containment parameters below design limits and within the limits that allow continued use of RCIC. This is not expected to occur prior to 6.3 hours post event per the FLEX MAAP cases.
- HCVS Power for Primary HCVS operation: 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 and dedicated batteries with motive force supplied to HCVS valves from installed nitrogen storage bottles. Critical HCVS controls and instruments associated with containment will be DC powered. The HCVS controls and instruments are operated from the HCVS Control Panel (primary location for the first 24 hours) or from the Main Control Room after AC power is available (within 24 hours). The DC power for HCVS will be available as long as the HCVS is required. Station batteries will provide power for greater than 12 hours, HCVS battery capacity will be available to extend past 24 hours via a new battery bank with a throw-over switch located at the HCVS Control Panel. This throw-over switch would be operated if required based on Division 2 Battery Voltage (available in the Division 2 battery area). In addition, the Phase 2 FLEX Diesel Generator (DG) can provide power before the HCVS battery life is exhausted. Also, the FLEX supplemental Diesel Generator will supply 480 VAC to the Division 2 Battery chargers prior to 3 hours after the event per the FLEX response. Thus, initiation of the HCVS from the HCVS Control Panel as required is acceptable because the actions can be performed any time after declaration of an ELAP until the venting is needed. 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 2A.
- Required motive air for the primary method of HCVS operation: The local (Primary) nitrogen tank supplies will ensure sufficient nitrogen for 8 HCVS valve operations without makeup over the first 24 hours.
- Required 120 VAC power for alternate method of HCVS Operation is available prior to 24 hours: The FLEX supplemental Diesel Generator will supply 480 VAC to the Division 2 Battery chargers prior to 3 hours after the event per the FLEX response. Credit for this power is not allowed under the Order but the method of restoring 120 VAC is planned for < 6 hours after the event and can be credited at the 24 hour point.
- Required Motive Air for alternate method of HCVS Operation is available prior to 24 hours: NIAS will be supplied by FLEX Compressor to supplement the local (Primary) nitrogen tank supplies. The FLEX Compressor is expected to be started and NIAS supplied by the 6 hour actions for FLEX response.
- Site Specific actions that are time sensitive for HCVS initiation: Based on required actions and timing of FLEX actions, there are NO time sensitive actions for HCVS initiation.

Part 2: Boundary Conditions for Wet Well Vent

Discussion of radiological and temperature constraints identified in Attachment 2

- Heat Impact: Review of the actions required and location of the actions shows that all Remote Manual Actions (actions outside the Control Room) occur in the Auxiliary Building (AB), in a space outside the influence of the HCVS Piping heat impact, or in the Yard. The loss of Reactor Building (RB) and Auxiliary Building HVAC will result in an increase in temperatures in the affected areas (Switchgear Rooms, AB1, and Relay Room) but will also result in a significant loss of heat load (ELAP). These impacts can easily be countered via the actions under 29.FSG.20 for areas impacted by loss of ventilation (yet not impacted by HCVS Piping heat impact). Analysis using the GOTHIC computer program will define the necessary actions and solutions (pending design calculation DC-6639).

  [Phase 1 Open Item-1: Confirm thermal environment**]**

- Radiological Impact: Review of the actions required and location of the actions shows that all Remote Manual Actions (actions outside the Control Room) occur in the AB in an area that has significant shielding between the RB and AB. The Control Room/Relay Room areas meet GDC 19 requirements for Radiological conditions and the wall thickness in the area of the HCVS Control Panel and Division 1 Switchgear rooms provide similar shielding. Specific application of severe accident doses from the hardened vent will be analyzed as part of the design modifications under the guidance of HCVS-WP-02 (pending design calculation DC-6645). The AB1 location also has significant shielding and the Yard location is accessed before any potential significant Severe Accident dose consequences.

  [Phase 1 Open Item-2: Confirm radiological environment**]**

  Specific Table 2-1 action locations:

  Division 2 Switchgear Room: Actions 1, 2, 4, 6, 7.

  Relay Room: Action 3

  Control Room: Action 4

  Yard: Action 5

  Auxiliary Building First Floor: Action 5

  Turbine Building First Floor: Action 5

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)?

Part 2: Boundary Conditions for Wet Well Vent

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)

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

Part 2: Boundary Conditions for Wet Well Vent

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 344-1975, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," or a substantially similar industrial standard could be used.

Demonstration that the instrumentation is substantially similar in design to instrumentation that has been previously tested to seismic loading levels in accordance with the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges). Such testing and analysis should be similar to that performed for the plant licensing basis.

Vent Size and Basis

The HCVS wetwell path is designed to vent steam/energy at a nominal capacity of 1.1% of original licensed reactor thermal power of 3293 MWt at a pressure of 53.9 psig (bounds the 1% of MWt at the uprated licensed power of 3486 MWt). The pressure of 53.9 psig is lower than the containment design pressure (56 psig) and the PCPL value (58.8 psig). The size of the wetwell portion of the HCVS is 20 and 24 inches in diameter until it reduces to a HCVS dedicated 10 inch pipe on RB5, which provides adequate capacity to meet or exceed the Order criteria.

Vent Capacity

The 1.1% of 3293 MWt value at Fermi 2 assumes that the suppression pool pressure suppression capacity is sufficient to absorb the decay heat generated during the first 3 hours. HCVS venting 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.

[Phase 1 Open Item-3: Confirm suppression pool heat capacity**]**

Vent Path and Discharge

The existing HCVS vent path at Fermi 2 consists of a wetwell and drywell vent. The wetwell vent rises using Standby Gas Treatment System piping from the torus, joins the drywell vent on RB 3rd floor, and exhausts on RB 5th floor through a dedicated 10 inch vent stack.

Part 2: Boundary Conditions for Wet Well Vent

HCVS has its own discharge path. The HCVS discharge path is routed to a point above the Reactor Building roof. The cooling towers have a higher elevation than HCVS discharge point but they are not adjacent to the Reactor Building. The Reactor Building ventilation system vent stack is at a higher elevation and is 67 feet south of HCVS stack. The vent stack will be extended to discharge 3 feet above the RB roof parapet. The HCVS discharge will vent away from emergency ventilation system intake and exhaust openings, main control room location, location of HCVS portable equipment, access routes required following an ELAP and BDBEE, and emergency response facilities.

Missile protection for HCVS components on the RB 5th floor will be provided by following the guidance of NRC endorsed white paper, *HCVS-WP-04 Missile Evaluation for HCVS Components 30 Feet Above Grade.* In some cases component protection will be provided through design of conventional missile protection structures. The issue of defining tornado missile protection for RB 5th floor components was identified previously as Phase 1OIP as licensee-identified Open Item-4.

Power and Pneumatic Supply Sources

For the first 24 hours following the ELAP event, power for the HCVS is provided from either the station battery or a dedicated HCVS battery for operation from HCVS Control Panel H21P101 (primary controls location). After 24 hours, power is available from FLEX sources through existing MPU #1, MPU #2, and the station battery chargers for HCVS operation from the Control Room and Relay Room (alternate controls location). Battery power will be provided from the station batteries during the coping period and from the dedicated HCVS battery for the remaining period until the use of FLEX power sources. After 24 hours, power is available and credited from a FLEX Phase 2 480V generator for both the station batteries and 120VAC distribution equipment, to allow HCVS operation from the either the HCVS Control Panel or Control Room.

Pneumatic power is provided by the local Nitrogen bottles for the first 24 hours. Alternate method of operation used the non-interruptible air system with backup air provided from the FLEX Compressor. Following an ELAP event, station air system is lost. The Primary pneumatic power is supplied by the local Nitrogen bottles until NIAS is restored via FLEX. The alternate method is expected to be in service based on FLEX actions conducted prior to 6 hours post event but is not credited until > 24 hours post event.

1. The existing HCVS flow path valves are either air-operated valves (AOV) with air-to-open and spring-to-shut (i.e., the wet well containment isolation valves and the torus hardened vent isolation valves) or AOV air-to-shut and spring-to-open (RBHVAC isolation from RB 3rd and RB 5th floor). Operating the valves to their required positions for HCVS requires energizing an AC or DC powered solenoid operated valve (SOV) and providing motive air/gas. The initial stored motive air/gas will allow for a minimum of 8 valve operating cycles for the HCVS control valve for the first 24 hours. After the first 24 hours, FLEX generators and compressor will be available to maintain electric power and pneumatic supply for HCVS components.
2. An assessment of temperature and radiological conditions will be confirmed acceptable to ensure that operating personnel can safely access and operate controls at the HCVS Control Panel based on time constraints listed in Attachment 2.

Part 2: Boundary Conditions for Wet Well Vent

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 will be designed for remote manual operation following an ELAP, such that the primary means of valve manipulation does not rely on use of a hand wheel, reach–rod or similar means that requires close proximity to the valve (reference FAQ HCVS-03). The operating mechanisms are routed to the HCVS Control Panel located in the Division 2 Switchgear room (AB 3rd Floor). This location is outside the heat influence zone for the HCVS discharge pipe (located in the Reactor Building) and ventilation is supplemented by the FLEX Battery Exhaust fans. This location is also east of the concrete shield wall between the Reactor Building and the Auxiliary Building for adequate shielding from the expected HCVS pipe source term. DC power supplemental system is located at the HCVS Control Panel and will be designed to minimize man-power resources. Required portable equipment for the alternate HCVS operation is all required FLEX mitigating strategies support equipment and is protected to the standards in NEI 12-06 (Attachment 1). Based on this, 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, alternate motive force will be supplied from the FLEX Compressor to the NIAS header for operation of the HCVS valves via their normally designed operators from the Control Room. The FLEX compressor can be started prior to 6 hours following the event but will not be credited for < 24 hours following the event. Vital 120 VAC power for HCVS Valve and Radiation Monitor operation from the Control Room (alternate operation) will be supplied via the FLEX Generators 3 hours after event initiation. This alternate AC power will not be credited for <24 hours following the event.

Location of Control Panels

The HCVS design allows initiating and then operating and monitoring the HCVS from the HCVS Control Panel located in the Division 2 Switchgear Room (Primary controls location) and the Main Control Room (MCR) (alternate controls location). Both the HCVS Control Panel and the MCR location are protected from adverse natural phenomena and will be evaluated as a normal control point for Plant Emergency Response actions. The HCVS Control Panel location is in the Auxiliary Building outside the heat influence zone for the HCVS discharge pipe (located in the Reactor Building). This location is also east of the concrete shield wall between the Reactor Building and the Auxiliary Building for adequate shielding from the expected HCVS pipe source term.

Hydrogen

As 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. As required, Fermi 2 is using a discharge check valve installed after the last HCVS Isolation Valve. The use of a check valve will not adversely impact HCVS use for anticipatory venting as this is a contingency method of containment heat removal in the Fermi 2 FLEX response.

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Unintended Cross Flow of Vented Fluids

The HCVS uses the Containment Purge System containment isolation valves for containment isolation. These containment isolation valves are AOVs and they are air-to-open and spring-to-shut. An SOV must be energized to allow the motive air to open the valve. Although these valves are shared between the Containment Purge System and the HCVS, separate control circuits are provided to each valve for each function. Specifically:

- The Containment Purge System control circuit will be used during all "design basis" operating modes including all design basis transients and accidents.
- Cross flow potential exists between the HCVS and the Standby Gas Treatment System (SGTS). Based on evaluation of SGTS boundary valve leakage, testing and maintenance will be performed to ensure that the valves remain leak tight within established leakage criteria.

Prevention of Inadvertent Actuation

EOP/EPG operating procedures will provide clear guidance that the HCVS is not to be used to defeat containment integrity during any design basis transients and accidents. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error.

The features that prevent inadvertent actuation are:

- Key lock switches will be provided to prevent inadvertent operation of the HCVS control valves.
- The HCVS Control Panel override capability of Containment isolation function is not powered to allow this override without operator action.
- Energizing the HCVS Control Panel will be annunciated in the MCR per the IEEE-279 standards.
- Procedures will also provide clear guidance to not circumvent containment integrity by simultaneously opening torus and drywell vent valves during any design basis transient or accident.

Component Qualifications

The HCVS components downstream of the second containment isolation valve and components that interface with the HCVS are routed in seismically qualified structures. HCVS components that directly interface with the pressure boundary will be designed in accordance with existing safety system boundaries. The containment system limits the leakage or release of radioactive materials to the environment to prevent offsite exposures from exceeding the guidelines of 10CFR100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material. Newly installed components will be seismically qualified within their isolation boundaries to appropriate requirements.

Any newly installed electrical or controls component that 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 newly installed components will be considered Augmented Quality. Currently installed components are qualified in accordance with plant design bases. Electrical and controls components will be seismically qualified and will include the ability to handle harsh environmental conditions expected in the severe accident event (although they will not be considered part of the site Environmental Qualification (EQ) program).

Part 2: Boundary Conditions for Wet Well Vent

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 344-1975
3. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	**Qualification Method***
HCVS Process Temperature	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Process Valve Position	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 Fermi 2 wetwell HCVS will be capable of being manually operated during sustained operations from an HCVS Control panel located in the Division 2 Switchgear Room. The Division 2 Switchgear Room location is in a separate ventilation zone from the Reactor Building area and is not directly impacted by the HCVS piping heat load.

The HCVS Control Panel is on the east side with a 4.3' (feet) thick concrete shield wall between the HCVS piping and the HCVS Control Panel, providing protection equivalent to GDC 19/Alternate Source Term (AST). This operating location meets the requirements of Order element 1.2.4. The controls and indications at the HCVS 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. (Pending Design Calculation DC-6639, see Open Items 1 and 2)

The Fermi 2 wetwell HCVS will also be capable of being manually operated during sustained operations from a control panel located in the MCR (alternate controls location). The MCR is a readily accessible location with no further evaluation required. Control Room dose associated with HCVS

Part 2: Boundary Conditions for Wet Well Vent

operation conforms to GDC 19/Alternate Source Term (AST). This location meets the intent for an alternate control location of section 1.2.5 of the Order as described in NEI 13-02 section 4.2.2.1.2.1. The controls and indications at the MCR 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 confirm 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 at both the HCVS Control panel and the MCR. The HCVS Control panel includes valve position indications for the seven operating valves and the two SGTS Isolation valves. There are four items of concern which are addressed as listed below:

1. HCVS operation indicated by valve position and gas flow (indicated by temperature),
2. HCVS effluent indicated by the radiation monitor,
3. HCVS pneumatic capability indicated by bottle sizing for 24 hours in addition to pneumatic capability from the NIAS system after first 24 hours, and
4. HCVS electrical capability indicated by Division II station battery voltage and HCVS battery voltage.

The above indicators will provide compliance with Order element 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, has been 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, and total integrated dose for the vent pipe effluent.

Torus vent design temperature and pressure will be increased from 300°F and 62 psig to 340°F and 80 psig. Containment and isolation valves T4600F400, T4600F401 and T4600F412 are currently qualified for 340°F. NEI 13-02 guidance section 2.4.3 and 5.1.1 recommends 350°F and 80 psig. The Fermi 2 hardened vent will be opened to protect the PCPL of 58.8 psig and containment design pressure of 56 psig, which equates to a saturation temperature of 303°F. 340°F provides adequate margin to ensure the torus vent containment isolation valves will perform their hardened vent and isolation functions.

Conduit 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.

Part 2: Boundary Conditions for Wet Well Vent

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 for electro-magnetic compatibility (per RG 1.180). These qualifications will be bounding conditions for Fermi 2.

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 IEEE Standard 344-1975, *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 Wet Well Vent

Part 2 Boundary Conditions for WW Vent: BDBEE Venting

Determine venting capability for Beyond Design Bases External Event (BDBEE) Venting, such as may be used in an ELAP scenario to mitigate core damage.

BDBEE Venting is NOT being used at Fermi 2 as the primary success path for ELAP induced by a BDBEE. This section describes contingency use of the BDBEE Venting.

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 in the FLEX Contingency mode will be designed to minimize the reliance on operator actions for response to a ELAP and BDBEE hazards identified in part 1 of this OIP. Immediate operator actions can be completed by Operators from the HCVS control station 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 HCVS Control Panel. 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. Permanently installed equipment will supply air and power to HCVS for 24 hours.

System control:

i. Active: Control valves and/or PCIVs are operated in accordance with EOPs/SOPs to control containment pressure. The HCVS is designed for 8 open/close cycles under ELAP conditions over the first 24 hours following an ELAP. Controlled venting as a contingency action under FLEX will be permitted in the revised EPGs and associated implementing EOPs.

ii. Passive: Inadvertent actuation protection is provided by a normally de-energized HCVS Control Panel with energization annunciated in the MCR. A key-lock is provided to prevent inadvertent operation at the HCVS Control Panel.

Part 2: Boundary Conditions for Wet Well Vent

Part 2 Boundary Conditions for WW Vent: BDBEE Venting

Greater Than 24 Hour Coping Detail

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

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

After 24 hours, available personnel will be able to power 120 VAC and NIAS air supplies to allow operation of the HCVS Valves from the Control Room. FLEX Generators are credited for re-energizing MPU #1 and MPU #2 electrical supplies to restore normal HCVS valve operations. Actions taken in FLEX bypass the required Containment Isolation logic to allow HCVS Valve positioning. As stated previously, operation of the HCVS system after 24 hours is only a contingency if the credited FLEX method of Feed and Bleed of the Torus fails to maintain Torus Temperature below 220ºF.

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.

Primary Containment Control Flowchart exists to direct operations in protection and control of containment integrity, including use of the existing Hardened Vent System. Other site procedures for venting containment using the HCVS include: 29.FSG.13, FLEX Containment Venting, Technical Support Guidelines, 29.100.01 Sheet 2, 29.ESP.07, 29.ESP.22, and 29.200.01 Sheet 1.

Identify modifications*:*

List modifications and describe how they support the HCVS Actions.

<u>EA-12-049 Modifications</u>

- EDP 37037(completed in RF16): Installed containment isolation trip signal bypass switches to permit operation of the containment vent valves through the existing valve control circuits (alternate controls). Installed divisional cabling between the Auxiliary Building and Reactor Building to provide electrical control of vent valves and instrumentation valves from the new HCVS Control Panel (primary controls).

- EDP 37122 (Cycle 17): FLEX Backup Power to Div. 1 & 2, 480V Division 1 ESF Buses. Supplies 480 VAC to DC Chargers, 480 VAC loads and 120 VAC for alternate HCVS controls (alternate controls) and SAWA power for RHR Valves.

Part 2: Boundary Conditions for Wet Well Vent

Part 2 Boundary Conditions for WW Vent: BDBEE Venting

- EDP 37114 (Cycle 17 and RF17): Opens T5000F420B and T4600F421B with DC operated SOVs to restore DW/WW instrumentation following loss of NIAS for Containment indications. This modification supports FLEX instrumentation for Decision Maker on use of HCVS.
- EDP 37084 (Cycle 17 and RF17): FLEX RHR cross-tie modification which supplies water from alternate source for SAWA injection.

EA-13-109 Modifications

- EDP 37037: (completed in RF16): Installed containment isolation trip signal bypass switches to permit operation of the containment vent valves through the existing valve control circuits. Installed divisional cabling between the Auxiliary Building and Reactor Building to provide electrical control of vent valves and instrumentation valves from the new HCVS Control Panel (primary controls).
- EDP 37114 (Cycle 17 and RF17): Opens T5000F420B and T4600F421B with DC operated SOVs to restore DW/WW instrumentation following loss of NIAS for Containment indications. This modification supports Decision Maker on use of HCVS. Abandoned Panel H21P101 will be designed to mount the controls necessary for primary control of HCVS during ELAP.
- EDP 37115 (Cycle 18 and RF18): Installs portable bottles and DC solenoids for HCVS Primary controls. Installs the valve position indications and controls on HCVS Control Panel. Revise power feed to T46F420/F421 and to the hardened vent Rad Monitor. Adds a dedicated battery to ensure power to H21P101 for a minimum of 24 hours.
- EDP 37295 (Cycle 17 and RF17): Installs leak rate test capability of HCVS and NIAS connection for a portable compressor. Supplies FLEX Compressor for NIAS supplies for alternate HCVS controls.

Key Venting Parameters:

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

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

Key Parameter	Component Identifier	Indication Location
HCVS Effluent temperature	TBD	HCVS Control Panel
HCVS valve position indication	TBD	HCVS Control Panel/MCR
HCVS Effluent Radiation	RE-D11-N551	HCVS Control Panel/MCR

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 Regulatory Guide 1.97 per the existing plant design:

Part 2: Boundary Conditions for Wet Well Vent

Part 2 Boundary Conditions for WW Vent: BDBEE Venting

Key Parameter	Component Identifier	Indication Location
Drywell pressure	T50N401B (NR), T50N415B (WR) T50R802B Recorder	MCR
Torus pressure	T50N499B (NR) T50N414B (WR) T50R802B Recorder	MCR
Torus water temperature	T50N404B T50N405B T50R800B Recorder	MCR
Torus level	T50N406B T50R804B Recorder	MCR
Reactor pressure	B21N051A/B B21R623A/B Recorders	MCR

Indications for HCVS valve position, HCVS effluent temperature, HCVS effluent radiation will be installed in HVCS primary control panel to comply with EA-13-109. Final configuration of the HCVS control panel is still under consideration.

Notes:

Part 2: Boundary Conditions for Wet Well Vent

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. Actions will be completed by Operators at the HCVS Control Panel and will include remote-manual actions to operate HCVS valves using the locally installed operating bottles and DC solenoids. 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). Operator actions required are limited to DC load shedding (Relay Room), energizing the HCVS Control Panel, and operation of the HCVS Control Panel.

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: Primary method: Control valves and/or PCIVs are operated in accordance with EOPs/SOPs to control containment pressure. The HCVS will be designed for 8 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.
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.

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.

Part 2: Boundary Conditions for Wet Well Vent
Part 2 Boundary Conditions for WW Vent: Severe Accident Venting
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
The operation of the HCVS is governed by SAMGs for severe accident venting operation. EPG/SAG Rev. 3 29.200.01 Sheet 1 & 2 direct that containment pressure be controlled less than PSP pressure (17-25 psig) prior to RPV breach by degraded core to protect containment integrity from a high pressure melt ejection. Wetwell venting will be used to accomplish this. Following, RPV breach by the degraded core, containment pressure will be maintained within PCPL limits (< 58.8 psig) and containment design pressure (56 psig) to protect containment integrity.
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
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)*
The same as for BDBEE Venting Part 2
Notes:

Part 2: Boundary Conditions for Wet Well Vent

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 HCVS Control Panel or MCR.

Venting will require support from DC power and pneumatic supplies from permanently installed local bottles (Primary operating mechanism for the first 24 hours). Existing safety related station batteries will provide sufficient electrical power for HCVS operation for greater than 12 hours. Before station batteries are depleted, installed HCVS dedicated batteries will be placed in service using a throw over switch located at the HCVS Control panel to attain > 24 hours capacity for HCVS Operation with DC Load Shedding accomplished via the FLEX actions.

Severe Accident Venting

Provide a general description of the Severe Accident Venting actions support functions. Identify methods and strategy(ies) utilized to achieve venting results.

Ref: EA-13-109 Section 1.2.8, 1.2.9 / NEI 13-02 Section 2.5, 4.2.2, 4.2.4, 6.1.2

The same support functions that are used in the BDBEE scenario would be used for severe accident venting. To ensure power for the 12 to 24 hours, dedicated HCVS batteries will be available to feed HCVS loads via a manual transfer switch to attain > 24 hours capacity for HCVS Operation with DC Load Shedding accomplished via the FLEX actions.

At 24 hours, power will be available at the station service batteries which, at that point, will be backed up by FLEX generators evaluated for SA capability. FLEX generators supplying the DC Battery chargers are located outside the Reactor Building in a FLEX rated structure so issues of thermal or radiological impacts are minimized. This allows them to be used under Severe Accident conditions based on available distance and shielding provide by the Reactor Building exterior walls.

Multiple sources of compressed air will be available (FLEX compressor and FLEX generator supplied NIAS compressors) to tie-in supplemental pneumatic sources to the NIAS system for HCVS valve operation.

Details:

Provide a brief description of Procedures / Guidelines:

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

Part 2: Boundary Conditions for Wet Well Vent
Part 2 Boundary Conditions for WW Vent: HCVS Support Equipment Functions
Most of the equipment used in the HCVS is permanently installed. Portable equipment is only used to support the alternate operating method of HCVS (FLEX generators to supply 120 VAC and FLEX compressors to run pneumatic supplies for HCVS valve operation).
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
See Section "Part 2 Boundary Conditions for WW Vent: DBDEE Venting, Identify Modifications"   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. HCVS connections are located inside the AB 1st floor flood protected area in a Seismic Class 1/Tornado qualified structure and on the west wall of the Turbine Building 1st floor. Connection is not required until after the flood recedes; therefore, the Turbine Building and Auxiliary Building are accessible and connection points 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)*
Controls and instruments associated with the FLEX DG electrical load and fuel supply (stored on-site).   Controls and instruments associated with the FLEX compressor (stored on-site).   Pressure gauges on permanently installed local Nitrogen bottles to verify proper standby conditions (installed on local bottles). Bottles installed in inaccessible locations will be sized for sufficient capacity beyond 24 hours such that no makeup is needed.   Operation of the portable equipment is the same as for compliance with Order EA-12-049.
Notes:

Part 2: Boundary Conditions for Wet Well Vent

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. At Fermi 2, no deployment is required in the areas around the Reactor Building or in the vicinity of the HCVS piping for access, operation, and replenishment of consumables related to 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 and is acceptable without further evaluation.

HCVS Actions	Modifications	Protection of connections
Per compliance with Order EA-12-049 (FLEX)	N/A	Per compliance with Order EA-12-049 (FLEX)

Notes:

Part 3: Boundary Conditions for EA-13-109, Option B.2

General

Licensees that use Option B.1 of EA-13-109 (SA Capable DW Vent without SAWA) must develop their own OIP. This template does not provide guidance for that option.

Licensees using Option B.2 of EA-13-109 (SAWA and SAWM or 545°F SADW Vent (SADV) with SAWA) may use this template for their OIP submittal. Both SAWM and SADV require the use of SAWA and may not be done independently. The HCVS actions under Part 2 apply to all of the following.

This Part is divided into the following sections:

3.1: Severe Accident Water Addition (SAWA)

3.1.A: Severe Accident Water Management (SAWM)

3.1.B: Severe Accident DW Vent (545 deg F) ***Not applicable to Fermi 2.***

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

SAWA and SAWM or SADV Actions supporting SA conditions that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment). Actions already identified under the HCVS part of this template need not be repeated here.

The time to establish the water addition capability into the RPV or DW should be less than 8 hours from the onset of the loss of all injection sources.

- *Electrical generators satisfying the requirements of EA-12-049 may be credited for powering components and instrumentation needed to establish a flow path.*
- *Time Sensitive Actions (TSAs) for the purpose of SAWA are those actions needed to transport, connect and start portable equipment needed to provide SAWA flow or provide power to SAWA components in the flow path between the connection point and the RPV or drywell. Actions needed to establish power to SAWA instrumentation should also be included as TSAs.*

Ref: NEI 13-02 Section 6.1.1.7.4.1, I.1.4, I.1.5

The operation of the HCVS using SAWA and SAWM will be designed to minimize the reliance on operator actions in response to hazards listed in Part 1. Initial operator actions will be completed by plant personnel and will include the capability for monitoring Torus and Containment conditions, direction of both Venting at the HCVS Control panel and SAWM flow reductions at the SAWA/SAWM Flow Control Station located in the Yard as well as SAWA pump flow indications located in the yard. In addition, HCVS operation may occur/be shifted into the Control Room when credit can be taken for FLEX Air/Power (e.g., > 24 hours).

Timelines (see attachment 2.1.A for SAWA/SAWM) were developed to identify required operator response times and actions. The timelines are an expansion of Attachment 2 and begin either as core damage occurs (SAWA) or after initial SAWA injection is established and as flowrate is adjusted for option B.2 (SAWM). The timelines do not assume the core is ex-vessel and the actions taken are appropriate for both in-vessel and ex-vessel core damage conditions.

Part 3.1: Boundary Conditions for SAWA

Table 3.1 – SAWA Manual Actions

Primary Action	Primary Location / Component	Notes
1. Establish HCVS capability in accordance with Part 2 of this guidance	HCVS Control Panel (first 24 hours)/ Main Control Room (> 24 hours)	Applicable to SAWA/SAWM strategy
2. Deploy SAWA Hoses and pumps	Fermi 2 Yard.	Same as for FLEX Water System
3. Startup FLEX (SAWA) Pumps and establish Flow to RB	Fermi 2 Yard.	Same as for FLEX Water System
4. Power up FLEX Generators to allow CR positioning of RHR Valves	Fermi 2 Yard.	Same as for FLEX Electrical System
5. Align Fermi 2 Buses to receive FLEX Power for RHR	Auxiliary Building Division 2 Switchgear Room	Same as for FLEX Electrical System
6. Align Manual SAWA to RHR Valves in RB	Division 2 RB 2	Same as for FLEX Water System but done at less than one hour from loss of injection.
7. Inject to RPV using SAWA pump (s) (diesel driven) and Flow Control Trailer	Division 2 flowpath controlled from MCR H11P602	Initial SAWA injection rate is 500 gpm
8. Monitor SAWA indications	Flow and Containment Pressure for initiation of SAWM	Pump Flow at Flow Trailer RHR Valve Position in CR Containment Pressure in CR and at HCVS Panel
9. Use SAWM to maintain availability of the WW vent (Part 3.1.A)	Follow flow reduction plan (Based on Containment pressure and time)	Monitor DW Pressure and Suppression Pool Level in MCR Control SAWA flow at Flow Control Trailer.

Part 3.1: Boundary Conditions for SAWA

Discussion of timeline SAWA identified items

HCVS operations are discussed under Phase 1 of EA-13-109 (Part 2 of this OIP).

- 1 Hour – Align RB valves to support SAWA/Attempt to restore RCIC/HPCI
- 5 Hours – Establish electrical power and other EA-12-049 actions needed to support the strategies for EA-13-109, Phase 1 and Phase 2. All actions required are assumed to be in-line with the FLEX timeline submitted in accordance with the EA-12-049 requirements.
- Less than 8 Hours – Initiate SAWA flow to the RPV. Having the HCVS in service will assist in minimizing the peak DW pressure during the initial cooling conditions provided by SAWA.
- Less than 12 Hours - SAWM Flow reductions: 4 hours after SAWA reduce to 100 gpm

Severe Accident Operation

Determine operating requirements for SAWA, such as may be used in an ELAP scenario to mitigate core damage.

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Section I.1.6, I.1.4.4

It is anticipated that SAWA will be used in Severe Accident Events based on presumed failure of injection systems or presumed failure to implement an injection system in a timely manner leading to core damage. SAWA will consist of both portable and installed equipment. The SAWA equipment at Fermi 2 is the same equipment used for EA-12-049.

The motive force equipment needed to support the SAWA strategy shall be available prior to T=8 hours from the loss of injection (assumed at T=0).

The SAWA flow path includes methods to minimize exposure of personnel to radioactive liquids / gases and potentially flammable conditions by inclusion of backflow prevention. Use of the RHR injection check valve and check valves in the SAWA/FLEX/RHR cross tie piping provides two levels of backflow prevention.

Description of SAWA actions for first 24 hours:

T<1 hr:

- No evaluation required for actions inside the reactor building for SAWA. Expected actions are*:*
  - Attempts to Blackstart RCIC under EOPs
  - Opening of FLEX to RHR cross tie valves on RB-2 (preferred path)

T=1 – 8 hr:

- Evaluation of core gap and early in-vessel release impact to reactor building access for SAWA actions is required. It is assumed that reactor building access is limited due to the source term at this time unless otherwise noted. (Refer to HCVS-FAQ-12 for actions in T=1-7 hr) Expected actions are:
  - There are no actions in the window between 1 hour and 8 hours in the Reactor Building for SAWA.

Part 3.1: Boundary Conditions for SAWA

- Establish electrical power for SAWA systems and indications using EA-12-049, or other systems.
  - Steps 4 and 5 of table 3.1
- Establish flow to the RPV using SAWA systems. Begin injection at a maximum rate, not to exceed 500 gpm.
  - Steps 2, 3, 6, and 7 of table 3.1

T≤8 –12 hr:

- Continue injection for 4 hours after SAWA injection begins at initial SAWA rate.

T≤12 hrs:

- Proceed to SAWM actions (Part 3.1.A)
  - Step 9 of table 3.1

Greater Than 24 Hour Coping Detail

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

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3/ NEI 13-02 Section 4.2.2.4.1.3.1, I.1.4,

SAWA Operation is the same for the full period of sustained operation. If SAWM is employed, flow rates will be directed to preserve the availability of the HCVS wetwell vent (see 3.1.A). SAWM flow reductions based on time (and checked by containment pressure prediction): 4 hours after SAWA flow initiated, flow is reduced to 100 gpm until 168 hours (7 days) OR Alternate Decay Heat removal established.

Details

Details of Design Characteristics/Performance Specifications

SAWA shall be capable of providing an RPV injection rate of 500 gpm within 8 hours of a loss of all RPV injection following an ELAP/Severe Accident. SAWA shall meet the design characteristics of the HCVS with the exception of the dedicated 24 hour power source. Hydrogen mitigation is provided by backflow prevention for SAWA.

Ref: EA-13-109 Attachment 2, Section B.2.1, B.2.2, B.2.3/ NEI 13-02 Section I.1.4

Equipment Locations/Controls/Instrumentation

The locations of the SAWA equipment and controls, as well as ingress and egress paths have been evaluated for the expected severe accident conditions (temperature, humidity, radiation) for the Sustained Operating period. Equipment has been evaluated to remain operational throughout the Sustained Operating period. Personnel exposure and temperature / humidity conditions for operation

Part 3.1: Boundary Conditions for SAWA

of SAWA equipment will not exceed the limits for ERO dosage and plant safety guidelines for temperature and humidity.

The flow path will be from the FLEX suction in the Circulating Water Pond through the FLEX Source and Booster Pumps (2) via the 10" hose to the Flow Control Trailer. The Flow Control Trailer branch lines contain individual flow indicators. It is expected that either or both 1.5" branch lines will be used to get to 500 gpm. If required, the 4" branch line could also be opened. The outlet of the Flow Control Trailer will be connected to Div 2 RHR connection (Southern connection on West RB Wall). The monitored water flow rate will pass through the RHR cross connect piping into the Reactor Building where it will connect with the Division 2 RHR system. The flow will then be directed into the RPV via the LPCI injection valves. Cross flow into other portions of the RHR system will be isolated by ensuring closure of RHR Cross Tie and Div 2 branch path MOVs from the MCR (if required). DW pressure and Suppression Pool level will be monitored and flow rate will be adjusted by use of the Flow Control Trailer branch lines valves located at the West Wall of the RB. Communication will be established between the MCR and the Flow Control Trailer/ FLEX pump control locations.

MOVs will be powered from the FLEX diesel generators connected in the Control Building as described in the EA-12-049 compliance documents. The FLEX DGs are located in FSF-1 which is located 200' West and 120' below the HCVS Discharge. Refueling of the FLEX DG will be accomplished from site fuel oil tanks as described in the EA-12-049 compliance documents. The Circulating Water pond is 500' North from the discharge of the HCVS (see mechanical and electrical sketches in attachments, plant layout sketches in the assumptions part and a list of actions in this part).

Evaluations (in pending Design Calculations DC-6639 and DC-6649) for projected SA conditions (radiation / temperature) indicate that personnel can complete the initial and support activities without exceeding the ERO allowable dose for equipment operation or site safety standards. (Reference HCVS-WP-02, *Plant-Specific Dose Analysis for the Venting of Containment during the SA Conditions*)

Electrical equipment and instrumentation will be powered from the existing station batteries, and from AC distribution systems that are powered from the EA-12-049 generator(s). The battery chargers are also powered from the EA-12-049 generator(s) to maintain the battery capacities during the Sustained Operating period. The indications include (* are minimum):

Parameter	Instrument	Location	Power Source / Notes
*DW Pressure	Div 2 PCMS:T50R802B	MCR	Station batteries via EA-12-049 generator; HCVS Air Supply
*Suppression Pool Level	Div 2 PCMS: T50R804B Wide range (-12' to +4.8')	MCR	Station batteries via EA-12-049 generator; HCVS Air Supply
*SAWA Flow	Flow Control Trailer Branch line indicators	Flow Control Trailer	Flow Control Branch lines
Valve controls	MCR Panels	MCR & Control Building	72C-F Bus from EA-12-049 generator

Part 3.1: Boundary Conditions for SAWA

The instrumentation and equipment being used for SAWA and supporting equipment has been evaluated to perform for the Sustained Operating period under the expected radiological and temperature conditions.

Equipment Protection

Any SAWA component and connections external to protected buildings have been protected against the screened-in hazards of EA-12-049 for the station. SAWA Connections are seismic, above flood elevation, and Tornado Missile protected per EA-12-049 Compliance. Portable equipment used for SAWA implementation will meet the protection requirements for storage in accordance with the criteria in NEI 12-06 Revision 0.

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Section 5.1.1, 5.4.6, I.1.6

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

Ref: EA-13-109 Attachment 2, Section A.3.1, B.2.3 / NEI 13-02 Section 1.3, 6.1.2

- SAWA Deployment, hose fill and pump start up procedure: 29.FSG.02 (Deployment)
- Hook-up and start FLEX DG to repower valves: 29.FSG.02, 29.FSG.04
- RPV Injection: 29.FSG.11 (RPV Injection)
- Adjust flow rate at Flow Control Trailer: 29.FSG.11

Identify modifications*:*

List modifications and describe how they support the SAWA Actions.

Ref: EA-13-109 Attachment 2, Section B.2.2, / NEI 13-02 Section 4.2.4.4, 7.2.1.8, Appendix I

None. All modifications completed for FLEX Compliance.

Component Qualifications:

State the qualification used for equipment supporting SAWA

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Section I.1.6

Permanently installed plant equipment shall meet the same qualifications as described in Part 2 of this OIP. Temporary/Portable equipment shall be qualified and stored to the same requirements as FLEX equipment as specified in NEI 12-06 Rev 0. SAWA components are not required to meet NEI 13-02, Table 2-1 design conditions.

Notes:

Part 3.1.A: <u>Boundary Conditions for SAWA/SAWM</u>

Time periods for the maintaining SAWM actions such that the WW vent

SAWM Actions supporting SA conditions that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walkthrough of deployment). Actions already identified under the HCVS part of this template need not be repeated here.

There are three time periods for the maintaining SAWM actions such that the WW vent remains available to remove decay heat from the containment:

- *SAWM can be maintained for >7 days without the need for a drywell vent to maintain pressure below PCPL or containment design pressure, whichever is lower.*
  - *Under this approach, no detail concerning plant modifications or procedures is necessary with respect to how alternate containment heat removal will be provided.*
- *SAWM can be maintained for at least 72 hours, but less than 7 days before DW pressure reaches PCPL or design pressure, whichever is lower.*
  - *Under this approach, a functional description is required of how alternate containment heat removal might be established before DW pressure reaches PCPL or design pressure whichever is lower. Under this approach, physical plant modifications and detailed procedures are not necessary, but written descriptions of possible approaches for achieving alternate containment heat removal and pressure control will be provided.*
- *SAWM can be maintained for <72 hours* SAWM strategy can be implemented but for less than 72 hours before DW pressure reaches PCPL or design pressure whichever is lower.
  - *Under this approach, a functional description is required of how alternate containment heat removal might be established before DW pressure reaches PCPL or design pressure whichever is lower. Under this approach, physical plant modifications and detailed procedures are required to be implemented to insure achieving alternate containment heat removal and pressure control will be provided for the sustained operating period.*

Ref: NEI 13-02 Appendix C.7

At Fermi 2, SAWM can be maintained for >7 days without the need for a drywell vent to maintain pressure below PCPL or containment design pressure, whichever is lower.

- Under this approach, no detail concerning plant modifications or procedures is necessary with respect to how alternate containment heat removal will be provided.

Basis for SAWM time frame

<u>Option 1 - SAWM can be maintained greater than or equal to 7 days</u>:

Fermi 2 was evaluated by the GEH White Paper BWROG TP-2015-008. The evaluation concluded that, based on a MAAP evaluation for Fermi 2, SAWA/SAWM can be maintained for greater than 7 days. (NEI 13-02 C.7.1.4.1)

Part 3.1.A: Boundary Conditions for SAWA/SAWM

Instrumentation relied upon for SAWM operations is Drywell Pressure, Suppression Pool level and SAWA flow. All of which are initially powered by the station batteries and then by the FLEX (EA-12-049) diesel generator (DG), which is placed in-service prior to core breach. The DG will provide power throughout the Sustained Operation period (7 days). DW Temperature monitoring is not a requirement for compliance with Phase 2 of the order, but some knowledge of temperature characteristics provides information for the operation staff to evaluate plant conditions under a severe accident and provide confirmation to adjust SAWA flow rates. (C.7.1.4.2, C.8.3.1)

Suppression Pool level indication is maintained throughout the Sustained Operation period, so the HCVS remains in-service. The time to reach the level at which the WW vent must be secured is >7days using SAWM flowrates. (C.6.3, C.7.1.4.3)

Procedures will be developed that control the Suppression Pool level, while ensuring the DW pressure indicates the core is being cooled, whether in-vessel or ex-vessel. Procedures will dictate conditions during which SAWM flowrate should be adjusted (raised or lowered) using suppression pool level and DW pressure as controlling parameters to remove the decay heat from the containment. This is similar to the guidance currently provided in the BWROG SAMGs. (C.7.1.4.3)

Attachment 2.1.A shows the timeline of events for SAWA / SAWM. (C.7.1.4.4)

Table 3.1.B – SAWM Manual Actions

Primary Action	Primary Location / Component	Notes
1. Lower SAWA injection rate to control Suppression Pool Level and decay heat removal	Flow Control Trailer at West wall of RB	■ Control to maintain containment and WW parameters to ensure WW vent remains functional. ■ 75 gpm minimum capability is maintained for greater than 7 days
2. Control to SAWM flowrate for containment control / decay heat removal	Flow Control Trailer at West wall of RB	■ SAWM flow rates will be monitored using the following instrumentation o Branch Line Flow o Suppression Pool Level o DW pressure ■ SAWM flow rates will be controlled using Branch line valves at the Flow Control Trailer
3. Establish alternate source of decay heat removal	Yard	■ >7 days
4. Secure SAWA / SAWM	Yard	■ When reliable alternate containment decay heat removal is established.

Part 3.1.A: Boundary Conditions for SAWA/SAWM

SAWM Time Sensitive Actions

Time Sensitive SAWM Actions:

12 Hours OR 4 hours after start of SAWA injection – Initiate actions to maintain the Wetwell (WW) vent capability by lowering injection rate, while maintaining the cooling of the core debris (SAWM). Monitor SAWM critical parameters while ensuring the WW vent remains available.

SAWM Severe Accident Operation

Determine operating requirements for SAWM, such as may be used in an ELAP scenario to mitigate core damage.

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Appendix C

It is anticipated that SAWM will only be used in Severe Accident Events based on presumed failure of plant injection systems per direction by the plant SAMGs. Refer to attachment 2.1.C for SAWM SAMG language additions.

First 24 Hour Coping Detail

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

Given the initial conditions for EA-13-109:

- *BDBEE occurs with ELAP*
- *Failure of all injection systems, including steam-powered injection systems*

Ref: EA-13-109 Section 1.2.6, Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 2.5, 4.2.2, App C, Section C.7

SAWA will be established as described as stated above. SAWM will use the installed instrumentation to monitor and adjust the flow from SAWA to control the branch line flow to deliver flowrates applicable to the SAWM strategy.

Once the SAWA initial low rate has been established for 4 hours, the flow will be reduced monitoring DW pressure and Suppression Pool level. SAWM flowrate can be lowered to maintain containment parameters and preserve the WW vent path. SAWM will be capable of injection for the period of Sustained Operation.

Greater Than 24 Hour Coping Detail

Provide a general description of the SAWM 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, Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 4.2.2, App C, Section C.7

<u>SAWM can be maintained >7 days</u>:

The SAWM flow strategy will be the same as the first 24 hours until ‘alternate reliable containment heat removal and pressure control’ is reestablished. SAWM flow strategy uses the SAWA flow path.

Part 3.1.A: Boundary Conditions for SAWA/SAWM

No additional modifications are being made for SAWM.

Details:

Details of Design Characteristics/Performance Specifications

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Section Appendix C

SAWM shall be capable of monitoring the containment parameters (DW pressure and Suppression Pool Level) to provide guidance on when injection rates shall be reduced, until alternate containment decay heat/pressure control is established. SAWA will be capable of injection for the period of Sustained Operation.

Equipment Locations/Controls/Instrumentation

Describe location for SAWM monitoring and control.

Ref: EA-13-109 Attachment 2, Section B.2.2, B.2.3 / NEI 13-02 Appendix C, Section C.8, Appendix I

The SAWM control location is the same as the SAWA control location. Local indication of SAWM flow rate is provided at Flow Control Trailer Branch lines by installed flow instrument qualified to operate under the expected environmental conditions. The SAWA flow instrument is power independent (rotameter). Satellite Phone Communications will be established between the SAWM control location and the MCR.

Injection flowrate is controlled by Branch lines located on the Flow Control Trailer.

Suppression Pool level and DW pressure are read in the control room using indicators powered by the station Batteries OR FLEX DG installed under EA-12-049. These indications are used to control SAWM flowrate to the RPV.

Key Parameters:

List instrumentation credited for the SAWM Actions.

Parameters used for SAWM are (*=minimum required):

- DW Pressure*
- Suppression Pool Level*
- SAWM Flowrate

The Drywell pressure and Suppression Pool level instruments are qualified to RG 1.97 / equivalent and are the same as listed in part 2 of this OIP. The SAWM flow instrumentation will be qualified for the expected environmental conditions.

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: operation of HCVS System in both standby and operating conditions, maintenance of HCVS permanent equipment, interface with NRC Order EA-12-049 equipment, connection points and timing for alternate HCVS control equipment being used, protection of HCVS 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.

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 plant process for initiating or revising procedures and will 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,
- testing of portable equipment, and
- performance or surveillance testing.

Provisions for out-of-service requirements of the HCVS and compensatory measures will be documented in the Beyond-Design-Bases Event Coping Strategies Program Document (MOP25):

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 be entered into the corrective action system
    - The HCVS functionality will be restored in a manner consistent with plant procedures

Part 4: Programmatic Controls, Training, Drills and Maintenance

- A cause assessment will be performed to prevent future loss of function for similar causes
- The appropriate compensatory actions will be implemented

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

Identify how the drills and exercise parameters will be met.

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

Ref: EA-13-109 Section 3.1 / NEI 13-02 Section 6.1.3

Use of the HCVS system in drills, tabletops, or exercises will be aligned with the Mitigation of Beyond Design Bases Events (MBDBE) proposed rulemaking 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 using backup power, from the primary or alternate location, during conditions of ELAP/loss of UHS with no core damage based on Torus temperature. System use is for containment heat removal and containment pressure control.
- HCVS operation on backup power and from the 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.

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 requirements resulting from the MBDBE rulemaking.

Describe maintenance plan:

- *The 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.*

Part 4: Programmatic Controls, Training, Drills and Maintenance

- *Periodic testing and frequency should be determined based on equipment type, expected use and manufacturer's recommendations (further details are provided in Section 5 of NEI 13-02).*
- *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 established in accordance with guidance in Fermi 2 Conduct Manual MES51, "Preventative Maintenance" will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

Fermi 2 will implement the following operation, testing and inspection requirements for the HCVS to ensure reliable operation of the system (see Table 4-1).

Part 4: Programmatic Controls, Training, Drills and Maintenance

Table 4-1: Testing and Inspection Requirements

Description	Frequency
Cycle the HCVS valves[1] and the interfacing system valves not used to maintain containment integrity during operations	Once per every[2] operating cycle
Perform visual inspections and a walk down of HCVS components	Once per every other[3] operating cycle
Functionally check the HCVS radiation monitors	Once per every operating cycle
Leak test the HCVS	(1) Prior to first declaring the system functional; (2) Once every three operating cycles thereafter; and (3) After restoration of any breach of system boundary within the buildings
Validate the HCVS operating procedures by conducting an open/close test of the HCVS control logic from its control panel and ensuring that all interfacing system valves move to their proper (intended) positions	Once per every other operating cycle

[1] Not required for HCVS check valves

[2] After two consecutive successful performances, the test frequency may be reduced to once per every other operating cycle.

[3] After two consecutive successful performances, the test frequency may be reduced by one operating cycle to a maximum of once per every fourth operating cycle.

Notes:

Part 5: Milestone Schedule

Provide a milestone schedule

This schedule should include:

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

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

Ref: EA-13-109 Section D.1, D.3 / NEI 13-02 Section 7.2.1

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

Phase 1 Milestone Schedule

Phase 1 Milestone Schedule

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	
Design Change Package issued for Cycle 17/RF17	Sept. 2014	Complete	
Submit 6 Month Status Report	Dec. 2014	Complete	
Submit 6 Month Status Report	June 2015	Complete	
Design Change implementation Cycle 17	Aug. 2015	Complete	
Design Change implementation RF17	Nov. 2015	Complete	
Submit 6 Month Status Report	Dec. 2015	This document	
Submit 6 Month Status Report	June 2016		
Design Change Package issued for RF18	July 2016		
Operations Procedure Changes Developed	Dec. 2016		

Part 5: Milestone Schedule

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Site Specific Maintenance Procedure Developed	Dec. 2016		
Submit 6 Month Status Report	Dec. 2016		
Training Complete	Feb. 2017		
Submit 6 Month Status Report	June 2017		
Design Change implementation RF18	Apr. 2017		
Procedure Changes Active	May 2017		
Walk Through Demonstration/Functional Test	June 2017		
Submit Completion Report	June 2017		

Phase 2 Milestone Schedule:

Phase 2 Milestone Schedule

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Submit Overall Integrated Implementation Plan	Dec. 2015	This document	
Submit 6 Month Status Report	June 2016		
Submit 6 Month Status Report	Dec. 2016		
Submit 6 Month Status Report	June 2017		
Design Engineering Complete	Sep. 2017		
Submit 6 Month Status Report	Dec. 2017		
Operations Procedure Changes Developed	Mar. 2018		
Site Specific Maintenance Procedure Developed	Mar. 2018		
Submit 6 Month Status Report	June 2018		
Training Complete	Aug. 2018		
Procedure Changes Complete	Aug. 2018		
Implementation Outage	Sep. 2018		
Submit 6 Month Status Report	Dec. 2018		
Walk Through Demonstration/Functional Test	Jan. 2019		
Submit Completion Report	Jan. 2019		

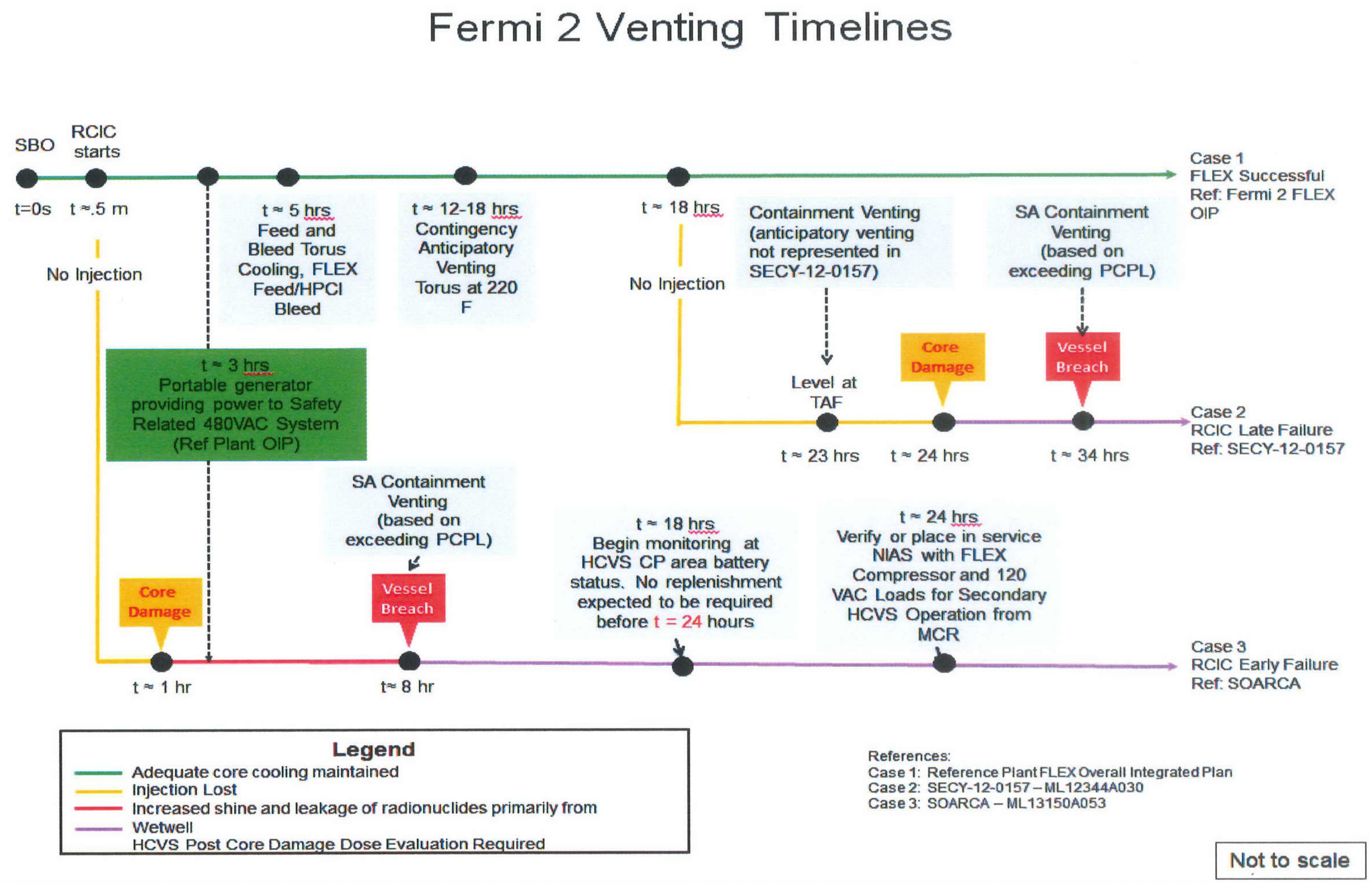
Part 5: Milestone Schedule
Notes:

Attachment 1: HCVS/SAWA Portable Equipment

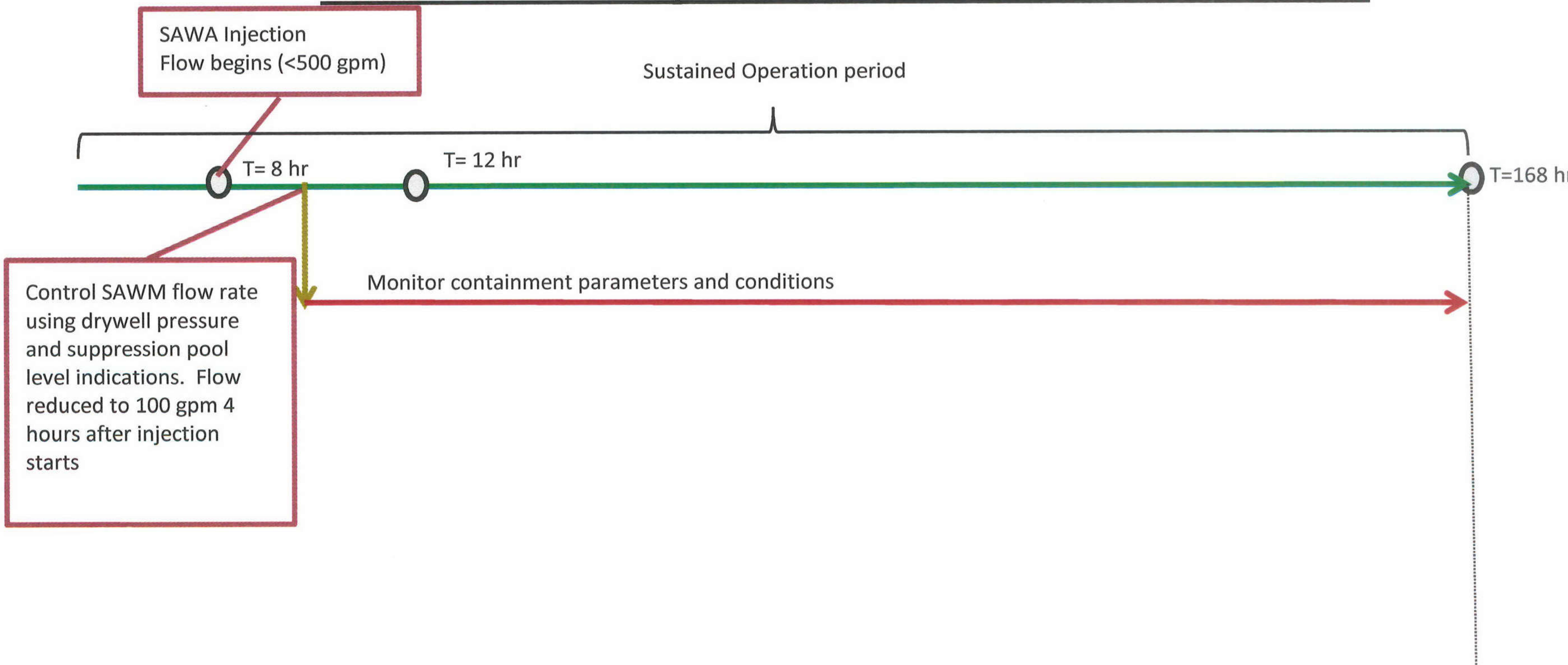
List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*
FLEX Compressor	X	X	100 scfm @ 100 psig	Periodically run for functional testing per response to EA-12-049
FLEX Generator	X	X	550 kW @ 480 V with 80% power factor (687.5 kVA)	Periodically run for functional testing per response to EA-12-049
FLEX Source and Booster Pump (Neptune System)		X	> 500 gpm at > 126 psig	Periodically run for functional testing per response to EA-12-049
FLEX Booster Pump (Dominator System)		X	> 500 gpm at > 126 psig	Periodically run for functional testing per response to EA-12-049
FLEX Flow Control Trailer		X	Controls flow from 500 to 100 gpm	Periodically run for functional testing per response to EA-12-049

Attachment 2A: Sequence of Events Timeline

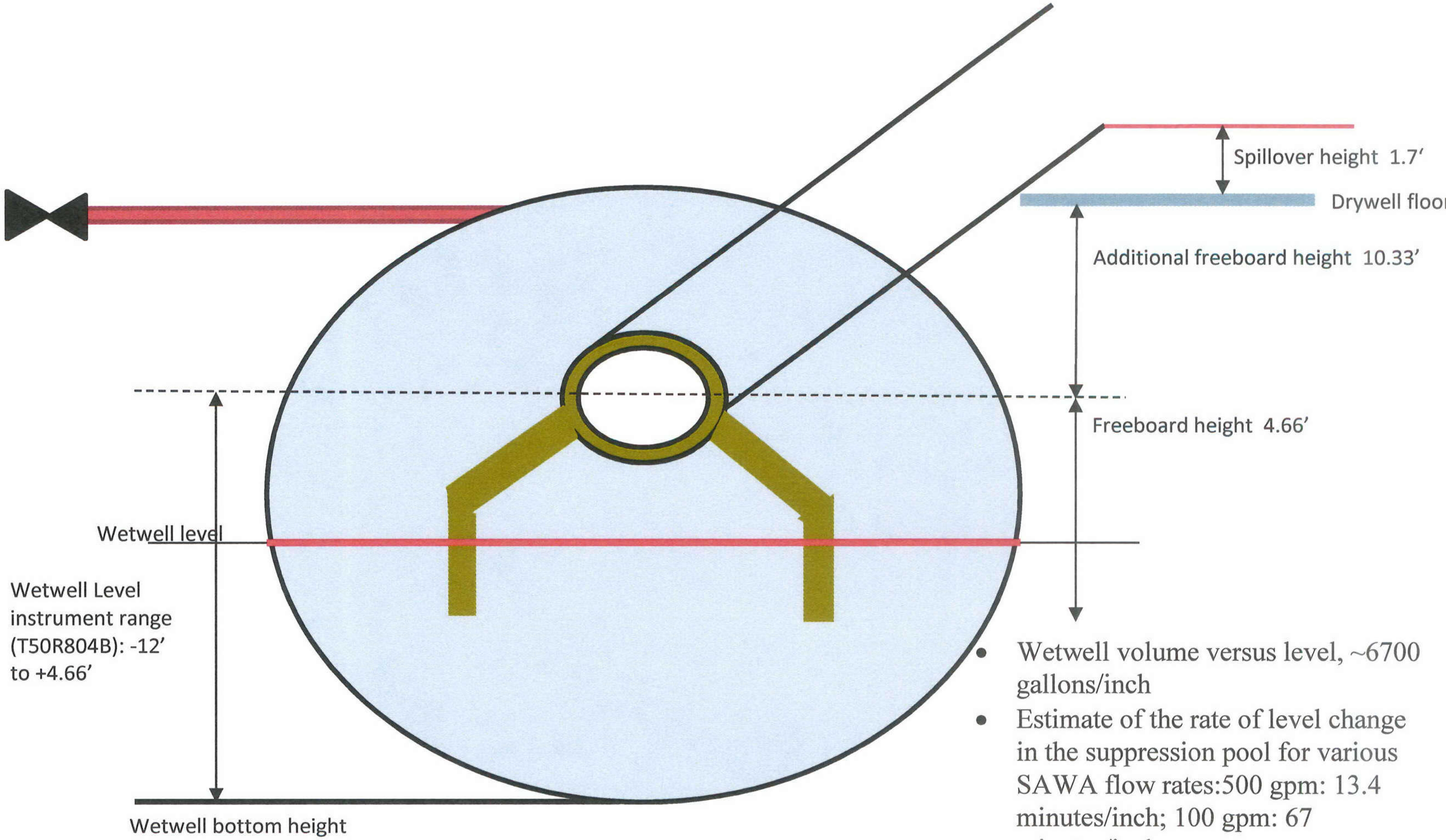
Table 2A: Wet Well HCVS Timeline



Attachment 2.1.A: Sequence of Events Timeline – SAWA / SAWM



Attachment 2.1.B: SAWA / SAWM Plant-Specific Datum



- Wetwell volume versus level, ~6700 gallons/inch
- Estimate of the rate of level change in the suppression pool for various SAWA flow rates:500 gpm: 13.4 minutes/inch; 100 gpm: 67 minutes/inch.

Attachment 2.1.C: SAWM/SAMG Approved Language

The following general cautions, priorities and methods will be evaluated for plant specific applicability and incorporated as appropriate into the plant specific SAMGs using administrative procedures for EPG/SAG change control process and implementation. SAMGs are symptom based guidelines and therefore address a wide variety of possible plant conditions and capabilities while these changes are intended to accommodate those specific conditions assumed in Order EA-13-109. The changes will be made in a way that maintains the use of SAMGs in a symptom based mode while at the same time addressing those conditions that may exist under extended loss of AC power (ELAP) conditions with significant core damage including ex-vessel core debris.

Actual approved language that will be incorporated into site SAMG*

Cautions:

- Addressing the possible plant response associated with adding water to hot core debris and the resulting pressurization of the primary containment by rapid steam generation
- Addressing the plant impact that raising suppression pool water level above the elevation of the suppression chamber vent opening elevation will flood the suppression chamber vent path

Priorities:

With significant core damage and RPV breach, SAMGs prioritize the preservation of primary containment integrity while limiting radioactivity releases as follows:

- Core debris in the primary containment is stabilized by water addition (SAWA)
- Primary containment pressure is controlled below the Primary Containment Pressure Limit (Wetwell venting)
- Water addition is managed to preserve the Mark I/II suppression chamber vent paths, thereby retaining the benefits of suppression pool scrubbing and minimizing the likelihood of radioactivity and hydrogen release into the secondary containment (SAWM)

Methods:

Identify systems and capabilities to add water to the RPV or drywell, with the following generic guidance:

- Use controlled injection if possible
- Inject into the RPV if possible
- Maintain injection from external sources of water as low as possible to preserve suppression chamber vent capability

* Actual language may vary by acceptable site procedure standards, but intent and structure should follow this guidance.

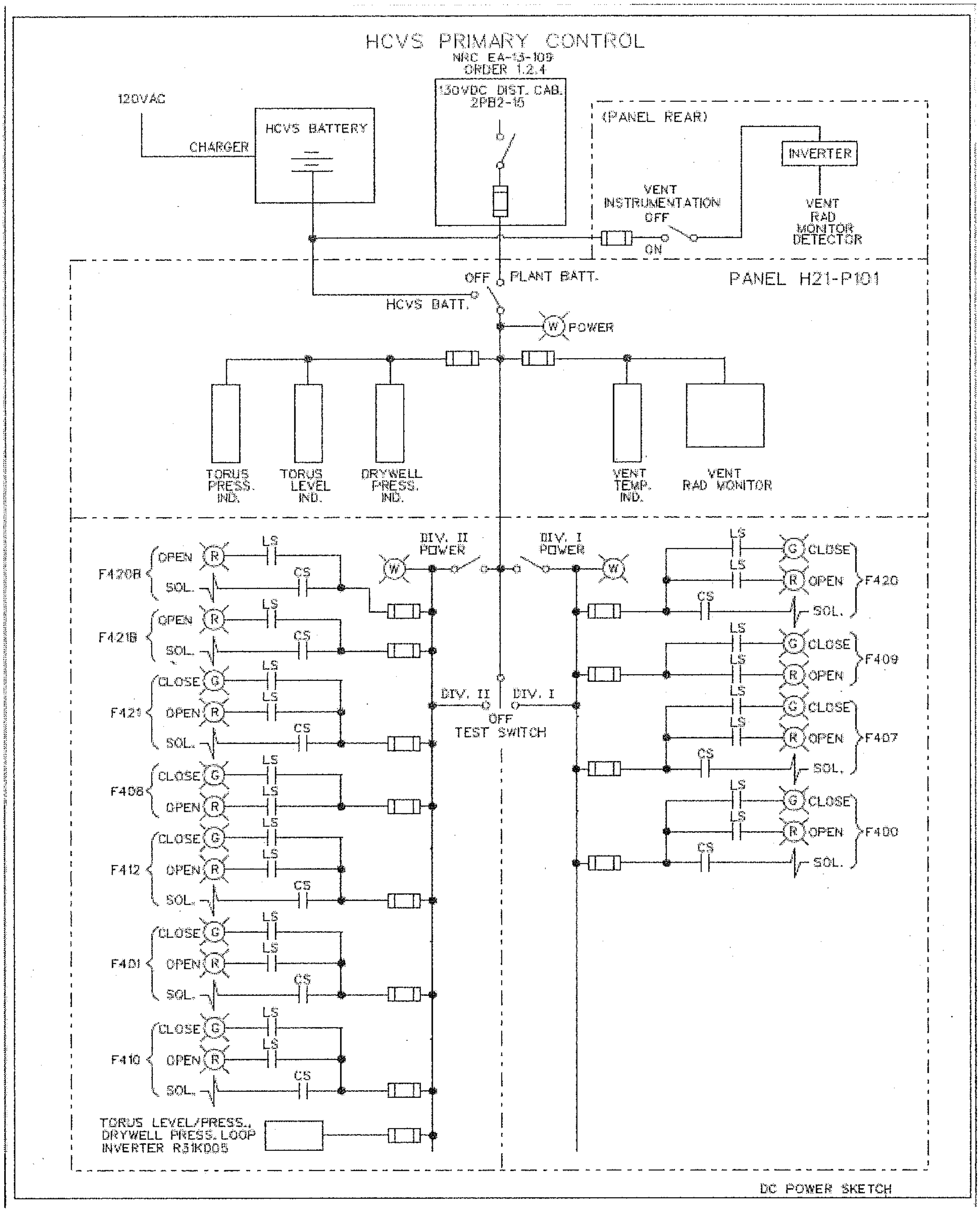
Attachment 3: Conceptual Sketches

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

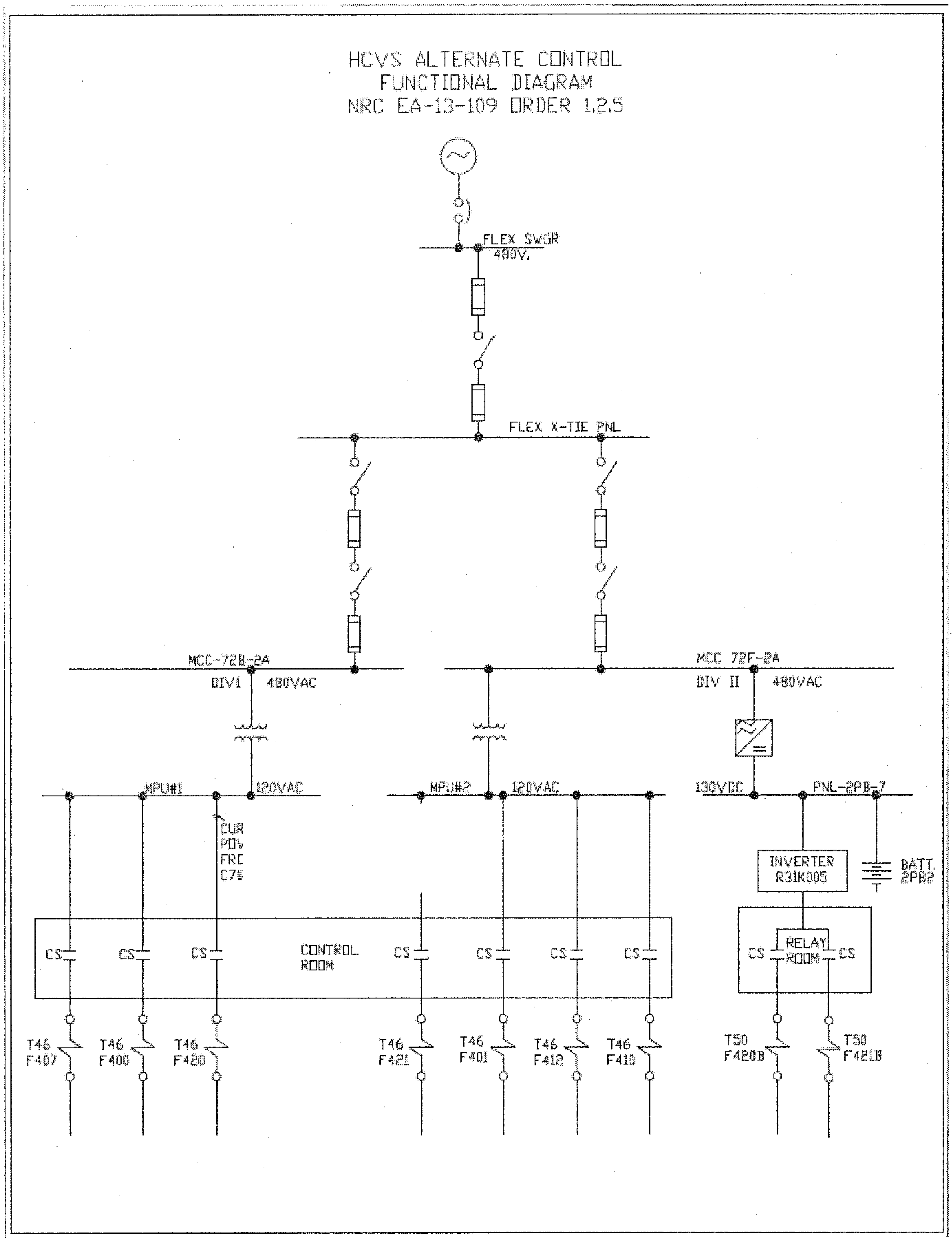
- Plant layout with egress and ingress pathways
- Piping routing for vent path
- Instrumentation Process Flow
- Electrical Connections
- Include a piping and instrumentation diagram of the vent system. Demarcate the valves (in the vent piping) between the currently existing and new ones.

Sketch 1: HCVS Control Panel (DC) Electrical Layout of System (preliminary)
Sketch 2: MCR (AC) Electrical Layout of System (preliminary)
Sketch 3: FLEX/SAWA Electrical
Sketch 4: FLEX/SAWA Mechanical
Sketch 5: Layout of HCVS (preliminary)

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

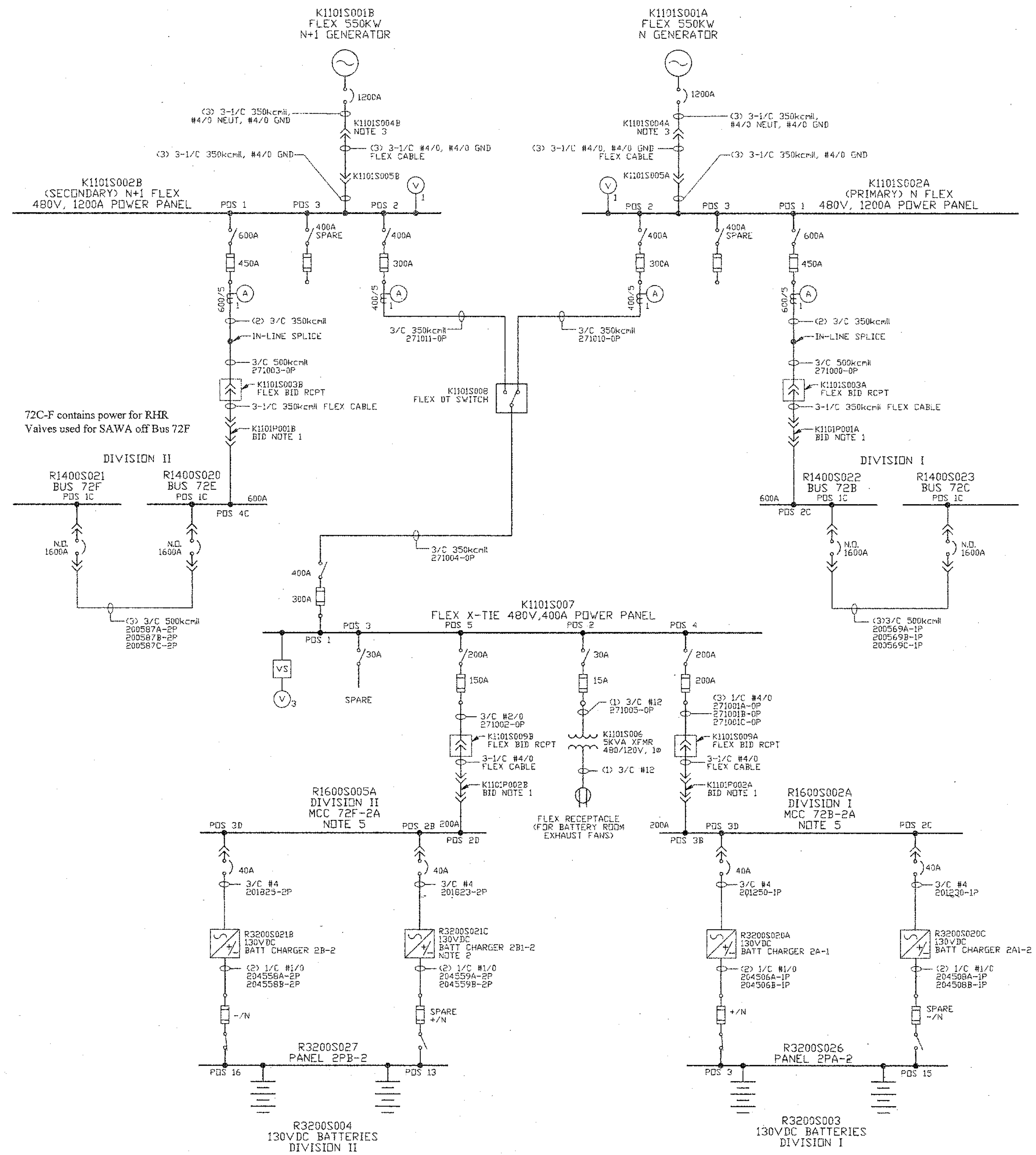


Sketch 1: HCVS Control Panel (DC) Electrical Layout of System



Sketch 2: MCR (AC) Electrical Layout of System

EDP 37122 FLEX AC ONE LINE DIAGRAM



NOTES:

1. BREAKER INSERT DEVICES (BID) ARE NOT INSTALLED AND FLEX CABLES NOT CONNECTED DURING NORMAL OPERATION.
2. SPARE CHARGER 2B1-2 LEFT IN +/N CONFIGURATION AFTER MAINTENANCE.
3. FLEX CONNECTION ENCLOSURE MOUNTED ON GENERATOR TRAILER.
4. ONLY SELECT BREAKERS FROM R1400S020, S21, S22 AND S23 ARE SHOWN. SEE SD-2510-01 FOR ALL BREAKERS.
5. ONLY SELECT LOADS FROM R1600S002A AND R1600S005A ARE SHOWN. SEE SD-2S12-20 AND SD-2S12-22, RESPECTIVELY, FOR ALL LOADS.

SYMBOLS & ABBREVIATIONS

BID	BREAKER INSERT DEVICE
N.O.	NORMALLY OPEN
(A)	ANALOG AMMETER MTD IN SEPARATE ENCLOSURE
(V)1	ANALOG VOLTMETER MTD IN SEPARATE ENCLOSURE 1Ø (PH X-Y) METERING
(V)3	ANALOG VOLTMETER MTD IN SEPARATE ENCLOSURE 3Ø, 480V METERING
VS	VOLTMETER SELECTOR SWITCH
600/5	CURRENT TRANSFORMER W/STATED RATIO MTD INSIDE POWER PANEL METERING PHASE Y
	FEMALE CONNECTOR
	MALE CONNECTOR
	BREAKER INSERT DEVICE (BID) NOTE 1
	BATTERY CHARGER

REFERENCE DRAWINGS:

SD-2510-01	ONE LINE DIAGRAM 480V E.S.S. BUS
SD-2512-20	FRONTAL ELEVATION 480V MCC 72B-2A
SD-2512-22	FRONTAL ELEVATION 480V MCC 72F-2A
SD-2530-10	ONE LINE DIAGRAM 260/130V E.S.S. 2PA
SD-2530-11	ONE LINE DIAGRAM 260/130V E.S.S. 2PB
SD-2500-14	FLEX PHASE 2 AC MODIFICATION CONNECTING BDBBE ELECTRICAL SUPPLY OPERATORS ACTIONS
SD-2500-15	FLEX WIRING DIAGRAM

TCECR-37122-7	REV. Ø	ECR PAGE NO. ___
INDEX ITEM NO. A028	REV. Ø	INDEX PAGE NO. ___
PREPARED BY:		
CHECKED BY:		

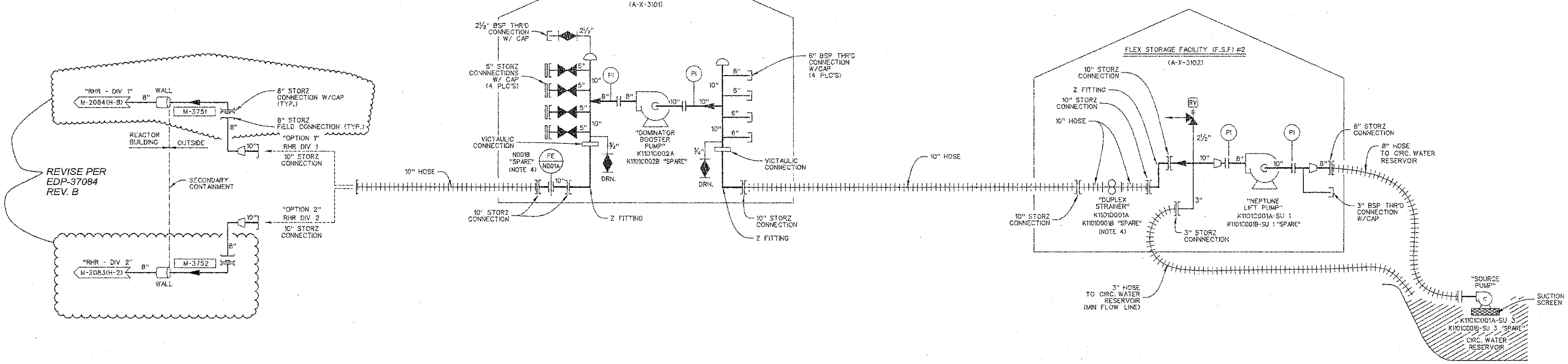
DTC: TCEDP EDP-37122.A028 REV. Ø
DATE ISSUED ____ RECIPIENT ____ PG. 1 OF 1
TITLE OF DOCUMENT:
FLEX ONE-LINE DIAGRAM
DOCUMENT TO BE REVISED:
SD-2500-13 HAS BEEN RESERVED
THE FOLLOWING IS ONLY USED FOR NEW DRAWINGS:
NSR ____ NON-NSR ____ INC. CODE ____
PIS #'S ____
PREPARED BY: ____
CHECKED BY: ____

REFERENCES:

M-2083	P&ID CORE SPRAY SYS DIV 2
M-2084	P&ID CORE SPRAY SYS DIV 1
A-X-3101	EQUIPMENT LOCATION PLAN AND TIE-DOWNS FOR FSF #1
A-X-3102	EQUIPMENT LOCATION PLAN AND TIE-DOWNS FOR FSF #2
C-X-3100	FLEX STORAGE FACILITIES SITE PLAN AND NOTES

NOTES:

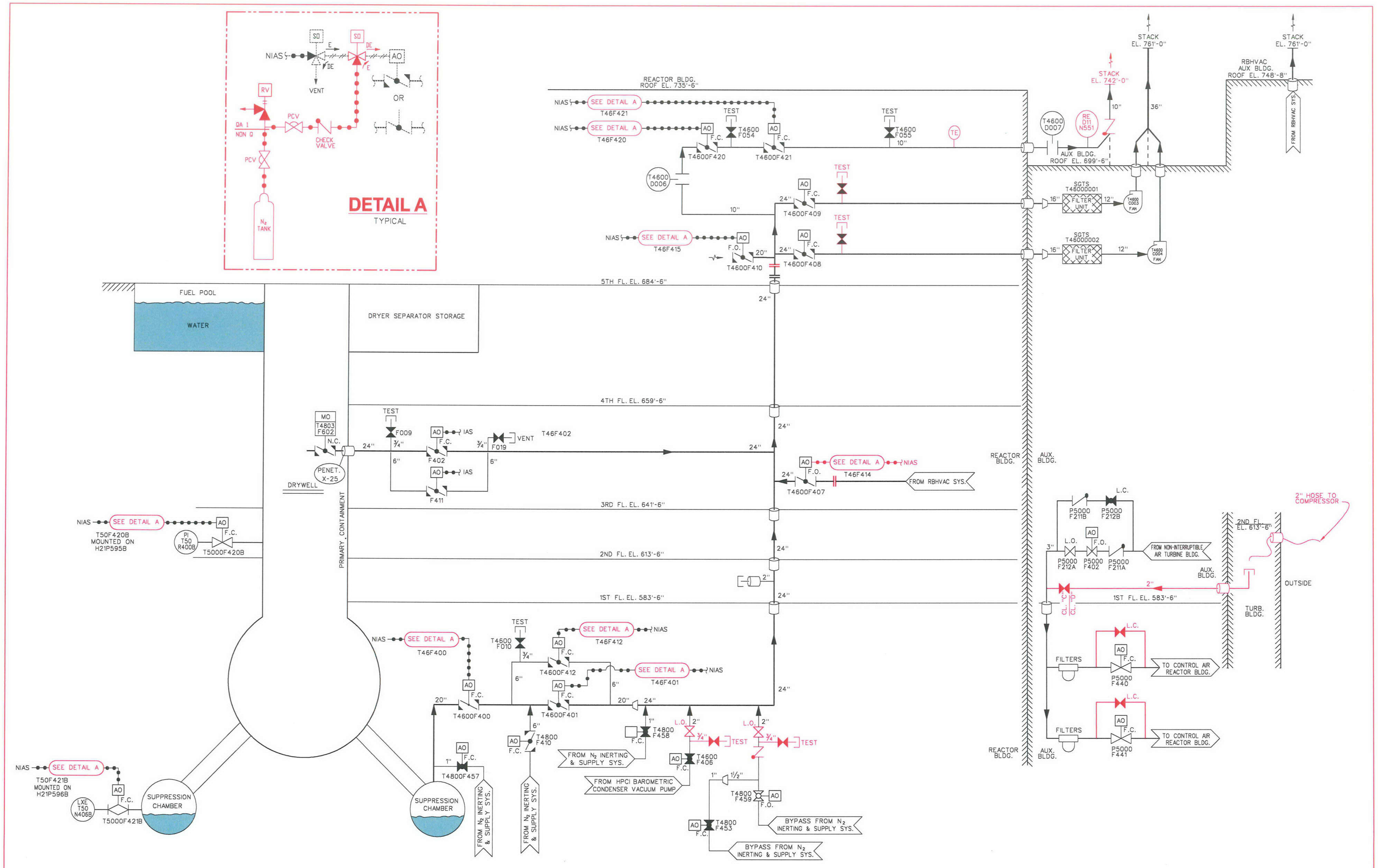
1. "UNLESS OTHERWISE NOTED:
   ALL INSTRUMENT PIS NOs. ARE PREFIXED K11
   ALL VALVE AND EQUIPMENT PIS NOs. ARE PREFIXED K1100
2. [X-XXXX-X] IDENTIFIES PIPING ISOMETRIC OR PIPING LAYOUT DRAWING
3. N.C. = NORMALLY CLOSED
4. K11N001A (OR N001B) AND K1101D001A (OR D001B) MAY BE RELOCATED ANYWHERE IN THE K1100 SYSTEM.



NEW INDEX ITEM
PER EDP 37084, REV. A

DTC: TCEDP EDP-37084,3035 REV. 2	DATE ISSUED 2-19-15 RECIPIENT PG. 1 OF 1
TITLE OF DOCUMENT:	
FLEX SYSTEM DIAGRAM	
DOCUMENT TO BE REVISED:	
M-2021 HAS BEEN RESERVED	
THE FOLLOWING IS ONLY USED FOR NEW DRAWINGS: NSR ___ NON-NSR X INC. CODE T	PIS #'S K1100
PREPARED BY: [signature] 1-21-15	CHECKED BY: [signature] 1-21-15

HARDENED CONTAINMENT VENT SYSTEM
CONCEPTUAL DESIGN



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	Power will be tied into station battery or dedicated battery for a minimum of 24 hours. Operator to switch power from station battery to HCVS dedicated battery when necessary.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of alternate AC power (long term)	Connect station batteries to FLEX generator within 24 hours.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to complete loss of batteries (long term)	Operate valves from MCR with AC power with FLEX provided generators.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal pneumatic air supply	No action needed, air will be supplied by locally installed gas bottles, which is sufficient for at least 8 cycles of valve T4600F420 over first 24 hours. Replace bottles as appropriate.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of alternate pneumatic air supply (long term)	FLEX provided compressor connected to charge NIAS system.	No
Failure of Vent to Open on Demand	Valves fail to open due to SOV failure	Redundant capability to open SOVs (AC and DC) to supply motive force.	No
Failure of Vent to close on demand	Valves fail to close due to SOV or motive force failure	Any of four independent valves fail close to isolate vent (T4600F400, T4600F401, T4600F420, T4600F421)	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 1, dated August 2012
11. NEI 13-02, Industry Guidance for Compliance with Order EA–13–109, Revision 0, Dated November 2013
12. NEI 13-06, Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents and Events, Revision 0, dated March 2014
13. NEI 14-01, Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents, Revision 0, dated March 2014
14. NEI HCVS-FAQ-01, HCVS Primary Controls and Alternate Controls and Monitoring Locations
15. NEI HCVS-FAQ-02, HCVS Dedicated Equipment
16. NEI HCVS-FAQ-03, HCVS Alternate Control Operating Mechanisms
17. NEI HCVS-FAQ-04, HCVS Release Point
18. NEI HCVS-FAQ-05, HCVS Control and ‘Boundary Valves’
19. NEI HCVS-FAQ-06, FLEX Assumptions/HCVS Generic Assumptions
20. NEI HCVS-FAQ-07, Consideration of Release from Spent Fuel Pool Anomalies
21. NEI HCVS-FAQ-08, HCVS Instrument Qualifications
22. NEI HCVS-FAQ-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 344-1975, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations,
28. Fermi 2 Correspondence NRC-13-0009, EA-12-049 (FLEX) Overall Integrated Plan, Rev 0, February 2013
29. Fermi 2 Correspondence NRC-13-0008, EA-12-050 (HCVS) Overall Integrated Plan, Rev 0, February 2013
30. Fermi 2 Correspondence NRC-13-0006, EA-12-051 (SFP LI) Overall Integrated Plan, Rev 0, February 2013
31. JLD-ISG-2015-01, Compliance with Phase 2 of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions, dated March 2015
32. Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments, SECY-12-0157, ML12344A030
33. NUREG/CR-7110, V1, R1, State-of-the-Art Reactor Consequence Analyses (SOARCA) Project: Peach Bottom Integrated Analysis, ML13150A053
34. NEI HCVS-FAQ-10, Severe Accident Multiple Unit Response
35. NEI HCVS-FAQ-11, Plant Response During a Severe Accident
36. NEI HCVS-FAQ-12, Radiological Evaluations on Plant Actions Prior to HCVS Initial Use

<u>Attachment 6: Changes/Updates to this</u>

<u>Overall Integrated Plan</u>

This Overall Integrated Plan has been updated in format and content to encompass both Phase 1 and Phase 2 of Order EA-13-109. 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

OIP Open Item	Action	Comment
1	Confirm thermal environment for actions using Gothic.	See Phase 1 ISE Open Item 2.
2	Confirm radiological environment	See Phase 1 ISE Open Item 2.
3	Confirm suppression pool heat capacity.	See Phase 1 ISE Open Item 3.
4	Define tornado missile protection for RB 5th floor components.	Missile protection for HCVS components on the RB 5th floor will be provided by following the guidance of NRC endorsed white paper, *HCVS-WP-04 Missile Evaluation for HCVS Components 30 Feet Above Grade.* In some cases component protection will be provided through design of conventional missile protection structures.

Phase 1 ISE Open Item	Action	Comment
1	Make available for NRC staff audit documentation confirming that all load stripping will be accomplished within one hour and fifteen minutes of event initiation and will occur at locations not impacted by a radiological event.	Validation of times needed for load stripping is contained in the FLEX Validation Program results that are documented in TMII-15-0012 which will be posted on the e-portal.
2	Make available for NRC staff audit an evaluation of Section 3.2.1 temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.	The evaluation of temperature conditions will be contained in DC-6639 and the evaluation of radiological conditions will be contained in DC-6645. These design calculations will be posted to the e-portal when finalized.
3	Make available for NRC staff audit, analyses demonstrating that HCVS has the capacity to vent the steam/energy equivalent of one percent of licensed/rated thermal power (unless a lower value is justified), and that the suppression pool and the HCVS together are able to absorb and reject decay heat, such that following a reactor shutdown from full power containment pressure is restored and then maintained below the primary containment design pressure and the primary containment pressure limit.	HCVS vent capacity evaluation will be contained in DC-6646. Suppression pool heat capacity will be included in a calculation yet to be determined. These design calculations will be posted to the e-portal when finalized.

Phase 1 ISE Open Item	Action	Comment
4	Make available for NRC staff audit the descriptions of local conditions (temperature, radiation and humidity) anticipated during extended loss of alternating current (AC) power (ELAP) and severe accident for the components (valves, instrumentation, sensors, transmitters, indicators, electronics, control devices, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.	The evaluation of HCVS components capability during ELAP and severe accident conditions will be performed by review of vendor test reports and plant design basis environmental qualification material in comparison to local conditions determined by the design calculations discussed in the response to question 2 above.
5	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	The HCVS pneumatic design is included in EDP 37115 which is under development. The requested information will be provided on the e-portal when finalized.
6	Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX diesel generator (DG) loading calculation.	The sizing evaluation for the HCVS battery will be incorporated by posting to DC-6584, FLEX DC Calculations. The requested information will be provided on the e-portal when finalized.
7	Make available for NRC staff audit documentation that demonstrates adequate communication between the remote HCVS operation locations and HCVS decision makers during ELAP and severe accident conditions.	The primary method of communications will be via satellite phone.
8	Provide a description of the final design of HCVS to address hydrogen detonation and deflagration.	The plant is using the guidance from NEI 13-02 and white paper HCVS-WP-03, rev 1. Fermi 2 is using the check valve option.
9	Provide a description of the strategies for hydrogen control that minimizes the potential for hydrogen gas migration and ingress into the reactor building or other buildings.	By use of the HCVS in conjunction with the EPG/SAGs, the containment will be maintained below pressure limits (except that short excursion may occur and are acceptable). Maintaining containment within failure limits will minimize containment leakage to secondary containment; therefore, minimizing the potential for hydrogen gas migration and ingress outside of containment and the HCVS piping. In addition, cross flow is addressed in question 10 for leakage between HCVS and Standby Gas Treatment System.

Phase 1 ISE Open Item	Action	Comment
10	Make available for NRC staff review design details to ensure the potential for cross flow between HCVS and Standby Gas Treatment System (SGTS) is minimized.	The expected differential is within the scope of containment design for compliance with GL 89-16.
11	Provide a justification for deviating from the instrumentation seismic qualification guidance specified in Nuclear Energy Institute (NEI) 13.02, endorsed, in part, by JLD-ISG-2013-02 as an acceptable means for implementing applicable requirements of Order EA-13-109.	The Fermi 2 existing design basis instrument seismic qualification standard is IEEE-344-1975.
12	Make available for NRC staff audit description of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	The instrumentation planned and existing is listed in the OIP. The selected qualification methods for the instruments will be specified in a six month update when determined in the final design.
13	Make available for NRC staff audit documentation of an evaluation verifying the existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during beyond design basis external events (BDBEE) and severe accident wetwell venting.	The expected differential is within the scope of containment design for compliance with GL 89-16