Entergy

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BVY 13-064

July 17, 2013

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
11555 Rockville Pike
Rockville, MD 20852

SUBJECT: Response to Request for Additional Information Regarding Overall Integrated Plan For Mitigation Strategies For Beyond-Design-Basis External Events (Order Number EA-12-049)
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

REFERENCE:

1. NRC Order Number EA-12-049, Order To Modify Licenses With Regard To Requirements For Mitigation Strategies For Beyond-Design-Basis External Events, dated March 12, 2012
2. Vermont Yankee Overall Integrated Plan in Response to March 12, 2012 Commission Order to Modify Licenses With Regard to Requirements For Mitigation Strategies For Beyond-Design-Basis External Events (Order EA-12-049), BVY 13-017, dated February 28, 2013
3. NRC Request for Additional Information Regarding Overall Integrated Plan In Response to March 12, 2012 Commission Order to Modify Licenses With Regard to Requirements For Mitigation Strategies For Beyond-Design-Basis External Events (Order EA-12-049), NVY 13-065, dated June 17, 2013 (TAC No. MF0779)

Dear Sir or Madam:

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued an order (Reference 1) to Entergy Nuclear Operations for Vermont Yankee. Reference 1 required submission of an Overall Integrated Plan which was provided by Reference 2. In Reference 3, the Nuclear Regulatory Commission issued a request for additional information (RAIs) due within 30 days.

The attachment to this letter provides the RAI responses for Vermont Yankee which are based upon the current, but preliminary design information and vendor input, which is subject to change as our design is further developed and finalized.

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NRR

This letter contains no new regulatory commitments.

If you have any questions regarding this report, please contact Mr. Robert J. Wanczyk at (802) 451-3166.

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

executed on July 17, 2013.

Sincerely,

CJW / PLC

Attachment:

1. Entergy Response to Request for Additional Information (RAI) Regarding the Vermont Yankee Overall Integrated Plan (OIP) for NRC Order EA-12-049, Mitigating Strategies for Beyond Design Basis External Events (BDBEE)

cc: Mr. William M. Dean
Regional Administrator
U. S. Nuclear Regulatory Commission, Region 1
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NRC Senior Resident Inspector
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Mr. Christopher Recchia, Commissioner
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ATTACHMENT 1

ENTERGY RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI) REGARDING THE VERMONT YANKEE OVERALL INTEGRATED PLAN (OIP) FOR NRC ORDER EA-12-049, MITIGATING STRATEGIES FOR BEYOND DESIGN BASIS EXTERNAL EVENTS (BDBEE)

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (RAI)

049-RAI-Vermont Yankee-1

Please identify any License Amendment Requests that are necessary for modifications proposed in the integrated plan.

Entergy Response:

No License Amendment Requests (LARs) have currently been identified as required. Identification of the necessary LARs, requested in the above request for additional information will become available later in the design development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

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Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," provided for the installation of wetwell vents in BWR Mark I containments "primarily to avoid exceeding the primary containment pressure limit." Installation of the hardened vents under the provisions of 10 CFR 50.59 was appropriate because there were no changes to procedures as described in the licensee's final safety analysis reports, as updated, that would allow opening the vents; opening the vents was to only occur at pressures exceeding peak calculated containment accident pressures. Opening of the hardened vent was primarily accepted as a last resort effort to be employed when exceeding the primary containment pressure limit was imminent and all other viable mitigation strategies had been exhausted without yielding a successful result. The portion of the VY response on page 24 follows directly from this position when it states, in part, "... if the maximum containment pressure is reached, EOP [Emergency Operating Plan] requires operators to vent the containment."

The design pressure of the VY containment is 56 pounds per square inch gauge (psig), but page 24 of the response also states, in part, "torus venting is assumed to open at an approximate pressure of 30 psig...."

The response does not propose venting at 30 psig as an extreme, last resort action to prevent the containment from experiencing an uncontrolled release. The staff has not previously reviewed or accepted "early venting" as a mitigation strategy to compensate for limitations in core cooling caused by the use of existing equipment, e.g., reactor core isolation cooling (RCIC). In light of this, please provide a discussion of the technical and regulatory bases which were relied upon to justify this approach. In the response, please include a detailed discussion of whether any plant modifications were considered that would maintain both core cooling and preserve containment integrity during an Extended Loss of AC Power (ELAP) without employing "early venting"?

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

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Several of the time constraints identified in Attachment 1A are either identical or very close to analytically determined values. For example, the analytical value for operator action to stem the rise in the main control room temperature is 2.5 hours and the time restraint is 2.4 hours (pages 36, 47, and 5). Another example is in order to remain in the safe region of the heat capacity temperature limit (HCTL) the analytical value of 7.5 hours is cited as the time it takes to depressurize the reactor pressure vessel (RPV). This value is the same as the time restraint (pages 12 and 47). Similarly, the time constraint of 9.5 hrs for refilling the condensate storage tank (CST) is the same as the analytically determined value (pages 12 and 48). Unless the analysis is conservative, the required action times have minimal or no margins when compared to the analytically determined values.

Provide a basis that describes how the time constraints can reasonably be met as described in Nuclear Energy Institute's (NEI) 12-06, Section 3.2.1.7, Principle 6

Entergy Response:

A staffing study will be performed to demonstrate that sufficient action time margin is available. This effort will include comparison of the available analytical timing and margin with the staffing study results.

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Page 7, Item 4.c states, "equipment needed for the station blackout (SBO) coping duration is available at the site once Phase 2 is implemented." Identify equipment needed for the SBO coping duration that is being credited for ELAP during Phase 2. Specify if this equipment is permanently installed equipment or portable equipment.

Entergy Response

Item 4.c from the Overall Integrated Plan (OIP), and noted above in the RAI, was provided in support of the OIP Attachment 1A time line and its related discussion of time constraints beginning on Page 5 of the OIP. This statement was intended to mean that, as for SBO, the equipment credited for ELAP Phase 2 is already at the site.

No portable equipment required for the SBO coping duration is credited for ELAP during Phase 2. Some permanently installed equipment (e.g., RCIC, batteries, SRVs, etc.) which may be required for SBO coping is also required for ELAP; however, any AC power source credited for the SBO analysis is not credited during an ELAP.

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On page 36, the Main Control Room Accessibility section indicates that the assumed maximum temperature for efficient human performance is 110°F, as described in NUMARC 87-00. It further states that through the use of smoke ejectors and by removing ceiling tiles, the main control room temperature can be maintained at this temperature for up to 72 hours. However, NUMARC 87-00 also indicates that the technical basis for defining the habitability standard comes from MIL-STD-1472C, which concludes that 110°F is tolerable for light work for a 4 hour period while dressed in conventional clothing with a relative humidity of ~30%. In light of these conflicting technical bases, please provide justification for the long term habitability of the main control room and/or please indicate what additional relief efforts for the main control room staff will be provided (e.g. short stay time cycles, use of ice vests/packs, supplies of bottled water, etc.).

Entergy Response

Long term habitability will be assured by monitoring of control room conditions, heat stress countermeasures, and rotation of personnel to the extent feasible. At VY, the impact to habitability would be primarily from elevated temperatures. Initially, there would be some delay in the Control Room air temperature increasing to outside air temperature. Therefore, the VY FLEX Support Guidelines will provide guidance for control room staff to evaluate the control room temperature and take actions as necessary. VY is storing bottled water on site as part of the miscellaneous items to support the FLEX strategy. In addition, current general site training includes a module on the recognition of dehydration along with methods to cope. VY is also evaluating the use of passive cooling technologies to be used for response personnel. Additional information will be provided in a future six-month update.

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The integrated plan states that the engineered safety feature (ESF) switchgear rooms and the residual heat removal (RHR) rooms will exceed a limit of 110°F. In the case of the ESF switchgear rooms, the plan states that, without reference to a technical basis, the temperatures would be reduced to 108°F and 105°F for the east and west switchgear rooms respectively, but relies on a maximum temperature of 114°F determined in the switchgear room heatup calculation.

In the case of the RHR rooms, the plan states that the temperature will be below 148°F during the time in which the RHR pump and two RHR service water pumps would be placed into service. It discusses industrial safety procedures to prevent adverse impacts on personnel due to heat stress, but provides no further information on the provisions of protective clothing, other equipment provided to protect operators, or on the extent of potential local operator actions necessary in these locations.

Please discuss planned provisions for access to these areas.

Entergy Response

FLEX strategies include re-energization of equipment in the East and/or West ESF Switchgear rooms. The FLEX strategies require access to the ESF switchgear rooms to perform mitigation actions to make connections between the portable FLEX power sources and permanent electrical equipment that is required to be repowered such as 480 V buses and/or battery chargers; however, continuous occupation of these areas is not required. Since the primary heat source for these areas is AC powered electrical equipment, the heat addition to the areas prior to the re-energization of the electrical equipment will be minimal. In addition, the primary strategy includes repowering the Control Building air handling units in Phase 3, which will return normal air flow and reduce temperatures. Intermittent access may be required to check operation of equipment or evaluate room conditions. When access is required, a course of action will be established based on existing area conditions and in accordance with station procedures, to provide protection to personnel from high temperatures.

The RHR system will be placed in service in the torus cooling and/or shutdown cooling mode in Phase 3. With reasonable assumptions concerning room heat load at the time of the ELAP, calculations show that the ECCS pump rooms would only heat up to 136°F at 72 hours at which time a large DG from the Regional Response Center will be available to power the 4160V switchgear and provide ventilation to the ECCS pump rooms. The primary strategy for RHR startup (for torus cooling or shutdown cooling) will require access to the RHR pump rooms for system fill and vent prior to system startup. When access is required, a course of action will be established based on existing area conditions and in accordance with station procedures, to provide protection to personnel from high temperatures.

Protective measures for heat stress at VY include storage of bottled water on site as part of the miscellaneous items to support the FLEX strategy and training on the recognition of dehydration along with methods to cope. In addition VY is evaluating the use of passive cooling technologies to be used for response personnel. Additional information will be provided in our future six-month updates.

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The strategies for regulating the temperature in the main control room and the RCIC room, as well as ventilation strategies for the battery room and the spent fuel pool area involve propping open of doors to these rooms, or doors to stairways and equipment hatches. Please indicate what security measures have been considered or will be implemented in light of these open pathways.

Entergy Response

NEI 12-06, Sections 2 and 3.2.1.3, Initial Condition (9), states that there are no prior or simultaneous security events with an ELAP. Security measures used will be dependent upon the physical condition of the plant following and during the BDBEE. Priority will be given to maintaining core and spent fuel pool cooling.

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With regard to the load shedding of the DC bus in order to conserve battery capacity:

a. **Provide the DC load profile for the mitigation strategies to maintain core cooling, containment, and spent fuel pool cooling during all modes of operation. In your response, describe any load shedding that is assumed to occur and the actions necessary to complete each load shed. Also provide a detailed discussion on the loads that will be shed from the dc bus, the equipment location (or location where the required action needs to be taken), and the required operator actions necessary and the time to complete each action. In your response, explain which functions are lost as a result of shedding each load and discuss any impact on defense-in-depth strategies and redundancy.**

b. **Identify any plant components that will change state if vital ac or dc power is lost or de-energized during the load shed. The staff are particularly interested in whether a safety hazard is introduced, such as de-energizing the DC-powered seal oil pump for the main generator and allowing hydrogen to escape, which could contribute to risk of fire or explosion in the vicinity from the uncooled main turbine bearings.**

c. **Identify DC breakers that must be opened as a part of the load shed evolution.**

d. **Identify whether the DC breakers that must be opened will be physically identified by special markings to assist operators in manipulating the correct breakers.**

Entergy Response:

Finalization of the DC bus load shedding needed to conserve battery capacity, and the associated operator actions is not complete. Likewise, the load shedding procedures have not been developed. Completion of these activities is necessary to provide a comprehensive response to this request for additional information (RAI). Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

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The licensee states that their batteries can last at least 9 hours. The Institute of Electrical and Electronics Engineers (IEEE) Standard 535-1986, "IEEE Standard for Qualification of Class 1E Lead Storage Batteries for Nuclear Power Generating Stations," as endorsed by Regulatory Guide 1.158, "Qualification of Safety-Related Lead Storage Batteries for Nuclear Power Plants," provides guidance for qualifying nuclear-grade batteries and describes a method acceptable to the NRC staff for complying with Commission regulations with regard to qualification of safety-related lead storage batteries for nuclear power plants. Provide documentation that shows that your battery cells fully comply with the qualification principles in clause 5 and meet the requirements in clause 8.2 of IEEE Standard 535, for the duration you are crediting the station batteries in your

mitigating strategies integrated plan (See Agencywide Documents Access and Management System Accession No. ML13094A397 for additional information).

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

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In the discussion of safety relief valve (SRV) control on pages 5 and 6 of the integrated plan, Entergy assumes that battery power for SRV control is available throughout Phases 1 and 2 by providing a FLEX diesel generator (DG) to power the battery chargers at approximately 8 hours. Describe Entergy's basis for concluding that this time constraint can reasonably be met as specified in NEI 12-06, Section 3.2.1.7, Principle 6 given the potential limitation of battery capability as discussed above.

Entergy Response

NEI 12-06, Section 3.2.1.7, Principle 6 states the following:

Strategies that have a time constraint to be successful should be identified and a basis provided that the time can reasonably be met.

Staging of the FLEX DG will begin at approximately five hours after event initiation. The FLEX DG will be readily accessible and protected because it will be maintained in an on-site FLEX storage buildings that meet the requirements of NEI 12-06. The FLEX DG will be transferred and staged via haul routes and staging areas evaluated for impact from external hazards. Modifications to buses 8 and 9 will be performed to allow simplified connection of the FLEX DG to the 480V Buses. Programs, procedures, and training will be implemented to support staging and operation of FLEX DG.

When design for the connection points is finalized and FLEX DGs procured, a staffing study will be completed to confirm the ability to accomplish the task by the 8 hour constraint time listed in the OIP.

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Describe how the portable/FLEX diesel generators and the Class 1E diesel generators are isolated to prevent simultaneously supplying power to the same Class 1E bus in order to conform to NEI 12-06, Section 3.2.2, guideline (13), which specifies that appropriate electrical isolations and interactions should be addressed in procedures and guidance.

Entergy Response

At the onset of the ELAP, Class 1E diesel generators (DGs) are assumed to be unavailable to supply the Class 1E busses. Portable DGs are used in response to an ELAP in FLEX strategies for Phases 2 and 3. At the point when ELAP mitigation activities require tie-in of FLEX diesel generators, in addition to existing electrical interlocks, procedural controls, such as inhibiting diesel generator start circuits and breaker rack-outs, will be employed to prevent simultaneous connection of both the FLEX DGs and Class 1E diesel generators to the same AC distribution system or component. Should the 4160V Class 1E DGs become available during the BDBEE, they could be restarted to provide power to their associated 4160V busses to repower divisional loads where safe and appropriate; this would also be procedurally controlled. FLEX strategies, including the transition from installed sources to portables sources (and vice versa), will be addressed in the FLEX procedures and guidance which are in the development stage.

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Provide the minimum DC bus voltage that must be maintained to ensure proper operation of all required electrical equipment.

Entergy Response

To maintain required component functionality, the minimum voltage for Battery A-1 is 107 VDC. The minimum voltage for Battery B-1 is 108 VDC.

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The second bullet on page 5 of the Vermont Yankee (VY) integrated plan indicates that entry into ELAP will occur at one hour to conservatively reflect the need to verify the entry conditions and validate that emergency diesel generators are not available based on Plant procedure OPOT-3122-02, "Station Blackout," Revision 1. The third bullet on page 5 indicates that load shed initiated by the SBO procedures will be completed by approximately one hour. This is documented in the VY Overall Integrated Plan, Attachment 1A as simultaneously occurring. Explain how operators will simultaneously identify an ELAP condition and complete all DC load shedding. Is this an action to be performed by a dedicated operator? Describe the basis for concluding that these time constraints can reasonably be met as specified in NEI 12-06, Section 3.2.1.7, Principle 6.

Entergy Response

Identification of the ELAP condition and completion of the DC load shedding will not occur simultaneously. Initial shedding of some loads (e.g., emergency lube oil pumps for recirculation pump motor generators, main turbine, seal oil) will be performed during the first hour in accordance with procedure OPOT-3122-02, "Station Blackout. Operations." Confirmation that the EDGs are unavailable will be accomplished in one hour, at which time deep load shedding will begin. It is estimated that deep load shedding can be accomplished in approximately 30 minutes. Therefore, the Sequence of Events Timeline (VY FLEX OIP Attachment 1A) and the Time Constraints discussion (pages 5 and 6 of the VY FLEX OIP) will be updated to reflect load shedding beginning at one hour after the BDBEE occurs and being completed in 30 minutes.

The estimated load shedding time is based on the location of the breakers needed to facilitate the deep load shed, the identification markings that will be added to the breakers required to be opened, procedures that will provide direction on the load shedding, and realistic assumptions related to operator actions necessary to perform the load shedding as described in the FLEX strategies. Presently, the battery discharge calculations prepared to support the FLEX strategies are based on deep load shedding being completed at one hour into the event. Therefore, these calculations are required to be updated to reflect the revised battery load shed completion timeline.

Based on the current project schedule for VY, this updated information is estimated to be available prior to the end of September 2013; therefore, this information is currently planned to be provided to NRC in the second six-month status report scheduled to be submitted on February 28, 2014.

049-RAI-Vermont Yankee-14

The licensee stated that "if onsite diesel fuel reserves are needed to operate temporary equipment, there are two locations to obtain diesel fuel." The first option would be the fuel oil storage tank. The second option would be the two diesel generator (DG) day tanks." Describe the design of these tanks (e.g., seismically qualified or robust?).

Entergy Response

Diesel fuel for the standby diesel generators is stored in the 75,000 gallon fuel oil storage tank located in the yard adjacent to the Turbine Building. There are also two 800 gallon standby diesel generator day tanks (one per standby diesel generators). The fuel oil storage tank and day tanks are Class I equipment. UFSAR Section 12.2.1.2 describes the seismic design of Class I structures and equipment.

The day tanks are located in the diesel generator building which is a Class 1 structure.

The fuel oil storage tank is located outdoors and is partially below grade for missile protection. The protected section of the tank contains about 25,000 gallons of fuel oil as discussed in UFSAR Section 8.5.4. The tank is protected by tornado walls which are Class I structures that have been designed to withstand short-term tornado winds up to 300 mph as discussed in UFSAR Section 12.2.1.

The portions of the Turbine Building that support and protect the diesel generators and fuel oil day tank areas are of Class I seismic design and strengthened where required to meet Class I requirements as described in UFSAR Sections 12.2.1.1.1 and 12.2.3.2.

049-RAI-Vermont Yankee-15

The licensee stated that "in this case, the reliable hardened vent (RHV) system will be used as implemented per EA-12-050 to vent containment with control from the control room (CRP 9-25)." Describe the power requirements for the valves and indication or instrumentation and how the power will be supplied.

Entergy Response:

Reliable, hardened containment vent requirements were originally given in Generic Letter 89-16 and later in NRC Order EA-12-050. NRC Order EA-13-109, June 6, 2013, rescinds the requirements of NRC Order EA-12-050. Compliance with the requirements of NRC Order EA-

12-050, including applicable schedule deadlines for submittals or implementation, is no longer required. The industry, through NEI and the owners' group, is addressing the new requirements provided in NRC Order EA-13-109 on the schedule outlined in NRC Order EA-13-109.

The concern presented in the above request for additional information (RAI) are associated with generic industry concerns and are being addressed by NEI, the owners' group, and the NRC staff. Information to address the Phase 1 requirements of NRC Order EA-13-109 will be provided in the integrated plan to be submitted June 30, 2014.

049-RAI-Vermont Yankee-16

Regulatory Position C.6 in Regulatory Guide 1.128, "Installation Design and Installation of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," states that conformance with the IEEE Std. 484-2002 requirements (indicated by the verb "shall") for installation design and installation of vented lead-acid storage batteries for nuclear power plants provides an adequate basis for complying with the design, fabrication, erection, and testing requirements set forth in GDCs 1, 17, and 18 of Appendix A to 10 CFR Part 50, as well as Criterion III of Appendix B to 10 CFR Part 50, subject to the following stipulation: In Subsection 5.4, "Ventilation," revise the second sentence to be consistent with Regulatory Guide 1.189, as follows: "The ventilation system shall limit hydrogen accumulation to one percent of the total volume of the battery area."

The licensee stated that "the accumulation of hydrogen from the batteries located in the battery room would not exceed 4% concentration in the battery room in 2.5 days (36 hours) with a complete loss of the ventilation system (Reference 2, Section 8.6.4).

Discuss the accumulation of hydrogen with respect to national standards and codes which limit hydrogen concentration to less than 1% according to the National Fire Code and Regulatory Guide 1.128, "Installation Design and Installation of Vented Lead-Acid Storage Batteries for Nuclear Power Plants," which endorses IEEE Standard 484, with exceptions.

Entergy Response

Vermont Yankee is not committed to Regulatory Guide 1.128, Regulatory Guide 1.189, or IEEE Standard 484-2002. The strategy will meet the plant's design basis of $\leq$ 4% hydrogen accumulation in 2.5 days (60 hours) with the complete loss of ventilation as described in UFSAR Section 8.6.4 and in the OIP. (Note: "36 hours" as shown in the RAI above and in the OIP on page 38 was a typographical error and is corrected to be "60 hours".) The typographical error of "36 hours" on page 38 of the OIP will be corrected to "60 hours". Based on the current project schedule for VY, this updated information is currently planned to be reflected in the first six-month status report scheduled to be submitted on August 28, 2013

049-RAI-Vermont Yankee-17

The licensee stated that "there are two strategies for venting the battery rooms. The primary strategy will be to repower the existing exhaust fan which is connected to the

emergency power bus. The alternate strategy is to prop open doors and set up portable fans." Provide a discussion on the hydrogen gas exhaust path for each strategy.

Entergy Response:

The strategy used to provide ventilation of the battery rooms while the batteries are being recharged will be specified in the procedures which are in the development stage. Response to this request for additional information (RAI) is deferred until later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-18

The integrated plan contains insufficient information to support a conclusion that considerations 2 through 4 of NEI 12-06, Section 5.3.3, will be taken into account in the development of the mitigation strategies pursuant to Order EA-12-049. These considerations address the potential impacts of large internal flooding sources that are not seismically robust and do not require ac power, the potential reliance on ac power to mitigate ground water, and the potential impacts of non-seismically robust downstream dams. Please discuss the effects of these considerations on the strategies being developed at VY pursuant to EA-12-049.

Entergy Response

The following discusses potential impacts of large internal flooding sources that are not seismically robust and do not require ac power, the potential reliance on ac power to mitigate ground water, and the potential impacts of non-seismically robust downstream dams per the guidance of NEI 12-06 Section 5.3.3 considerations 2 through 4:

2. Consideration should be given to the impact from large internal flooding sources that are not seismically robust and do not require AC power (e.g. gravity drain from lake or cooling basins for non-safety-related cooling water systems).

   Vermont Yankee Individual Plant Examination External Events (IPEEE) Rev. 1 evaluated the plant for potential internal floods. Nine potential internal flooding events were identified in Section 5.4.4.3 that could impact the plant. Seven of these flooding events are eliminated as a potential flooding concern during a FLEX event because they rely on AC driven pumps to supply the potential break with no potential for gravity feed of the potential break. The two scenarios that have a potential of flooding areas following a pipe break either by gravity or from a non-AC driven pump are discussed below:

   - The Fire Water piping breaks can be fed by a diesel driven fire pump. One of the two scenarios includes the potential for a break in the fire water piping in the RCIC room. The current flooding analysis takes credit for plant equipment that is not credited in the FLEX response. A design change is being considered to address the potential for flooding in the RCIC room caused by the failure of the fire water piping.

- The second scenario of concern involves the potential for a break in the Service Water piping in the reactor building. The Service Water piping is divided into non-seismic portion and a seismic Class I portion. The non-seismic portion of the large bore SW supply piping can be isolated via automatic or manual remote closure of motor operated valves. The seismic Class I portion of the Service water piping would not be expected to fail during a seismic event, but procedural actions have been developed to address a potential pipe break. Actions to isolate the potential flooding are contained in procedure ON 3148, Revision 18.

3. For sites that use ac power to mitigate ground water in critical locations, a strategy to remove this water will be required.

   The plant does not credit any safety related active AC powered dewatering systems for mitigating ground water intrusion into the portions of the plant which contain SSCs credited in the FLEX strategies or that require access for personnel during the BDBEE.

4. Additional guidance may be required to address the deployment of FLEX for those plants that could be impacted by the failure of a not seismically robust downstream dam.

   The Vernon dam is immediately downstream of the Vermont Yankee. IPEEE Rev 1 Section 3.2.1.2.1 determined that the Vernon Dam would withstand a seismic event.

   However, a failure of the Vernon Dam was considered in the UFSAR, Sections 10.8, 11.9.3, and 12.2.6.5. The Alternate Cooling system and deep basin were designed to address the potential loss of the ability to take water from the Connecticut River in the event of a failure of the Vernon Dam. As stated in the OIP, the FLEX strategy utilizes the deep basin for replenishing the CST as a suction source for RCIC (primary strategy) or for providing core cooling directly (secondary strategy). No additional guidance is required to address the failure of downstream dams.

049-RAI-Vermont Yankee-19

The response identifies the limiting source of external flooding as being regional precipitation, which NEI 12-06 characterizes in Table 6-1 as having warning time in days and persistence in months. Failing to apply the longer warning time in the development of the strategies would not enable a licensee to make use of the allowances of NEI 12-06, Section 6.2.3.2, consideration 1 for pre-event preparations, which would be conservative to a set of strategies making use of that consideration. However, failing to characterize the persistence of an external flooding hazard prevents the staff from concluding that NEI 12-06, Section 6.2.3.2, Consideration 2 on the ability to move equipment and restock supplies during a flood with long persistence has been appropriately addressed. Please discuss the persistence of the external flooding hazard.

Entergy Response:

Design of storage facilities, specification of FLEX equipment, protection of FLEX equipment, control of FLEX equipment, implementation of FLEX strategies, and protection of safety related plant structures from FLEX equipment will be determined during the design development and procedure development phase. These procedures will address the persistence of an external flooding hazard. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-20

The integrated plan response presents information on Entergy's participation in the industry regional response centers for phase 3 equipment sufficient to allow the staff to conclude that there is reasonable assurance that Entergy will establish a capability to obtain equipment and commodities to sustain and backup the site's coping strategies as specified in NEI 12-06, Section 12.2, item 1. However, Entergy has provided insufficient information to allow the NRC staff to conclude that items 2 through 10 of that section will be adequately addressed. Please discuss.

Entergy Response

Entergy is actively involved in industry initiatives to establish the Regional Response Centers (RRC) which are described in the OIP and required for implementation of Phase 3 per the VY FLEX strategy. The industry has contracted with the Strategic Alliance for FLEX Emergency Response (SAFER) organization through Pooled Equipment Inventory Company (PEICo) to establish and operate the Regional Response Centers as part of PEICo's existing Pooled Inventory Management (PIM) Program. The contract with PIM will address the items in NEI 12-06, Section 12.2.

049-RAI-Vermont Yankee-21

The integrated plan response presents no information on the identification of plant procedures and guidance of portable lighting such as flashlights, headlamps and communications systems necessary for ingress and egress to plant areas, which is required for deployment of the strategies as discussed in NEI 12-06, Section 3.2.2, paragraph (8). Please discuss.

Entergy Response

Part of the standard gear/equipment of operators with duties in the plant (outside the main control room (MCR)) includes flashlights. This requirement is currently in procedure EN-OP-115-01, Operator Rounds and will be added to procedure OP 0150, Conduct of Operations, while lighting for the MCR will be maintained throughout the event by the DC powered control room emergency lighting system.

Although not credited, in addition, Appendix R lighting provides for emergency lighting in select areas of the plant, where operators or maintenance personnel may need to perform actions, during loss of power conditions. The Appendix R lights have batteries that last for a minimum of 8 hours.

The existing site radio system will be used for communications between MCR staff and operators/emergency personnel in the plant. This method of communication was described in Vermont Yankee's response to the 10 CFR 50.54(f) information request for NTTF

Recommendation 9.3, Emergency Preparedness Communications. The NRC reviewed and found Vermont Yankee's communications assessment to be reasonable and that existing systems, enhancements, and interim actions would ensure communications are maintained. This conclusion is documented in a letter to Vermont Yankee titled, "Staff Assessment In Response To Recommendation 9.3 of the Near-Term Task Force Related to the Fukushima Dai-Ichi Nuclear Power Plant Accident", dated May 21, 2013, ADAMS Accession No.ML13127A176.

049-RAI-Vermont Yankee-22

Page 8 of the integrated plan discusses programmatic controls that will be implemented, but it omits discussions of unavailability control for equipment and connections per NEI 12-06, Sections 3.2.2 and 11.5. Please discuss.

Entergy Response

The unavailability of FLEX mitigation equipment that supports a key safety function (i.e., less than N+1 available or all unavailable) and the unavailability of applicable connections required to implement a key safety function (i.e., loss of either or both of the primary or alternate connection points) will be controlled by site procedures and programs. The actions required when FLEX equipment or connections become unavailable will meet the guidance established in NEI 12-06 Sections 3.2.2 and 11.5.

The unavailability of installed plant equipment is controlled by existing plant processes such as the Technical Specifications.

049-RAI-Vermont Yankee-23

The nitrogen gas supply to the safety relief valves is non-seismic and so may be lost. The plant operators will rely on backup N2 bottles that need to be replaced within 72 hours. Discuss access and protection of the connections for the nitrogen bottles.

Entergy Response

Generic Letter (GL) 87-02 specified that licensees should be able to bring the plant to, and maintain it in, a hot shutdown condition during the first 72 hours following an SSE. The statement that the backup N2 bottles will need replacement after 72 hours is based on the Vermont Yankee response to Unresolved Safety Issue (USI) A-46 (SQUG) requirements and the need to maintain hot shutdown conditions for 72 hours. The actual capacity of the backup N2 bottles is documented in the Automatic Depressurization System (ADS) Design Basis Document (Section 3.11) and the N2 bottle sizing calculation, VYC-1835. Based on these documents, there is availability of N2 to operate the SRVs via the backup bottles for a period significantly in excess of 72 hrs (approximately 140 hrs). The backup N2 supply bottles and process connections are seismically designed.

The nitrogen gas supply bottles are located outside the containment on the 252'-6" elevation of the seismically designed reactor building. This location on the north side of the containment is near the CRD Hydraulic Control Units. However, access to the backup nitrogen bottles is not required during FLEX mitigating activities since the bottles have in excess of 72 hours of backup nitrogen for the SRVs and the SRVs are not required after 72 hours, the time at which core cooling transitions to shutdown cooling.

049-RAI-Vermont Yankee-24

Page 11 also states, "...the nitrogen storage bottles automatically supply backup pneumatic pressure for SRV operation with enough capacity to provide for 72 hour of operation..."

Provide additional basis and supporting details for this statement, including the differences between ELAP and the original basis for sizing of nitrogen storage bottles. Please focus your response on why the storage bottles are sufficient for 72 hours of operation under ELAP.

Entergy Response:

Generic Letter (GL) 87-02 specified that licensees should be able to bring the plant to, and maintain it in, a hot shutdown condition during the first 72 hours following an SSE. The statement that the backup N2 bottles provide enough capacity for 72 hours of operation is based on the Vermont Yankee response to Unresolved Safety Issue (USI) A-46 (SQUG) requirements and the need to maintain hot shutdown conditions for 72 hours. The actual capacity of the backup N2 bottles is documented in the Automatic Depressurization System (ADS) Design Basis Document (Section 3.11) and the N2 bottle sizing calculation, VYC-1835. Based on these documents, there is availability of N2 to operate the SRVs via the backup bottles for a period significantly in excess of 72 hrs (approximately 140 hrs).

049-RAI-Vermont Yankee-25

Page 8 indicates that VY procedures and programs will be developed in accordance with NEI 12-06 to address storage structure requirements. However the submittal is silent on the securing of large portable equipment to protect the plant during a seismic event and the evaluation of stored equipment for seismic interactions. Please clarify the inclusion of these considerations in the planned procedures and programs.

Entergy Response:

Any large portable FLEX equipment stored in the proximity of permanent plant structures, systems, or components (SSCs) will be secured to ensure protection of SSCs during seismic events. Additionally, evaluation of stored FLEX equipment for seismic interaction will be considered. Procedures and programs to be developed will consider the issues given in this request for additional information (RAI). Response to this RAI will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-26

Page 8 indicates that identified paths and deployment areas will be accessible during all modes of operation. However, the submittal provides no information on considerations for the effects of ac power loss on access to the protected area and internal locked areas where remote equipment is necessary, as discussed in NEI 12-06, Section 3.2.2, paragraph (9).

Entergy Response

Procedures are in place to control access to these areas and include OP-3547, "Security Actions during an Emergency", SGAD-PTRL-0922, "Security Patrols, and Alarm Response", OPOP-SECU-3132, "Operations Department Response to Security Events", and ON 3177, "Operations Response to an Aircraft Threat". Procedures will be revised or developed as necessary to include appropriate actions required by the FLEX strategy. Response to this request for additional information (RAI) is deferred until later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-27

Pages 19, 20 and 34 indicate that plant piping and valves for connections, specifically valves V70-320A/B, V73-26, the 4" Storz splitter and the connection upstream of valve V19-50 will be within Seismic Class 1 structures, but insufficient information has been presented to confirm that access to these connections will only require access through seismically robust structures. Please confirm that the path to access these connection points will not require entry into non-seismically robust structures.

Entergy Response:

Procedures and programs necessary to implement the strategies given in the OIP will be developed with consideration of staffing, environmental conditions, and access pathways. Response to the specific concerns given in this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-28

Page 44 identifies two vehicles with sufficient rating to tow the pumps and DGs during phase 2, but provides no information on the protection of the vehicles from external events. Please discuss the level of protection to be afforded the vehicles as discussed in NEI 12-06, Sections 5.3.2, 6.2.3.2, and 7.3.2.

Entergy Response:

Protection of the transport vehicles from external events will be addressed during the development of the final design and associated implementing procedures. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-29

Pages 14 and 25 of the integrated plan indicates that key parameters can be determined from local readings using standard I&C instruments, but provides insufficient information for the NRC to determine whether a reference source currently exists for obtaining necessary instrument readings or whether one will be developed as discussed in NEI 12-06, Section 5.3.3. Please clarify.

Entergy Response:

Procedures will be developed detailing the determination of key parameters from local readings in accordance with NEI 12-06, Section 5.3.3. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-30

Page 46 indicates that debris clearing equipment will be provided during phase 3. Page 3 indicates that this equipment will be available within 72 hours of the event. The goal of which is to maintain key safety functions for up to 72 hours using installed and onsite portable equipment. Given the potential need for debris removal in the context of a hurricane or tornado, discussed in NEI 12-06, Section 7.3.2, and the identified time constraint of 8 hours for powering up both divisions of the Class 1E battery chargers using a portable DG, please discuss the basis for this being achievable without onsite debris removal equipment.

Entergy Response:

As stated on page 46 of the OIP, debris removal equipment will be available for Phase 3 response to facilitate transport of equipment from the regional response center. Removal of debris prior to 72 hours will be as specified in the response procedures under development. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-31

The integrated plan response identifies that the administrative program for deployment of strategies will include elements that ensure pathways are clear or require actions to clear pathways, but does not provide sufficient information on the capabilities to remove snow and ice for NRC staff to come to a conclusion since such equipment is not listed in the tables on pages 44 through 46. Please discuss.

Entergy Response:

Removal of snow, ice, and debris will be as specified in the response procedures under development. This will include identification of any needed equipment. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-32

The response includes information on the heat-up of a variety of enclosed rooms and spaces, but has no information on the potential effects of high ambient temperatures at the locations where portable equipment would operate in the event that mitigation strategies are implemented, as discussed in NEI 12-06, Section 9.3.3. Please discuss.

Entergy Response:

Procedures will be developed or enhanced to address the effects of high temperatures on FLEX equipment and will meet the requirements of NEI 12-06, Section 9.3.3.

NEI 12-06, Section 9.3.2, states that the FLEX equipment should be procured to function, including the need to move the equipment, in the extreme conditions applicable to the site. VY will procure the FLEX equipment that is deployed in external applications to comply with this requirement. The equipment specifications for procurement of this equipment will specify the extreme conditions applicable to the site that the FLEX equipment needs to function in.

049-RAI-Vermont Yankee-33

The response does not contain sufficient analytical results to support the conclusions that the analytical predictions of the Modular Accident Analysis Program (MAAP) code are consistent with expected plant behavior and that core cooling is maintained. Please provide the relevant calculations which demonstrate adequate core cooling for NRC staff audit review.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-34

The actions reported in the integrated plan and their timing are based on analyses performed with version 4.05 of the MAAP code. The NRC staff has not conducted a detailed review of the capabilities of this code for application to an ELAP conditions. The staff is further aware that the MAAP code contains simplified models and correlations

and allows user-specified inputs that can affect the accuracy of its predictions for significant parameters such as core two-phase level and system pressure. Therefore, please provide adequate technical basis to support the conclusion that the capability of the MAAP code is sufficient to predict whether the intended mitigating strategies would adequately cool the reactor core during an ELAP event. The justification may include discussion of the adequacy of the code's relevant models and correlations, benchmarking of code calculations against relevant experimental data, and relevant comparisons to calculations with state-of-the-art thermal-hydraulic codes.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-35

Please provide a summary of the techniques, assumptions, and boundary conditions for the MAAP evaluation model created for VY. For example, discuss important aspects of the evaluation model include the nodalization, two-phase flow modeling (e.g., homogeneity, equilibrium, or lack thereof, between phases), modeling of heat transfer and losses, vent line pressure losses, etc.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-36

Please discuss the quality assurance process under which the MAAP calculations were performed.

Entergy Response:

The MAAP calculations evaluated beyond design basis events and were classified as non-safety related. These calculations were performed under the subcontractor's QA program as non-safety related calculations in accordance with the subcontractor's preparation and control of calculations procedure.

The engineers performing the calculations have attended MAAP training programs conducted by a qualified MAAP mentor and are certified in keeping with the MAAP4 Analyst Certification Guide in Appendix D of the MAAP4 Applications Guide. The MAAP calculations were reviewed in accordance with applicable Quality Assurance requirements and the records of the calculations will be retained.

049-RAI-Vermont Yankee-37

Please identify and provide justification for the assumptions made regarding primary system leakage from the recirculation pump seals and other sources. Please include a discussion of the assumed pressure-dependence of the leakage rate. Please further clarify whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell and discuss how mixing of the leakage flow with the drywell atmosphere is modeled.

Entergy Response

MAAP analysis was performed to determine the projected response of the containment during a beyond design basis external event. However, the recirculation pump seal leakage was not modeled in the calculation. The MAAP analysis will be revised to include leakage from the reactor recirculation pumps. In addition, discussion will be provided regarding the assumed pressure-dependence of the leakage rate and whether the leakage was determined or assumed to be single-phase liquid, two-phase mixture, or steam at the donor cell and how mixing of the leakage flow with the drywell atmosphere is modeled. Changes, if necessary, will be reflected in a six-month status report following completion of the completed analysis. Based on the current project schedule for VY, this updated information is currently planned to be provided to NRC in the second six-month status report scheduled to be submitted on February 28, 2014.

049-RAI-Vermont Yankee-38

The ELAP analyses for VY generally appear to be based on the assumption that the RCIC system will be placed into service. However, the potential for the high pressure coolant injection (HPCI) system to provide backup capability is identified in several places, including the discussion of mitigating an ELAP event that occurs during cold shutdown mode when the operability of either system is not required. Please clarify whether use of HPCI instead of RCIC would significantly affect the analysis for VY (e.g., steam requirements, temperature qualification, etc.) and provide justification.

Entergy Response

The RCIC system provides sufficient flow to maintain core cooling during the initial stages of the BDBEE (see UFSAR Section 4.7.2) and is the only system credited in the analysis for maintaining core cooling during these initial stages.

The HPCI system is not credited in the VY FLEX strategy. HPCI is discussed in the OIP due to the fact that it is expected to initially start in the ELAP for Modes 1, 2, and 3. The OIP states that HPCI will be secured at or before one hour in accordance with EOPs (or will trip on high reactor vessel level) and RCIC will be utilized to maintain vessel inventory. Discussions of HPCI are intended to indicate that HPCI interactions will be present, but are not intended to indicate the use of HPCI as a backup or alternate. HPCI has been analyzed as running for 20 minutes as part of its automatic start on low reactor level. HPCI is then secured with no requirement or plans for additional usage. In summary, there is no plan to use HPCI instead of RCIC and, therefore, there is no additional impact to the analysis for Vermont Yankee.

The 6 month update will clarify that when HPCI automatically starts in Modes 1, 2, or 3 during an ELAP, it will be secured at or before 20 minutes.

For Modes 4 and 5, RCIC is credited. HPCI is not being credited for Modes 4 and 5. Mention of HPCI is meant to point out that turbine driven emergency systems are generally available at the start and end of an outage when the vessel head is in place and the vessel may pressurize.

The above clarifications regarding securing HPCI within 20 minutes of event start will be included in a future six-month update. Based on the current project schedule for VY, this updated information is planned to be provided to NRC in the first six-month status report scheduled to be submitted on August 28, 2013.

049-RAI-Vermont Yankee-39

Please provide confirmation that suppression pool water level remains adequately stable under long-term injection of external water sources.

Entergy Response

Calculations indicate, for the primary strategy, that torus water level increases until venting with the Reliable Hardened Vent (RHV) occurs at approximately 14 hours. Torus level then drops and stabilizes at approximately 12.8 feet over the next 58 hours. During this period, the RHV is discharging sufficient steam to compensate for continued addition of steam exhausted from reactor core isolation cooling (RCIC) and safety-relief valves (SRVs) into the suppression pool. As described in the OIP for Phase 3, the residual heat removal (RHR) system is subsequently placed in the Shutdown Cooling mode, such that external water input into the reactor vessel and the suppression pool is terminated, which will allow the suppression pool level to remain stable for long term operation.

Throughout the event, the suppression pool level remains between initial level of 10.88 feet (minimum torus level) and approximately 13 feet.

The FLEX strategies in the OIP currently rely on the current conceptual design of the reliable hardened vent (RHV) system that was developed in response to NRC Order EA-12-050. However, due to the new hardened vent order (NRC Order EA-13-109) the design of the RHV is being reevaluated. Preceding the final design of the RHV in response to the new order (NRC Order EA-13-109), an interim hardened vent design to support FLEX actions is being considered. Any HCVS design changes resulting from the revised hardened vent order will be reflected in a six month update.

049-RAI-Vermont Yankee-40

Describe whether any equipment protection features will interfere with the operation of RCIC during ELAP.

Entergy Response

An evaluation of RCIC protective features during prolonged station blackout events was performed by General Electric/Hitachi (GEH) in Project Task Report 0000-0143-0382-R0, RCIC system Operation in Prolonged Station Blackout - Feasibility Study, for the BWR Owners Group (BWROG). The study provided recommendations for addressing each RCIC trip or isolation. The study recommendations included defeating isolation signals. Several of these recommendations to defeat isolation signals are already incorporated in EOP procedures. It is the intention of Entergy to incorporate the recommendations of GEH feasibility study. Based on incorporation of the GEH recommendations the potential for equipment protection features to interfere with operation of RCIC will be minimized.

049-RAI-Vermont Yankee-41

Page 16 states:

> **Providing defense in depth for RCIC pump is to deploy the diesel driven FLEX pump to the west deep basin. While taking suction from the deep basin, the diesel driven FLEX pump will then discharge to a 4" flexible hose which will be run approximately 500 feet through the Protected Area fences, by cutting a hole, to the south side of the reactor building. There, the hose will be run through the new penetration on the south wall of the reactor building (FLEX Connection #1) (Figure 1). Per Reference 6, approximately another 200 feet of 4" flexible hose will then be run from the interior side of this penetration in the reactor building, split into two, 2" hoses and tie into the 'A' loop RHR system via valves V70-320A and V70-320B. The system will be lined up per existing plant procedure (Reference 1) and provide make up to the vessel using the RHR seismically qualified piping.**

And "...A portable diesel driven FLEX pump will supply the required flow rate of 120 gpm at 140 feet of head...."

In the event that the described defense-in-depth configuration is needed, what is the timeframe for getting it staged and operating?

Entergy Response

As discussed in the OIP, this strategy is a defense in depth strategy and not the credited strategy during the first 72 hours. As a defense in depth strategy, no specific time limitations are applicable and a timeline for implementation has not been developed.

049-RAI-Vermont Yankee-42

Page 11 of the integrated plan states that the automatic depressurization system (ADS) will either be placed in 'inhibit' or closely monitored to prevent automatic initiation. Please clarify how the determination of placing the system in 'inhibit' will be made and

justified such that the planned monitoring approach is an acceptable alternative for preventing system actuation.

Entergy Response

It is the goal of the FLEX strategy to maintain operation of RCIC as the primary method of the reactor core cooling function. If the automatic depressurization system (ADS) initiated during the FLEX event, the reactor pressure would quickly be reduced to a pressure that would not support RCIC operation. As described in UFSAR Section 1.6.2.11, the function of ADS is to rapidly reduce reactor pressure during a LOCA event in which the HPCI system fails to maintain reactor water level and thereby allow injection of low pressure ECCS systems. As noted in NEI 12-06, Section 3.2.1.4, no independent failures, other than those causing the ELAP/LUHS event, are assumed to occur in the course of the transient. Therefore ADS is not required for an ELAP/LUHS event.

Based on this information, the VY FLEX strategy will be revised to remove the option for monitoring the system to prevent automatic operation. ADS will be placed in "inhibit" when the determination is made that an ELAP is in progress. This action will be incorporated into EOPs or FLEX procedures that will be developed. This change will be reflected into a future submittal to the NRC. Based on the current project schedule for VY, this updated information is currently planned to be provided to NRC in the first six-month status report scheduled to be submitted on August 28, 2013.

049-RAI-Vermont Yankee-43

Page 12 states: Raising the standpipes will allow the CST to last greater than the 7 hour limit that is currently in effect due to the limited 75,000 reserve gallons (Reference 9, Section 4.7.5). The increased height of the standpipes allow for crediting another 11,000 gallons (a total of 86,000 gallons) and provide for the CST inventory to last approximately 9.5 hours.

There was no reference provided supporting the statement that increasing the reserved storage by 11,000 gallons would support an additional duration of 2.5 hours of RCIC operation. Discuss whether this conclusion is based on a linear comparison or if any calculations were performed to support this conclusion, including sufficient details to support the conclusion.

Entergy Response

Raising the standpipes will allow the CST to provide RCIC makeup greater than the 7 hour limit that is currently available due to the limited 75,000 gallon reserve. The increased height of the standpipes allows crediting another 11,000 gallons (a total of 86,000 gallons). MAAP analysis (Reference 1) identifies the volume of make-up water needed as a function of time. As identified in the MAAP analysis, at approximately 9.5 hours, the volume needed is less than 86,000 gallons.

References:

1. Calculation ENTGVY033-CALC-002, *Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies*, Revision 0.

049-RAI-Vermont Yankee-44

On page 16, the alternate strategy for maintaining core cooling using portable equipment for Phase 2 in lieu of RCIC indicates that the diesel driven FLEX pump will be deployed to the west deep basin. Then hose connections will be made to allow for injection via the 'A' RHR loop in order to maintain/recover reactor pressure vessel (RPV) inventory. According to Attachment 1A, the time at which injection begins is 9.5 hrs after RPV depressurization from 200psig to 400psig. However, according to page 44, the diesel-driven FLEX pump has a 500 ft dynamic head, which has a pressure of approximately 200 psig. As this is insufficient to overcome the pressure in the RPV, the RPV would need to be further depressurized for water injection to occur, but there is no mention of further RPV depressurization in the coping strategy. Please provide additional basis or analysis that supports the diesel-driven FLEX pump when considering the pressure within the RPV and the loss of pressure along the FLEX pump supply lines is capable of injecting water into the RPV with a sufficient rate to maintain and recover core inventory.

Entergy Response

Attachment 1A of the OIP shows the timeline for the primary strategy only. In the event that the alternate strategy, using a diesel driven FLEX pump to makeup RPV inventory through the reactor heat removal (RHR) system, is required, the vessel will be depressurized using safety relief valves (SRVs) to approximately 50 psig. This approach will allow the FLEX pump to provide the required vessel injection, considering vessel pressure and loss of pressure along the FLEX pump supply lines. Calculation ENTGVY033-CALC-001, Vermont Yankee Nuclear Power Station B.5.b Pump System Loss Calculation, determined that the FLEX pump provides sufficient flow and pressure using the hose and system configuration described in the OIP. The necessary actions will be included in FLEX procedures to be developed.

049-RAI-Vermont Yankee-45

Page 16 also describes an arrangement of hoses and hydraulic components that will be incorporated into the portable system which is intended to refill the CST.

What analyses or evaluations were done or are planned for confirming the ability of the diesel driven FLEX pumps to deliver the required flow through the system of flex hoses, wye splitters, valves, elevation changes, etc. Please discuss in terms of both the primary and alternate strategies.

Entergy Response

Calculation ENTGVY033-CALC-001, Vermont Yankee Nuclear Power Station B.5.b Pump System Loss was performed to determine the system losses of the following pipe runs in order to perform preliminary sizing of the FLEX pumps:

Cooling Tower Deep Basin to the reactor pressure vessel (RPV).

Cooling Tower Deep Basin to the spent fuel pool (SFP).

Cooling Tower Deep Basin to the Condensate Storage Tank (CST).

These pipe runs are used to supply water to the RPV, CST and SFP for the primary and alternate strategies as tabulated below:

Primary and Alternate Strategies Requiring Makeup via FLEX Pump

	Phase 1		**Phase 2**		**Phase 3**	
Key Safety Function	Primary	Alternate	Primary	Alternate	Primary	Alternate
RPV Makeup	None	None	Deep Basin to CST	Deep Basin to RPV via RHR	None	None
SFP Makeup	None	None	Deep Basin to SFP	River to SFP	Deep Basin to SFP	River to SFP

Hydraulic analysis will be performed during the final design process to confirm that the FLEX pump selected for the alternate strategy for SFP cooling/makeup, i.e. FLEX pump taking suction from the Connecticut river instead of the west deep basin, will provide sufficient flow and pressure to satisfy the requirements of the alternate strategy.

Additionally, confirmatory evaluations of the FLEX flow paths with the FLEX pump aligned to the deep basin will be performed as part of the final design process.

049-RAI-Vermont Yankee-46

For the Phase 2 strategy for maintaining adequate core cooling, page 16 of the integrated plan response indicates that water from the west deep basin or Connecticut River may be supplied to cool the reactor core. Please discuss the quality of this water (e.g., suspended solids) and provide justification that its use will not result in blockage at the fuel assembly inlets to an extent that would inhibit adequate flow to the core. Alternately, if deleterious blockage at the fuel assembly inlets cannot be precluded, then please discuss alternate means for assuring adequate core cooling.

Entergy Response:

Implementation of the FLEX strategy through the modification process will involve additional investigations of the west deep basin and/or Connecticut River water quality. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-47

Page 13 states: If an ELAP occurs during Cold Shutdown, water in the vessel will heatup. When temperature reaches 212°F (Hot Shutdown), the vessel will begin to pressurize. The turbine driven systems (RCIC and HPCI) are generally available for emergency use at the beginning and end of an outage, thus during the pressure rise RCIC can be returned to service, after testing, with suction from the CST to provide injection flow. When pressure rises to the SRV setpoints then pressure will be controlled by SRVs.

Provide an assessment of the timeline for pressure rise, including specific times when the minimum pressure required for RCIC operation is reached, testing is completed, and RCIC is available and aligned to inject. The assessment should consider the bounding case with respect to core heat up and demonstrate that adequate core cooling is maintained during the period without primary system makeup. Additionally, discuss whether portable equipment could be successfully used if the installed turbine-driven systems cannot be restored to service in adequate time for an ELAP event that occurs during cold shutdown mode.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-48

Page 13 states: The most limiting condition is the case in which the reactor head is removed and water level in the vessel is at or below the reactor vessel flange. If an ELAP/LUHS (loss of ultimate heat sink) occurs during this condition then (depending on the time after shutdown) boiling in the core occurs quite rapidly.

Provide a timeline for boiling to occur for the most limiting water level condition within the vessel when the reactor head is removed. Use the shortest historical time after shutdown in which the reactor head was able to be removed. Discuss the ability to place Phase 2 makeup measures in effect within this time and the basis for concluding that mitigating actions can be taken in time to satisfy the event acceptance criteria. Alternatively, provide the lowest RPV water level that could be reached before the Phase 2 measures are effective.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-49

Page 24 of the submittal (emphasis added) states: The containment design pressure is 56 psig (Reference 1, Section 5.2.3.2 and Table .2.1). Containment pressure limits are not expected to be reached during Phase 1 of the event. However, *if the maximum containment pressure is reached,* EOP requires operators to vent the containment (Reference 2). In this case, the RHV System will be used as implemented per EA-12-050 to vent containment with control from the Control Room (CRP 9-25).

Then continues to state, "As determined by MAAP analysis (Reference 3), torus venting is assumed to open at an approximate pressure of 30 psig via the RHV system at approximately time t = 14 hours."

Explain the inconsistency between the guidance in the EOPs quote #1, and the implementation of the Mitigation Strategies plan to vent the containment at approximately 30 psig (quote #2).

Entergy Response

There is no inconsistency between the guidance in the EOPs (Quote #1) and the implementation of the Mitigation Strategies (Quote #2). The intent of the discussion in Quote #1 from the OIP is to communicate that the reliable hardened vent (RHV) system will be used to vent containment if containment design limits are approached or exceeded. The action to employ the RHV system to vent containment is a requirement of EOP-3, Primary Containment Control.

As noted by Quote #2 from the OIP, the MAAP analysis, which predicts containment response, determined that another containment design parameter (suppression pool temperature) could be exceeded at approximately 14 hours and, as a result, venting is necessary. The text of the OIP used the saturation pressure of 30 psig in the torus instead of specifying the temperature, 274°F. An action to vent containment when suppression pool temperature/pressure reaches 274°F/30 psig was selected to provide a margin to the design limit of 281°F.

The FLEX strategies in the OIP currently rely on the current conceptual design of the RHV system that was developed in response to NRC Order EA-12-050. However, due to the new hardened vent order (NRC Order EA-13-109) the design of the RHV is being reevaluated. Preceding the final design of the RHV in response to the new order (NRC Order EA-13-109), an interim hardened vent design to support FLEX actions is being considered. Regardless of the interim or final design of the RHV, the conditions at which the containment is vented to support the FLEX strategy are not anticipated to change.

049-RAI-Vermont Yankee-50

Page 26 states: Containment pressure limits are not expected to be reached during the event as indicated by MAAP analysis (Reference 1), because the hardened containment vent system HCVS is opened prior to exceeding any containment pressure limits. Containment integrity is maintained throughout the event by permanently installed equipment.

Please confirm that the maintenance of containment integrity as described in the above statement is intended to demonstrate the ability to quickly restore containment integrity at some time in the future while supporting decay heat removal from containment in the meantime.

Entergy Response

The FLEX strategies in the OIP currently rely on the current conceptual design of the reliable hardened vent (RHV) system that was developed in response to NRC Order EA-12-050. This conceptual design of the RHV includes the ability to close the isolation valves at any time during the BDBEE after they have been opened to support the FLEX strategy for core cooling. However, due to the new hardened vent order (NRC Order EA-13-109) the design of the RHV is being reevaluated. Preceding the final design of the RHV in response to the new order (NRC Order EA-13-109), an interim hardened vent design to support FLEX actions is being considered. The response to this RAI will be updated in the six month update following the completion of the design of the venting methodology.

049-RAI-Vermont Yankee-51

Page 48 states: MAAP analysis indicates that the containment pressure limit would be exceeded at approximately 20 hours. However, to keep from approaching this limit and the other containment limits (noted above), the vents are assumed to open early at approximately 30 psig which is reached at approximately 14 hours.

Which parameter is the limiting factor in the analysis: 14 hours or 30 psig? If venting was done at 30 psig, will the containment ever reach the design pressure; if so, when?

Entergy Response

The limiting parameter is the design basis maximum suppression pool temperature (281°F). A temperature of 274°F psig was selected as the limit to provide a margin to 281°F. The text of the OIP used the corresponding saturation pressure of 30 psig in the torus at 274°F instead of specifying the temperature.

The MAAP calculation results show that this pressure (30 psig) will be reached at approximately 14 hrs into the event. Venting at this pressure will prevent exceeding the suppression pool design temperature of 281 °F. Venting at 30 psig will also prevent the containment pressure limit (56 psig) from being exceeded. The containment design pressure will not be reached using this strategy since the venting is sufficient to result in a reduction in the containment pressure to below 30 psig.

The FLEX strategies in the OIP currently rely on the current conceptual design of the RHV system that was developed in response to NRC Order EA-12-050. However, due to the new hardened vent order (NRC Order EA-13-109) the design of the RHV is being evaluated. Preceding the final design of the RHV in response to the new order (NRC Order EA-13-109), an interim hardened vent design to support FLEX actions is being considered. Regardless of the interim or final design of the RHV, the conditions at which the containment is vented to support the FLEX strategy are not anticipated to change.

049-RAI-Vermont Yankee-52

The essential containment instrumentation listed in the response (e.g., page 25) does not include instrumentation for measuring drywell temperature. Please provide the basis for concluding that monitoring drywell temperature is not required for purposes such as validating the qualification range of measurement instruments located in the drywell or establishing the survivability of penetration seals or other equipment. The basis should also consider the assumptions in light of the information provided in NEDC-33771P (e.g., Figures D-11 and G-11).

Entergy Response

The essential containment instrumentation listed in the OIP is consistent with the guidance provided in NEI 12-06 Section 3.2.1.10. Based on ENTGVY033-CALC-002, "Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies" (MAAP analysis) performed to support the FLEX strategy, the average drywell temperature remains below the design drywell temperature limit, 281°F (Reference UFSAR Section 5.2.3.2), for the first 72 hours with only momentary spikes above 281°F that occur due to SRV cycling. After 72 hours, the strategy places the shutdown cooling system in service to cool the plant to cold shutdown conditions. Therefore, because the average drywell temperature remains below the design drywell temperature limit throughout the event, instrumentation for measuring drywell temperature was not identified as essential containment instrumentation.

049-RAI-Vermont Yankee-53

The response appears to correlate containment integrity with ensuring containment pressure limits are not exceeded (e.g., discussion on page 26). Please clarify whether the calculated containment temperatures would remain within design values during an ELAP event. If not, please clarify whether excessive temperatures could result in a loss of containment integrity due to the failure of containment penetration seals or other portions of the containment boundary and provide justification.

Entergy Response

Average drywell temperature as evaluated in ENTGVY033-CALC-002, Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies (MAAP analysis), remains below the design temperature limit of 281°F for the initial 72 hours of the ELAP event with only momentary spikes above 281°F that occur due to SRV cycling. At the end of the 72 hours, reactor heat removal (RHR) and RHR service water (RHRSW) will be restored allowing shutdown cooling and suppression pool cooling to be utilized to cool the reactor and containment. According to MAAP projections, containment temperature begins to decrease at this point and will not challenge the integrity of the containment.

049-RAI-Vermont Yankee-54

Provide the range of plant states that will require venting, and describe the information and parameter values used by the operator to make the decision to vent.

Entergy Response

Based on VY FLEX strategy, containment venting will be required to prevent the containment from exceeding its design basis limits. ENTGVY033-CALC-002, "Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies" (MAAP analysis), projects that the first containment parameter to approach its design limit is torus temperature at approximately 14 hours after event initiation. The design basis limit for torus temperature is 281°F. FLEX strategy requires that the RHV system be used to stem the increasing torus temperature when the saturated conditions of the torus reach 30 psig/274°F thus providing margin to exceeding the design limit. The information used to make the venting decision is provided to operators in the control room by instruments LI/PI-16-19-12A/B for containment pressure and TI-16-19-33A/C for torus temperature.

Other parameters that would require containment venting include high containment pressure and high torus water level. Based on ENTGVY033-CALC-002, "Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies" (MAAP analysis), these parameters will not exceed their limits if venting is initiated to control torus temperature as noted above; however, containment pressure and torus water level will be monitored from the control room by operators on instruments LI/PI-16-19-12A/B. The containment design pressure is 56 psig. Operators use the EOP primary containment pressure limit curve, PCPL-A, to make venting decisions associated with primary containment pressure. The maximum torus water level is 14.75 ft per EOP-3.

Containment venting is also required by the Severe Accident Guidelines (SAGs) for various extreme plant states such as torus temperatures and torus pressure. These are generally coupled with extended loss of core cooling and severe core damage. Based on evaluations of the VY FLEX strategy, these situations will not be reached.

In accordance with BWROG input, EOPs will be revised to reflect the guidance for venting as noted above.

049-RAI-Vermont Yankee-55

Page 7 states (emphasis added),"The guidance provided in [NEDC-33771P, Revision 1] was utilized as appropriate to develop coping strategies and *for prediction of the plant's response.*"

Page 46 of the subject NEDC document states, "Therefore, the analyses results presented herein are not deemed to be bounding. Plant-specific justification or detailed analysis is required."

To what extent do VYs Integrated Plan and the time constraints depend on NEDC-33771P, Revision 1? To the extent that the NEDC report was relied upon, were any plant specific analyses performed to support the applicability of the document to VY?

Identify each instance where a plant parameter or time constraint for VY was based on the data and/or analyses from the subject NEDC document and provide a technical justification for its applicability to VY.

Entergy Response

VY's strategy presented in the OIP does not depend on NEDC-33771P, Revision 1. No plant parameters or time constraints are specifically based on the information or analysis from the NEDC. The discussion in the OIP is intended to indicate that the document was used for general guidance on how the VY plant design could be expected to respond to the various options being considered in order to facilitate strategy development. All analyses supporting the OIP strategy are plant specific.

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In conjunction with the request immediately above, provide the VY, plant-specific ELAP analysis information commensurate with the level of detail contained in NEDC-33771P, including analysis assumptions and results in their tabulated and plotted formats.

Entergy Response

MAAP BWR Version 4.0.5 was employed to evaluate the mitigating strategies developed in Vermont Yankee's OIP. Four cases were developed. Cases 1, 2, and 3 analyze containment feedback for varying reliable hardened vent (RHV) actuation pressure set points. The fourth case performed sensitivity by adding extra flow resistance to the RHV. NEDC-33771P, "GEH Evaluation of FLEX Implementation Guidelines," Revision 1, developed detailed analysis and output for a generic BWR Mark I containment, and was used as a guide in developing the site-specific analysis for Vermont Yankee.

Calculation ENTGVY033-CALC-002, "Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies," Revision 0, is commensurate with the level of detail contained in NEDC-33771P except that the calculation does not provide figures showing the temperature profile for the wetwell (torus) airspace temperature. In addition NEDC-33771P performed a generic containment analysis for the case of no containment venting which the site specific analysis did not include. Lastly, the NEDC-33771P analysis was performed to cover a time span of the first 24 hours of the event where the site specific calculation covered the first 72 hours.

Calculation ENTGVY033-CALC-002 will be revised to include figures showing the torus airspace temperature profiles for each of the four cases evaluated by MAAP. Based on the current project schedule for VY, this updated information is currently planned to be available to NRC at the time of the second six-month status report scheduled to be submitted on February 28, 2014. At this time, the calculation can be made available for NRC review.

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Pages 5, 6, 12, and 24 of the integrated plan cite MAAP evaluations contained in a referenced ENERCON Calculation, ENTGVY033-CALC-002, "Vermont Yankee Nuclear Power Station Containment Analysis of FLEX Strategies," Revision 0.

Page 26 cites a different MAAP evaluation applicable to Phase 2 contained in a referenced ENERCON Report, ENTGVY033-PR-002, "Diverse and Flexible Coping Strategies (FLEX) and Conceptual Design in Response to NRC Order EA-12-049, 'Mitigation Strategies for Beyond-Design-Basis External Events", Revision 1, but also refers the reader back to the "...Phase 1 description for discussion of containment integrity applicable throughout the event."

Explain the differences in the two cited MAAP calculations. If they are identical, describe the administrative controls in place to ensure that both calculations are appropriately revised if/when the need arises.

Entergy Response

The MAAP analysis cited in the OIP attributed to ENTGVY033-CALC-002 and ENTGVY-PR-002 are the same MAAP analysis. ENTGVY-PR-002 is a report developed as a basis for the OIP and references calculation ENTGVY033-CALC-002 which contains the MAAP analysis; there is only one document that contains the MAAP analysis.

049-RAI-Vermont Yankee-58

Page 24 states, "no non-permanently installed equipment will be required to maintain containment integrity. Therefore, there is no defined end time for the Phase 1 coping period for maintaining containment integrity."

Confirm that deployment of FLEX portable equipment for replenishment of consumables (e.g. compressed air/nitrogen bottles, power, etc.) is not relied upon to support continued operation of the HCVS beyond the 24-hour duration, which is specified in NRC Order EA-12-050.

Entergy Response:

Reliable, hardened containment vent requirements were originally given in Generic Letter 89-16 and later in NRC Order EA-12-050. NRC Order EA-13-109, June 6, 2013, rescinds the requirements of NRC Order EA-12-050. Compliance with the requirements of NRC Order EA-12-050, including applicable schedule deadlines for submittals or implementation, is no longer required. The industry, through NEI and the owners' group, is addressing the new requirements provided in NRC Order EA-13-109 on the schedule outlined in NRC Order EA-13-109.

The concern presented in the above request for additional information (RAI) are associated with generic industry concerns and are being addressed by NEI, the owners' group, and the NRC staff. Information to address the Phase 1 requirements of NRC Order EA-13-109 will be provided in the integrated plan to be submitted June 30, 2014.

049-RAI-Vermont Yankee-59

As quoted in the request immediately above, page 24 states, "no non-permanently installed equipment will be required to maintain containment integrity."

The following statement is applied several times on page 27 and referenced on page 29:

The HCVS will be implemented and enhanced in accordance with NRC Order EA-12-050, Issuance of Order to Modify Licenses with Regard to Reliable hardened Containment Vents and guidance in JLD-ISG-2012-02. The HCVS will meet the design requirements as specified for reasonable protection per NEI 12-06.

This section covers the storage and protection of portable equipment. If no portable equipment is required for HCVS operation, this section should state as such. If portable equipment is required, the statements in this section should be similar to those under the core cooling section. Please clarify the intent of this statement.

Entergy Response:

Reliable, hardened containment vent requirements were originally given in Generic Letter 89-16 and later in NRC Order EA-12-050. NRC Order EA-13-109, June 6, 2013, rescinds the requirements of NRC Order EA-12-050. Compliance with the requirements of NRC Order EA-12-050, including applicable schedule deadlines for submittals or implementation, is no longer required. The industry, through NEI and the owners' group, is addressing the new requirements provided in NRC Order EA-13-109 on the schedule outlined in NRC Order EA-13-109.

Because of the new order (NRC Order EA-13-109), the design of the hardened containment vent is being reevaluated. Therefore, details of its operation are not available at this time. Information to address the Phase 1 requirements of NRC Order EA-13-109 will be provided in the integrated plan to be submitted June 30, 2014.

049-RAI-Vermont Yankee-60

Based on the discussion on page 31 of the integrated plan response, please clarify whether earthquake loads considered within the scope of the Order would result in sloshing losses from the spent fuel pool and whether these have been factored into the time to boil calculation.

Entergy Response:

Sloshing losses from the spent fuel pool which may result from earthquake loads considered within the scope of the Order are not included in the time to boil analyses described in the OIP.

Vermont Yankee will follow the "Proposed Path Forward for NTTF Recommendation 2.1 Seismic Reevaluations" (VY letter to the NRC, Adams Accession No. ML13123A161). The Proposed Path Forward is described in a letter from NEI to NRC dated April 9, 2013 (Adams Accession No. ML 13107B386), which incorporates use of the NRC-endorsed Seismic Evaluation Guidance: Screening, Prioritization, and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic (EPRI 1025287) for the NRC requested seismic hazard evaluations and risk assessments. EPRI Report 1025287, Section 7.3.2, discusses sloshing losses from the SFP in relation to a rapid drain-down analysis and provides a simplified and conservative method to determine sloshing losses. The EPRI report states that, "For most scenarios, it is judged that this conservative estimate of the inventory lost due to sloshing will not have a significant effect on the estimate of SFP drain-down."

The Vermont Yankee UFSAR, Section 10.3.4, indicates that there are no penetrations in the SFP below 10 ft above the top of the fuel assemblies. Therefore, a rapid drain-down assessment, which would include considerations of sloshing and its effects on time to boil, was not required as a part of the seismic walkdown efforts (Adams Accession No. ML123620055). EPRI Report 1025286, "Seismic Walkdown Guidance," dated June 2012, discusses the need for a rapid drain-down assessment of the SFP, and actions which should be taken if the need for such an assessment is identified. As discussed in Section 3, Selection of SSCs, Spent Fuel Pool Related Items, a rapid drain-down analysis is not required to be performed specifically in cases where there are no penetrations in the SFP below 10 feet above the top of the fuel assemblies.

It follows from review of these two documents that the sloshing losses from earthquake loads considered within the scope of the Order would not have a significant effect on time to boil, as the overall volume reduction would be small, and the time to boil is long.

Given the long time to boil the SFP at Vermont Yankee (29 hours under design basis heat load and 8.5 hours for full-core offload), the additional 60.5 hours to boil the SFP inventory down to the top of the fuel (full-core offload heat load), and considering the SFP design does not have penetrations below 10 feet above the top of the fuel, evaluation of sloshing losses in the time to boil analysis from earthquake loads considered within the scope of the Order is not considered necessary. Impacts to the OIP will be included to update references and to correct the description of water level in the SFP (21 ft. is the Technical Specifications minimum level) in the first six month update submittal (August 28, 2013).

049-RAI-Vermont Yankee-61

The integrated plan response states on page 39 that a high point vent should be created above the reactor building, 345 feet elevation, if possible. Please discuss the consequences of not establishing a high point vent and confirm that the analysis demonstrates that steam from boiling in the spent fuel pool can be adequately vented without adversely affecting other mitigation equipment or activities (e.g. preventing manual operation of valves or connection of hoses to provide spent fuel pool makeup) even if a high point vent is not established.

Entergy Response:

The need for and design of a high point vent will be addressed in the design development and procedure development phase. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-62

On page 31, the Primary Strategy Method 1 for maintaining spent fuel pool cooling using portable equipment for Phase 2 indicates that the hose will be run from the 4inch Storz valve splitter, which is connected to the same FLEX pump used for RPV injection (via CST and RCIC or directly through 'A' RHR), to a new valve header installed upstream of

valve V19-50. In the process of running this hose, valve X004 on the 4" Storz valve splitter will be closed, and the adjacent valve X002 will be opened. This will prevent the FLEX pump from supplying makeup water to the CST, when so aligned. Please clarify if maintaining spent fuel pool cooling requires closing off makeup to the CST and if so, discuss the basis for this. Additionally, if it is required for makeup to the CST be closed off, the CST may run dry and deprive RCIC of its primary injection source. This would then necessitate using the FLEX pump to supply RPV injection via the "A" RHR loop as discussed in the Maintain Core Cooling Alternate Strategy on page 16. However, the need to align the FLEX pump to inject via the 'A' RHR loop when spent fuel pool cooling begins is not indicated in the Spent Fuel Pool Cooling section of the coping strategy. Please clarify whether the 'A' RHR loop injection alignment will always be used with spent fuel pool cooling or whether the discharge of the FLEX pump would be alternated between the CST and spent fuel pool.

Entergy Response

Maintaining spent fuel pool cooling does not require closing off makeup to the condensate storage tank (CST). A single diesel driven FLEX pump can adequately supply combinations of either the reactor pressure vessel (RPV) makeup through the 'A' reactor heat removal (RHR) system and spent fuel pool (SFP) cooling or the CST fill connection and the SFP cooling. In order to accommodate the accessibility of lineup hose connections to the SFP, tie-in point and routing of the SFP cooling was changed. A new 4" connection will be made to the existing 8" FPC-2 line between valve V19-25 and hanger CUN-HD-50 on the 303' elevation of the Reactor Building. The pipe will split into three (3) separate lines, terminating with a hose connection. One line will be used as the makeup inlet from the FLEX pump with water supply from the West Deep Basin or river; one line will be used to connect the hose for SFP makeup; and one line will be used to connect the hose for spray over the SFP (See attached Figure 1, markup drawing G-191173 SH. 1 per proposed modification package EC 44174).

Throttling of system valves will be required to achieve the desired flows. The valves used to throttle flows and guidance for establishing proper flows will be included in FLEX procedures. Hydraulic analysis will be performed to confirm the required flow through each path for simultaneous operation. Response to this request and changes of the new tie-in point for the SFP cooling will be provided to NRC in the second six-month status update report (February , 2014).

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On page 32, the Primary Strategy Method 3 for maintaining spent fuel pool cooling using portable equipment for Phase 2 indicates that the use of valve X006 will require a spray flow of 250 gpm over the spent fuel pool. Please provide justification that when the diesel-driven FLEX pump is providing injection to the RPV via 'A' RHR loop that the loss of in-line pressure due to supplying a 250 gpm spray flow to the spent fuel pool does not adversely impact the pump's ability to inject and supply adequate flow rate to maintain and recover the RPV inventory. Further, if flow is simultaneously supplied to the reactor

vessel and spent fuel pool, please clarify whether adequate flow indications are available to ensure an adequate flow split.

Entergy Response

Hydraulic analysis was performed for individual and simultaneous reactor pressure vessel (RPV) injection and spent fuel pool spray flow paths to size the FLEX pump such that it would have the capability to provide the required flows at the required pressures. Throttling of system valves will be required to achieve the desired flows. The valves used to throttle flows and guidance for establishing proper flows will be included in FLEX procedures. Flow indication will be provided in each flowpath to allow operators to establish the proper flow splits. Confirmatory evaluations of the FLEX flow paths will be performed as part of the final design process. Additionally the flow indication details will be developed during the final design process.

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Page 31 indicates that for a full core offload, spent fuel pool boiling occurs at 8.5 hours, and it takes 60.5 hours to boil off the 21 feet of water protecting the tops of the spent fuel. However, for a full core offload it is not clear if the intent is to begin cooling and maintaining the spent fuel pool at 8 hours, before boiling occurs, or, as a result of the 60.5 hours margin, to begin cooling and maintaining the spent fuel pool at 28 hrs, just as it would for the design basis conditions. Please clarify when spent fuel pool cooling will begin for a full core offload. If the intent is to begin at 28 hours, this means there will be 19.5 hours of time during which the water level in the spent fuel pool is boiling and the inventory of water is lowering. In this case, please provide justification that the resulting reduction in water level does not result in an increase in exposure beyond acceptable levels.

Entergy Response

During a FLEX event with a full core offload, analysis indicates that SFP boiling will not occur until 8.5 hours after event initiation. The intent of the VY strategy is to stage FLEX equipment prior to eight (8) hours. SFP cooling/makeup, using one of the methods described in the OIP as Primary Strategy Methods 1, 2, or 3 will be provided to the SFP as level decreases. The level will be maintained between normal water level and Level 2 water level (as defined in NRC Order EA-12-051), thereby preventing reduction in water level to a point that would increase exposure levels beyond acceptable levels.

Clarification regarding staging of the FLEX equipment and initiation of SFP cooling for a full core offload as described above will be included in a six month update report. Based on the current project schedule for VY, this updated information is currently planned to be provided to NRC in the first six-month status report scheduled to be submitted on August 28, 2013.

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Page 17 states:

If onsite diesel fuel reserves are needed to operate temporary equipment, there are two locations to obtain diesel fuel. The first option would be the Fuel Oil Storage Tank. The

second option would be the two DG day tanks. A minimum of 36,000 gallons of diesel fuel is stored in the Fuel Oil Storage Tank and two day tanks have a nominal capacity of 800 gallons each (Reference 5, Section 8.5.4). The fuel could be accessed through a hose connected to accessible drain valves of the day tanks. The oil in the Fuel Oil Storage Tank can be transferred to the day tanks using the fuel oil transfer pumps or with a portable transfer pump connected to the system. Adequate fuel supplies are available and accessible to operate emergency response equipment.

Page 44 includes a listing of 500 gallon diesel tank carts and fuel transfer pumps/carts.

Provide a discussion on fueling provisions for the portable equipment, including the level of protection afforded the diesel tank carts and fuel transfer pumps/carts and time constraints associated with fueling and refueling the portable equipment.

Entergy Response:

The level of protection afforded the diesel tank and fuel transfer pump/carts needed for refueling the portable equipment will be addressed during the design and procedure development phase. Response to this request for additional information (RAI) will be provided later in the design / procedure development process. It is anticipated that this information will be submitted no later than the second six-month update report (February, 2014).

049-RAI-Vermont Yankee-66

Describe the instrumentation that will be used to monitor portable/FLEX electrical power equipment including their associated measurement tolerances/accuracy to ensure that: 1) the electrical equipment remains protected (from an electrical power standpoint – e.g., power fluctuations) and 2) the operator is provided with accurate information to maintain core cooling, containment, and spent fuel cooling.

Entergy Response:

Adequate information to monitor core cooling, containment, and spent fuel cooling is provided by installed plant instrumentation and is not provided by portable equipment.

Instrumentation used to monitor portable FLEX electrical power equipment will be addressed during the design and procedure development phase and will consider the equipment to which it will be connected.

049-RAI-Vermont Yankee-67

Provide details of the maintenance and testing plan for electrical equipment that is credited for events that require mitigating strategies. The staff is trying to understand how Regulatory Guidance documents, IEEE Standards, manufacturer recommendations, etc. will be utilized to establish the maintenance and testing programs for the portable/FLEX electrical equipment, especially for batteries and diesel generators.

Entergy Response:

This request for additional information was identified as a generic concern or question which the nuclear industry will resolve generically through the Nuclear Energy Institute (NEI) and the applicable industry groups (e.g., BWROG, EPRI, etc.). Once this concern is resolved, Entergy will provide an update to this RAI response in a subsequent six-month update. NEI will be coordinating with the NRC on the schedule for resolution.

049-RAI-Vermont Yankee-68

How are the mitigating actions proposed by VY affected by the severe accident environment, including high temperature, radiation, and combustible gases that could be present in the reactor building, as well as the routing of the severe accident containment vent line?

For example, page 2 states, "...operator actions to open MCR doors, remove ceiling tiles and deploy smoke ejectors (Item 6) to ventilate the MCR."

Is this strategy still feasible with an accident source term in the drywell and a vent sending radiation out of the containment?

Entergy Response:

Consistent with NEI 12-06, severe accident conditions and VY FLEX mitigation strategies are not considered to occur simultaneously. Therefore severe accident conditions do not affect the proposed VY mitigation actions.

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How are the Mitigation Strategies Phase 1 and Phase 2 responses, including the transporting of FLEX equipment to their intended locations, and the response times affected by the severe accident environment and the location of the vent releases?

Entergy Response:

Consistent with NEI 12-06, severe accident conditions and VY FLEX mitigation strategies are not considered to occur simultaneously. Therefore severe accident conditions do not affect the proposed VY mitigation actions.

049-RAI-Vermont Yankee-70

What additional FLEX equipment, including permanent FLEX connections and additional mitigation actions, would be required for drywell flooding to maintain containment integrity?

Entergy Response:

Consistent with NEI 12-06, severe accident conditions and VY FLEX mitigation strategies are not considered to occur simultaneously. Flooding of the drywell is a mitigating action for severe accident conditions. Therefore drywell flooding is not considered and does not affect the proposed VY mitigation actions for containment integrity.

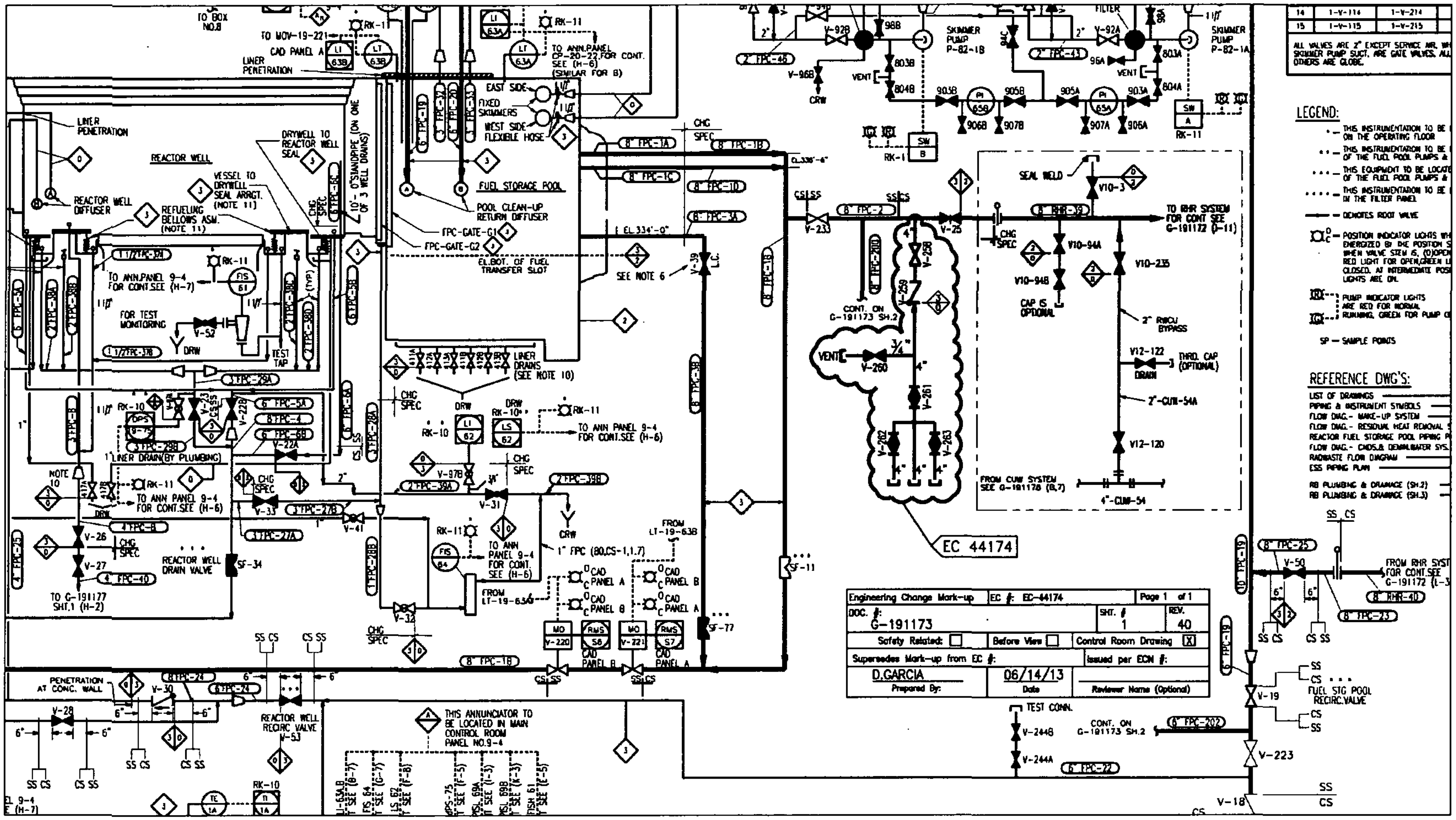

Figure 1 (for RAI-62 Response)