



Order No. EA-13-109

RS-15-152

June 30, 2015

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: Second Six-Month Status Report For 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)

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 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 NRC 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. 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.

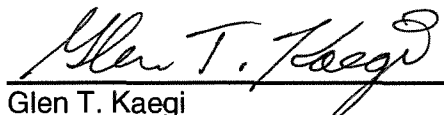
Reference 1 required submission of a Phase 1 Overall Integrated Plan pursuant to Section IV, Condition D by June 30, 2014. Reference 2 endorses industry guidance document NEI 13-02, Revision 1 (Reference 3) with clarifications and exceptions identified in Reference 2. Reference 4 provided the EGC initial answer to the Order 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 Overall Integrated Plan.

Reference 1 requires submission of a status report at six-month intervals following submittal of the Phase 1 overall integrated plan. Reference 3 provides direction regarding the content of the status reports. Reference 6 provided the first six-month status report pursuant to Section IV, Condition D.3 of Reference 1 for Quad Cities Station. The purpose of this letter is to provide the second six-month status report for Phase 1 pursuant to Section IV, Condition D.3, of Reference 1, that delineates progress made in implementing the requirements of Reference 1. 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 7.

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 2015.

Respectfully submitted,



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

Enclosure:

Quad Cities Nuclear Power Station, Units 1 and 2 Second Six-Month Status Report for Phase 1 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, Units 1 and 2
NRC Project Manager, NRR – Quad Cities Nuclear Power Station, Units 1 and 2
Mr. Charles H. Norton, NRR/JLD/PPSD/JOMB, NRC
Mr. John P. Boska, NRR/JLD/JOMB, NRC
Illinois Emergency Management Agency - Division of Nuclear Safety

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2

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

(7 pages)

Enclosure

Quad Cities Nuclear Power Station, Units 1 and 2 Second Six Month Status Report for the 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), 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. This enclosure provides an update of milestone accomplishments since submittal of the Phase 1 Overall Integrated Plan First Six Month Update, 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 Overall Integrated Plan (Reference 1), and are current as of June 30, 2015.

- Second Six-Month Update (complete with this submittal)

3 Milestone Schedule Status

The following provides an update to Part 5 of the Overall Integrated Plan (OIP) (Ref. 1). 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 implementation date.

Milestone	Target Completion Date	Activity Status	Comments
Phase 1 HCVS Milestone Table			
Submit Phase 1 Overall Integrated Plan	June 2014	Complete	

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

Submit 6 Month Updates:			
Update 1 Phase 1	December 2014	Complete	
Update 2 Phase 1	June 2015	Complete with this submittal	
Update 3 [Simultaneous with Phase 2 OIP]	December 2015	Not Started	
Update 4 Phase 1 and 2	June 2016	Not Started	
Update 5 Phase 1 and 2	December 2016	Not Started	
Update 6 Phase 1 and 2	June 2017	Not Started	
Update 7 Phase 1 and 2	December 2017	Not Started	
Modifications:			
Hold preliminary/conceptual design meeting	June 2014	Complete	July 2014
Modifications Evaluation	March 2016	In Progress	
Unit 1 Design Engineering Complete	March 2016	In Progress	
Unit 1 Implementation Outage (Phase 1)	April 2017	Not Started	
Unit 1 Implementation Outage (Phase 2)	April 2019	Not Started	
Unit 1 Phase 1 Walk Through Demonstration/Functional Test	April 2017	Not Started	
Unit 2 Design Engineering Complete	March 2017	Not Started	
Unit 2 Implementation Outage (Phase 1 and 2)	April 2018	Not Started	
Unit 2 Phase 1 and 2 Walk Through Demonstration/Functional Test	April 2018	Not Started	
Procedure Changes			
Operations Procedure Changes Developed	December 2016	Not Started	
Site Specific Maintenance Procedure Developed	December 2016	Not Started	
Procedure Changes Active	April 2017	Not Started	
Training:			

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

Training Complete	December 2016	Not Started	
Completion			
Unit 1 Phase 1 HCVS Implementation	April 2017	Not Started	
Unit 1 Phase 1 Completion Report [60 days after Unit 1 Phase 1 compliance]	June 2017	Not Started	
Unit 2 HCVS Implementation (Phase 1 and 2)	April 2018	Not Started	
Unit 2 Phase 1 and 2 Completion Report [60 days after Unit 2 compliance]	June 2018	Not Started	
Unit 1 Phase 2 HCVS Implementation	April 2019	Not Started	
Unit 1 Phase 2 Completion Report [60 days after Unit 1 Phase 2 compliance]	June 2019	Not Started	

4 Changes to Compliance Method

The following changes have been made to the compliance method for Phase 1 (the Phase 1 Overall Integrated Plan was provided under Reference 1):

- The Quad Cities HCVS Design has been changed to replace all previous references to a Secondary Containment Isolation Valve (SCIV) with a rupture disc rated for a pressure sufficient to withstand leakage through the downstream PCIV during a Design Basis Accident or LLRT.
- An Argon purge system has been determined to be the method of preventing hydrogen deflagration. The Argon purge system will be used to rupture the disc to allow anticipatory venting.

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

Quad Cities Station expects to comply with the order implementation date; therefore, no relief/relaxation is required at this time.

6 Open Items from Overall Integrated Plan and Interim Staff Evaluation

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

Overall Integrated Plan Phase 1 Open Item	Status
1. Determine how Motive Power and/or HCVS Battery Power will be disabled during normal	Complete – Conceptual design (completed July 2014) determined

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

operation.	the HCVS primary control panel will be provided with a key lock switch to activate the system. This must be unlocked prior to performing any actuations of the DC powered components. Since the panel will be located in the MCR, unlocking and turning the switch can be performed in an ELAP with minimal operator action.
2. Confirm that the Remote Operating Station (ROS) will be in an area accessible following a Severe Accident (SA).	Superseded by ISE Open Item No. 4.
3. Confirm diameter on new common HCVS Piping.	Superseded by ISE Open Item No. 5.
4. Confirm suppression pool heat capacity.	Complete – The MAAP analysis verifies that the vent is not required for at least 5 hours (Reference 7). At 5 hours, the decay heat will be less than 1%.
5. Determine the approach for combustible gases.	Superseded by ISE Open Item Nos. 10 and 11.
6. Develop a procedure for HCVS out-of-service requirements and compensatory measures.	Started.
7. Provide procedures for HCVS Operation.	Superseded by ISE Open Item No. 14.
8. Confirm 125 Volt DC Station Battery Life.	Complete - QDC-8300-E-2100 (Reference 6) 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.
9. Supply Part 3 Drywell Boundary Condition.	Not Started – Will be provided with Phase 2 OIP (December 2015).

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

Interim Staff Evaluation Open Item	Status
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 of non-dedicated containment instrumentation.	Complete – Supplied to NRC Audit team during onsite FLEX evaluation (Jan 2015). (Reference 6).
2. Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.	Started – HCVS Battery design in progress. (References 8 and 9)
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 8 and 9)
4. Make available for the NRC staff audit an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.	Started - Temperature evaluation (Calculation 2014-02948) was made available to NRC Audit team during onsite FLEX evaluation (Jan 2015). Radiological evaluation in progress. (References 8 and 9)
5. Make available for NRC staff review documentation that confirms the final design diameter of the HCVS piping.	Started – Refer to the response to ISE Open Item No. 6.
6. Make available for NRC staff audit analyses demonstrating that HCVS has the capacity to vent the steam/energy equivalent to one percent of licensed/rated thermal power (unless a lower value is justified) and that the suppression pool and 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 the primary containment pressure limit.	Started - The required 1% vent capacity at the lower of PCPL or containment design pressure will be verified using RELAP which models the line size and routing. In addition, MAAP analyses will be credited to verify that (1) venting can be delayed for at least three hours and (2) anticipatory venting sufficiently limits the suppression pool heat up to maintain RCIC functional. (References 8 and 9)
7. Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.	Started - The HCVS stack seismic design criteria is the Station's design basis earthquake. The HCVS line will exit the Reactor Building more than 30 feet above any highest ground elevation located within ½ mile. The tornado missile criterion for

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

	above 30 feet is under evaluation. (References 8 and 9)
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, and 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 condition impacts are in progress. The HCVS primary control panel will be located in the MCR. (References 8 and 9)
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.	Not Started.
10. Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	Started - Argon purge system design in progress. (References 8 and 9)
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.	<p>Started – As described in the OIP (Ref. 1), the HCVS torus vent path in each Quad Cities unit starting with, and including, the downstream PCIV will be a dedicated HCVS flow path. There are no interconnected systems downstream of the dedicated HCVS PCIV. Interconnected systems are upstream of the HCVS PCIV and are isolated by normally shut, fail shut (air-to-open, spring-to-shut) PCIVs which, if open, would shut on an ELAP. There is no shared HCVS piping between the two units.</p> <p>The vent path will rely on an Argon purge system to prevent line failure due to potential hydrogen deflagration and detonation. (References 8 and 9)</p>
12. Make available for NRC staff audit documentation of a seismic qualification	Not Started.

Quad Cities Nuclear Power Station, Units 1 and 2
Second Six Month Status Report for the Implementation of HCVS Phase 1
June 30, 2015

evaluation of HCVS components.	
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 in progress. (References 8 and 9)
14. Make available for NRC staff audit the procedures for HCVS operation.	Not Started.

7 Interim Staff Evaluation Impacts

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

8 References

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

1. Quad Cities Nuclear Power Station, Units 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 June 30, 2014.
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-2015-01 , "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 April 2015 (Accession No. ML15104A118).
5. NRC Endorsement of Industry "Hardened Containment Venting System (HCVS) Phase 1 Overall Integrated Plan Template (EA-13-109) Rev 0," dated May 14, 2014 (Accession No. ML14128A219).
6. Exelon Calculation QDC-8300-E-2100, Unit 1(2) 125 VDC Battery Coping Calculation for Beyond Design Basis FLEX Event, dated September 26, 2014.
7. QC-MISC-013, Revision 3, MAAP Analysis to Support FLEX Initial Strategy.
8. EC 392256 - Unit 1 Hardened Containment Vent System (Non-Outage Portion) as Required by NRC Order EA-13-109.
9. EC 392257 - Unit 1 Hardened Containment Vent System (Outage Portion) as Required by NRC Order EA-13-109.