Exelon Generation

Order No. EA-13-109

RS-16-108

June 30, 2016

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

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

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

References:

1. NRC Order Number EA-13-109, "Issuance of Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," dated June 6, 2013
2. NRC Interim Staff Guidance JLD-ISG-2015-01, "Compliance with Phase 2 Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions", Revision 0, dated April 2015
3. NEI 13-02, "Industry Guidance for Compliance With Order EA-13-109, BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions", Revision 1, dated April 2015
4. Exelon Generation Company, LLC's Answer to June 6, 2013, Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 26, 2013
5. Exelon Generation Company, LLC Phase 1 Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated June 30, 2014 (RS-14-060)
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-14-304)
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-15-150)

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. 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

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 Limerick Generating 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 Limerick Generating Station. Reference 8 provided the Limerick Generating Station, Units 1 and 2, Phase 1 updated and Phase 2 OIP pursuant to Section IV, Conditions D.2 and D.3 of Reference 1.

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

This letter contains no new regulatory commitments. If you have any questions regarding this report, please contact David P. Helker at 610-765-5525.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of June 2016.

Respectfully submitted,

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

Enclosure:

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

cc: Director, Office of Nuclear Reactor Regulation
NRC Regional Administrator - Region I
NRC Senior Resident Inspector - Limerick Generating Station
NRC Project Manager, NRR - Limerick Generating Station
Mr. Raj Auluck, NRR/JLD/TSD/JCBB, NRC
Mr. John D. Hughey, NRR/JLD/JOMB, NRC
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Enclosure

Limerick Generating Station, Units 1 and 2

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

(9 pages)

Enclosure

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

1 Introduction

Limerick Generating Station (LGS) 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. Starting with this six month status report, updates of milestone accomplishments will be based on the combined Phases 1 and 2 Overall Integrated Plan dated December 15, 2015.

LGS developed an updated and combined Phases 1 and 2 Overall Integrated Plan (Reference 1), 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 submittal 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.

2 Milestone Accomplishments

The following milestone(s) have been completed since the December 15, 2015 status report (Reference 1) and are current as of May 15, 2016.

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

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}
Phases 1 and 2 HCVS Milestone Table			
Submit Overall Integrated Plan (Phase 1)	Jun 2014	Complete	Reference 7
Submit 6 Month Updates			
Update 1	Dec 2014	Complete	Reference 8
Update 2	Jun 2015	Complete	Reference 9
Update 3 [Simultaneous with Phase 2 OIP]	Dec 2015	Complete	Reference 1
Update 4	Jun 2016	Complete with this submittal	
Update 5	Dec 2016	Not Started	
Update 6	Jun 2017	Not Started	
Update 7	Dec 2017	Not Started	
Update 8	Jun 2018	Not Started	
Update 9	Dec 2018	Not Started	
Phase 1 Specific Milestones			
Phase 1 Modifications			
Hold preliminary/conceptual design meeting	Jun 2014	Complete	
Modifications Evaluation	Mar 2017	Started	
Unit 1 Design Engineering On-site/Complete	Mar 2017	Started	
Unit 1 Implementation Outage	Apr 2018	Not Started	
Unit 1 Walk Through Demonstration/Functional Test	Apr 2018	Not Started	
Unit 2 Design Engineering On-site/Complete	Nov 2016	Started	
Unit 2 Walk Through Demonstration/Functional Test	May 2017	Not Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phases 1 and 2 HCVS Milestone Table			
Unit 2 Implementation Outage	May 2017	Not Started	
Phase 1 Procedure Changes Active			
Unit 1 Operations Procedure Changes Developed	Feb 2018	Not started	
Unit 1 Site Specific Maintenance Procedure Developed	Feb 2018	Not started	
Unit 1 Procedure Changes Active	Apr 2018	Not started	Date moved to match outage date
Unit 2 Operations Procedure Changes Developed	Feb 2017	Not started	
Unit 2 Site Specific Maintenance Procedure Developed	Feb 2017	Not started	
Unit 2 Procedure Changes Active	May 2017	Not started	Date moved to match outage date
Phase 1 Training			
Unit 1 Training Complete	Feb 2018	Not started	
Unit 2 Training Complete	Feb 2017	Not started	
Phase 1 Completion			
Unit 1 HCVS Implementation	Apr 2018	Not Started	
Unit 2 HCVS Implementation	May 2017	Not Started	
Full Site HCVS Implementation	Apr 2018	Not Started	
Submit Unit 1 Completion Report [with Phase 2 compliance report]	Jun 2018	Not Started	Date moved to match 60 days after outage
Submit Unit 2 Completion Report [with Phase 2 compliance report]	Jul 2019	Not Started	Date moved to match 60 days after outage

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phases 1 and 2 HCVS Milestone Table			
Phase 2 Specific Milestones			
Phase 2 Modifications			
Hold preliminary/conceptual design meeting	Jun 2016	Not started	
Modifications Evaluation	Feb 2019	Not Started	
Unit 1 Design Engineering On-site/Complete	Feb 2017	Not Started	Moved to align with outage milestone
Unit 1 Implementation Outage	Apr 2018	Not Started	
Unit 1 Walk Through Demonstration/Functional Test	Apr 2018	Not Started	
Unit 2 Design Engineering On-site/Complete	Mar 2018	Not Started	Moved to align with outage milestone
Unit 2 Walk Through Demonstration/Functional Test	Apr 2019	Not Started	
Unit 2 Implementation Outage	May 2019	Not Started	
Phase 2 Procedure Changes Active			
Unit 1 Operations Procedure Changes Developed	Feb 2018	Not Started	
Unit 1 Site Specific Maintenance Procedure Developed	Feb 2018	Not Started	
Unit 1 Procedure Changes Active	Apr 2018	Not Started	
Unit 2 Operations Procedure Changes Developed	Feb 2019	Not Started	
Unit 2 Site Specific Maintenance Procedure Developed	Feb 2019	Not Started	
Unit 2 Procedure Changes Active	May 2019	Not Started	

Milestone	Target Completion Date	Activity Status	Comments {Include date changes in this column}
Phases 1 and 2 HCVS Milestone Table			
Phase 2 Training			
Unit 1 Training Complete	Feb 2018	Not started	
Unit 2 Training Complete	Feb 2019	Not started	
Phase 2 Completion			
Unit 1 HCVS Implementation	Apr 2018	Not Started	
Unit 2 HCVS Implementation	May 2019	Not Started	
Full Site HCVS Implementation	May 2019	Not Started	Date moved to match outage date
Submit Unit 1 Phase 1 and Phase 2 Completion Report [60 days after Unit 1 compliance]	Jun 2018	Not Started	
Submit Unit 2 Phase 1 and Phase 2 Completion Report [60 days after Unit 2 compliance]	Jul 2019	Not Started	Date moved to match outage date

4 Changes to Compliance Method

There are no changes to the compliance method as documented in the combined Phases 1 and 2 Overall Integrated Plan (Reference 1).

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

LGS expects to comply with the Order implementation date and no relief/relaxation is required at this time.

6 Open Items from Combined Phases 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 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*
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.*	*Started*
OI-8	*Evaluate drywell pressure indication for environmental qualifications to ensure this instrument can survive for 7 days after an event.*	*Not Started*
OI-9	*Determine Performance Criteria for Motive gas Cylinders, Argon Cylinders, FLEX Diesel Generator, and FLEX (SAWA) pump pressure at 500 gpm.*	*Started*
OI-10	*Perform radiological evaluation for Phase 1 vent line impact on ERO response actions.*	*Not Started*
Phase 2 Open Items		
	None	

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*	*Started*

Phase 1 Interim Staff Evaluation Open Items		Status
	following an ELAP.	
ISE-2	*Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation.*	*Not Started*
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.*	*Not Started*
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.*	*Started* *The required one percent capacity at the lower of Primary Containment Pressure Limit or containment design pressure will be verified using Reactor Excursion and Leak Analysis Program (RELAP). In addition, Modular Accident Analysis Program (MAAP) analyses will be 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.*
ISE-5	*Make available for NRC staff audit the seismic and tornado missile final design criteria for the HCVS stack.*	*Started* *As discussed in the December 2015 OIP submittal, the Limerick design complies with the reasonable tornado protection criteria of "Missile Evaluation for HCVS Components 30 feet above Grade" HCVS-WP-04 (Reference 10).*
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.*	*Not Started*
ISE-7	*Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.*	*Not Started*

Phase 1 Interim Staff Evaluation Open Items		Status
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.*	*Not Started*
ISE-9	*Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.*	*Started* *As discussed in the December 2015 OIP submittal, the Limerick design will use an Argon purge system to prevent the possibility of hydrogen detonation and deflagration.*
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.*	*Started* *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).*
ISE-11	*Make available for NRC staff audit documentation of a seismic qualification evaluation of HCVS components.*	*Not Started*
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.*	*Not Started*
ISE-13	*Make available for NRC staff audit the procedures for HCVS operation.*	*Not Started*

Phase 2 Interim Staff Evaluation Open Items		Status
	Phase 2 ISE not 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 attachment.

1. 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
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," dated May 14, 2014 (Accession No. ML14128A219)
6. 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)
7. 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
8. 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
9. 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
10. Missile Evaluation for HCVS Components 30 feet Above Grade, HCVS-WP-04, Revision 0 (ML15244A923), 8/8/2015
11. HCVS Release Point, HCVS-FAQ-04, Revision 1, (ML14120A289), 4/14/ 2014