Xcel Energy®

Monticello Nuclear Generating Plant
2807 W County Road 75
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February 28, 2013

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Monticello Nuclear Generating Plant
Docket No. 50-263
Renewed Facility Operating License No. DPR-22

MNGP's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents (Order Number EA-12-050)

References:

1. NRC Order Number EA-12-050, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Hardened Containment Vents," dated March 12, 2012 (ADAMs Accession Number ML12054A694).

2. NRC Interim Staff Guidance JLD-ISG-2012-02, "Compliance with Order EA-12-050, Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents," Revision 0, dated August 29, 2012 (ADAMs Accession Number ML12229A475).

3. NSPM Letter to NRC, "MNGP's Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents (Order Number EA-12-050)," dated October 29, 2012 (ADAMs Accession Number ML12305A384).

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an Order (Reference 1) to all NRC power reactor licensees and holders of construction permits in active or deferred status. Reference 1 was immediately effective and directs Northern States Power Company (NSPM), a Minnesota corporation, d/b/a Xcel Energy to require the Monticello Nuclear Generating Plant (MNGP), a Boiling Water Reactor (BWR) with a Mark I containment, to take certain actions to ensure the functionality of reliable hardened vent (RHV) systems to remove decay heat and maintain control of containment pressure following events that result in loss of active containment heat removal capability or prolonged Station Blackout (SBO). Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 requires submission of an Overall Integrated Plan by February 28, 2013. The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 1. The interim staff guidance (Reference 2) was issued August 29, 2012 which provides direction regarding the content of this Overall Integrated Plan. Section 4.0 of Reference 2 contains the specific reporting requirements for the Overall Integrated Plan. The information in the enclosure to this letter aligns with the guidance provided in this section of Reference 2. For the purposes of compliance with Order EA-12-050, NSPM plans to use a wetwell vent.

The enclosed Overall Integrated Plan is based on conceptual design information. Final design details and associated procedure guidance, as well as any revisions to the information contained in the Enclosure, will be provided in the six-month status reports required by Reference 1.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

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

Executed on February 28, 2013.

Mark A. Schimmel
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Director of Nuclear Reactor Regulation (NRR), USNRC
NRR Project Manager, MNGP, USNRC
Senior Resident Inspector, MNGP, USNRC

ENCLOSURE

Monticello Nuclear Generating Plant

NRC Order EA-12-050

Overall Integrated Plan

(29 Pages to Follow)

Enclosure
Monticello Nuclear Generating Plant
NRC Order EA-12-050
Overall Integrated Plan

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Figures:

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References:

1. NRC Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," dated September 1, 1989.
2. NRC Order Number EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012 (Accession Number ML12054A736).
3. NRC Order Number EA-12-050, "Issuance of Order to Modify Licenses with Regard to Requirements for Reliable Hardened Containment Vents," dated March 12, 2012 (Accession Number ML12054A694).
4. NRC Interim Staff Guidance JLD-ISG-2012-02, "Compliance with Order EA-12-050, Order Modifying Licenses with Regard to Requirements for Reliable Hardened Containment Vents," Revision 0, dated August 29, 2012 (Accession Number ML12229A475).
5. 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," dated August 29, 2012 (Accession No. ML12229A477).
6. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide," Revision 0, dated August, 2012.

Section 1: <u>System Description (FSAR Level of Detail)</u>

<u>ISG Criteria:</u>

Licensees shall provide a complete description of the system, including important operational characteristics. The level of detail generally considered adequate is consistent with the level of detail contained in the licensee's Final Safety Analysis Report.

<u>Response:</u>

System Overview:

The Hardened Containment Vent System (HCVS) is designed to mitigate loss-of-decay-heat removal by providing sufficient containment venting capability to limit containment pressurization and maintain core cooling capability. The vent is designed with sufficient capacity to accommodate decay heat input equivalent to one percent of 2004 MWt which accounts for a 13 percent planned power uprate above the current licensed thermal power (CLTP). Thus, the hardened vent capacity is adequate to relieve decay heat for a prolonged station blackout (SBO) event. The HCVS is intended for use as one element of core damage prevention strategies.

The HCVS flow path from the containment to an elevated release point is shown in the simplified diagram below. No ductwork is used in the flow path.

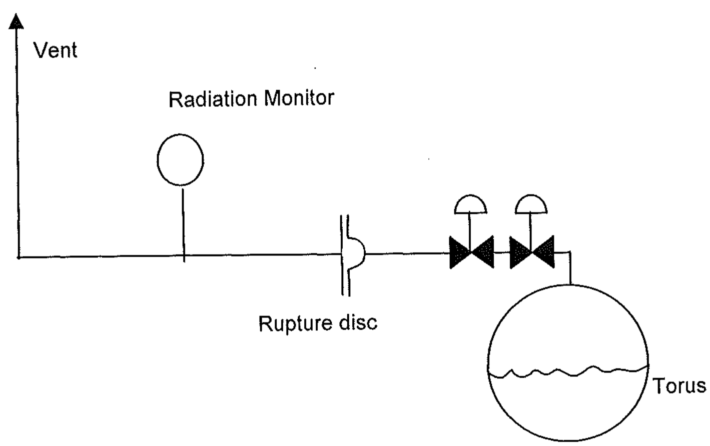

Figure 1 – HCVS Flow Path*

*Note: See Figures in Section 8 for more detail.

Equipment and Components:

The following equipment and components are or will be provided:

i. HCVS Mechanical Components –
   a) Containment isolation piping, valves and controls - The HCVS vent piping and supports up to and including the second containment isolation valve are designed in accordance with existing design basis. Containment isolation valves are provided consistent with the plants containment isolation valve design basis. The valves are air-operated valves (AOV) operated by solenoid valves (SOV), and can be operated from controls on the Alternate Shutdown System Panel.
   b) Other system valves and piping - The HCVS piping and supports downstream of the second containment isolation valve have been designed and analyzed to conform to the requirements consistent with the applicable design codes for the plant and to ensure functionality following a design basis earthquake.
   c) A rupture disc of 44 to 50 psig capability is provided in the HCVS vent line downstream of the containment isolation valves. The rupture disc can be intentionally breached from the Alternate Shutdown System (ASDS) Panel as directed by applicable procedures.

ii. Instrumentation to monitor the status of the HCVS –
   a) Instrumentation indications are available at the ASDS Panel.
   b) An effluent radiation monitor is located outside the vent line with indication on the ASDS panel.
   c) HCVS vent flow path valves position indication monitors the status of the HCVS containment isolation valves to aid the operator to ensure verification of proper venting operation. A failure of the position indication instrumentation would not prevent opening and closing the valve.

iii. Support systems –
   a) Normal power for the HCVS valve solenoids is provided from the Division II 480V busses.
   b) In the event of a loss of Division II 480V power, the Division II 250V Battery System will provide power for an estimated 8 hours. A future evaluation will quantify this time.
   c) The Alternate Nitrogen System supply for HCVS operation will be modified as necessary to operate for 24 hours under prolonged SBO conditions.
   d) FLEX equipment will have the capability to provide back-up support equipment for reliable HCVS operation. For example, power to the Division II 250 V battery will be supplied from a FLEX 480V portable diesel generator (to be procured). If additional motive nitrogen for HCVS operation is needed, additional nitrogen bottles are stored on-site.

System control:

i. Active: HCVS valves are operated in accordance with Emergency Operating Procedures (EOP). The HCVS is designed for rupturing the rupture disc under prolonged SBO conditions. The Alternate Nitrogen System will be modified, if necessary, to ensure the valves will be able to cycle multiple times (at least five cycles). EOPs allow opening the

HCVS vent when drywell pressure is above the Pressure Suppression Pressure (PSP), which is approximately 17 to 34 psig, depending on Torus level. A manual valve will be added to allow the Alternate Nitrogen System to open the HCVS valves in the event of a loss of DC power or solenoid failure.

ii. Passive: Inadvertent actuation protection is provided by a rupture disc in the vent line downstream of the containment isolation valves. Remote operation of HCVS is controlled by key lock switches located in the Alternate Shutdown System Panel.

Section 2: A description of how the design objectives contained in Order EA-050 Attachment 2, Requirements 1.1.1, 1.1.2, and 1.1.3, are met.

Order EA-050 1.1.1 Requirement:

The HCVS shall be designed to minimize the reliance on operator actions.

ISG 1.1.1 Criteria:

During events that significantly challenge plant operations, individual operators are more prone to human error. In addition, the plant operations staff may be required to implement strategies and/or take many concurrent actions that further places a burden on its personnel. During the prolonged SBO condition at the Fukushima Dai-ichi units, operators faced many significant challenges while attempting to restore numerous plant systems that were necessary to cool the reactor core, including the containment venting systems. The difficulties faced by the operators related to the location of the HCVS valves, ambient temperatures and radiological conditions, loss of all alternating current electrical power, loss of motive force to open the vent valves, and exhausting dc battery power. The NRC staff recognizes that operator actions will be needed to operate the HCVS valves; however, the licensees shall consider design features for the system that will minimize the need and reliance on operator actions to the extent possible during a variety of plant conditions, as further discussed in this ISG.

The HCVS shall be designed to be operated from a control panel located in the main control room or a remote but readily accessible location. The HCVS shall be designed to be fully functional and self sufficient with permanently installed equipment in the plant, without the need for portable equipment or connecting thereto, until such time that additional on-site or off-site personnel and portable equipment become available. The HCVS shall be capable of operating in this mode (i.e., relying on permanently installed equipment) for at least 24 hours during the prolonged SBO, unless a shorter period is justified by the licensee. The HCVS operation in this mode depends on a variety of conditions, such as the cause for the SBO (e.g., seismic event, flood, tornado, high winds), severity of the event, and time required for additional help to reach the plant, move portable equipment into place, and make connections to the HCVS.

When evaluating licensee justification for periods less than 24 hours, the NRC staff will consider the number of actions and the cumulative demand on personnel resources that are needed to maintain HCVS functionality (e.g., installation of portable equipment during the first 24 hours to restore power to the HCVS controls and/or instrumentation) as a result of design limitations. For example, the use of supplemental portable power sources may be acceptable if the supplemental power was readily available, could be quickly and easily moved into place, and installed through the use of pre-engineered quick disconnects, and the necessary human actions were identified along with the time needed to complete those actions. Conversely, supplemental power sources located in an unattended warehouse that require a qualified electrician to temporarily wire into the panel would not be considered acceptable by the staff because its installation requires a series of complex, time-consuming actions in order to achieve a successful outcome. There are similar examples that could apply to mechanical systems, such as pneumatic/compressed air systems.

Response (ref. ISG Item 1.1.1):

The operation of the HCVS has been designed to minimize the reliance on operator actions. The operator actions required to open a vent path are summarized in Table 1 below.

Table 1 - Operator Actions Necessary to Vent the Containment during an SBO		
Vent containment with containment pressure **above** the rupture disc rupture pressure	Vent containment with containment pressure **below** the rupture disc rupture pressure	Equipment Location
1. Open a manual valve to supply nitrogen to the HCVS valves*	1. Open a manual valve to supply nitrogen to the HCVS valves*	Turbine building
	2. Open valve to provide nitrogen to pressurize area between rupture disc and closed valve	ASDS Panel (EFT bldg)
	3. Shut valve to stop nitrogen after 5 minutes	ASDS Panel (EFT bldg)
2. Open 1st Containment Isolation Valve	4. Open 1st Containment Isolation Valve	ASDS Panel (EFT bldg)
3. Open 2nd Containment Isolation Valve	5. Open 2nd Containment Isolation Valve	ASDS Panel (EFT bldg)
*NOTE: The normal position of this valve is currently SHUT and will be changed to OPEN. This will eliminate step 1, which relies on an operator action.		

No other operator actions are required to initiate venting.

The HCVS is designed to allow initiation, control, and monitoring of venting from the Alternate Shutdown System Panel in the Emergency Filtration (EFT) Building. The EFT building is a Class I structure located away from the Reactor Building and contains no radioactive material or piping with contaminated material, thereby minimizing plant operators' exposure to adverse temperature and radiological conditions.

Permanently installed equipment will supply nitrogen for an estimated 24 hours and power to HCVS for at least 8 hours. These times will be confirmed by future evaluations. Staffing studies, when completed in response to the NRC's 10 CFR 50.54(f) letter dated March 12, 2012, will demonstrate that sufficient manpower is available to ensure that supplemental DC control power can be re-established and any supplemental nitrogen bottles required can be installed in the required time. Connections for supplementing electrical power and motive nitrogen will be located in Class I areas of the turbine building, EFT or administration buildings.

A failure evaluation table is included as Table 3 in Section 8.

Order EA-050 1.1.2 Requirement:

The HCVS shall be designed to minimize plant operators' exposure to occupational hazards, such as extreme heat stress, while operating the HCVS system.

ISG 1.1.2 Criteria:

During a prolonged SBO, the drywell, wetwell (torus), and nearby areas in the plant where HCVS components are expected to be located will likely experience an excursion in temperatures due to inadequate containment cooling combined with loss of normal and emergency building ventilation systems. In addition, installed normal and emergency lighting in the plant may not be available. Licensees should take into consideration plant conditions expected to be experienced during applicable beyond design basis external events when locating valves, instrument air supplies, and other components that will be required to safely operate the HCVS system. Components required for manual operation should be placed in areas that are readily accessible to plant operators, and not require additional actions, such as the installation of ladders or temporary scaffolding, to operate the system.

When developing a design strategy, the NRC staff expects licensees to analyze potential plant conditions and use its acquired knowledge of these areas, in terms of how temperatures would react to extended SBO conditions and the lighting that would be available during beyond design basis external events. This knowledge also provides an input to system operating procedures, training, the choice of protective clothing, required tools and equipment, and portable lighting.

Response (ref. ISG Item 1.1.2):

Following the changing of the position of the Alternate Nitrogen System supply valve in the turbine building, the HCVS design will allow initiating and then operating and monitoring the HCVS from the ASDS panel, which minimizes plant operators' exposure to adverse temperature and radiological conditions. In order to minimize operator exposure to temperature excursions due to the impact of the prolonged SBO (i.e., loss of normal and emergency building ventilation systems and/or containment temperature changes) procedures will not require personnel to access the Torus area for HCVS operations or for backup operation of electrical and pneumatic systems.

Connections for supplemental equipment needed for sustained operation of the HCVS will be located in Class I structures, as listed below:

DC Power:

- 480 V AC breakers in 4kV switch gear rooms to power battery chargers (primary)
- Battery charger connections in the battery rooms (alternate)

Alternate Nitrogen System:

- Seismically protected area of turbine building

Tools required for sustained operation, such as portable headlamps or lighting alternatives like flashlights or portable lights, and connection specific tooling will be stored in the FLEX equipment storage locations.

Neither temporary ladders nor scaffolding will be required to access these connections or storage locations.

Order EA-050 1.1.3 Requirement:

The HCVS shall also be designed to minimize radiological consequences that would impede personnel actions needed for event response.

ISG 1.1.3 Criteria:

The design of the HCVS should take into consideration the radiological consequences resulting from the event that could negatively impact event response. During the Fukushima event, personnel actions to manually operate the vent valves were impeded due to the location of the valves in the torus rooms. The HCVS shall be designed to be placed in operation by operator actions at a control panel, located in the main control room or in a remote location. The system shall be designed to function in this mode with permanently installed equipment providing electrical power (e.g., dc power batteries) and valve motive force (e.g., N2/air cylinders). The system shall be designed to function in this mode for a minimum duration of 24 hours with no operator actions required or credited, other than the system initiating actions at the control panel. Durations of less than 24 hours will be considered if justified by adequate supporting information from the licensee. To ensure continued operation of the HCVS beyond 24 hours, licensees may credit manual actions, such as moving portable equipment to supplement electrical power and valve motive power sources.

In response to Generic Letter (GL) 89-16, a number of facilities with Mark I containments installed vent valves in the torus room, near the drywell, or both. Licensees can continue to use these venting locations or select new locations, provided the requirements of this guidance document are satisfied. The HCVS improves the chances of core cooling by removing heat from containment and lowering containment pressure, when core cooling is provided by other systems. If core cooling were to fail and result in the onset core damage, closure of the vent valves may become necessary if the system was not designed for severe accident service. In addition, leakage from the HCVS within the plant and the location of the external release from the HCVS could impact the event response from on-site operators and off-site help arriving at the plant. An adequate strategy to minimize radiological consequences that could impede personnel actions should include the following:

1. Licensees shall provide permanent radiation shielding where necessary to facilitate personnel access to valves and allow manual operation of the valves locally. Licensee may use alternatives such as providing features to facilitate manual operation of valves from remote locations, as discussed further in this guidance under Requirement 1.2.2, or relocate the vent valves to areas that are significantly less challenging to operator access/actions.

2. In accordance with Requirement 1.2.8, the HCVS shall be designed for pressures that are consistent with the higher of the primary containment design pressure and the primary containment pressure limit (PCPL), as well as including dynamic loading resulting from system actuation. In addition, the system shall be leak-tight. As such, ventilation duct work (i.e., sheet metal) shall not be utilized in the design of the HCVS. Licensees should perform appropriate testing, such as hydrostatic or pneumatic testing, to establish the leak-tightness of the HCVS.

3. The HCVS release to outside atmosphere shall be at an elevation higher than adjacent plant structures. Release through existing plant stacks is considered acceptable, provided the guidance under Requirement 1.2.6 is satisfied. If the release from HCVS is through a vent stack different than the plant stack, the elevation of the stack should be higher than the nearest building or structure.

Response (ref. ISG Item 1.1.3):

The HCVS is designed for reliable, remote-manual operation. Operators will not be required to access the Torus area. The HCVS is designed to be independent of other ventilation systems, prevent steam flow into unintended areas, and provide containment isolation. No duct work is used in the HCVS.

No actions are required in the Torus area. Therefore, shielding or other alternatives to facilitate manual actions are not required for operation of the HCVS. The containment valves are located in the Torus room and are tested per the 10 CFR Appendix J requirements. The vent piping is routed through the HPCI room roof, up the side of the reactor building, along the reactor plenum, to an elevated release point. The stack is higher than the nearest building or structure.

See Section 1.2.8 for discussion of design pressure.

Section 3: Operational characteristics and a description of how each of the Order's technical requirements are being met.

Order EA-050 1.2.1 Requirement:

The HCVS shall have the capacity to vent the steam/energy equivalent of 1 percent of licensed/rated thermal power (unless a lower value is justified by analyses), and be able to maintain containment pressure below the primary containment design pressure.

ISG 1.2.1 Criteria:

Beyond design basis external events such as a prolonged SBO could result in the loss of active containment heat removal capability. The primary design objective of the HCVS is to provide sufficient venting capacity to prevent a long-term overpressure failure of the containment by keeping the containment pressure below the primary containment design pressure and the PCPL. The PCPL may be dictated by other factors, such as the maximum containment pressure at which the safety relief valves (SRVs) and the HCVS valves can be opened and closed.

The NRC staff has determined that, for a vent sized under conditions of constant heat input at a rate equal to 1 percent of rated thermal power and containment pressure equal to the lower of the primary containment design pressure and the PCPL, the exhaust-flow through the vent would be sufficient to prevent the containment pressure from increasing. This determination is based on studies that have shown that the torus suppression capacity is typically sufficient to absorb the decay heat generated during at least the first three hours following the shutdown of the reactor with torus as the source of injection, that decay heat is typically less than 1 percent of rated thermal power three hours following shutdown of the reactor, and that decay heat continues to decrease to well under 1 percent, thereafter. Licensees shall have an auditable engineering basis for the decay heat absorbing capacity of their torus, selection of venting pressure such that the HCVS will have sufficient venting capacity under such conditions to maintain containment pressure at or below the primary containment design pressure and the PCPL. If required, venting capacity shall be increased to an appropriate level commensurate with the licensee's venting strategy. Licensees may also use a venting capacity sized under conditions of constant heat input at a rate lower than 1 percent of thermal power if it can be justified by analysis that primary containment design pressure and the PCPL would not be exceeded. In cases where plants were granted, have applied, or plan to apply for power uprates, the licensees shall use 1 percent thermal power corresponding to the uprated thermal power. The basis for the venting capacity shall give appropriate consideration of where venting is being performed from (i.e., wetwell or drywell) and the difference in pressure between the drywell and the suppression chamber. Vent sizing for multi-unit sites must take into consideration simultaneous venting from all the units, and ensure that venting on one unit does not negatively impact the ability to vent on the other units.

Response (ref. ISG Item 1.2.1):

The HCVS wetwell path is designed for venting steam/energy at a capacity of 1 percent of 2004 MW thermal power at containment pressure of 56 psig. This pressure is the containment design pressure, which is the lower value when comparing the containment design pressure value and the primary containment pressure limit (PCPL) value.

The one percent value assumes that the Torus capacity is sufficient to absorb the decay heat generated during the first three hours. The vent would then be able to prevent containment pressure from increasing above the containment design pressure. The Torus is able to absorb the necessary decay heat for at least the first three hours.

Order EA-050 1.2.2 Requirement:

The HCVS shall be accessible to plant operators and be capable of remote operation and control, or manual operation, during sustained operations.

ISG 1.2.2 Criteria:

The preferred location for remote operation and control of the HCVS is from the main control room. However, alternate locations to the control room are also acceptable, provided the licensees take into consideration the following:

1. *Sustained operations mean the ability to open/close the valves multiple times during the event. Licensees shall determine the number of open/close cycles necessary during the first 24 hours of operation and provide supporting basis consistent with the plant-specific containment venting strategy.*
2. *An assessment of temperature and radiological conditions that operating personnel may encounter both in transit and locally at the controls. Licensee may use alternatives such as providing features to facilitate manual operation of valves from remote locations or relocating/reorienting the valves.*
3. *All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during a prolonged SBO (electric power, N2/air) shall be located above the maximum design basis external flood level or protected from the design basis external flood.*
4. *During a prolonged SBO, manual operation/action may become necessary to operate the HCVS. As demonstrated during the Fukushima event, the valves lost motive force including electric power and pneumatic air supply to the valve operators, and control power to solenoid valves. If direct access and local operation of the valves is not feasible due to temperature or radiological hazards, licensees should include design features to facilitate remote manual operation of the HCVS valves by means such as reach rods, chain links, hand wheels, and portable equipment to provide motive force (e.g., air/N2 bottles, diesel powered compressors, and dc batteries). The connections between the valves and portable equipment should be designed for quick deployment. If a portable motive force (e.g., air or N2 bottles, dc power supplies) is used in the design strategy, licensees shall provide reasonable protection of that equipment consistent with the staff's guidance delineated in JLD-ISG-2012-01 for Order EA-12-049.*
5. *The design shall preclude the need for operators to move temporary ladders or operate from atop scaffolding to access the HCVS valves or remote operating locations.*

Response (ref. ISG Item 1.2.2):

The HCVS design allows initiating and then operating and monitoring the HCVS from the ASDS panel. As discussed in Table 1, the position of the manual Alternate Nitrogen System valve in the turbine building will be changed from closed to open to allow complete operation of the HCVS from the ASDS panel. This location is protected from adverse natural phenomena, including the design basis external flood.

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

   The station batteries will be used initially to power the solenoids. Station battery power will be maintained by a portable diesel generator (FLEX equipment). The portable diesel generator will provide continuous power.

   Motive nitrogen pressure is delivered from the Alternate Nitrogen System. The Alternate Nitrogen System will be confirmed to be able to provide a nitrogen supply for a minimum of five valve operating cycles.

   The SOVs are the only electrical components required for valve functionality that are located inside the area considered not-accessible following a prolonged SBO. Should all power to the SOV be lost or an SOV fail to open, a remote manual bypass for the containment isolation valves will be added to open the valves using nitrogen gas, independent of any electric power.

2. All operations of the HCVS will occur in the EFT building, the turbine building or the battery rooms. None of these areas are near the HCVS piping. Also, no fuel damage has occurred per the event scenario. Therefore, no adverse radiological conditions will exist in these areas.

   Due to the low heat loads in these areas during an SBO, loss of ventilation is not expected to affect the local temperatures significantly. Should cooling be needed, portable FLEX equipment will be available after portable diesel generators are set up.

3. All permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during a prolonged SBO (electric power, N2/air) will be located in areas reasonably protected from the defined hazards discussed in Section 1.1.1 above.

4. All valves required to open the flow path are designed for remote operation following a prolonged SBO, i.e., no valve operation via handwheel, reach–rod or similar means that requires close proximity to the containment isolation valve. Supplemental connections will be pre-engineered to minimize man-power resources and any needed portable equipment will be reasonably protected from hazards defined in NEI 12-06.

5. Access to the locations described above will not require temporary ladders or scaffolding.

<u>Order EA-050 1.2.3 Requirement:</u>

The HCVS shall include a means to prevent inadvertent actuation.

<u>ISG 1.2.3 Criteria:</u>

The design of the HCVS shall incorporate features, such as control panel key-locked switches, locking systems, rupture discs, or administrative controls to prevent the inadvertent use of the vent valves. The system shall be designed to preclude inadvertent actuation of the HCVS due to any single active failure. The design should consider general guidelines such as single point vulnerability and spurious operations of any plant installed equipment associated with HCVS.

The objective of the HCVS is to provide sufficient venting of containment and prevent long-term overpressure failure of containment following the loss of active containment heat removal capability or prolonged SBO. However, inadvertent actuation of HCVS due to a design error, equipment malfunction, or operator error during a design basis loss-of-coolant accident (DBLOCA) could have an undesirable effect on the containment accident pressure (CAP) to provide adequate net positive suction head to the emergency core cooling system (ECCS) pumps. Therefore, prevention of inadvertent actuation, while important for all plants, is essential for plants relying on CAP. The licensee submittals on HCVS shall specifically include details on how this issue will be addressed on their individual plants for all situations when CAP credit is required.

<u>Response (ref. ISG Item 1.2.3):</u>

A rupture disc and key lock switches on the ASDS panel prevent inadvertent venting.

The HCVS containment isolation valves are normally closed AOVs that are nitrogen-to-open and spring-to-shut. The SOV is energized by a key-locked switch to allow the motive nitrogen to open the AOV. Manual Alternate Nitrogen System valves that bypass the containment isolation valve solenoids will be installed, locked and controlled by procedure.

EOPs provide supplementary instructions to point out that reducing primary containment pressure will affect Net Positive Suction Head (NPSH) margin. This administrative control, along with locked valves and a rupture disc, will prevent inadvertent vent opening.

Order EA-050 1.2.4 Requirement:

The HCVS shall include a means to monitor the status of the vent system (e.g., valve position indication) from the control room or other location(s). The monitoring system shall be designed for sustained operation during a prolonged SBO.

ISG 1.2.4 Criteria:

Plant operators must be able to readily monitor the status of the HCVS at all times, including being able to understand whether or not containment pressure/energy is being vented through the HCVS, and whether or not containment integrity has been restored following venting operations. Licensees shall provide a means to allow plant operators to readily determine, or have knowledge of, the following system parameters:

(1) HCVS vent valves' position (open or closed),

(2) system pressure, and

(3) effluent temperature.

Other important information includes the status of supporting systems, such as availability of electrical power and pneumatic supply pressure. Monitoring by means of permanently installed gauges that are at, or nearby, the HCVS control panel is acceptable. The staff will consider alternative approaches for system status instrumentation; however, licensees must provide sufficient information and justification for alternative approaches.

The means to monitor system status shall support sustained operations during a prolonged SBO, and be designed to operate under potentially harsh environmental conditions that would be expected following a loss of containment heat removal capability and SBO. Power supplies to all instruments, controls, and indications shall be from the same power sources supporting the HCVS operation. "Sustained operations" may include the use of portable equipment to provide an alternate source of power to components used to monitor HCVS status. Licensees shall demonstrate instrument reliability via an appropriate combination of design, analyses, operating experience, and/or testing of channel components for the following sets of parameters:

- *radiological conditions that the instruments may encounter under normal plant conditions, and during and after a prolonged SBO event.*
- *temperatures and pressure conditions as described under requirement 1.2.8, including dynamic loading from system operation.*
- *humidity based on instrument location and effluent conditions in the HCVS.*

Response (ref. ISG Item 1.2.4):

The existing HCVS was designed with containment isolation valve position indications and an inline radiation monitor. These instruments provide indirect system flow information. Valve position identifies when flow can occur and the radiation monitor is designed to detect when flow does occur. The instrument range will provide indication of flow at low levels such as conditions when all fuel is intact.

The existing HCVS includes a primary containment pressure indicator in the ASDS panel where the HCVS controls are located. The pressure in the HCVS will be bounded by the containment pressure indication. Additional HCVS temperature and pressure monitors were evaluated and determined not be necessary, as existing HCVS instrumentation is adequate for plant operators to monitor venting status.

The HCVS valve position indication, HCVS inline radiation monitor and containment pressure indicator are all powered from essential DC power.

The range for the containment pressure indication is -5 to 250 psig. The upper limit is more than twice the required design containment pressure.

The installed instruments for valve position indication and containment pressure are reliable for the radiological, temperature, pressure and humidity conditions as described in ISG 1.2.4. The instrument

detector for radiation monitoring is installed outside the reactor building and the radiation monitor instrumentation is in the ASDS panel in the EFT building. Due to the location of the equipment for the detector and monitor, it is not expected to experience abnormal radiological, temperature, pressure or humidity conditions as a result of the event.

Order EA-050 1.2.5 Requirement:

The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication in the control room or other location(s), and shall be designed for sustained operation during a prolonged SBO.

ISG 1.2.5 Criteria:

Licensees shall provide an independent means to monitor overall radioactivity that may be released from the HCVS discharge. The radiation monitor does not need to meet the requirements of NUREG 0737 for monitored releases, nor does it need to be able monitor releases quantitatively to ensure compliance with Title 10 of the Code of Federal Regulations (10 CFR) Part 100 or 10 CFR Section 50.67. A wide-range monitoring system to monitor the overall activity in the release providing indication that effluent from the containment environment that is passing by the monitor is acceptable. The use of other existing radiation monitoring capability in lieu of an independent HCVS radiation monitor is not acceptable because plant operators need accurate information about releases coming from the containment via the HCVS in order to make informed decisions on operation of the reliable hardened venting system.

The monitoring system shall provide indication in the control room or a remote location (i.e., HCVS control panel) for the first 24 hours of an extended SBO with electric power provided by permanent DC battery sources, and supplemented by portable power sources for sustained operations. Monitoring radiation levels is required only during the events that necessitate operation of the HCVS. The reliability of the effluent monitoring system under the applicable environmental conditions shall be demonstrated by methods described under Requirement 1.2.4.

Response (ref. ISG Item 1.2.5):

A dedicated radiation monitor is installed in the HCVS. The approximate range of the radiation monitoring system is 0.1 mrem/hr to 10,000 mrem/hr. This range exceeds the NRC guidance provided in the NRC Responses to Public Comments document.

The detector is physically mounted on the outside of the HCVS piping. The radiation level is indicated at the ASDS panel. The radiation monitoring system is powered from the same source as all other powered HCVS components. Refer to the response in Section 1.0, Equipment and Components, subpart iii, for a discussion on power supply.

Order EA-050 1.2.6 Requirement:

The HCVS shall include design features to minimize unintended cross flow of vented fluids within a unit and between units on the site.

ISG 1.2.6 Criteria:

At Fukushima, an explosion occurred in Unit 4, which was in a maintenance outage at the time of the event. Although the facts have not been fully established, a likely cause of the explosion in Unit 4 is that hydrogen leaked from Unit 3 to Unit 4 through a common venting system. System cross-connections present a potential for steam, hydrogen, and airborne radioactivity leakage to other areas of the plant and to adjacent units at multi-unit sites if the units are equipped with common vent piping. In this context, a design that is free of physical and control interfaces with other systems eliminates the potential for any cross-flow and is one way to satisfy this requirement. Regardless, system design shall provide design features to prevent the cross flow of vented fluids and migration to other areas within the plant or to adjacent units at multi-unit sites.

The current design of the hardened vent at several plants in the U.S. includes cross connections with the standby gas treatment system, which contains sheet metal ducts and filter and fan housings that are not as leak tight as hard pipes. In addition, dual unit plant sites are often equipped with a common plant stack. Examples of acceptable means for prevention of cross flow is by valves, leak-tight dampers, and check valves, which shall be designed to automatically

close upon the initiation of the HCVS and shall remain closed for as long as the HCVS is in operation. Licensee's shall evaluate the environmental conditions (e.g. pressure, temperature) at the damper locations during venting operations to ensure that the dampers will remain functional and sufficiently leak-tight, and if necessary, replace the dampers with other suitable equipment such as valves. If power is required for the interfacing valves to move to isolation position, it shall be from the same power sources as the vent valves. Leak tightness of any such barriers shall be periodically verified by testing as described under Requirement 1.2.7.

Response (ref. ISG Item 1.2.6):

The HCVS fluid path starts at a dedicated Torus penetration, passes through two dedicated containment isolation valves, through a rupture disc, through a pipe that exits the reactor building, and then the pipe goes up the outside of the reactor building to an open pipe tee near the top of the reactor building exhaust plenum. The only piping connections are a drain line, a nitrogen line to open the rupture disc, and containment isolation leakage testing connections. Therefore, there are no connections with other systems and no cross flow interactions with the HCVS.

MNGP is a single unit site.

Order EA-050 1.2.7 Requirement:

The HCVS shall include features and provision for the operation, testing, inspection and maintenance adequate to ensure that reliable function and capability are maintained.

ISG 1.2.7 Criteria:

The HCVS piping run shall be designed to eliminate the potential for condensation accumulation, as subsequent water hammer could complicate system operation during intermittent venting or to withstand the potential for water hammer without compromising the functionality of the system. Licensees shall provide a means (e.g., drain valves, pressure and temperature gauge connections) to periodically test system components, including exercising (opening and closing) the vent valve(s). In situations where total elimination of condensation is not feasible, HCVS shall be designed to accommodate condensation, including applicable water hammer loads.

The HCVS outboard of the containment boundary shall be tested to ensure that vent flow is released to the outside with minimal leakage, if any, through the interfacing boundaries with other systems or units. Licensees have the option of individually leak testing interfacing valves or testing the overall leakage of the HCVS volume by conventional leak rate testing methods. The test volume shall envelope the HCVS between the outer primary containment isolation barrier and the vent exiting the plant buildings, including the volume up to the interfacing valves. The test pressure shall be based on the HCVS design pressure. Permissible leakage rates for the interfacing valves shall be within the requirements of American Society of Mechanical Engineers Operation and Maintenance of Nuclear Power Plants Code (ASME OM) – 2009, Subsection ISTC – 3630 (e) (2), or later edition of the ASME OM Code. When testing the HCVS volume, allowed leakage shall not exceed the sum of the interfacing valve leakages as determined from the ASME OM Code. The NRC staff will consider a higher leakage acceptance values if licensees provide acceptable justification. When reviewing such requests, the NRC staff will consider the impact of the leakage on the habitability of the rooms and areas within the building and operability of equipment in these areas during the event response and subsequent recovery periods. Licensees shall implement the following operation, testing and inspection requirements for the HCVS to ensure reliable operation of the system.

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 year*
Perform visual inspections and a walkdown 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 five years 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*

Response (ref. ISG Item 1.2.7):

Condensation accumulation resulting from intermittent venting will be evaluated.

The HCVS Containment Isolation Valves will be tested in accordance with the licensing and design basis. The test pressure shall be based on the HCVS design pressure 62 psig. When testing the HCVS volume, the allowed leakage will not exceed ASME Operations and Maintenance (OM) Code unless a higher leakage acceptance value is justified to the NRC.

The test types and frequencies will conform to Table 2 below:

Table 2 – Testing and Frequencies

Description	Frequency
Cycle the HCVS valves and the HCVS valves used to rupture the rupture disc.	Once per year
Perform visual inspections and a walkdown of HCVS components.	Once per operating cycle
Test and calibrate the HCVS radiation monitor.	Once per operating cycle
Leak test the HCVS boundary valves.	Per Appendix J requirements
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

Rupture discs will be replaced at manufacturer's recommendations not to exceed 10 years, per the NRC Responses to Public Comments document.

Order EA-050 1.2.8 Requirement:

The HCVS shall be designed for pressures that are consistent with maximum containment design pressures, as well as, dynamic loading resulting from system actuation.

ISG 1.2.8 Criteria:

The vent system shall be designed for the higher of the primary containment design pressure or PCPL, and a saturation temperature corresponding to the HCVS design pressure. However, if the venting location is from the drywell, an additional margin of 50 °F shall be added to the design temperature because of the potential for superheated conditions in the drywell. The piping, valves, and the valve actuators shall be designed to withstand the dynamic loading resulting from the actuation of the system, including piping reaction loads from valve opening, concurrent hydrodynamic loads from SRV discharges to the torus, and potential for water hammer from accumulation of steam condensation during multiple venting cycles.

Response (ref. ISG Item 1.2.8):

The HCVS design pressure is 62 psig and design temperature is 309°F. The HCVS design pressure is the higher of the containment design pressure and the PCPL value. The HCVS design temperature is the saturation temperature corresponding to the design pressure.

The internal piping is Class I and located in a Class I structure. The piping, supports, torus penetrations, and valves were designed to withstand loads from a seismic event, Mark I/LOCA loads, rupture disc opening loads, deadweight, thermal, and dynamic loads, including piping reaction loads and hydrodynamic loads from SRV discharges to the Torus. Condensation accumulation resulting from intermittent venting will be evaluated for water hammer potential.

The external piping is Class II that meets Class I seismic requirements to prevent it from impacting any safety related equipment.

Order EA-050 1.2.9 Requirement:

The HCVS shall discharge the effluent to a release point above main plant structures.

ISG 1.2.9 Criteria:

The HCVS release to outside atmosphere shall be at an elevation higher than adjacent plant structures. Release through existing plant stacks is considered acceptable, provided the guidance under Requirement 1.2.6 is satisfied. If the release from HCVS is through a stack different than the plant stack, the elevation of the stack should be higher than the nearest building or structure. The release point should be situated away from ventilation system intake and exhaust openings, and emergency response facilities. The release stack or structure exposed to outside shall be designed or protected to withstand missiles that could be generated by the external events causing the prolonged SBO (e.g., tornadoes, high winds).

Response (ref. ISG Item 1.2.9):

The HCVS discharge path is routed next to the reactor building plenum with the vent three feet above the top of the reactor building plenum (see drawing below). This is above the main plant structures as required by the Order. The vent is located above ground level by over 100 feet, providing an elevated release point that will not affect personnel staging any portable equipment needed for the station blackout event.

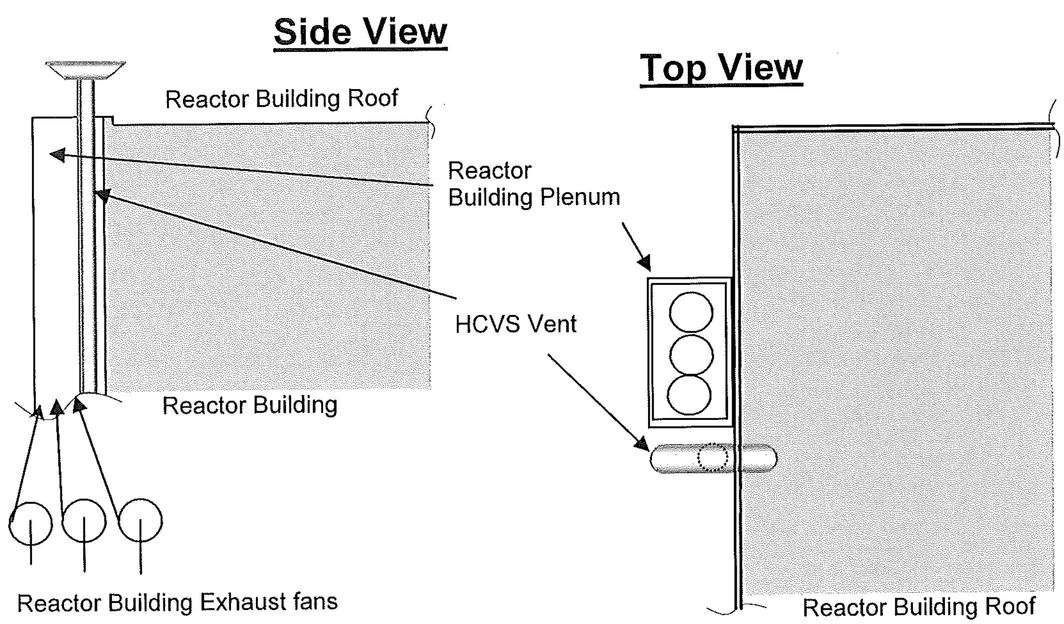

Figure 2 – Side and Top View of the HCVS

The vent is not near the reactor building intake, control room intake, or any of the emergency response facilities, but is in the vicinity of the reactor building exhaust path through the reactor building plenum. A negative pressure could be developed in the reactor building plenum exhaust in one of three ways:

1. Running Standby Gas Treatment System
2. Running the stack dilution fans
3. Wind creating a negative pressure on one side of the reactor building

Standby Gas treatment fans are also powered from 480 V AC Motor Control Centers (MCC) which are not backed up with any DC power supply. The stack dilution fans are powered from 480 V AC MCCs which are not backed up with any DC power supply. None of these fans will have power in a station blackout event. The geometry of the vent exhaust, and the fact that the HCVS exhaust will be heated to 212°F or greater and therefore, less dense than the surrounding air, and three feet elevation above the plenum exhaust, make it very unlikely that the HCVS venting gases will be drawn into the reactor building. In conclusion, the existing HCVS vent configuration meets the requirements of the Order and is acceptable as installed.

The piping outside safety-related structures is designed to Class II and supported to meet Class I seismic requirements to prevent the piping from affecting other safety related structures or equipment. This piping is designed to withstand the design basis flood and tornado winds forces. The piping may experience plastic deformation during a tornado, but has been analyzed to not become a missile. The vent piping is not designed to withstand tornado missiles.

Section 4: Applicable Quality Requirements (Order EA-050 requirements 2.1 and 2.2)

Order EA-050 2.1 Requirement:

The HCVS system design shall not preclude the containment isolation valves, including the vent valve from performing their intended containment isolation function consistent with the design basis for the plant. These items include piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication components.

ISG 2.1 Criteria:

The HCVS vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant. These items include piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication components. The HCVS design, out to and including the second containment isolation barrier, shall meet safety-related requirements consistent with the design basis of the plant. The staff notes that in response to GL 89-16, in many cases, the HCVS vent line connections were made to existing systems. In some cases, the connection was made in between two existing containment isolation valves and in others to the vacuum breaker line. The HCVS system design shall not preclude the containment isolation valves, including the vent valve from performing their intended containment isolation function consistent with the design basis for the plant. The design shall include all necessary overrides of containment isolation signals and other interface system signals to enable the vent valves to open upon initiation of the HCVS from its control panel

Response (ref. ISG Item 2.1):

The HCVS vent path, from the dedicated Torus penetration up to and including the second containment isolation valve, piping and supports, are designed in accordance with the existing design basis. The containment isolation valves do not open or shut on any automatic signals. The only controls are remote key locked switches in the ASDS panel. These valves are considered "sealed-closed barriers" as defined by NUREG-0800, Standard Review Plan, 6.2.4, Containment Isolation System. The control circuit will allow operation of the HCVS from its control panel regardless of containment isolation signals.

Order EA-050 2.2 Requirement:

All other HCVS components shall be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. These items include electrical power supply, valve actuator pneumatic supply, and instrumentation (local and remote) components.

ISG 2.2 Criteria:

All components of the HCVS beyond the second containment isolation barrier shall be designed to ensure HCVS functionality following the plant's design basis seismic event. These components include, in addition to the hardened vent pipe, electric power supply, pneumatic supply and instrumentation. The design of power and pneumatic supply lines between the HCVS valves and remote locations (if portable sources were to be employed) shall also be designed to ensure HCVS functionality. Licensees shall ensure that the HCVS will not impact other safety-related structures and components and that the HCVS will not be impacted by non-seismic components. The staff prefers that the HCVS components, including the piping run, be located in seismically qualified structures. However, short runs of HCVS piping in non-seismic structures are acceptable if the licensee provides adequate justification on the seismic ruggedness of these structures. The hardened vent shall be designed to conform to the requirements consistent with the applicable design codes for the plant, such as the American Society of Mechanical Engineers Boiler and Pressure Vessel Code and the applicable Specifications, Codes and Standards of the American Institute of Steel Construction.

To ensure the functionality of instruments following a seismic event, the NRC staff considers any of the following as acceptable methods:

- *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.*

Response (ref. ISG Item 2.2):

The HCVS components downstream of the second containment isolation valve up to the HPCI room roof are routed in seismically qualified structures. The piping outside safety-related structures is designed to Class II and supported to meet Class I seismic requirements.

The HCVS downstream of the second containment isolation valve, including piping and supports, electrical power supply, valve actuator pneumatic supply, and containment pressure indication, up to the HPCI room roof was designed to conform to the requirements consistent with the applicable design codes for the plant and to ensure functionality following a design basis earthquake.

The HCVS instruments, including valve position indication, containment pressure indication, and radiation monitoring, were installed as safety-related or will be qualified by using one 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**
Containment Pressure	Installed instrument is safety-related
HCVS Process Radiation Monitor	To be determined*
HCVS Process Valve Position	Installed instrument is safety-related

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

The HCVS radiation detector and radiation monitor are currently not safety-related components nor do they currently meet the ISG 2.2 guidance for instruments. They will be analyzed and qualified via demonstration that the instrument is substantially similar in design to instrumentation that has been previously tested to seismic loading levels in accordance with the plant design basis as described in ISG 2.2, or will be replaced with components that meet ISG 2.2 requirements.

Section 5: Procedures and Training (Order EA-050 requirements 3.1 and 3.2)

Order EA-050 3.1 Requirement:

Licensees shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during SBO conditions.

ISG 3.1 Criteria:

Procedures shall be developed describing 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 equipment. The procedures shall identify appropriate conditions and criteria for use of the HCVS. The procedures shall clearly state the nexus between CAP and ECCS pumps during a DBLOCA and how an inadvertent opening of the vent valve could have an adverse impact on this nexus. The HCVS procedures shall be developed and implemented in the same manner as other plant procedures necessary to support the execution of the Emergency Operating Procedures (EOPs).

Licensees shall establish provisions for out-of-service requirements of the HCVS and compensatory measures. These provisions shall be documented in the Technical Requirements Manual (TRM) or similar document. The allowed unavailability time for the HCVS shall not exceed 30 days during modes 1, 2, and 3. If the unavailability time exceeds 30 days, the TRM shall direct licensees to perform a cause assessment and take the necessary actions to restore HCVS availability in a timely manner, consistent with plant procedures and prevent future unavailability for similar causes.

Response (ref. ISG Item 3.1):

Procedures are established for system operation when normal and backup power is available and during prolonged SBO conditions. Current procedures provide an alternate method that could be used to operate the vent valves locally, but requires an entry into the Torus room. These operator actions are unnecessary if all systems perform as designed. Also, these operator actions will be eliminated after completion of a modification to install a manual containment isolation valve solenoid bypass. Procedures for providing the backup DC power, location of equipment, directions for sustained operation and available instrumentation will be generated as part of FLEX.

Some Monticello design bases accidents rely on containment pressure for NPSH for ECCS pumps. A comment in the EOPs states that while venting, "Reducing primary containment pressure affects margin to NPSH limits."

Provisions for out-of-service requirements of the HCVS and compensatory measures will be provided in the Technical Requirements Manual (TRM), as follows:

- The allowed unavailability time for the HCVS shall not exceed 30 days during modes 1, 2, and 3.
- If the unavailability time exceeds 30 days
    - The condition will be entered into the corrective action system,
    - The HCVS availability will be restored in a manner consistent with plant procedures,
    - A cause assessment will be performed to prevent future unavailability for similar causes.

Order EA-050 3.2 Requirement:

Licensee shall train appropriate personnel in the use of the HCVS. The training curricula shall include system operations when normal and backup power is available, and during SBO conditions.

ISG 3.2 Criteria:

All personnel expected to operate the HCVS shall receive training in the use of plant procedures developed for system operations when normal and backup power is available, and during SBO conditions consistent with the plants systematic approach to training. The training shall be refreshed on a periodic basis and as any changes occur to the HCVS.

Response (ref. ISG Item 3.2):

Personnel expected to perform direct operation of the HCVS have received necessary training in the use of plant procedures for system operations. Training will be refreshed on a periodic basis and as any changes occur to the HCVS. Additional training will be provided following the creation of procedures to provide backup DC power during prolonged SBO conditions. The training will utilize the systematic approach to training.

In addition, per NEI 12-06, untrained personnel on-site will be used to supplement trained personnel.

Section 6: Implementation Schedule Milestones

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

Original Target Date	Activity	Status (including any target date revisions)
October 2012	Submit 60 Day Status Report	Complete
February 2013	Submit Overall Integrated Implementation Plan	Completed by this submittal
August 2013	Submit six month status report	
January 2014	Commence engineering design	
February 2014	Submit six month status report	
July 2014	Commence installation	
August 2014	Submit six month status report	
February 2015	Submit six month status report	
End of 2015 Refueling Outage	HCVS Operational	
August 2015	Submit Completion Report	

Section 7: Changes/Updates to this Overall Integrated Implementation Plan

Consistent with the requirements of NRC Order EA-12-050, the six month status reports will delineate progress made, any proposed changes in NSPM's compliance methods, updates to the schedule, and if needed, requests for relief and the bases for these requests.

Section 8: Additional Tables and Figures

Table 3 – Failure Evaluation Table

Functional Failure Mode	Failure Cause	Alternate Action	Alternate Action Corrects Failure
One or Both Containment Isolation Valve Fails to Open on Demand	Loss of Normal AC power to solenoid valve supplying nitrogen gas	DC power supplied to inverter	Yes
	Loss of AC and DC power	Recharge DC batteries with FLEX diesel generator or open manual bypass (future installation)	Yes
	Loss of safety-related Alternate Nitrogen System	Add additional gas bottles to the Alternate Nitrogen System (on site FLEX equipment)	Yes
	Solenoid valve fails to open	Open manual bypass (future installation)	Yes
	Mechanical valve problem	None	No
One Containment Isolation Valve Fails to Close on Demand	Any failure	Close alternate valve	Yes
Both Containment Isolation valves Fail to Close and Rupture Disc Open	Both solenoid valves fail to close for any reason	De-pressurize alternate nitrogen supply to solenoids	Yes
	Mechanical problems in both valves	None	No
Spurious Containment Isolation Valve Opening	Not creditable as key locked switches prevent mis-positioning. Also, the installed rupture disc prevents flow, if it has not be ruptured as part of the event	NA	NA
Automatic Containment Isolation Closure from other signals	No automatic closure signals	NA	NA
Failure to be able to open rupture disc at a containment pressure below the rupture pressure	Loss of safety-related Alternate Nitrogen System	Add additional gas bottles to the Alternate Nitrogen System (on site FLEX equipment)	Yes
	Solenoid valve fails to open	Open manual bypass (future installation)	Yes

Figure 3 – HCVS Connection to Torus

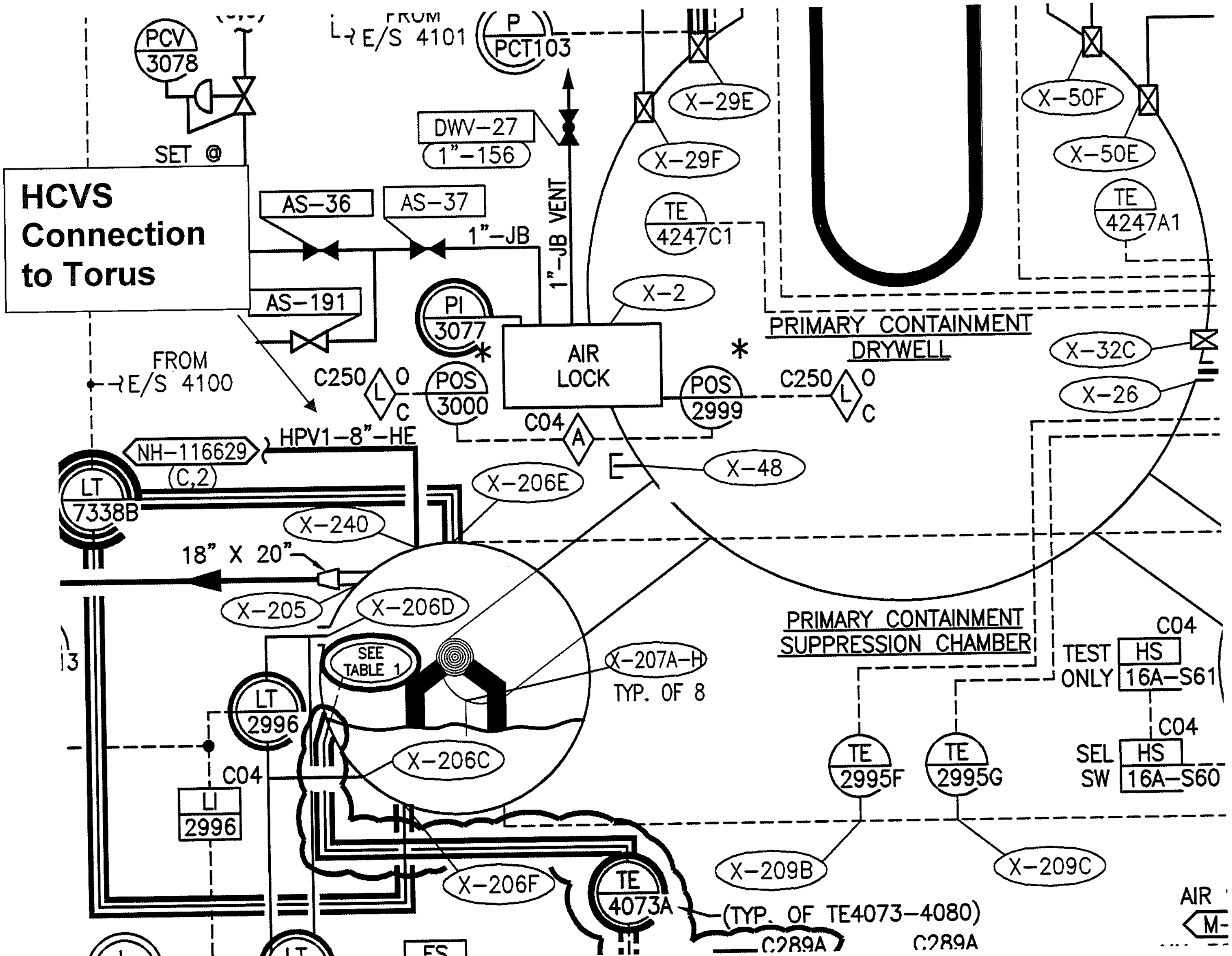

Figure 4 – HCVS Piping

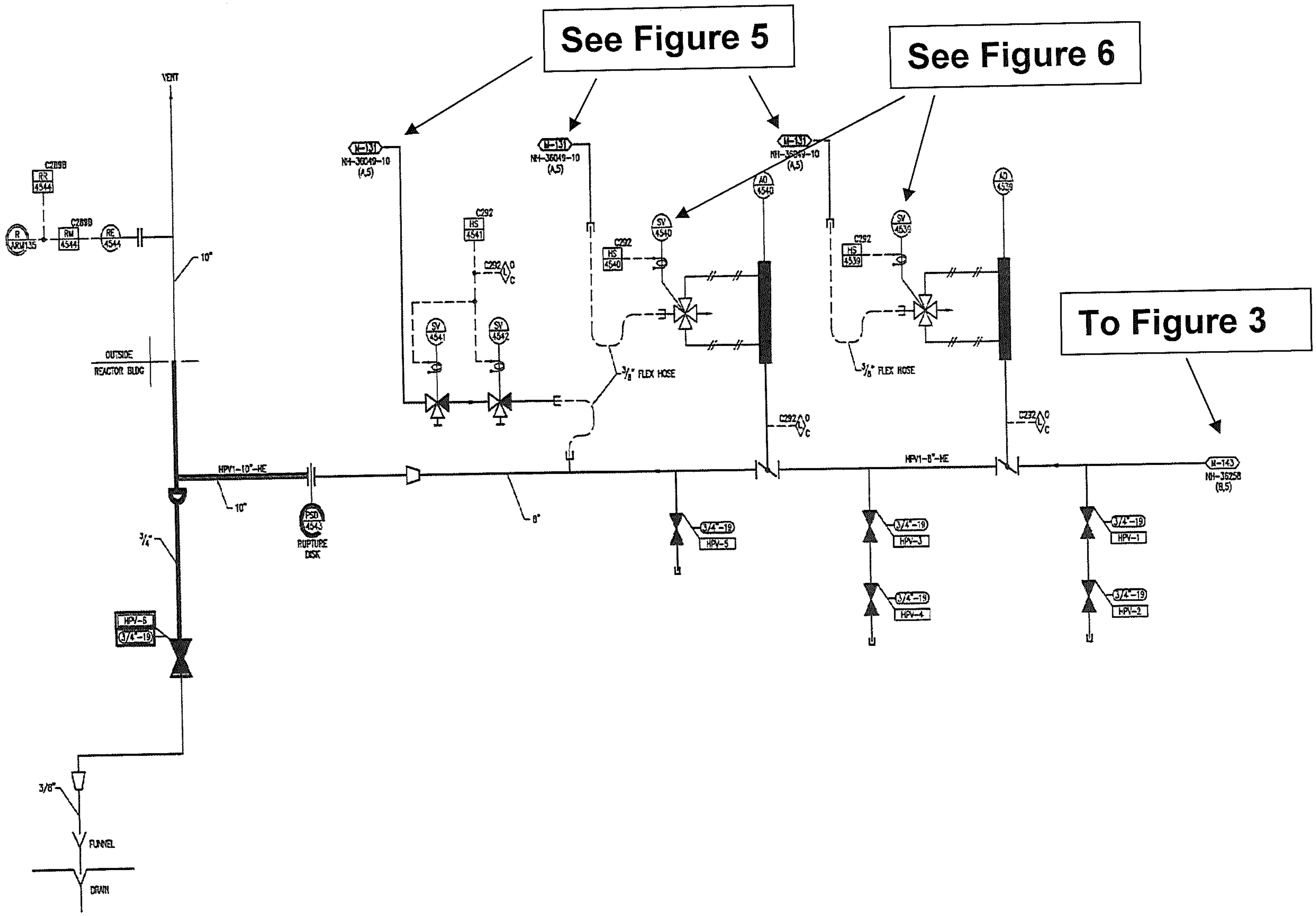

Figure 5 – Alternate Nitrogen System

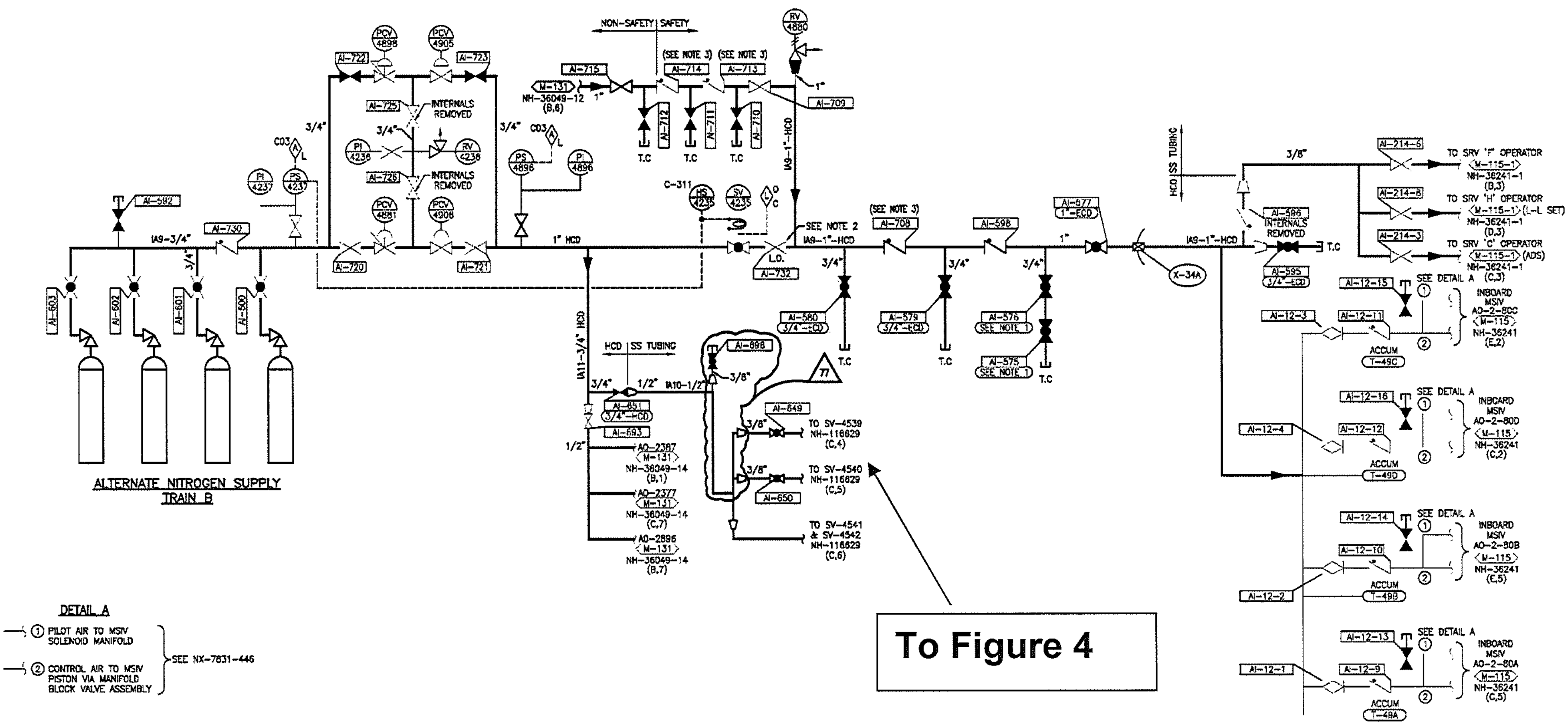

Figure 6 – Electrical Drawing for the HCVS Valves