Exelon Generation®

Order No. EA-13-109

RS-15-299

December 16, 2015

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

Dresden Nuclear Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-19 and DPR-25
NRC Docket Nos. 50-237 and 50-249

Subject: Phase 1 (Updated) and Phase 2 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)

References:

1. NRC Order Number 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
2. 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
3. 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
4. Exelon Generation Company, LLC's Answer 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 26, 2013
5. Exelon Generation Company, LLC Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 30, 2014 (RS-14-058)
6. Exelon Generation Company, LLC First Six-Month Status Report Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated December 17, 2014 (RS-14-302)
7. Exelon Generation Company, LLC Second Six-Month Status Report Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 30, 2015 (RS-15-148)

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8. NRC letter to Exelon Generation Company, LLC, Dresden Nuclear Power Station, Units 2 and 3 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Phase 1 of Order EA-13-109 (Severe Accident Capable Hardened Vents) (TAC Nos. MF4462 and MF4463), dated February 11, 2015

On June 6, 2013, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directs EGC to require their BWRs with Mark I and Mark II containments to take certain actions to ensure that these facilities have 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 1.

Reference 1 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 2) provides direction regarding the content of the OIP for Phase 1 and Phase 2. Reference 2 endorses industry guidance document NEI 13-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial response regarding reliable hardened containment vents capable of operation under severe accident conditions. Reference 5 provided the Dresden Nuclear Power Station, Units 2 and 3, Phase 1 OIP. References 6 and 7 provided the first and second six-month status reports pursuant to Section IV, Condition D.3 of Reference 1 for Dresden Station.

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 1, and the OIP for Phase 2 of the Order pursuant to Section IV, Condition D.2 of Reference 1, for Dresden Nuclear Power Station, Units 2 and 3. The third six-month update for Phase 1 of the Order is incorporated into the HCVS Phase 1 and Phase 2 overall integrated plan document which provides a complete updated Phase I 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 3, Section 7.0 contains the specific reporting requirements for the Phase 1 and Phase 2 OIP. The information in the Enclosure provides the Dresden Nuclear Power Station, Units 2 and 3 HCVS Phase 1 and Phase 2 OIP pursuant to Reference 2. The enclosed Phase 1 and Phase 2 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 1.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 16th day of December 2015.

Respectfully submitted,

Glen T. Kaegi
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

Dresden Nuclear Power Station, Units 2 and 3, Overall Integrated Plan for Phase 1 and Phase 2 Requirements for Reliable Hardened Containment Vent System (HCVS) Capable of Operation Under Severe Accident Conditions

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region III
NRC Senior Resident Inspector - Dresden Nuclear Power Station
NRC Project Manager, NRR - Dresden Nuclear Power Station
Mr. Charles H. Norton, NRR/JLD/PPSD/JOMB, NRC
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Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure 1

Dresden Nuclear Power Station, Units 2 and 3

Overall Integrated Plan for Phase 1 and Phase 2 Requirements for Reliable Hardened Containment Vent System (HCVS) Capable of Operation Under Severe Accident Conditions

(69 pages)

Table of Contents:

Introduction

In 1989, the NRC issued Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," (Reference 2) to all licensees of 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 (Reference 26) 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 Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accidents*, June 6, 2013 (Reference 4). 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 (Reference 6) and JLD-ISG-2015-01 issued in April 2015 (Reference 31). The ISGs endorse the compliance approach presented in NEI 13-02 Revisions 0 and 1, *Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents* (Reference 9), 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 these 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 EA-13-109.

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. It is expected 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.

Note: Per the Generic OIP, at the Licensee's option, the December 2015 six month update for Phase 1 may be independent of the Phase 2 OIP submittal, but will require separate six month updates for Phases 1 and 2 until each phase is in compliance. Exelon has not selected this option.

The Dresden venting actions for the EA-13-109, Phase 1 severe accident capable venting scenario can be summarized by the following:

- The Hardened Containment Vent System (HCVS) will be initiated via manual action from either the Main Control Room (MCR) or from a Remote Operating Station (ROS) at the appropriate time based on procedural guidance in response to plant conditions from observed or derived symptoms. The ROS capabilities are limited to the Order EA-13-109 Requirement 1.2.5. Specifically, in case the HCVS flow path valves or the Argon purge flow cannot be opened from the MCR, the ROS provides a back-up means of opening the valve(s) that does not require electrical power or control circuitry.
- The vent will utilize Containment Parameters of Pressure and Suppression Pool Level from the MCR instrumentation to monitor effectiveness of the venting actions.
- The vent operation will be monitored by HCVS valve position, temperature and effluent radiation levels.
- The HCVS motive force will be monitored and have the capacity to operate for 24 hours with installed equipment (EA-13-109, 1.2.6). Replenishment of the motive force will be by use of portable equipment prior to the installed motive force being exhausted.
- Venting actions will be capable of being maintained for a sustained period of up to 7 days (NEI 13-02, 4.2.2.1.1).

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). Although SAWA to the Drywell (DW) is an option, Exelon is planning SAWA injection to the RPV.
- Utilization of Severe Accident Water Management (SAWM) to control injection and Suppression Pool level to ensure the HCVS (Phase 1) wetwell vent (SAWV) will remain functional for the removal of decay heat from containment.

- Ensure that the decay heat can be removed from the containment for seven (7) days using the HCVS or describe the alternate method(s) to remove decay heat from the containment from the time the HCVS is no longer functional until alternate means of decay heat removal are established that make it unlikely the drywell vent will be required for DW pressure control.
- The SAWA and SAWM actions will be manually activated and controlled from areas that are accessible during severe accident conditions.
- Parameters measured should be Drywell pressure, Suppression Pool level, SAWA flowrate and the HCVS parameters listed above.

Note: Although EA-13-109 Phase 2 allows selecting SAWA and a Severe Accident Capable Drywell Vent (SADV) strategy, Exelon has selected SAWA and SAWM.

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 Dresden 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:

- The Hardened Containment Vent System (HCVS) will be comprised of installed and portable equipment and operating guidance:
    - Severe Accident Wetwell Vent (SAWV) – Permanently installed vent from the Suppression Pool to the top of the Reactor Building.
    - Severe Accident Water Addition (SAWA) – A combination of permanently installed and portable equipment to provide a means to add water to the RPV following a severe accident and monitor system and plant conditions.
    - Severe Accident Water Management (SAWM) strategies and guidance for controlling the water addition to the RPV for the sustained operating period. (Reference attachment 2.1.D)
- Unit 3 Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for 4Q2016.
- Unit 2 Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for 4Q2017.
- Unit 2 Phase 2 (alternate 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 4Q2017.
- Unit 3 Phase 2: (alternate 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 4Q2018.

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 Dresden:

- Seismic, external flooding, extreme cold, high wind, and extreme high temperature.

The following extreme external hazards screen out for Dresden:

- NA

Key Site assumptions to implement NEI 13-02 strategies.

Part 1: General Integrated Plan Elements and Assumptions

Provide key assumptions associated with implementation of HCVS Phase 1 Strategies.

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

Mark I/II Generic HCVS Related Assumptions:

Applicable EA-12-049 (Reference 3) assumptions:

049-1. Assumed initial plant conditions are as identified in NEI 12-06, §3.2.1.2, items 1 and 2 (Reference 8).

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

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

049-4. No additional events or failures are assumed to occur immediately prior to or during the event, including security events, except for the failure of Reactor Core Isolation Cooling (RCIC) or High Pressure Coolant Injection (HPCI) (Reference NEI 12-06, §3.2.1.3, item 9 [8]).

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.

049-6. At time=1 hour (time sensitive at a time greater than 1 hour) an ELAP is declared and actions begin as defined in EA-12-049 compliance.

049-7. DC power and distribution can be credited for the duration determined per the EA-12-049 (FLEX) methodology for station battery usage, (greater than approximately 6 hours with a calculated limiting value of approximately 6 hrs., EC Eval. 391973) (NEI 12-06, section 3.2.1.3 item 8).

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

049-9. All activities associated with EA-12-049 (FLEX) that are not specific to implementation of the HCVS, including such items as debris removal, communication, notifications, Spent Fuel Pool (SFP) level and makeup, security response, opening doors for cooling, and initiating conditions for the events, can be credited as previously evaluated for FLEX. (Refer to assumption 109-02 below for clarity on SAWA)(HCVS-FAQ-11)

Applicable EA-13-109 (Reference 4) generic assumptions:

109-1. Site response activities associated with EA-13-109 actions are considered to have no access limitations associated with radiological conditions 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 (Reference 9). 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 HCVS-FAQ-07 [18]).

109-4. Existing containment components design and testing values are governed by existing plant containment

Part 1: General Integrated Plan Elements and Assumptions

criteria (e.g., Appendix J) and are not subject to the testing criteria from NEI 13-02 (Reference HCVS-FAQ-05 [16] and NEI 13-02, §6.2.2 [9]).

109-5. Classical design basis evaluations and assumptions are not required when assessing the operation of the HCVS. The reason that 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 that classical design basis evaluations are intended to prevent (Reference NEI 13-02, §2.3.1 [9]).

109-6. HCVS manual actions require minimal operator steps and can be performed in the postulated thermal radiological environment at the location of the step(s) (e.g., load stripping, control switch manipulation, valving-in nitrogen bottles) are acceptable to obtain HCVS venting dedicated functionality (Reference HCVS-FAQ-01[12]). 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 HCVS-FAQ-02 [13] and White Paper HCVS-WP-01 [21]). 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 Beyond Design Basis External Event (BDBEE) and SA HCVS operation (Reference FLEX MAAP Endorsement ML13190A201 [29]). Additional analysis using RELAP5/MOD 3, GOTHIC, and MICROSHIELD, etc., are acceptable methods for evaluating environmental conditions in other portions of the plant, provided that 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.

109-9. NRC Published Accident evaluations (e.g., SOARCA, SECY-12-0157, NUREG 1465) as related to Order EA-13-109 conditions are acceptable as references (Reference NEI 13-02, §8 [9]).

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

109-11. This Overall Integrated Plan is based on Emergency Operating Procedure (EOP) changes consistent with Emergency Procedures Guidelines/Severe Accident Guidelines (EPG/SAGs) Revision 3 as incorporated per the site's EOP/Severe Accident Procedure (SAP) 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 Main Control Room is adequately protected from excessive radiation dose as 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 distance away from the MCR or is shielded to minimize impact to the MCR dose. In addition, adequate protective clothing and respiratory protection are available if required to address contamination issues (Reference HCVS-FAQ-01 [12] 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.

Part 1: General Integrated Plan Elements and Assumptions

109-14. RPV depressurization is directed by the EPGs in all cases prior to entry into the SAGs. (reference NEI 13-02 Rev 1 §I.1.3)

109-15. The Severe Accident impacts are assumed on one unit only due to the site compliance with NRC Order EA-12-049. However, each BWR Mk I and II under the assumptions of NRC Order EA-13-109 ensure the capability to protect containment exists for each unit. (HCVS-FAQ-01) This is further addressed in HCVS-FAQ-10.

Plant Specific HCVS Related Assumptions/Characteristics:

Dresden-1 Provided Severe Accident (SA) conditions are not reached EA- 12-049 (FLEX) actions to restore power are sufficient to ensure continuous operation of non-dedicated containment instrumentation identified in Part 2 (Key Venting Parameters) of this OIP. Modifications that allow a FLEX generator to recharge the HCVS battery are assumed to have been installed such that a FLEX generator can be credited for HCVS operation beyond the initial 24-hour sustained operational period. If SA conditions are reached, these non-dedicated containment instruments will be monitored by use of hand held, test instrumentation that rely on small batteries, and Dresden will provide a small portable generator to maintain HCVS battery charge beyond the initial 24 hours.

Dresden -2 In case of a severe flood warning, the Dresden units will be shutdown and cooldown (per procedure DOA 0010-04) prior to the flooding causing an ELAP. The shutdown and cooldown prior to the ELAP will significantly reduce the decay heat that would have to be removed by the Isolation Condenser System (ICS) or, in case of a failure of the ICS, by the HCVS. Dresden will evaluate what actions may be necessary to ensure the WW venting path remains viable following a severe flood. Reactor building dewatering strategy is under development and will be updated in the next 6-month update (Ref. ISE Open Item 2).

Dresden -3 The Plant layout of buildings and structures are depicted in Sketches 2B and 2C. Note the Main Control Room is located at Control Building elevation 534'. The Control Building has substantial structural walls and features independent of the Reactor Building. The HCVS vent routing external to the Reactor Building is indicated on Sketch 2-C. The external piping is vertical with the exception of the point at which it exits the Reactor Building.

Dresden -4 The HCVS external piping is all above 30-feet from ground level and it consists solely of large bore (10-inches nominal diameter piping and its piping supports (EC 400578). The external piping has less than 300 square feet of cross section. The HCVS external piping meets the reasonable protection requirements of HCVS-WP-04. The external support structure used to support the HCVS piping is analyzed to the Dresden design basis tornado missiles to preclude a failure of the tower due to tornado winds and missiles.

Part 2: Boundary Conditions for Wetwell Vent

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

HCVS Actions that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, action to open vent valves).

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

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

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

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 containment purge exhaust at each Dresden unit consists of a wetwell primary containment isolation valve (PCIV), a DW PCIV, and a common downstream PCIV. The HCVS flow path will utilize portions of this system. The HCVS will connect between the two containment purge exhaust PCIVs. Consequently, the HCVS flow path will share the upstream PCIVs with the containment purge system, but it will have a downstream PCIV dedicated to the HCVS flow path. The new HCVS flow path will have a rupture disc downstream of the last PCIV on the HCVS line to serve as the secondary containment leakage barrier.

Each unit will have piping that is totally separate from the other unit and with no interconnected systems downstream of the new downstream PCIV. The discharge from each unit is routed separately and discharges above the unit's Reactor Building roof.

The two Dresden units will have a dedicated motive power (Pressurized N2) for HCVS valves, Argon Purge system, and DC power for HCVS components that, except for battery charging after 24 hours, does not rely on FLEX (EC 400578).

Existing containment instruments (pressure and suppression pool level) are not considered HCVS components and power will be maintained through the actions for EA-12-049 for non-severe accident conditions or using test equipment during severe accident conditions.

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 trained 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 (Table 2-1). A HCVS ELAP Failure Evaluation table, which shows alternate actions that can be performed, is included in Attachment 4.

Table 2-1 HCVS Remote Manual Actions

Part 2: Boundary Conditions for Wetwell Vent

Primary Action	Primary Location / Component	Notes
1. Energize the HCVS power supply to the HCVS components	MCR	
2. Enable the N2 motive air for the HCVS valves	ROS*	
3. Check shut the DW PCIV 2(3)-1601-23, the downstream PCIV to the containment purge exhaust 2(3)-1601-24, and downstream PCIV to the SGTS 2(3)-1601-63	MCR	Precautionary steps; these valves are normally shut and fail shut.
4. Breach the Rupture Disc by opening the Argon Purge Line for the specified amount of time	MCR	Only required if venting is initiated at a containment pressure below the rupture disc setpoint (40 psid).
5. Open Wetwell PCIV 2(3)-1601-60	Override the containment isolation signal by opening the PCIV in the HVCS Panel	Alternate control via motive air manual valves at the ROS.
6. Open the downstream PCIV 2(3)-1601-93 on the common HCVS line	Key locked hand switch located in the HVCS Panel	Alternate control via motive air manual valves at the ROS.
7. Align FLEX Generator to maintain power to Station Battery	As described in response to EA-12-049	Prior to depletion of station battery. Required to maintain power to containment instrumentation. If FLEX DG not available (i.e., under SA conditions), DW pressure and suppression pool level will be monitored using test equipment.
8. Align generator to HCVS battery charger.	At ROS	Prior to depletion of the HCVS battery supply, actions will be required to recharge the battery. If FLEX DG is not available (i.e., under SA conditions), a small portable generator will be used.
9. Replace N2 motive power bottles or align portable compressor	Replacement Nitrogen bottles and/or compressor will be located at the ROS.	Prior to depletion of the pneumatic sources, actions will be required to connect back-up sources at a time greater than 24 hours.
10. Replace Argon purge gas bottles	At ROS	Prior to depletion of the Argon purge supply at a time greater than 24 hours. Required only if SA conditions are reached.

*ROS – Remote Operating Station

Part 2: Boundary Conditions for Wetwell Vent

Attachment 2A, Sequence of Events Timeline, was developed to identify required operator response times and potential environmental constraints. This timeline is based upon the following three sequences:

1. Sequence 1 is based upon the action response times developed for FLEX when utilizing anticipatory venting in a BDBEE without core damage. Containment venting is not required for Dresden FLEX response since the Isolation Condenser System (ICS) removes all the decay heat from the reactor and the containment does not become pressurized enough to require venting. Dresden does not have a RCIC system but it has a steam driven High Pressure Coolant Injection System (HPCI).
2. Sequence 2 is based on SECY-12-0157 long-term station blackout (LTSBO) (or ELAP) with a failure of RCIC after a black start where failure occurs because of subjectively assuming over injection. It is used for Dresden to represent a late failure of the ICS and HPCI. Late failure of the ICS is due to the assumption that FLEX fails to provide make-up water to the ICS.
3. Sequence 3 is based on NUREG-1935 (SOARCA) results for a prolonged SBO (or ELAP) with loss of RCIC case without black start. For Dresden, this represents that the ICS fails after its initial water volume is expended (i.e., no FLEX make-up to the ICS), and the HPCI fails early at a pool temperature of 140^0F [MAAP case 8].

The following is a discussion of time constraints identified in Attachment 2A for the 3 timeline sequences identified above:

- With case 1 (ICS operating), HCVS operation is not required since the only heat input into the containment is from RCS leaks and ambient losses to the environment.
- For case 3 (limiting case), in approximately 8 hours, initiate use of Hardened Containment Vent System (HCVS) per site procedures to maintain containment parameters below the lower of Primary Containment Pressure Limit (PCPL) or containment design pressure. Reliable operation of HCVS will be met because HCVS meets the seismic requirements identified in NEI 13-02, will be powered by DC power from a dedicated power source, and HCVS valves are supplied with motive force from portable nitrogen bottles. HCVS controls and instrumentation and controls will be DC powered. HCVS valve motive force is from pressurized gas. Valves will be operable from the HCVS control panel in the MCR. DC power and motive air will be available for 24 hours from permanent sources. Containment pressure and WW indication will initially be powered from existing 1E Station battery. If SA conditions are not reached, these containment indications will be maintained by FLEX generators. If SA conditions are reached, these indications will be monitored by hand held instruments powered from small batteries. Thus, initiation of the HCVS from the MCR or the Remote Operating Station within approximately 8 hours is acceptable because the actions can be performed any time after declaration of an ELAP until the venting is needed at approximately 8 hours for BDBEE venting. This action can also be performed for SA HCVS operation which occurs at a time further removed from an ELAP declaration as shown in Attachment 2.
- Within 24 hours, the permanently installed nitrogen bottles at the ROS will be replaced, as required, to maintain sustained operation or alternatively a portable compressor will be connect at the ROS. Typical of all activities required at 24 hours, this can be performed at

Part 2: <u>Boundary Conditions for Wetwell Vent</u>

any time prior to 24 hours to ensure adequate capacity is maintained so this time constraint is not limiting.

- Within 24 hours, the permanently installed Argon bottles at the ROS will be replaced, as required, to maintain sustained operation. Note that purging is only required if venting hydrogen following severe accident conditions.
- Within 24 hours, a generator will be installed and connected to recharge the dedicated HCVS power supply to maintain sustained operation. Under non-SA conditions this will be the FLEX generator. Under SA conditions this will be a small, portable generator.
- Current Dresden station battery durations are calculated to last 6 hours. If SA conditions are not reached, FLEX pre-staged DG will be in service 6 hours after an event (Reference FLEX OIP). Modifications will be implemented to facilitate the connections and operational actions required to supply power within approximately 6 hours. Thus, under non-SA conditions, the FLEX DGs will be available to be placed in service at any point after approximately 6 hours as required to supply power to containment parameters (containment pressure and WW level). A FLEX DG will be maintained and used in on-site FLEX storage buildings. For the flood event, the DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards.

<u>Discussion of radiological, temperature, other environmental constraints identified in Attachment 2A</u>

- Actions to initiate HCVS operation are taken from the MCR or from the ROS in the Turbine Building. Both locations have significant shielding and/or physical separation from radiological sources. Non-radiological habitability for the MCR is being addressed as part of the Dresden FLEX response. The ROS location in the Turbine Building has no heat sources.
- Before the end of the initial 24-hour period, replenishment of the HCVS dedicated DC power, Argon purge gas, and PCIV motive power (pressurized gas) will occur at the ROS. The selection of the ROS location will take into account the SA temperature and radiation condition to ensure access to the ROS is maintained. The design will allow replenishment with minimal actions.

ISE Open Item - 12: Confirm that the ROS will be in an area accessible following a SA.

Provide Details on the Vent characteristics.

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

<u>Vent Capacity (EA-13-109 Section 1.2.1 / NEI 13-02 Section 4.1.1)</u>
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.

Part 2: Boundary Conditions for Wetwell Vent

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)

Provide 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.

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, and 1.2.12 / NEI 13-02 Section 2.3,2.4, 4.1.1, 4.1.6, 4.1.7, 5.1, & Appendix H)

State which approach or combination of approaches 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)

State qualification criteria based on use of a combination of safety related and augmented quality dependent on the location, function and interconnected system requirements.

Monitoring of HCVS (Order Elements 1.1.4, 1.2.8, 1.2.9/NEI 13-02 4.1.3, 4.2.2, 4.2.4, and Appendix F/G)

Provide a description of instruments used to monitor HCVS operation and effluent. Power for an instrument will require the intrinsically safe equipment installed as part of the power sourcing.

Component reliable and rugged performance (EA-13-109 Section 2.2 / NEI 13-02 Section 5.2, 5.3)

HCVS components including instrumentation should be designed, as a minimum, to meet the seismic design requirements of the plant.

Part 2: **Boundary Conditions for Wetwell Vent**

Components including instrumentation that are not required to be seismically designed by the design basis of the plant should be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. (Reference JLD-ISG-2012-01 and JLD-ISG-2012-03 for seismic details.)

The components including instrumentation external to a seismic category 1 (or equivalent building or enclosure should be designed to meet the external hazards that screen in for the plant as defined in guidance NEI 12-06 as endorsed by JLD-ISG-12-01 for Order EA-12-049.

Use of instruments and supporting components with known operating principles that are supplied by manufacturers with commercial quality assurance programs, such as ISO9001. The procurement specifications shall include the seismic requirements and/or instrument design requirements, and specify the need for commercial design standards and testing under seismic loadings consistent with design basis values at the instrument locations.

Demonstration of the seismic reliability of the instrumentation through methods that predict performance by analysis, qualification testing under simulated seismic conditions, a combination of testing and analysis, or the use of experience data. Guidance for these is based on sections 7, 8, 9, and 10 of IEEE Standard 344-2004, "IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations," or a substantially similar industrial standard could be used.

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

Part 2: Boundary Conditions for Wetwell Vent

Vent Size and Basis
The HCVS flow path is designed for venting steam/energy from the suppression pool at a nominal capacity of 1% of the currently licensed power, 2957 MWt thermal power at pressure of 62 psig (UFSAR Table 1.2-1). This pressure is the lower of the containment design pressure and the PCPL value assuming nominal torus water level. The nominal diameter is 18-inches through the shared upstream PCIV that is shared with the containment purge exhaust and 10-inches for the downstream portion. The 10-inch diameter portion includes the downstream PCIV and rupture disc. Refer to Sketch 2A, the P&ID. This line has been verified to meet the Order criteria for 1%.

Vent Capacity
The 1% value at Dresden assumes that the suppression pool pressure suppression capacity is sufficient to absorb the decay heat generated during the first 3 hours. The vent would then be able to prevent containment pressure from increasing above the containment design pressure. As part of the detailed design, the duration of suppression pool decay heat absorption capability was confirmed to exceed 3 hours (Reference 37, MAAP).

Vent Path and Discharge
The Dresden station HCVS vent path will consist of a separate wetwell vent for each unit. The upstream portion consists of 18-inch nominal diameter piping and the upstream PCIV that is shared with the torus containment purge exhaust path. The downstream portion consists of 10-inch nominal diameter piping and includes the downstream PCIV and the rupture disc. The downstream PCIV and rupture disc are dedicated to the HCVS function. The rupture disc is credited as the secondary containment isolation barrier. The 10-inch diameter vent line is initially routed vertically with the Reactor Building and then horizontally through the Reactor Building wall at elevation 591', which is approximately 74 feet above nominal plant ground elevation (EC 401069, DWG M-1194A-1). This line is then routed vertically on the outside of the Reactor Building to a point above the top of the Reactor Building. There are no interconnected systems downstream of the second PCIVs and there is no sharing of any flow path between the two units.

The HCVS discharge path is being routed to a point above any adjacent structure. This discharge point is just above that unit's Reactor Building and will follow the guidance of FAQ- HCVS-04 (Reference 15) to the extent reasonably possible such that the release point will vent away from emergency ventilation system intake and exhaust openings, main control room location, location of HCVS portable equipment, access routes required following a ELAP and BDBEE, and emergency response facilities; however, these must be considered in conjunction with other design criteria (e.g., flow capacity) and pipe routing limitations, to the degree practical. The external vertical piping for the two units will be run in close proximity to each other to allow a common external support structure. The external piping meets the criteria for tornado missile reasonable protection (refer to Dresden Assumption 4).

Power and Pneumatic Supply Sources
All electrical power required for operation of HCVS components will be from a dedicated HVCS DC battery source with permanently installed capacity for the first 24 hours and design provisions for recharging to maintain sustained operation.

Motive (pneumatic) power to the HCVS valves is provided by a dedicated bank of N2 gas bottles with permanently installed capacity for the first 24 hours and design provisions for replacing bottles and/or

Part 2: Boundary Conditions for Wetwell Vent

connecting a portable compressor to maintain sustained operation. The initial stored motive air/gas will allow for a minimum of 8 vent cycles for the HCVS valves for the first 24-hours. The 8 vent cycles is defined as initially opening all valves in the wetwell flow path, and then shutting and reopening one of the valves in the flow paths.

1. The HCVS flow path valves are air-operated valves (AOV). The existing, upstream PCIV is air-to-open and air-to-shut. The new downstream PCIV will be air-to-open and spring-to-shut. Opening the valves from the HCVS control panel located in the MCR requires energizing a DC powered solenoid operated valve (SOV) and providing motive air/gas.
2. An assessment of temperature and radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the Remote Operating Station based on time constraints listed in Attachment 2.
3. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during an ELAP (i.e., DC power, Argon purge gas, and motive force [pressurized 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 handwheel, reach–rod or similar means that requires close proximity to the valve (reference FAQ HCVS-03). The preferred method is opening from the MCR through the control switch that energizes the AOV's SOV. The back-up method for new valves is from the ROS by repositioning valves on the pneumatic supply; this allows opening and closing of a valve from the ROS without reliance on any electrical power or control circuit. Accessibility to the ROS will be verified during the detailed design.
5. Any supplemental connections will be pre-engineered to minimize man-power resources and address environmental concerns. Required portable equipment will be reasonably protected from screened in hazards listed in Part 1 of this OIP.
6. Access to the locations described above will not require temporary ladders or scaffolding.

Location of Control Panels

The HCVS design allows initiating and then operating and monitoring the HCVS from the Main Control Room (MCR) and in addition, opening PCIVs and the Argon purge system from the ROS in case of a DC circuit failure. The tentative location for the ROS is 561 foot elevation Turbine Building. The MCR location is protected from adverse natural phenomena and it is the normal control point for Plant Emergency Response actions. The ROS will be evaluated to ensure acceptable temperature and dose consequences.

Hydrogen

As required by EA-13-109, Section 1.2.11, the HCVS design will include an Argon purge system that will be connected just downstream of the second PCIV. It will be designed to prevent hydrogen detonation downstream of the second PCIV. The Argon purge system will have a switch for the control valve in the MCR to allow opening the purge for the designated time, but it will also allow for local operation in the ROS in case of a DC power or control circuit failure. The Argon purge will only be utilized following severe accident conditions when hydrogen is being vented. The installed capacity for the Argon purge

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system will be sized for at least 8 purges within the first 24 hours of the ELAP. This number of vent cycles is the same value used for sizing the PCIV motive air supply. The design will allow for Argon bottle replacement for continued operation past 24 hours.

The Argon purge system can also be used to breach the rupture disc if venting is required before reaching the rupture disc setpoint. The MCR panel will include an indication of Argon pressure to the HCVS path to verify that the Argon purge system flow is occurring.

Unintended Cross Flow of Vented Fluids
Refer to Sketch 2A, the HCVS P&ID. The HCVS piping in each unit is totally independent of the other unit's HCVS flow path. The upstream 18-inch nominal diameter portion isolates any interconnected, non-HCVS systems in that unit through normally shut, air-operated PCIVs that, if open, will automatically shut. The downstream dedicated 10-inch portion does not have any interconnected systems. This precludes unintended cross flow of vented fluids.

Prevention of Inadvertent Actuation
EOP/ERG operating procedures provide clear guidance that the HCVS is not to be used to defeat containment integrity during any design basis transients and accident. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error such that any credited containment accident pressure (CAP) that would provide net positive suction head to the emergency core cooling system (ECCS) pumps will be available (inclusive of a design basis loss-of-coolant accident (DBLOCA)). However, the ECCS pumps will not have normal power available because of the starting boundary conditions of an ELAP.

Note that Dresden credits CAP for its DBLOCA. Preventing inadvertent operation is addressed. The features that prevent inadvertent actuation are two PCIVs in series with a downstream rupture disc. The downstream PCIV is a normally shut, fail-shut AOV dedicated to the HCVS function. This valve is air to open; spring to shut that requires energizing a SOV to allow the motive air to open the valve. This PCIV is controlled by its own key-locked switch. In addition, the DC power to its SOV and the motive air supplied will normally be disabled to prevent inadvertent operation.

Component Qualifications
The HCVS components and components that interface with the HCVS are routed in seismically qualified structures.

HCVS components that are part of the containment pressure boundary will be safety-related. The containment system limits the leakage or release of radioactive materials to the environment to prevent offsite exposures from exceeding the guidelines of 10 CFR 100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material. HCVS components downstream of the containment pressure boundary (i.e., downstream of the downstream PCIV) will not be safety-related.

The HCVS components (SOVs and instrumentation) will be powered from a normally de-energized, dedicated power supply that will not be safety-related but will be considered Augmented Quality. However, if any HCVS electrical or controls component interfaces with Class 1E power sources, it 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. Newly installed piping and valves will be seismically analyzed to handle the forces associated with the Plant's Design Basis Seismic Requirements back to their isolation boundaries. Electrical and controls components

Part 2: Boundary Conditions for Wetwell Vent

will be seismically analyzed and will include the ability to handle harsh environmental conditions (although they will not be considered part of the site Environmental Qualification (EQ) program).

HCVS instrumentation performance (e.g., accuracy and precision) need not exceed that of similar plant installed equipment. Additionally, radiation monitoring instrumentation accuracy and range will be sufficient to determine core conditions (i.e., no core damage thru severe core damage). The HCVS instruments, including valve position indication, process instrumentation, radiation monitoring, and support system monitoring, will be qualified by using one or more of the three methods described in the ISG, which includes:

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

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

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

[ISE OPEN ITEM-15: Complete evaluation for HCVS instrumentation qualification.]

Monitoring of HCVS
The Dresden wetwell HCVS will be capable of being remote-manually operated during sustained operations from a control panel located in the main control room (MCR) and will meet the requirements of Order element 1.2.4. The MCR is a readily accessible location with no further evaluation required (Generic Assumption 109-12). Additionally, to meet the requirement of EA-13-109 Section 1.2.5, an accessible Remote Operating Station (ROS) will also be incorporated into the HCVS design as described in NEI 13-02 section 4.2.2.1.2.1. The controls and indications at the ROS location will be accessible and functional under a range of plant conditions, including severe accident conditions with due consideration to source term and dose impact on operator exposure, extended loss of AC power (ELAP), and inadequate containment cooling. An evaluation will be performed to determine accessibility to the ROS location, habitability, staffing sufficiency, and communication capability with Vent-use decision makers.

Part 2: Boundary Conditions for Wetwell Vent

The wetwell HCVS will include means to monitor the status of the vent system in the MCR and to monitor DC power, Argon pressure, and N2 pressure at the ROS. The proposed design for the HCVS includes control switches in the MCR with valve position indication. The HCVS controls will meet the environmental and seismic requirements of the Order for the plant severe accident with an ELAP. The ability to open/close these valves multiple times during the event's first 24 hours will be provided by dedicated motive air and DC power. Beyond the first 24 hours, the ability to maintain these valves open or closed will be maintained by sustaining the motive air and DC power.

The wetwell HCVS will include indications for vent pipe temperature and effluent radiation levels at the MCR. Other important information on the status of supporting systems, (i.e., DC power source status, Argon purge gas pressure and pneumatic supply pressure), will also be included in the design and located to support HCVS operation. Other instrumentation that supports HCVS function will be provided in the MCR. This includes existing containment pressure and suppression pool level indication. This instrumentation is not required to validate HCVS function and is therefore not powered from the dedicated HCVS batteries. However, these instruments are expected to be available since (a) under non-SA conditions the FLEX DG supplies the station battery charger for these instruments and will be installed prior to depletion of the station batteries and (b) under SA conditions, they will be monitored using hand-held test equipment.

Component reliable and rugged performance
Unless otherwise required to be safety-related, Augmented Quality requirements will be applied to the components installed in response to this Order.

The HCVS downstream of the second containment isolation valve, including piping and supports, electrical power supply, valve actuator pneumatic supply, and instrumentation (local and remote) components, will be designed/analyzed to conform to the requirements consistent with the applicable design codes (e.g., Non-safety, Seismic Category 1, B31.1) for the plant and to ensure functionality following a design basis earthquake.

Additional modifications required to meet the Order will provide reliability at the postulated vent pipe conditions (temperature, pressure, and radiation levels). The instrumentation/power supplies/cables/connections (components) will be qualified for temperature, pressure, radiation level, total integrated dose radiation appropriate for that location (e.g., near the effluent vent pipe or at the HCVS ROS location).

Conduit design and/or cable trays will be installed to Seismic Class 1 criteria.

Dresden complies with HCVS-WP-04 from reasonable protection of HCVS components located outside of seismic Class 1 concrete structures.

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) and environmentally (IEEE 323). These qualifications will be bounding conditions for Dresden per UFSAR 1.1.8 and 3.11.

For the instruments required after a potential seismic event, the following methods will be used to verify

Part 2: Boundary Conditions for Wetwell Vent

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

- demonstration of seismic motion will be consistent with that of existing design basis loads at the installed location;
- substantial history of operational reliability in environments with significant vibration with a design envelope inclusive of the effects of seismic motion imparted to the instruments proposed at the location;
- adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations*, (Reference 28) or a substantially similar industrial standard;
- demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
- seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

Part 2: Boundary Conditions for WW Vent – BDBEE Venting

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

Ref: EA-13-109 Section 1.1.4 /NEI 13-02 Section 2.2

First 24 Hour Coping Detail

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

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

The operation of the HCVS will be designed to minimize reliance on operator actions for response to an ELAP and severe accident events. Immediate operator actions will be completed by qualified plant personnel from either the MCR or the HCVS ROS using remote-manual actions. 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 MCR. This location minimizes plant operators' exposure to adverse temperature and radiological conditions and is protected from hazards assumed in Part 1 of this report.

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

System control:

i. Active: The PCIVs will be operated in accordance with EOPs/SOPs to control containment pressure. The HCVS will be designed for at least 8 vent 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: Inadvertent actuation protection is provided by:

A key locked switch for the dedicated downstream PCIV located in the Main Control Room and controlled by procedures
AND
Disabling the HCVS DC power to the SOV and disabling the motive power (pressurized N2) for the dedicated PCIV except when required by procedures to initiate containment venting
AND
A rupture disc downstream of the PCIVs with a design pressure of 40 PSID.

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 / NEI 13-02 Section 4.2.2

Before the end of the 24 hours initial phase, available personnel will be able to connect supplemental air/gas for the motive air system. Connections for supplementing electrical power and air/gas required for HCVS will be located in accessible areas with reasonable protection per NEI 12-06 that minimize personnel exposure to adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources. Replenishment of the Argon supply is not required under non-SA conditions since purging is not required.

FLEX is credited to sustain power for a BDBEE ELAP to containment instruments used to monitor the containment (e.g., pressure and wetwell level) during non-Severe Accident (SA) conditions. Portable instruments will be used during SA conditions. The response to NRC EA-12-049 will demonstrate the capability for FLEX efforts to maintain the power source.

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

Details:

Provide a brief description of Procedures / Guidelines:

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

Primary Containment Control Flowchart will be provided to direct operations in protection and control of containment integrity, including use of the existing Hardened Containment Vent System.

These flowcharts are being revised as part of the EPG/SAGs Revision 3 updates and associated EOP/SAP implementation. HCVS-specific procedure guidance will be developed and implemented to support HCVS implementation.

ISE Open Item 18: *– Provide procedures for HCVS Operation.*

Identify modifications:

List modifications and describe how they support the HCVS Actions.

EA-12-049 Modifications

- No additional EA-12-049 modifications are required to support HCVS.

EA-13-109 Modifications

- A modification will be required to install the new wetwell vent piping including the new downstream PCIV and rupture disc. The rupture disc controls primary containment leakage during a design basis

Part 2: Boundary Conditions for WW Vent – BDBEE Venting

LOCA. The new valve will include valve position indication and remote-manual control only. There is no sharing of any flow paths with the opposite unit.

- A modification will be required to allow operation of the existing upstream wetwell PCIV. This includes the capability to override a containment isolation signal. Reopening the valves following a BDBEE will be remote-manual.
- A modification will be required to install the dedicated batteries needed to supply power to HCVS for the first 24 hours including capability for recharging from a portable charger at or before 24 hours. The battery will be located at the ROS.
- A modification will be required to install the dedicated motive power (Pressurized N2 gas) needed to open the HCVS valves for the first 24 hours including capability for replacing N2 bottles or connection a portable compressor after 24 hours. The N2 bottles will be located at the ROS.
- A modification will be required to install the dedicated Argon purge system. For non-SA conditions, the Argon purge system is not required to prevent hydrogen detonation in the piping. The Argon purge system, however, can be credited with breaching the rupture disc if venting is initiated at a containment pressure below the rupture disc setpoint.
- A modification will be required to add (a) HCVS flow path instrumentation consisting of temperature and effluent radiation in the MCR and (b) Motive power and DC HCVS battery indication in the MCR and the ROS.

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. Indication for these parameters will be installed in the MCR or ROS to comply with EA-13-109:

Key Parameter	Component Identifier	Indication Location
HCVS Effluent temperature	TBD	MCR
HCVS Effluent Radiation	TBD	MCR
HCVS valve position indication	TBD	MCR
HCVS DC Power Voltage/Conditions	TBD	ROS
HCVS Pneumatic supply pressure	TBD	ROS
HCVS Purge System pressure	TBD	MCR/ROS

Initiation and cycling of the HCVS will be controlled based on several existing MCR key parameters and indicators which are qualified to the existing plant design: (Reference NEI 13-02 Section 4.2.2.1.9 [9]):

Key Parameter	Component Identifier	Indication Location
Drywell pressure	2(3)-1640-11A(B)	MCR
wetwell level	2(3)-1640-13A(B)	MCR

Notes: None

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

Severe accident (SA) conditions assume that specific core cooling actions from the FLEX strategies identified in the response to Order EA-12-049 were not successfully initiated. Core damage is assumed to start at 1.9 hours. (MAAP Case 8, Reference 37). This case assumes ICS is automatically initiated at the start of the ELAP but secured at T=20 minutes (no credit for make-up to the ICS) and failure of the HPCI when suppression pool temperature reaches 140^{0}F. The operator actions required to open a vent path under SA conditions are the same as previously listed in the BDBEE Venting Part 2 section of this report (Table 2-1). The operation of the HCVS under SA conditions is the same as discussed under BDBEE (i.e., non-SA conditions) with the following exceptions:

- Access is not restricted prior to core damage. Thereafter, access to the reactor building will be restricted as determined by the RPV water level and core damage conditions.
- HCVS permanently installed power, Argon purge, and motive air/gas capability will be available to support operation and monitoring of the HCVS for 24 hours. Specifics are the same as for BDBEE Venting Part 2.
- Containment instrumentation (DW pressure and suppression pool) will be monitored using test instruments that are powered from self-contained batteries following depletion of the Station battery.

A preliminary evaluation of travel pathways for dose and temperature concerns has been completed and travel paths identified (ISE Open Item #12). A final evaluation of environmental conditions will be completed as part of detailed design for confirmation.

[ISE OPEN ITEM-12: Confirm travel path accessibility.]

System control:

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

ii. Passive: Same as for BDBEE Venting Part 2

Greater Than 24 Hour Coping Detail

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

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

Part 2: <u>Boundary Conditions for WW Vent</u> – Severe Accident Venting
Specifics are the same as for BDBEE Venting Part 2 except that (a) Argon purge gas replenishment is required after 24 hours and (b) under SA conditions the FLEX DG will not be available and, consequently, the DW pressure and suppression pool level indications will be monitored using hand held instruments. The HCVS support systems (including the Argon purge system) will be designed to allow replenishment under SA conditions. These actions provide long term support for HCVS operation for the period beyond 24 hours to 7 days (sustained operation time period) because on-site and off-site personnel and resources will have access to the unit(s) to provide needed action and supplies.
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
The operation of the HCVS will be governed the same for SA conditions as for BDBEE conditions. Existing guidance in the SAMGs directs the plant staff to consider changing radiological conditions in a severe accident.
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
Modifications are the same as for BDBEE Venting Part 2 with the exception that a suitable location for connecting test instruments for DW pressure and suppression pool water level will be required.
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).*
Key venting parameters are the same as for BDBEE Venting Part 2.
Notes: None

Part 2: Boundary Conditions for WW Vent – 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

All containment venting functions will be performed from the MCR or ROS.

Venting to prevent containment overpressurization will be maintained by permanently installed equipment. The HCVS dedicated DC power source, Argon purge gas, and dedicated motive force is adequate for the first 24 hours, but it can be replenished to support sustained operation.

Existing safety related station batteries will provide sufficient electrical power for MCR containment instrumentation for greater than approximately 6 hours (EC Eval 391973). Before station batteries are depleted, portable FLEX diesel generators, as detailed in the response to Order EA-12-049, will be credited to charge the station batteries and maintain DC bus voltage after approximately 6 hours.

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 with the exception that the FLEX DG is not available. A suitable location for connecting test instruments for DW pressure and suppression pool water level will be required to monitor these parameters after approximately 6 hours.

The ROS (the location of the HCVS DC power source, Argon purge, and motive force) will be evaluated to confirm accessibility under severe accident conditions.

Details:

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

The operation of the HCVS will be governed the same for SA conditions as for BDBEE conditions. Existing guidance in the SAMG directs the plant staff to consider changes in radiological conditions in a severe accident.

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

The same as for BDBEE Venting Part 2 with the exception that a suitable location for connecting test instruments for DW pressure and suppression pool water level will be required.

Part 2: Boundary Conditions for WW Vent – Support Equipment Functions
Key Support Equipment Parameters: *List instrumentation credited for the support equipment utilized in the venting operation. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order).*
The same as for BDBEE Venting Part 2.
Notes: None

Part 2: Boundary Conditions for WW Vent – 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 developed 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.

Before the end of the initial 24-hour period, replenishment of the HCVS dedicated DC power, Argon purge gas, and motive power (pressurized gas) will occur at the ROS. The selection of the ROS location will take into account the SA temperature and radiation condition to ensure access to the ROS is maintained. The design will allow replenishment with minimal actions.

Details:

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

The portable equipment that must be deployed for HCVS operation is limited to the FLEX DG that is credited for maintaining power to the containment instrumentation following Station battery depletion.
Under non-SA conditions, operation of the FLEX DG is the same as for compliance with Order EA-12-049; thus, it is acceptable without further evaluation.

Under SA conditions, radiological conditions will impede deployment of the FLEX DG. Consequently, procedures will be developed to install test instruments to monitor DW pressure and suppression pool water level per Engineering Change (EC) process.

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

Notes: None

Part 3: Boundary Conditions for EA-13-109, Option 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)

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/SADV 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 MCR using control switches. In addition, HCVS valve operation, as required by EA-13-109 Requirement 1.2.5, may occur at the ROS on the 561 foot elevation of the Turbine Building.

Timelines (see attachments 2.1.A for SAWA/SAWM) were developed to identify required operator response times and actions. The timelines are an expansion of Attachment 2A 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: Boundary Conditions for EA-13-109, Option 2

Part 3.1: Boundary Conditions for SAWA

Table 3.1 – SAWA Manual Actions
(Dresden non-flood scenario; flood scenario is less time limiting since there is greater than 24-hour flood warning, equipment can be fully deployed before flood, and plant will be shutdown and in partial cooldown to Mode 4)

Primary Action	Primary Location/ Component	Notes
1. Establish HCVS capability in accordance with Part 2 of this OIP.	■ MCR or ROS.	■ Applicable to SAWA/SAWM strategy.
2. Connect SAWA pump discharge to injection piping.	■ Reactor building 517' elevation (ground level) hard pipe connection to Low Pressure Coolant Injection (LPCI) Line. ■ Manually open motor operated valve (MOV) 2(3)-1501-22A(B). The second MOV 2(3)-1501-21A(B) is normally open).	■ Perform reactor building portions of deployment first.
3. Connect SAWA pump to water source.	■ At Ultimate Heat Sink (UHS) near intake structure.	■ Consist of a Diesel Driven submersible pump discharging to a diesel driven SAWA Booster pump; with hoses.
4. Install test equipment to allow monitoring of DW pressure and suppression pool water level.	■ MCR	■ Required when Station batteries are depleted.
5. Inject to RPV using SAWA pump (diesel).	■ Flow control is by a manual valve at the SAWA Booster pump.	■ Initial SAWA flow rate is 421 gpm.
6. Monitor SAWA indications.	■ Flow indication at SAWA Pumps' location(s).	■ Pump flow.
7. Use SAWM to maintain availability of the WW vent (Part 3.1.A).	■ TBD	■ Monitor DW pressure and Suppression Pool level. ■ Control SAWA flow at valve located on the diesel driven pump to reduce flow to 85 gpm.

Discussion of timeline SAWA identified items

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

- Action being taken within the reactor building under EA-12-049 conditions after RPV level lowers to 2/3 core height must be evaluated for radiological conditions assuming permanent containment shielding remains intact. (HCVS-FAQ-12)

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

- 6 hours – Install test equipment for monitoring DW pressure and suppression pool water level. All other 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.

Part 3.1: Boundary Conditions for SAWA

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 of injection systems in a timely manner. This does not preclude the use of the SAWA system to supplement or replace the EA-12-049 injection systems if desired. SAWA will consist of both portable and installed equipment.

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. The SAWA pump check valve is integral with the pump skid and will close and prevent leakage when the SAWA pump is secured. LPCI injection mode has installed ECCS check valve 2(3)-1501-25A(B) qualified for accident scenarios to prevent reverse flow from the RPV.

Description of SAWA actions for first 24 hours:

Table 3.2 – SAWA Manual Actions Timeline

Time	Action	Notes
T<1 hour	■ Connect SAWA hose in Reactor Building *(Step 2 of Table 3.1)*. ■ Open MOV 2(3)-1501-22A(B).	■ No evaluation required for actions inside Reactor Building. ■ Core damage for Dresden is assumed to start at 1.9 hours. (MAAP Case 8).
T=1-7* hours *The assumed times of T=1 hr to T=8 hrs to establish the bounds of applicability of radiological evaluations have been reduced to T=1 hr to T=7 hrs in order to provide sufficient margin to inform operator action feasibility evaluations and will be further informed by emergency response	■ Complete actions started at T<1 hour *(Step 2 of Table 3.1)*. ■ Connect SAWA pump to water supply at intake structure *(Step 3 of Table 3.1)*. ■ Install test equipment to monitor DW Pressure and Suppression pool water level (*Step 4 of Table 3.1*). ■ Establish flow of at least 421 gpm to the RPV using SAWA systems. Begin injection *(Step 5 of Table 3.1)*.	■ Evaluate core gap and early in vessel release impact to reactor building access for SAWA actions. 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=1-8 hour timeframe.

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

dose assessment activities during an actual event. This accounts for the one hr gap between 7 and 8 hrs in this time line.		
T≤8-12 hours	■ Monitor and Maintain SAWA flow at 421 GPM for four hours *Steps 5 & 6 of Table 3.1).*	■ SAWA flow must commence at T=8 hours but should be done as soon as motive force is available.
T≤12 hours	■ Proceed to SAWM actions per Part 3.1.A *(Step 7 of Table 3.1).*	■ SAWA flow may be reduced to 85 GPM at four hours following SAWA initiation.

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).

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

Dresden has not performed a site specific evaluation to justify the use of a lower site unique initial SAWA flow rate. Consequently, Dresden will assume an initial flow rate of 421 gpm. This is based on the Industry generic value of 500 gpm multiplied by (Dresden rated power (2957 MWt)/Rated power for the generic plant (3514 MWt, NEI 13-02, 4.1.1.2.3). This initial flow rate will be established within 8 hours of the loss of all RPV injection following an ELAP/Severe Accident and will be maintained for four hours before reduction to the Wetwell vent preservation flow rate.

The locations of the SAWA equipment and controls, as well as ingress and egress paths will be evaluated for the expected severe accident conditions (temperature, humidity, radiation) for the Sustained Operating period. Equipment will be evaluated to remain operational throughout the Sustained Operating period. Personnel exposure and temperature / humidity conditions for operation of SAWA equipment will not exceed the limits for ERO dose and plant safety guidelines for temperature and humidity.

The flow path will be suction at the intake structure for the plant Ultimate Heat Sink (UHS) through the submersible pump and a downstream SAWA Booster pump. A valve manifold at the discharge of SAWA Booster pump will include valves with throttle capability and separate lines for Dresden Unit 2 RPV and Dresden Unit 3 RPV. This valve manifold will also provide minimum flow and freeze protection for the pump. This pump and valve manifold will be in a suitable location to allow access under severe accident conditions.

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

From this valve manifold, hoses will be routed to the permanent SAWA connection point located in the Reactor Building 517' elevation. The connection at the Reactor Building location is on a LPCI line to the RPV. This connection point includes one manual valve, which will be opened and kept open. In addition, it requires locally manually opening motor operated valve (MOV) 2(3)-1501-22A(B) on the LPCI line. The second MOV (2(3)-1501-21A(B)) is normally open. The actions at the Reactor Building will be done within the first hour of the event prior to severe accident conditions occurring. Backflow in the LPCI line is prevented by an existing LPCI check valve 2(3)-1501-25A(B).

DW pressure and Suppression Pool level will be monitored and flow rate will be adjusted by use of the FLEX pump control valve at the valve manifold that also contains the SAWA flow indication. Communication will be established between the MCR and the SAWA flow control location.

Containment instrumentation required for SAWA will be monitored through testing instruments powered from batteries (e.g., 9 VDC).

The Intake structure is a significant distance from the discharge of the HCVS pipe with substantial structural shielding between the HCVS pipe and the pump deployment location. Pump refueling will also be accomplished from the EDG fuel oil tanks as described in the EA-12-049 compliance documents. See mechanical and electrical sketches in attachments, plant layout sketches in the assumptions part and a list of actions elsewhere in this part.

Evaluations of actions outside the Reactor Building 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 SA Conditions). Evaluation of actions inside the Reactor Building for projected SA conditions (radiation/temperature) will be performed to determine that personnel can complete the initial and support activities without exceeding the ERO-allowable dose for equipment operation or site safety standards (reference HCVS-FAQ-12).

Electrical equipment and instrumentation will be powered from the power sources noted in the table below with portable generators to maintain battery capacities during the Sustained Operating period.

Parameter	Instrument	Location	Power Source / Notes
DW Pressure*	2(3)-1640-11A(B)	MCR	Hand held test equipment RG 1.97 qualified
Suppression Pool Level*	2(3)-1640-13A(B)	MCR	Hand held test equipment RG 1.97 qualified
SAWA Flow*	FLEX Pump Flow indicator	TBD	Self-powered from internal battery
Valve indications and controls	NA	NA	All valves are locally manually operated

* minimum required instruments.

The instrumentation and equipment being used for SAWA and supporting equipment will be evaluated to perform

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

for the Sustained Operating period under the expected radiological and temperature conditions.

Equipment Protection

SAWA installed components and connections external to protected buildings will be protected against the screened-in hazards of EA-12-049 for the station. 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

1. Connect SAWA pump discharge to LPCI piping.
   - Connect SAWA hose in Reactor Building *(Step 2 of Table 3.1).*
   - Open MOV 2(3)-1501-22A(B).
2. Connect SAWA pump to intake using FSG*.
3. Power SAWA/HCVS components using FSG.
4. Start SAWA pump to establish SAWA flow.
5. Adjust SAWA flow at valve manifold and using SAWA flow indication to establish and maintain required flow.

*Where an FSG (FLEX Support Guidelines) is referenced, it is yet to be determined if new guidance needs to be developed or if it will be the same FSG reference with the same steps used for FLEX.

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

The list of modifications, below, is limited to those required to upgrade EA-12-049 FLEX equipment to meet EA-13-109 Phase 2 SAWA requirements.

Electrical Modifications - TBD

Mechanical Modifications – TBD

Instrument Modifications - SAWA flow instrument (others TBD)

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

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

conditions.

Notes:

None

Part 3.1.A: **Boundary Conditions for SAWA/SAWM**

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

SAWM can be maintained for >7 days without the need for a drywell vent to maintain pressure below PCPL.

Basis for SAWM time frame

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

Dresden has not performed a site specific evaluation to justify the use of a lower site unique initial SAWA flow rate. Consequently, Dresden will assume an initial flow rate of 421 GPM. This is based on the Industry generic value of 500 gpm multiplied by (Dresden rated power/Rated power for the generic plant).

This initial flow rate will be established within 8 hours of the loss of all RPV injection following an ELAP/Severe Accident and will be maintained for four hours before reduction to the Wetwell vent preservation flow rate of 85 gpm.

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

Instrumentation relied upon for SAWM operations is Drywell Pressure, Suppression Pool level and SAWA flow. Except for SAWA flow, SAWM instruments are initially powered by station batteries. After Station battery depletion, these parameters will be monitored by portable test equipment using small batteries that will be available for the Sustained Operation period (7 days). The SAWA flow instrument will be self-powered from an internal power supply capable of being replenished, if needed, through the Sustained Operation period. 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 (Ref. 9: 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 >7 days using SAWM flowrates (Ref. 9: 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 (up or down) 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.) (Ref. 9: C.7.1.4.3)

Attachment 2.1.A shows the Sequence of Events Timeline for SAWA / SAWM. (Ref. 9: 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.	At the valve manifold on the SAWA Booster pump.	• Control to maintain containment and WW parameters to ensure WW vent remains functional. • 85 gpm minimum capability is maintained for greater than 7 days.
2. Control SAWM flowrate for containment control/decay heat removal.	Containment Instrument monitoring in MCR. SAWA flow at the valve manifold on the SAWA Booster pump.	• SAWM flowrate will be monitored using the following instruments: – SAWA Flow – Suppression Pool Level – Drywell Pressure • SAWM flowrate will be controlled using the manual valve at the valve manifold.
3. Establish alternate decay heat removal.	Various locations.	SAWM strategy can preserve the wetwell vent path for >7 days.
4. Secure SAWA / SAWM.	At SAWA Pumps' location(s).	When alternate decay heat removal is established.

SAWM Time Sensitive Actions

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

Time Sensitive SAWM Actions:

12 Hours – 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.D 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, Appendix 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 pump discharge to deliver flowrates applicable to the SAWM strategy.

Once the SAWA initial flow rate has been established for 4 hours, the flow will be reduced while 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 Section 4.2.2, Appendix 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. No additional modifications are being made for SAWM.

Details:

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

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 the valve manifold by installed flow instrument qualified to operate under the expected environmental conditions. The SAWA flow instrument is self-powered by an internal power supply. Communications will be established between the SAWM control location and the MCR.

Injection flowrate is controlled by FLEX manual valve located on the valve manifold.

Suppression Pool level and DW pressure will be read with hand-held test instruments. 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:

- Drywell Pressure
- Suppression Pool Level
- SAWM Flowrate

The Drywell pressure and Suppression Pool level instruments (2(3)-1640-11A(B) and 2(3)-1640-13A(B)) are qualified to RG 1.97 and are the same as listed in Part 2 of this OIP. The SAWM flow instrumentation will be qualified for the environmental conditions expected when needed.

Notes:

None

Part 3: Boundary Conditions for EA-13-109, Option 2
Part 3.1.B: **Boundary Conditions for SAWA/SADV**
Applicability of WW Design Considerations
This section is not applicable to Dresden since Dresden is not using the option of SADV.
Table 3.1.C – SADV Manual Actions
Timeline for SADV
Severe Accident Venting
First 24 Hour Coping Detail
Greater Than 24 Hour Coping Detail
Details:

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, 3.20 / NEI 13-02 Section 6.1.2, 6.1.3, 6.2

Program Controls:

The HCVS venting actions will include:

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

Procedures:

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

The HCVS and SAWA procedures will be developed and implemented following plant processes for initiating or revising procedures and contain the following details:

- appropriate conditions and criteria for use of the HCVS and SAWA
- when and how to place the HCVS and SAWA in operation
- location of system components
- instrumentation available
- normal and backup power supplies
- directions for sustained operation (Reference 9), including the storage and location of portable equipment
- location of the remote control HCVS operating station (panel)
- training on operating the portable equipment
- testing of portable equipment

Dresden credits Containment Accident Pressure (CAP) for ECCS pump NPSH.

Dresden will establish provisions for out-of-service requirements of the HCVS and compensatory measures that comply with the criteria from NEI 13-02 (Reference 9). The following provisions will be documented in the HCVS Program Document:

The provisions for out-of-service requirements for HCVS/SAWA are applicable in Modes 1, 2 and 3:

- If for up to 90 consecutive days, the primary or alternate means of HCVS/SAWA operation are non-functional, no compensatory actions are necessary.
- If for up to 30 days, the primary and alternate means of HCVS/SAWA operation are non-functional,

Part 4: Programmatic Controls, Training, Drills and Maintenance

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 through the site corrective action program:
  - Determine the cause(s) of the non-functionality,
  - Establish the actions to be taken and the schedule for restoring the system to functional status and to prevent recurrence,
  - Initiate action to implement appropriate compensatory actions, and
  - Restore full HCVS functionality at the earliest opportunity not to exceed one full operating cycle.

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 HCVS/SAWA/SAWM actions 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/SAWA/SAWM actions, systems or strategies. Training content and frequency will be established using the Systematic Approach to Training (SAT) process.

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.

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

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

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

Dresden will utilize the guidance provided in NEI 13-06 and 14-01 (References 10 and 11) for guidance related to drills, tabletops, or exercises for HCVS operation. In addition, Dresden will integrate these requirements with compliance to any rulemaking resulting from the NTTF Recommendations 8 and 9.

Part 4: Programmatic Controls, Training, Drills and Maintenance

Describe maintenance plan:

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

Dresden 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/SAWA/SAWM components. The control program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

Dresden will implement the following operation, testing and inspection requirements for the HCVS and SAWA to ensure reliable operation of the system.

Table 4-1: Testing and Inspection Requirements

Description	Frequency
Cycle the HCVS and installed SAWA valves[1] and the interfacing system valves not used to maintain containment integrity during Mode 1, 2 and 3. For HCVS valves, this test may be performed concurrently with the control logic test described below.	Once per every[2] operating cycle
Cycle the HCVS and installed SAWA check valves not used to maintain containment integrity during unit operations[3].	Once per every other[4] operating cycle
Perform visual inspections and a walk down of HCVS and installed SAWA components.	Once per every other[4] operating cycle

Part 4: Programmatic Controls, Training, Drills and Maintenance

Functionally test the HCVS radiation monitors.	Once per operating cycle
Leak test the HCVS.	(1) Prior to first declaring the system functional; (2) Once every three operating cycles thereafter; and (3) After restoration of any breach of system boundary within the buildings
Validate the HCVS operating procedures by conducting an open/close test of the HCVS control function from its control location and ensuring that all HCVS vent path and interfacing system valves[5] move to their proper (intended) positions.	Once per every other operating cycle

[1] Not required for HCVS and SAWA check valves.
[2] After two consecutive successful performances, the test frequency may be reduced to a maximum of once per every other operating cycle.
[3] Not required if integrity of check function (open and closed) is demonstrated by other plant testing requirements.
[4] 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.
[5] Interfacing system boundary valves that are normally closed and fail closed under ELAP conditions (loss of power and/or air) do not require control function testing under this part. Performing existing plant design basis function testing or system operation that reposition the valve(s) to the HCVS required position will meet this requirement without the need for additional testing.

Notes:

PCIVs are required for containment integrity during Modes 1-3 and thus are excluded from EA-13-109 testing requirements. However, these PCIVs are tested per by the Dresden design basis requirements to ensure valve operability and leakage tightness. Refer to generic assumption 109-4.

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 Milestones:

Milestone	Target Completion Date	Activity Status	Comments
Hold preliminary/conceptual design meeting	June 2014	Complete	
Submit Overall Integrated Implementation Plan	Jun 2014	Complete	
Submit 6 Month Status Report	Dec 2014	Complete	
Submit 6 Month Status Report	Jun 2015	Complete	
Submit 6 Month Status Report	Dec. 2015	Complete with this submittal	Simultaneous with Phase 2 OIP
U3 Design Engineering Complete	December 2015	Started	
U3 Implementation Outage	October 2016	Not Started	
U3 Maintenance and Operation Procedure Changes Developed, Training Complete, & Walk-Through Demonstration/Functional Test	November 2016	Not Started	
U2 Design Engineering Complete	September 2016	Not Started	
U2 Implementation Outage	October 2017	Not Started	
U2 Maintenance and Operation Procedure Changes Developed, Training Complete, & Walk-Through Demonstration/Functional Test	November 2017	Not Started	

Part 5: Milestone Schedule

Submit Completion Report	May 2018		

Phase 2 Milestone Schedule:

Phase 2 Milestone Schedule

Milestone	Target Completion Date	Activity Status	Comments
Submit Overall Integrated Implementation Plan	Dec 2015	Complete with this submittal	Simultaneous with Phase 1 Updated OIP
Hold preliminary/conceptual design meeting	Jan 2016		Expect to be engineering justification not modifications
Submit 6 Month Status Report	June 2016		
Submit 6 Month Status Report	Dec 2016		
Submit 6 Month Status Report	June 2017		
Submit 6 Month Status Report	Dec 2017		
Submit 6 Month Status Report	June 2018		
Submit 6 Month Status Report	Dec 2018		
U2 Design Engineering Complete	October 2016	Not Started	Conceptual completed
U2 Implementation Outage	October 2017	Not Started	Concurrent with Unit 2 Phase 1
U2 Maintenance and Operation Procedure Changes Developed, Training Complete, & Walk-Trough Demonstration/Functional Test	November 2017	Not Started	SAMG Revision; Concurrent with Unit 2 Phase 1
U3 Design Engineering Complete	TBD	Not Started	
U3 Implementation Outage	October 2018	Not Started	
U3 Maintenance and Operation Procedure Changes Developed, Training Complete, & Walk-Trough Demonstration/Functional Test	November 2018	Not Started	
Submit Completion Report	May 2019		

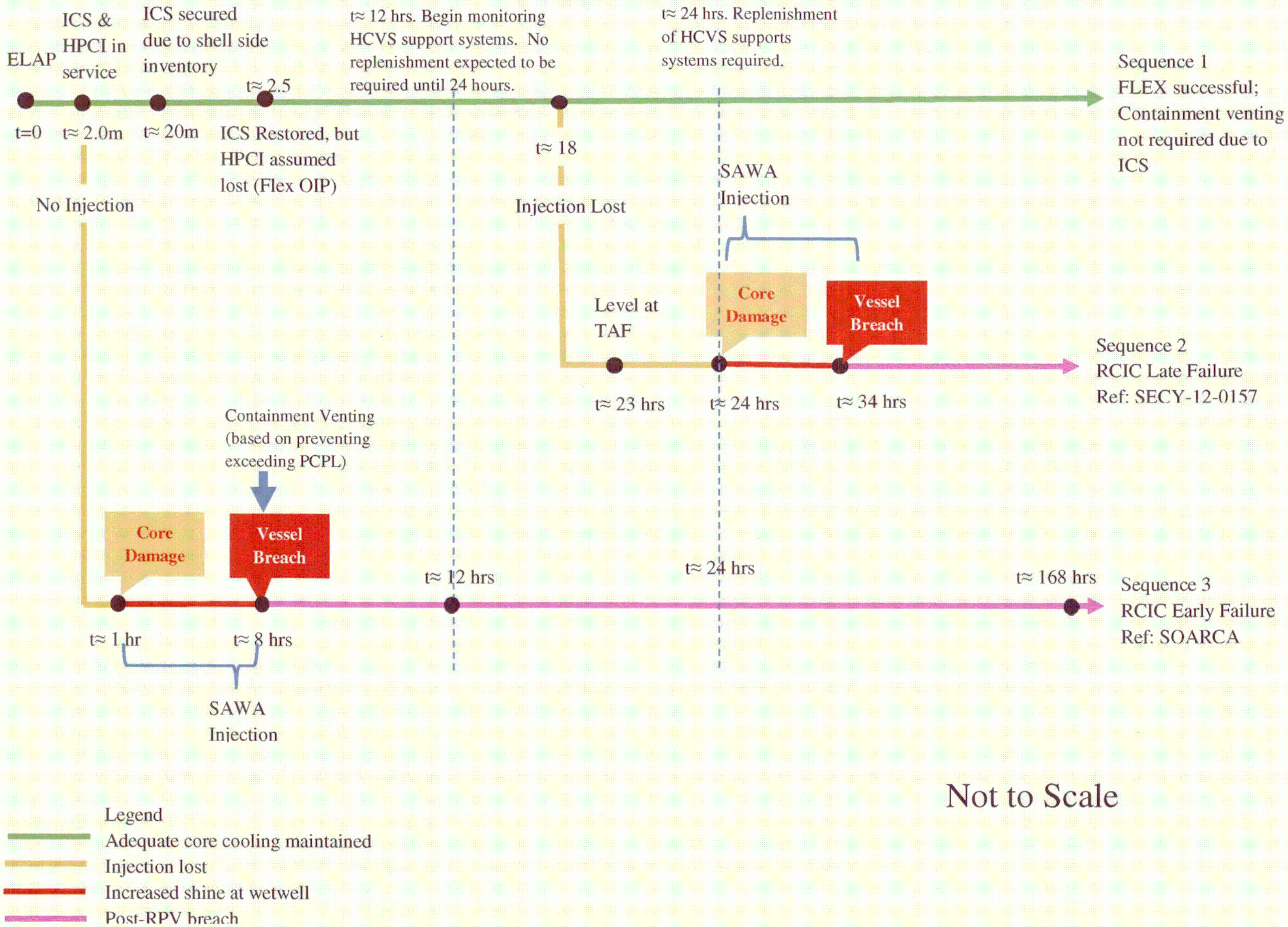
Notes:

None

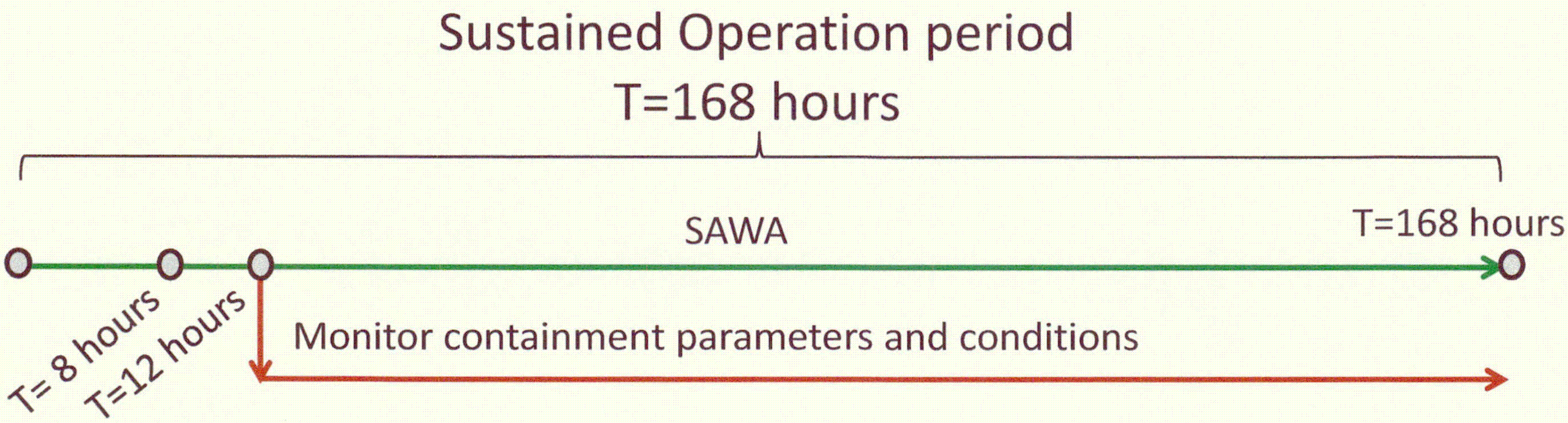
Attachment 1: HCVS/SAWA/SADV Portable Equipment

List portable equipment	*BDBEE Venting*	*Severe Accident Venting*	*Performance Criteria*	*Maintenance / PM requirements*
Nitrogen Cylinders	X	X	2 cylinders	Check periodically for pressure, replace or replenish as needed (EC 400578, frequency specified by PM).
Argon Cylinders	NA	X	14 cylinders	Check periodically for pressure, replace or replenish as needed.
FLEX DG	X	X	800 KW 480V	Per response to EA-12-049.
FLEX/SAWA Pump	X	X	TBD	Per vendor manual.
Portable Air Compressor (optional)	X	X	TBD	Per vendor manual.
Small Portable Generator	X	X	TBD	Per vendor manual.
DW Pressure Indicator. Hand Held Test Eqpt.	X	X	TBD	Per vendor manual
Suppression Pool Level Indicator, Hand Held Test Equipment	X	X	TBD	Per vendor manual

Attachment 2A: Sequence of Events Timeline - HCVS



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

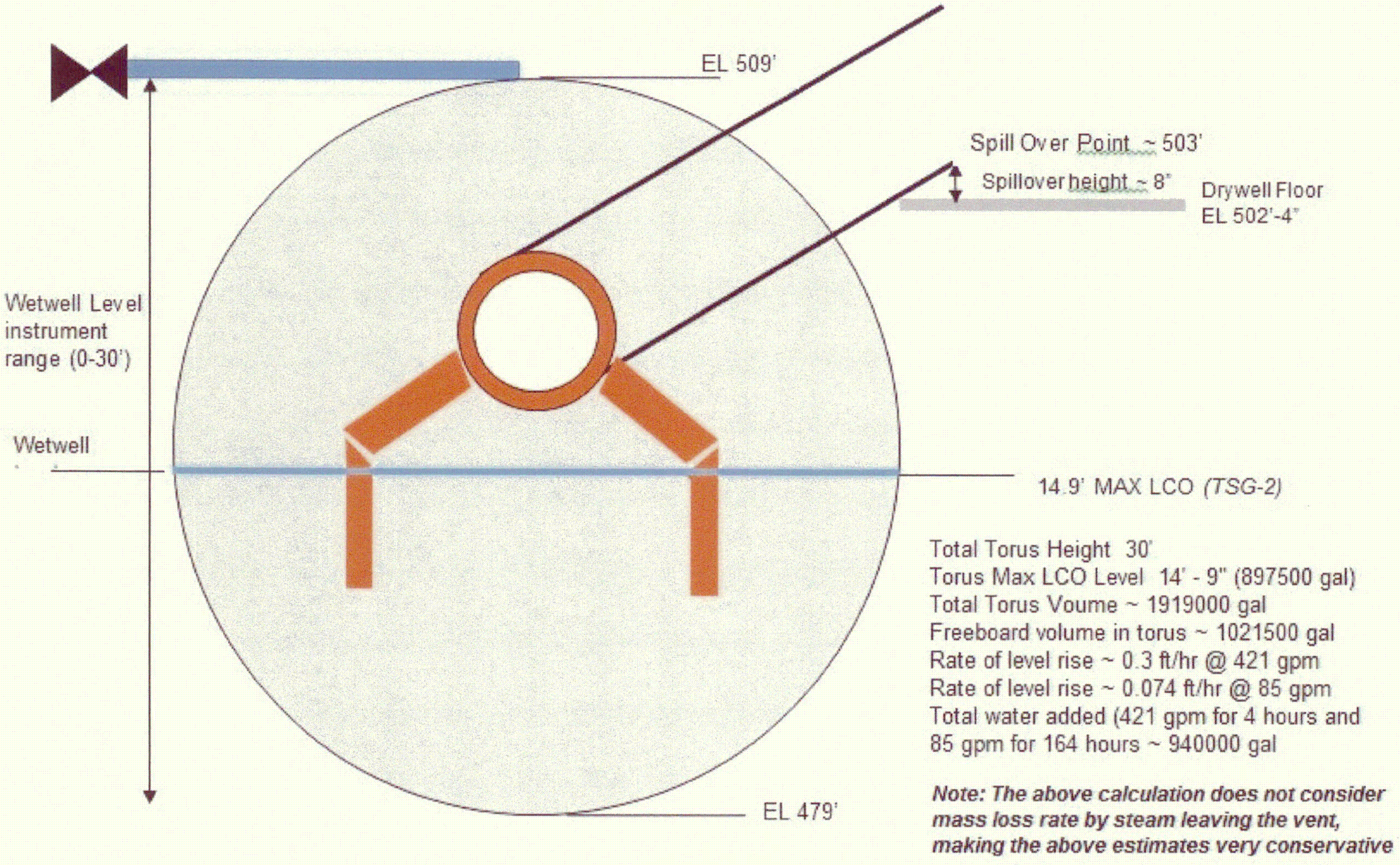


Time	Action
T=0 hours	Start of ELAP
T=8 hours	Initiate SAWA flow at 421 gpm as soon as possible but no later than 8 hours
T=12 hours	Throttle SAWA flow to 85 gpm 4 hours after initiation of SAWA flow
T=168 hours	End of Sustained Operation

Attachment 2.1.B Sequence of Events Timeline – SADV

Not applicable to Dresden

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



Attachment 2.1.D: 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.

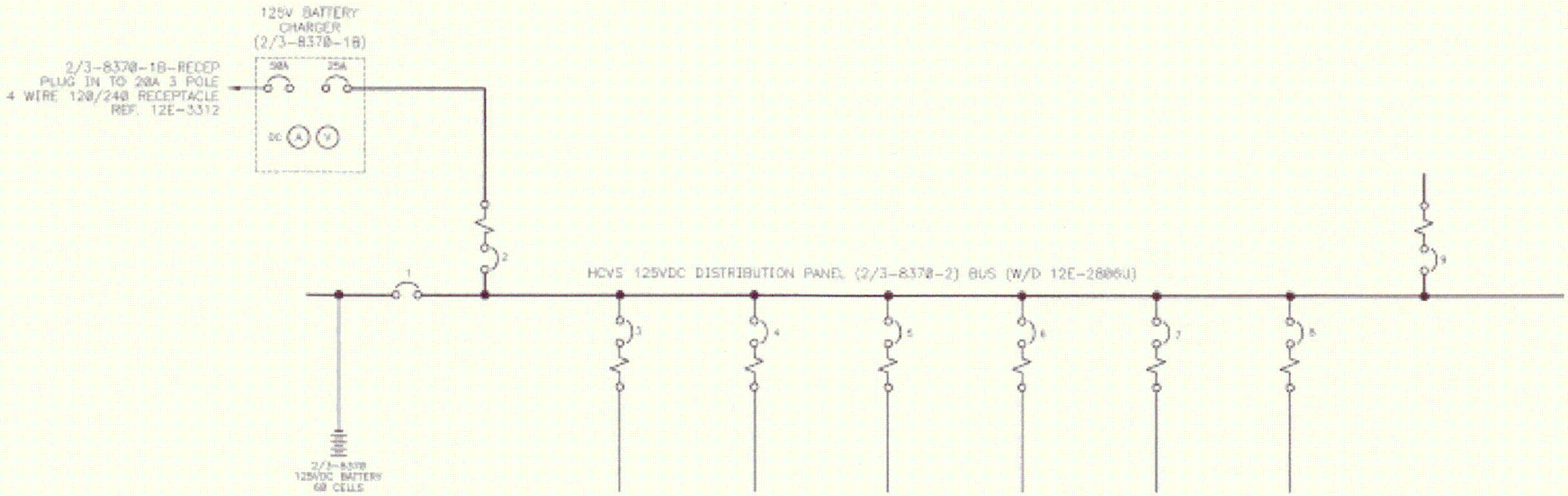
* Actual language may vary by acceptable site procedure standards, but intent and structure should follow this guidance.

Attachment 3: Conceptual Sketches

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

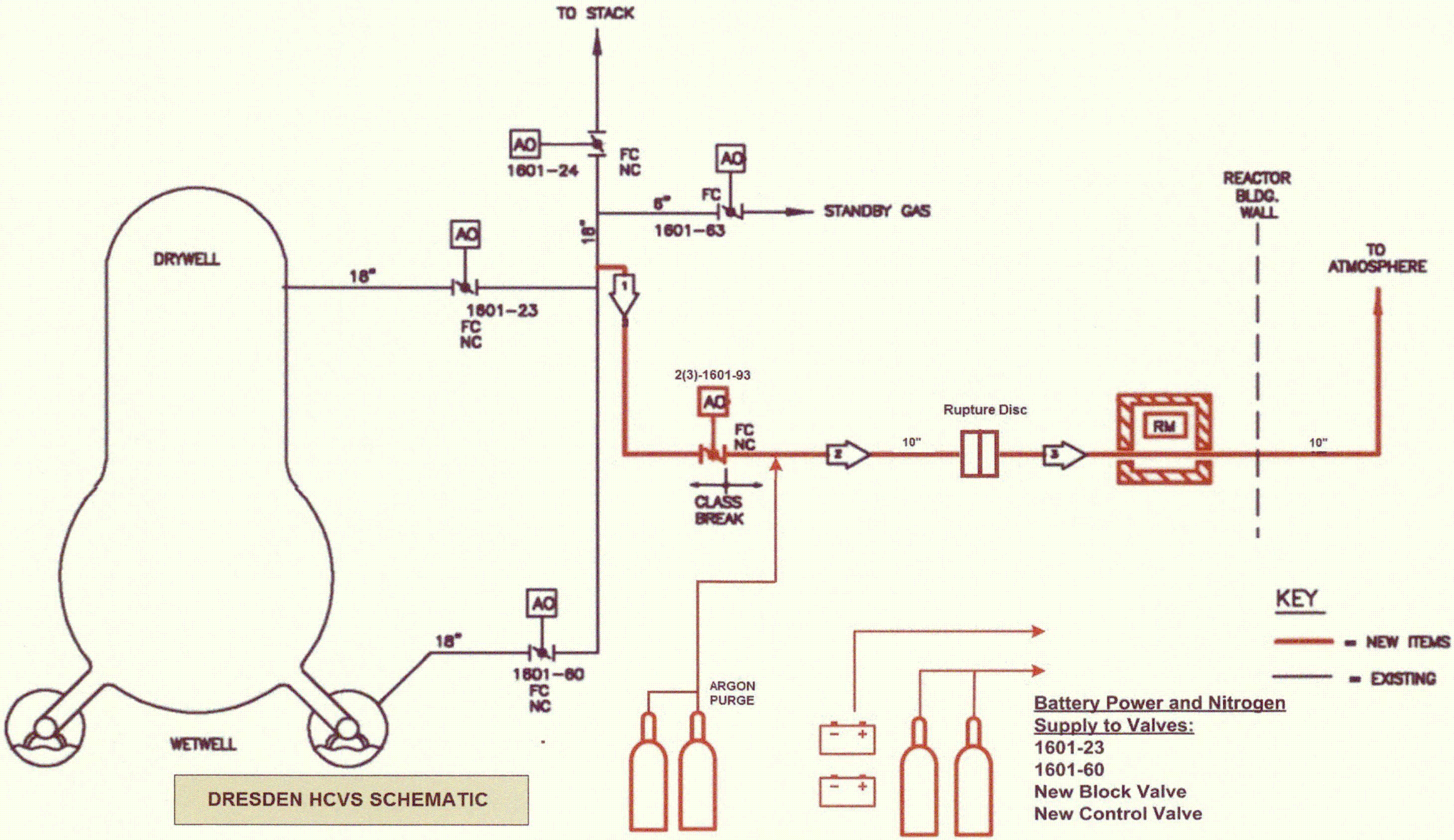
Sketch 1A	**Electrical Layout of System *(preliminary)***
Sketch 2A	**P&ID Layout of Wetwell Vent**
Sketch 2B	**Remote Operating Station**
Sketch 2C	**HCVS Layout Overview**
Sketch 3A	**P&ID Layout of SAWA**
Sketch 3B	**SAWA Site Layout**

Sketch 1A: Electrical Layout of System - HCVS

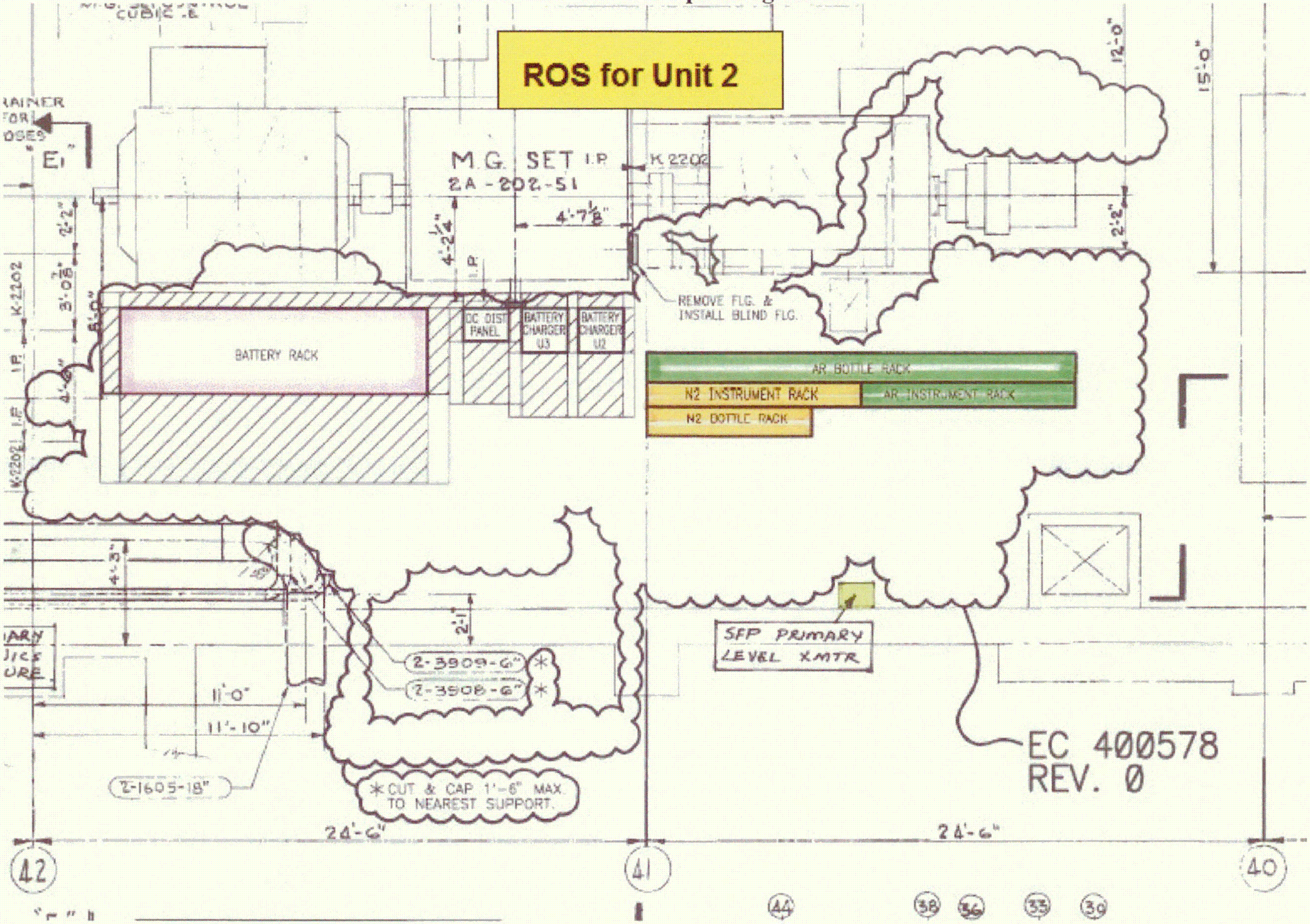


SCHEMATIC DIAGRAM	—	—	12E-3512B						—
WIRING DIAGRAM	12E-2806U	12E-2806U	12E-3706B						12E-2806U
ACB TRIP RATING (AMP)	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1	NOTE 1
LOAD RATING	—	—	—					—	—
SERVICE	125V BATTERY (2/3-8370)	125V BATTERY CHARGER (2/3-8370-1B)	HVCS PANEL 903-13	SPARE	SPARE	SPARE	SPARE	SPARE (NOTE 3)	SPARE (NOTE 4)

Sketch 2A: **P&ID of Wetwell Vent**

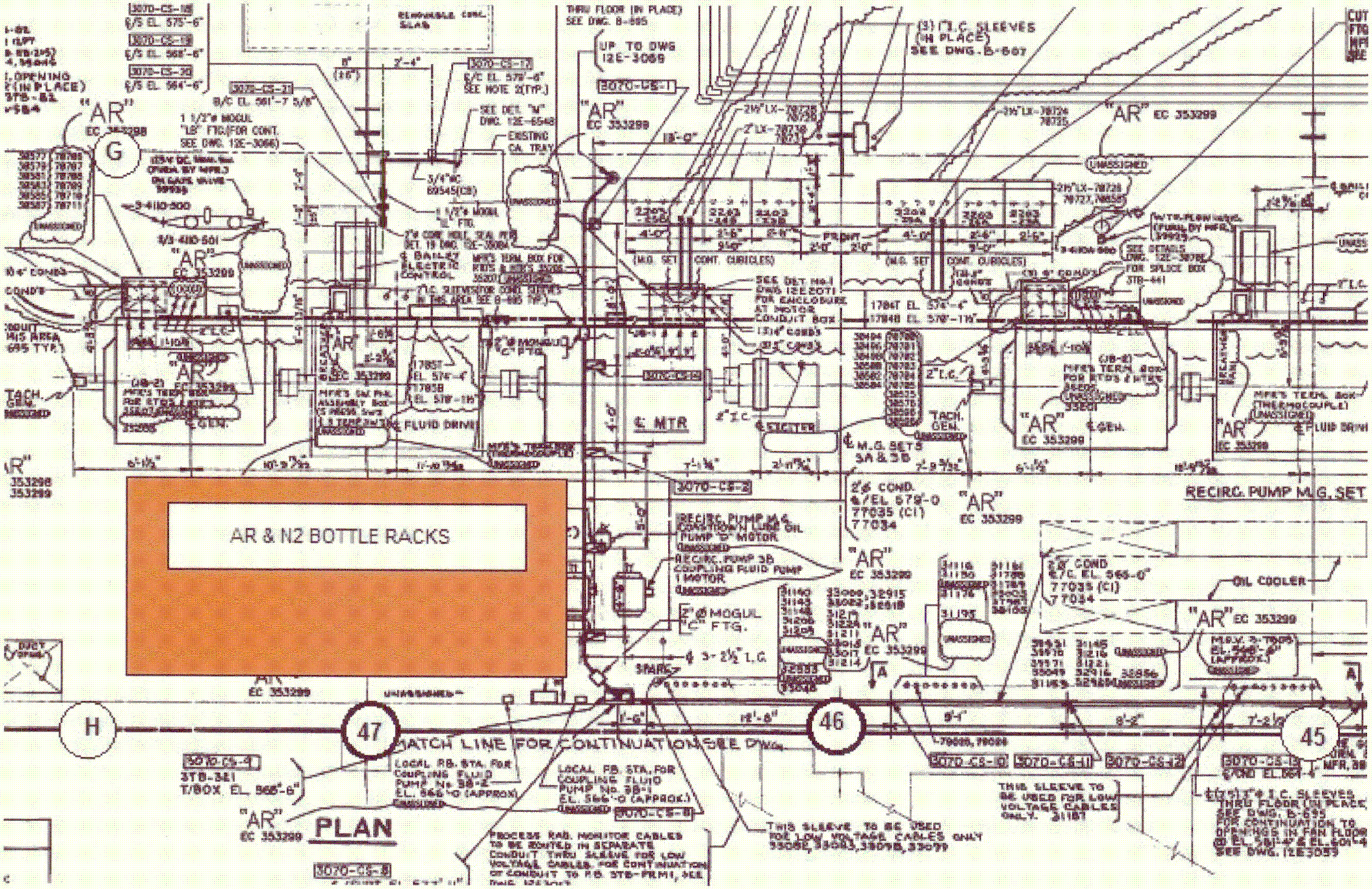


Sketch 2B: Remote Operating Station

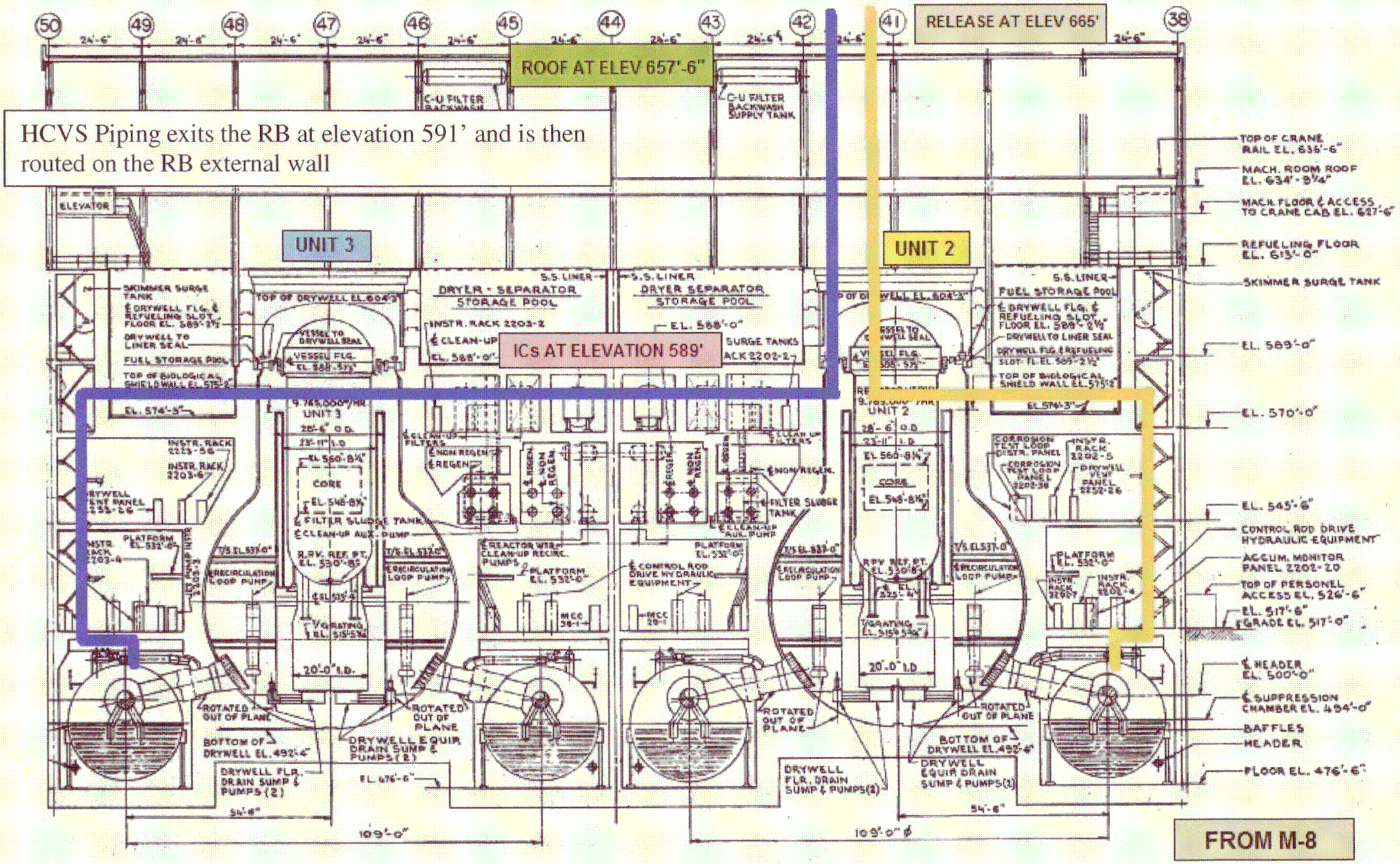


Sketch 2B contd..: Remote Operating Station

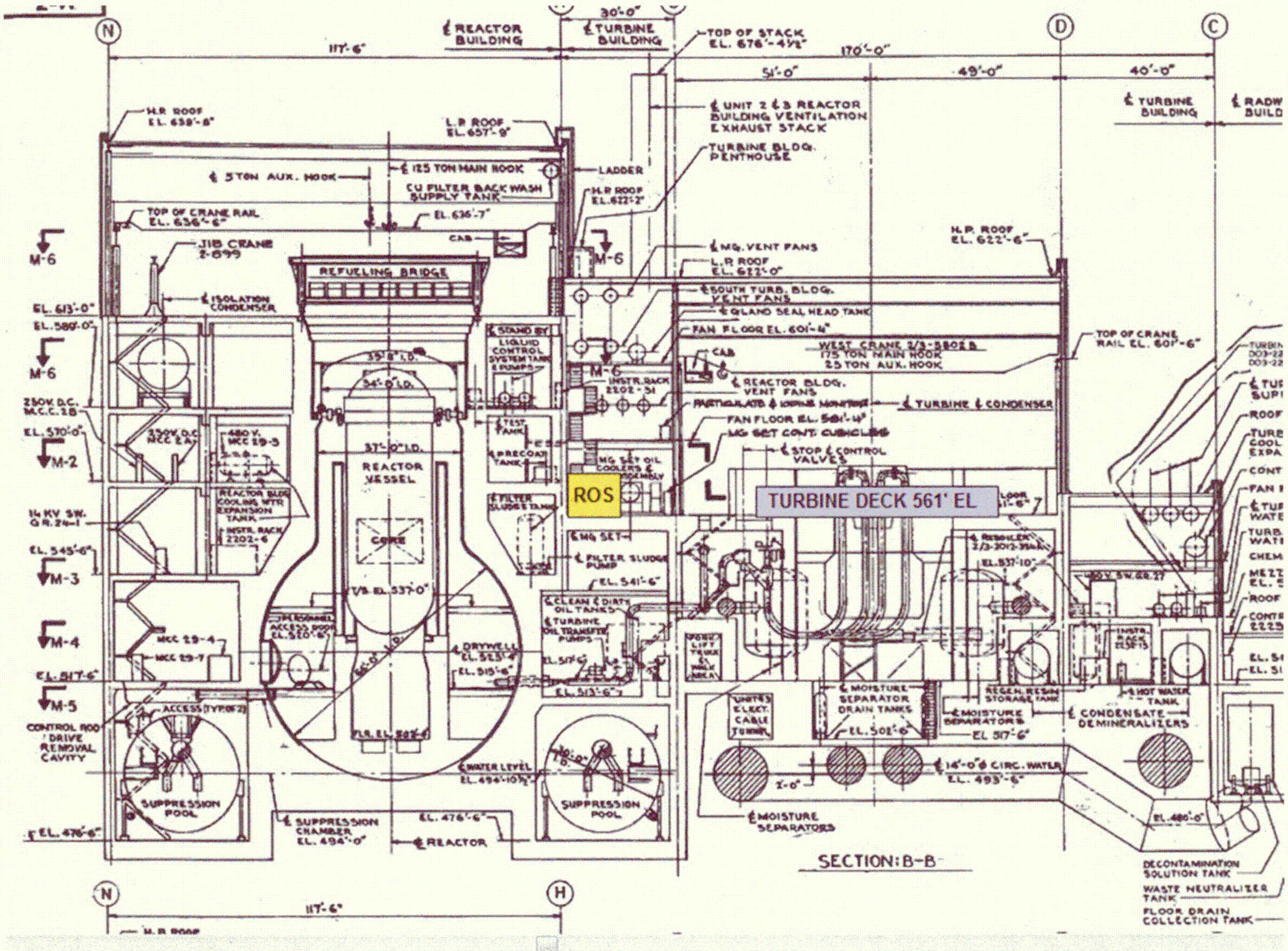
ROS for Unit 3



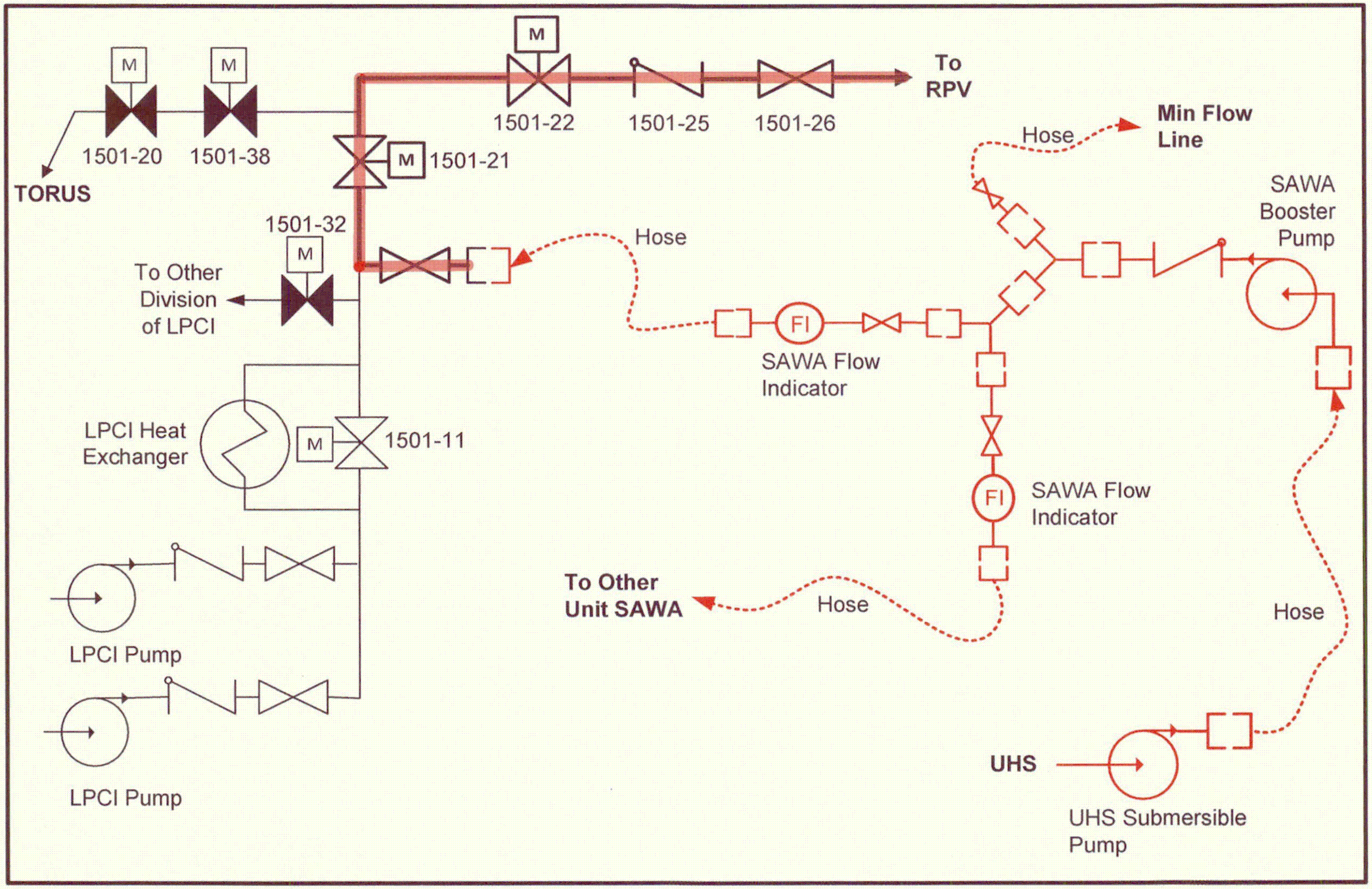
Sketch 2C: HCVS Layout Overview – View 1



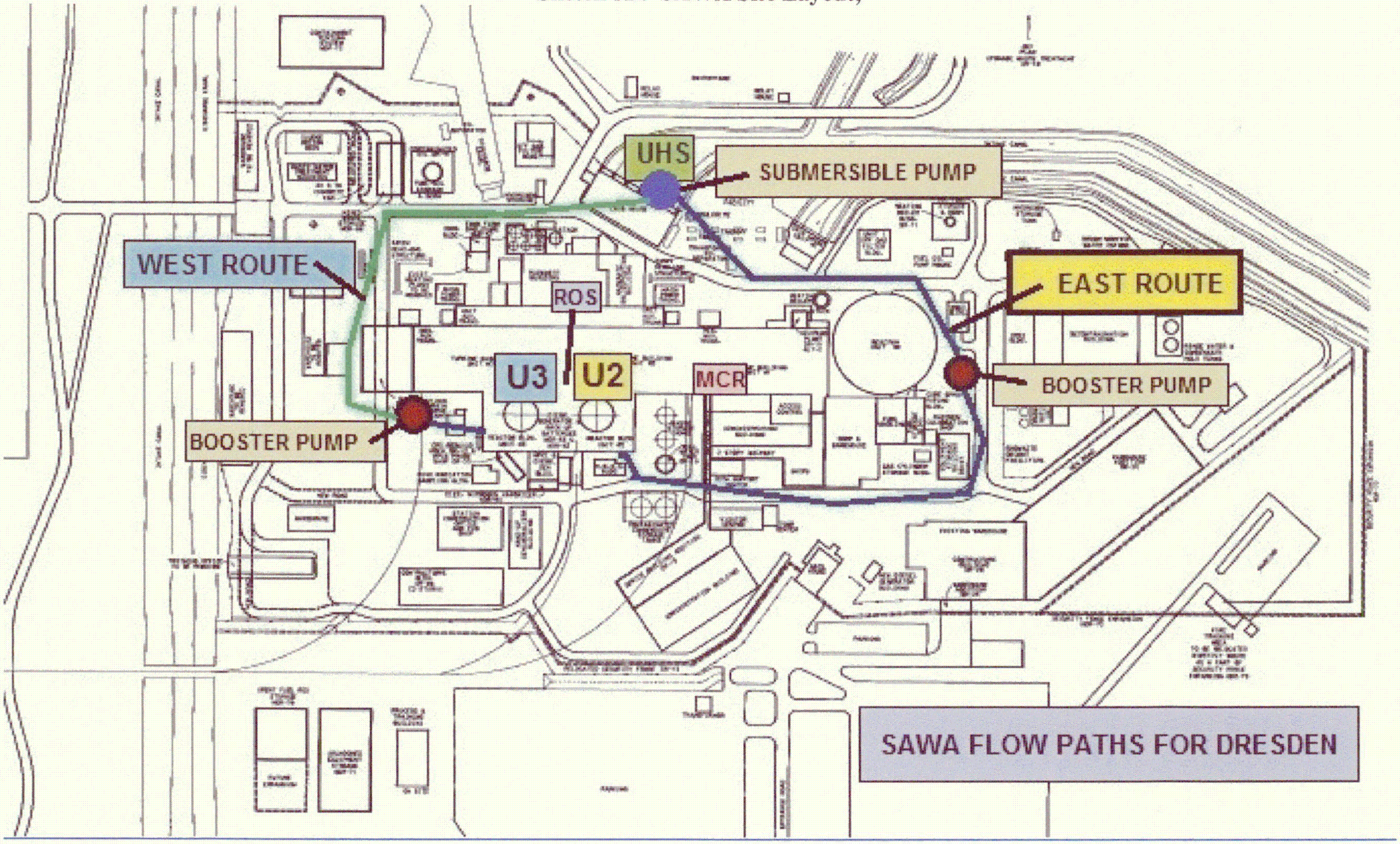
Sketch 2C contd…: HCVS Layout Overview – View 2 showing ROS



Sketch 3A: P&ID Layout of SAWA



Sketch 3B: SAWA Site Layout,



Attachment 4: Failure Evaluation Table (per NEI 13-06)

Table 4A: Wetwell HCVS Failure Evaluation Table

Functional Failure Mode	Failure Cause	Alternate Action	Failure with Alternate Action Prevents Containment Venting?
Fail to Vent (Open) on Demand	Valves fail to open/close due to loss of normal AC power/DC batteries.	None required – system SOVs utilize dedicated 24-hour power supply.	No
	Valves fail to open/close due to depletion of dedicated power supply.	Recharge system with provided portable generators.	No
	Valves fail to open/close due to complete loss of power supplies.	Manually operate backup pneumatic supply/vent lines at ROS.	No
	Valves fail to open/close due to loss of normal pneumatic supply.	No action needed. Valves are provided with dedicated motive force capable of 24-hour operation.	No
	Valves fail to open/close due to loss of alternate pneumatic supply (long term).	Replace bottles as needed and/or recharge with portable air compressors.	No
	Valve fails to open/close due to SOV failure.	Manually operate backup pneumatic supply/vent lines at ROS.	No
Fail to stop venting (Close) on demand	Not credible as there is not a common mode failure that would prevent the closure of at least 1 of the 2 valves needed for venting. Both valves designed to fail shut.	N/A	No
Spurious Opening	Not credible as key-locked switch prevents mispositioning of the downstream HCVS PCIV and, additionally, DC power for the solenoid valve is normally de-energized.	N/A	No
Spurious Closure	Valves fail to remain open due to depletion of dedicated power supply.	Recharge system with provided portable generators.	No
	Valves fail to remain open due to complete loss of power supplies.	Manually operate backup pneumatic supply/vent lines at ROS.	No
	Valves fail to remain open due to loss of alternate pneumatic supply (long term).	Replace bottles as needed and/or recharge with portable air compressors.	No

Attachment 5: References

1. Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109) RS-14-058
2. Generic Letter 89-16, Installation of a Hardened Wetwell Vent, dated September 1, 1989
3. Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
4. Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated June 6, 2013
5. JLD-ISG-2012-01, Compliance with Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated August 29, 2012
6. JLD-ISG-2013-02, Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated November 14, 2013
7. 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
8. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 0, dated August 2012
9. NEI 13-02, Industry Guidance for Compliance with Order EA–13–109, Revision 1, Dated April 2015
10. NEI 13-06, Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents and Events, Revision 0, dated March 2014
11. NEI 14-01, Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents, Revision 0, dated March 2014
12. NEI HCVS-FAQ-01, HCVS Primary Controls and Alternate Controls and Monitoring Locations
13. NEI HCVS-FAQ-02, HCVS Dedicated Equipment
14. NEI HCVS-FAQ-03, HCVS Alternate Control Operating Mechanisms
15. NEI HCVS-FAQ-04, HCVS Release Point
16. NEI HCVS-FAQ-05, HCVS Control and 'Boundary Valves'
17. NEI HCVS-FAQ-06, FLEX Assumptions/HCVS Generic Assumptions
18. NEI HCVS-FAQ-07, Consideration of Release from Spent Fuel Pool Anomalies
19. NEI HCVS-FAQ-08, HCVS Instrument Qualifications
20. NEI FHCVS-AQ-09, Use of Toolbox Actions for Personnel
21. NEI White Paper HCVS-WP-01, HCVS Dedicated Power and Motive Force
22. NEI White Paper HCVS-WP-02, HCVS Cyclic Operations Approach
23. NEI White Paper HCVS-WP-03, Hydrogen/CO Control Measures
24. Not Used
25. NUREG/CR-7110, Rev. 1, State-of-the-Art Reactor Consequence Analysis Project, Volume 1: Peach Bottom Integrated Analysis
26. SECY-12-0157, Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments, 11/26/12
27. Dresden UFSAR, Updated Safety Analysis Report.
28. IEEE Standard 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations
29. FLEX MAAP Endorsement ML13190A201
30. Not Used
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 April 2015
32. NEI White Paper HCVS-WP-04, Missile Evaluation for HCVS Components 30 Feet Above Grade, Revision 0, dated August 17, 2015
33. NEI HCVS-FAQ-10, Severe Accident Multiple Unit Response
34. NEI HCVS-FAQ-11, Plant Response During a Severe Accident
35. NEI HCVS-FAQ-12, Radiological Evaluations on Plant Actions Prior to HCVS Initial Use

36. NEI HCVS-FAQ-13, Severe Accident Venting Actions Validation
37. MAAP Analysis to Support FLEX initial strategy, RM Document No. DR-MISC-043 Rev. 1

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

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.

None

Attachment 7: List of Overall Integrated Plan Open Items

The following tables provide a summary of the open items documented in the Phase 1 Overall Integrated Plan or the Interim Staff Evaluation (ISE) and the status of each item.

Phase 1 Open Items	Open Items from OIP	Status
1	Confirm that at least 6 hours battery coping time is available.	Deleted. Closed to ISE Open Item number 1.
2	Determine actions to enable wetwell (WW) venting following a flooding around the torus.	Deleted. Closed to ISE Open Item number 2.
3	Determine how Motive Power and/or HCVS Battery Power will be disabled during normal operation.	Deleted. Closed to ISE Open Item number 3.
4	Confirm that the Remote Operating Station (ROS) will be in an accessible area following a Severe Accident (SA).	Deleted. Closed to ISE Open Item number 12.
5	Confirm diameter on new common HCVS Piping.	Deleted. Closed to ISE Open Item number 5.
6	Confirm suppression pool heat capacity.	Deleted. Closed to ISE Open Item number 6.
7	Determine the approach for combustible gases.	Deleted. Closed to ISE Open Item number 7.
8	Provide procedures for HCVS Operation.	Deleted. Closed to ISE Open Item number 18.
9	Perform radiological evaluation for Phase 1vent line impact on ERO response actions.	Not Started

Phase 1 Open Items	Interim Staff Evaluation (ISE) Open Items	Status
1	Make available for NRC staff audit documentation confirming that at least 6 hours battery coping time is available.	Complete. EC 391973 Rev. 0 was completed to evaluate proposed battery load shed to support FLEX events. The evaluation addressed both 125V and 250V battery systems. The evaluation identified that with the load shed, the 125V and 250V batteries will maintain acceptable capacity for a minimum of six (6) hours. This time supports the FLEX Strategy time line actions.
2	Make available for NRC staff audit documentation that confirms the ability to operate HCVS following flooding around the suppression pool.	Started.
3	Make available for NRC staff audit documentation of a method to disable HCVS during normal operation to provide assurances against inadvertent operation that also minimizes actions to enable HCVS operation following an ELAP.	Started.
4	Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.	Started.
5	Make available for NRC staff audit documentation of the licensee design effort to confirm the diameter on the new common HCVS piping.	Started. Refer to the response to ISE open item 6.
6	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.	Started. The required 1% vent capacity at the lower of PCPL or containment design pressure is being verified using RELAP which models the line size and routing. In addition, MAAP analyses are being credited to verify that venting can be delayed for at least three (3) hours, which supports assuming a maximum decay heat rate of 1%.
7	Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	Started. Argon purge system design in progress.
8	Make available for NRC staff audit documentation of a determination of seismic adequacy for the ROS location.	Started.

9	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.	Not Started.
10	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.	Started. As described in the OIP, the HCVS torus vent path in each Dresden unit, starting at and including the downstream PCIV, will be a dedicated HCVS flow path. There are no interconnected systems downstream of the downstream, dedicated HCVS PCIV. Interconnected systems are upstream of the downstream HCVS PCIV and are isolated by normally shut, fail shut PCIVs which, if open, would shut on an ELAP. There is no shared HCVS piping between the two units. The vent path will rely on an Argon purge system to prevent line failure due to hydrogen deflagration and detonation.
11	Provide descriptions of design details that minimize unintended cross flow of vented fluids within a unit and between units on the site.	Started. Refer to the response to ISE item 10. This eliminates the possibility of cross flow of vented fluids within a unit and between the two units.
12	Make available for NRC staff audit an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.	Started. Component location design in progress. The HCVS primary control panel will be located in the Main Control Room (MCR).
13	Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.	Started.
14	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	Started. Nitrogen system design in progress.
15	Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	Started. Instrument design in progress.

16	Make available for NRC staff audit the descriptions of local conditions (temperature, radiation and humidity) anticipated during 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.	Started. Component location design in progress. The HCVS primary control panel will be located in the MCR.
17	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 BDBEE and severe accident wetwell venting.	Started. The existing containment isolation valves are being evaluated for their performance under wetwell venting conditions.
18	Make available for NRC staff audit procedures for HCVS operation.	Not Started

Phase 2 Open Item	Open Items from OIP	Comment
1	Determine SAWA flow control.	Not started
2	Resolve location of the FLEX DG to mitigate radiological consequences during severe accident conditions.	Not started
3	Validate time-line for Reactor Building hose connections does not exceed 1 hour.	Not started