J. Todd Conner
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DTE Energy

10 CFR 2.202

February 28, 2013
NRC-13-0008

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

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

2) NRC Order EA-12-050, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents," dated March 12, 2012

3) NRC Interim Staff Guidance JLD-ISG-2012-02, "Compliance with Order EA-12-050, Reliable Containment Hardened Vents," Revision 0, dated August 29, 2012

4) DTE Electric letter, NRC-12-0062, "Detroit Edison's Initial Status Report in Response to March 12, 2012 Commission Order Modifying Licenses With Regard to Reliable Hardened Containment Vents (Order Number EA-12-050)," dated October 19, 2012

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

On March 12, 2012, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an order (Reference 2) to DTE Electric Company* (DTE). Reference 2 was immediately effective and directed DTE to install a reliable hardened containment venting capability. Specific requirements are provided in Attachment 2 of Reference 2.

Reference 2 requires submission of an Overall Integrated Plan by February 28, 2013. Compliance details are provided in the interim staff guidance (ISG) (Reference 3)

* Previously The Detroit Edison Company

which was issued August 29, 2012. ISG Section 4.0, Reporting Requirements, provides direction regarding the content of the Overall Integrated Plan.

The purpose of this letter is to provide the Overall Integrated Plan pursuant to Section IV, Condition C.1, of Reference 2. This letter also confirms that DTE has received Reference 3 and has developed an Overall Integrated Plan for the purpose of providing a reliable containment venting capability as described in Attachment 2 of Reference 2.

Reference 4 provided DTE's initial status report regarding reliable containment venting capability for Fermi 2, as required by Reference 2.

The enclosed Fermi 2 Overall Integrated Plan is consistent with the requirements in Section 4.0 of Reference 3.

This letter contains no new regulatory commitments.

Should you have any questions or require additional information, please contact Mr. Kirk R. Snyder, Manager, Industry Interface at (734) 586-5020.

Sincerely,

cc: Director, Office of Nuclear Reactor Regulation
NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, J. Todd Conner, do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

J. Todd Conner
Site Vice President, Nuclear Generation

On this 28th day of February, 2013 before me personally appeared J. Todd Conner, being first duly sworn and says that he executed the foregoing as his free act and deed.

Notary Public

SHARON S. MARSHALL
NOTARY PUBLIC, STATE OF MI
COUNTY OF MONROE
MY COMMISSION EXPIRES Jun 14, 2013
ACTING IN COUNTY OF Monroe

Enclosure to
NRC-13-0008

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

Overall Integrated Plan
Reliable Hardened Containment Vent System
For Fermi 2 Nuclear Power Plant

Table of Contents:

References:

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

2. NRC Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," dated March 12, 2012

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

4. JLD-ISG-2012-02, "Compliance with Order EA-12-050, Reliable Hardened Containment Vents," revision 0, dated August 29, 2012

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.

6. NEI 12-06, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide", Revision 0, dated August 2012.

7. NRC Inspection Manual, Temporary Instruction 2515/121, "Verification of Mark I Hardened Vent Modifications (GL 89-16)".

8. DTE Letter to NRC dated October 20, 1989, NRC-89-0219, "Change in Corrective Action for Jamesbury Butterfly Valves".

9. DTE Letter to NRC dated October 20, 1989, NRC-89-0216, "Response to Generic Letter 89-16".

10. DTE Letter to NRC dated February 26, 1993, NRC-93-0016, "Final Response to Generic Letter 89-16".

11. DTE Letter to NRC dated February 28, 2013, NRC-13-0009, DTE Electric Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)

12. Fermi Engineering Design Change Package (EDP) 10820 revision 0, "Installation Of Hardened Torus Vent"

Section 1: System Description

NRC Order Section IV.C.1 Requirements:

All Licensees shall, by February 28, 2013, submit to the Commission for review an overall integrated plan including a description of how compliance with the requirements described in Attachment 2 will be achieved.

Interim Staff Guidance (ISG) Criteria (ISG Section 4.0 Reporting Requirements):

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.

Response:

System Overview:

Fermi 2 is a Mark I containment design. In response to Generic Letter (GL) 89-16, Fermi 2 installed the existing Hardened Vent following the requirements of 10CFR50.59 (Reference 1). The system, installed in 1992, is designed to be operated prior to reaching the design basis pressure of the torus or drywell (DW) to avoid rupturing the primary containment.

The Hardened Containment Vent System (HCVS) will be modified to be in compliance with the requirements described in Attachment 2 of the NRC Order (Reference 3) and the ISG (Reference 4). This Integrated Plan describes actions being taken by DTE 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). The modified HCVS will be designed to be accessible and operable under a range of plant conditions, including a prolonged SBO and inadequate containment cooling. The HCVS is intended for use as an element of core damage prevention strategies.

The HCVS will be operated from a remote control panel. This remote control panel, H21P101, was part of original construction intended to be utilized to remotely operate the High Pressure Coolant Injection (HPCI) system. This panel was abandoned in place and never used to control HPCI. This panel will be modified to include all the HCVS controls and indications needed by the operators to successfully comply with this order. This panel is located in the Auxiliary Building (AB) in close proximity to and on the same elevation as the main control room.

The existing HCVS wet well (torus) and DW path is currently designed and sized such that it complies with NRC Order EA-12-050 and can pass 1% of rated steam flow without exceeding a primary containment design limit. This compliance is possible as the original HCV was designed with potential power uprates in mind and thus was slightly oversized when constructed in 1992. Thus the sizing of the current Hardened Vent is within the requirements of NRC EA-12-050 and no sizing modification is needed.

A radiation monitor (D11N551) is located on the Auxiliary Building (AB) roof to give operators indication of release radiation levels and confirm valve alignment.

Table 1 provides a listing of HCVS components.

Table-1 Component Description

PIS #	Description
	Valves
T4600F400	Torus Exhaust Isolation Valve (AOV)
T4600F401	Torus 20" Purge Isolation Valve (AOV)
T4600F407	RBHVAC to SGTS Isolation Valve (AOV)
T4600F408	Div 2 SGTS Secondary Containment (SC) Inboard Isolation Damper (AOV)
T4600F409	Div 1 SGTS SC Inboard Isolation Damper (AOV)
T4600F410	RB5 Air Inlet Isolation Valve (AOV)
T4600F420	SC Hardened Vent Inboard Isolation Valve (AOV)
T4600F421	SC Hardened Vent Outboard Isolation Valve (AOV)
	Local Remote Panel
H21P101	HCVS Control Panel
	DC Power Sources
R3200S004	DC 260/130V Dual Battery (2PB) – Division 2
R3200S053	DC Battery 2B-1 Engineered Safeguard Systems 1-260V Voltmeter
R3200S054	DC Battery 2B-2 Engineered Safeguard Systems 1-260V Voltmeter
R3200S065	DC Reactor Building 130V Distribution Cabinet 2PB2-15

	Main Control Room Panels
H11P808	Control Room Panel Heating-Ventilation and Air Conditioning and SGTS Division 1, Combination Operating Panel (COP 808)
H11P817	Control Room Panel Heating Ventilation and Air Conditioning and SGTS Division 2 (COP 817)
	Radiation Monitoring
D11N551	Primary Torus Hardened Ventilation Exhaust Wide Range Radiation Monitor System Dual Range Gamma Detector
D11P302	Primary Torus Hardened Ventilation Exhaust Wide Range Radiation Monitor Process Controller

In response to NRC Order Number EA-12-050, DTE plans to modify the existing system to include the following:

i. HCVS Mechanical Components:

a) Containment isolation piping, valves and controls – The existing 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 consistent with the plant's containment isolation valve design basis. The torus isolation valves are air-operated valves (AOV) [normally closed, fail closed]. New DC powered solenoid valves (SOV) will be added to provide the opportunity to operate the valves from switches in the HCVS Control Panel H21P101 located at AB Third Floor, Elevation 641' 06". This area is also known as the "Division 2 Switchgear Room".

b) Other system valves and piping – The existing HCVS piping and supports downstream of the second containment isolation valve, including valve actuator pneumatic supply components, have been designed and analyzed to conform to requirements consistent with the applicable design codes for the plant.

c) Interface valves provide positive isolation to the interconnected systems. The HCVS shares part of its flow path with the Standby Gas Treatment System (SGTS). Prior to initiating the HCVS, the valves to the SGTS filters must be isolated. SGTS isolation valves are AOVs, with air-to-open and spring to shut. Additionally, the HCVS piping interfaces with the Reactor Building (RB) HVAC system as well as the Refueling Floor area of the Reactor Building 5th Floor (RB5). These two systems will have their isolation valves modified to be overridden closed when venting is required. Valve position indicating lights at the HCVS Control Panel H21P101 will verify all required valves are properly positioned.

d) Missile protection of the equipment on RB5 and the Auxiliary Building (AB) roof will be evaluated and modified as required.

ii. Instrumentation to monitor the status of the HCVS:

a) Instrumentation indications will be available at the new HCVS Control Panel H21P101. DC power source indication will be at the DC voltmeters R3200S053 and R3200S054 located at AB third floor Column F-11. N_2/air pressure indicator will be a local pressure gauge at the N_2/air bottles. The capability to monitor torus level, pressure and temperature will be provided using either the existing equipment located in the Main Control Room (MCR) or additional indication to be provided at the remote HCVS Control Panel. Detail design will determine the actual location and any additional controls, power or pneumatic supplies required.

b) Radiation monitor D11N551, installed in response to Generic Letter 89-16, is located on the vent line downstream of the last isolation valve T4600F421. The radiation monitor allows the operator to monitor HCVS effluent from the MCR.

c) HCVS vent flow path valves position indication, temperature and pressure instrumentation will be provided to monitor the status of the HCVS to aid the operator in verifying proper venting operation. Failure of the position indication instrumentation would not prevent opening and closing of the valves.

iii. Support systems:

a) Power for the new HCVS valve solenoids will be provided from the essential DC batteries source 130 VDC Div 2 Distribution Cabinet 2PB2-15. This source is backed by NRC Order EA-12-049, Reference 2 (FLEX) phase 2 supplemental DC supplied by small DC generators. Additionally, FLEX phase 2 supplemental AC generators will restore normal DC supply via the permanent battery chargers.

b) Detail design will determine the correct combination of permanent and FLEX power needed to provide DC power for a minimum of 30 hours.

c) Motive N_2/air supply for HCVS operation will be designed to be adequate for at least the first 30 hours of operation under prolonged SBO conditions provided by the N_2/air supply bottles located in the RB.

d) FLEX phase 3 equipment will have the capability to provide long term support for reliable HCVS operation past 30 hours. Power will be supplied via FLEX phase 3 arrangements to recharge 130V DC batteries with FLEX phase 3 provided AC generators. Motive N_2/air for HCVS operation will be supplied from an external compressor through the Non-Interruptible Air Supply (NIAS).

iv. System control:

a) Control valves and Containment Isolation Valves (CIVs) are operated in accordance with Emergency Operating Procedures (EOPs) to control containment pressure. The HCVS control air will be sized for five open/close cycles under prolonged SBO conditions. Separate control circuits will be provided for each valve. These modifications will not affect the normal function of the SGTS and containment isolation function.

The HCVS controls will provide for independent operation of the HCVS at Control Panel H21P101 and includes no automatic functions. Separate Containment Isolation (CI) signal override key-lock switches, necessary to support the HCVS function, will be installed in the Relay Room for T4600F400, T4600F401, and T4600F412. Jumpers will be installed in the relay room for T4600F407 and T4600F410 to defeat containment isolation function using procedure 29.ESP.22, Defeat of Primary Containment Vent Valve Isolations. The Fermi Relay Room is located directly below the Control Room. These features allow operation of the Containment Vent System from either the new HCVS Control Panel or the Main Control Room, dependent on the availability of both AC power and NIAS.

Inadvertent actuation protection will be provided by key-lock switches located at the HCVS Control Panel H21P101. Deliberate action will be required to activate HCVS components. Activation of any key-locked switch will be annunciated in the Control Room.

During normal plant operation, the DC power supply breaker to the HCVS Control Panel will be kept in the "OFF" position. This breaker will be turned to the "ON" position only following an event that requires operating the HCVS Control Panel H21P101.

Cables will be routed in accordance with all current design requirements.

Refer to Section 8 Figure 2 for Power Distribution.

<u>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.</u>

<u>Order EA- 12-050 Section 1.1.1 Requirement:</u>

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

<u>ISG Section 1.1.1 Criteria:</u>

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:

The operation of the modified Hardened Containment Vent System (HCVS) will be designed to minimize the reliance on operator actions in response to hazards identified in NEI 12-06, FLEX Implementation Guide (Reference 6).

Operation of the HCVS requires the operator to transit from the Control Room, across the hall to the AB third floor (AB3) switchgear room, where both the supply breaker for the HCVS panel and the panel itself are located. The only other action the operators need to perform is the overriding of containment isolation signals in the Relay Room, which is located in the same environment as the Control Room but one floor lower.

Operators will be able to monitor Torus pressure, level and temperature conditions, HCVS stack effluent from the MCR, and HCVS stack pressure and temperature from H21P101. No other remote locations need to be accessed for monitoring of the HCVS and the associated parameters.

The new HCVS valve controls and indications on HCVS Control Panel H21P101 are separate from the existing MCR controls. Key-lock switches will be provided to defeat a containment isolation signal and to prevent inadvertent valve actuation. DC power to the controls will be supplied from the R3200S065 to HCVS Control Panel H21P101. Valve position indication limit switches will be powered from the same DC control power as the DC Solenoid Operated Valves (SOVs). Valve position indication will be at the HCVS Control Panel H21P101.

This panel location on AB3 minimizes plant Operators' exposure to adverse temperature, radiological conditions, and is protected from hazards assumed in NEI 12-06.

A separate new N_2/air supply will be provided for the DC SOVs, located on the RB first, third and fifth floors. Exact locations on the floors will be finalized during the detailed design process. The N_2/air supply tanks will have pressure regulators, safety relief valves, and a pressure indicator at the N_2/air bottle.

Installed DC power may not be sufficient to support 24 hours of operation. Therefore the FLEX strategy involves providing DC power to the installed batteries prior to dropping below minimum voltage for operation of the required equipment. Initially, small generators (easily installed and located nearby) will provide sufficient DC power to sustain critical applications until the phase 2 FLEX equipment can be deployed to provide AC power to the permanent battery chargers.

Connections for supplemental equipment needed for sustained operation will be located in accessible areas protected from severe natural phenomena and minimize exposure to occupational hazards. No hand tools, jumpers, ladders, or scaffold are required for operation of the HCVS. Emergency/portable lighting will be available.

Order EA-12-050 Section 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 Section 1.1.2 Criteria:

During a prolonged SBO, the drywell, wetwell (torus), and nearby areas in the plant where HVCS 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:

The modified HCVS design will allow remote initiating, operating, and monitoring the HCVS from the HCVS Control Panel H21P101 located at AB third floor, Division 2 Switchgear Room. HCVS stack pressure and temperature will be indicated at HCVS Control Panel H21P101. Stack radiation monitor, torus temperature, level, and pressure indication will be indicated in the MCR. These locations minimize plant operator exposure to adverse temperature conditions caused by the SBO condition.

Connections for supplemental equipment needed for sustained operation will be located in accessible areas protected from severe natural phenomena and minimize exposure to occupational hazards. No hand tools, jumpers, ladders, or scaffold are required for operation of the HCVS. Emergency and portable lighting will be available.

During the detail design process, calculation or analysis will confirm that the environmental area temperature of the HCVS Control Panel location, will not adversely impact habitability.

Order EA-12-050 Section 1.1.3 Requirement:

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

ISG Section 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 deigned to function in this mode with permanently installed equipment providing electrical power (e.g., dc power batteries) and valve motive force (e.g., N_2/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:

The HCVS design will allow remote initiating, operating, and monitoring from the HCVS Control Panel H21P101 located at AB third floor, Division 2 Switchgear Room. HCVS stack pressure and temperature will be indicated at HCVS Control Panel H21P101. Stack radiation monitor, torus temperature, level, and pressure indication will be indicated in the MCR. This location minimizes plant operator exposure to adverse radiological conditions.

The HCVS utilizes piping that is built to withstand design pressures in containment. Testing of the system will be performed in accordance with the response to requirement 1.2.7 of this order. There is no ductwork in the Fermi 2 design.

The Fermi HCVS will utilize the existing Hardened Vent stack discharge at elevation 740' 0". This is above the RB roof elevation of 735' 6".The relationship to other area structures is discussed and justified in the response to Requirement 1.2.9.

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

Order EA-12-050 Section 1.2.1 Requirement:

The HCVS shall have the capacity to vent the steam/energy equivalent of one 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 Section 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 one 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 suppression pool 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 one percent, thereafter. Licensees shall have an auditable engineering basis for the decay heat absorbing capacity of their suppression pools, 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 one 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 one 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:

The existing HCVS was installed in 1992 per the requirements of Generic Letter 89-16 by Engineering Design Package (EDP) 10820.

The existing HCVS wetwell/DW path is designed and sized for venting energy in the form of steam at a nominal capacity of 1.1% of 3293 MWt thermal power which is 36.2 MWt. The vent size is designed to maintain the torus pressure below 53.9 psig, which is the Primary Containment Pressure Limit (PCPL), since it is the lower of the containment design pressure and the PCPL value. The additional 0.1% above the Generic Letter 89-16 requirement was added to allow for future power uprates. Fermi 2 implemented a power uprate to Current Licensed Thermal Power (CLTP) of 3430 MWt from the original licensed power level of 3293 MWt. Fermi 2 future power uprate plans are 3486 MWt; therefore, the HCVS needs to accommodate 34.86 MWt. The original design of the HCVS still meets the capacity requirements of the Order both at the current and planned power levels for Fermi 2.

Order EA 12-050 Section 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 Section 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, N_2/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/N_2 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 N_2 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:

The modified HCVS design allows initiating, operating, and monitoring the HCVS from a remote HCVS Control Panel H21P101 located approximately 100 feet from the MCR entrance on the same level. After the initial 30 hours, control will be from either panel H21P101 or the MCR depending on the power and pneumatic availability through FLEX phase 3. Both the

Division 2 Switchgear Room and the MCR are protected from adverse natural phenomena and are located within close proximity.

1. The existing HCVS flow path valves include eight (8) valves, six (6) AOV (T4600F400, T4600F401, T4600F408, T4600F409, T4600F420, and T4600F421) which are air-to-open and spring-to-shut, and two (2) valves (T4600F407 and T4600F410) which are air-to-shut and spring-to-open. Opening the flow path during station blackout requires energizing DC powered SOVs and N_2/air for motive force. Valves T4600F408 and T4600F409 fail closed, which is the desired position to isolate SGTS during HCVS operation. These valves will not require any motive N_2/air force or power during sustained operation. Valves T4600F407 and T4600F410 will be closed to establish the boundary to RB air space. These valves close once and will not be cycled. Valves T4600F400 and T4600F401 are opened to establish a flow path from the torus. These valves are also opened once and will not be cycled. Valves T4600F420 and T4600F421 will be opened to initiate HCVS.

   The initial stored motive N_2/air will allow for a minimum of five valve operating cycles, where only two (2) cycles are expected. Each of the six flow path valves that need to be operated will have dedicated DC powered SOV and all eight AOVs will have position indication. The SOVs are the only electrical components required for valve operation. The limit switch indication is considered an aid for the Operator to verify the AOV position. The DC power supply and N_2/air supply to the eight) AOVs will be adequate for the first 30 hours. Power and N_2/air supply after 30 hours will rely on FLEX phase 3 support. The response to NRC Order EA-12-049 will demonstrate this capability under the FLEX phase 3 effort to maintain the power and motive N_2/air requirements.

2. An assessment of temperature and radiological conditions that operating personnel may encounter both in transit and locally at the controls will be performed as part of design development to assure the HCVS can be operated and monitored during short term (30 hours) with prolonged SBO conditions.

3. Permanently installed HCVS equipment, including any connections required to supplement the HCVS operation during a prolonged SBO (e.g. electric power, N_2/air) are or will be located in areas protected from flooding as defined in NEI 12-06.

4. Valves required to open or remain closed via N_2/air motive force in the flow path are designed for remote manual operation following a prolonged SBO, i.e., no valve operation via handwheel, reach-rod or similar means that requires close proximity to the valve. Supplemental N_2/air connections will be pre-engineered to minimize man-power resources, will not require access inside the RB and any needed portable equipment will be reasonably protected from defined hazards in NEI 12-06.

5. Access to the locations described above (H21P101, DC power supply, and MCR) will not require the use of temporary ladders or scaffolding.

Order EA-12-050 Section 1.2.3 Requirement:

The HCVS shall include a means to prevent inadvertent actuation.

ISG Section 1.2.3 Criteria:

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.

Response:

There are numerous features that prevent inadvertent actuation of the HCVS. These features also adhere to the rules of a single failure not causing an inadvertent loss of the containment function during a DBLOCA.

The first feature is the DC control power. The breaker to power the HCVS panel will remain in the off position and will only be closed as directed by Operations procedures. All eight valves operated at the HCVS use DC solenoids that must be energized to function. Therefore without DC power it is reasonable to conclude the DC solenoids cannot re-position to the energized state.

Secondly, once the DC breaker is closed for the HCVS panel no operation can occur until an operator turns a key-lock switch for each of the eight valves on the panel. Each valve has its own key lock switch. Operation of any of the key-locked switches will annunciate in the Control Room. The circuit has no energized relays in its design that could fail and cause an inadvertent operation. Single point vulnerabilities are addressed through the use of separate control circuits for each of the DC and AC SOVs.

The third feature is continuing compliance with 10CFR50 App A, GDC 56, for containment isolation. There are no features associated with the HCVS jeopardizing compliance with this GDC. Additionally, as each valve has its own independent circuitry there is no one failure that could result in the loss of containment function.

Order EA-12-050 Section 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 Section 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:

The design of the HCVS will have valve position indication, stack pressure and effluent temperature indicated at the HCVS Control Panel H21P101. Containment pressure monitoring will be retained in the Control Room.

DC power source monitoring will be performed from DC voltmeters R3200S053 and R3200S054 located at the AB third floor in close proximity to the HCVS control panel. The same DC safety-related batteries also supply power to the containment instrumentation in the Control Room. N_2/air bottles will have pressure regulators with local pressure gauge indicators. Capacity and pressures associated with these N_2/air bottles will be determined in the detailed design process. Local confirmation of pressure will be part of daily operator rounds. This assures adequate quantity of N_2/air motive force is available for operation. Additionally, during phase 3 FLEX normal motive forces to the HCVS valves will be restored. Therefore, N_2/air monitoring during prolonged SBO conditions is not necessary.

The approximate range for the temperature indication will be 50°F to 600°F. The approximate range for the pressure indication will be 0 psig to 120 psig. The upper limits are approximately twice the required design containment temperature and pressure. The ranges will be finalized when the detailed design and equipment specifications are prepared.

The detailed instrument design will address the radiological, temperature, pressure, flow induced vibration and internal piping dynamic forces, humidity/condensation and seismic qualification requirements. Assumed radiological conditions are those expected after a prolonged SBO.

Order EA-12-050 Section 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 Section 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 to 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:

A Geiger-Mueller tube detector radiation monitor (D11N551) was installed in the stack with the existing HCVS in response to Generic Letter 89-16. The approximate range of the radiation monitoring system is 0.1 mrem/hr to 1000 mrem/hr. This range is considered adequate to determine core integrity per the NRC Responses to Public Comments document. (Reference 5)

The detector is mounted on the outside of the HCVS piping, accounting for the pipe wall thickness shielding in order to provide a measurement of the radiation level on the inside of the HCVS piping. The radiation level is indicated in the MCR. This detector provides dedicated monitoring of HCVS effluent.

Rechargeable lead acid batteries located in the radiation monitor currently provide a minimum of eight hours of operation. The battery backup is continuously trickle charged when the unit is being operated from AC power. Prior to venting HCVS power from the HCVS Control Panel H21P101 will be supplied to the D11N551 loop. The HCVS Control Panel H21P101 power will be provided by permanent plant DC power. This meets the requirements for sustained monitoring during a prolonged SBO.

Order EA-12-050 Section 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 Section 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:

The HCVS valve controls will be activated by key-lock switches to prevent accidental operation of the system or override of the safety-related function of the SGTS. The HCVS shares its flow path with the SGTS. Prior to venting through HCVS, valves T4600F407, T4600F408, T4600F409 and T4600F410 in the SGTS must be closed.

Valve T4600F407 is normally open and valve T4600F410 is normally closed, both are fail open AOVs that open to the RB atmosphere and ductwork to exhaust the RB atmosphere through the SGTS. Prior to venting through HCVS, both valves will be closed by the Operator from HCVS Control Panel H21P101. Both valves will have a dedicated N_2/air bottle to ensure that the valves do not open at any time once the system is actuated. Control and position indications for these valves will be provided on the HCVS Control Panel H21P101, with power supplied from the same power sources as the HCVS valves.

The SGTS exhaust isolation valves T4600F408 and T4600F409 are normally closed, fail closed AOVs. Both valves open on a secondary containment isolation signal. Prior to operation of the hardened vent, the Operator verifies the SGTS remains off and both valves T4600F408 and T4600F409 are closed. Position indications for these valves will be provided on the HCVS Control Panel H21P101.

Other systems that interface with the HCVS vent path will be evaluated for cross flow and design measures implemented as required to prevent cross flow.

The detailed design phase will review these to determine if the pressure boundary valves can meet the required leakage criteria under the limiting HCVS design conditions. If required, valves will be rebuilt and the soft valve seat replaced/upgraded. Leak testing of the system is discussed in the response to Requirement 1.2.7.

Fermi 2 is a single unit site, so cross flow between units is not applicable.

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 Section 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

<u>Response:</u>

The detailed design for the HCVS will address condensation accumulation resulting from intermittent venting. In situations where total elimination of condensation is not feasible, the HCVS will be designed to accommodate condensation, including allowance for applicable water hammer loads. The 24" system rises from the top of the torus which minimizes the possibility of water accumulation. The stack has a drain at the base to vent rainwater in the stack.

The modified HCVS Containment Isolation Valves will be tested in accordance with the licensing and design basis for the plant. Containment isolation valves are tested in accordance with the Fermi 2 10CFR50 Appendix J program. The modified HCVS downstream of outboard Containment Isolation Valves will be tested in conformance with American Society of Mechanical Engineers ASME-OM 2009 Subsection ISTC. The test pressure shall be based on the HCVS design pressure. Permissible leakage rates for the interfacing valves will be within the requirements of ASME OM – 2009, Subsection ISTC – 3630 (e), or later edition of the ASME OM Code.

When testing the HCVS volume, the allowed leakage will not exceed the sum of the interfacing valve leakages as determined from the ASME OM Code.

The test types and frequencies will conform to the Table in ISG Section 1.2.7 "Testing and Inspection Requirements" with the clarification that "Leak test the HCVS" applies to the HCVS boundary valves.

Some SGTS and communicating Nitrogen piping may be modified to create a limited pressure boundary for testing by:

1. Adding taps for pressure input
2. Adding taps downstream of the large valves for leak detection.
3. Adding isolation valves for testing the small lines.
4. Add an isolation flange or valve to test T4600F407 with back pressure.
5. Add an isolation valve or spectacle flange to isolate the RB 5th floor piping during testing.

Procedures will be prepared as part of the design process to execute the testing and inspection requirements.

Order EA-12-050 Section1.2.8 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 Section 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 suppression pool, and potential for water hammer from accumulation of steam condensation during multiple venting cycles.

Response:

The existing HCVS design pressure is 62 psig and design temperature is 300°F. The existing HCVS design pressure is the higher of the containment design pressure and the PCPL value. The existing HCVS design temperature is the saturation temperature corresponding to the design pressure.

The piping, valves, and valve actuators will be evaluated to ensure that they will withstand the dynamic loading resulting from the actuation of the HCVS, including piping reaction loads from valve opening, concurrent hydrodynamic loads from Safety Relief Valves (SRV) discharges to the torus, and potential for water hammer from accumulation of condensation during multiple venting cycles. The DW vent isolation valves will not be modified as part of this proposed modification. Venting through the torus vent valves is adequate to relieve containment pressure. Therefore, no DW venting is required.

Order EA-12-050 Section 1.2.9 Requirement:

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

ISG Section 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:

The Fermi HCVS will utilize the existing Hardened Vent stack discharge at elevation 740' 0". This is above the RB roof elevation of 735' 6".

The Fermi cooling towers have a much higher elevation than the HCVS stack, but they are not adjacent to the RB and are not occupied. The roof of the structure for the RB ventilation exhaust is elevation 748' 8" and the top of the stack is elevation 761' 0". Horizontally, the hardened vent stack centerline is 57' 6" from the RB ventilation exhaust structure and 115' 9" from the ventilation exhaust pipe vent centerline.

The potential to expose the structure above the existing HCVS stack to releases does not pose a hazard to plant staff or public; and therefore, it is unnecessary to raise the HCVS above the RB exhaust stack. The discharge point is 4' 6" above the RB. The release point will vent above the ventilation system intake and exhaust openings, MCR location, location of FLEX Operations, access routes required following a prolonged SBO, and emergency response facilities. The SGTS will not be operated if the hardened vent is operated and the isolation valves, T4600F408 and T4600F409 will be closed so there is no risk of back flow through the SGTS.

The detailed design will address missile protection from external events as defined by NEI 12-06 above the RB fifth floor level of elevation 684' 6", which includes the outside portions of the selected release stack and piping and equipment on RB5. This will be a design element using reasonable protection features for the screened in hazards from NEI 12-06 and Regulatory Guide 1.76 revision 1. Engineering will use design basis missile hazards methods in the calculations.

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

<u>Order EA-12-050 Section 2.1 Requirement:</u>

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.

<u>ISG Section 2.1Criteria:</u>

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

<u>Response:</u>

Fermi 2 is a Mark 1 containment design. In response to Generic Letter (GL) 89-16, Fermi 2 installed the HCVS under 10CFR50.59 in 1992 (Reference 10). Compliance with NRC Order EA-12-050, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents," will be achieved by manipulating the existing torus hardened vent valves. The HCVS vent path up to and including the second containment isolation piping and supports are designed in accordance with existing design basis. The HCVS system design will not preclude the containment isolation valves, including the vent valves, from performing their intended containment isolation function consistent with the design basis for the plant. Associated actuators, position indication, and power supplies are designed consistent with the design basis of the plant as required to maintain their design basis function of maintaining the valves closed. Separate DC control circuits with their own N_2/air motive force will allow operation of the HCVS from the remote control panel initially, and after 30 hours from the control room via their normal controls powered by FLEX phase 3 regardless of containment isolation signals.

Order EA-12-050 Section 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 Section 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:

The SGTS containment isolation valves are ASME Section III, Seismic Class I. Piping through the DW containment isolation valves is ASME Group B, 62 psig, 340°F. Piping through the torus containment isolation valves is ASME Group B, 62 psig, 300°F. Piping downstream of the containment isolation valves is ASME Group D, B31.1 Schedule 40 Seismic I, 62 psig, and 300°F. Pipe and support stress analysis Design Calculations (DC) DC-5448 Vol I, DC-2991 Vol IA, and DC-2991 Vol II DCD were prepared in response to Generic Letter 89-16 (Reference 10).

The hardened vent line on top the SGTS is a 10" schedule 40, B31.1 Seismic I, 62 psig, 300°F, carbon steel pipe routed from the 24" piping. SGTS inlet header on the RB 5th floor through the RB siding into the stack which discharges at an elevated location. Piping from the first spectacle flange downstream of the SGTS line to and including the stack is classified as Class D, QA I and Seismic I.

The HCVS up to RB5 is located in the seismically qualified, missile protected RB. Wind and tornado missile protection design criteria will be applied for components and pipe above the RB 5th floor level and on the AB roof.

The HCVS downstream of the second containment isolation valve, including piping and supports, electrical power supply, valve actuator pneumatic supply, and instrumentation (local and remote) components, will be designed/analyzed to conform to the requirements consistent with the applicable design codes and the Fermi 2 UFSAR (e.g., Non-safety, Category 1, and 300°F ASME or B31.1, NEMA 4, etc.) for the plant and to ensure functionality following a design basis earthquake.

The HCVS instruments, including valve position indication, process instrumentation, radiation monitoring, and support system monitoring, 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 344-1975, which is the Fermi 2 design basis.
3. Demonstration that instrumentation is substantially similar to the design of instrumentation previously qualified.

Instrument	Qualification Method*
HCVS Process Temperature	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Process Pressure	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Process Radiation Monitor	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Process Valve Position	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Pneumatic Supply Pressure	ISO9001 / IEEE 344-1975 / Demonstration
HCVS Electrical Power Supply Availability	ISO9001 / IEEE 344-1975 / Demonstration

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

Section 5: <u>Procedures and Training (Order EA-050 requirements 3.1 and 3.2)</u>

<u>Order EA-12-050 Section 3.1 Requirement:</u>

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.

<u>ISG Section 3.1 Criteria:</u>

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.

<u>Response:</u>

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

The HCVS procedures will be developed and implemented following the plant's process for initiating or revising procedures and contain as a minimum 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 (reference NEI 12-06), including the storage location of portable equipment,
- Training on operating the portable equipment,
- Testing and maintenance of portable equipment.

Fermi 2 will establish provisions for out-of-service requirements of the HCVS and compensatory measures. The following provisions will be documented in the Technical Requirements Manual (TRM) or other controlled 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 HCVS availability will be restored in a timely manner.
    - A cause assessment will be performed to prevent future unavailability for similar causes.

Order EA-12-050 Section 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 Section 3.2 Criteria:

All personnel expected to operate the HVCS 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:

Personnel expected to perform direct execution of the HVCS will receive necessary training in the use of plant procedures for system operations when normal and backup power is available and during prolonged SBO conditions. The training will be refreshed on a periodic basis and as changes occur to the HCVS. The training will utilize the systematic approach to training. In addition, per NEI 12-06, additional on-site personnel will be available to supplement trained personnel.

Section 6: Implementation Schedule Milestones

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.

Original Target Date	**Activity**	**Status**
October 2012	Hold preliminary/conceptual design meeting	Complete
October 2012	Submit 60 Day Status Report	Complete
February 2013	Submit Overall Integrated Implementation Plan	Complete
August 2013	Submit 6 Month Status Report	
October 2013	Design Change Package Issued for Fermi RF16	
February 2014	Submit 6 Month Status Report	
April 2014	Design Change Package Issued for Fermi Cycle 17 implementation	
April 2014	Fermi 2 Design Change Implemented for RF16	
August 2014	Submit 6 Month Status Report	
October 2014	Fermi 2 Design Change Package Issued for Fermi RF17	
February 2015	Submit 6 Month Status Report	
August 2015	Design Change Implemented for Cycle 17	
August 2015	Submit 6 Month Status Report	
December 2015	Fermi 2 Design Change Implemented for RF17	
December 2015	Demonstration/Functional Test	
December 2015	Procedure Changes Training Material Complete	
December 2015	Procedure Changes Active	
February 2016	Submit 6 Month Status Report	

Section 7: 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

Section 8: Figures/Diagrams

Figure 1 – Flow Diagram of Hardened Vent System

Figure 2 – Power Supply for Hardened Vent System

Figure 1 – Flow Diagram of Hardened Vent System

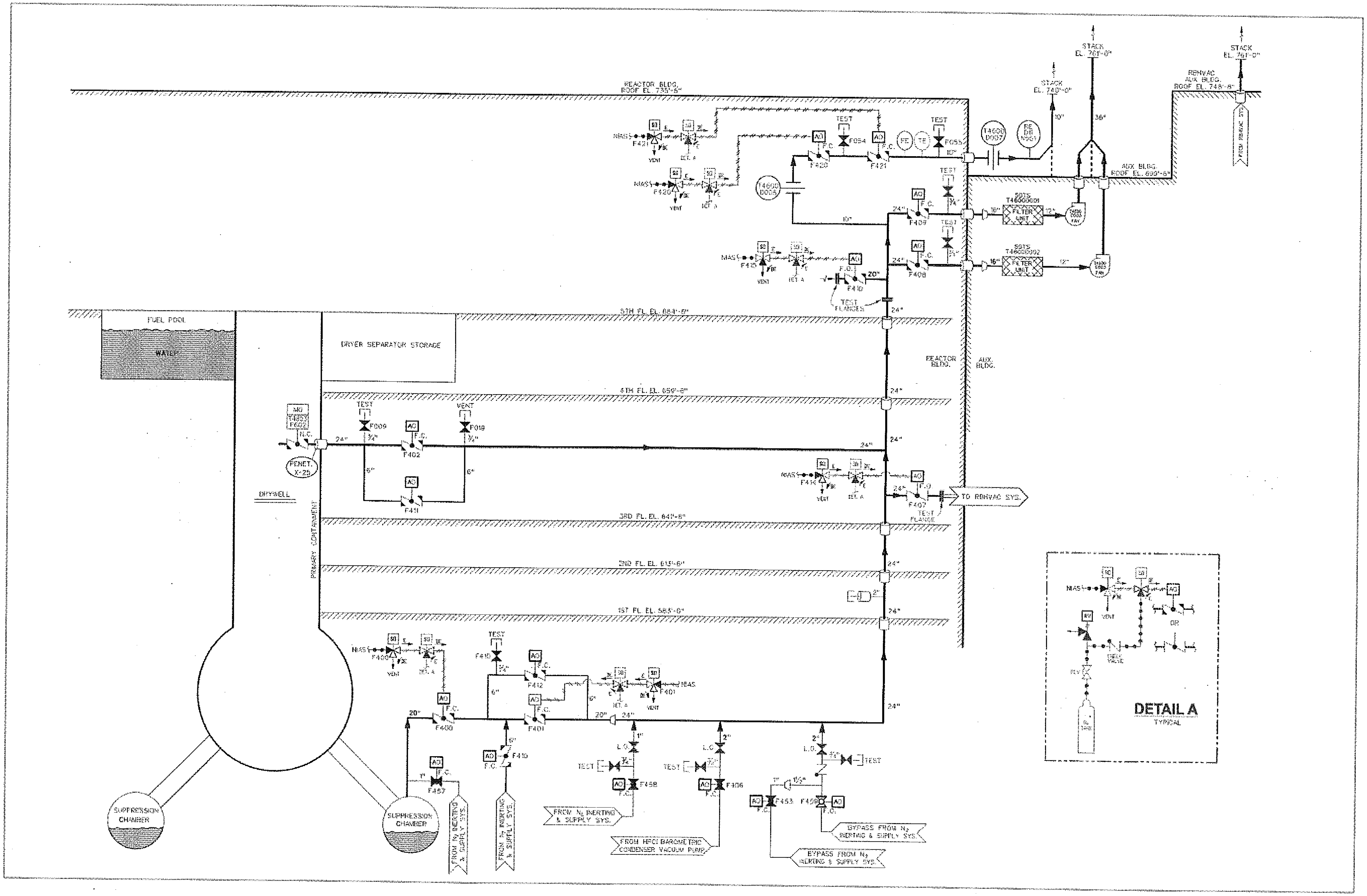

Figure 2 – Power Supply for Hardened Vent System