Exelon Generation.

RS-14-318
RA-14-092

November 25, 2014

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

Oyster Creek Nuclear Generating Station
Renewed Facility Operating License No. DPR-16
NRC Docket No. 50-219

Subject: Supplemental Response to Request for Additional Information Regarding Request for Extension to Comply with NRC Order EA-13-109: Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (TAC No. MF4352)

References:

1. NRC Order EA-13-109, Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated June 6, 2013
2. Exelon Generation Company, LLC Letter to USNRC, Request for Extension to Comply with NRC Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 2, 2014 (RS-14-081)
3. NRC letter to Exelon Generation Company, LLC, Request for Additional Information Regarding Request for Extension to Comply with NRC Order EA-13-109: Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated August 27, 2014
4. Exelon Generation Company, LLC Letter to USNRC, Response to Request for Additional Information Regarding Request for Extension to Comply with NRC Order EA-13-109: Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated September 26, 2014

On June 6, 2013, the Nuclear Regulatory Commission (NRC) issued Order EA-13-109 (Reference 1) to all licensees that operate boiling-water reactors with Mark I and Mark II containment designs. The Order was effective immediately and is applicable to Oyster Creek Nuclear Generating Station (Oyster Creek). In Reference 2, Exelon Generation Company, LLC (EGC) requested an extension of the final compliance dates of Order EA-13-109 requirements in Section IV of NRC Order EA-13-109 concerning implementation of the Phase 1 (wetwell vent) and Phase 2 (drywell vent) at Oyster Creek until January 31, 2020. Also in Reference 2, EGC stated that it will submit a request for relief from NRC Order EA-13-109 no later than January 31, 2020 based upon the permanent shutdown condition of the plant at that time. In Reference 3, the NRC issued a request for additional information (RAI) in order for the NRC staff to complete its technical review of the EGC extension request. Reference 4 provided the EGC response to the NRC request for additional information.

The purpose of this letter is to provide supplemental revised responses to the NRC RAI Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, and 13 describing additional compensatory measures that will be implemented at Oyster Creek in order to provide enhanced containment vent capability and reliability and further reduction of severe accident risk at Oyster Creek for the period of the extension request. The supplemental revised responses to these NRC RAIs are provided in Enclosure 1 to this letter, and replace the corresponding RAI responses previously submitted in Reference 4.

This letter contains new regulatory commitments, which are identified in Enclosure 2 to this letter.

If you have any questions regarding this response, please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 25th day of November 2014.

Respectfully submitted,

D. P. Helker

David P. Helker
Manager - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

1. Oyster Creek Nuclear Generating Station – Supplemental Response to Request for Additional Information Regarding Request for Extension to Comply with NRC Order EA-13-109: Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (TAC No. MF4352)

2. Summary of Regulatory Commitments

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator – Region I
NRC Senior Resident Inspector – Oyster Creek Nuclear Generating Station
NRC Project Manager, NRR – Oyster Creek Nuclear Generating Station
Mr. John D. Hughey, NRR/JLD/JOMB, NRC

Enclosure 1

Oyster Creek Nuclear Generating Station

Supplemental Response to Request for Additional Information

Regarding Request for Extension to Comply with NRC Order EA-13-109: Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (TAC No. MF4352)

(27 pages)

RAI-1

EA-13-109, Attachment 2, Requirement 1.1.2: (NEI 13-02 Section 4.2.5 and 4.2.6)

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

Section 6.2.7.2.2 of OCNGS Updated Final Safety Analysis Report (UFSAR) describes the operation of the Hardened Vent System and states in part:

> To start the venting operation, an operator will be dispatched to align the hardened vent system by closing the Nitrogen line butterfly valve (V-23-357) and opening the vent line butterfly valve (V-23-358). Once these valves are aligned manually, the venting operation can be performed by opening either the Drywell isolation valves V-23-13 and 14 or the Torus isolation valves V-23-15 and 16 from the Control Room.

Question

Discuss the environmental conditions to which the operators would be subjected in order to accomplish these actions. Discuss the availability of operator aids (such as ice vests or self-contained breathing apparatus) needed to perform these tasks, if applicable.

Response

The Hardened Containment Vent System (HCVS) as currently installed is capable of performing as follows during a Station Blackout (SBO) event. AC power to the pilot solenoids controlling the motive force (compressed air) to the HCVS Air-Operated Valves (AOV) would still be available from a currently installed battery backed continuous instrument panel. The time this power will remain available is discussed in the response to RAI-6 below. The AOV motive force will be available from installed accumulators. The time that accumulators can supply this motive force is discussed in the response to RAI-5 below.

To commence the venting operation, an operator will be dispatched to align the HCVS by manually closing the nitrogen line butterfly valve (V-23-357) and opening the vent line butterfly valve (V-23-358). These valves are located at ground level on the outside of the northeast corner of the Reactor Building and are manually operated by reach rods through a shield wall. Since the HCVS containment AOVs are still closed at this time, and venting has yet to commence, radiation levels at the shield wall area will be at their lowest. The operator would be exposed only to the environmental conditions outside of the northeast corner of the Reactor Building. Once these valves are aligned manually, venting operations can commence by opening the air-operated HCVS isolation valves from the Main Control Room (MCR).
The use of operator devices (such as ice vests or self-contained breathing apparatus) would not be required in order to operate the HCVS.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The compensatory measures would not expose the operators to environmental conditions that would require the use of supplemental operator aids. Additionally, the modifications described would increase system operational capabilities during an Extended Loss of AC Power (ELAP) and limit operator environmental and radiological exposure when implementing compensatory actions.

RAI-2

EA-13-109, Attachment 2, Requirement 1.1.3: (NEI 13-02 Section 4.2.5)
The HCVS shall also be designed to account for radiological conditions that would impede personnel actions needed for event response.

Question

Discuss the operator's ability to complete the tasks in the assumed dose fields. Has a site-specific analysis in accordance with the guidance of NEI 13-02, Appendices F and G been performed to determine the predicted radiological conditions which would be applicable at OCNGS following a severe accident? If not, discuss the differences between the NEI 13-02, Appendices F and G analysis and the dose assumptions used at OCNGS.

Response

NEI 13-02, Appendix F requires evaluation of operator dose under the severe accident conditions that may be present under an NRC Order EA-13-109 scenario. NEI 13-02, Appendix G requires evaluation of source terms for the HCVS under severe accident conditions. A site-specific analysis in accordance with the guidance of NEI 13-02, Appendices F and G has not been performed to determine the predicted radiological conditions which would be applicable at OCNGS following a severe accident.

The Oyster Creek NRC GL 89-16 HCVS was specifically designed to vent the equivalent of 1% thermal energy in response to the TW[1] sequence. The TW sequence is described in NUREG -75/014, Appendix V, page V-58 as a failure of long term decay heat removal from the containment following a plant transient and trip from hot operating conditions. For this sequence, the reactor is sub-critical, steam is released to the suppression pool via the main steam safety valve(s) and makeup to the reactor is available (Reference 5). A site specific dose rate calculation was performed for the NRC GL 89-16 response. Using the methodology in NUREG-1228, which estimates the piping shine dose rates associated with the hardened vent at Oyster Creek, once the hardened vent path is aligned during a TW sequence and assuming no fuel damage, the radiation dose rates of the entire vent path of the HCVS are less than 1 mrem/hr (References 1 and 2). NUREG-1228 states: "the consensus is that even for the worst accident analyzed, if the plant safety systems work as designed, less than 20% of fuel pin cladding will fail, releasing a large fraction of gap in those pins" (Reference 4). Thus, 20% fuel pins damaged was assumed when determining the shine dose rates for the limiting case. If the Torus is vented 24 hours after an event (scrubbed venting) with 20% fuel damage, the dose rate behind the radiation shield wall at the valve station discussed in RAI-1 above is 700 mrem/hr (References 1 and 3).

[1] BWR Accident Sequence Symbols: T = Transient event, W = Failure to remove residual core heat.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The modification will allow for a connection of supplemental compressed gas to the Torus HCVS isolation valves. A connection for supplemental compressed gas will be provided outside of secondary containment providing the operators protection from environmental and radiological conditions in secondary containment. The location of the connections for supplemental gas supply and solenoid valve control will be reviewed for radiological conditions at the connection / control points assuming severe accident conditions. The operator dose assessment will use the guidelines from NEI 13-02, Appendix F and G.

References

1. UFSAR 6.2.7.3, Rev. 18, Design Evaluation
2. C-1302-242-5340-011, Rev. 0, Hardened Vent Doserates (No fuel damage)
3. C-1302-242-5340-009, Rev 0, Hardened Vent Doserates NUREG-1228
4. NUREG- 1228, Source Term Estimation During Incident Response to Severe Nuclear Power Plant Accidents
5. EXLNOC094-PR-01, Rev. 0, Assessment of the Oyster Creek Hardened Vent System

RAI-3

EA-13-109, Attachment 2, Requirement 1.2.2: (NEI 13-02 Section 4.1.5.2.3)

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

NEI 13-02, Section 4.1.5.2.3:

> The release stack or structure exposed to outside should be designed or protected to withstand missiles that could be generated by the external events that screen in for the plant site using the guidance in NEI 12-06 as endorsed by JLD-ISG-12-01.

Per NEI 12-06 guidance, hurricanes and tornado hazards are applicable to Oyster Creek. In addition, Section 3.5.1.4.1 of the OCNGS UFSAR lists potential missiles.

Question

Provide a description of the differences, if any, between the guidance stated in NEI 13-02, Section 4.1.5.2.3, and the actual, physical configuration and/or capabilities of the containment venting system which will be in operation during the requested period of extension. Include a description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities as required by the Order and described in the guidance.

Response

The Oyster Creek NRC GL 89-16 external hardened vent path was not analyzed or protected against wind (hurricane or tornado) generated missiles. The HCVS utilizes the Nitrogen Purge isolation valves. Isolation valves V-23-13 and 14 are located in the west side of the Reactor Building at elevation 75'3". Isolation valves V-23-15 and 16 are located in the southwest side of the Reactor Building at elevation 23'6". The pipe lines from the Drywell isolation valve V-23-13 and the Torus isolation valve V-23-15 join together at floor elevation 51'3" at the south side of the Reactor Building. From this location, the line runs along the east wall, down to elevation 14'9" and surfaces outside above the ground at the northeast corner of the Reactor Building. From the northeast corner, the vent pipe is routed along the east wall of the Reactor Building and along the south wall of the railroad airlock. The main stack penetration is provided with an industrial quality rubber boot to seal the gap between the main stack and the vent pipe and to allow for thermal movement of the pipe. The vent discharge is directed upward and ends at elevation 38' (approximately) inside the main stack. The main stack release is vented at elevation 368' above the grade elevation of 23' (References 1 and 2). The section of piping from the northeast corner of the Reactor Building to the stack penetration is external to the Reactor Building.

The tornado risk to Oyster Creek is considered negligible. As part of the NRC Systematic Evaluation Program (SEP) conducted for older plants, the tornado risk to Oyster Creek was evaluated. This evaluation did not credit the hardened vent since it preceded the NRC GL 89-16 requirement and implementation. The SEP effort documented that tornado winds and associated missiles represented a negligible contributor to the Oyster Creek overall core melt probability. The risks of tornado missiles disabling electrical systems were based on (Reference 3):

- Scenario 1: a missile hit to the diesel exhaust stack line on one of the two on-site emergency diesels, with the realistic assumption that off-site power was lost due to the tornado, and the conservative assumption that the second diesel failed to start resulting in a loss of all AC power. The probability of a disabling missile hit to a diesel was 1.0E-7/reactor year. The core melt frequency of this scenario was calculated as 1.0E-11/reactor year.

- Scenario 2: loss of safety related equipment in the vicinity of the Reactor Building air-lock due to a missile penetrating the outer door of the air-lock with the assumption that the inner door was always open. It is conservatively assumed that the missile disabled a number of safety-related components. The core melt frequency of this scenario was calculated as 1.4E-7/reactor year.

The NRC's review of the tornado risk to the diesel generator buildings is documented in Reference 4, and determined that the probability of a disabling missile was low, in the order of 10E-7.

A re-evaluation of the above Scenario 2, as documented in Reference 5, demonstrated that with a failure of the components in the vicinity of the open inner airlock door, "a system consisting of the isolation condenser (IC), Torus, and core spray pump is available both for shutting the plant down and for maintaining it in the shutdown mode, and, therefore, acceptable".

As described above, portions of the existing vent path installed in response to NRC GL 89-16 exist outside safety-related structures. A valve station also exists at ground level in a narrow space between two buildings and is protected from direct wind generated missiles by steel plate. The vent pipe is located on the eastern side of the Reactor Building. This location effectively protects the vent from tornado generated missiles or debris since the predominant path of tornadoes originates from the west and west-south west directions at Oyster Creek.

A review of historical tornado storm data provided by National Weather Service (NOAA) for the plant locale and for New Jersey's Ocean County from 1950 to 2013 (Reference 9) reveals no high intensity (F4-F6) tornadoes have been experienced. The tornado-generated missile flux from low intensity tornadoes (F1-F3) is not as extensive or damaging as those of higher intensity. Tornado path length (lifetime) is shorter and also contributes to lower missile generation potential and strike probability. In addition, the conditions needed for tornado development do not exist over the entire course of the year, they are seasonal. Lastly, the potential for a tornado, or tornado-generated missiles to concurrently impact the installed methods of heat removal from containment, Isolation Condensers, and the vent while simultaneously causing the Extended Loss of AC Power (ELAP) are extremely small.

A review of wind and tornado loading responses at Oyster Creek was developed by the Franklin Research Center for the NRC (Reference 6). An evaluation of the vent stack indicates wind related loadings will not cause failure or collapse of the vent stack.

The Oyster Creek IPEEE Report (Reference 7) and corresponding NRC Safety Evaluation Report (SER) (Reference 8) considered the impact of external hazards on the existing vent.

Installation of this vent was prior to the study and thus evaluated for potential missile risk related to hurricanes and tornadoes. The IPEEE report, Section 1.5.1 states: "In the case of other external events, only the high winds analysis produced quantitative results. An upper bound value of 9.9E-07 per year or 8.1% of the total external event core damage frequency was estimated from high winds. The NRC IPEEE SER, Section 2.0 states: "staff estimates that core damage frequency from high winds and tornadoes to be less than the screening criterion of 1E-06 per year."

Exelon procedure OP-AA-108-111-1001, "Severe Weather and Natural Hazard Guidelines," requires if high winds, hurricane, or tornado activity is forecasted for the site or likely to occur, then walk-downs of the site should be performed to identify items and take action to reduce the potential threat of projectiles in high wind situations.

The consideration of wind hazards associated with NRC Order EA-13-109 requires the hazard to not only create ELAP conditions but also fail the vent simultaneously. Given the above considerations, the limited extension time, and recognized low probability of occurrence of wind hazards, use of the existing vent meets the requirements of NRC Order EA-13-109 by virtue of exhibiting "similar capabilities" from wind driven missiles.

Compensatory Measures

Oyster Creek procedure OP-OC-108-109-1001, "Severe Weather Preparation T&RM for Oyster Creek," will be revised to ensure the northeast corner of the Reactor Building near the HCVS manual valve station is clear of loose objects that could become wind driven missiles.

Similar Capabilities

The original design basis for Oyster Creek includes safety-grade, redundant isolation condenser trains that do not require AC power. The original design basis for the isolation condenser system includes a station black-out (SBO) event. Accordingly, during an ELAP event, the isolation condenser system would be expected to remain available. ICS usage prevents any significant containment pressurization since it releases the reactor decay heat directly to the outside atmosphere. The RPV steam condensed in the isolation condenser is returned to the RPV, thereby minimizing the loss of RPV inventory.

In response to NRC Order EA-12-049, water make-up sources are being added to the isolation condenser shell-side for an ELAP event, which are not dependent on permanently installed equipment. These NRC Order EA-12-049 actions will provide increased availability of the Station's DC power required to maintain isolation condenser system operability. The NRC Order EA-12-049 FLEX modifications are being implemented in the OC1R26 Refueling Outage (Fall 2016) in accordance with the Order completion milestone schedule. The availability of redundant isolation condenser trains in an ELAP prevents any significant containment pressurization and, by returning the condensate to the reactor, reduces the risk of core damage. Accordingly, the isolation condenser system would be used in an ELAP instead of the hardened vent path for decay heat removal and as such provides equivalent or similar capabilities.

References

1. UFSAR 6.2.7.2.1, Rev. 18, System Arrangement
2. UFSAR 3.8.4.1.4, Rev. 18, Ventilation Stack
3. Oyster Creek Tornado Missile Risk Analysis Rev 0 PLG-0276 (Oyster Creek Document Number 990-2491)
4. NRC Letter to Oyster Creek 1990-02-26 "Evaluation of Diesel Generator Buildings Subject to Tornado Wind Generated Loading – Oyster Creek"
5. NRC letter to Oyster Creek December 7, 1992 (tornado wind at reactor building)
6. Technical Evaluation Report "Review of Wind and Tornado Loading Responses", NRC TAC No. 49392, Franklin Research Center, October 31, 1984
7. Oyster Creek Nuclear Generating Station, "Oyster Creek Individual Plant Examination for External Events (IPEEE) for Severe Accident Vulnerabilities," GPU Nuclear Corporation, December 29, 1995.
8. NRC Safety Evaluation Report for Oyster Creek IPEEE, Letter from Helen N. Pastis, NRC, to Ronald J. DeGregorio, AmerGen, dated February 1, 2001.
9. NOAA National Weather Service (http://www.spc.noaa.gov/wcm/)

RAI-4

Section 6.2.7.2.2 of OCNGS Updated Final Safety Analysis Report (UFSAR) describes the operation of the Hardened Vent System and states in part:

> To start the venting operation, an operator will be dispatched to align the hardened vent system by closing the Nitrogen line butterfly valve (V-23-357) and opening the vent line butterfly valve (V-23-358). Once these valves are aligned manually, the venting operation can be performed by opening either the Drywell isolation valves V-23-13 and 14 or the Torus isolation valves V-23-15 and 16 from the Control Room.

EA-13-109, Attachment 2, Requirement 1.2.4: (NEI 13-02 Section 4.2.2.1.4)

> The HCVS shall be designed to be manually operated during sustained operations from a control panel located in the main control room or a remote but readily accessible location.

NEI 13-02, Section 4.2.2.1.4:

> The controls/control location design should preclude the need for operators to move temporary ladders or operate from atop scaffolding to access the HCVS valves or remote operating locations.

Question

For the actions listed in the OCNGS UFSAR Section 6.2.7.2.2 quoted above, clarify whether any of the proposed operator actions require temporary ladders or operations atop scaffolding to accomplish the objectives.

Response

For the actions listed in OCNGS UFSAR, Section 6.2.7.2.2, the HCVS will be operated as described in the response to RAI-1 above and would not require the use of ladders or scaffolding. The manual valves in the system are operated outside of secondary containment from behind a shield wall at ground level. Air operated isolation valves would be operated from a panel located in the Main Control Room.

If manual operation of the air operated isolation valves as described in the response to RAI-7 below was required, the procedure and system configuration as currently designed require working from scaffolding or a portable ladder to connect a regulated high pressure nitrogen supply directly to the air operator for the HCVS isolation valves. The modifications described below will eliminate the need for scaffolding or ladders.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The compensatory measures will provide a means to reposition Torus HCVS isolation valve control solenoids from a remote location during a loss of all station AC, DC and control air supply. The compensatory measures would not require operators to move temporary ladders or operate from atop scaffolding to access the Torus HCVS valves or remote operating locations.

RAI-5

EA-13-109, Attachment 2, Requirement 1.2.6: (NEI 13-02 Section 4.2.2.1.1.1 and 4.2.6.1.2.2)

> The HCVS shall be capable of operating with dedicated and permanently installed equipment for at least 24 hours following the loss of normal power or loss of normal pneumatic supplies to air operated components during an extended loss of [alternating current] AC power.

The subject extension request and the OCNGS UFSAR, Section 6.2.7.2.2, each state that in the event of a loss of instrument air, venting operations can be performed a maximum of six times utilizing the permanently installed accumulators.

Question

Provide a site-specific justification which describes how the six cycles of motive force available in the accumulators is sufficient to support the OCNGS procedural actions to cope with the first 24 hours of a postulated severe accident. Include a description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities as required by the Order and described in the guidance during the requested period of extension.

Response

Containment Isolation Valves (CIV) V-23-13, V-23-14, V-23-15 and V-23-16 are utilized as part of the HCVS. The valve accumulators are designed to open and be cycled up to six times postulating a loss of instrument air. The basis for the six cycles is described in Reference 1, which was developed for beyond-design-basis conditions for venting the containment. Five cases were run where venting commenced when the Primary Containment Pressure Limit (PCPL) of 55 psig was reached and stopped when the containment pressure drops to 45 psig in accordance with the Emergency Operating Procedures (EOP) guideline. In all the cases run, the containment isolation valves had to be cycled 6 times within 24 hours (Reference 1).

There is a separate accumulator for Drywell valves V-23-13 (Y-6-42) and V-23-14 (Y-6-43). One accumulator is shared by Torus valves V-23-15 and V-23-16 (Y-6-44). The volume for the installed air accumulators is obtained from the Component Record List (CRL) for components Y-6-42, Y-6-43 (60 gallons each) and Y-6-44 (80 gallons). The mass of air required for a single valve stroke is 0.137 pounds and 0.823 pounds are required for six strokes per valve. The required volume is 4.075 cubic feet for each valve. The shared accumulator would need to have double that volume as it supplies two valves (8.15 cubic feet). The available margin is 3.947 cubic feet for the single valve accumulators and 2.546 cubic feet for the shared accumulator. In terms of additional valve strokes, the single valve accumulator can provide 5 additional strokes in a 24-hour postulated loss of instrument air. The shared valve accumulator can provide 1 additional stroke for each valve in a 24-hour postulated loss of instrument air (Reference 2).

A 2-year frequency preventative maintenance activity is performed to test the instrument air piping and associated accumulators to minimize the potential for valve failure of the hardened vent containment isolation valves. The air leak test removes the tubing between the isolation check valve and the instrument air system to simulate a complete loss of instrument air, and to provide the check valve with a leak path. If the pressure drop is greater than the acceptance criteria, then the instrument air piping is reworked as needed to satisfy the acceptance criteria.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The compensatory measure will install a connection that will provide a supplemental compressed gas supply. This gas supply to the Torus HCVS isolation valves will extend operation past the six cycles of the currently installed system. The location of this connection will allow for change-out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. A means of operating Torus HCVS isolation valve control solenoids independent of currently installed plant systems will also be provided.

References

1. C-1302-243-5450-062, Rev 0, Containment vent valve cycle at beyond design basis accidents
2. C-1302-242-5360-012 Rev.1, Accumulator Sizing for V-23-13, 14, 15, & 16

RAI-6

Question

The extension request states that, "Power for the solenoid valves is available as long as "B" battery can supply power and indefinitely once the FLEX generator restores the "B" battery charger. What is the length of time the "B" battery can supply power to the solenoid valves before the FLEX generator is required?

Response

Oyster Creek Generating Station Battery Coping Evaluation Report, Document No.: 12-4159.OCGS Rev 0 02/08/2013, built an Electrical Transient Analyzer Program (ETAP) model of the OCGS 125VDC distribution system to provide approximate coping times for Batteries A, B, and C for various load profiles. The coping time is defined as how long the battery will continue to supply adequate voltage to the loads (load profile) until the minimum required battery voltage (based on specified end of discharge volts per cell) is reached. The study found that the "B" battery would provide power during an SBO/ELAP event for 351 minutes (5.85 hours) with no DC load shedding. Preliminary deep load shedding analysis of "B" battery where load shedding is not complete until 1 hour, 2 hours, and 2.3 hours, indicated that up to 10 hours of battery life can be expected from the worst case of 2.3 hours. However, for the best case of completing the load shed within 1 hour, 13 hours of battery life can be expected. Oyster Creek is developing its load shed procedure based on the above report to support the FLEX strategies. Additional loads to those identified on the battery coping report could be shed thereby improving battery life.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The modification will provide a connection to an independent means of controlling Torus HCVS isolation valve solenoids. The control method will be available for use if "B" battery and the 500Kw FLEX generator are not available.

RAI-7

Question

The extension request states, “If there is a loss of station air, AC, and [direct current] DC power, then the current site B.5.b procedures direct manual opening of the HCVS isolation valves.” Provide a description of how the manual opening and keeping open of the containment isolation valves is accomplished.

Response

The existing B.5.b procedure EDMG-SPX9, "Manually Opening Containment Vent Valves in a B.5.b Event," opens a selected HCVS containment isolation valve pair using a regulated high pressure nitrogen supply connected directly to the valves' air operators. Gas pressure is then applied to open the HCVS valves. The HCVS valves are visually verified to have stroked open at the valve station. Once the HCVS isolation valves are opened they remain open. The operator then exits the area before the main venting operation is commenced. To commence the venting operation, an operator will be dispatched to align the HCVS by closing the nitrogen line butterfly valve (V-23-357) and opening the vent line butterfly valve (V-23-358). These valves are located outside of secondary containment, at the northeast corner of the Reactor Building. The procedure and system configuration as currently designed require working from scaffolding or a portable ladder to connect a regulated high pressure nitrogen supply directly to the air operator for the HCVS isolation valves.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The modification will provide a connection to an independent means of controlling Torus HCVS isolation valve solenoids from a remote location. The modification will also provide a means to connect an independent compressed gas source at a remote location. These connections will allow sustained operation beyond the capacity of the currently installed HCVS system. The location to the connection point will allow changing out of spent supplemental compressed gas supply source during an event.

RAI-8

EA-13-109, Attachment 2, Requirement 1.2.8: (NEI 13-02 Section 4.2.2.)

> The HCVS shall include means to monitor the status of the vent system (e.g. valve position indication) from the control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of AC power.

Question

Provide a description of the differences, if any, between the guidance in NEI 13-02, Section 4.2.2, and the actual, physical configuration and/or capabilities of the containment venting system which will be in operation during the requested period of extension. Include a description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities as required by the Order and described in the guidance during the requested period of extension.

Response

NEI 13-02, Section 4.2.2 specifies that a control panel for sustained operation of the HCVS be designed with the ability for manual operation with means of monitoring the status of the vent system (i.e., radiation, temperature, pressure, and valve position indication). The monitoring system shall be designed for sustained operation during an Extended Loss of AC Power (ELAP). The HCVS system should include indications for the containment pressure and wetwell level for determination of vent operation. Other aspects of NEI 13-02, Section 4.2.2 are covered by the response to RAI-2 and RAI-7 above.

There is no effluent temperature monitoring of the HCVS piping. The HCVS utilizes the existing stack radiation monitor and its instrumentation which is currently instrumented to the Main Control Room (MCR). During an ELAP, Radioactive Gaseous Effluent Monitoring System (RAGEMS) is non-functional (as described in the response to RAI-9 below). There is no pressure indication of the HCVS piping in the MCR. However, there is a HCVS pipe pressure gauge located at the manual valve station which provides local pressure indication. Operators will rely on containment pressure and Torus water level indication in making the decision to vent. Narrow range level indication for the Torus will be available during an ELAP, and containment pressure can be obtained using a local pressure gauge near the MCR.

The control switches and status indicating lights of the four (4) containment isolation valves are located in the MCR (Reference 1). A two-position key locked bypass switch labeled "Normal" and "Bypassed" is provided in Panel 12XR to allow for these valves (V-23-13, 14, 15, & 16) to be opened with an isolation signal present (Reference 2). The current plant configuration has a loss of indication for one out of the two hardened containment isolation valves that are connected to the Torus and Drywell (V-23-13 & V-23-15) during an ELAP.

Compensatory Measures

Oyster Creek is currently in the design phase of modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will supply a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment.

The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement venting operations. Procedures will be developed to perform continuity checks across isolation valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. These modifications will be scheduled to be installed by completion of the OC1R26 Refueling Outage (Fall 2016).

The compensatory measure modification has the following features which have the capabilities or similar capabilities of those described in NEI 13-02, Section 4.2.2.

- The ability to open/close the Torus HCVS isolation valves multiple times during the event by providing additional motive gas.
- The ability to open/close the Torus HCVS isolation valves multiple times during the event by providing additional methods of controlling operating solenoids.
- The ability to change out spent supplemental compressed gas supply source during an event providing sustained operations greater than 7 days.
- Simple connection/disconnect.
- Modification connection/control points protected from severe external events.
- The location of connection points will be outside secondary containment and take into consideration the temperature and radiological conditions the operating personnel may encounter in transit and at the connection point.
- Staged portable equipment will be consistent with the guidance for NRC Order EA-12-049 which states: "The equipment would be staged and reasonably protected from applicable site-specific severe external events to provide reasonable assurance that the equipment will remain deployable following such an event."
- The modification will remove the need to work from scaffolding or ladders.
- The modification will remove the need for operators to perform actions in the vicinity of the Torus HCVS isolation valves.

Additional compensatory measures will provide the following features:

- Continuity checks across the Torus HCVS isolation valve limit switches from the MCR will provide position indication when normal indication is lost.
- Portable radiation meters at the shield wall will provide gross fuel damage indication.
- Pressures readings can be obtained from the installed pressure gauge at the shield wall.
- If the temperature probe evaluation proves acceptable, then the HCVS piping temperature would be available at a remote location.

References

1. UFSAR 6.2.7.2.1, Rev. 18, System Arrangement
2. UFSAR 6.2.7.6, Rev. 18, Instrumentation Requirements

RAI-9

EA-13-109, Attachment 2, Requirement 1.2.9: (NEI 13-02 Section 4.2.4.1.2.)

> The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication from the control panel required by 1.2.4 and shall be designed for sustained operation during an extended loss of AC power.

Section 6.2.7.3 of the OCNGS UFSAR describes the design evaluation of the Hardened Vent System and states in part:

> During venting operation coincident with the loss of offsite power, the flow to the stack is less than the design cut-off flow of 94,000 CFM of the RAGEMS [Radioactive Gaseous Effluent Monitoring System]. At this flow condition the RAGEMS will go to automatic default mode using the low range monitor. Since there is no fuel damage when venting on TW sequence [loss of decay heat cooling capability] is performed, the radiation level of the releases will be within the range of the low range monitor.

Question

Provide a description of the differences, if any, between the guidance in NEI 13-02, Section 4.2.4.1.2, and the actual, physical configuration and/or capabilities of the containment venting system which will be in operation during the requested period of extension. Include description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities as required by the Order and described in the guidance during the requested period of extension.

Response

The power source of the RAGEMS is IP-4C BKR#3 and IP-4B BKR#14. These monitors are emergency diesel powered and are not provided with battery backup power. Therefore, during an Extended Loss of AC Power (ELAP) condition, there would be no capability to monitor the main stack effluent discharge for radioactivity that may be released from operation of the HCVS.

Compensatory Measures

As a compensatory measure, Oyster Creek will develop procedures to use a hand held radiation monitor at the shield wall to determine if there was a transition from no core damage (1 mrem/hr) to 20% fuel pin damage (700 mrem/hr) or greater. The equipment will be staged and reasonably protected from applicable site-specific severe external events to provide reasonable assurance that the equipment will remain deployable following such an event. The procedures will be implemented by the OC1R26 Refueling Outage (Fall 2016).

RAI-10

EA-13-109, Attachment 2, Requirement 1.2.10: (NEI 13-02 Section 2.4.4.1)

> The HCVS shall be designed to withstand and remain functional during severe accident conditions, including containment pressure, temperature, and radiation while venting steam, hydrogen, and other non-condensable gases and aerosols. The design is not required to exceed the current capability of the limiting containment components.

NEI 13-02, Section 2.4.4.1, states in part:

> The PCPL [Primary Containment Pressure Limit] and 545°F, is recommended as the design pressure and temperature for the drywell vent system and any common and shared portions of the vent line...

Question

Provide a description of the differences, if any, between the guidance in NEI 13-02, Section 2.4.4.1, and the actual, physical configuration and/or capabilities of the containment venting system which will be in operation during the requested period of extension. Include a description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities, as required by the Order and described in the guidance during the requested period of extension.

Response

The existing design was not evaluated for 545°F for drywell venting. Criteria and options have significantly evolved since the issuance of NEI 13-02, Revision 0 and have not been finalized.

The Oyster Creek NRC GL 89-16 hardened vent piping is designed for 75 psig and 305°F (Reference 2). The existing design pressure meets the NRC Order EA-13-109 requirements since it exceeds the Torus design pressure (35 psig) and the Primary Containment Pressure Limit (PCPL) (55 psig) (Reference 1). The design temperature of 305°F was based on the saturation temperature at 55 psig. The CIV seat material is able to withstand 400°F (Reference 3). Since Torus venting assumes saturated conditions in the Torus, the existing design temperature meets the intent of the Order for Torus venting. In addition, NEI 13-02, Section 2.4.4.1.1 addresses the possibility of operation at more extreme temperatures and states that: "Inherent margins above design of the components, such as higher plastic failure temperatures provide assurance of this capability...". The rated capacity is 1% of rated thermal power assuming a containment pressure of 55 psig.

Following a venting operation, condensation of steam will occur in the pipe. The condensed steam in the pipe inside the Reactor Building and in the vertical portion of the vent pipe outside the Reactor Building will be drained through the air trap located in the northeast corner of the building. The condensed water in the horizontal portion of the vent pipe outside the building will flow down towards the stack where it will be drained to the bottom of the stack through the 2" drain provided at the low point of the vent pipe inside the stack. The floor drain of the stack is utilized to drain the water collected on the stack floor (Reference 4).

The use of the hardened vent is expected to preclude core melt during the TW sequence. Therefore, radiation dose rates resulting from operation of this system during the TW sequence would not preclude system operability and accessibility. The piping was routed in such a way as to minimize the radiation dose rate to the operators and plant personnel (Reference 2).

Upon implementation of EPG/SAG Revision 3, venting for combustible gas control and primary containment pressure control will be directed by steps in the SAMGs and implemented through support procedures. Venting for primary containment pressure control without combustible gas will be directed by steps in the Emergency Operating Procedures (EOPs).

Similar Capabilities

The original design basis for Oyster Creek includes safety-grade, redundant isolation condenser trains that do not require AC power. The original design basis for the isolation condenser system includes a station black-out (SBO) event. Accordingly, during an ELAP event, the isolation condenser system would be expected to remain available. ICS usage prevents any significant containment pressurization since it releases the reactor decay heat directly to the outside atmosphere. The RPV steam condensed in the isolation condenser is returned to the RPV, thereby minimizing the loss of RPV inventory.

In response to NRC Order EA-12-049, water make-up sources will be added to the isolation condenser shell-side for an ELAP event, which are not dependent on permanently installed equipment. These NRC Order EA-12-049 actions will provide increased availability of the Station's DC power required to maintain isolation condenser system operability. The NRC Order EA-12-049 FLEX modifications are being implemented in the OC1R26 Refueling Outage (Fall 2016) in accordance with the Order completion milestone schedule. The availability of redundant isolation condenser trains in an ELAP prevents any significant containment pressurization and, by returning the condensate to the reactor, reduces the risk of core damage. Accordingly, the isolation condenser system would be used in an ELAP instead of the hardened vent path for decay heat removal and as such provides equivalent or similar capabilities.

References

1. UFSAR 6.2.7, Rev. 18 Hardened Vent System
2. MDD-OC-822-A DIV1, Rev 2, Hardened Vent System
3. MDD-OC-822-A DIV 2, Rev. 1, Hardened Vent System
4. SE-402968-001, Rev 2, Hardened Vent Modification

RAI-12

EA-13-109, Attachment 2, Requirement 2.2: (NEI 13-02 Section 5.2 and 5.3)

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

In addition, the OCNGS UFSAR Section 6.2.7.4 describes the Failure Modes and Effects Analysis (FMEA) of the Hardened Vent System and states in part:

> The 10" vent pipe which is not seismic, is provided with anti-fall down pipe supports. In the event of a seismic event, failure of the hardened vent pipes (8" and 10") may occur.

Question

Given the severe accident conditions associated with the Order, address the potential failure of the hardened vent pipes in the response to RAI-12 below.

Provide a description of the differences, if any, between the guidance in NEI 13-02, Section 5.2 and 5.3, and the actual, physical configuration and/or capabilities of the containment venting system which will be in operation during the requested period of extension. Include a description of compensatory measures, if any, which will be utilized to achieve equivalent or similar capabilities as required by the Order and described in the guidance during the requested period of extension.

Response

NEI 13-02 Sections 5.2.1 and 5.3.1.1

The containment isolation valves V-23-13, V-23-14, V-23-15 and V-23-16, operators, containment penetration piping, valve position limit switches, pilot solenoids, power supplies, accumulators and the accumulator's piping/tubing are qualified to seismic class 1 (References 2 and 3). This complies with NEI 13-02, 5.2.1 and 5.3.1.1. HCVS isolation valves and selected associated components are being added to the Expedited Seismic Equipment List (ESEL) to be evaluated under the Expedited Seismic Evaluation Process (ESEP).

NEI 13-02 Sections 5.2.2 and 5.3.1.2

The portions of the Oyster Creek NRC GL 89-16 external hardened vent path that are downstream of the primary containment penetrations consist of 8" and 10" nominal diameter piping. The 8" nominal diameter hardened vent path, which is inside the Reactor Building from the containment penetration to the Reactor Building wall, was part of the original Oyster Creek design for the nitrogen inerting system. The 8" nominal diameter piping analysis did not include any seismic loads (Reference 4). The 10" nominal diameter externally routed hardened vent path from the Reactor Building wall to the main stack was added in 1992 as part of the NRC GL

89-16 modification and is designed to anti-falldown seismic criteria (Reference 4). However, the Electric Power Research Institute (EPRI) has documented the effects of strong earthquakes of magnitude 5.9 to 7.6 in California on various facilities of different vintages in many reports such as NP-7126 (Reference 5), NP-7500-SL (Reference 6), TR-103477 (Reference 7), and TR-103454 (Reference 8).

These reports concluded that welded steel piping generally exhibited excellent earthquake performance, even for piping with only sporadic provisions for seismic loads in pipe support systems. As described in the Oyster Creek UFSAR, Section 2.5.2.3, the "Seismic Probability Map of the United States" (U.S. Coast and Geodetic Survey) assigns New Jersey to seismic Zone 1 (minor damage) as compared with seismic Zone 3 (major damage) for California. The seismicity of the general region of the Oyster Creek Site is sufficiently low that it would be expected to have a low intensity of ground motion. The shocks in this region are too small to be listed in "Seismicity of the Earth" by Gutenberg and Richter, and the U.S. Coast and Geodetic Survey publication does not provide information on the magnitudes of the shocks.

<u>NEI 13-02 Section 5.2.3</u>

"The components including instrumentation external to a seismic category 1 (or equivalent building or enclosure) should be designed to meet the external hazards that screen in for the plant as defined in guidance NEI 12-06, as endorsed by JLD-ISG-2012-01, for NRC Order EA-12-049."

Oyster Creek screens in for Seismic, External Flooding, Snow, Ice and Extreme Cold, Extreme High Temperature, and High Wind Hazard. The Oyster Creek HCVS components satisfy the requirements of NEI 12-06 as described below:

- Seismic is addressed in RAI-12 above.
- External Flooding: The flooding IPEEE results (Reference 11) indicate that HCVS components external to a seismic category 1 structure will not be affected by the most limiting flooding conditions.
- Snow, Ice, and Extreme Cold: Snow and Ice will be addressed by the compensatory measure procedure changes listed below.
- Extreme High Temperature: The highest recorded temperature documented in the UFSAR for southern New Jersey was listed as 106°F (Reference 10). The components external to a seismic category 1 structure will not be affected by the extreme high temperature.
- High Wind Hazards: Wind Hazards are addressed in the compensatory measure procedure changes listed below and as addressed in RAI-3 above.

<u>NEI 13-02 Sections 5.3.1.3 and 5.3.1.4</u>

The compensatory HCVS modification(s) described in RAI-1, 2, 4, 5, 6, 7, and 8 will comply with NEI 13-02, Section 5.2, Seismic and External Conditions and NEI 13-02, Section 5.3, Quality Requirements.

The potential failure of the hardened vent piping during a seismic event could result in venting the primary containment into the Reactor Building, which has a potential for unmonitored ground releases of radioactive materials. As discussed in the OCNGS UFSAR, Section 6.2.7.4 (Reference 1), the consequence of a failure of the primary containment is more severe than the consequences of a controlled venting of the primary containment with a potential for ground releases.

Compensatory Measures

Oyster Creek procedure OP-OC-108-109-1001, "Severe Weather Preparation T&RM for Oyster Creek," will be revised to ensure a snow and ice removal plan is in place to provide access to the manual valve station for the HCVS located at the northeast corner of the Reactor building. The procedure will also include steps to ensure the northeast corner of the Reactor Building near the HCVS manual valve station is clear of loose objects that could become wind driven missiles. The procedure will be implemented by the OC1R26 Refueling Outage (Fall 2016).

Similar Capabilities

The original design basis for Oyster Creek includes redundant isolation condenser trains that are designed to Seismic Class 1 criteria and do not require AC power. The original design basis for the isolation condenser system includes a station black-out (SBO) event. Accordingly, following a seismic event and an Extended Loss of AC Power (ELAP) event, the isolation condenser system would be expected to remain available. ICS usage prevents any significant containment pressurization since it releases the reactor decay heat directly to the outside atmosphere. The RPV steam condensed in the isolation condenser is returned to the RPV, thereby minimizing the loss of RPV inventory.

In response to NRC Order EA-12-049, water make-up sources will be added to the isolation condenser shell-side for an ELAP event, which are not dependent on permanently installed equipment. The NRC Order EA-12-049 actions will provide increased availability of the Station's DC power required to maintain isolation condenser system operability. The NRC Order EA-12-049 FLEX modifications are being implemented in the OC1R26 Refueling Outage (Fall 2016) in accordance with the Order completion milestone schedule. The availability of Seismic Class 1 redundant isolation condenser trains following an ELAP prevents any significant containment pressurization and, by returning the condensate to the reactor, reduces the risk of core damage. Accordingly, the isolation condenser system would be used following a seismic event and an ELAP instead of the hardened vent path for decay heat removal and as such provides equivalent or similar capabilities.

References

1. UFSAR 6.2.7.4, Rev. 18 Failure Modes and Effects Analysis (FMEA)
2. C-1302-822-5320-044, Hardened Vent Modification Seismic Support for Air Accumulators
3. SE-402968-001, Rev 2, Hardened Vent Modification
4. C-1302-822-5320-041, Rev 0. Hardened Vent Piping
5. EPRI NP-7126, "The October 1, 1987, Whittier Earthquake: Effects on Selected Power, Industrial, and Commercial Facilities", prepared by EQE Engineering, December 1990.
6. EPRI NP-7500-SL, "The October 17, 1989, Loma Prieta Earthquake: Effects on Selected Power and Industrial Facilities", prepared by EQE Engineering, September 1991.

7. EPRI Report TR-103477, "The Cape Mendocino Earthquake Sequence of April 25 and 26, 1992: Effects on Electric Power Facilities", prepared by EQE International, November 1994.
8. EPRI Report TR-103454, "The June 28, 1992, Landers and Big Bear Earthquakes: Effects on Power and Industrial Facilities", prepared by EQE Engineering, December 1993
9. Oyster Creek UFSAR Section 2.5.2.3
10. Oyster Creek UFSAR, Table 2.3-2
11. Oyster Creek UFSAR Section 2.4.2.1

RAI-13

EA-13-109, Attachment 2, Requirement 3.1:

> The Licensee shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during an extended loss of AC power.

EA-13-109, Attachment 2, Requirement 3.2:

> The Licensee shall train appropriate personnel in the use of the HCVS. The training curricula shall include system operations when normal and backup power is available, and during an extended loss of AC power.

Question

Provide a description of procedure changes and/or changes to the training curricula, if any, to support the use of the containment venting system during the requested period of extension.

Response

Oyster Creek has requested an extension for implementation of NRC Order EA-13-109. The extension, if granted, would not significantly change the design of the HCVS system. Procedures and training curriculum for the normal and off normal operation of the HCVS, as currently designed, have been developed and implemented at the site. The approved procedure set includes the operation of the HCVS during a B.5.b event. The B.5.b event assumes damage to site systems and components such that local operation of the HCVS isolation valves would be required as described in the response to RAI-7 above. Operator training for operation of the HCVS system currently consists of classroom lectures, infield walk downs, and a demonstration laboratory where a mockup is used to manually open an air operated valve.

Upon implementation of EPG/SAG Revision 3, venting for combustible gas control and primary containment pressure control will be directed by steps in the SAMGs and implemented through support procedures. Venting for primary containment pressure control without combustible gas will be directed by steps in the Emergency Operating Procedures (EOPs). These changes affecting the use and control of the HCVS would be incorporated into the procedures and training required for the implementation of the overall FLEX strategies and EPG/SAG Revision 3.

Compensatory Measures

Training for the operation of the compensatory modifications and associated procedures are controlled by the modification process and included in FLEX training programs to be completed in accordance with the NRC Order EA-12-049 milestone schedule. Training for EPG/SAG Revision 3 would also include training on operation of the HCVS.

Enclosure 2

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
1. Oyster Creek will implement modifications for the Torus HCVS isolation valves V-23-15 and V-23-16. The modifications will enhance the capability of the Torus HCVS during Extended Loss of AC Power (ELAP) conditions. The modifications, once completed, will provide a supplemental compressed gas connection to the Torus HCVS isolation valves, extending the availability of this motive force. The location of this connection will allow for change out of the compressed gas source extending indefinitely the availability of the Torus HCVS isolation valve motive force. The modification and procedure changes will provide a means of operating Torus HCVS isolation valve control solenoids with a total loss of station AC, DC and control air supply from a remote location. The supplemental compressed gas connection and means of Torus HCVS isolation valve solenoid control will be located outside of secondary containment. The location of the modification connection points is being determined, and will take into consideration the environment and radiological conditions that the operator would be exposed to during an event. The location of the modification connection points will be protected from severe external events. The design requires the connections to be simple and not require the disassembly and reassembly of components. The use of ladders or scaffolding will not be required to make required connections or implement the modification. Procedures will be developed to perform continuity checks across isolation	Prior to startup from OC1R26 Refuel Outage (Fall 2016)	Yes	No

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
valve position indication switches as a means of determining valve position from the main control room when position indication is lost. Additionally, Oyster Creek is evaluating the use of a temperature probe that could be read with a portable device at the connection/control point. The operator dose assessment will use the guidelines from NEI 13-02, Appendix F and G. Means to reposition Torus HCVS isolation valve control solenoids from a remote location during a loss of all station AC, DC, and control air supply will be provided. These means will not require operators to move temporary ladders or operate from scaffolding to access the Torus HCVS valves or remote operating locations. The gas supply to the Torus HCVS isolation valves will extend operation past the six cycles of the currently installed system. The location of this connection will allow for change-out of the compressed gas source extending indefinitely the availability of the torus HCVS isolation valve motive force during an event. A means of operating Torus HCVS isolation valve control solenoids independent of currently installed plant systems will be provided, including unavailability of the "B" battery and the 500Kw FLEX generator. Components installed as part of the HCVS modification will comply with NEI 13-02, Section 5.2 Seismic and External Conditions, and NEI 13-02, Section 5.3 Quality Requirements. The modification has the following features which have the capabilities or similar capabilities of those described in NEI 13-02, Section 4.2.2.			

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
• The ability to open/close the Torus HCVS isolation valves multiple times during the event by providing additional motive gas. • The ability to open/close the Torus HCVS isolation valves multiple times during the event by providing additional methods of controlling operating solenoids. • The ability to change out spent supplemental compressed gas supply source during an event providing sustained operations greater than 7 days. • Simple connection/disconnect. • Modification connection/control points protected from severe external events. • The location of connection points will be outside secondary containment and take into consideration the temperature and radiological conditions the operating personnel may encounter in transit and at the connection point. • Staged portable equipment will be consistent with the guidance for NRC Order EA-12-049 which states: "The equipment would be staged and reasonably protected from applicable site-specific severe external events to provide reasonable assurance that the equipment will remain deployable following such an event." • The modification would remove the need to work from scaffolding or ladders. • The modification would remove the need for operators to perform actions in the vicinity of the Torus HCVS isolation valves. • Continuity checks across the Torus HCVS isolation valve limit switches from the Main Control Room (MCR) will provide position indication when normal indication is lost.			

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
• Portable radiation meters at the shield wall will provide gross fuel damage indication. • Pressures readings can be obtained from the installed pressure gauge at the shield wall. • If the temperature probe evaluation proves acceptable, then the HCVS piping temperature would be available at a remote location.			
2. Oyster Creek procedure OP-OC-108-109-1001, "Severe Weather Preparation T&RM for Oyster Creek," will be revised to ensure the northeast corner of the Reactor Building near the HCVS manual valve station is clear of loose objects that could become wind driven missiles.	Prior to startup from OC1R26 Refuel Outage (Fall 2016)	No	Yes
3. Oyster Creek will develop procedures to use a hand held radiation monitor at the shield wall to determine if there was a transition from no core damage (1 mrem/hr) to 20% fuel pin damage (700 mrem/hr) or greater. The equipment will be staged and reasonably protected from applicable site-specific severe external events to provide reasonable assurance that the equipment will remain deployable following such an event.	Prior to startup from OC1R26 Refuel Outage (Fall 2016)	No	Yes
4. Oyster Creek procedure OP-OC-108-109-1001, "Severe Weather Preparation T&RM for Oyster Creek," will be revised to ensure a snow and ice removal plan is in place to provide access to the manual valve station for the HCVS located at the northeast corner of the Reactor Building. The procedure will also include steps to ensure the northeast corner of the Reactor Building near the HCVS manual valve station is clear of loose objects that could become wind driven missiles.	Prior to startup from OC1R26 Refuel Outage (Fall 2016)	No	Yes