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JAFP-14-0075
June 30, 2014

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk

Subject: James A. FitzPatrick Overall Integrated Plan In Response To June 6, 2013 Commission Order Modifying License With Regard To Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)

James A. FitzPatrick Nuclear Power Plant
Docket No. 50-333
License No. DPR-59

Reference:

1. NRC Order, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, EA-13-109, dated June 6, 2013
2. NRC Interim Staff Guidance, Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions, JLD-ISG-2013-02, dated November 14, 2013
3. NEI document, Industry Guidance for Compliance with NRC Order EA-13-109, NEI 13-02 Revision 0, dated November 2013
4. Entergy letter, Entergy's Answer to the June 6, 2013, Commission Order Modifying License with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), JAFP-13-0088, dated June 26, 2013

Dear Sir or Madam:

On June 6, 2013, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order [Reference 1] to the James A. FitzPatrick Nuclear Power Plant (JAF). Reference 1 was immediately effective and directs JAF to have reliable hardened containment vents capable of operation under severe accident conditions. Specific requirements are outlined in the Enclosure of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by June 30, 2014. The NRC Interim Staff Guidance (ISG) [Reference 2] was issued November 14, 2013, which endorses industry guidance document NEI 13-02, Revision 0 [Reference 3], with clarifications and exceptions identified in Reference 2. Reference 3 provides direction regarding the content of this Overall Integrated Plan.

The purpose of this letter is to provide that Overall Integrated Plan pursuant to Section IV, Condition D.1, of Reference 1 and Section 7.1.3 of Reference 3.

Reference 4 provided JAF's initial response to Reference 1. JAF has not yet identified any impediments to compliance with the Order. JAF will provide an overall integrated plan for Phase 2 requirements by December 31, 2015 in accordance with Section IV, Condition D.2, of Reference 1, and pursuant to 7.1.4 of Reference 3. Future six (6)-month status reports will be provided as required by Section IV, Condition D.3, of Reference 1, and pursuant to 7.1.5 of Reference 3.

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact Mr. Chris M. Adner, Regulatory Assurance Manager, at (315) 349-6766.

I declare under penalty of perjury that the foregoing is true and correct; executed on June 30, 2014.

Sincerely,

Lawrence M. Coyle

LMC/CMA/mh

Enclosure: Entergy – James A. FitzPatrick (JAF) Overall Integrated Plan for Hardened Containment Vent: EA-13-109

cc: Mr. Douglas Pickett, Senior Project Manager
Regional Administrator, NRC Region 1
NRC Resident Inspectors Office
Mr. John B. Rhodes, Jr., President and CEO, NYSERDA
Ms. Bridget Frymire, New York State Dept. of Public Service

ENCLOSURE TO JAFP-14-0075

Entergy – James A. FitzPatrick (JAF)

Overall Integrated Plan for Hardened Containment Vent: EA-13-109

(51 Pages)

Table of Contents:

Introduction

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

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

The Order requirements are applied in a phased approach where:

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

The NRC provided an acceptable approach for complying with Order EA-13-109 through Interim Staff Guidance (JLD-ISG-2013-02) issued in November 2013. The ISG endorses the compliance approach presented in NEI 13-02 Revision 0, "Industry Guidance for Compliance with Order EA-13-109", with clarifications. Except in those cases in which a licensee proposes an acceptable alternative method for complying with

Order EA-13-109, the NRC staff will use the methods described in this ISG (NEI 13-02) to evaluate licensee compliance as presented in submittals required in Order EA-13-109.

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

The James A. FitzPatrick Nuclear Power Plant (JAF) venting actions for the EA-13-109 severe accident capable venting scenario can be summarized by the following:

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

Part 1: General Integrated Plan Elements and Assumptions

Extent to which the guidance, JLD-ISG-2013-02 and NEI 13-02, are being followed. Identify any deviations.
Include a description of any alternatives to the guidance. A technical justification and basis for the alternative needs to be provided. This will likely require a pre-meeting with the NRC to review the alternative.

Ref: JLD-ISG-2013-02

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

- Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Implementation of the Phase 1 Wetwell Vent is currently scheduled for the fall of 2016.
- Phase 2: Later; no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first. Implementation of the Phase 2 Drywell Vent is currently scheduled for fall of 2018.

If deviations are identified at a later date, then the deviations will be communicated in a future 6 month update following identification.

State Applicable Extreme External Hazard from NEI 12-06, Section 4.0-9.0
List resultant determination of screened in hazards from the EA-12-049 Compliance.

Ref: NEI 13-02 Section 5.2.3 and D.1.2

The following extreme external hazards screen in for JAF

- Seismic, Extreme Cold (includes snow and ice), High Wind, Extreme High Temperature

The following extreme external hazards screen out for JAF

- External Flooding

Key Site assumptions to implement NEI 13-02 HCVS Actions.
Provide key assumptions associated with implementation of HCVS Phase 1 Actions

Ref: NEI 13-02 Section 1

Mark I/II Generic HCVS Related Assumptions:

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

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

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

Part 1: General Integrated Plan Elements and Assumptions

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

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

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

049-6. At 60 minutes (time critical at a time greater than 1 hour) an ELAP is declared and actions begin as defined in EA-12-049 compliance

049-7. DC power and distribution can be credited for the duration determined per the EA-12-049 (FLEX) methodology for battery usage (up to 10 hours.) (NEI 12-06, Section 3.2.1.3 item 8)

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

049-9. All activities associated with plant specific EA-12-049 FLEX strategies that are not specific to implementation of the HCVS, including such items as debris removal, communication, notifications, SFP level and makeup, security response, opening doors for cooling, and initiating conditions for the event, can be credited as previously evaluated for FLEX.

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

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

109-2. Portable equipment can supplement the installed equipment after 24 hours provided the portable equipment credited meets the criteria applicable to the HCVS. An example is use of FLEX portable air supply equipment that is credited to recharge air lines for HCVS components after 24 hours. The FLEX portable air supply used must be demonstrated to meet the “SA Capable” criteria that are defined in NEI 13-02 Section 4.2.4.2 and Appendix D Section D.1.3.

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

109-4. Existing containment components design and testing values are governed by existing plant containment criteria (e.g., Appendix J) and are not subject to the testing criteria from NEI 13-02 (Reference HCVS-FAQ-05 and NEI 13-02 Section 6.2.2).

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

109-6. HCVS manual actions that require minimal operator steps and can be performed in the postulated thermal and radiological environment at the location of the step(s) (e.g., load

Part 1: General Integrated Plan Elements and Assumptions

stripping, control switch manipulation, valving-in nitrogen bottles) are acceptable to obtain HCVS venting dedicated functionality. (Reference HCVS-FAQ-01)

109-7. HCVS dedicated equipment is defined as vent process elements that are required for the HCVS to function in an ELAP event that progresses to core melt ex-vessel. (Reference HCVS-FAQ-02 and White Paper HCVS-WP-01)

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

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

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

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

109-12. Under the postulated scenarios of order EA-13-109 the Control Room is adequately protected from excessive radiation dose per General Design Criterion (GDC) 19 in 10CFR50 Appendix A and no further evaluation of its use as the preferred HCVS control location is required. (Reference HCVS-FAQ-01). In addition, adequate protective clothing and respiratory protection is available if required to address contamination issues.

<u>Plant Specific HCVS Related Assumptions/Characteristics:</u>

Not Required

Part 2: Boundary Conditions for Wet Well Vent

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

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

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

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

See attached sequence of events timeline (Attachment 2)

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

The operation of the HCVS will be designed to minimize the reliance on operator actions in response to hazards listed in Part 1. Immediate operator actions will be completed by plant personnel and will include the capability for remote-manual initiation from the HCVS control station. A list of the remote manual actions performed by plant personnel to open the HCVS vent path can be found in the following table (2-1). A HCVS Extended Loss of AC Power (ELAP) Failure Evaluation table, which shows alternate actions that can be performed, is included in Attachment 4.

Table 2-1 HCVS Remote Manual Actions

Primary Action	**Primary Location/Component**	**Notes**
1. Ensure 27AOV-SGT is in the closed position	HCVS Control Panel in Relay Room.	Alternate control via manual valves at ROS
2. Power HCVS Control Panel	Key-locked switches at HCVS Control Panel in Relay Room	This action not required for alternate control
3. Set key-locked switches for alarms to manual override	Key-locked switches at HCVS Control Panel in Relay Room	This action not required for alternate control
4. Open torus primary containment isolation valves (PCIV) 27AOV-117 & 27AOV-118	control switches at HCVS Control Panel in Relay Room	Alternate control via manual valves at ROS
5. Open Vent Control Isolation Valve, 27AOV-HCV	Key-locked switch at HCVS Control Panel in Relay Room	Alternate control via manual valves at ROS

Part 2: Boundary Conditions for Wet Well Vent

6. Monitor electrical power status, pneumatic pressure, and HCVS conditions	HCVS Control Panel in Relay Room	This action not required for alternate control
7. Connect back-up DC power supply to HCVS battery charger	Reactor Building Track Bay	Prior to depletion of the dedicated HCVS power supply batteries (no less than 24 hours from initiation of ELAP)
8. Engage back-up DC power supply for all valves and instruments via Inverters	HCVS Control Panel in Relay Room	Prior to depletion of the dedicated HCVS power supply batteries (no less than 24 hours from initiation of ELAP)
9. Replenish pneumatic supply	Backup Nitrogen Bottle Station in the Administration Building	Prior to depletion of the pneumatic supply (no less than 24 hours from initiation of ELAP)

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

1. Case 1 is based upon the action response times developed for FLEX when utilizing anticipatory venting in a BDBEE without core damage.
2. Case 2 is based on a SECY-12-0157 long term station blackout (LTSBO) (or ELAP) with failure of RCIC after a black start where failure occurs because of subjectively assuming over injection.
3. Case 3 is based on NUREG-7110 (SOARCA) results for a prolonged SBO (or ELAP) with the loss of RCIC case without black start.

<u>Discussion of time constraints identified in Attachment 2 for the 3 timeline cases identified above</u>

1. (*Cases 1 & 2 at 23 hours; Case 3 at 8 hours*): Initiate use of Hardened Containment Vent System (HCVS) per site procedures to maintain containment parameters below design limits and within the limits that allow continued use of RCIC. The reliable operation of HCVS will be met because HCVS meets the seismic requirements identified in NEI 13-02 and will be powered by DC buses with motive force supplied to HCVS valves from an installed, dedicated nitrogen bottle station. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the Main Control Room, Relay Room or a ROS. The DC power for HCVS will be

Part 2: Boundary Conditions for Wet Well Vent

available as long as the HCVS is required. Dedicated HCVS batteries will provide power for greater than 24 hours. In addition, when available, a temporary power source can provide power before the HCVS battery life is exhausted. Thus, initiation of the HCVS from the Relay Room or the ROS within 24 hours is achievable because the actions can be performed any time after the declaration of an ELAP, prior to when the venting is needed to maintain containment conditions, under all three scenarios as outlined in Attachment 2.

2. (*Cases 1, 2 & 3 greater than 24 hours; time critical*): Installed dedicated nitrogen bottles ensure a 24 hour supply of nitrogen for HCVS valve operation, assuming a minimum of 12 cycles of operation (Ref. 24). After 24 hours, the nitrogen bottles can be replenished two at a time leaving the other 2 supplying the HCVS. This can be performed at any time prior to 24 hours to ensure adequate capacity is maintained so this time constraint is not limiting. The nitrogen bottles will be located at the ROS, which will be an area accessible to operators during a BDBEE or severe accident (SA) event. This location will be above the maximum design basis external flood level and will not be exposed to high temperature and significant radiological conditions from a resulting SA event.
3. (*Cases 1, 2 & 3 greater than 24 hours; time critical*): A temporary power source can be installed and connected to power up the dedicated HCVS battery charger to supply power to HCVS critical components/instruments - Time critical after 24 hours. Current HCVS battery durations are calculated to last greater than 24 hours. Modifications will be implemented to facilitate the connections and operational actions required to supply power within 24 hours which is acceptable because the actions can be performed any time after declaration of an ELAP until the repowering is needed at greater than 24 hours.

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

- At 23 hours, actions required to vent in the first 24 hours include operating critical HCVS controls and instruments from a panel in the Relay Room or the ROS, connecting to the dedicated HCVS DC power supply, and utilizing backup motive gas. The backup electrical power and motive gas will be located in accessible areas with reasonable protection that minimize personnel exposure to adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources. These actions provide long term support for HCVS operation after 24 hours following an ELAP event. On-site and off-site personnel and resources will have access to the unit to provide needed action and supplies. The temperature and significant radiological conditions that operating personnel may encounter both in transit and locally at the controls will be identified in the final, detailed design severe accident evaluation.

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, Primary Containment Pressure Limit (PCPL), or some other criteria (e.g. anticipatory venting)?

Part 2: Boundary Conditions for Wet Well Vent

Vent Capacity (EA-13-109 Section 1.2.1 / NEI 13-02 Section 4.1.1)

Indicate any exceptions to the 1% decay heat removal criteria, including reasons for the exception. Provide the heat capacity of the suppression pool in terms of time versus pressurization capacity, assuming suppression pool is the injection source.

Vent Path and Discharge (EA-13-109 Section 1.1.4, 1.2.2 / NEI 13-02 Section 4.1.3, 4.1.5 and Appendix F/G)

Provides a description of vent path, release path, and impact of vent path on other vent element items.

Power and Pneumatic Supply Sources (EA-13-109 Section 1.2.5 & 1.2.6 / NEI 13-02 Section 4.2.3, 2.5, 4.2.2, 4.2.6, 6.1)

Provide a discussion of electrical power requirements, including a description of dedicated 24 hour power supply from permanently installed sources. Include a similar discussion as above for the valve motive force requirements. Indicate the area in the plant from where the installed/dedicated power and pneumatic supply sources are coming.

Indicate the areas where portable equipment will be staged after the 24 hour period, the dose fields in the area, and any shielding that would be necessary in that area.

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, 5.3)

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

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

Provides a description of instruments used to monitor HCVS operation and effluent. Power for an

Part 2: Boundary Conditions for Wet Well Vent

instrument will require the intrinsically safe equipment installed as part of the power sourcing.

Component reliable and rugged performance (EA-13-109 Section 2.2 / NEI 13-02 Section 5.2, 5.3)
HCVS components including instrumentation should be designed, as a minimum, to meet the seismic design requirements of the plant.

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

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

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

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

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

Vent Size and Basis
The HCVS wetwell path will be designed for venting the steam / energy equivalent of 1% or greater of the Current Licensed Thermal Power (CLTP) of 2,536 MWt at a pressure of 56 psig. This pressure is the lower of the containment design pressure and the PCPL value. The wetwell portion of the HCVS piping will be sized to provide adequate capacity to meet or exceed the Order criteria. Evaluations for an extended power uprate were previously performed at JAF. However, there are no future plans to move forward with the uprate.

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

Part 2: Boundary Conditions for Wet Well Vent

Vent Path and Discharge

The HCVS vent path at JAF utilizes the existing Containment Air Dilution System piping from the suppression chamber and drywell up to a new isolation valve just upstream of the Standby Gas Treatment System isolation valves (27MOV-120 and 27MOV-121). The suppression chamber 20" diameter piping exits the primary containment into the Reactor Building and increases in diameter to 30". The 24" drywell vent piping ties into the 30" suppression chamber pipe. The combined 30" Drywell/Wetwell vent piping will be isolated by a new 20" boundary valve 27AOV-SGT that will be installed between two 20" x 30" reducers (See Attachment 3, Sketch 2.A). New 8" piping will tie into this header upstream of the 20" isolation valve and will contain a new air-operated control valve, 27AOV-HCV, to serve as secondary containment isolation.

JAF will have a single and independent release vent pipe. The discharge piping will exit through the Reactor Building roof with a minimum discharge point of 3' above the highest point of the roof. The distance between the vent release point and any surrounding structure will be at least 25' (horizontal distance; See HCVS-FAQ-04). This value is based on the ability of the effluent stream to overcome wind effects above the roof (and appurtenances) elevation and agrees with accepted industry practice for roof vents. However, this must be considered as part of the final design in conjunction with other design criteria (e.g., flow capacity) and pipe routing limitations, to the degree practical. Vent line and new AOV sizes will be confirmed during final design of the HCVS system.

The Reactor Building's parapet is at an elevation of approximately 434' (Reference 32). The HCVS pipe will exit seismic class I structures at an elevation well over 30' from the nominal ground elevation of 272'. However, sections of the vent piping will be located within a seismic class I structure which is not of substantial construction with regard to protection from tornado missiles (i.e., those sections of the piping located above the elevation of the refuel floor). These piping sections will be evaluated for reasonable protection from missiles and protected as required (Reference 17). The piping and supports will be seismically rugged.

Power and Pneumatic Supply Sources

All electrical power required for operation of HCVS components will be routed through three inverters: one inverter for each of the two electrical divisions and one inverter for non-divisional loads. These inverters will be sized to convert DC power from installed batteries into AC power for the end users (e.g. solenoid valves, indicating lights, etc.). In addition, a converter will provide 24 VDC power for instruments. Battery power will be provided by dedicated HCVS batteries that will supply power for at least 24 hours. After that time, it is expected that a temporary power source will be in service to recharge the HCVS batteries.

Pneumatic power is normally provided by the station's instrument air system. Following an ELAP event, the normal station instrument air that supplies motive force to the HCVS AOVs is lost. Therefore, for the first 24 hours, pneumatic force will be supplied from a newly installed dedicated backup nitrogen bottle station. The nitrogen bottles will supply the required motive force to those HCVS valves needed to maintain flow through the HCVS effluent piping.

1. The HCVS flow path valves are air-operated valves (AOVs) with air-to-open and spring-to-close pneumatic cylinders. Opening the valves requires energizing AC powered solenoid operated valves (SOVs) and providing motive gas. The detailed design will provide a permanently

Part 2: Boundary Conditions for Wet Well Vent

installed power source and motive gas supply adequate for the first 24 hours. After 24 hours, FLEX can be credited to sustain electrical power. The detailed design will finalize whether FLEX will be used for sustained power. The capability under the FLEX effort to maintain the electrical source is still applicable under the EA-13-109 Order Elements. The initial stored motive gas will allow for a minimum of 12 valve operating cycles for the HCVS valves for the first 24-hours of operation.

2. An assessment of temperature and significant radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the ROS based on the 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., HCVS battery station and nitrogen bottle station), 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 16). Motive force for the AOVs will be provided from nitrogen bottles located in the Administration Building hallway between the Reactor Building and the Turbine Building on Elevation 272'. This area is accessible to operators and will not be exposed to high temperature or significant radiological conditions from a resulting severe accident (SA) event. Any supplemental connections will be pre-engineered to minimize man-power resources and address environmental concerns. Required portable equipment will be reasonably protected from screened in hazards listed in Part 1 of this OIP.
5. Access to the locations described above will not require temporary ladders or scaffolding.
6. Following the initial 24 hour period, additional motive force will be supplied from nitrogen bottles that will be staged at a gas cylinder rack located such that radiological impacts are not an issue. Additional bottles can be brought in as needed.

Location of Control Panels

The HCVS design allows initiating and then operating and monitoring the HCVS from the Relay Room and the ROS located in the Administration Building hallway between the Reactor Building and Turbine Building. Adequate shielding provided by the adjacent Reactor Building wall will minimize dose rates at the ROS located in the Administration Building. The Relay Room is a normal control point for Plant Emergency Response actions. Both of these locations are protected from adverse natural phenomena and the ROS is free from any harsh thermal and significant radiological conditions.

Hydrogen

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

Part 2: Boundary Conditions for Wet Well Vent

These and other possible solutions are being studied for effectiveness and potential use at JAF. The final determination of the method to be used to address the control of flammable gases will be determined during final design.

Unintended Cross Flow of Vented Fluids

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

- The PCP System control circuit will be used during all “design basis” operating modes including all design basis transients and accidents.
- Cross flow could exist between the HCVS and the Standby Gas Treatment System (SGTS). Isolation between the proposed vent path and SGTS is provided by two separate (parallel) AC powered motor operated valves (i.e., MOVs 27MOV-120 and 27MOV-121). These valves would fail-as-is during loss of AC events and as such, could not be credited as a leak tight boundary. To address this, a new boundary valve, 27AOV-SGT, will be installed on the common vent line upstream of the SGTS MOVs. The testing criteria for this new valve will be based on JAF’s Appendix J test criteria for the HCVS PCIVs (27AOV-117 and 27AOV-118). The allowable leakage will be set equal to the allowable leakage for the HCVS PCIV which exhibits the highest accepted leakage rate during the current Appendix J testing cycle. The valve will be tested at the frequency specified in NEI 13-02, Section 6.2.4 and the testing criteria suggested in HCVS-FAQ-05 (Ref. 18).

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 accidents. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error 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 JAF does not rely on CAP to maintain NPSH for ECCS pumps, but does credit 2 psig for both the core spray and residual heat removal systems.

- The features that prevent inadvertent actuation at all times are two PCIV’s in series powered from different divisions and automatic isolation of the valves upon a containment isolation signal. Procedures also provide clear guidance to not circumvent containment integrity by simultaneously opening torus and drywell vent valves during any design basis transient or accident. In addition, the HCVS will be designed to provide features to prevent inadvertent actuation due to a design error, equipment malfunction, or operator error.

Component Qualifications

The HCVS components downstream of the second containment isolation valve and components that interface with the HCVS are routed in seismically designed structures.

HCVS components that directly interface with the primary containment pressure boundary will be

Part 2: Boundary Conditions for Wet Well Vent

considered safety related, as the existing system is safety related. The containment system limits the leakage or release of radioactive materials to the environment to prevent offsite exposures from exceeding the guidelines of 10 CFR 100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material.

Likewise, any electrical or controls component which interfaces with Class 1E power sources will be considered safety related, up to and including appropriate isolation devices such as fuses or breakers, as their failure could adversely impact containment isolation and/or a safety-related power source. The remaining components will be considered Augmented Quality. Newly installed piping and valves will be seismically evaluated to handle the forces associated with the seismic margin earthquake (SME) back to their isolation boundaries. Electrical and controls components will be seismically rugged and will include the ability to handle harsh environmental conditions, as needed (although they will not be considered part of the site Environmental Qualification (EQ) program).

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

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 Pressure	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Process Valve Position	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344-2004 / Demonstration
HCVS Electrical Power Supply Availability	ISO9001 / IEEE 344-2004 / Demonstration

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

Part 2: Boundary Conditions for Wet Well Vent

Monitoring of HCVS

The JAF wetwell HCVS will be capable of being manually operated during sustained operations from a control panel located in the Relay Room and will meet the requirements of Order element 1.2.4. The Relay Room is a readily accessible location that will be evaluated for sustained habitability in accordance with HCVS-FAQ-01 (Reference 14). Additionally, to meet the intent for a secondary control location of Section 1.2.5 of the Order, a readily accessible Remote Operating Station (ROS) will also be incorporated into the HCVS design as described in NEI 13-02 Section 4.2.2.1.2.1. The controls and indications at the ROS location will be accessible and functional under a range of plant conditions, including severe accident conditions with due consideration to source term and dose impact on operator exposure, extended loss of AC power (ELAP), and inadequate containment cooling. An evaluation will be performed to determine accessibility to the location, habitability, staffing sufficiency, and communication capability with Vent-use decision makers.

The wetwell HCVS will include means to monitor the status of the vent system in both the Relay Room and the ROS. Included in the current design of the HCVS are control switches in the Relay Room with valve position indication. The existing HCVS controls currently meet the environmental and seismic requirements of the Order for the plant severe accident and will be upgraded to address ELAP. The ability to cycle these valves multiple times during the event's first 24 hours will be provided by backup nitrogen bottles and dedicated HCVS batteries, supplemented by installed backup battery power sources. Beyond the first 24 hours, the ability to cycle these valves will be provided with replaceable nitrogen bottles and a temporary power source.

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

Component reliable and rugged performance

The HCVS downstream of the second containment isolation valve, including piping and supports, electrical power supply, valve actuator pneumatic supply, and instrumentation (local and remote) components, will be designed/analyzed to conform to the requirements consistent with the applicable design codes (e.g., Non-safety, Cat 1, SS and 300# ASME or B31.1, NEMA 4, etc.) for the plant and to ensure functionality following a design basis earthquake.

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

Conduit design will be installed to Seismic Class 1 criteria. Both existing and new barriers will be used

Part 2: Boundary Conditions for Wet Well Vent

to provide a level of protection from missiles when equipment is located outside of seismically qualified structures. Augmented quality requirements will be applied to the components installed in response to this Order.

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

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

- demonstration of seismic motion will be consistent with that of existing design basis loads at the installed location;
- substantial history of operational reliability in environments with significant vibration with a design envelope inclusive of the effects of seismic motion imparted to the instruments proposed at the location;
- adequacy of seismic design and installation is demonstrated based on the guidance in Sections 7, 8, 9, and 10 of IEEE Standard 344-2004, *IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations*, (Reference 27) or a substantially similar industrial standard;
- demonstration that proposed devices are substantially similar in design to models that have been previously tested for seismic effects in excess of the plant design basis at the location where the instrument is to be installed (g-levels and frequency ranges); or
- Seismic qualification using seismic motion consistent with that of existing design basis loading at the installation location.

Part 2: Boundary Conditions for Wet Well Vent

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

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

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

First 24 Hour Coping Detail

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

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

The operation of the HCVS will be designed to minimize the reliance on operator actions for response to an ELAP and BDBEE hazards identified in Part 1 of this OIP. Immediate operator actions can be completed by Operators from the HCVS control station and includes remote-manual initiation. The operator actions required to open a vent path are as described in Table 2-1.

Remote-manual is defined in this report as a non-automatic power operation of a component and does not require the operator to be at or in close proximity to the component. No other operator actions are required to initiate venting under the guiding procedural protocol.

The HCVS will be designed to allow initiation, control, and monitoring of venting from the Relay Room. This location minimizes plant operators' exposure to adverse temperature and significant radiological conditions and is protected from hazards assumed in Part 1 of this report.

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

System control:

i. Active: HCVS control valves and PCIVs are operated in accordance with EOPs/SOPs and SAOGs to control containment pressure. The HCVS will be designed for a minimum of 12 open/close cycles of the vent path under ELAP conditions over the first 24 hours following an ELAP. Controlled venting will be permitted in the revised EPGs and associated implementing EOPs. The configuration of the new pneumatic supplies allows the HCVS system controls to override the containment isolation circuit on the PCIVs needed to vent containment.

ii. Passive: Inadvertent actuation protection is provided by use of key-locked switches for both the HCVS power supply actuation and valve operation. The normal state of the system is de-energized and closed. Provisions will be provided so that the N2 backup supply into the SOV vent ports does not cause inadvertent actuation of the valves.

Part 2: Boundary Conditions for Wet Well Vent

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

Greater Than 24 Hour Coping Detail

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

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

After 24 hours, available personnel will be able to connect supplemental motive gas to the HCVS. Connections for supplementing electrical power and motive 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. These actions provide long term support for HCVS operation for the period beyond 24 hours following an ELAP event. On-site and off-site personnel and resources will have access to the unit to provide needed action and supplies.

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 JAF 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 Flowcharts exist to direct operations in protection and control of containment integrity (which are EOP-4 and EOP-4a). Similarly, severe accident procedures exist for when EOP actions do not halt the progression of the BDBEE to a severe accident. The flowcharts / procedures include SAOG-1a, SAOG-1b, SAOG-1c, SAOG-1d, SAOG-1e, SAOG-1f, SAOG-2, EP-6, TSG-9, and OP-37. These flowcharts/procedures will be revised as part of the EPG/SAGs revision 3 updates. HCVS-specific procedure guidance will be developed and implemented to support HCVS implementation.

Identify modifications*:*

List modifications and describe how they support the HCVS Actions.

EA-12-049 Modifications

- Consideration for a modification to install a connection point to allow a small PDG to power the HCVS battery charger or a FLEX 600VAC diesel generator to connect to the 600 VAC bus to provide power to the HCVS battery charger and critical AC components. This will be discussed in a six month status update.

Part 2: Boundary Conditions for Wet Well Vent

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

EA-13-109 Modifications

- A modification will be required to install the HCVS pneumatic supply station.
- A modification will be required to install the dedicated HCVS batteries, battery charger, and transfer switches needed to supply power to the HCVS for 24 hours following an ELAP event.
- A modification will be required to install required HCVS instrumentation and controls, including radiation monitors. This also includes the addition of a ROS and modification of an existing control panel in the Relay Room.
- A modification will be required to install dedicated HCVS piping, a boundary AOV and a control AOV on the common HCV piping downstream of the outboard wet well and dry well containment isolation valves.
- Additional modifications may be required to existing system isolation valves, HCVS piping, and piping supports.

Key Venting Parameters:

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

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

Key Parameter	Component Identifier	Indication Location
HCVS Effluent Temperature	TBD	Relay Room
HCVS Pneumatic Supply Pressure	TBD	Relay Room/ROS
HCVS Valve Position Indication	TBD	Relay Room/ROS
HCVS System Pressure Indication	TBD	Relay Room
HCVS Radiation Monitor	TBD	Relay Room
HCVS Electrical Power Supply	TBD	Relay Room

Initiation and operation of the HCVS system will rely on several existing MCR key parameters and indicators which are qualified or evaluated to the existing plant design (reference NEI 13-02 Section 4.2.2.1.9):

Part 2: Boundary Conditions for Wet Well Vent

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

Key Parameter	Component Identifier	Indication Location
Drywell Pressure	27PI-115A1	Main Control Room
Torus Pressure	27PR-101A	Main Control Room
Torus Water Temperature	16-1TR-131A	Main Control Room
Containment Water Level	23LI-203A	Main Control Room
Torus Water Level	23LI-202A	Main Control Room

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

Notes:

None

Part 2: Boundary Conditions for Wet Well Vent

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

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

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

First 24 Hour Coping Detail

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

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

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

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

System control:

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

Greater Than 24 Hour Coping Detail

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

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

Specifics are the same as for BDBEE Venting Part 2 except the location and refueling actions for the temporary power source and replacement nitrogen bottles will be evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway.

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 JAF to provide needed action and supplies.

The pneumatic supply station will be located outside of the secondary containment and the HCVS

Part 2: Boundary Conditions for Wet Well Vent
Part 2 Boundary Conditions for WW Vent**: Severe Accident Venting**
batteries / battery charger will be located in the secondary containment equipment access lock. The HCVS piping will exit the Reactor Building on the southwest side of the Reactor Building. An evaluation will be completed to address radiological and temperature concerns when the locations of the batteries, battery charger and ROS are finalized.
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
The operation of the HCVS is governed the same for SA conditions as for BDBEE conditions. Existing guidance in the SAOGs 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.
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 Wet Well Vent

Part 2 Boundary Conditions for WW Vent**: HCVS Support Equipment Functions**

Determine venting capability support functions needed

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

BDBEE Venting

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

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

Containment integrity is initially maintained by permanently installed equipment. All containment venting functions will be performed from the Relay Room or ROS located in the Administration Building.

Venting will require support from the HCVS dedicated batteries, battery charger, and pneumatic supply station. These provide a minimum of 24 hour operation on installed supplies and provide connection points for additional pneumatic supplies (nitrogen bottles) and electrical supplies.

The location of the pneumatic supply station in the Administration Building will be evaluated for reasonable protection per Part 1 of this OIP. Actions to replenish the pneumatic supplies may include replacement of nitrogen bottles. Sufficient replacement HCVS nitrogen bottles will be staged in a location to support operations for beyond 24 hours following the ELAP event.

The HCVS batteries and battery charger will be sufficient for a minimum of 24 hour operation. The normal power source for the battery charger is a dedicated 600 VAC to 120/240 VAC transformer, which will be powered from a 600 VAC bus that may be re-powered by temporary power source.

These actions provide long term support for HCVS operation for the period beyond 24 hrs. On-site and off-site personnel and resources will have access to the unit to provide needed action and supplies.

Severe Accident Venting

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

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

The same support functions that are used in the BDBEE scenario would be used for severe accident venting. To ensure power for venting during the first 24 hours, a set of dedicated HCVS batteries will be available to feed HCVS loads via control power transfer switches. Beyond 24 hours, power can be backed up by a temporary power source.

Nitrogen bottles that will be located outside of the reactor building and in the immediate area of the ROS will be available to tie-in supplemental pneumatic sources.

Details:

Part 2: Boundary Conditions for Wet Well Vent

Part 2 Boundary Conditions for WW Vent**: HCVS Support Equipment Functions**

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

Most of the equipment used in the HCVS is permanently installed. The key portable items are the temporary power source and the HCVS nitrogen bottles needed to supplement the gas supply to the AOVs after 24 hours. These will be staged in position for the duration of the event.

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

Flex modifications applicable to HCVS operation:
As an option to support HCVS operation beyond 24 hours, a FLEX 600VAC diesel generator can be connected to the 600 VAC bus to provide power to the HCVS battery charger and critical AC components. This will be discussed in a six month status update.

HCVS modification:
The HCVS modifications include adding piping and connection points in the hallway between the Reactor Building and Turbine Building to connect portable N2 bottles for motive force to HCVS components after 24 hours. HCVS connections required for portable equipment will be protected from all applicable screened-in hazards and located such that operator exposure to radiation and occupational hazards will be minimized. Structures to provide protection of the HCVS connections will be constructed to meet the requirements identified in NEI-12-06 Section 11 for screened in hazards.

Key Support Equipment Parameters:
List instrumentation credited for the support equipment utilized in the venting operation. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)

- New local control features of the temporary power source's electrical load and fuel supply.
- New pressure gauge on supplemental nitrogen bottles.
- New HCVS battery voltage indicator.

Notes:

None

Part 2: Boundary Conditions for Wet Well Vent

Part 2 Boundary Conditions for WW Vent**: HCVS Venting Portable Equipment Deployment**

Provide a general description of the venting actions using portable equipment including modifications that are proposed to maintain and/or support safety functions.

Ref: EA-13-109 Section 3.1 / NEI 13-02 Section 6.1.2, D.1.3.1

Deployment pathways for compliance with Order EA-12-049 are acceptable without further evaluation needed except in areas around the Reactor Building or in the vicinity of the HCVS piping. Deployment in the areas around the Reactor Building or in the vicinity of the HCVS piping will allow access, operation and replenishment of consumables with the consideration that there is potential Reactor Core Damage and HCVS operation.

Details:

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

Operation of the portable equipment is the same as for compliance with Order EA-12-049 thus they are acceptable without further evaluation

HCVS Actions	Modifications	Protection of connections
Identify Actions including how the equipment will be deployed to the point of use.	*Identify modifications*	*Identify how the connection is protected*
Per compliance with Order EA-12-049 (FLEX)	N/A	Per compliance with Order EA-12-049 (FLEX)

Notes:

None

Part 3: Boundary Conditions for Dry Well Vent

Provide a sequence of events and identify any time constraint required for success including the basis for the time constraint.
HCVS Actions that have a time constraint to be successful should be identified with a technical basis and a justification provided that the time can reasonably be met (for example, a walk through of deployment).

Describe in detail in this section the technical basis for the time constraint identified on the sequence of events timeline Attachment 2B

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

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

This section will be completed with the Phase 2 OIP submittal by December 31, 2015

Severe Accident Venting

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

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

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

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

This section will be completed with the Phase 2 OIP submittal by December 31, 2015

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

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

This section will be completed with the Phase 2 OIP submittal by December 31, 2015

Details:

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

This section will be completed with the Phase 2 OIP submittal by December 31, 2015

Part 3: Boundary Conditions for Dry Well Vent
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
This section will be completed with the Phase 2 OIP submittal by December 31, 2015
Key Venting Parameters: *List instrumentation credited for the venting HCVS Actions.*
This section will be completed with the Phase 2 OIP submittal by December 31, 2015
Notes: None

Part 4: Programmatic Controls, Training, Drills and Maintenance

Identify how the programmatic controls will be met.
Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality addressing the impact of temperature and environment

Ref: EA-13-109 Section 3.1, 3.2 / NEI 13-02 Section 6.1.2, 6.1.3, 6.2

Program Controls:

The HCVS venting actions will include:

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

Procedures:

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

The HCVS procedures will be developed and implemented following JAF's process for initiating or revising procedures and contain the following details:

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

JAF will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in the JAF HCVS program document:

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

- If for up to 90 consecutive days, the primary or alternate means of HCVS operation are non-functional, no compensatory actions are necessary.
- If for up to 30 days, the primary and alternate means of HCVS operation are non-functional, no compensatory actions are necessary.
- If the out of service times exceed 30 or 90 days as described above, the following actions will be performed:

Part 4: Programmatic Controls, Training, Drills and Maintenance

- The condition will be entered into the corrective action system,
- The HCVS functionality will be restored in a manner consistent with plant procedures,
- A cause assessment will be performed to prevent future loss of function for similar causes.
- Initiate action to implement appropriate compensatory actions

Describe training plan

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

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

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

In addition, (Reference 10) all personnel on-site will be available to supplement trained personnel.

Identify how the drills and exercise parameters will be met.

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

The Licensee should demonstrate use of the HCVS system in drills, tabletops, or exercises as follows:

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

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

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

Describe maintenance plan:

- The HCVS maintenance program should ensure that the HCVS equipment reliability is being achieved in a manner similar to that required for FLEX equipment. Standard industry templates

Part 4: Programmatic Controls, Training, Drills and Maintenance

(e.g., EPRI) and associated bases may be developed to define specific maintenance and testing.
  - Periodic testing and frequency should be determined based on equipment type, expected use and manufacturer's recommendations.
  - 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 permanently installed equipment should be maintained in a manner that is consistent with assuring that it performs its function when required.
  - HCVS permanently installed equipment should be subject to maintenance and testing guidance provided to verify proper function.
- HCVS non-installed equipment should be stored and maintained in a manner that is consistent with assuring that it does not degrade over long periods of storage and that it is accessible for periodic maintenance and testing.

Ref: EA-13-109 Section 1.2.13 / NEI 13-02 Section 5.4, 6.2

The site will utilize the standard EPRI industry PM process (Similar to the Preventive Maintenance Basis Database) for establishing the maintenance calibration and testing actions for HCVS components. The control program will include maintenance guidance, testing procedures and frequencies established based on type of equipment and considerations made within the EPRI guidelines.

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

Table 4-1: Testing and Inspection Requirements

Description	Minimum Frequency
Cycle the HCVS valves and the interfacing system valves not used to maintain containment integrity during operations.	Once per operating cycle
Perform visual inspections and a walk down of HCVS components.	Once per operating cycle
Test and calibrate the HCVS radiation monitors.	Once per operating cycle
Leak test the HCVS.	(1) Prior to first declaring the system functional; (2) Once every three operating cycles

Part 4: Programmatic Controls, Training, Drills and Maintenance

	thereafter; and (3) After restoration of any breach of system boundary within the buildings
Validate the HCVS operating procedures by conducting an open/close test of the HCVS control logic from its control panel and ensuring that all interfacing system valves move to their proper (intended) positions.	Once per every other operating cycle

Notes:

None

Part 5: Milestone Schedule

Provide a milestone schedule. This schedule should include:

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

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

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

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

Milestone	Target Completion Date	Activity Status	Comments *{Include date changes in this column}*
Hold preliminary/conceptual design meeting	Jan. 2014	Complete	
Submit Overall Integrated Implementation Plan	Jun 2014		
Submit 6 Month Status Report	Dec. 2014		
Submit 6 Month Status Report	Jun. 2015		
Design Engineering On-site/Complete	Jun. 2015		
Submit 6 Month Status Report	Dec. 2015		Simultaneous with Phase 2 OIP
Submit 6 Month Status Report	Jun. 2016		
Operations Procedure Changes Developed	Aug. 2016		
Site Specific Maintenance Procedure Developed	Aug. 2016		
Implementation Outage	Oct. 2016		
Procedure Changes Active	Nov. 2016		
Walk Through Demonstration/Functional Test	Nov. 2016		
Submit 6 Month Status Report	Dec. 2016		
Training Complete	Dec. 2016		
Submit 6 Month Status Report	Jun. 2017		
Submit Completion Report	Jun. 2017		

Attachment 1: HCVS Portable Equipment

List portable equipment	***BDBEE Venting***	***Severe Accident Venting***	***Performance Criteria***	***Maintenance / PM requirements***
Nitrogen Cylinders	X	X	TBD	Check periodically for pressure, replace or replenish as needed
Temporary Power Supply	X	X	TBD	As determined later

Attachment 2: Sequence of Events Timeline

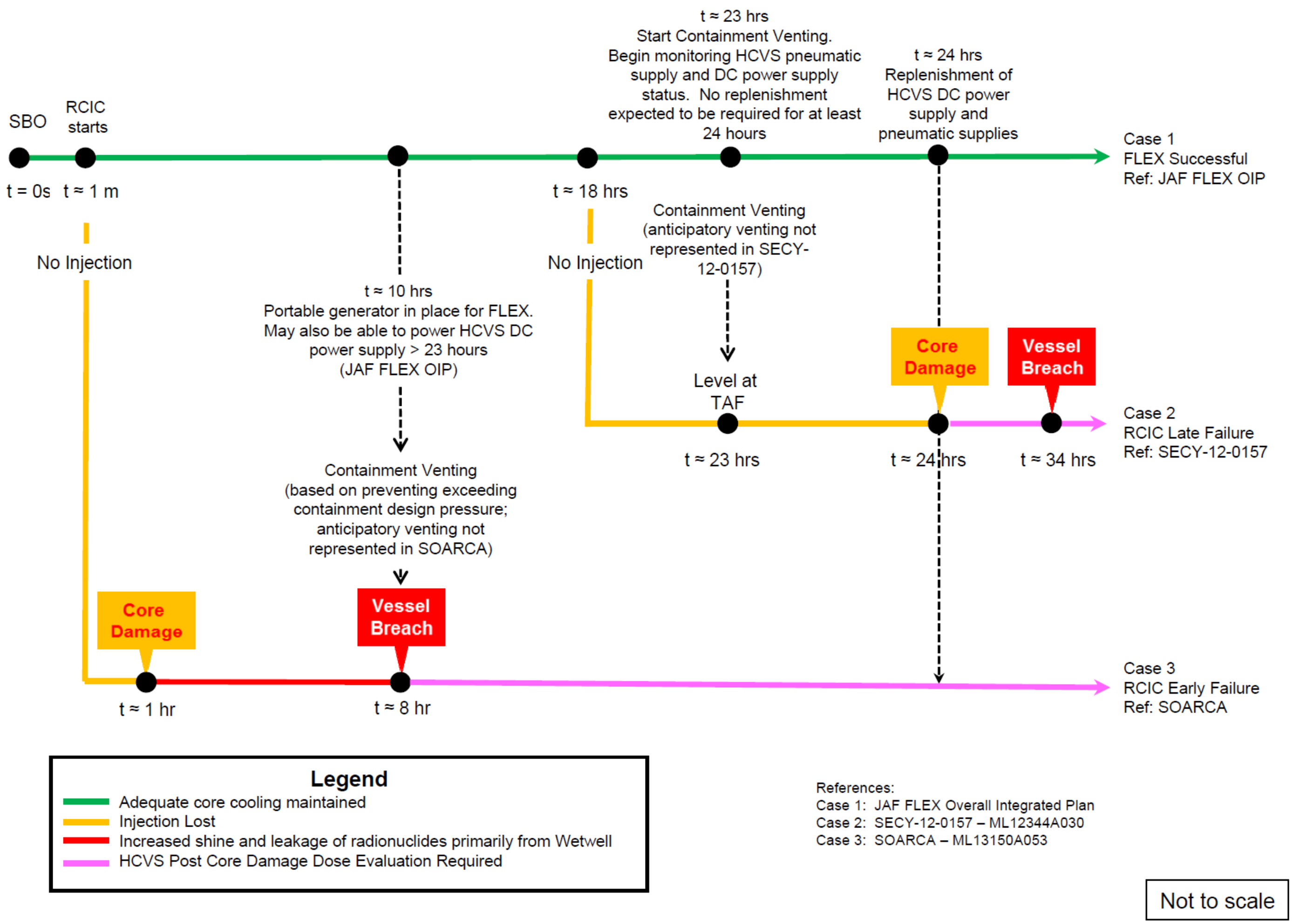


Table 2A: Wet Well HCVS Timeline

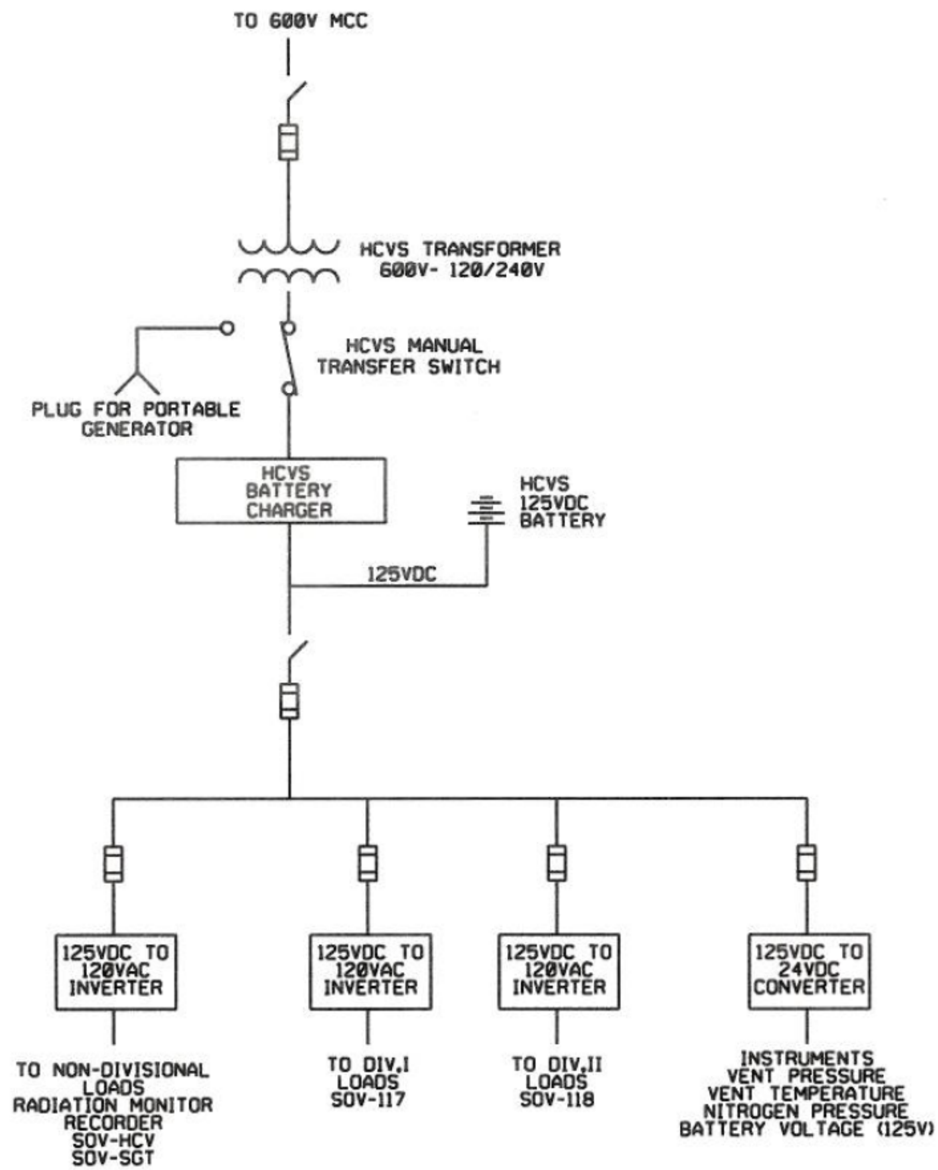
Attachment 3: Conceptual Sketches

1: Electrical Layout of System *(preliminary)*
- **Sketch 1.A: Electrical Layout of System - One Line Diagram**
- **Sketch 1.B: Electrical Layout of System - Block Diagram**

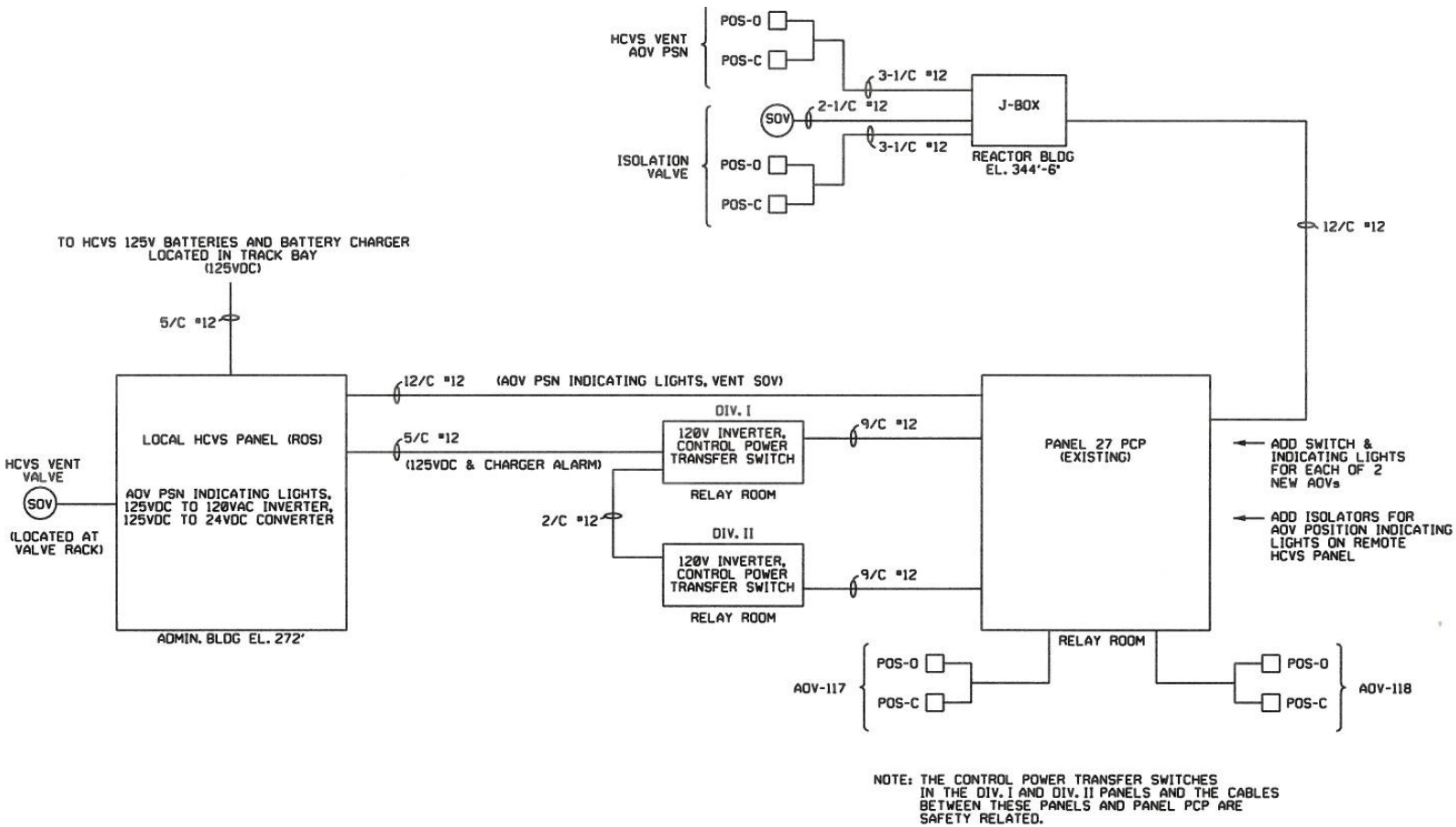
2: Layout of HCVS *(preliminary)*
- **Sketch 2.A: P&ID**

  Note: [This sketch includes the piping routing for vent path, the demarcation of the valves (in the vent piping) between the currently existing and new ones, and the instrumentation process flow lines]
- **Sketch 2.B: HCVS Pipe Routing**
- **Sketch 2.C: HCVS Pipe Routing**

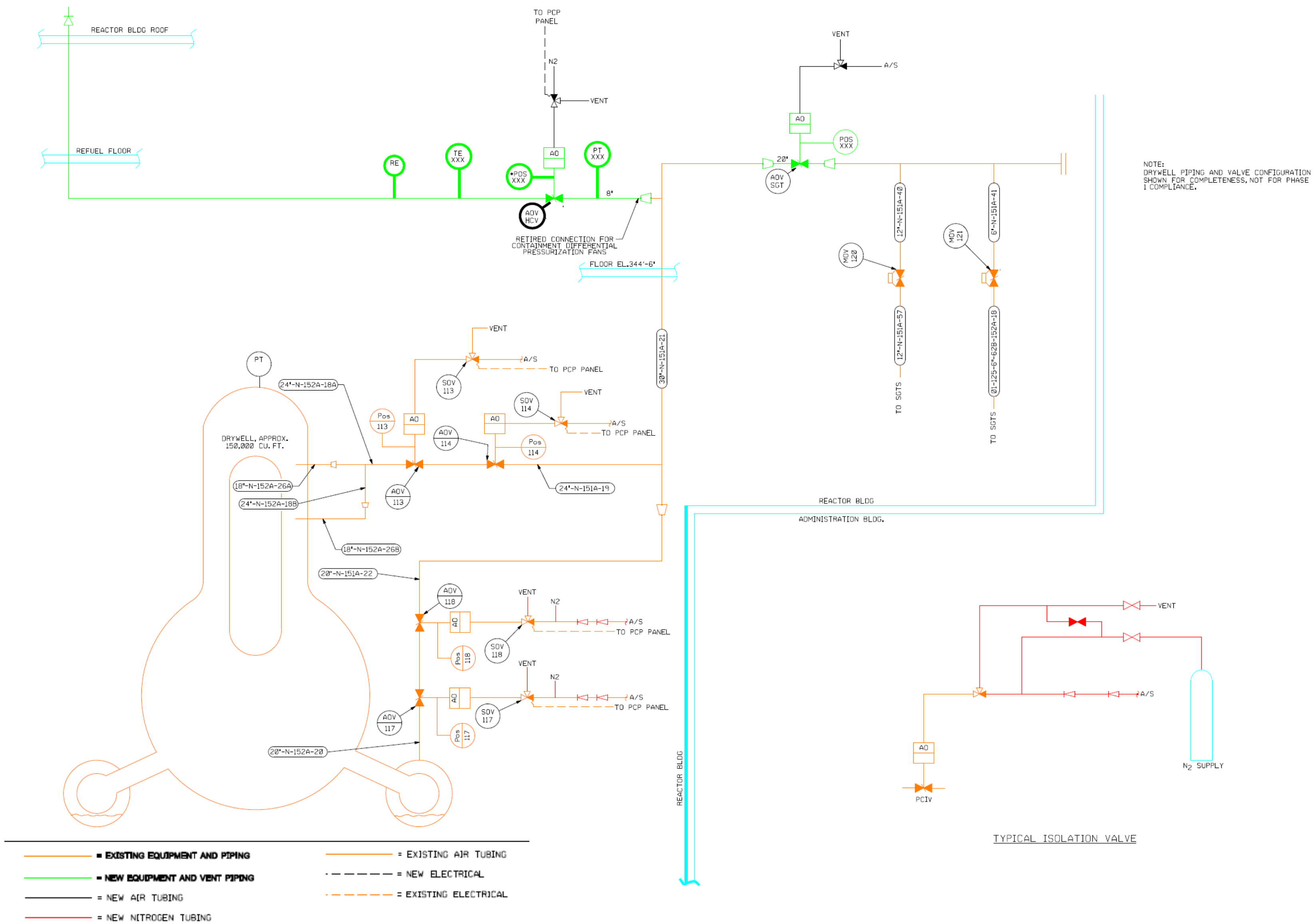
3: Plant Layout *(preliminary)*
- **Sketch 3.A - Location of ROS in Administration (Control) Building**
- **Sketch 3.B – Location of HCVS Battery Station in Reactor Building Track Bay**
- **Sketch 3.C - Deployment Location and Haul Path [Reference 28]**
- **Sketch 3.D - Site Plan of HCVS Piping, ROS, N2 Bottle Station, and Battery Station**



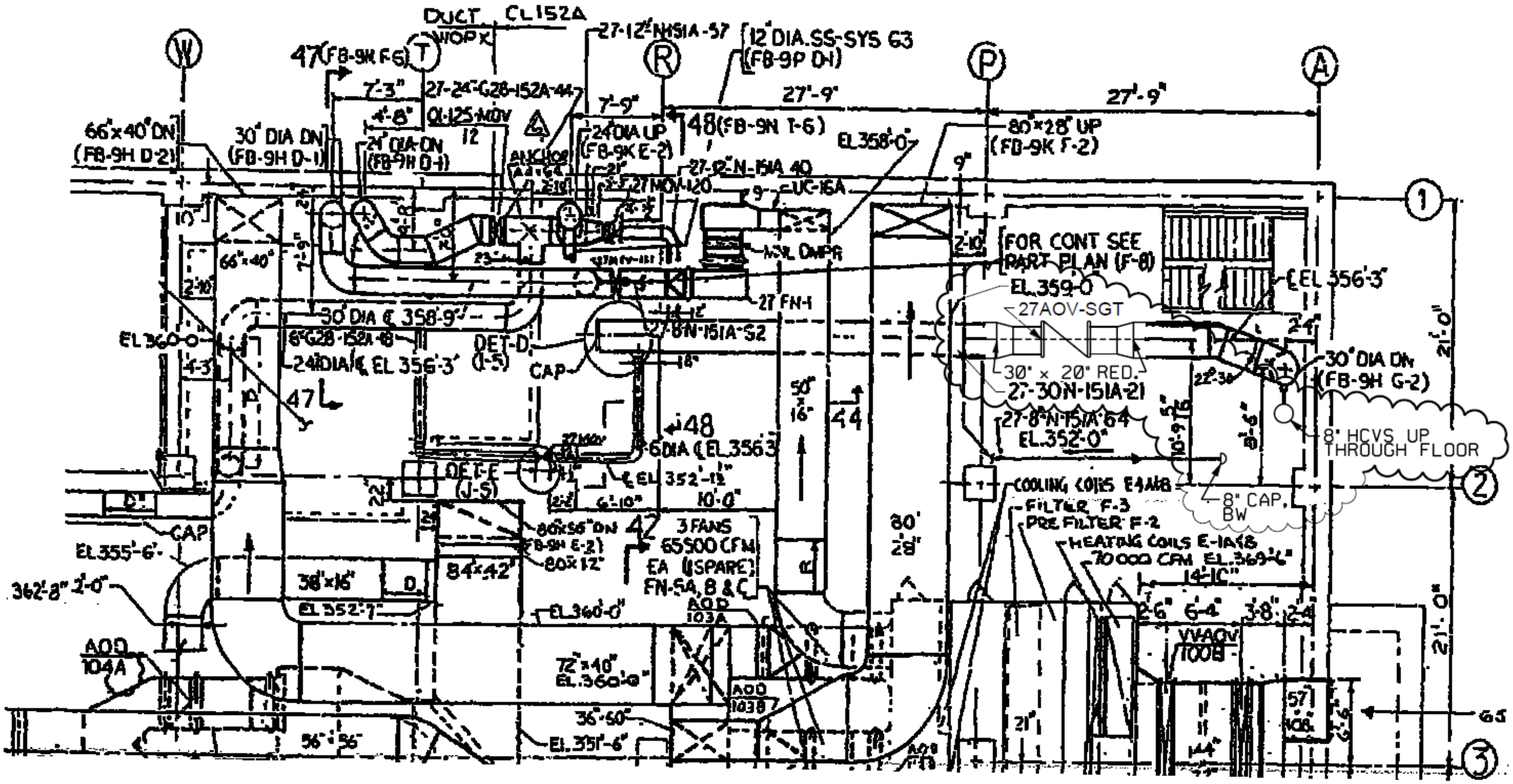
Sketch 1.A: Electrical Layout of System – One Line Diagram



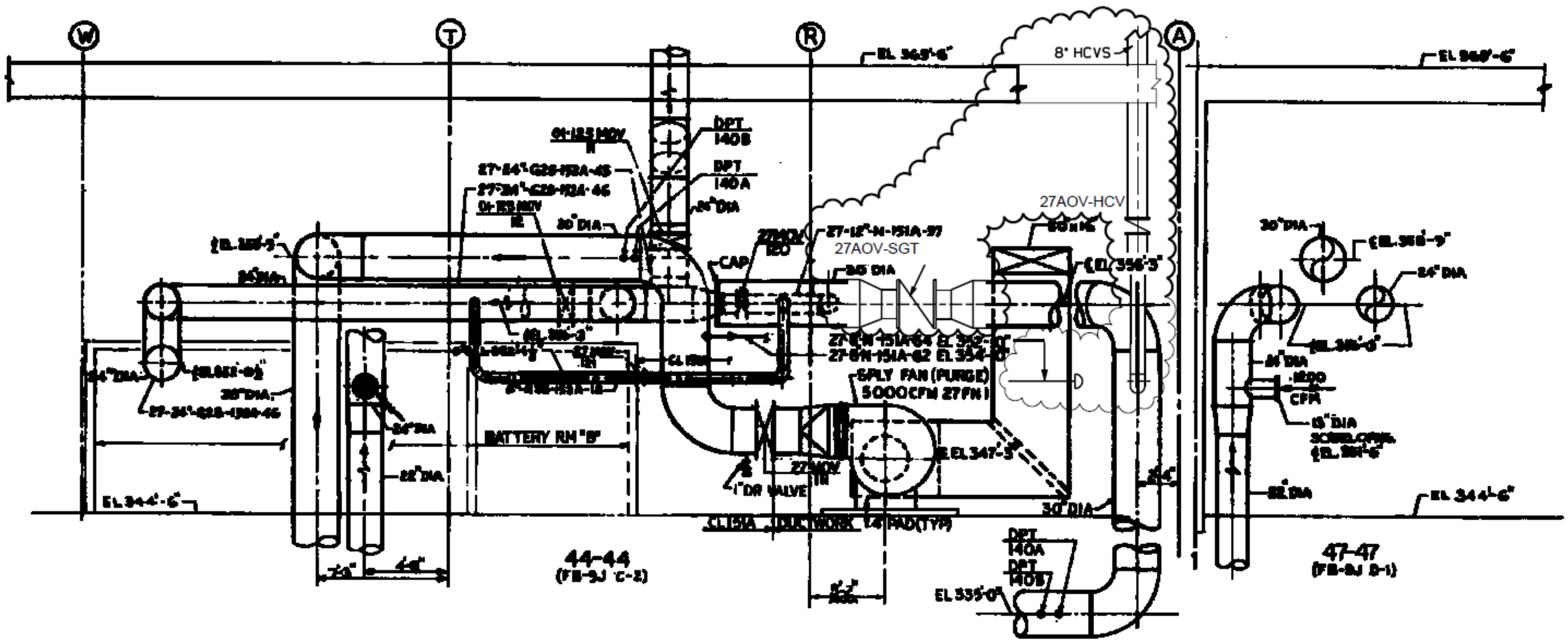
Sketch 1.B: Electrical Layout of System – Block Diagram



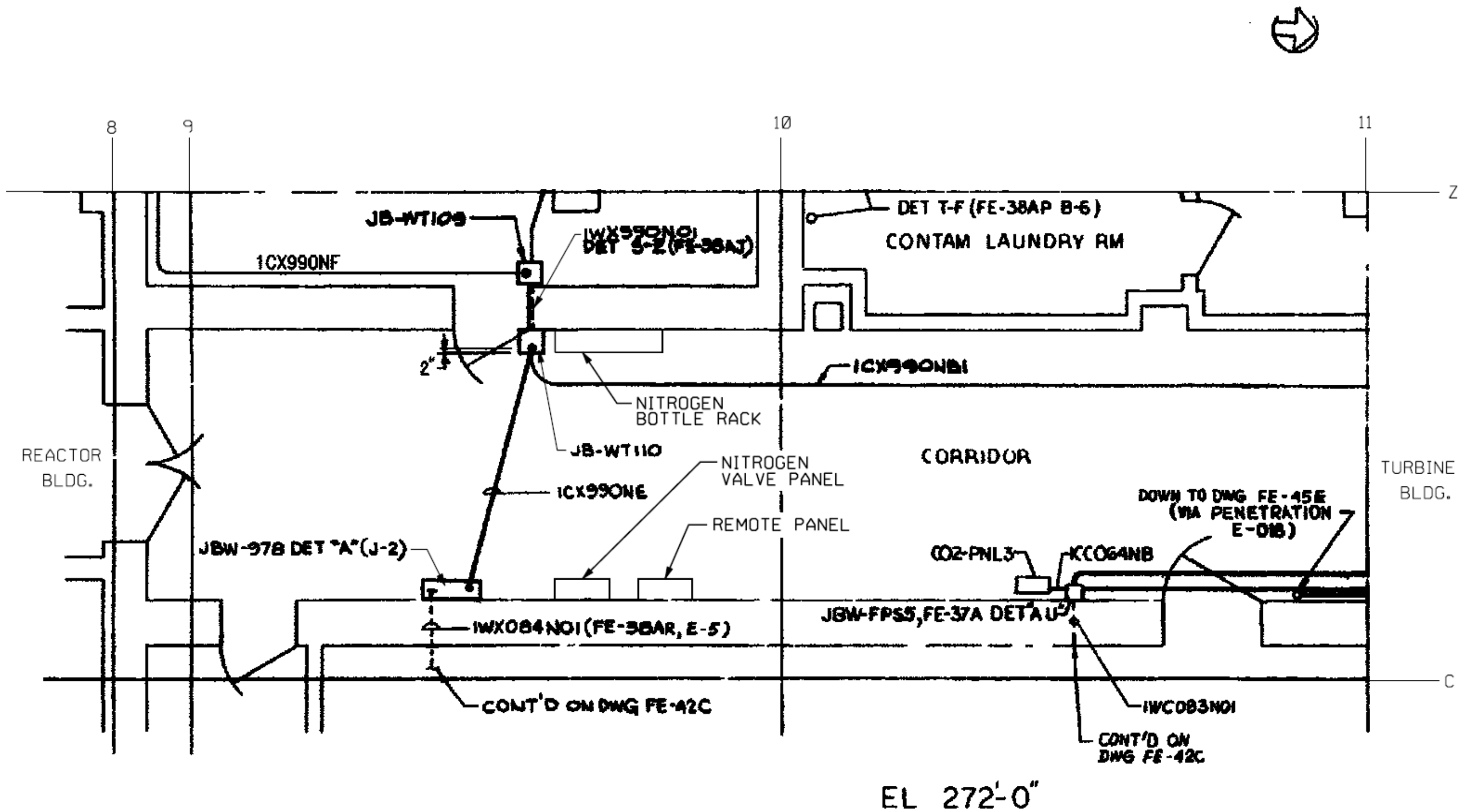
Sketch 2.A: P&ID Layout of current HCVS



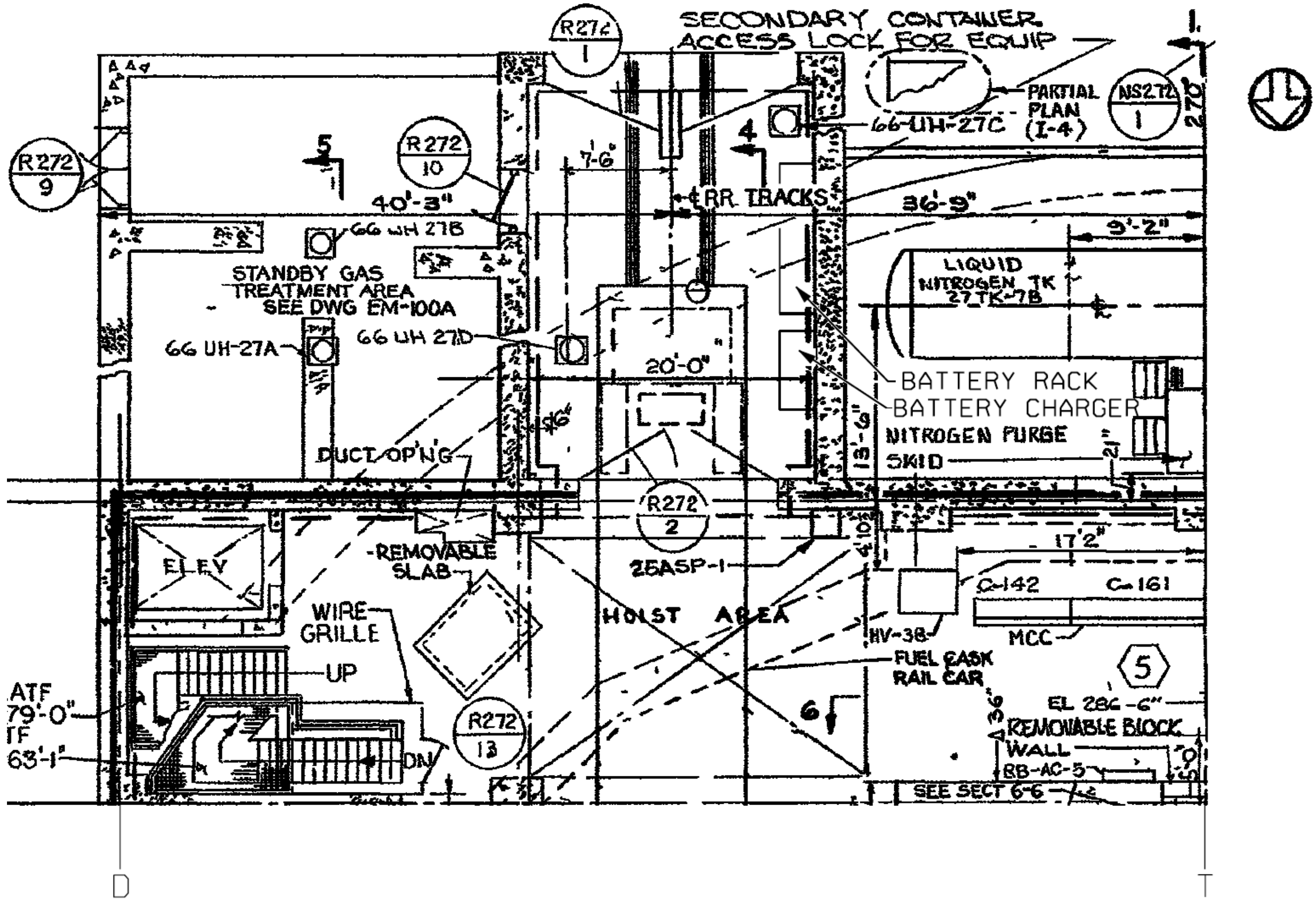
Sketch 2.B: HCVS Pipe Routing



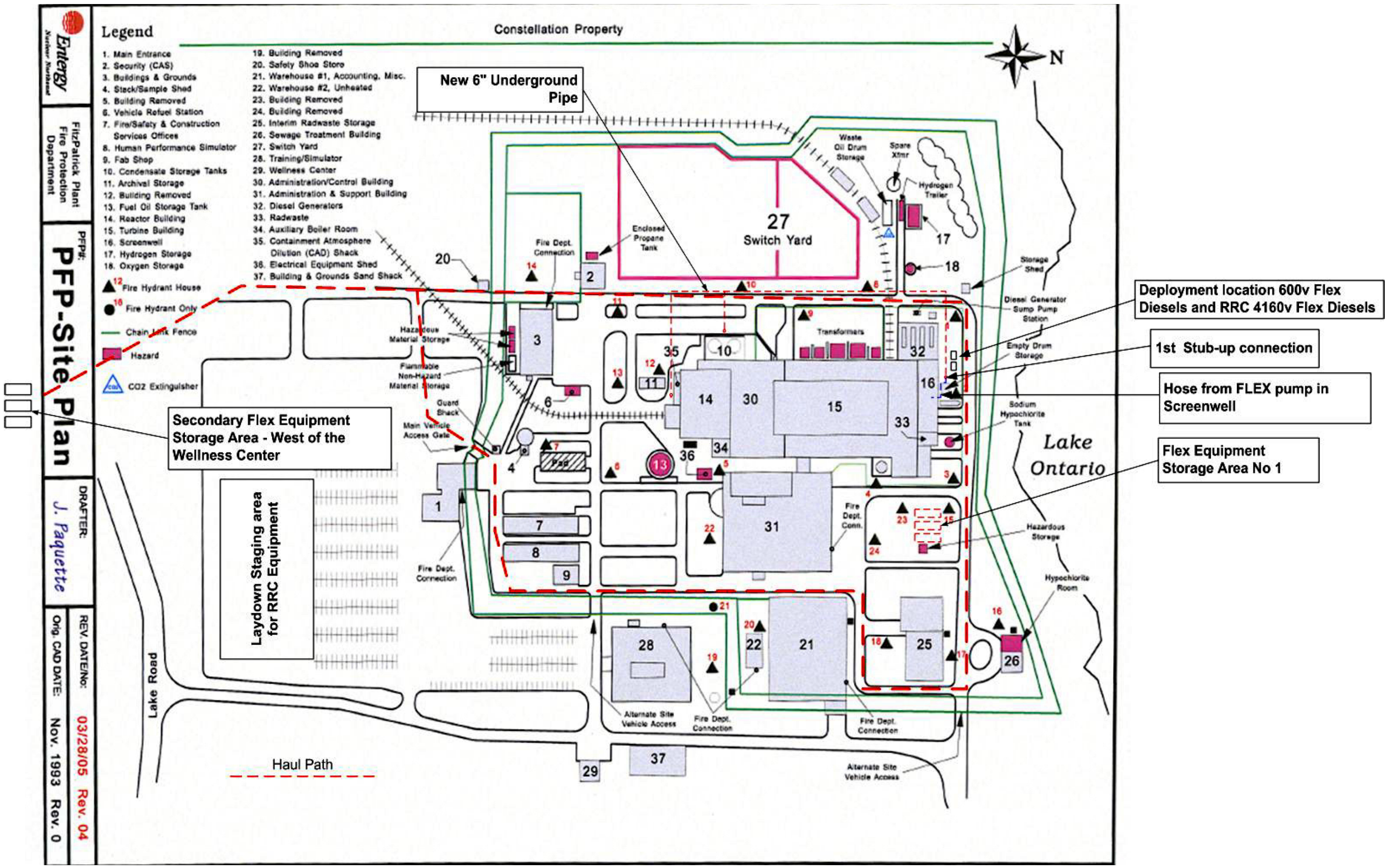
Sketch 2.C: HCVS Pipe Routing



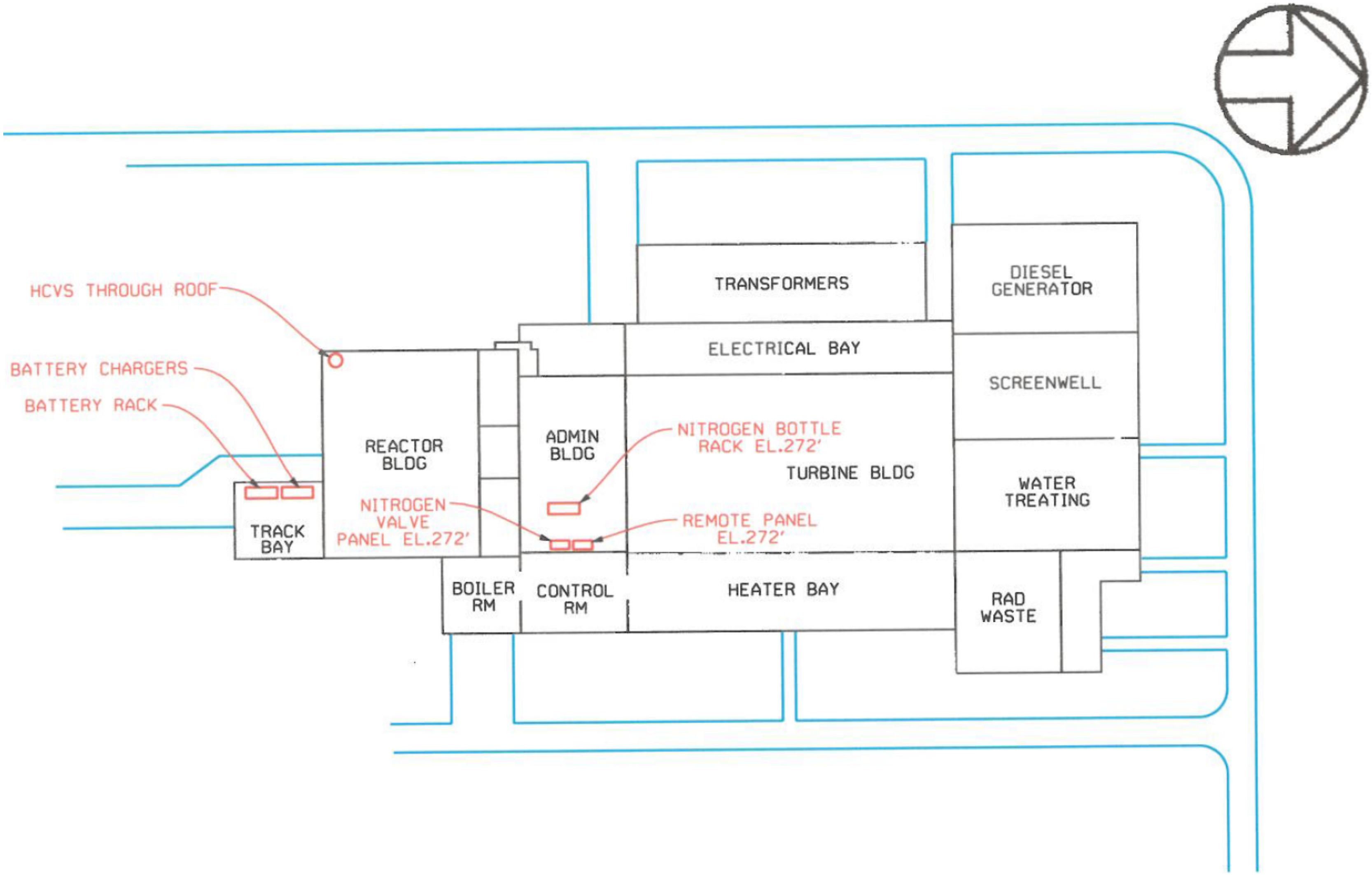
Sketch 3.A: Plant Layout – Location of ROS in Administration (Control) Building



Sketch 3.B: Plant Layout – Location of HCVS Battery Station in Reactor Building Track Bay



Sketch 3.C: Plant Layout – Deployment Location and Travel Path *(From FLEX OIP; Ref. 28)*



Sketch 3.D: Plant Layout – Site Plan of HCVS Piping, ROS, N2 Bottle Station, and Battery Station

Attachment 4: Failure Evaluation Table

Table 4A: Wet Well HCVS Failure Evaluation Table

Functional Failure Mode	**Failure Cause**	**Alternate Action**	**Failure with Alternate Action Impact on Containment Venting?**
Failure of Vent to Open on Demand	Valves fail close due to loss of normal AC power	Power the HCVS from dedicated HCVS batteries via inverters for a minimum of 24 hours	No
Failure of Vent to Open on Demand	Valves fail close due to loss of alternate AC power (long term)	Power the HCVS from dedicated HCVS batteries via inverters for a minimum of 24 hours	No
Failure of Vent to Open on Demand	Valves fail close due to complete loss of batteries (long term)	Recharge dedicated HCVS batteries with temporary power source, considering severe accident conditions.	No
Failure of Vent to Open on Demand	Valves fail close due to complete loss of batteries (long term)	Perform manual override at nitrogen valve station. Motive gas can be supplied by nitrogen bottle tanks, which is sufficient for at least 12 cycles of the new control valve, 27AOV-HCV, over the first 24 hours.	No
Failure of Vent to Open on Demand	Valves fail close due to loss of normal pneumatic air supply	No action needed, motive gas can be supplied by nitrogen bottle tanks, which is sufficient for at least 12 cycles of the new control valve, 27AOV-HCV, over the first 24 hours.	No
Failure of Vent to Open on Demand	Valves fail close due to loss of alternate pneumatic air supply (long term)	Tie-in nitrogen cylinders to air system supporting HCVS valves, replace bottles as needed.	No
Failure of HCVS system to isolate after use	Valves are not able to fail close due to malfunction	No action needed. Redundant isolation is provided for the PCIVs and the downstream valves are designed to fail close.	No

Attachment 5: References

1. Generic Letter 89-16, Installation of a Hardened Wetwell Vent, dated September 1, 1989
2. Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
3. Order EA-12-050, Reliable Hardened Containment Vents, dated March 12, 2012
4. Order EA-12-051, Reliable SFP Level Instrumentation, dated March 12, 2012
5. Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated June 6, 2013
6. JLD-ISG-2012-01, Compliance with Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated August 29, 2012
7. JLD-ISG-2012-02, Compliance with Order EA-12-050, Reliable Hardened Containment Vents, dated August 29, 2012
8. JLD-ISG-2013-02, Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents, dated November 14, 2013
9. NRC Responses to Public Comments, Japan Lessons-Learned Project Directorate Interim Staff Guidance JLD-ISG-2012-02: Compliance with Order EA-12-050, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents, ADAMS Accession No. ML12229A477, dated August 29, 2012
10. NEI 12-06, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, Revision 1, dated August 2012
11. NEI 13-02, Industry Guidance for Compliance with Order EA–13–109,Revision 0, Dated November 2013
12. NEI 13-06, Enhancements to Emergency Response Capabilities for Beyond Design Basis Accidents and Events, Revision 0, dated March 2014
13. NEI 14-01, Emergency Response Procedures and Guidelines for Extreme Events and Severe Accidents, Revision 0, dated March 2014
14. NEI FAQ HCVS-01, HCVS Primary Controls and Alternate Controls and Monitoring Locations
15. NEI FAQ HCVS-02, HCVS Dedicated Equipment
16. NEI FAQ HCVS-03, HCVS Alternate Control Operating Mechanisms

17. NEI FAQ HCVS-04, HCVS Release Point
18. NEI FAQ HCVS-05, HCVS Control and ‘Boundary Valves’
19. NEI FAQ HCVS-06, FLEX Assumptions/HCVS Generic Assumptions
20. NEI FAQ HCVS-07, Consideration of Release from Spent Fuel Pool Anomalies
21. NEI FAQ HCVS-08, HCVS Instrument Qualifications
22. NEI FAQ HCVS-09, Use of Toolbox Actions for Personnel
23. NEI White Paper HCVS-WP-01, HCVS Dedicated Power and Motive Force
24. NEI White Paper HCVS-WP-02, HCVS Cyclic Operations Approach
25. NEI White Paper HCVS-WP-03, Hydrogen/CO Control Measures
26. NEI White Paper HCVS-WP-04, FLEX/HCVS Interactions
27. IEEE Standard 344-2004, IEEE Recommended Practice for Seismic Qualification of Class 1E Equipment for Nuclear Power *Generating Stations*,
28. JAF EA-12-049 (FLEX) Overall Integrated Implementation Plan, Rev 0, February 2013
29. JAF EA-12-050 (HCVS) Overall Integrated Implementation Plan, Rev 0, February 2013
30. JAF EA-12-051 (SFP LI) Overall Integrated Implementation Plan, Rev 0, February 2013
31. JAF Drawing 3.11-44, Rev. 2, “Drywell Shell – General Plan”
32. JAF Drawing FA-2G, Rev. 5, “General Arrangement - Elevation”
33. JAF Drawing FM-18B, Rev. 40, “Flow Diagram Drywell Inerting C.A.D. Purge and Containment Differential Pressurization System 27”
34. JAF Procedure EP-2, Rev. 8 “Isolation / Interlock Overrides”
35. JAF Procedure EP-6, Rev. 9, “Post Accident Containment Venting and Gas Control
36. JAF Procedure SAOG 1A, Rev. 3, “RPV & PC Flooding, RPV Breach”
37. JAF Procedure SAOG 1B, Rev. 2, “RPV & PC Flooding, RPV Level Above TAF”
38. JAF Procedure SAOG 1C, Rev. 2, “RPV & PC Flooding, RPV Above BAF”

39. JAF Procedure SAOG 1D, Rev. 2, “RPV & PC Flooding, RPV Above MDRIR”
40. JAF Procedure SAOG 1E, Rev. 2, “RPV & PC Flooding, Parameters Within PSP”
41. JAF Procedure SAOG 1F, Rev. 2, “RPV & PC Flooding, Parameter Outside PSP”
42. JAF Procedure SAOG 2, Rev. 3, “RPV, Containment and Radioactivity Release Control”
43. JAF Procedure TSG-9, Rev. 4, “Primary Containment Venting Without AC Power”

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

Any significant changes to this plan will be communicated to the NRC staff in the 6 Month Status Reports

Attachment 7: List of Overall Integrated Plan Open Items

Open Item	Action	Comment