Exelon Generation®

Order No. EA-13-109

RS-16-110

June 30, 2016

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

Quad Cities Nuclear Power Station, Units 1 and 2
Renewed Facility Operating License Nos. DPR-29 and DPR-30
NRC Docket Nos. 50-254 and 50-265

Subject: Fourth Six-Month Status Report For Phases 1 and 2 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)

References:

1. NRC Order Number 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. NRC Interim Staff Guidance JLD-ISG-2015-01, "Compliance with Phase 2 Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions", Revision 0, dated April 2015
3. NEI 13-02, "Industry Guidance for Compliance With Order EA-13-109, BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions", Revision 1, dated April 2015
4. Exelon Generation Company, LLC's Answer to June 6, 2013, Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 26, 2013
5. Exelon Generation Company, LLC Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 30, 2014 (RS-14-063)
6. Exelon Generation Company, LLC First Six-Month Status Report Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated December 17, 2014 (RS-14-306)
7. Exelon Generation Company, LLC Second Six-Month Status Report Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 30, 2015 (RS-15-152)

8. Exelon Generation Company, LLC Phase 1 (Updated) and Phase 2 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated December 16, 2015 (RS-15-304)
9. NRC letter to Exelon Generation Company, LLC, Quad Cities Nuclear Power Station, Units 1 and 2 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Phase 1 of Order EA-13-109 (Severe Accident Capable Hardened Vents) (TAC Nos. MF4460 and MF4461), dated April 1, 2015

On June 6, 2013, the Nuclear Regulatory Commission ("NRC" or "Commission") issued an Order (Reference 1) to Exelon Generation Company, LLC (EGC). Reference 1 was immediately effective and directs EGC to require their BWRs with Mark I and Mark II containments to take certain actions to ensure that these facilities have a hardened containment vent system (HCVS) to remove decay heat from the containment, and maintain control of containment pressure within acceptable limits following events that result in loss of active containment heat removal capability while maintaining the capability to operate under severe accident (SA) conditions resulting from an Extended Loss of AC Power (ELAP). Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 required submission of an Overall Integrated Plan (OIP) by June 30, 2014 for Phase 1 of the Order, and an OIP by December 31, 2015 for Phase 2 of the Order. The interim staff guidance (Reference 2) provides direction regarding the content of the OIP for Phase 1 and Phase 2. Reference 2 endorses industry guidance document NEI 13-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial response regarding reliable hardened containment vents capable of operation under severe accident conditions. Reference 5 provided the Quad Cities Nuclear Power Station, Units 1 and 2, Phase 1 OIP pursuant to Section IV, Condition D.1 of Reference 1. References 6 and 7 provided the first and second six-month status reports pursuant to Section IV, Condition D.3 of Reference 1 for Quad Cities Nuclear Power Station. Reference 8 provided the Quad Cities Nuclear Power Station, Units 1 and 2, Phase 1 updated and Phase 2 OIP pursuant to Section IV, Conditions D.2 and D.3 of Reference 1.

The purpose of this letter is to provide the fourth six-month update report for Phases 1 and 2, pursuant to Section IV, Condition D.3 of Reference 1, that delineates progress made in implementing the requirements of Reference 1 for Quad Cities Nuclear Power Station, Units 1 and 2. The enclosed report provides an update of milestone accomplishments since the last status report, including any changes to the compliance method, schedule, or need for relief and the basis, if any. The enclosed report also addresses the NRC Interim Staff Evaluation open items contained in Reference 9.

It is noted that as a result of the recently announced early permanent plant shutdown date of June 1, 2018, EGC is evaluating the need for schedule relaxation and expects to submit a request for Order schedule relaxation after submittal of the notice of permanent cessation of operation for both units.

This letter contains no new regulatory commitments. If you have any questions regarding this report, 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 30th day of June 2016.

Respectfully submitted,

Glen T. Kaegi
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosure:

Quad Cities Nuclear Power Station, Units 1 and 2 Fourth Six-Month Status Report for Phases 1 and 2 Implementation of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region III
NRC Senior Resident Inspector - Quad Cities Nuclear Power Station
NRC Project Manager, NRR - Quad Cities Nuclear Power Station
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Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2

Fourth Six-Month Status Report for Phases 1 and 2 Implementation of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions

(14 pages)

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2 Fourth Six-Month Status Report for Phases 1 and 2 Implementation of Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions"

1 Introduction

Quad Cities Nuclear Power Station, Units 1 and 2 (Quad Cities Station) developed an Overall Integrated Plan (Reference 1 in Section 8), documenting the installation of a Hardened Containment Vent System (HCVS) that provides a reliable hardened venting capability for pre-core damage and under severe accident conditions, including those involving a breach of the reactor vessel by molten core debris, in response to Reference 2. Starting with this six month status report, updates of milestone accomplishments will be based on the combined Phase 1 and Phase 2 Overall Integrated Plan dated December 16, 2015.

Quad Cities Station developed an updated and combined Phase 1 and Phase 2 Overall Integrated Plan (Reference 7 in Section 8), documenting:

1. The installation of a HCVS that provides a reliable hardened venting capability for pre-core damage and under severe accident conditions, including those involving a breach of the reactor vessel by molten core debris, in response to Reference 2.
2. An alternative venting strategy that makes it unlikely that a drywell vent is needed to protect the containment from overpressure related failure under severe accident conditions, including those that involve a breach of the reactor vessel by molten core debris, in response to Reference 2.

This enclosure provides an update of milestone accomplishments since submittal of the combined Phase 1 and Phase 2 Overall Integrated Plan (Reference 7), including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

2 Milestone Accomplishments

The following milestone(s) have been completed since the development of the combined Phase 1 and Phase 2 Overall Integrated Plan (Reference 7), and are current as of May 15, 2016.

- Started On-line installation of Unit 1 Phase 1.
- Began conceptual design of Phase 2 for Unit 1 and Unit 2.

3 Milestone Schedule Status

The following provides an update to Attachment 2 of the combined Phase 1 and Phase 2 Overall Integrated Plan. It provides the activity status of each item, and whether the expected completion date has changed. The dates are planning dates subject to change as design and implementation details are developed.

The revised milestone target completion dates do not impact the Order EA-13-109 implementation date.

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phase 1 and Phase 2 HCVS Milestone Table			
Submit Overall Integrated Plan	**Jun 2014**	Complete	
Submit 6 Month Updates:			
Update 1	**Dec. 2014**	Complete	
Update 2	**Jun. 2015**	Complete	
Update 3	**Dec. 2015**	Complete	
Update 4	**Jun 2016**	Complete with this submittal	
Update 5	**Dec 2016**	Not Started	
Update 6	**Jun 2017**	Not Started	
Update 7	**Dec 2017**	Not Started	
Update 8	**Jun 2018**	Not Started	
Update 9	**Dec 2018**	Not Started	
Phase 1 Specific Milestones			
Phase 1 Unit 1 Modifications:			
Complete Conceptual Design	**Jun 2014**	Complete	
Complete Detailed Design and Issue Modification Package	**Mar 2016**	Complete	
Begin Online Portion of the Installation	**Jan 2016**	Complete	
Complete Online Installation	**Mar 2017**	Started	
Begin Outage Portion of the Installation	**Mar 2017**	Not Started	
Complete Outage Installation	**Apr 2017**	Not Started	
Phase 1 Unit 1 Procedure Changes Active			
Operations Procedure Changes Developed	**Apr 2017**	Started	
Site Specific Maintenance Procedure	**Apr 2017**	Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phase 1 and Phase 2 HCVS Milestone Table			
Developed			
Procedure Changes Active	**Apr 2017**	Not Started	
Phase 1 Unit 1 Training:			
Training Complete	**Apr 2017**	Not Started	
Phase 1 Unit 1 Completion			
Phase 1 Unit 1 HCVS Implementation	**Apr 2017**	Not Started	
Submit Phase 1 Unit 1 Completion Report	**Jun 2019**	Not Started	
Phase 1 Unit 2 Modifications:			
Complete Conceptual Design	**Jun 2014**	Complete	
Complete Detailed Design and Issue Modification Package	**Mar 2017**	Started	
Begin Online Portion of the Installation	**Nov 2016**	Not Started	
Complete Online Installation	**Mar 2018**	Not Started	
Begin Outage Portion of the Installation	**Mar 2018**	Not Started	
Complete Outage Installation	**Apr 2018**	Not Started	
Phase 1 Unit 2 Procedure Changes Active			
Operations Procedure Changes Developed	**Apr 2018**	Started	
Site Specific Maintenance Procedure Developed	**Apr 2018**	Started	
Procedure Changes Active	**Apr 2018**	Not Started	
Phase 1 Unit 2 Training:			
Training Complete	**Apr 2018**	Not Started	
Phase 1 Unit 2 Completion			
Phase 1 Unit 2 HCVS Implementation	**Apr 2018**	Not Started	
Submit Phase 1 Unit 2 Completion Report	**Jun 2018**	Not Started	Formerly May 2018

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phase 1 and Phase 2 HCVS Milestone Table			
Phase 2 Specific Milestones			
Phase 2 Unit 1 Modifications:			
Begin Conceptual Design	**Apr 2016**	Started	
Complete Conceptual Design	**Feb 2017**	Not Started	
Begin Detailed Design	**Apr 2017**	Not Started	
Complete Detailed Design and Issue Modification Package	**Jul 2017**	Not Started	Common design with Unit 2. Formerly Mar 2018.
Begin Online Portion of the Installation	**Sep 2017**	Not Started	Common installation with Unit 2.
Complete Online Installation	**Mar 2018**	Not Started	Common installation with Unit 2.
Begin Outage Portion of the Installation	**N/A**	N/A	No outage scope
Complete Outage Installation	**N/A**	N/A	No outage scope
Phase 2 Unit 1 Procedure Changes Active			
Operations Procedure Changes Developed	**Apr 2019**	Not Started	
Site Specific Maintenance Procedure Developed	**Apr 2019**	Not Started	
Procedure Changes Active	**Apr 2019**	Not Started	
Phase 2 Unit 1 Training:			
Training Complete	**Apr 2019**	Not Started	
Phase 2 Unit 1 Completion			
Phase 2 Unit 1 HCVS Implementation	**Apr 2019**	Not Started	
Submit Phase 1 and Phase 2 Unit 1 Completion Report	**Jun 2019**	Not Started	
Phase 2 Unit 2 Modifications:			

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phase 1 and Phase 2 HCVS Milestone Table			
Begin Conceptual Design	**Apr 2016**	Started	
Complete Conceptual Design	**Feb 2017**	Not Started	
Begin Detailed Design	**Apr 2017**	Not Started	
Complete Detailed Design and Issue Modification Package	**Jul 2017**	Not Started	Common design with Unit 1. Formerly Mar 2017.
Begin Online Portion of the Installation	**Sep 2017**	Not Started	Common installation with Unit 1.
Complete Online Installation	**Mar 2018**	Not Started	Common installation with Unit 1.
Begin Outage Portion of the Installation	**N/A**	N/A	No outage installation
Complete Outage Installation	**N/A**	N/A	No outage installation
Phase 2 Unit 2 Procedure Changes Active			
Operations Procedure Changes Developed	**Apr 2018**	Not Started	
Site Specific Maintenance Procedure Developed	**Apr 2018**	Not Started	
Procedure Changes Active	**Apr 2018**	Not Started	
Phase 2 Unit 2 Training:			
Training Complete	**Apr 2018**	Not Started	
Phase 2 Unit 2 Completion			
Phase 2 Unit 2 HCVS Implementation	**Apr 2018**	Not Started	
Submit Phase 1 and Phase 2 Unit 2 Completion Report	**Jun 2018**	Not Started	

4 Changes to Compliance Method

Phase 1 Changes

None.

Phase 2 Changes

Quad Cities completed a dose assessment based on assumed Severe Accident conditions to determine the impacts on Emergency Response Organization actions during a Beyond Design Bases External Event (BDBEE). This assessment included determining the impacts on previously planned FLEX response actions and Phase 2 HCVS response actions to implement the Severe Accident Water Addition/Severe Accident Water Management (SAWA/SAWM) strategy. The assessment indicated high dose rates in some areas currently designated for use in the primary FLEX strategy. As a result, the Phase 2 design will require the use of available alternate FLEX deployment locations and changing the sequencing of FLEX actions in those locations in order to implement the SAWA/SAWM strategy.

The following table and narrative describe the changes to the conceptual Phase 2 design as previously described in the December 2015 OIP (Reference 7), and is subject to future changes as the design progresses.

The following changes **(bolded)** are made to Table 3.1 of the December 2015 Overall Integrated Plan (OIP) (Ref. 7):

Table 3.1 – SAWA Manual Actions

Primary Action	Primary Location/ Component	Notes
1. Establish HCVS capability in accordance with Part 2 of this OIP.	• MCR and ROS.	• Applicable to SAWA/SAWM strategy.
2. Deploy diesel FLEX/SAWA pump.	• **FLEX/SAWA pump west of Turbine Building (TB).**	• **Pump at Discharge Bay for all BDBEE except Local Intense Precipitation (LIP).** • **Pump at storm drain west of Unit 1 Main Power Transformer for LIP.**
3. Align flow path from **FLEX** / SAWA pump discharge to injection piping.	• **Turbine Building (ground level) valve manifold.** • FLEX Storz connections in Reactor Building **(RB).** • **Penetrations through RB / TB wall.**	• **RB connections made in first hour.** • Function of radiological assessment ***(ISE-4, Attachment 7)***. • **TB connections made to FLEX timeline (more limiting than SAWA).**

4. Power SAWA / HCVS components with second EA-12-049 (FLEX) generator.	• FLEX DG alternate deployment location at the northwest corner of the Turbine Building.	• FLEX primary deployment location in direct line-of-sight to the HCVS vent line. • **Extend cables 200' to make use of TB wall shielding.**	
5. Inject to Reactor Pressure Vessel (RPV) using FLEX / SAWA pump.	• Remote-manually open motor operated RHR valves (MOVs). • **Flow control is by TB valve manifold.**	• MOVs energized through FLEX diesel. MOVs are not throttled for flow control. • Initial SAWA flow rate is 400 gpm starting 8 hours after event.	
6. Monitor SAWA indications.	• **Mechanical flow meters on SAWA hose between distribution manifold and TB wall.**	• Pump flow. • MOV valve position indication as per normal MCR RHR indicators.	
7. Use SAWM to maintain availability of the WW vent (Part 3.1.A).	• **Suppression Pool indications in MCR.** • **Turbine Building valve manifold.**	• Monitor DW pressure and Suppression Pool level. • Control SAWA flow at valve manifold. • Vent line tap at top of Suppression Pool.	

The Discharge Bay is already analyzed for use as a water source in response to a BDBEE IAW EA-12-049 (Reference 9). An Equipment Operator would be stationed with a Godwin HL130M diesel powered mobile pump at an existing concrete pad intended for that purpose near the Discharge Bay water level.

In the event of a LIP resulting in a Severe Accident, a Godwin HL130M will be deployed west of the Unit 1 Main Power Transformer. The LIP study (Reference 10) indicates the water is relatively stagnant in this area soon into the event response, with a depth of approximately 1 foot above grade. A grating to the Site storm drain system will be removed, and the suction hose will be dropped into the drain.

From the FLEX/SAWA pump (at either Discharge Bay or western storm drain), a 5" diameter hose will route to the line-of-site dose shadow of the Turbine and Reactor Buildings, through the Turbine Building, to a manifold near the centerline of the ground floor (595' elevation). Several paths are available for routing this hose, so a partial collapse of the Turbine Building would not inhibit hose deployment. The length of the discharge hose is bounded by the existing FLEX hydraulic analysis (1350 feet, Reference 11), so there will be sufficient pressure and flow at the manifold to meet all water demands during the event.

From the manifold, 5" hoses will lead to three 6" pipes through wall penetrations between the Turbine Building and the Reactor Building. Each penetration will have a 6" gate valve in the Turbine Building to maintain Secondary Containment during normal operation.

In the Reactor Building, 5" fire hoses will connect the pipe penetrations to Storz connections installed under EA-12-049 to provide FLEX water supply to both Reactor Pressure Vessels (RPVs). The location of the wall penetrations at the ground level of the Reactor Building (595') centerline will be such that one 50-foot length of 5" hose will bridge each wall penetration to its respective RPV supply Storz connection.

Due to the timeline for Severe Accident progression and the rise of dose rates in the Reactor Building, the hose deployment in the Reactor Building will be performed in the first hour post-event. Hose deployment outside of the Reactor Building will conform to the FLEX response timeline, which is more limiting than the Severe Accident timeline.

Under this plan, the only difference between the water demand for a FLEX response and a SAWA response is flow rate. The FLEX hydraulic analysis used an input of 196 gpm to a single RPV, where SAWA requires 400 gpm to a single RPV starting at 8 hours post-event and reducing to 80 gpm at 12 hours post-event. Each Godwin HL130M pump is capable of flow in excess of 1000 gpm.

5 Need for Relief/Relaxation and Basis for the Relief/Relaxation

Quad Cities Station will comply with the Order implementation date and no relief/relaxation is required at this time. However, as a result of the recently announced early permanent plant shutdown date of June 1, 2018, EGC is evaluating the need for schedule relaxation and expects to submit a request for Order schedule relaxation after submittal of the notice of permanent cessation of operation for both units.

6 Open Items from Combined Phase 1 and Phase 2 Overall Integrated Plan and Interim Staff Evaluations

The following tables provide a summary of the open items documented in the combined Phase 1 and Phase 2 Overall Integrated Plan or the Interim Staff Evaluation (ISE) and the status of each item.

Combined Phase 1 and Phase 2 OIP Open Items		Status
Phase 1 Open Items		
OI-1	*Determine how Motive Power and/or HCVS Battery Power will be disabled during normal operation.*	*Complete – Per Quad Cities Station detailed design, HCVS primary control panel will be provided with a key lock switch to activate the system. Normally, system remains de-energized. This must be unlocked prior to performing any actuations of the DC powered components. With the panel being located in the MCR, unlocking and turning the switch can be performed in an ELAP with minimal operator action. Detailed in December 2015 OIP (Reference 7).*
OI-2	*Confirm that the Remote Operating Station (ROS) will be in an accessible area following a Severe Accident (SA).*	*Closed to ISE Open Item number 4.*

Combined Phase 1 and Phase 2 OIP Open Items		Status
OI-3	*Confirm diameter on new common HCVS Piping.*	*Closed to ISE Open Item number 5.*
OI-4	*Confirm suppression pool heat capacity.*	*Complete - The MAAP analysis verified that the vent is not required for at least 5 hours (Reference 12). At 5 hours, the decay heat will be less than 1 %.*
OI-5	*Determine the approach for combustible gases.*	*Closed to ISE Open Items 10 and 11.*
OI-6	*Develop a procedure for HCVS out-of-service requirements and compensatory measures.*	*Started. Will be incorporated into QCAP 1500-07, Administrative Tracking Requirements for Unavailable FLEX Equipment.*
OI-7	*Provide procedures for HCVS Operation.*	*Closed to ISE Open Item No.14.*
OI-8	*Confirm 125 Volt DC Station Battery Life.*	*Complete per Quad Cities Station calculation - QDC-8300-E-2100 (Reference 13) confirms that the 125 VDC Station Battery will continue to supply necessary power during the 8-hour duration prior to aligning the FLEX diesel generator. Also, refer to NRC ISE Open Item No. 1.*

Phase 2 Open Items		
OI-9	*Supply Part 3 Drywell Boundary Condition.*	*Complete – the Phase 2 Alternate option (SAWA/SAWM) was added to the December 2015 OIP (Reference 7).*
OI-10	*Determine deployment path for Discharge Bay booster pump with respect to HCVS dose.*	*Not Started.*

Phase 1 Interim Staff Evaluation Open Items (Reference 18)		Status
ISE-1	*Make available for NRC staff audit the calculation (QDC-8300-E-2100) that confirms that Order EA-12-49 actions to restore power are sufficient to ensure continuous operation*	*Complete - Supplied to NRC Audit team during onsite FLEX evaluation (Jan 2015). (Reference 13).*

	of non-dedicated containment instrumentation.	
ISE-2	*Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.*	*Complete - HCVS Battery design has been completed. (References 14, 15 and 17)* *Started - Incorporation into FLEX DG loading calculations is in progress.*
ISE-3	*Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.*	*Started- HCVS Nitrogen system design in progress. (References 14, 15 and 17)*
ISE-4	*Make available for NRC staff audit an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.*	*Complete- Temperature evaluation (Calculation 2014-02948) was made available to NRC Audit team during onsite FLEX evaluation (Jan 2015)(Reference 21).* *Complete - Phase I Radiological evaluation has been completed. (Reference 16).* *Started - Phase II Radiological evaluation has been initiated (Reference 6).*
ISE-5	*Make available for NRC staff audit documentation of the licensee design effort to confirm the diameter on the new common HCVS piping.*	*Started. Refer to the response to ISE open item 6.*
ISE-6	*Make available for NRC staff audit analyses demonstrating that HCVS has the capacity to vent the steam/energy equivalent of one percent of licensed/rated thermal power (unless a lower value is justified), and that the suppression pool and the HCVS together are able to absorb and reject decay heat, such that following a reactor shutdown from full power containment pressure is restored and then maintained below the primary containment design pressure and primary containment pressure limit.*	*Started. The required 1% vent capacity at the lower of PCPL or containment design pressure is being verified using RELAP which models the line size and routing.(Reference 19 prepared and in Site review)* *In addition, MAAP analyses (Reference 12) are credited to verify that (1) venting can be delayed for at least three (3) hours and (2) anticipatory venting sufficiently limits the suppression pool heat up to maintain RCIC functional.*
ISE-7	*Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.*	*Complete –The HCVS stack seismic design meets the Station's design basis earthquake design criteria. (Reference 20)*

		The information provided in December 2015 OIP (Reference 7) demonstrates that the external piping meets the tornado missile protection criteria of HCVS-WP-04.
ISE-8	*Make available for NRC staff audit the descriptions of local conditions (temperature, radiation and humidity) anticipated during ELAP and severe accident for the components (valves, instrumentation, sensors, transmitters, indicators, electronics, control devices, etc.) required for HCVS venting including confirmation that the components are capable of performing their functions during ELAP and severe accident conditions.*	*Started – Component location design and local conditions impact are in progress. The HCVS primary control panel will be located in the MCR (References 14, 15 and 17).* *Reactor Building temperatures are as noted in Calculation 2014-02948 (Reference 21).* *Turbine Building temperatures at the ROS are as noted in Evaluation EC 402709 (Reference 22).* *Limiting radiation conditions for equipment as per Calculation QDC-0000-M-2199, HCVS 7-Day Dose Analysis (Reference 16).*
ISE-9	*Make available for NRC staff audit documentation that demonstrates adequate communication between the remote HCVS operation locations and HCVS decision makers during ELAP and severe accident conditions.*	*Started – Communication as determined by FLEX response. Sound-powered phone jack near battery rack and bottle stations.*
ISE-10	*Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.*	*Complete – as stated in the December 2015 OIP, Quad Cities will utilize Argon purge system to address combustible gases in the HCVS piping. A summary of the design features is included in the December 2015 OIP (Reference 7).*
ISE-11	*Provide a description of the strategies for hydrogen control that minimizes the potential for hydrogen gas migration and ingress into the Reactor Building or other buildings.*	*Complete - As described in the December 2015 OIP (Reference 7), the HCVS torus vent path in each Quad Cities unit, starting at and including the downstream PCIV, will be a dedicated HCVS flow path. There are no interconnected systems downstream of the downstream, dedicated HCVS PCIV. Interconnected systems are upstream of the downstream HCVS PCIV and are isolated by normally shut, fail shut PCIVs which, if open, would shut on an ELAP. There is no*

		shared HCVS piping between the two units. *The vent path will rely on Argon purge system to prevent the formation of a combustible gas mixture from forming within the line (References 14, 15 and 17).*
ISE-12	*Make available for NRC staff audit documentation of a determination of seismic qualification evaluation of the HCVS components.*	*Started – the Quad Cities Station seismic evaluation will be based on the Quad Cities Station design basis earthquake.*
ISE-13	*Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.*	*Started. Instrument design is in progress (References 14, 15 and 17).*
ISE-14	*Make available for NRC staff audit the procedures for HCVS operation.*	*Started. Procedures are under development by Operations.*
Phase 2 Interim Staff Evaluation Open Items		**Status**
Phase 2 ISE has not been issued.		

7 Interim Staff Evaluation Impacts

There are no potential impacts to the Interim Staff Evaluation(s) identified at this time.

8 References

The following references support the updates to the combined Phase 1 and Phase 2 Overall Integrated Plan described in this enclosure.

1. Quad Cities Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)," dated June 30, 2014 (RS-14-063)
2. NRC Order Number EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 6, 2013

3. NEI 13-02, "Industry Guidance for Compliance with NRC Order EA-13-109, To Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," Revision 1, dated April 2015
4. NRC Interim Staff Guidance JLD-ISG-2013-02, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," Revision 0, dated November 2013 (ML13304B836)
5. NRC Endorsement of Industry "Hardened Containment Venting System (HCVS) Phase 1 Overall Integrated Plan Template (EA-13-109), Rev 0" (ML14128A219)
6. Calculation QDC-0000-M-2223, Revision 0, HCVS Phase II 7-Day Dose Analysis
7. Quad Cities Combined Phase 1 and 2 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)," dated December 16, 2015 (RS-15-304)
8. NRC Interim Staff Guidance JLD-ISG-2015-01, "Compliance with Phase 2 of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," Revision 0, dated April 2015 (ML15104A118)
9. NRC Order EA-12-049, Mitigation Strategies for Beyond-Design-Basis External Events, dated March 12, 2012
10. Exelon Calculation LIP-QDC-001, Rev. 4A, Quad Cities Local Intense Precipitation Evaluation
11. Exelon Calculation QDC-0000-M-2097, PIPE FLO Analysis of FLEX Strategy
12. Exelon Calculation QC-MISC-015, Rev. 0, MAAP Analysis to Support HCVS Design
13. Exelon Calculation QDC-8300-E-2100, Unit 1(2) 125 VDC Battery Coping Calculation for Beyond Design Basis FLEX Event
14. EC 392256 - Unit 1 Hardened Containment Vent System (Non-Outage Portion) as Required by NRC Order EA-13-109
15. EC 392257 - Unit 1 Hardened Containment Vent System (Outage Portion) as Required by NRC Order EA-13-109
16. Exelon Calculation QDC-0000-M-2199, HCVS 7 Day Dose Analysis
17. EC 400666 – Hardened Containment Vent System as Required by NRC Order EA-13-109 – Unit 2
18. NRC Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Phase One of Order EA-13-109 (Severe Accident Capable Hardened Vents) (TAC NOS. MF4460 and MF4461) (ML 15089A421), dated April 1, 2015
19. Exelon Calculation QDC-1600-M-2188, HCVS Vent Line Sizing Calculation, Rev. 0
20. Exelon Calculation QDC-0020-S-2192, HCVS Steel Tower Structural Calculation, Rev. 0

21. Exelon Calculation 2014-02948, Reactor Building Temperature Analysis Resulting from Extended Loss of AC Power
22. Exelon Evaluation EC 402709 – Temperature in Proposed Location of Remote Operating Station