Exelon Generation

Order No. EA-13-109

RS-18-052

June 7, 2018

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

Limerick Generating Station, Unit 1
Renewed Facility Operating License No. NPF-39
NRC Docket No. 50-352

Subject: Report of Full Compliance with Phase 1 and Phase 2 of 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. 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
3. 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
4. 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
5. Limerick Generating 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 December 15, 2015
6. Exelon Generation Company, LLC, First 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), dated December 17, 2014
7. Exelon Generation Company, LLC, 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), dated June 30, 2015

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 15, 2015 (RS-15-301)
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
10. Exelon Generation Company, LLC, 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) dated December 15, 2016
11. Exelon Generation Company, LLC, Sixth 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, 2017
12. Exelon Generation Company, LLC, Seventh 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 December 15, 2017
13. NRC letter to Exelon Generation Company, LLC, Limerick Generating 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. MF4418 and MF4419), dated April 1, 2015
14. NRC letter to Exelon Generation Company, LLC, Limerick Generating Station, Units 1 and 2 – Interim Staff Evaluation Relating to Overall Integrated Plan in Response to Phase 2 of Order EA-13-109 (Severe Accident Capable Hardened Vents) (TAC Nos. MF4418 and MF4419), dated August 2, 2016
15. NRC letter to Exelon Generation Company, LLC, Limerick Generating Station, Units 1 and 2 – Report for the Audit of Licensee Responses to Interim Staff Evaluations Open Items Related to NRC Order EA-13-109 to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions, dated May 29, 2018

On June 6, 2013, the Nuclear Regulatory Commission ("NRC" or "Commission") issued Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," (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 2 provided EGC's initial answer to the Order.

Reference 3 provided the NRC interim staff guidance on methodologies for compliance with Phases 1 and 2 of Reference 1 and endorsed industry guidance document NEI 13-02, Revision 1 (Reference 4) with clarifications and exceptions. Reference 5 provided the Limerick Generating Station, Unit 1 Phase 1 Overall Integrated Plan (OIP), which was replaced with the Phase 1 (Updated) and Phase 2 OIP (Reference 8). References 13 and 14 provided the NRC review of the Phase 1 and Phase 2 OIP, respectively, in an Interim Staff Evaluation (ISE).

Reference 1 required submission of a status report at six-month intervals following submittal of the OIP. References 6, 7, 8, 9, 10, 11, and 12 provided the first, second, third, fourth, fifth, sixth, and seventh six-month status reports, respectively, pursuant to Section IV, Condition D.3, of Reference 1 for Limerick Generating Station, Unit 1.

The purpose of this letter is to provide the report of full compliance with Phase 1 and Phase 2 of the 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) (Reference 1) pursuant to Section IV, Condition D.4 of the Order for Limerick Generating Station, Unit 1.

Limerick Generating Station, Unit 1 has designed and installed a venting system that provides venting capability from the wetwell during severe accident conditions in response to Phase 1 of NRC Order EA-13-109. Limerick Generating Station, Unit 1 has implemented a reliable containment venting strategy that makes it unlikely that the plant would need to vent from the containment drywell before alternative reliable containment heat removal and pressure control is reestablished in response to Phase 2 of NRC Order EA-13-109. The information provided herein documents full compliance for Limerick Generating Station, Unit 1 with NRC Order EA-13-109.

EGC's response to the NRC Interim Staff Evaluation (ISE) Phase 1 Open Items identified in Reference 13 have been addressed and closed as documented in Reference 12 and as described below, and are considered complete per Reference 15. The following table provides completion references for each OIP and ISE Phase 1 Open Item.

Reference 15 provides the results of the audit of ISE Open Item closure information provided in Reference 12. All Phase 1 and Phase 2 ISE Open Items are statused as closed as discussed in Reference 15.

There were no Phase 2 OIP Open Items.

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.*	*Closed to ISE -1*
OI-2	*Confirm that the Remote Operating Station (ROS) will be in an accessible area following a Severe Accident (SA).*	*Closed to ISE-3*

Combined Phase 1 and Phase 2 OIP Open Items		Status
Phase 1 Open Items		
OI-3	*Determine wetwell line size to meet 1% venting criteria.*	*Closed to ISE- 4*
OI-4	*Confirm suppression pool heat capacity.*	*Closed to ISE-4*
OI-5	*Determine the approach for combustible gases.*	*Closed to ISE-9 and ISE-10*
OI-6	*Provide procedures for HCVS Operation.*	*Closed to ISE-13*
OI-7	*Verify the external piping consists solely of large bore piping and its supports have less than 300 square feet of cross section.*	*Complete. (Reference EC 423331, Attachment 8 (formally known as ECR 16-00011)). EC 423331 is available in ePortal.*
OI-8	*Evaluate drywell pressure indication for environmental qualifications to ensure this instrument can survive for 7 days after an event.*	*Unit 1 - Complete.* *Unit 1 Pressure indicator will survive the environmental conditions for 7 days after the event. (See EC 423381 for replacement details).* *EC 423381 is available in ePortal.*
OI-9	*Determine Performance Criteria for Motive gas Cylinders, Argon Cylinders, FLEX Diesel Generator, and FLEX (SAWA) pump pressure at 500 gpm.*	*Unit 1 - Complete.* *The performance criteria for the Motive Gas Cylinders, Argon Cylinder has been defined and the system will meet the requirements of the order. (Reference EC 423381 Section 3.5 and 3.33 and EC 423382 Section 3.19)* *EC 423381, and EC 423382 are available in ePortal.* *See ISEP2-6 for FLEX SAWA response.*
OI-10	*Perform radiological evaluation for Phase 1 vent line impact on ERO response actions.*	*Unit 1 - Complete.* *The peak dose rates and 7-day integrated doses at operating stations, equipment locations, and along transit pathways required for sustained operation of the HCVS have been calculated. The peak dose rates along potential operator transit pathways external to the Reactor Building are bounded by the peak dose rate outside the FLEX storage building. (Reference*

Combined Phase 1 and Phase 2 OIP Open Items		Status
Phase 1 Open Items		
		Calculation LM-0721). Calculation LM-0721 is available in ePortal.

Phase 1 Interim Staff Evaluation Open Items		Status
ISE-1	*Make available for NRC staff audit documentation of a method to disable HCVS during normal operation to provide assurances against inadvertent operation that also minimizes actions to enable HCVS operation following an ELAP.*	*Unit 1 – Complete. The system is designed to prevent inadvertent operation. The new control switch HS-057V-183 installed in the MCR panel 10-C689 is a key-lock switch. The switch is kept locked in "OFF" position (with key removed) to prevent inadvertent powering of the HCVS components from 125 Vdc HCVS battery source. Additionally, locked valves are used with the gas bottles to prevent inadvertent operation. (Reference EC 423381 section 3.19). EC 423381 is available in ePortal.*
ISE-2	*Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.*	*Unit 1 - Complete. The HCVS batteries have been sized to meet the requirements of the HCVS system and function for the initial 24 hours into the event. (Reference Calculation LE-0128). The FLEX diesel generator loading is acceptable and rated loading of the FLEX diesel generator will not be exceeded due to the additional HCVS loading. (Reference EC 423381 section 3.35). LE-0128 and EC 423381 are available in ePortal.*
ISE-3	*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.*	*Unit 1 - Complete. The primary operating station for HCVS operation is located in the Main Control Room. A*

Phase 1 Interim Staff Evaluation Open Items		Status
		remote operating station (ROS) is located in the EDG Corridor, EL. 217' (Room 313). The ROS location and travel path to ROS location were evaluated for habitability and accessibility during a severe accident. (Reference EC 423382 section 3.19). *EC 423382 is available in ePortal.* *See Note 1 on page 15 for ROS temperature discussion.*
ISE-4	*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 the primary containment pressure limit.*	*Unit 1 - Complete.* *The required one percent capacity at the lower of Primary Containment Pressure Limit or containment design pressure is verified using Reactor Excursion and Leak Analysis Program (RELAP). In addition, Modular Accident Analysis Program (MAAP) analyses are credited to verify that venting can be delayed for at least three hours and that anticipatory venting can be credited to maintain Reactor Core Isolation Cooling (RCIC) functional.* *(Reference EC 423382 section 3.33 and LM-709).* *EC 423382 and LM-709 are available in ePortal.*
ISE-5	*Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.*	*Unit 1 - Complete.* *(Reference EC 423331 section 3.2, 3.5, 3.9, and 3.38 (formally known as 16-00011) and EC 423332 section 3.38 (formally known as 16-00012), and EC 422831 section 3.24 (formally known as 13-264)) describe seismic and tornado missile design criteria for HCVS stack. EC pkgs 423331,*

Phase 1 Interim Staff Evaluation Open Items		Status
		423332, and 422831 are available in ePortal for review.
ISE-6	*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.*	*Unit 1 - Complete.* *HCVS is designed to minimize the impact of elevated temperatures, due to the potential loss of ventilation, radiation and humidity impact on the ability of operators to initiate and maintain the functionality of the HCVS. The locations of system equipment that require operator action and the travel paths to reach the controls and indications are in mild environments. (Reference EC 423382 section 3.19 and 3.24).* *EC 423281 and EC 423382 are available in ePortal for review.* *The loss of all general area lighting, coincident with the ELAP, does not pose a threat to the operators' ability to access and operate HCVS, since self-contained emergency lights illuminate the travel paths and handheld or portable lighting is available to manipulate HCVS equipment.*
ISE-7	*Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.*	*Unit 1 - Complete.* *HCVS is designed to operate for first 24 hours with installed independent pneumatic air supply, thereby eliminating the reliance on portable equipment. HCVS is also designed for multiple venting and purge cycles during the first 24-hour period without the need to recharge pneumatic air supplies. The*

Phase 1 Interim Staff Evaluation Open Items		Status
		pneumatic air supply is located in the emergency diesel corridor. (Reference EC 423381 section 3.19 and Calculation LM-0723). EC 423381 and Calculation LM-0723 are available in ePortal for review.
ISE-8	*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.*	*Unit 1 - Complete. This communication method is the same as accepted in Order EA-12-049. These items will be powered and remain powered using the same methods as evaluated under EA-12-049 for the period of sustained operation, which may be longer than identified for EA-12-049. Communication will be via the plant radio system if available. If the radio system is not available, the Plant page system can be used. The page system was modified for FLEX to include a UPS that can be manually aligned to repower the system. (Reference AR 2492527-42). AR 2492527-42 is available in ePortal for review.*
ISE-9	*Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.*	*Unit 1 - Complete. HCVS has been designed to ensure the flammability limits of gases passing through the system are not reached. A purge gas (argon) supply system has been provided to displace potentially flammable/ detonable mixtures of gases that may be present in the vent after system actuation. The purge gas supply system is designed for four purge cycles during the first 24-hour period*

Phase 1 Interim Staff Evaluation Open Items		Status
		without the need to recharge. (Reference EC 423381 section 3.19). EC 423381 is available in ePortal for review.
ISE-10	*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.*	*Unit 1 – Complete. As discussed in the December 2015 OIP, the Limerick wetwell vent line for each unit has a dedicated HCVS flowpath from the wetwell penetration to the outside with no interconnected system. The discharge point meets the guidance of "HCVS Release Point", HCVS-FAQ-04 (Reference 11). Calculation LM-0709 is available in ePortal for review.*
ISE-11	*Make available for NRC staff audit documentation of a seismic qualification evaluation of HCVS components.*	*Unit 1- Complete. Seismic documentation has been provided in EC 423381, Section 3.4, EC 423382, Section 3.4, and AR 2492527-97. EC 423381, EC 423382, and AR 2492527-97 are available in ePortal for review.*
ISE-12	*Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.*	*Unit 1 - Complete. EC 423381 installed and qualified the following components in the MCR and in the plant: valve position indicating lights, power key-locked switch, temperature indicator displays, radiation monitoring system consisting of an element local to the HCVS vent pipe, and a monitor. (Reference EC 423381 section 3.19 and 3.36). Existing pressure instrument PI-042-170-1 will be used to monitor containment pressure*

Phase 1 Interim Staff Evaluation Open Items		Status
		in the drywell. The transmitter (PT-042-170) has been replaced with an RG 1.97 qualified component to ensure this will remain functioning during the event. See EC 423381 for replacement and EC 423382 section 3.19 for qualification of the component. EC 423381 and EC 423382 are available in ePortal for review.
ISE-13	*Make available for NRC staff audit the procedures for HCVS operation.*	*Unit 1 - Complete. Reference the following procedures. SAMP-1: RPV Control SAMP-2: Containment and Radioactivity Release Control T-101: RPV Control T-102: Primary Containment Control SP/T, SP/L, PC/P, DW/T, PC/H T-341: Primary Containment Venting Via Hardened Containment Vent System. These procedures are in ePortal for review.*

EGC's response to the NRC ISE Phase 2 Open Items identified in Reference 14 have been addressed and closed as documented in this submittal and are considered complete per Reference 15. The following table provides completion references for each ISE Phase 2 Open Item.

Phase 2 Interim Staff Evaluation Open Items		Status
ISEP2-1	*Licensee to demonstrate that the HCVS components meeting reasonable protection from tornado missiles is at least 30 feet above the highest grade within 300 yards.*	*Unit 1 - Complete. Per Drawing HBD-842-01, HCVS pipe leaves the protected structure more than 120 feet above grade elevation, which is 217 feet MSL, as indicated on site topographical drawing C-0062 that shows grade elevation referenced to MSL within 300 yards of the HCVS components*

Phase 2 Interim Staff Evaluation Open Items		Status
		evaluated.
ISEP2-2	*Licensee to confirm through analysis the temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.*	*Unit 1 - Complete.* *Actions taken within the first hour (prior to start of core damage) from the start of the ELAP are acceptable from an environmental and radiological perspective without further evaluation.* *Actions within the MCR are acceptable for the entire period of Sustained Operation per HCVS-FAQ-01.* *For actions within the Reactor Building and between 1 and 7 hours, evaluation of expected temperatures and dose rates has been performed and determined them to be acceptable. (Reference EC 622673, and calculations LM-0721 and LM-0725).* *For locations outside the Reactor Building between 7 hours and 7 days, Limerick performed evaluations for the temperature and radiological conditions for the equipment and deployment locations, including ingress/egress paths and determined them to be acceptable. (Reference EC 622673, and calculations LM-0721 and LM-0725). EC 622673, LM-0721 and LM-0725 are available in ePortal for review.* *See Note 1 on page 15 for ROS temperature discussion.*
ISEP2-3	*Licensee to evaluate the SAWA equipment and controls, as well as the ingress and egress paths for the expected severe accident conditions (temperature, humidity, radiation) for the sustained operating period.*	*Unit 1 - Complete.* *Equipment and Controls* *Plant instrumentation for*

Phase 2 Interim Staff Evaluation Open Items		Status
		SAWA/SAWM that is qualified to RG 1.97 or equivalent is considered qualified for the sustained operating period without further evaluation. *Passive components that do not need to change state after initially establishing SAWA flow do not require evaluation beyond the first 8 hours, at which time they are expected to be installed and ready for use to support SAWA/SAWM.* *The following additional equipment performing an active SAWA/SAWM function is considered:* *SAWA/SAWM flow instrument* *SAWA/SAWM/FLEX pump* *SAWA/SAWM/FLEX generator* *Active valves in SAWA flow path.* *Ingress and Egress* *For locations outside the Reactor Building between 7 hours and 7 days when SAWA is being utilized, Limerick performed evaluations of expected temperatures, humidity and the dose rates and determined them to be acceptable. (Reference EC 622673, and calculations LM-0721 and LM-0725).* *EC 622673, LM-0721 and LM-0725 are available in ePortal for review.*
ISEP2-4	*Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.*	*Unit 1 - Complete.* *The wetwell vent has been designed and installed to meet NEI 13-02 Rev 1 guidance, which will ensure that it is*

<table>
<tr><th colspan="2">Phase 2 Interim Staff Evaluation Open Items</th><th>Status</th></tr>
<tr><td></td><td></td><td>adequately sized to prevent containment overpressure under severe accident conditions.

The SAWM strategy will ensure that the wetwell vent remains functional for the period of sustained operation. LGS will follow the guidance (flow rate and timing) for SAWA/SAWM described in BWROG-TP-15-008 and BWROG-TP-15-011.These documents have been posted to the ePortal for NRC staff review. The wetwell vent will be opened prior to exceeding the PCPL value of 60 PSIG. Therefore, containment over pressurization is prevented without the need for a drywell vent.</td></tr>
<tr><td>ISEP2-5</td><td>Licensee shall demonstrate how the plant is bounded by the reference plant analysis that shows the SAWM strategy is successful in making it unlikely that a drywell vent is needed.</td><td>Unit 1 - Complete.
Using Figure 2.1.C from the combined Phases 1 and 2 OIP, compare the reference plant parameters to the plant specific parameters.

<table>
<tr><th>Reference Plant</th><th>LGS</th></tr>
<tr><td>Torus freeboard volume is 525,000 gallons</td><td>Suppression Pool freeboard volume is 147,670 ft3 (1,104,572 gallons)</td></tr>
<tr><td>SAWA flow is 500 GPM at 8 hours followed by 100 GPM from 12 hours to</td><td>SAWA flow is 500 GPM at 8 hours followed by 100 GPM from 12 hours to 168</td></tr>
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</table>

Phase 2 Interim Staff Evaluation Open Items		Status
		168 hours | *hours* *The above parameters for LGS compared to the reference plant that determine success of the SAWM strategy demonstrate that the reference plant values are bounding. Therefore, the SAWM strategy implemented at LGS makes it unlikely that a DW vent is needed to prevent containment overpressure related failure.*
ISEP2-6	*Licensee to demonstrate that there is adequate communication between the MCR and the operator at the FLEX pump during severe accident conditions.*	*Unit 1 - Complete.* *This communication method is the same as accepted in Order EA-12-049. These items will be powered and remain powered using the same methods as evaluated under EA-12-049 for the period of sustained operation, which may be longer than identified for EA-12-049.* *Communication will be via the plant radio system if available. If the radio system is not available, the Plant page system can be used. The page system was modified for FLEX to include a UPS that can be manually aligned to repower the system. (Reference AR 2492527-42)*
ISEP2-7	*Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions*	*Unit 1 - Complete.* *For locations outside the Reactor Building between 7 hours and 7 days when SAWA is being utilized, Limerick Generating Station performed evaluation of expected temperatures, humidity and the dose rates and determined them to be acceptable. (Reference EC 622673).*

<table>
<tr><th colspan="2">Phase 2 Interim Staff Evaluation Open Items</th><th>Status</th></tr>
<tr><td></td><td></td><td>
<table>
<tr><th>SAWA Pump Flow Instrument Qualification</th><th>Expected SAWA Parameter Range</th></tr>
<tr><td>37 to 1246 GPM</td><td>100 to 500 GPM</td></tr>
<tr><td>32 to 140 °F fluid temperature 14 to 122 °F Instrument Electronics[2]</td><td>32 to 95 °F fluid temperature 0 to 100 °F Ambient air temperature</td></tr>
<tr><td>275 PSI maximum</td><td>239.7 PSI maximum</td></tr>
</table>
[2] Below 14 °F, the LCD may become sluggish or unresponsive; however, it will continue to measure and function to at least -4 °F. (Reference MS2500-DataSheet). MS2500-DataSheet and EC 622673 are available in ePortal for review.
</td></tr>
</table>

Note 1:
For the location of the ROS in the DG corridor, there is a maximum expected temperature of 121 °F. This temperature is expected to occur due to a non-safety related heating steam pipe rupturing during a seismic event. To mitigate this issue, the heating steam pipe was analyzed and additional supports have been installed to ensure the piping will not rupture (EC 423333 and EC 423381). There are no additional process fluid piping or heat generating equipment that would add significant heat to this area. Therefore, the area will then be at outside ambient conditions which does not normally exceed 100 °F.

The performance validation for T-341 to align the HCVS for operation determined the longest duration of 16 minutes in the EDG corridor would be required to align the system. Activation of the system included opening the argon and air bottles and repositioning a three-way valve. This would be the longest duration of any operator at the ROS during the event. If required, operating personnel working in high temperature areas will be protected using SA-AA-111, Heat Stress Control. With the use of SA-AA-111 heat stress controls, it is reasonable to assume the operator actions required to implement the HCVS and SAWA/SAWM strategies can be accomplished. SA-AA-111 and the validation study are available in ePortal.

MILESTONE SCHEDULE – ITEMS COMPLETE

Limerick Generating Station, Unit 1 - Phases 1 and 2 Specific Milestone Schedule

Milestone	Target Completion Date	Activity Status	Comments
Phases 1 and 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 [Simultaneous with Phase 2 OIP]	Dec 2015	Complete	
Update 4	Jun 2016	Complete	
Update 5	Dec 2016	Complete	
Update 6	Jun 2017	Complete	
Update 7	Dec 2017	Complete	
Phase 1 Specific Milestones			
Phase 1 Modifications			
Hold preliminary/conceptual design meeting	Jun 2014	Complete	
Unit 1 Modifications Evaluation	Feb 2018	Complete	
Unit 1 Design Engineering On-site/Complete	Feb 2018	Complete	
Unit 1 Implementation Outage	Apr 2018	Complete	
Unit 1 Walk Through Demonstration/Functional Test	Apr 2018	Complete	
Phase 1 Procedure Changes Active			
Unit 1 Operations Procedure Changes Developed	Feb 2018	Complete	

Milestone	Target Completion Date	Activity Status	Comments
Phases 1 and 2 HCVS Milestone Table			
Unit 1 Site Specific Maintenance Procedure Developed	Feb 2018	Complete	
Unit 1 Procedure Changes Active	Apr 2018	Complete	
Phase 1 Training			
Unit 1 Training Complete	Feb 2018	Complete	
Phase 1 Completion			
Unit 1 HCVS Implementation	Apr 2018	Complete	
Phase 2 Specific Milestones			
Phase 2 Modifications			
Hold preliminary/conceptual design meeting	Jun 2016	Complete	
Modifications Evaluation	Mar 2018	Complete	Moved to align with actual completion date
Unit 1 Design Engineering On-site/Complete	Feb 2018	Complete	
Unit 1 Implementation Outage	Apr 2018	Complete	
Unit 1 Walk Through Demonstration/Functional Test	Apr 2018	Complete	
Phase 2 Procedure Changes Active			
Unit 1 Operations Procedure Changes Developed	Feb 2018	Complete	
Unit 1 Site Specific Maintenance Procedure Developed	Feb 2018	Complete	
Unit 1 Procedure Changes Active	Apr 2018	Complete	
Phase 2 Training			
Unit 1 Training Complete	Feb 2018	Complete	
Phase 2 Completion			
Unit 1 HCVS Implementation	Apr 2018	Complete	
Submit Unit 1, Phase 1 & Phase 2, Completion Report [60 days after Unit 1 compliance]	Jun 2018	Completed with this submittial	

ORDER EA-13-109 COMPLIANCE ELEMENTS SUMMARY

The elements identified below for Limerick Generating Station, Unit 1, Phase 1 and Phase 2 OIP response submittal (Reference 5), and the 6-Month Status Reports (References 6, 7, 8, 9, 10, 11, and 12), demonstrate compliance with NRC Order EA-13-109. The Limerick Generating Station, Units 1 and 2 Final Integrated Plan for reliable hardened containment vent Phase 1 and Phase 2 strategies will be provided upon full compliance for Limerick Generating Station, Unit 2 (Spring 2019).

HCVS PHASE 1 AND PHASE 2 FUNCTIONAL REQUIREMENTS AND DESIGN FEATURES – COMPLETE

The Limerick Generating Station, Unit 1, Phase 1 HCVS provides a vent path from the wetwell to remove decay heat, vent the containment atmosphere, and control containment pressure within acceptable limits. The Phase 1 HCVS will function for those accident conditions for which containment venting is relied upon to reduce the probability of containment failure, including accident sequences that result in the loss of active containment heat removal capability during an extended loss of alternating current power.

The Limerick Generating Station, Unit 1, Phase 2 HCVS provides a reliable containment venting strategy that makes it unlikely that the plant would need to vent from the containment drywell before alternative reliable containment heat removal and pressure control is reestablished. The Limerick Generating Station, Unit 1, Phase 2 HCVS strategies implement Severe Accident Water Addition (SAWA) with Severe Accident Water Management (SAWM) as an alternative venting strategy. This strategy consists of the use of the Phase 1 wetwell vent and SAWA hardware to implement a water management strategy that will preserve the wetwell vent path until alternate reliable containment heat removal can be established.

The Limerick Generating Station, Unit 1, Phase 1 and Phase 2 HCVS strategies are in compliance with Order EA-13-109. The modifications required to support the HCVS strategies for Limerick Generating Station, Unit 1 have been fully implemented in accordance with the station processes.

HCVS PHASE 1 AND PHASE 2 QUALITY STANDARDS – COMPLETE

The design and operational considerations of the Phase 1 and Phase 2 HCVS installed at Limerick Generating Station, Unit 1 complies with the requirements specified in the Order and described in NEI 13-02, Revision 1, "Industry Guidance for Compliance with Order EA-13-109". The Phase 1 and Phase 2 HCVS has been installed in accordance with the station design control process.

The Phase 1 and Phase 2 HCVS components including piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication have been designed consistent with the design basis of

the plant. All other Phase 1 and Phase 2 HCVS components including electrical power supply, valve actuator pneumatic supply and instrumentation have been designed for reliable and rugged performance that is capable of ensuring Phase 1 and Phase 2 HCVS functionality following a seismic event.

HCVS PHASE 1 AND PHASE 2 PROGRAMMATIC FEATURES - COMPLETE

Storage of portable equipment for Limerick Generating Station, Unit 1 Phase 1 and Phase 2 HCVS use provides adequate protection from applicable site hazards. Identified paths and deployment areas will be accessible during all modes of operation and during severe accidents, as recommended in NEI 13-02, Revision 1, Section 6.1.2.

Training in the use of the Phase 1 and Phase 2 HCVS for Limerick Generating Station, Unit 1 has been completed in accordance with an accepted training process as recommended in NEI 13-02, Revision 1, Section 6.1.3.

Operating procedures for Limerick Generating Station, Unit 1 have been developed and integrated with existing procedures to ensure safe operation of the Phase 1 and Phase 2 HCVS. Procedures have been verified and are available for use in accordance with the site procedure control program. Maintenance procedures for Limerick Generating Station, Unit 1 have been developed or have open tracking mechanisms created so that the procedures will be issued prior to being required. Limerick Generating Station, Unit 1 has implemented operation, testing, and inspection requirements for the HCVS and SAWA that follows the existing plant procedures and process to ensure reliable operation of the systems. The existing plant maintenance program will be applied to the HCVS and SAWA valves, instead of the maintenance frequency that has been listed in NEI 13-02, Section 6.2.4. The maintenance program uses PCM (Performance Centered Maintenance) template which is currently used to maintain the plant's safety related and non-safety related systems.

Site processes have been established to ensure the Phase 1 and Phase 2 HCVS is tested and maintained as recommended in NEI 13-02, Revision 1, Sections 5.4 and 6.2.

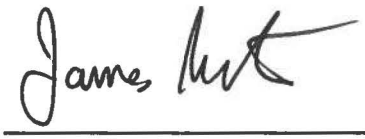
Limerick Generating Station, Unit 1 has completed validation in accordance with industry developed guidance to assure required tasks, manual actions and decisions for HCVS strategies are feasible and may be executed within the constraints identified in the HCVS Phases 1 and 2 OIP for Order EA-13-109 (Reference 5).

Limerick Generating Station, Unit 1 has completed evaluations to confirm accessibility, habitability, staffing sufficiency, and communication capability in accordance with NEI 13-02, Sections 4.2.2 and 4.2.3.

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 7th day of June 2018.

Respectfully submitted,



James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector – Limerick Generating Station
NRC Project Manager, NRR – Limerick Generating Station
Mr. Peter J. Bamford, NRR/JLD/JOMB, NRC
Mr. Brian E. Lee, NRR/JLD/JCBB, NRC
Mr. Rajender Auluck, NRR/JLD/JCBB, NRC
Director, Bureau of Radiation Protection – Pennsylvania Department of Environmental Resources
R. R. Janati, Chief, Division of Nuclear Safety, Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection