

RS-17-008

January 26, 2017

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: Fifth 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. Exelon Generation Company, LLC 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), dated June 30, 2016 (RS-16-110)
10. 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
11. Exelon Generation Company, LLC 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” and NRC Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated November 16, 2016 (RS-16-210)
12. Exelon Generation Company, LLC 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” and NRC Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated January 12, 2017 (RS-17-006)

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. Reference 9 provided the fourth six-month status report pursuant to Section IV, Condition D.3 of Reference 1 for Quad Cities Nuclear Power Station.

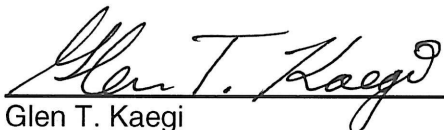
The purpose of this letter is to provide the fifth six-month update report for Phases 1 and 2, pursuant to Section IV, Condition D.3 of Reference 1, that delineates progress made in implementing the requirements of Reference 1 for Quad Cities Nuclear Power Station, Units 1 and 2. The enclosed report 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 10.

In Reference 11, EGC requested an extension to comply with NRC Order EA-13-109 based on the earlier decision to permanently cease power operations at Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018, and engineering design and plant modification activities supporting Order implementation were discontinued. In Reference 12, as a result of the reversed cessation of operation decision, EGC withdrew this request for extension to comply and provided a revised request for extension to comply with NRC Order EA-13-109 based on the continued operation of both units. EGC has resumed work to complete full implementation of NRC Order EA-13-109 at Quad Cities Nuclear Power Station, Units 1 and 2

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David J. Distel at 610-765-5517.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 26<sup>th</sup> day of January 2017.

Respectfully submitted,



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

Enclosure:

Quad Cities Nuclear Power Station, Units 1 and 2 Fifth 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  
Mr. Raj Auluck, NRR/JLD/TSD/JCBB, NRC  
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Illinois Emergency Management Agency - Division of Nuclear Safety

bcc: Site Vice President - Quad Cities Nuclear Power Station  
Site Engineering Director – Quad Cities Nuclear Power Station  
Regulatory Affairs Manager  
Regulatory Assurance Manager - Quad Cities Nuclear Power Station  
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William F. James  
Brett L. Hagerman



**Enclosure**

**Quad Cities Nuclear Power Station, Units 1 and 2**

**Fifth 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**

(20 pages)

## Enclosure

### Quad Cities Nuclear Power Station, Units 1 and 2

#### **Fifth 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 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. Updates of milestone accomplishments will be based on the combined Phases 1 and 2 Overall Integrated Plan dated December 16, 2015.

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

1. 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.
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 the Fourth Six-Month Update of the combined Phases 1 and 2 Overall Integrated Plan, including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any.

In Reference 24, EGC requested an extension to comply with NRC Order EA-13-109 based on the earlier decision to permanently cease power operations at Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018, which caused engineering design and plant modification activities supporting Order implementation to be discontinued. As a result of the recent reversed cessation of operation decision, in Reference 25 EGC withdrew this request for extension to comply and provided a revised request for extension to comply with NRC Order EA-13-109 based on the continued operation of both units. EGC has now resumed work to complete full implementation of NRC Order EA-13-109 at Quad Cities Nuclear Power Station, Units 1 and 2 in accordance with this update to the Overall Integrated Plan, Section 3, Milestone Schedule, which is consistent with the requested extension letter (Reference 25).

## 2 Milestone Accomplishments

The following milestone(s) have been completed since the Fourth Six-Month Update to the combined Phases 1 and 2 Overall Integrated Plan (Ref. 23), and are current as of January 31, 2017.

- None - Project had been paused due to anticipated Site cessation of operations.

## 3 Milestone Schedule Status

The following provides an update to Attachment 2 of the combined Phases 1 and 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.

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
Submit Overall Integrated Plan	Jun 2014	Complete	
<b>Submit 6 Month Updates:</b>			
Update 1	Dec. 2014	Complete	
Update 2	Jun. 2015	Complete	
Update 3	Dec. 2015	Complete	
Update 4	Jun 2016	Complete	
Update 5	Jan 2017	Complete with this submittal	
Update 6	Jun 2017	Not Started	
Update 7	Dec 2017	Not Started	
Update 8	Jun 2018	Not Started	
Update 9	Dec 2018	Not Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
<b>Phase 1 Specific Milestones</b>			
<b>UNIT 1</b>			
<b>Phase 1 Unit 1 Modifications:</b>			
Complete Conceptual Design	<b>Jun 2014</b>	Complete	
Complete Detailed Design and Issue Modification Package	<b>Mar 2016</b>	Complete	
Begin Online Portion of the Installation	<b>Jan 2016</b>	Complete	
Complete Online Installation	<b>Dec 2017</b>	Started	Date extended to meet critical path of Simulator upgrades. Relief Request submitted.
Begin Outage Portion of the Installation	<b>Mar 2017</b>	Not Started	
Complete Outage Installation	<b>Apr 2017</b>	Not Started	
Installation Operational Acceptance	<b>June 2018</b>	Not Started	Extended to meet Online completion, contingencies, and coincide with U2 completion.  Relief Request submitted
<b>Phase 1 Unit 1 Procedure Changes Active</b>			
Operations Procedure Changes Developed	<b>Dec 2017</b>	Started	Extended to meet Online completion.  Relief Request submitted.
Site Specific Maintenance Procedure Developed	<b>Dec 2017</b>	Started	Extended to meet Online completion.  Relief Request submitted.

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
Procedure Changes Complete	<b>Dec 2017</b>	Not Started	Extended to meet Online completion. Relief Request submitted.
<b>Procedure Final Validation and Implementation</b>	<b>June 2018</b>	Not Started	Extended to meet Online completion and coincide with U2 completion. Relief Request submitted.
<b>Phase 1 Unit 1 Training:</b>			
Simulator Upgrade Completion	<b>Dec 2017</b>	Not Started	Extended to meet 2017/2018 training cycle Relief Request submitted.
Training Complete	<b>April 2018</b>	Not Started	Extended to meet 2017/2018 training cycle and coincide with U2 outage completion. Relief Request submitted.
<b>Phase 1 Unit 1 Completion</b>			
Phase 1 Unit 1 HCVS Implementation	<b>June 2018</b>	Not Started	Extended to meet Online completion, contingencies, and coincide with U2 completion. Relief Request submitted.



<b>Milestone</b>	<b>Target Completion Date</b>	<b>Activity Status</b>	<b>Comments {Include date changes in this column}</b>
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
<b>UNIT 2</b>			
<b>Phase 1 Unit 2 Modifications:</b>			
Complete Conceptual Design	<b>Jun 2014</b>	Complete	
Complete Detailed Design and Issue Modification Package	<b>Mar 2017</b>	Started	
Begin Online Portion of the Installation	<b>Nov 2016</b>	Complete	
Complete Online Installation	<b>Mar 2018</b>	Not Started	
Begin Outage Portion of the Installation	<b>Mar 2018</b>	Not Started	
Complete Outage Installation	<b>Apr 2018</b>	Not Started	
Installation Operational Acceptance	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies.  Relief Request submitted.
<b>Phase 1 Unit 2 Procedure Changes Active</b>			
Operations Procedure Changes Developed	<b>Apr 2018</b>	Started	
Site Specific Maintenance Procedure Developed	<b>Apr 2018</b>	Started	
Procedure Changes Active	<b>Apr 2018</b>	Not Started	
<b>Procedure Final Validation and Implementation</b>	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies.  Relief Request submitted.
<b>Phase 1 Unit 2 Training:</b>			
Simulator Upgrade Completion	<b>Dec 2017</b>	Not Started	Meets 2017/2018 training cycle.
Training Complete	<b>Apr 2018</b>	Not Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
<b>Phase 1 Unit 2 Completion</b>			
Phase 1 Unit 2 HCVS Implementation	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies.  Relief Request submitted.
<b>Phase 2 Specific Milestones</b>			
<b>UNIT 1</b>			
<b>Phase 2 Unit 1 Modifications:</b>			
Begin Conceptual Design	<b>Apr 2016</b>	Started	
Complete Conceptual Design	<b>Feb 2017</b>	Not Started	Common design with Unit 2.
Begin Detailed Design	<b>Apr 2017</b>	Not Started	Common design with Unit 2.
Complete Detailed Design and Issue Modification Package	<b>Jul 2017</b>	Not Started	Common design with Unit 2. Formerly Mar 2018.
Begin Online Portion of the Installation	<b>Sep 2017</b>	Not Started	Common install with Unit 2.
Complete Online Installation	<b>Mar 2018</b>	Not Started	Common install with Unit 2.
Begin Outage Portion of the Installation	<b>N/A</b>	N/A	No outage scope
Complete Outage Installation	<b>Apr 2018</b>	Not Started	No outage scope
Installation Operational Acceptance	<b>April 2019</b>	Not Started	
<b>Phase 2 Unit 1 Procedure Changes Active</b>			
Operations Procedure Changes Developed	<b>Apr 2019</b>	Not Started	
Site Specific Maintenance Procedure Developed	<b>Apr 2019</b>	Not Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
Procedure Changes Active	<b>Apr 2019</b>	Not Started	
<b>Phase 2 Unit 1 Training:</b>			
Training Complete	<b>Apr 2019</b>	Not Started	
<b>Phase 2 Unit 1 Completion</b>			
Phase 2 Unit 1 HCVS Implementation	<b>Apr 2019</b>	Not Started	
Submit Phases 1 and 2 Unit 1 Completion Report (60 day letter)	<b>Jun 2019</b>	Not Started	
<b>UNIT 2</b>			
<b>Phase 2 Unit 2 Modifications:</b>			
Begin Conceptual Design	<b>Apr 2016</b>	Started	
Complete Conceptual Design	<b>Feb 2017</b>	Not Started	Common design with Unit 1.
Begin Detailed Design	<b>Apr 2017</b>	Not Started	Common design with Unit 1.
Complete Detailed Design and Issue Modification Package	<b>Jul 2017</b>	Not Started	Common design with Unit 1. Formerly Mar 2017.
Begin Online Portion of the Installation	<b>Sep 2017</b>	Not Started	Common install with Unit 1.
Complete Online Installation	<b>Mar 2018</b>	Not Started	Common install with Unit 1.
Begin Outage Portion of the Installation	<b>N/A</b>	N/A	No outage install
Complete Outage Installation	<b>Apr 2018</b>	Not Started	No outage install
Installation Operational Acceptance	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies, and coincide with U2 Phase 1 completion activities.  Relief Request submitted.

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
<b>Phase 1 and Phase 2 HCVS Milestone Table</b>			
<b>Phase 2 Unit 2 Procedure Changes Active</b>			
Operations Procedure Changes Developed	<b>Apr 2018</b>	Not Started	
Site Specific Maintenance Procedure Developed	<b>Apr 2018</b>	Not Started	
Procedure Changes Active	<b>Apr 2018</b>	Not Started	
<b>Procedure Final Validation and Implementation</b>	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies, and coincide with U2 Phase 1 completion activities.  Relief Request submitted.
<b>Phase 2 Unit 2 Training:</b>			
Training Complete	<b>Apr 2018</b>	Not Started	
<b>Phase 2 Unit 2 Completion</b>			
Phase 2 Unit 2 HCVS Implementation	<b>June 2018</b>	Not Started	Extended to meet Online final completion and contingencies, and coincide with U2 Phase 1 completion activities.  Relief Request submitted.
Submit Phases 1 and 2 Unit 2 Completion Report (60 day letter)	<b>Aug 2018</b>	Not Started	

#### 4 Changes to Compliance Method

##### Phase 1 Changes

None

##### Phase 2 Changes

Quad Cities contracted a dose assessment, based on assumed Severe Accident conditions, in order to determine effects on Emergency Response Organization actions during a Beyond Design Bases External Event (BDBEE), including effects on previously planned FLEX response actions and Phase 2 HCVS response actions to implement a SAWA / SAWM strategy. The assessment showed high dose rates in some areas currently designated as part of the primary FLEX strategy. This requires the use of the alternate FLEX deployment locations and changing the priorities of FLEX actions in those areas.

The following Table 3.1 and narrative describes the current conceptual design as previously described in the Fourth Six Month update of June 2016 (Ref. 23). There are no Table 3.1 changes in this report. Table 3.1 is subject to future changes as the design progresses.

**Table 3.1 – SAWA Manual Actions**

Primary Action	Primary Location/ Component	Notes
1. Establish HCVS capability in accordance with Part 2 of this OIP.	<ul style="list-style-type: none"> <li>MCR and ROS.</li> </ul>	<ul style="list-style-type: none"> <li>Applicable to SAWA / SAWM strategy.</li> </ul>
2. Deploy diesel FLEX / SAWA pump.	<ul style="list-style-type: none"> <li>FLEX / SAWA pump west of Turbine Building (TB).</li> </ul>	<ul style="list-style-type: none"> <li>Pump at Discharge Bay for all BDBEE except LIP.</li> <li>Pump at storm drain west of Unit 1 Main Power Transformer for LIP.</li> </ul>
3. Align flow path from FLEX / SAWA pump discharge to injection piping.	<ul style="list-style-type: none"> <li>Turbine Building (ground level) valve manifold.</li> <li>FLEX Storz connections in Reactor Building (RB).</li> <li>Penetrations through RB / TB wall.</li> </ul>	<ul style="list-style-type: none"> <li>RB connections made in first hour.</li> <li>Function of radiological assessment (<i>ISE-4, Attachment 7</i>).</li> <li>TB connections made to FLEX timeline (more limiting than SAWA).</li> </ul>
4. Power SAWA / HCVS components with second EA-12-049 (FLEX) generator.	<ul style="list-style-type: none"> <li>FLEX DG alternate deployment location at the northwest corner of the Turbine Building.</li> </ul>	<ul style="list-style-type: none"> <li>FLEX primary deployment location in direct line-of-sight to the HCVS vent line.</li> <li>Extend cables 200' to make use of TB wall shielding.</li> </ul>



5. Inject to RPV using FLEX / SAWA pump.	<ul style="list-style-type: none"> <li>• Remote-manually open motor operated RHR valves (MOV)s.</li> <li>• Flow control is by TB valve manifold.</li> </ul>	<ul style="list-style-type: none"> <li>• MOVs energized through FLEX diesel. MOVs are not throttled for flow control.</li> <li>• Initial SAWA flow rate is 400 gpm starting 8 hours after event.</li> </ul>
6. Monitor SAWA indications.	<ul style="list-style-type: none"> <li>• Mechanical flow meters on SAWA hose between distribution manifold and TB wall.</li> </ul>	<ul style="list-style-type: none"> <li>• Pump flow.</li> <li>• MOV valve position indication as per normal MCR RHR indicators.</li> </ul>
7. Use SAWM to maintain availability of the WW vent (Part 3.1.A).	<ul style="list-style-type: none"> <li>• Suppression Pool indications in MCR.</li> <li>• Turbine Building valve manifold.</li> </ul>	<ul style="list-style-type: none"> <li>• Monitor DW pressure and Suppression Pool level.</li> <li>• Control SAWA flow at valve manifold.</li> <li>• Vent line tap at top of Suppression Pool.</li> </ul>

The Discharge Bay is already analyzed for use as a water source in response to a BDBEE IAW EA-12-049 (Ref. 9). A Godwin HL130M diesel powered mobile pump would be stationed 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 (Ref. 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.

From the manifold, 5" hoses will lead to four 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.

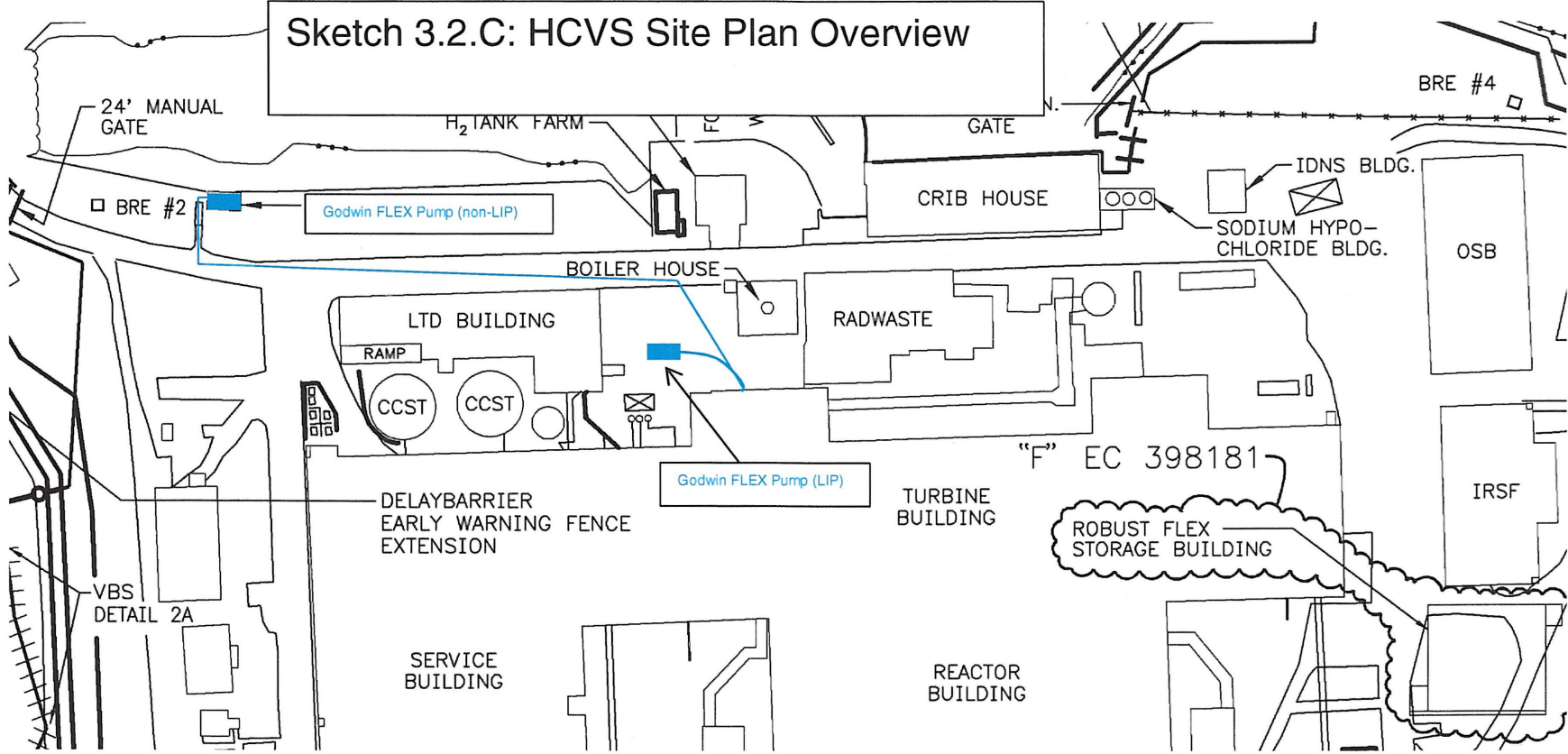
Under this plan, the only difference between the water demand for a FLEX response and a Severe Accident Water Addition (SAWA) response is flow rate. The FLEX hydraulic analysis used an input of 196 gpm to a single RPV, where SAWA requires 400 gpm to a single RPV starting at 8 hours post-event and reducing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

The discharge of the Godwin pump shall route to one core bore into the Heater Pull Space through the west Turbine Building wall, which would be filled with a pipe with hose connections on both sides. This will allow hoses to route inside from the western wall to the Distribution Manifold.

During a Severe Accident, an Equipment Operator stationed at the Discharge Bay pad will be exposed to 311 mR/hr. For LIP events, dose is expected to be less than 1 mR/hr in the shadow of the Offgas Building.

Sketch 3.2.C: HCVS Site Plan Overview, also changes to the following:

# Sketch 3.2.C: HCVS Site Plan Overview



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

Quad Cities has requested HCVS schedule relief until June 30, 2018 due to the delay while anticipating permanent plant shutdown. Since reversal of the decision for permanent plant shutdown has now been made, previously planned work can be restarted based on this revised schedule (Reference 25).

On June 20, 2016, EGC notified the NRC that it had decided to permanently cease power operations at the Quad Cities Nuclear Power Station, Units 1 and 2 by June 1, 2018 (Reference 26). In Reference 24, EGC requested on November 16, 2016, schedule relaxation of the requirements of NRC Orders EA-13-109 and EA-12-049 for Quad Cities Nuclear Power Station, Units 1 and 2 based on the planned cessation of operations.

In Reference 27, EGC notified the NRC on December 14, 2016, that EGC has reversed the permanent cessation of operation decision and, therefore, both units will continue to operate beyond June 1, 2018.

As a result of the recent reversed cessation of operation decision, on January 12, 2017 under Reference 25, EGC withdrew this request for extension to comply and provided a revised request for extension to comply with NRC Order EA-13-109 based on the continued operation of both units. Under the revised request, additional time is needed to complete implementation of the remaining engineering and design activities, plant modifications, and procedural and training activities required to fully implement the requirements of NRC Order EA-13-109 and NRC Order EA-12-049 for Quad Cities Nuclear Power Station, Units 1 and 2. As such, EGC has now resumed work to complete full implementation of NRC Order EA-13-109 at Quad Cities Nuclear Power Station, Units 1 and 2 in accordance with this updated Overall Integrated Plan, Section 3, Milestone Schedule, which is consistent with the requested extension letter (Reference 25).

The basis for the completion dates under this revised request for extension is as follows:

NRC Order EA-13-109, Section IV.B requires licensees to complete implementation of Phase 1 (severe accident capable wetwell venting system) no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever occurs first. NRC Order EA-13-109, Section IV.B also requires licensees to complete implementation of Phase 2 (severe accident capable drywell venting system or alternate venting strategy) no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever occurs first.

Thus, NRC Order EA-13-109, Section IV requires that Quad Cities Nuclear Power Station, Unit 1 shall complete implementation of Phase 1 of the Order no later than startup from the Q1R24 refueling outage (Spring 2017), and completion of implementation of Phase 2 of the Order no later than startup from the Q1R25 refuel outage (Spring 2019). NRC Order EA-13-109, Section IV requires that Quad Cities Nuclear Power Station, Unit 2 shall complete implementation of Phases 1 and 2 of the Order no later than startup from the Q2R24 refueling outage (Spring 2018).

In accordance with Section IV of NRC Order EA-13-109, EGC requested under Reference 25 that the Director, Office of Nuclear Reactor Regulation, grant an extension to comply with

the requirements in Section IV of NRC Order EA-13-109 concerning implementation of the Phase 1 (wetwell vent) at Quad Cities Nuclear Power Station, Units 1 and 2, and NRC Order EA-12-049 at Quad Cities Nuclear Power Station, Units 1 and 2, until June 30, 2018. Additionally, EGC requested an extension to comply with the requirements in Section IV of NRC Order EA-13-109 concerning implementation of the Phase 2 (alternate venting strategy) at Quad Cities Nuclear Power Station, Unit 2 until June 30, 2018. No request for extension to comply with Phase 2 of Order EA-13-109 for Quad Cities Nuclear Power Station, Unit 1 is needed at this time. The enclosure to Reference 25 provides the basis and justification supporting the request for extension to comply with the requirements of NRC Orders EA-13-109 Phase 1 and EA-12-049 for Quad Cities Nuclear Power Station, Unit 1; and for extension to comply with the requirements of NRC Orders EA-13-109 Phases 1 and 2, and EA-12-049 for Quad Cities Nuclear Power Station, Unit 2. The requested schedule extension to June 30, 2018 does not extend compliance beyond the latest compliance dates specified in NRC Order EA-13-109 for Phase 1 (June 30, 2018) or Phase 2 (June 30, 2019). The request for extension to comply under Reference 25 supersedes the previous request for extension to comply provided in Reference 24. Therefore, EGC requested that the requested extension to comply provided in Reference 24 be withdrawn.

No additional need for relief/relaxation relative to Order EA-13-109 (Ref 2), other than as described above, has been identified at this time.

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

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

Combined Phases 1 and 2 OIP Open Items		Status
<b>Phase 1 Open Items</b>		
OI-1	<i>Determine how Motive Power and/or HCVS Battery Power will be disabled during normal operation.</i>	<i>Complete – Per QDC 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 (Ref. 7).</i>



<b>Combined Phases 1 and 2 OIP Open Items</b>		<b>Status</b>
OI-2	<i>Confirm that the Remote Operating Station (ROS) will be in an accessible area following a Severe Accident (SA).</i>	<i>Closed to ISE Open Item number 4. Reference 12 has been provided in e-portal.</i>
OI-3	<i>Confirm diameter on new common HCVS Piping.</i>	<i>Closed to ISE Open Item number 5.</i>
OI-4	<i>Confirm suppression pool heat capacity.</i>	<i>Complete - The MAAP analysis verified that the vent is not required for at least 5 hours (Ref. 12). At 5 hours, the decay heat will be less than 1 %.</i>
OI-5	<i>Determine the approach for combustible gases.</i>	<i>Closed to ISE Open Items 10 and 11.</i>
OI-6	<i>Develop a procedure for HCVS out-of-service requirements and compensatory measures.</i>	<i>Started. Will be incorporated into QCAP 1500-07, Administrative Tracking Requirements for Unavailable FLEX Equipment.</i>
OI-7	<i>Provide procedures for HCVS Operation.</i>	<i>Closed to ISE Open Item No.14.</i>
OI-8	<i>Confirm 125 Volt DC Station Battery Life.</i>	<i>Complete per QDC calculation - QDC-8300-E-2100 (Ref. 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. Reference 13 has been provided in e-portal.</i>
<b>Phase 2 Open Items</b>		
OI-9	<i>Supply Part 3 Drywell Boundary Condition.</i>	<i>Complete – the Phase 2 Alternate option (SAWA/SAWM) was added to the December 2015 OIP (Ref. 7).</i>
OI-10	<i>Determine deployment path for Discharge Bay booster pump with respect to HCVS dose.</i>	<i>Not Started.</i>

<b>Phase 1 Interim Staff Evaluation Open Items (Reference 18)</b>		<b>Status</b>
ISE-1	<i>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</i>	<i>Complete - Supplied to NRC Audit team during onsite FLEX evaluation (Jan 2015). (Ref. 13). Calculation QDC-8300-E-2100 confirms that Order EA-</i>

	<i>of non-dedicated containment instrumentation.</i>	<i>12-49 actions to restore power are sufficient to ensure continuous operation of non-dedicated containment instrumentation.  Reference 13 has been provided in e-portal.</i>
<i>ISE-2</i>	<i>Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.</i>	<i>Started - HCVS Battery design has been completed. (Refs. 14, 15 and 17)  Calculation QDC-1600-E-2200 evaluates the sizing of the HCVS battery. (Ref. 28)  References have been provided in e-portal.  However, incorporation into FLEX DG loading calculations is in progress.</i>
<i>ISE-3</i>	<i>Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.</i>	<i>Started- HCVS Nitrogen system design in progress. (Refs. 14, 15 and 17)</i>
<i>ISE-4</i>	<i>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.</i>	<i>Complete- Temperature evaluation (Calculation 2014-02948) was made available to NRC Audit team during onsite FLEX evaluation (Jan 2015)(Ref. 13).  Phase I Radiological evaluation has been completed. (Ref.16).  Phase II Radiological evaluation has been completed (Ref. 6).  Evaluations of temperature and radiological conditions ensure that operating personnel can safely access and operate controls and support equipment.  References have been provided in e-portal.</i>
<i>ISE-5</i>	<i>Make available for NRC staff review documentation that confirms the final design diameter of the HCVS piping.</i>	<i>Started. Refer to the response to ISE open item 6.</i>
<i>ISE-6</i>	<i>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,</i>	<i>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.(Ref. 19 in prepared and in Site review)  In addition, MAAP analyses (Ref. 12) is credited to verify that (1) venting can be delayed for at least three (3) hours and (2) anticipatory venting sufficiently limits</i>

	<i>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.</i>	<i>the suppression pool heat up to maintain RCIC functional. References have been provided in e-portal.</i>
<i>ISE-7</i>	<i>Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.</i>	<i>Complete –The HCVS stack seismic design meets the Station’s design basis earthquake design criteria. (Ref. 20)  Reference has been provided in e-portal.  The information provided in December 2015 OIP (Ref. 7) demonstrates that the external piping meets the tornado missile protection criteria of HCVS-WP-04.</i>
<i>ISE-8</i>	<i>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.</i>	<i>Started – Component location design and local conditions impact are in progress. The HCVS primary control panel will be located in the MCR (Refs. 14, 15 and 17).  Reactor Building temperatures are as noted in calculation 2014-02948 (Ref. 21).  Turbine Building temperatures at the ROS are as noted in evaluation EC 402709 (Ref. 22).  Limiting radiation conditions for equipment as per calculation QDC-0000-M-2199, HCVS 7-Day Dose Analysis (Ref. 16).  References have been provided in e-portal.</i>
<i>ISE-9</i>	<i>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.</i>	<i>Started – Communication as determined by FLEX response. Sound-powered phone jack near battery rack and bottle stations.</i>
<i>ISE-10</i>	<i>Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.</i>	<i>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 (Ref. 7).</i>

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.	<p>Completed - As described in the December 2015 OIP (Ref. 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.</p> <p>The vent path will rely on Argon purge system to prevent the formation of a combustible gas mixture from forming within the line (Refs. 14, 15 and 17).</p> <p>References have been provided in e-portal.</p>
ISE-12	Make available for NRC staff audit documentation of a determination of seismic qualification evaluation of the HCVS components.	Started – the Quad Cities seismic evaluation will be based on the Quad Cities 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.	<p>Started. Instrument design is in progress (Refs. 14, 15 and 17).</p> <p>References have been provided in e-portal.</p>
ISE-14	Make available for NRC staff audit the procedures for HCVS operation.	Started. Procedures are under development by Operations.
<b>Phase 2 Interim Staff Evaluation Open Items</b>		<b>Status</b>
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 Phases 1 and 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 (Accession No. ML13304B836).
5. NRC Endorsement of industry “Hardened Containment Venting System (HCVS) Phase 1 Overall Integrated Plan Template (EA-13-109) Rev 0” (Accession No. 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 (Accession No. ML15104A118).
9. 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, Rev. 001.
15. EC 392257 - Unit 1 Hardened Containment Vent System (Outage Portion) as Required by NRC Order EA-13-109, Rev. 000.

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.
23. Quad Cities Units 1 and 2, 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), dated June 30, 2016 (RS-16-110).
24. Exelon Generation Company, LLC 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” and NRC Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated November 16, 2016 (RS-16-210).
25. Exelon Generation Company, LLC 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” and NRC Order EA-12-049, “Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events,” dated January 12, 2017 (RS-17-006).
26. Exelon Generation Company, LLC Letter to USNRC, Certification of Permanent Cessation of Power Operations at Quad Cities Nuclear Power Station, Units 1 and 2, dated June 20, 2016.
27. Exelon Generation Company, LLC Letter to USNRC, Withdrawal of Certification of Permanent Cessation of Power Operations for Quad Cities Nuclear Power Station, Units 1 and 2 and Previously Submitted Licensing Actions in Support of Decommissioning, dated December 14, 2016 (RS-16-253).
28. Exelon Calculation QDC-1600-E-2200, 125 VDC Battery Sizing Calculation for Hardened Containment Vent System for 24-Hour Duty Cycle, Rev. 0.