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PSEG
Nuclear LLC

Order EA-13-109

LR-N14-0155

JUN 25 2014

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

Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
NRC Docket No. 50-354

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

References:

1. NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 6, 2013

2. NRC Interim Staff Guidance JLD-ISG-2013-02, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," dated November 14, 2013

3. PSEG Letter LR-N13-0289, "Hope Creek Generating Station's Notification Pursuant to Condition IV.C.1 of 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)," dated December 13, 2013

4. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0, dated November 2013

5. NRC Letter to NEI Acknowledging NEI 13-02 Phase 1 OIP Template, dated May 14, 2014 (ADAMS Accession No. ML14128A219)

6. NRC Letter, "Installation of a Hardened Wetwell Vent (Generic Letter 89-16)," dated September 1, 1989

7. NRC Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," dated March 12, 2012

On June 6, 2013, the Nuclear Regulatory Commission (NRC) issued Order EA-13-109 (Reference 1) to PSEG Nuclear LLC (PSEG). NRC Order EA-13-109 was immediately effective and requires the Hope Creek Generating Station (HCGS) to take certain actions to ensure that HCGS has a hardened containment vent system (HCVS) to remove decay heat from the containment, and maintain control of containment pressure within acceptable limits following events that result in 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). Specific requirements are outlined in Attachment 2 of NRC Order EA-13-109.

NRC Order EA-13-109 requires submission of an Overall Integrated Plan (OIP) for Phase 1 of the order by June 30, 2014. The purpose of this letter is to provide, as Enclosure 1, the OIP for Phase 1 pursuant to Section IV, Condition D.1 of NRC Order EA-13-109.

NRC Interim Staff Guidance JLD-ISG-2013-02 (Reference 2), which provides direction regarding the content of this OIP, was issued on November 14, 2013. The enclosed HCGS Phase 1 OIP is based on the guidance of Reference 2 for the purpose of ensuring the functionality of a HCVS to remove decay heat from the containment and to maintain control of containment pressure within acceptable limits following events that result in the loss of active containment heat removal capability, while maintaining the capability to operate under SA conditions resulting from an ELAP as described in Attachment 2 of NRC Order EA-13-109.

PSEG provided a 20-day response to JLD-ISG-2013-02 via Reference 3, which describes an exception to NRC Order EA-13-109 Attachment 2, Requirement 1.2.2, regarding the vent release point height. The HCGS vent release point height and other planned alternatives to JLD-ISG-2013-02 are discussed in the enclosed OIP.

Section 7.0 of Nuclear Energy Institute (NEI) 13-02 (Reference 4) contains the specific reporting requirements for the OIP. The HCGS Phase 1 OIP provides the information pursuant to Section 7.0 NEI 13-02 by use of the Phase 1 OIP Template per Reference 5.

For the purposes of compliance with Phase 1 of NRC Order EA-13-109, HCGS plans to use a severe accident capable wetwell (torus) vent.

Compliance with the requirements of NRC Order EA-13-109 will supersede any and all actions associated with NRC Generic Letter 89-16 (Reference 6) and NRC Order EA-12-050 (Reference 7). Any regulatory actions or commitments associated with Reference 5 or Reference 6 are rescinded and not binding by submittal of the Phase 1 OIP via this letter.

There are no regulatory commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact Mr. Brian J. Thomas at 856-339-2022.

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

Executed on June 25th, 2014
(Date)

Sincerely,

Paul J. Davison

Paul J. Davison
Site Vice President
Hope Creek Generating Station

Enclosure 1: Hardened Containment Vent System Phase 1 EA-13-109 Overall Integrated Plan Response - Hope Creek Generating Station

cc: Mr. E. Leeds, Director of Office of Nuclear Reactor Regulation
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JUN 25 2014

LR-N14-0155

Enclosure 1

Hardened Containment Vent System Phase 1 EA-13-109 Overall Integrated Plan Response - Hope Creek Generating Station

Hope Creek Generating Station
PSEG Nuclear LLC

PSEG Nuclear LLC

HARDENED CONTAINMENT VENT SYSTEM PHASE 1

Order EA-13-109 OVERALL INTEGRATED PLAN RESPONSE

HOPE CREEK GENERATING STATION

SL-012405
Revision 0
June 24, 2014
Project Classification:
Non-Safety Related
S&L Project No. 12800-218

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Introduction

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

On March 19, 2013, the Nuclear Regulatory Commission (NRC) Commissioners directed the staff per Staff Requirements Memorandum (SRM) for SECY-12-0157 to require licensees with Mark I and Mark II containments to "upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions." In response, the NRC issued Order EA-13-109, *Issuance of Order to Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accidents*, June 6, 2013. The Order (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, *Compliance with Order EA-13-109, Severe Accident Reliable Hardened Containment Vents*, with clarifications. Except in those cases in which a licensee proposes an acceptable alternative method for complying with Order EA-13-109, the NRC staff will use the methods described in this ISG (NEI 13-02) to evaluate licensee compliance as presented in submittals required in Order EA-13-109.

The Order also requires submittal of an overall integrated plan which 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 plant venting actions for the Order EA-13-109 severe accident capable venting scenario can be summarized by the following**:**

- The HCVS will be initiated via manual action from the Primary Operating Station (POS) or Remote Operating Station (ROS) at the appropriate time based on procedural guidance in response to plant conditions from observed or derived symptoms. Control will be transferred from the Main Control Room (MCR) to the POS after an ELAP event is declared, but before initiation of venting.
- The vent will utilize containment parameters of pressure, level and temperature from the MCR instrumentation to monitor effectiveness of the venting actions.
- The vent operation will be monitored by HCVS valve position, vent flow, and effluent radiation levels.
- The HCVS motive force will be monitored and have the capacity to operate for 24 hours with installed equipment. Replenishment of the motive force will be by use of portable equipment once the installed motive force is exhausted.
- Venting actions will be capable of being maintained for a sustained period of up to 7 days or a shorter time if justified.

List of Acronyms

AOV	Air Operated Valve
BDBEE	Beyond Design Basis External Event
CAP	Containment Accident Pressure
CPCS	Containment Pre-purge Cleanup System
DBLOCA	Design Basis Loss Of Coolant Accident
ECCS	Emergency Core Cooling System
ELAP	Extended Loss of AC Power
EOP	Emergency Operating Procedure
EPG	Emergency Procedure Guideline
EQ	Environmental Qualification
FLEX	Diverse and Flexible Coping Strategies
FLEX DG	Phase 2 FLEX Diesel Generator
FRVS	Filtration, Recirculation, and Ventilation System
GDC	General Design Criteria
HCVS	Hardened Containment Vent System
HPCI	High Pressure Coolant Injection
HTV	Hardened Torus Vent
LCER	Lower Control Equipment Room
MCC	Motor Control Center
MCR	Main Control Room
MUR	Margin Uncertainty Recovery
MWt	Megawatts Thermal
NPSH	Net Positive Suction Head
PCIV	Primary Containment Isolation Valve
PCPL	Primary Containment Pressure Limit
POS	Primary Operating Station
RCIC	Reactor Core Isolation Cooling
ROS	Remote Operating Station
RPV	Reactor Pressure Vessel
SA	Severe Accident
SAG	Severe Accident Guideline
SAMG	Severe Accident Management Guideline
SFP	Spent Fuel Pool
SOV	Solenoid Operated Valve
SSE	Safe Shutdown Earthquake

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

Hope Creek will attain compliance with the guidelines in JLD-ISG-2013-02 and NEI 13-02 , with alternatives delineated below, for each phase as follows:

- Phase 1 (wetwell): by the startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. Currently scheduled for fourth quarter 2016.
- Phase 2: Later

Hope Creek's planned alternatives to JLD-ISG-2013-02 and NEI 13-02 are:

1. Hope Creek is taking an alternative approach to vent monitoring. JLD-ISG-2013-02 requires temperature and pressure monitoring of the vent piping as an indication of flow. Hope Creek currently has a dual-element flow monitor (high/low range) as part of the existing Hardened Torus Vent (HTV) radiation monitoring system. The vent flow signal will be displayed at the POS in lieu of vent pipe temperature and pressure.
2. The HCVS discharge path is a dedicated 12-inch vent pipe with the release point of the vent piping located at elevation 250' (PSEG datum), about 150 feet above ground level and about 50 feet below the top of the Reactor Building Dome, where the Filtration, Recirculation, and Ventilation System (FRVS) Discharge Structure is located. The vent pipe is routed to a point above any adjacent structure, except for the Reactor Building Dome, and located such that the release point will vent away from ventilation system intake and exhaust openings, MCR location, and emergency response facilities. The location of the release was originally analyzed during the detailed design to ensure habitability of the control room (Reference 33).

If additional alternatives are identified at a later date, then the alternatives will be communicated in a future six-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 Order EA-12-049 Compliance.

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

The following extreme external hazards screen in for Hope Creek

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

The following extreme external hazards screen out for Hope Creek

- None

Part 1: General Integrated Plan Elements and Assumptions

Key Site assumptions to implement NEI 13-02HCVS 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:

Applicable Order EA-12-049 assumptions:

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

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

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

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 1 hour an ELAP is declared and actions begin as defined in Order EA-12-049 compliance.

049-7. DC power and distribution can be credited for the duration determined per the Order EA-12-049 (FLEX) methodology for battery usage, greater than 5 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 Order EA-12-049 FLEX strategies that are not specific to implementation of the HCVS, including such items as debris removal, communication, notifications, SFP level and makeup, security response, opening doors for cooling, and initiating conditions for the event, can be credited as previously evaluated for FLEX.

Applicable Order EA-13-109 generic assumptions:

109-1. Site response activities associated with Order EA-13-109 actions are considered to have no access limitations associated with radiological impacts while RPV level is above two-thirds 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., 10CFR50 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).

Part 1: General Integrated Plan Elements and Assumptions

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

109-6. HCVS manual actions that require minimal operator steps and can be performed in the postulated thermal and radiological environment at the location of the step(s) (e.g., load stripping, control switch manipulation, valving-in nitrogen bottles) are acceptable to obtain HCVS venting dedicated functionality (Reference HCVS-FAQ-01).

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

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

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 Order 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 changes consistent with EPG/SAGs Revision 3 as incorporated per the site's EOP/SAMG procedure change process.

109-12. Generic assumption 109-12 from the NEI OIP template (ADAMS Accession No. ML14120A281) pertains to MCR radiation dose and is not applicable to Hope Creek based on plant-specific assumptions PLT-4 through PLT-6, below.

Plant-Specific HCVS Related Assumptions/Characteristics:

PLT-1. The Hope Creek Reactor Building consists of a square building up to Elevation 132' (approximately 30 feet above ground level) and a concrete dome up to approximately Elevation 300' (ref. Attachment 3 Sketch 3).

PLT-2. The charger for the HCVS battery will be fed from a 1E Motor Control Center (MCC) that will be re-powered by the phase 2 FLEX diesel generator (FLEX DG). No actions outside of the FLEX strategy are required to align the HCVS battery charger to the FLEX DG for sustained operation beyond 24 hours.

PLT-3. Hope Creek has an existing HTV that is operated from the MCR. These controls interface with the field through the Bailey logic system, where containment isolation interlocks are implemented. The MCR controls include position indication and pushbuttons to bypass containment isolation signals but do not meet the order requirements relative to valve status indication. The MCR controls remain available for beyond design basis use until the 1E station batteries are depleted at approximately 5 hours, assuming load shedding per the Hope Creek FLEX strategy (Reference 31).

Part 1: General Integrated Plan Elements and Assumptions

PLT-4. The Primary Operating Station (POS) as defined by Order EA-13-109 requirement 1.2.4 will be installed in the Lower Control Equipment Room (LCER), at a new control panel. This panel will contain vent status indications as outlined in this plan and will be permanently powered from the new HCVS inverter. Valve control and position indication will be transferred to this panel from the MCR in a similar fashion as a Remote Shutdown Panel, bypassing the Bailey control system and containment isolation interlocks.

PLT-5. The Remote Operating Station (ROS) as defined by Order EA-13-109 requirement 1.2.5 will be in the electrical chase on Elevation 102' of the Control/Diesel Building. The ROS will consist of backup nitrogen bottles with local pressure gauges, locked hand valves that can be used to bypass the HCVS solenoid valves, and the radiation monitor electronics for the HCVS.

PLT-6. Control will be transferred from the MCR to the POS after an ELAP event is declared, but before initiation of venting.

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: Order 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. 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.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). Note that the HCVS may be operated from the MCR using existing controls for up to five hours following a loss of power. A HCVS Extended Loss of AC Power (ELAP) Failure Evaluation table, which shows alternate actions that can be performed, is included in Attachment 4. Time constraints and their bases will be finalized as part of the HCVS design process.

[Open Item 1] Finalize time constraints and their bases.

Part 2: Boundary Conditions for Wet Well Vent

Table 2-1 HCVS Remote Manual Actions

Primary Action	Primary Location / Component	Notes
1. Remove fuses F5 and F20 at 1YF404.	Panel 1YF404 in the LCER, 102' El. Control/Diesel Bldg.	Removal of fuses disables boundary valves HV-4962 & HV-4963. Valves are spring-to-close.
2. Disable PCIV interlocks by switching HCVS valves to manual control at the POS.	POS: panel in the LCER, 102' El. Control/Diesel Bldg.	Two key-lock switches in series are required to defeat interlocks and align HCVS valves to battery motive power.
3. Breach the rupture disk by connecting the nitrogen cylinder and opening valve V202 (rupture disk test valve).	Manual hand wheels for valves at the nitrogen bottle and at the rupture disk test connection on the vent pipe.	Not required during SA event. Only required if performing early venting for FLEX.
4. Open Wetwell PCIV HV-4964.	Hand switch located at the POS.	Or locked hand valves at the nitrogen bottle station (see Att 3 sketch 2).
5. Open HCVS vent valve HV-11541.	Hand switch located at the POS.	Or locked hand valves at the nitrogen bottle station (see Att 3 sketch 2).
6. Replenish pneumatics with replaceable nitrogen bottles.	Nitrogen bottles will be located in an area that is accessible to operators, 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.
7. Replenish electrical motive force. No HCVS actions required.	N/A.	Prior to depletion of the installed power sources, actions will be required to connect back-up sources at a time greater than 24 hours. No action is required to align the HCVS battery charger to the FLEX diesel.

Part 2: Boundary Conditions for Wet Well Vent

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-1935 (SOARCA) results for a prolonged SBO (or ELAP) with the loss of RCIC case without black start.

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

- At 3 Hours, Initiate use of Hardened Containment Vent System (HCVS) per site procedures to maintain containment parameters below design limits and within the limits that allow continued use of RCIC. The reliable operation of HCVS will be met because HCVS meets the seismic requirements identified in NEI 13-02 and will be powered by DC buses with motive force supplied to HCVS valves from portable nitrogen storage bottles. Critical HCVS controls and instruments associated with containment will be DC powered and operated from the POS or ROS. The DC power for HCVS will be available as long as the HCVS is required. Station batteries will provide power for greater than 5 hours, HCVS battery capacity will be available to extend past 24 hours. In addition, when available, the Phase 2 FLEX Diesel Generator (FLEX DG) can provide power before battery life is exhausted. Thus initiation of the HCVS from the POS or the ROS within 3 hours is acceptable because the actions can be performed any time after declaration of an ELAP until the venting is needed at 3.6 hours for BDBEE venting. This action can also be performed for SA HCVS operation which occur at a time further removed from an ELAP declaration as shown in Attachment 2.
- At 24 Hours, installed nitrogen bottles will be replaced to supplement the nitrogen tank supply. The nitrogen bottles can be replenished one 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.
- At 24 Hours, the FLEX DG will have been installed and connected to the 10B420 Class 1E 480V Unit Substation. This substation feeds MCC 10B421 which feeds the HCVS battery charger, which supplies power to HCVS critical components/instruments. The new HCVS battery will be sized to last at least 24 hours. The FLEX DG will be staged and in service within 3 hours. Thus the FLEX DG will be available to be placed in service at any point after 24 hours as required to supply power to HCVS critical components/instruments. A FLEX DG will be maintained in on-site FLEX storage areas. The FLEX DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards. Modifications will be implemented to facilitate the connections and operational actions required to supply power within 3 hours which is acceptable because the actions can be performed any time after declaration of an ELAP until the re-powering is needed at greater than 24 hours.

Discussion of radiological and temperature constraints identified in Attachment 2

- At 3 hours, the rupture disk will be breached using a nitrogen bottle in the Reactor Building. The bottle will be stationed next to the vent piping on El. 102' and will be equipped with a flexible hose to connect to the rupture disk test connection.

Part 2: Boundary Conditions for Wet Well Vent

- At 3 hours, prior to initiation of venting, control will be transferred from the MCR to the POS. The transfer switches will be located at the POS in the Control/Diesel Building.
- At 24 hours, nitrogen bottles will be replaced as stated for the related time constraint item. Nitrogen bottles will be located in an area that is accessible to operators at the ROS.
- At 24 hours, the FLEX DG will have been installed and connected to the 10B420 Class 1E 480V Unit Substation. This substation feeds MCC 10B421 which feeds the HCVS battery charger, which supplies power to HCVS critical components/instruments. Batteries will be sized to last at least 24 hours. The FLEX DG will be staged and in service within 3 hours. Thus the FLEX DG will be available to be placed in service at any point after 24 hours as required to supply power to HCVS critical components/instruments. The connections, location of the FLEX DG and access for refueling will be located in an area that is accessible to operators on the roof of the cancelled Unit 2 Reactor Building or in the yard just west of the Control/Diesel building.

Provide Details on the Vent characteristics

<u>Vent Size and Basis (Order 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)?

<u>Vent Capacity (Order 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.

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

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

<u>Power and Pneumatic Supply Sources (Order 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)</u>

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

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

Part 2: Boundary Conditions for Wet Well Vent

Location of Control Panels (Order 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 (Order EA-13-109 Section 1.2.10, 1.2.11, 1.2.12 / NEI 13-02 Section 2.3,2.4, 4.1.1, 4.1.6, 4.1.7, 5.1, & Appendix H)

State which approach or combination of approaches the plant will take to address the control of flammable gases, clearly demarcating the segments of vent system to which an approach applies

Unintended Cross Flow of Vented Fluids (Order 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. CPCS). What design features are being included to limit leakage through interfacing valves or 10CFR50 Appendix J type testing features?

Prevention of Inadvertent Actuation (Order 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 (Order EA-13-109 Section 2.1 / NEI 13-02 Section 5.1, 5.3)

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

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

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

Component reliable and rugged performance (Order 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

Part 2: Boundary Conditions for Wet Well Vent

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 is designed for venting steam/energy at a nominal capacity of at least 1% of 3900 MWt thermal power at pressure of 62 psig. This power level assumes that Hope Creek implements a Margin Uncertainty Recovery (MUR) uprate. The thermal power assumes a power uprate of 1.56% above the currently licensed thermal power of 3840 MWt. This pressure (62 psig) is the lower of the containment design pressure and the PCPL value (Reference 34). The size of the wetwell portion of the HCVS is 12 inch Schedule 40 pipe which will be analyzed to ensure adequate capacity to meet or exceed the Order criteria. The existing vent piping is designed for a pressure rating of 65 psig, the higher of containment design pressure and PCPL (Reference 35).

Vent Capacity

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

[Open Item 2] Confirm vent sizing and suppression pool heat capacity.

Vent Path and Discharge

Existing HCVS vent path at Hope Creek consists of a wetwell vent. Vent path for the wetwell exits the reactor building at Elevation 132' (through the roof of the outer "square" of the reactor building). The pipe runs vertically up the side of the reactor building dome and exhausts at approximately Elevation 250'.

The HCVS discharge path is routed to approximately 250' Elevation on the side of the Reactor Building dome. The top of the dome, approximate elevation 300', is higher than the HCVS discharge point. A preliminary analysis was performed to evaluate the existing discharge point versus a discharge point at the top of the dome using diffusion analysis, and the χ/Q values at the MCR ventilation intake approximately double if the vent release point is moved to the top of the dome. The existing release point will vent away from emergency ventilation system intake and exhaust openings, MCR location, location of HCVS portable equipment, access routes required following a ELAP and BDBEE, and emergency response facilities.

[Open Item 3] Finalize χ/Q analysis.

Part 2: Boundary Conditions for Wet Well Vent

Power and Pneumatic Supply Sources

All electrical power required for operation of HCVS components will be routed through a dedicated HCVS inverter. The inverter will be sized for the connected loads and will convert DC power from installed batteries into AC power for the end users (instruments, solenoid valves, etc.). Battery power will be provided by a dedicated HCVS battery. The HCVS battery charger is supplied 120VAC from the 'A' 1E inverter (1A-D-481). Once the FLEX DG is in place to recharge the station batteries, inverter 1A-D-481 will supply power to the HCVS battery charger with no further action.

Pneumatic power is normally provided by the non-interruptible air system with backup nitrogen provided from installed nitrogen supply bottles. Following an ELAP event, the station air system is lost, and normal backup is supplied from installed nitrogen bottles. These 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 (AOV) with air-to-open and spring-to-close. Opening the valves requires energizing an AC powered solenoid operated valve (SOV) and providing motive air/gas. The detailed design will provide a permanently installed power source and motive air/gas supply adequate for the first 24 hours. A FLEX DG is credited for maintaining electrical motive force beyond 24 hours. The FLEX activities required to install, operate, and refuel the generator are applicable under Order EA-13-109 Order requirements. The initial stored motive air/gas will allow for a minimum of 8 valve operating cycles for the HCVS valves for the first 24 hours (Reference 24).
2. An assessment of temperature and radiological conditions will be performed to ensure that operating personnel can safely access and operate controls at the POS and ROS based on time constraints listed in Attachment 2.
3. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during an ELAP (i.e., electric power, nitrogen/air) will be located in areas reasonably protected from defined hazards listed in Part 1 of this report.
4. All valves required to open the flow path will be designed for remote manual operation following an ELAP, such that the primary means of valve manipulation does not rely on use of a hand wheel, reach–rod or similar means that requires close proximity to the valve (reference FAQ HCVS-03). Remote manual operation will be performed from the ROS in the Control/Diesel Building and will credit the Reactor Building-to-Aux Building shielding design. Toolbox actions (reference FAQ HCVS-09) will be used to address area habitability. 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 with the FLEX equipment 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 POS in the LCER on Elevation 102' of the Control/Diesel Building and ROS in the electrical chase on Elevation 102' of the Control/Diesel Building. The POS and ROS are protected from adverse natural phenomena and have adequate communication to the MCR. A dose evaluation will be performed for both the POS and ROS areas. This evaluation is identified as an open item at this time.

[Open Item 4] Perform dose evaluation for venting actions.

Part 2: Boundary Conditions for Wet Well Vent

Hydrogen

As is required by Order 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.

[Open Item 5] Finalize design of the HCVS for hydrogen detonation/deflagration.

Unintended Cross Flow of Vented Fluids

The HCVS uses the Containment Pre-purge Cleanup System (CPCS) outboard containment isolation valves (HV-4962 and HV-4963, Reference Attachment 3 Sketch 2) for isolation between the HCVS and CPCS. These containment isolation valves are AOVs and they are air-to-open and spring-to-close. A SOV must be energized to allow the motive air to open the valve. These valves are not shared between the CPCS and the HCVS (i.e. they are not operated for HCVS venting).

Prevention of Inadvertent Actuation

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. Hope Creek does not rely on CAP to maintain NPSH for ECCS pumps (Reference 32).

The features that prevent inadvertent actuation are two PCIVs in series powered from different divisions under normal conditions and key lock switches under BDBEE conditions. Procedures also provide clear guidance to not circumvent containment integrity by simultaneously opening torus and existing drywell vent valves. 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 are routed in seismically qualified structures. Existing HCVS components that directly interface with the containment pressure boundary are 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 10CFR100. During normal or design basis operations, this means serving as a pressure boundary to prevent release of radioactive material.

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

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

Part 2: Boundary Conditions for Wet Well Vent

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., ISO 9001) 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 Flow	ISO 9001 / IEEE 344-2004 / Demonstration
HCVS Process Radiation Monitor	ISO 9001 / IEEE 344-2004 / Demonstration
HCVS Process Valve Position	ISO 9001 / IEEE 344-2004 / Demonstration
HCVS Pneumatic Supply Pressure	ISO 9001 / IEEE 344-2004 / Demonstration
HCVS Electrical Power Supply Availability	ISO 9001 / IEEE 344-2004 / Demonstration

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

Monitoring of HCVS

The Hope Creek wetwell HCVS will be capable of being manually operated during sustained operations from the POS located in the LCER and will meet Order requirement 1.2.4. Additionally, to meet the intent for a secondary control location of requirement 1.2.5 of the Order, a readily accessible ROS will also be incorporated into the HCVS design as described in NEI 13-02 section 4.2.2.1.2.1. The controls and indications at the ROS location will be accessible and functional under a range of plant conditions, including severe accident conditions with due consideration to source term and dose impact on operator exposure, ELAP, and inadequate containment cooling. An evaluation will be performed to determine accessibility to the POS and ROS locations, habitability, staffing sufficiency, and communication capability with vent use decision makers.

The wetwell HCVS will include means to monitor the status of the vent system at both the POS and the ROS. Included in the current design of the HTV are control switches in the MCR with valve position indication. The existing HTV controls currently meet the environmental and seismic requirements of the Order for the plant severe accident and will be upgraded to address ELAP. The ability to open/close these valves multiple times during the first 24 hours of the event will be provided by nitrogen bottles and a dedicated HCVS battery. Beyond the first 24 hours, the ability to maintain these valves open or closed will be provided with replaceable nitrogen bottles and FLEX generators.

The wetwell HCVS will include indications for vent pipe flow and effluent radiation levels at both the POS and 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 MCR to monitor vent operation. This monitoring instrumentation provides the indication from the MCR as per Order requirement 1.2.4 and will be designed for sustained operation during an ELAP event.

Part 2: Boundary Conditions for Wet Well Vent

Component reliable and rugged performance

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

A HTV system was installed to satisfy the requirements of Generic Letter 89-16. The modifications associated with the HTV were performed under the provisions of 10CFR50.59. The Hope Creek HTV was designed, analyzed, and implemented consistent with the design basis of the plant. The current design will be evaluated to confirm that the existing system, coupled with the planned modifications to upgrade the HTV to a hardened containment vent system (HCVS), will meet the requirements of Order EA-13-109 and remain functional following a severe accident.

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

Conduit design will be installed to Seismic Class 1 criteria. Both existing and new barriers will be used to provide a level of protection from missiles when equipment is located outside of seismically qualified structures. Augmented quality requirements will be applied to the components installed in response to this Order.

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

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.
- Missile protection will be evaluated and described in a future 6-month update.

  [Open Item 6] Missile protection.

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: Order EA-13-109 Section 1.1.4/NEI 13-02 Section2.2

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: Order 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. Operator actions can be completed by Operators from the HCVS control stations and include remote-manual initiation. The operator actions required to open a vent path are as described in Table 2-1.

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

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

System control:

i. Active: PCIVs are operated in accordance with EOPs/SOPs to control containment pressure. The HCVS will be designed for eight open/close cycles under ELAP conditions over the first 24 hours following an ELAP (reference 24). Controlled venting will be permitted in the revised EPGs and associated implementing EOPs.

ii. Passive: Inadvertent actuation protection will be provided by key lock switches located at the POS and locked valves located at the ROS with keys controlled in accordance with applicable procedures.

Greater Than 24 Hour Coping Detail

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

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

At 24 hours, available personnel will be able to connect supplemental motive air/gas to the HCVS. Connections for supplementing electrical power and motive air/gas required for HCVS will be located in accessible areas with reasonable protection that will minimize personnel exposure to adverse conditions for HCVS initiation and operation. Connections will be pre-engineered quick disconnects to minimize manpower resources. Hope Creek is crediting FLEX to sustain electrical power for a BDBEE ELAP. The response to NRC Order EA-12-049 will demonstrate the capability for FLEX strategies to maintain the power source by repowering the 10B421 MCC as

Part 2: Boundary Conditions for WW Vent
BDBEE Venting

described above.

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 site 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.

Procedure HC.OP-EO.ZZ-0102, Containment Control, exists to direct operations in protection and control of containment integrity, including use of the existing Hardened Torus Vent System. Other site procedures for venting containment using the HCVS include:

- HC.OP-EO.ZZ-0318, Containment Venting
- HC.OP-EP.ZZ-0106, Primary Containment Control when Only HPCI/RCIC are Available for Injection (new procedure in development)

Identify modifications*:*

List modifications and describe how they support the HCVS Actions.

Order EA-12-049 Modifications

- DCP 80110322 will provide connections and electrical infrastructure for FLEX diesels used to support HCVS operation beyond 24 hours.

Order EA-13-109 Modifications

- A modification will be required for installation of the POS, which consists of a new HCVS control panel, including instrumentation and controls in the LCER.
- A modification will be required to install the dedicated batteries and the disconnect switches needed to supply power to HCVS following the ELAP event.
- A modification will be required to install a Remote Operation Station.
- A modification will be required to install/relocate the HCVS Radiation Monitor and power supply.
- Any additional modifications will be identified in future 6-month updates.

Key Venting Parameters:

Part 2: Boundary Conditions for WW Vent
BDBEE Venting

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 Flow	1SPFE-11542A/B	POS/ROS
HCVS Pneumatic supply pressure	TBD	ROS
HCVS Valve Position Indication	1GSZS-4964A/B 1GSZS-11541A/B	POS
HCVS Battery Status Indication	TBD	POS
HCVS Vent Pipe Radiation	1SPRE-11542/A	POS/ROS

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):

Key Parameter	Component Identifier	Indication Location
Drywell pressure	1GSPR-4960A2	MCR
Torus pressure	1GSPR-4960A1	MCR
Torus water temperature	1SBTR-3881B1	MCR
Torus level	1BJLR-4805-1	MCR
Reactor pressure	1BBPI-3684A	MCR

HCVS indications for valve position, radiation, flow, and battery status will be installed at the POS to comply with Order EA-13-109. HCVS pneumatic supply pressure is provided by local gauges on the nitrogen bottles at the ROS.

HCVS vent pipe temperature and pressure instruments are not being installed. The intent of the requirement to monitor vent pipe temperature and pressure is to provide system operators with a gross indication of flow. The existing flow instrument at Hope Creek is a mass-flow (low range) and annubar (high range) instrument and will provide a more definitive indication of flow than temperature or pressure instrumentation.

Notes:

Part 2: Boundary Conditions for WW Vent
Severe Accident Venting

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

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

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

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

System control:

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

ii. Passive: Same as for BDBEE Venting Part 2, except the rupture disk has a burst set pressure which has been determined to be above the maximum inlet header pressure expected during a design basis event. In a severe accident scenario, the pressure from the wetwell will be able to burst the rupture disk unassisted, as it will be above the pressure expected during the worst case design basis event.

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

Specifics are the same as for BDBEE Venting Part 2 except the location and refueling actions for the FLEX DG and replacement nitrogen bottles will be evaluated for SA environmental conditions resulting from the proposed damaged Reactor Core and resultant HCVS vent pathway (Open Item 4).

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

Part 2: Boundary Conditions for WW Vent Severe Accident Venting
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
The operation of the HCVS is 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.*
The same as for BDBEE Venting Part 2.
Key Venting Parameters: *List instrumentation credited for the HCVS Actions. Clearly indicate which of those already exist in the plant and what others will be newly installed (to comply with the vent order)*
The same as for BDBEE Venting Part 2.
Notes:

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

Determine venting capability support functions needed

Ref: Order EA-13-109 Section 1.2.8, 1.2.9 / NEI 13-02 Section2.5, 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: Order 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 POS or ROS.

Venting will require support from DC power as well as instrument air systems. Dedicated HCVS batteries will provide sufficient electrical power for HCVS operation for greater than 24 hours. Before the HCVS batteries are depleted, a FLEX DG, as detailed in the response to Order EA-12-049, will be credited to charge the HCVS batteries and maintain DC bus voltage after 24 hours. Permanently installed nitrogen bottles will provide sufficient motive force for all HCVS valve operation and will provide for multiple operations of the HV-11541 vent valve in the first 24 hours. Portable nitrogen bottles will be used to maintain valve motive force beyond the first 24 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: Order 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 at least 24 hours, a set of dedicated HCVS batteries will be available to feed HCVS loads via a manual transfer switch. At 24 hours, power will be restored to the ‘A’ 1E station battery via a FLEX DG evaluated for SA capability.

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:

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 SA capable FLEX DG and the nitrogen bottles needed to supplement the air supply to the AOVs after 24 hours. These will be staged in position for the duration of the event. New procedures will direct personnel to monitor and supplement motive force (replace bottles/refuel FLEX DG) when required.

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

Identify modifications*:*

List modifications and describe how they support the HCVS Actions.

FLEX modifications applicable to HCVS operation: add connection points and cabling in the Unit 2 130' El. Diesel Building corridor and the common 102' El. Control/Diesel Building corridor to connect a FLEX 480VAC diesel generator to the 480 VAC Bus A and Bus B Unit Substations to provide power to the battery chargers and critical AC components after 24 hours.

HCVS modification: Add POS control panel located in the LCER and HCVS batteries located in the Unit 2 Diesel Building. Add piping and connection points at a suitable location (ROS) in the Control/Diesel Building to connect portable nitrogen bottles for motive force to HCVS components after 24 hours. Reroute solenoid valve supply and vent tubing to the ROS to allow for operation via manual valves. HCVS connections required for portable equipment will be located such that they are protected from all applicable screened-in hazards and located such that operator exposure to radiation and occupational hazards will be minimized.

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 FLEX DG electrical load and fuel supply

New pressure gauge on supplemental nitrogen bottles

Notes:

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

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

Ref: Order 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 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 (Open Item 4).

Details:

Provide a brief description of Procedures / Guidelines:

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

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

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

Notes:

Part 3: Boundary Conditions for Dry Well Vent (Later)

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

See attached sequence of events timeline (Later).

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

Severe Accident Venting

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

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

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

Part 3: Boundary Conditions for Dry Well Vent (Later)
Details:
Provide a brief description of Procedures / Guidelines: *Confirm that procedure/guidance exists or will be developed to support implementation.*
Identify modifications: *List modifications and describe how they support the HCVS Actions.*
Key Venting Parameters: *List instrumentation credited for the venting HCVS Actions.*
Notes:

Part 4: Programmatic Controls, Training, Drills and Maintenance

Identify how the programmatic controls will be met.

Provide a description of the programmatic controls equipment protection, storage and deployment and equipment quality addressing the impact of temperature and environment

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

Program Controls:

The HCVS venting actions will include:

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

Procedures:

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

The HCVS procedures will be developed and implemented following the PSEG 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

Hope Creek will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in Operations department administrative controls:

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 (POS) **OR** alternate (ROS) means of HCVS operation are non-functional, no compensatory actions are necessary.
- If for up to 30 consecutive days, the primary (POS) **AND** alternate (ROS) means of HCVS operation are non-functional, no compensatory actions are necessary.
- If the out of service times exceed 30 or 90 days as described above, the following actions will be performed:
    - The condition will entered into the corrective action system,
    - The HCVS functionality will be restored in a manner consistent with plant procedures,
    - A cause assessment will be performed to prevent future loss of function for similar causes,
    - Initiate action to implement appropriate compensatory actions.

Part 4: Programmatic Controls, Training, Drills and Maintenance

Describe training plan

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

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

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

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

Identify how the drills and exercise parameters will be met.

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

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

- *Hardened containment vent operation on normal power sources (no ELAP).*
- *During FLEX demonstrations (as required by Order 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: Order EA-13-109 Section 3.1 / NEI 13-02 Section 6.1.3

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

Describe maintenance plan:

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

Part 4: Programmatic Controls, Training, Drills and Maintenance

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

Hope Creek 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.

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

Table 4-1: Testing and Inspection Requirements

Description	Frequency
Cycle the HCVS valves and the interfacing system valves not used to maintain containment integrity during operations.	Once per operating cycle
Perform visual inspections and a walk down of HCVS components	Once per operating cycle
Test and calibrate the HCVS radiation monitors.	Once per operating cycle
Leak test the HCVS.	(1) Prior to first declaring the system functional; (2) Once every three operating cycles thereafter; and (3) Post-maintenance test after restoration of any breach of the 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: Table 4-1 is based on NEI 13-02 and OIP template guidance. Cycling of interfacing valves may be not applicable to Hope Creek testing based on the plant-specific design.

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) –** ***Addressed in Order EA-12-049 FLEX Response***
- **Staffing analysis completion –** ***Addressed in Order EA-12-049 FLEX Response***
- **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: Order EA-13-109 Section D.1, D.3 / NEI 13-02 Section 7.2.1

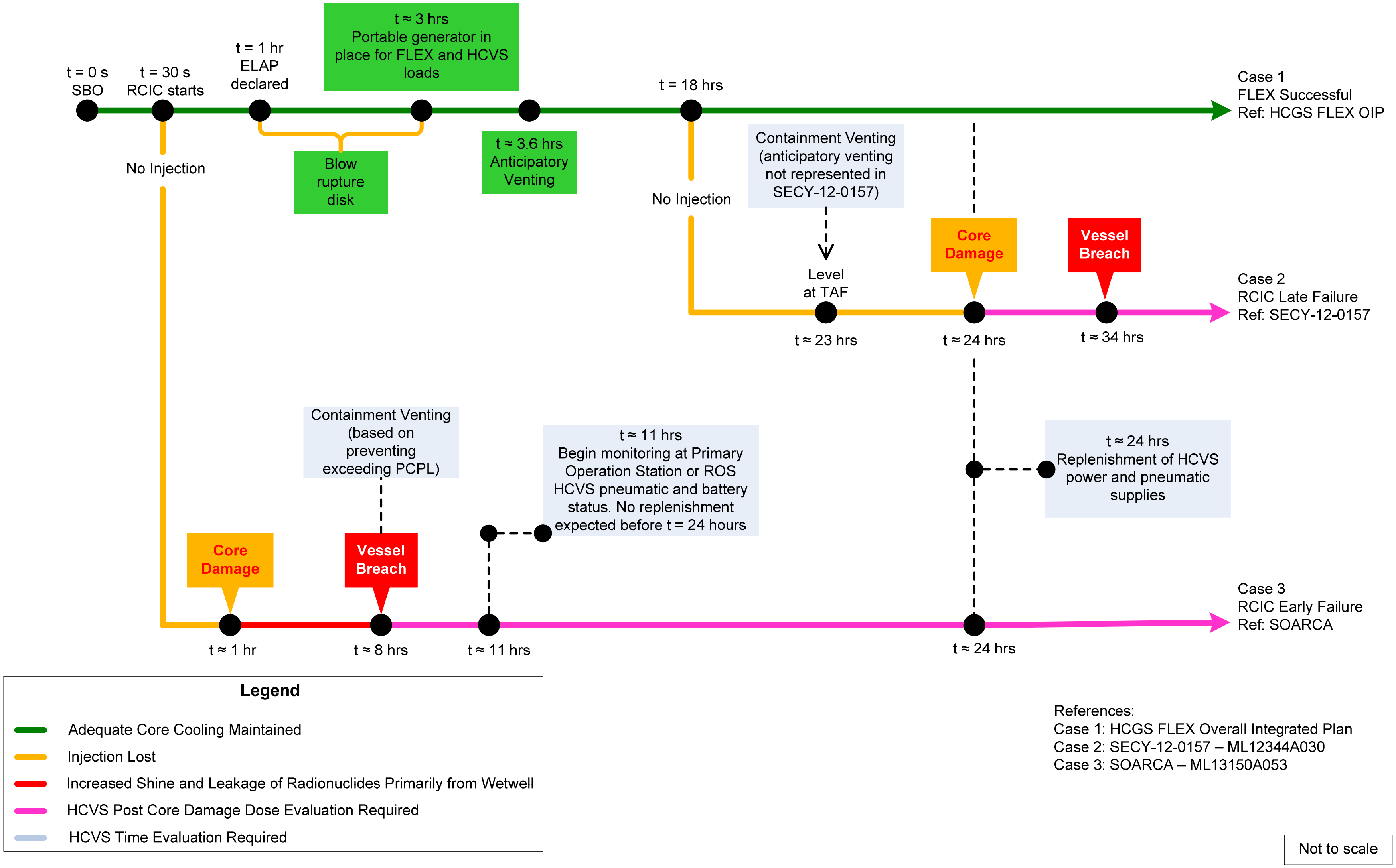
The following milestone schedule is provided. The dates are planning dates subject to change as design and implementation details are developed. Any changes to the following target dates will be reflected in the subsequent 6 month status reports.

Milestone	Target Completion Date	Activity Status	Comments
Hold preliminary/conceptual design meeting	Jun. 2014	Complete	
Submit Phase 1 Overall Integrated Implementation Plan	Jun. 2014	Complete	
Submit 6 Month Status Report	Dec. 2014		
Submit 6 Month Status Report	Jun. 2015		
Design Engineering On-site/Complete	Oct. 2015		
Submit 6 Month Status Report	Dec. 2015		Simultaneous with Phase 2 OIP
Submit 6 Month Status Report	Jun. 2016		
Operations Procedure Changes Developed	Jun. 2016		
Site Specific Maintenance Procedure Developed	Jun. 2016		
Training Complete	Jun. 2016		
Implementation Outage	Oct. 2016		
Procedure Changes Active	Nov. 2016		
Walk Through Demonstration/Functional Test	Nov. 2016		
Submit Completion Report	Dec. 2016		

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**
FLEX DG / diesel fuel	**X**	**X**	**Sized to power HCVS battery charger**	**Per Response to Order EA-12-049**

Attachment 2: Sequence of Events Timeline



Wet Well HCVS Timeline

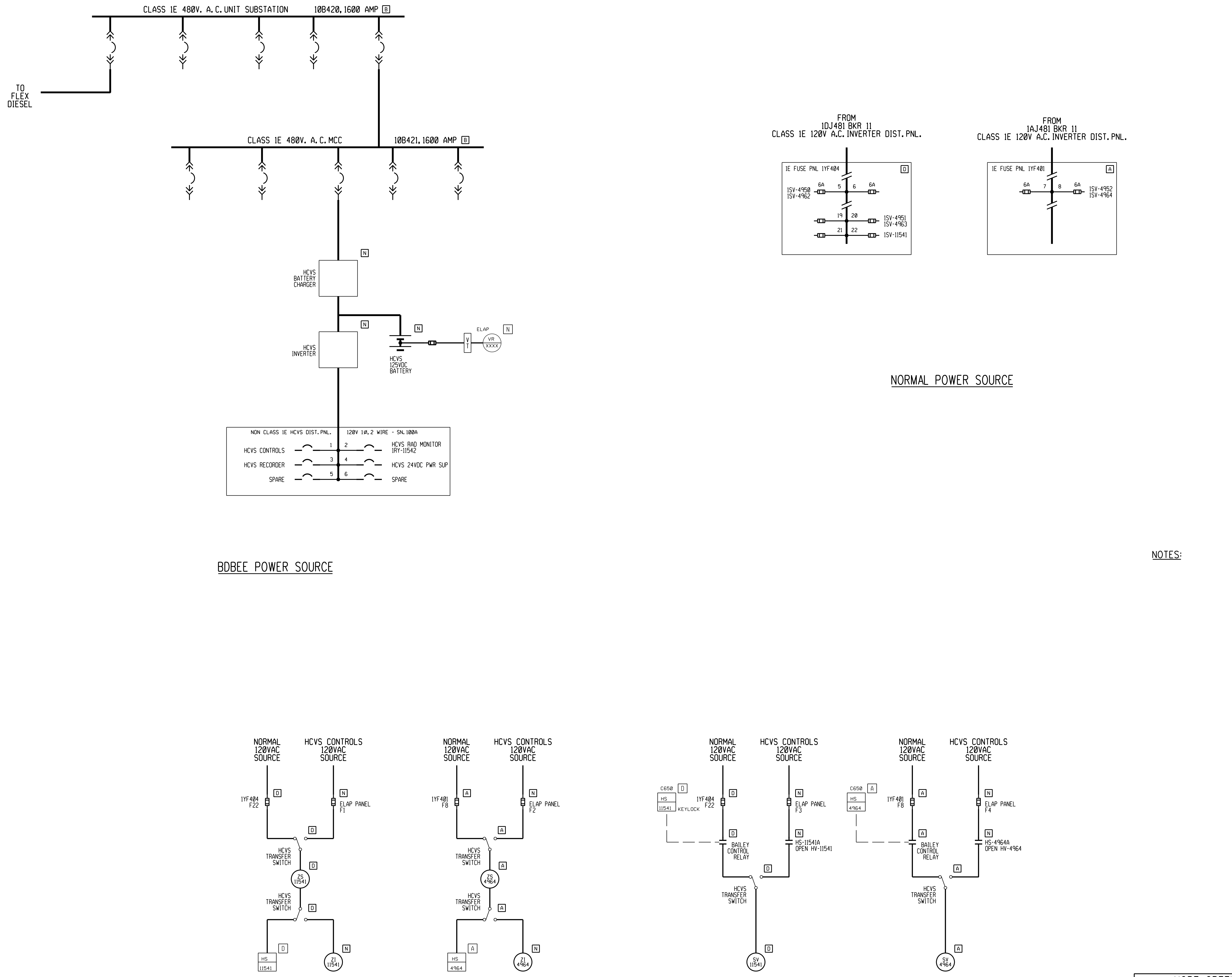
Attachment 3: Conceptual Sketches

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

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

Sketch 3: Plant Layout *(preliminary, 5 sheets)*

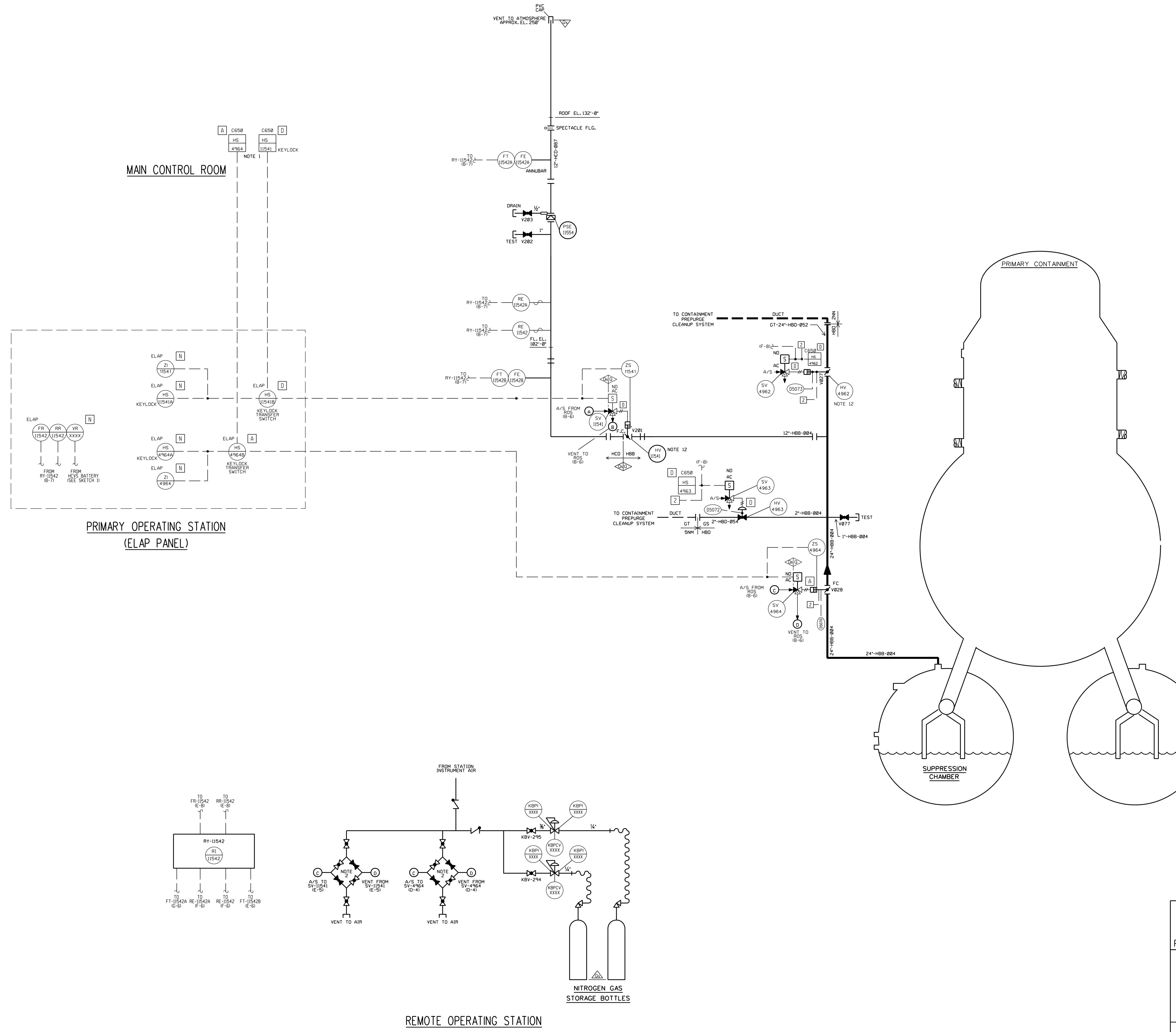
SYSTEM



HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN
ELECTRICAL ONE-LINE SKETCH

ATTACHMENT 3
SKETCH 1

SYSTEM GS



NOTES:

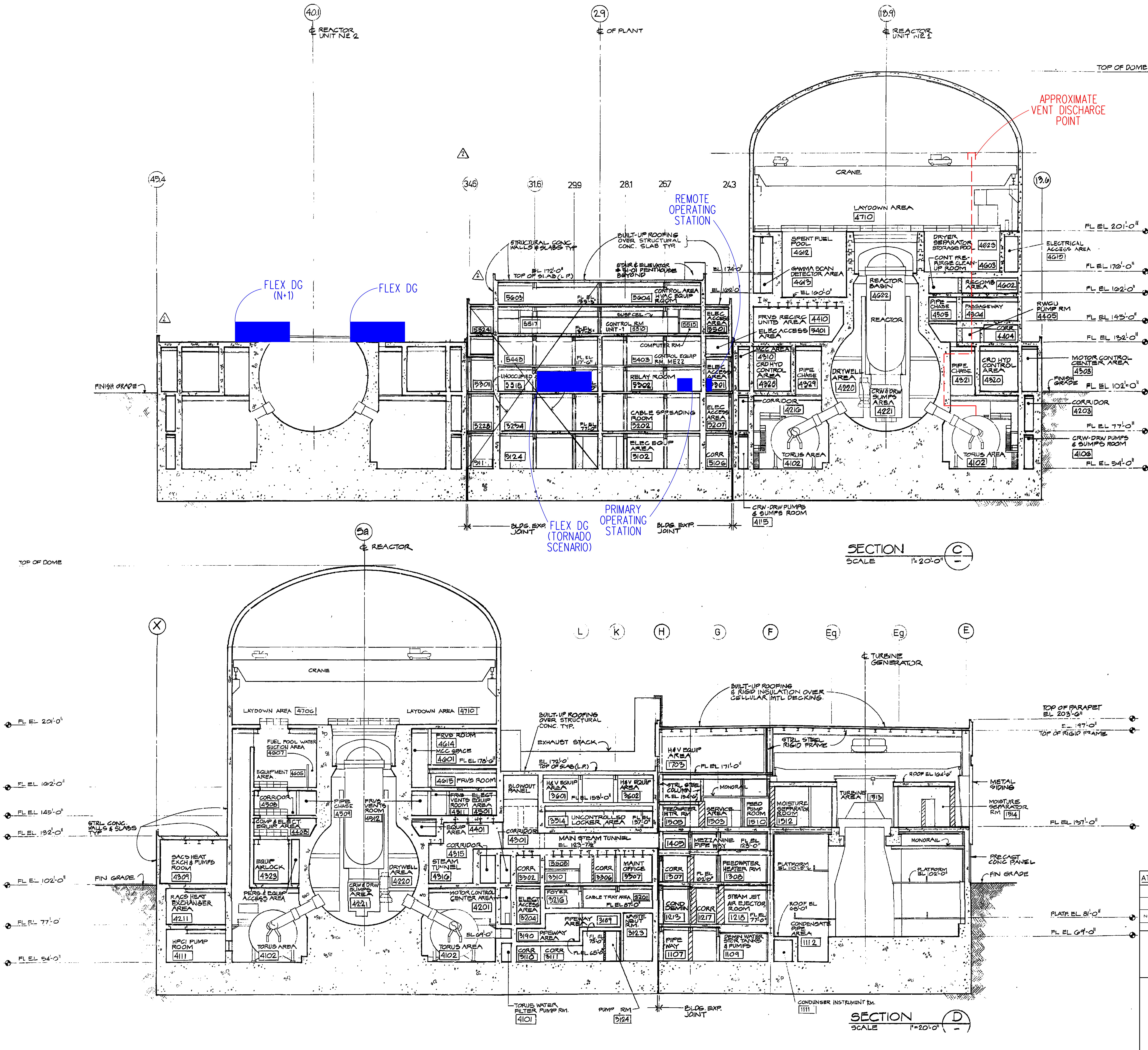
1. MAIN CONTROL ROOM SWITCHES HS-4964 AND HS-11541 INCLUDE POSITION INDICATING LIGHTS.
1. REMOTE OPERATING STATION HAND VALVES ARE LOCKED IN THE NORMAL POSITION SHOWN.

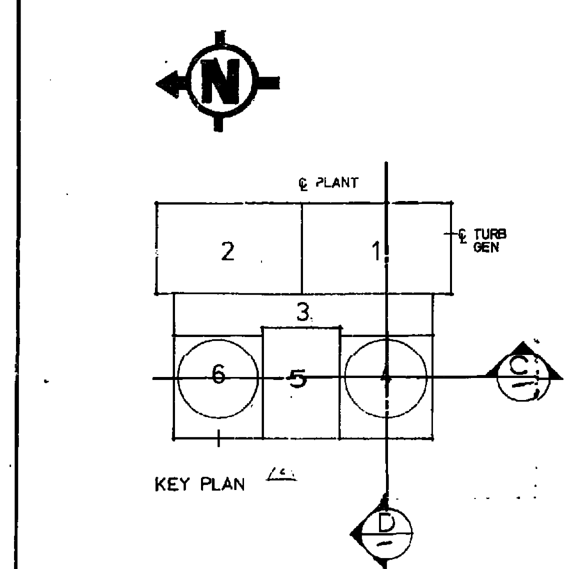
REFERENCE DRAWINGS:

HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN

P & I D | MECH./CONT.

ATTACHMENT 3
SKETCH 2





NOTES

1. FOR ABBREVIATIONS, LEGEND, SYMBOLS, DRAWING INDEX, NUMBERING SYSTEM AND GENERAL NOTES SEE DWG. A-0011-0.

LEGEND:

- HCVS PIPING
- EQUIPMENT

ATTENTION: ANY REVISION TO THIS DRAWING SHALL BE MADE ONLY BY CAED

SEE DCRMS RECORDS MANAGEMENT DOC ID NO. -0E- FOR REV DRAWING SIGNATURES AND DATE

SEE NOTE " " ( )

NO	DESCRIPTION	DWN	PEER REV	EXD	APD	DATE

REVISION

HOPE CREEK GENERATING STATION

HARDENED CONTAINMENT VENT SYSTEM

OVERALL INTEGRATED PLAN

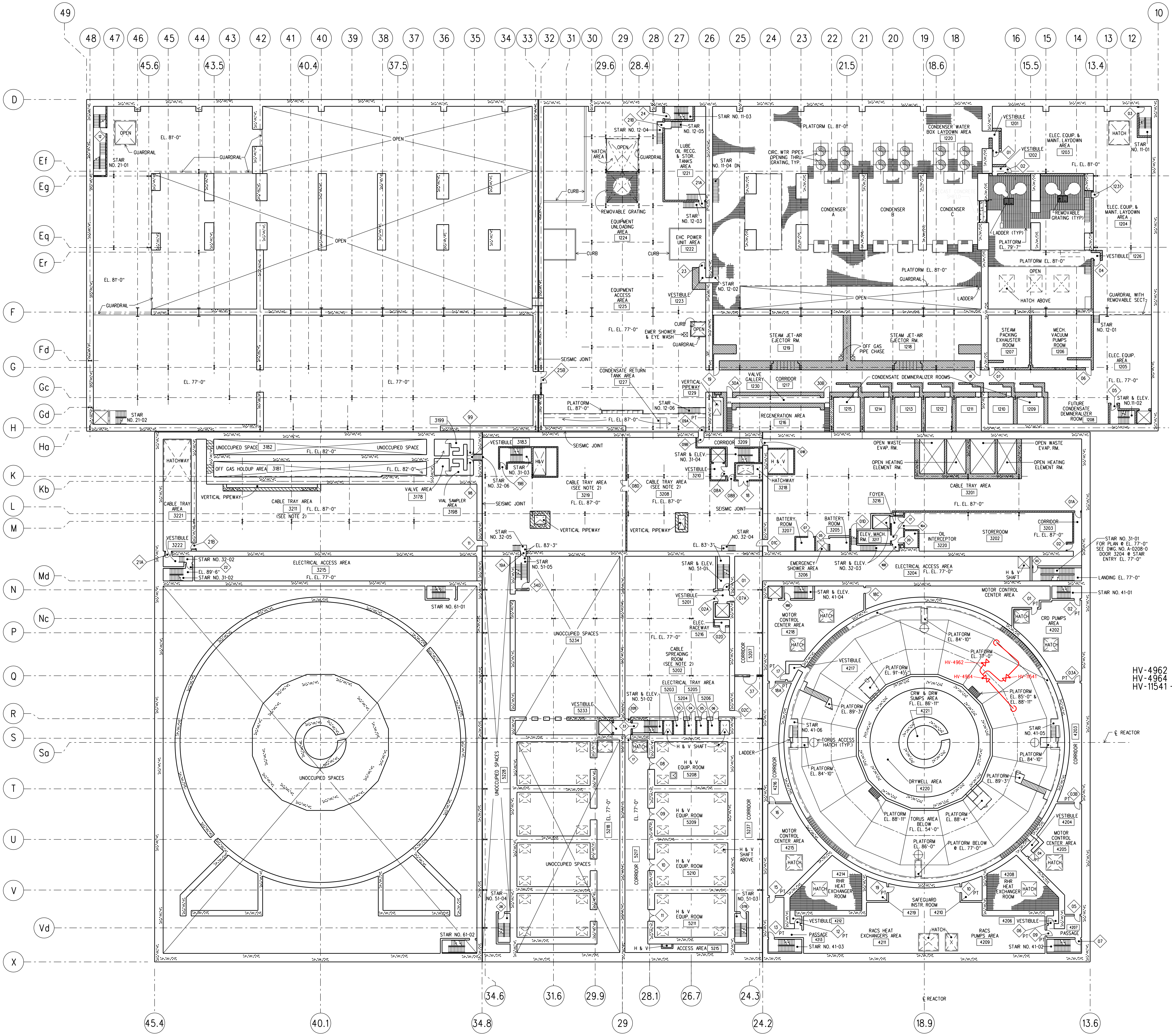
ATTACHMENT 3

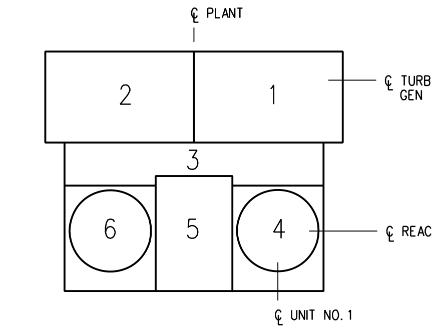
SKETCH 3

SHEET 1

SECTION VIEW

A-0202-0 - 20





KEY PLAN

NOTES

1. FOR ABBREVIATIONS, LEGEND, SYMBOLS, ARCHITECTURAL DRAWING TITLES & NUMBERS, NUMBERING SYSTEM, AND GENERAL NOTES, REFER TO DWG. NO. A-0011-0.
2. EMI/RFI PROHIBITED AREA. NO RADIO USE PERMITTED IN THESE ROOMS.

LEGEND:

- HCVS PIPING
- EQUIPMENT
- OPERATOR ACCESS PATH

HV-4962 - CONTAINMENT ISOLATION/BOUNDARY VALVE
HV-4964 - CONTAINMENT ISOLATION/VENT VALVE
HV-11541 - CONTAINMENT ISOLATION/VENT VALVE

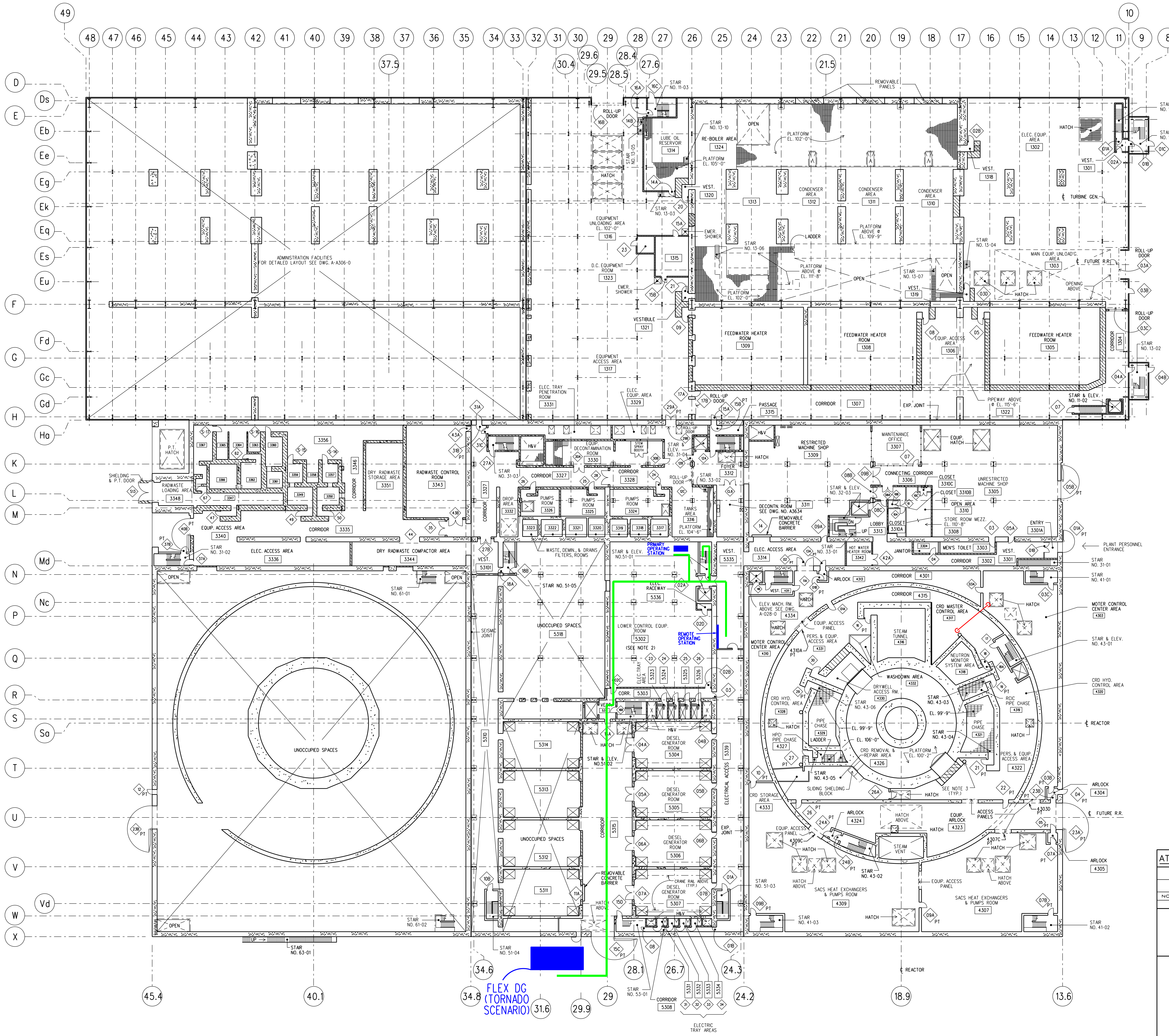
ATTENTION: ANY REVISION TO THIS DRAWING SHALL BE MADE ONLY BY CAED

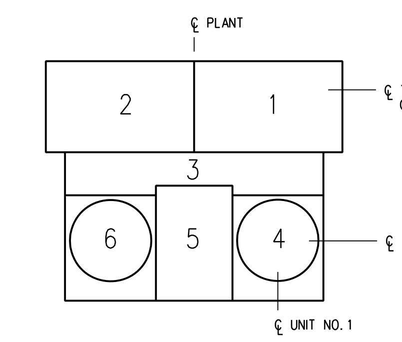
NO	DATE	DESCRIPTION	DWN	CKD	EXD	APD
		SEE NOTE " " ZONE .				
		SEE NOTE " " ZONE .				

REVISION

HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN

ATTACHMENT 3
SKETCH 3
SHEET 2
PLAN ELEVATION 77'





KEY PLAN

NOTES

1. FOR ABBREVIATIONS, LEGEND, SYMBOLS, ARCHITECTURAL DRAWING TITLES & NUMBERS, NUMBERING SYSTEM, AND GENERAL NOTES, REFER TO DWG. NO. A-0011-0.
2. EMI/RFI PROHIBITED AREA. NO RADIO USE PERMITTED IN THIS ROOM.
3. N_2 BOTTLES ARE REPRESENTED BY THE FOLLOWING SYMBOL ○

LEGEND:

- HCVS PIPING
- EQUIPMENT
- OPERATOR ACCESS PATH

ATTENTION: ANY REVISION TO THIS DRAWING SHALL BE MADE ONLY BY CAED

SEE NOTE "" - ZONE

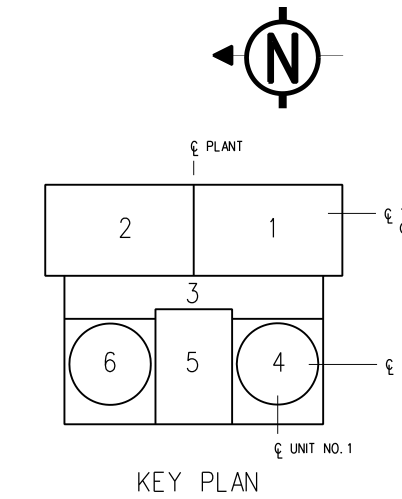
SEE NOTE "" - ZONE

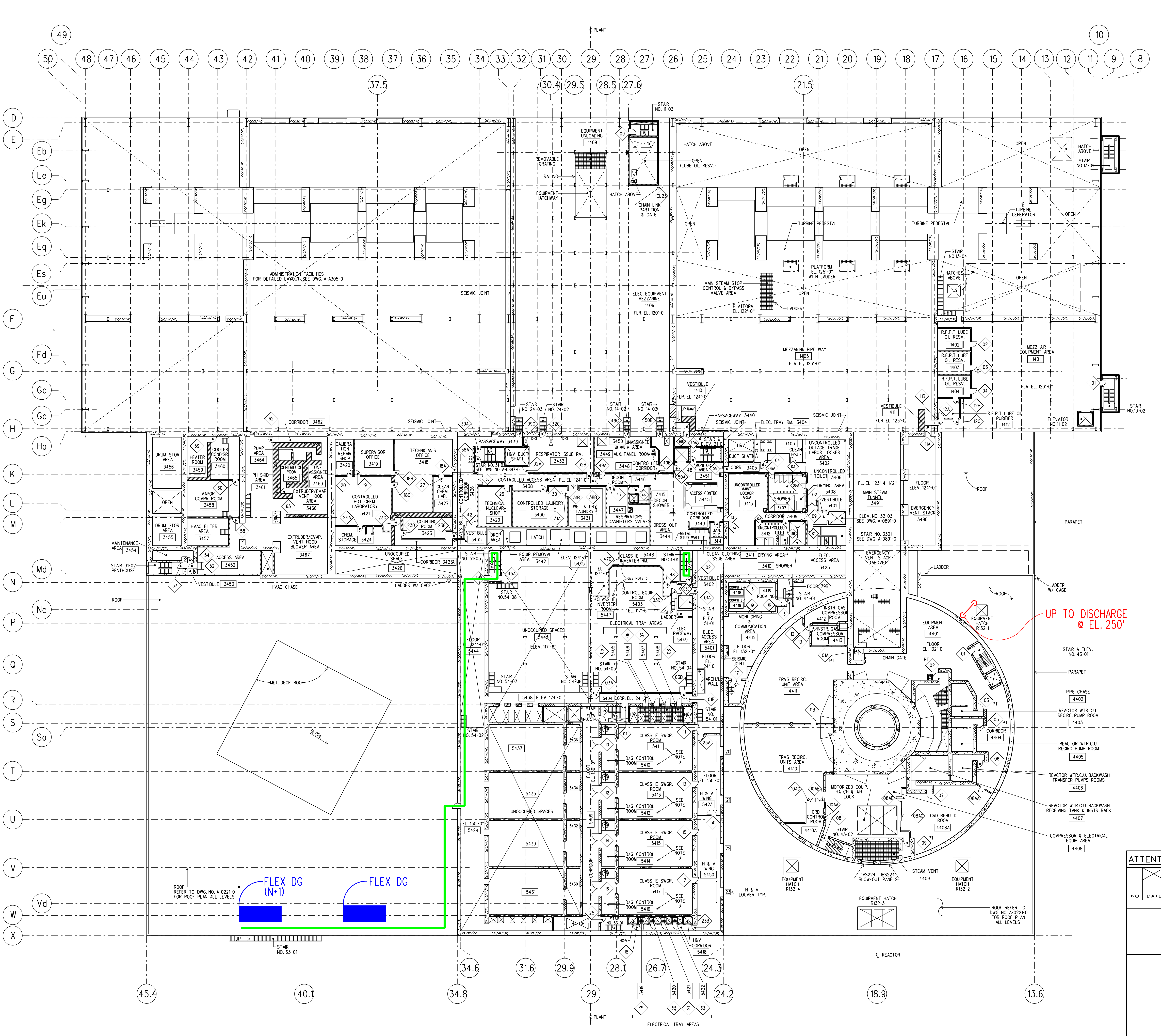
NO	DATE	DESCRIPTION	DWN	CKD	EXD	APD

REVISION

HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN

ATTACHMENT 3
SKETCH 3
SHEET 3
PLAN ELEVATION 102'





NOTES:

1. FOR ABBREVIATIONS, LEGEND, SYMBOLS, ARCHITECTURAL DWG. TITLES & NUMBERS,NUMBERING SYSTEM & GENERAL NOTES, REFER TO DRAWING NO. A-0011-0
2. FOR PLAN OF ROOF MOUNTED EQUIPMENT & APPURTENANCES, ROOF HATCHES, ROOF PENETRATIONS & PENTHOUSE ROOFS REFER TO DWG. NO. A-0221-0
3. EMI/RFI PROHIBITED AREA, NO RADIO USE PERMITTED IN THESE ROOMS.

LEGEND:

- HCVS PIPING
- EQUIPMENT
- OPERATOR ACCESS PATH

ATTENTION: ANY REVISION TO THIS DRAWING SHALL BE MADE ONLY BY CAED

NO	DATE	DESCRIPTION	DWN	CKD	EXD	APD
		SEE NOTE '' ZONE				
	- -	SEE NOTE '' ZONE				

REVISION

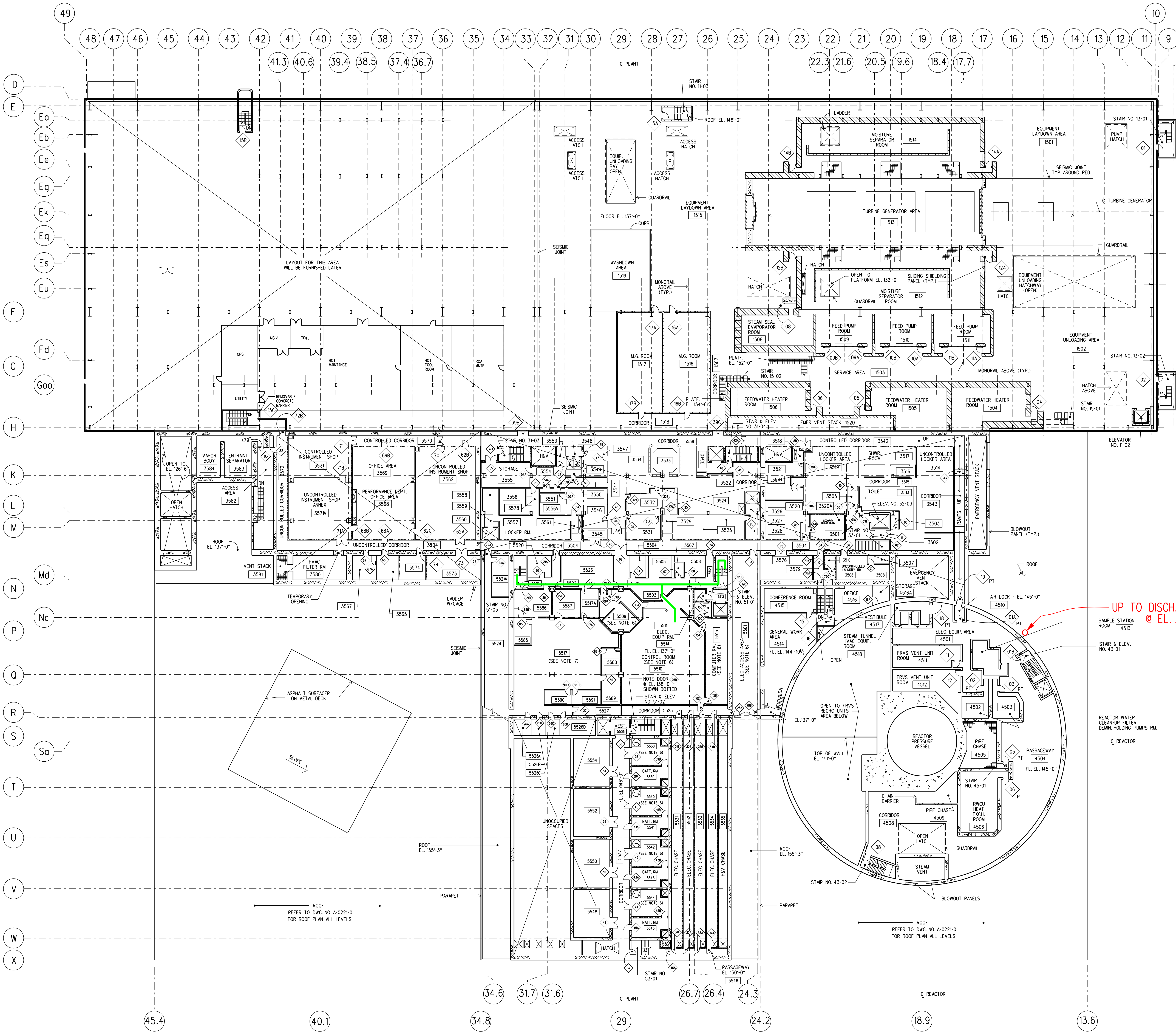
HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN

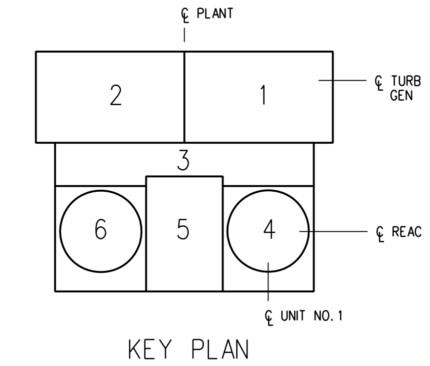
ATTACHMENT 3

SKETCH 3

SHEET 4

PLAN ELEVATION 120'-132'





NOTES

1. FOR ABBREVIATIONS, LEGEND, SYMBOLS, ARCHITECTURAL DRAWING TITLES & NUMBERS, NUMBERING SYSTEM, AND GENERAL NOTES, REFER TO DWG. NO. A-0011-0.
2. FOR COMPLETE DESCRIPTION OF ACCESS CONTROL SPACES REFER TO DWGS. NO. A-3636-0 & A-3637-0.
3. FOR COMPLETE DESCRIPTION OF CONTROL ROOM SPACES REFER TO DRAWINGS NO. A-5655-0 & A-5656-0.
4. FOR COMPLETE DESCRIPTION OF PERFORMANCE DEPT. & INSTRUMENT SHOPS SPACES REFER TO DRAWINGS NO. A-3636-0 & A-3637-0.
5. FOR PLAN OF ROOF MOUNTED EQUIPMENT & APPURTENANCES, ROOF HATCHES, ROOF PENETRATIONS & PENTHOUSE ROOFS, REFER TO DWG. NO. A-0221-0.
6. EMI/RFI PROHIBITED AREA. NO RADIO USE PERMITTED IN THESE ROOMS.
7. FOR COMPLETE DESCRIPTION OF OPERATIONS AREA SPACES REFER TO DRAWING NO. A-8002-2.

LEGEND:

- HCVS (red)
- EQUIPMENT (blue)
- OPERATOR ACCESS PATH (green)

ATTENTION: ANY REVISION TO THIS DRAWING SHALL BE MADE ONLY BY CAED

NO	DATE	DESCRIPTION	DWN	CKD	EXD	APD
		SEE NOTE "A" ZONE				

REVISION

HOPE CREEK GENERATING STATION
HARDENED CONTAINMENT VENT SYSTEM
OVERALL INTEGRATED PLAN

ATTACHMENT 3
SKETCH 3
SHEET 5
PLAN ELEVATION 137'

Attachment 4: Failure Evaluation Table

Table 4A: Wet Well HCVS Failure Evaluation Table

Functional Failure Mode	Failure Cause	Alternate Action	Failure with Alternate Action Impact on Containment Venting?
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal AC power	Remove fuses from 1YF404 and install in ELAP panel. Transfer control to ELAP panel, which is supplied by HCVS battery and inverter	No
Failure of Vent to Open on Demand	Valves fail to open/close due to complete loss of batteries (long term)	Recharge station service batteries with FLEX provided generators, considering severe accident conditions	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of normal pneumatic air supply	No action needed, air can be supplied by nitrogen bottles, which is sufficient for at least 8 cycles of HV-11541 valve over first 24 hours.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to loss of alternate pneumatic air supply (long term)	Replace nitrogen cylinders supporting HCVS valves as needed.	No
Failure of Vent to Open on Demand	Valves fail to open/close due to SOV failure	Use hand valves at ROS to open/close vent valves.	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. Hope Creek Order EA-12-049 (FLEX) Overall Integrated Implementation Plan, Rev 0, February 2013
29. Hope Creek Order EA-12-050 (HCVS) Overall Integrated Implementation Plan, Rev 0, February 2013
30. Hope Creek Order EA-12-051 (SFP LI) Overall Integrated Implementation Plan, Rev 0, February 2013
31. Calculation E-4.6, Hope Creek 125 VDC Beyond Design Base Event Battery Sizing Calculation
32. Hope Creek Updated Final Safety Analysis Report, Section 6.3.2.2.1
33. Calculation H-1-GS-MDC-0978, Torus Vent MCR Habitability Review
34. Hope Creek Updated Final Safety Analysis Report, Section 6.2.1.1.3
35. Calculation H-1-GS-MDC-0863, Hardened Torus Vent Pipe Line Sizing

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

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

Attachment 7: List of Overall Integrated Plan Open Items

Open Item	Action	Comment
1	Finalize time constraints and their bases	
2	Confirm vent sizing and suppression pool heat capacity	Confirmatory Action
3	Finalize χ/Q analysis	
4	Perform dose evaluation for venting actions	
5	Finalize design of the HCVS for hydrogen detonation/deflagration	
6	Missile protection	