Exelon Generation

Order No. EA-13-109

RS-16-235

December 15, 2016

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

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

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-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 14, 2013
3. 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
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. 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
6. 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-14-062)
7. 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 19, 2014 (RS-14-305)
8. 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-15-151)

9. 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-15-303)
10. 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-16-109)
11. NRC letter to Exelon Generation Company, LLC, Peach Bottom Atomic Power Station, Units 2 and 3 – 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. MF4416 and MF4417), dated February 12, 2015
12. NRC letter to Exelon Generation Company, LLC, Peach Bottom Atomic Power Station, Units 2 and 3 – 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. MF4416 and MF4417), dated August 2, 2016

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 (References 2 and 3) provide direction regarding the content of the OIP for Phase 1 and Phase 2. Reference 3 endorses industry guidance document NEI 13-02, Revision 1 (Reference 4) with clarifications and exceptions identified in References 2 and 3. Reference 5 provided the EGC initial response regarding reliable hardened containment vents capable of operation under severe accident conditions. Reference 6 provided the Peach Bottom Atomic Power Station, Units 2 and 3, Phase 1 OIP pursuant to Section IV, Condition D.1 of Reference 1. References 7 and 8 provided the first and second six-month status reports pursuant to Section IV, Condition D.3 of Reference 1 for Peach Bottom Atomic Power Station. Reference 9 provided the Peach Bottom Atomic Power Station, Units 2 and 3, Phase 1 updated and Phase 2 OIP pursuant to Section IV, Conditions D.2 and D.3 of Reference 1. Reference 10 provided the fourth six-month status report pursuant to Section IV, Condition D.3 of Reference 1 for Peach Bottom Atomic Power Station.

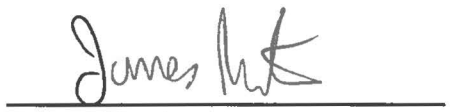
The purpose of this letter is to provide the fifth six-month update report for Phases 1 and 2, pursuant to Section IV, Condition D.3 of Reference 1, that delineates progress made in implementing the requirements of Reference 1 for Peach Bottom Atomic Power Station, Units 2 and 3. The enclosed report 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 References 11 and 12.

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 15th day of December 2016.

Respectfully submitted,



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

Enclosure:

Peach Bottom Atomic Power Station, Units 2 and 3 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 I
NRC Senior Resident Inspector - Peach Bottom Atomic Power Station
NRC Project Manager, NRR - Peach Bottom Atomic Power Station
Mr. Raj Auluck, NRR/JLD/TSD/JCBB, NRC
Mr. Brian E. Lee, NRR/JLD/JCBB, NRC
Mr. Peter Bamford, NRR/JLD/JOMB, 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
S. T. Gray, State of Maryland

Enclosure

Peach Bottom Atomic Power Station, Units 2 and 3

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

(19 pages)

Enclosure

Peach Bottom Atomic Power Station, Units 2 and 3
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"

1 Introduction

Peach Bottom Atomic Power Station (PBAPS) 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. This is the second six-month status report updating milestone accomplishments based on the combined Phases 1 and 2 Overall Integrated Plan dated December 15, 2015.

PBAPS developed an updated and combined Phases 1 and 2 Overall Integrated Plan (Reference 6 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 submittal of the Fourth Six-Month Status Report for Phase 1 and Phase 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 development of the combined Phases 1 and 2 Overall Integrated Plan (Reference 6), and are current as of December 2, 2016:

- Fifth Six-Month Update (complete with this submittal)
- Unit 2 achieved compliance with Phase 1 requirements on November 10, 2016

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
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 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	
Phase 1 Specific Milestones			
Phase 1 Unit 2 Modifications			
Begin Conceptual Design	Apr. 2014	Complete	
Complete Conceptual Design	Jun. 2015	Complete	
Begin Detailed Design	Jun. 2015	Complete	
Complete Detailed Design and Issue Modification Package	Jun. 2016	Complete	
Begin Online Portion of the Installation	Jun. 2016	Complete	
Complete Online Installation	Oct. 2016	Complete	
Begin Outage Portion of the Installation	Oct. 2016	Complete	
Complete Outage Installation	Nov. 2016	Complete	
Phase 1 Procedure Changes Active			
Operations Procedure Changes Developed	Nov. 2016	Complete	

Milestone	Target Completion Date	Activity Status	Comments
Phases 1 and 2 HCVS Milestone Table			
Site Specific Maintenance Procedure Developed	Nov. 2016	Complete	
Procedure Changes Active	Nov. 2016	Complete	
Phase 1 Training			
Training Complete	Nov. 2016	Complete	
Phase 1 Completion			
Unit 2 Phase 1 HCVS Implementation	Nov. 2016	Complete	
Phase 1 Unit 3 Modifications			
Begin Conceptual Design	N/A	N/A	
Complete Conceptual Design	N/A	N/A	
Begin Detailed Design	May 2016	Complete	
Complete Detailed Design and Issue Modification Package	Feb. 2017	Started	Date Change: Previously Oct. 2016
Begin Online Portion of the Installation	Mar. 2017	Not Started	Date Change: Previously Feb. 2017
Complete Online Installation	Oct. 2017	Not Started	Date Change: Previously Jun. 2017
Begin Outage Portion of the Installation	Oct. 2017	Not Started	
Complete Outage Installation	Nov. 2017	Not Started	
Phase 1 Procedure Changes Active			
Operations Procedure Changes Developed	Nov. 2017	Not Started	
Site Specific Maintenance Procedure Developed	Nov. 2017	Not Started	
Procedure Changes Active	Nov. 2017	Not Started	
Phase 1 Training			
Training Complete	Nov. 2017	Not Started	

Milestone	Target Completion Date	Activity Status	Comments
Phases 1 and 2 HCVS Milestone Table			
Phase 1 Completion			
Unit 3 Phase 1 HCVS Implementation	Nov. 2017	Not Started	
Phase 2 Specific Milestones			
Phase 2 Unit 3 Modifications			
Begin Conceptual Design	May 2016	Complete	
Complete Conceptual Design	Nov. 2016	Complete	Date Change: Previously Jul. 2016
Begin Detailed Design	Dec. 2016	Not Started	Date Change: Previously Jul. 2016
Complete Detailed Design and Issue Modification Package	Feb. 2017	Not Started	Date Change: Previously Oct. 2016
Begin Online Portion of the Installation	Mar. 2017	Not Started	Date Change: Previously Feb. 2017
Complete Online Installation	Oct. 2017	Not Started	Date Change: Previously Jun. 2017
Begin Outage Portion of the Installation	Oct. 2017	Not Started	
Complete Outage Installation	Nov. 2017	Not Started	
Phase 2 Procedure Changes Active			
Operations Procedure Changes Developed	Nov. 2017	Not Started	
Site Specific Maintenance Procedure Developed	Nov. 2017	Not Started	
Procedure Changes Active	Nov. 2017	Not Started	
Phase 2 Training			
Training Complete	Nov. 2017	Not Started	
Phase 2 Completion			

Milestone	Target Completion Date	Activity Status	Comments
Phases 1 and 2 HCVS Milestone Table			
Unit 3 Phase 2 HCVS Implementation	Nov. 2017	Not Started	
Submit Full Compliance Report for Phase 1 & Phase 2 for Unit 3	Jan. 2018	Not Started	
Phase 2 Unit 2 Modifications			
Begin Conceptual Design	N/A	N/A	
Complete Conceptual Design	N/A	N/A	
Begin Detailed Design	Mar. 2017	Not Started	
Complete Detailed Design and Issue Modification Package	Sep. 2017	Not Started	
Begin Online Portion of the Installation	Feb. 2018	Not Started	
Complete Online Installation	Oct. 2018	Not Started	Date Change: Previously Jun. 2018
Begin Outage Portion of the Installation	Oct. 2018	Not Started	
Complete Outage Installation	Nov. 2018	Not Started	
Phase 2 Procedure Changes Active			
Operations Procedure Changes Developed	Nov. 2018	Not Started	
Site Specific Maintenance Procedure Developed	Nov. 2018	Not Started	
Procedure Changes Active	Nov. 2018	Not Started	
Phase 2 Training			
Training Complete	Nov. 2018	Not Started	
Phase 2 Completion			
Unit 2 Phase 2 HCVS Implementation	Nov. 2018	Not Started	
Submit Full Compliance Report for Phase 1 & Phase 2 for Unit 2	Jan. 2019	Not Started	

4 Changes to Compliance Method

It was previously communicated in the combined Phases 1 and 2 Overall Integrated Plan (Reference 6) that the existing HCVS radiation monitoring system (RMS) was to be modified for both Unit 2 and Unit 3 such that the FLEX Diesel Generator will provide backup power to the system and that the detector and associated cabling was to be replaced and relocated; however, the existing HCVS RMS will not be modified. A new HCVS RMS was installed for Unit 2 and a new HCVS RMS will be installed for Unit 3 in addition to the existing system. This new HCVS RMS includes a detector assembly (RE-81405) located on elevation 195'-0" of the Unit 2 Reactor Building, processor (RT-81405) located in the Remote Operating Station (ROS), and indicator (RI-81405) located in Main Control Room Panel 20C010. The FLEX Diesel Generator will provide backup power to the new HCVS RMS. The new HCVS RMS is designed to align with the guidance provided in NEI 13-02, Rev. 1 (Reference 3).

The installed capacity of the argon purge system was also previously communicated in the combined Phases 1 and 2 Overall Integrated Plan (Reference 6) to be sized for at least 8 purges within the first 24 hours of an ELAP. A generic number of 8 Wetwell vent cycles within the first 24 hours of an ELAP is determined to be reasonable per HCVS-WP-02 (Reference 9). HCVS-WP-02 also states that the number of vent cycles is dependent on the strategy and scenario selected for the evaluation and a plant specific analysis can be used to determine the number of cycles estimated during the first 24 hours. The generic number of 8 Wetwell vent cycles is based on a 20 psi pressure control band for containment pressure. Peach Bottom will utilize a 41 psi pressure control band (15 – 56 psig). The high end of the pressure control band (56 psig) is the Primary Containment Design Pressure for Peach Bottom and the low end of the pressure control band (15 psig) is based on EPRI Severe Accident Management Guidance Technical Basis Report, Volume 2, Appendix S. Using this pressure control band, a Modular Accident Analysis Program (MAAP) calculation (Reference 11) was developed using MAAP 4.0.6. This analysis resulted in a MAAP calculation of four (4) containment vent cycles within the first 24 hours of an ELAP. Based on the results of this analysis, the installed capacity of the argon purge system will be sized for at least 4 purges within the first 24 hours of an ELAP.

There are no other changes to the compliance method outlined in Reference 6.

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

PBAPS 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) for Phase 1 and Phase 2 and the status of each item.

Combined Phases 1 and 2 OIP Open Item	Status
Phase 1 Open Items	
OI-1. Confirm that the Remote Operating Station (ROS) will be in an accessible area following a Severe Accident (SA).	Deleted. Closed to ISE Open Item number 09.
OI-2. Provide procedures for HCVS Operation	Deleted. Closed to ISE Open Item number 01.
OI-3. Identify site specific controlling document for HCVS out of service and compensatory measures	Deleted. Closed to ISE Open Item number 02.
OI-4. Determine the approach for combustible gases.	Deleted. Closed to ISE Open Item number 08.
OI-5. Perform radiological evaluation for Phase 1 vent line impact on ERO response actions.	Complete – This evaluation is captured in Calculation PM-1190. Calculation PM-1190 has been posted to the ePortal and a summary of the results is provided below:

Combined Phases 1 and 2 OIP Open Item	Status

Table 8-1 Operating Station and Equipment Location Dose Rates and Integrated Doses

Location	Distance from Vent Pipe	Concrete Shield Thickness (inches)	Peak Event Dose Rate (R/hr)	7-Day Integrated Dose (R)	TID (EQ Qualified Dose) (R)
Primary Operating Station (POS)	>100 ft	>60	(1)		
Units 2 and 3 Remote Operating Station (ROS)	40 ft (Unit 2) >100 ft (Unit 3)	54 (Unit 2) 42 (Unit 3)	5.684E-03	4.281E-01	350
HCVS Batteries	> 100 ft	>60	1.574E-04	1.186E-02	90
Equipment in MCR (e.g., HCVS monitoring)	>100 ft	>60	(1)		
Valve Operators: AO-2511, AO-80290, and AO-2512	1 cm	0	3.220E+05(2)	8.036E+06	8.0E+06 (1E+07)
Radiation Monitor Detector Assembly	1 cm	0	6.605E+04	4.963E+06	5.0E+06 (2.0E+08)
Temperature Element TI-81407	Within Well(3)	0	4.505E+05(2)	1.769E+07	1.8E+07 (3.00E+08)

(1) Not required per NEI 13-02 HCVS-FAQ-01 [Reference 4.1].
(2) Dose rate contribution from wetwell included.
(3) Although the temperature element is at the surface of the HCVS vent pipe, the 7-day integrated radiation dose is conservatively calculated for a thermal well within the pipe.

Table 8-2 Vent Pipe Peak Dose Rates at FLEX Equipment Locations

Location	Peach Bottom Unit in Severe Accident	Distance from Vent Pipe	Concrete Shield Thickness (inches)	Peak Event Dose Rate (R/hr)(1)
Unit 2 Diesel Generator	2	250 ft	30	2.740E-03
	3	450 ft	>60	7.871E-05
Unit 3 Diesel Generator	2	450 ft	>60	7.871E-05
	3	250 ft	30	2.740E-03
Refueling Station	2	200 ft	(2)	(2)
	3	400 ft	>60	(2)
FLEX Pump (Flood Event)	2	~600 ft	8	1.50E-01
	3	~400 ft	8	5.60E-01
FLEX Pump (Seismic Event)	2	~600 ft	0 (for top 20' to 33' of Pipe)	8.84E-01
	3	~500 ft	0 (for top 20' to 33' of Pipe)	8.84E-01

(1) Although the shielded direct dose rates are small due to the radiation shielding, the dose rates at the diesel generator locations are not expected to be insignificant, due to the dose rate contribution from air scattered radiation of the activity within the vent pipe.
(2) The refueling station is south of the Unit 2 reactor building south wall. The refueling station must be within the area shielded from the HCVS vent pipe by the shadow of the Unit 2 reactor building south wall. The closer the refueling station is to the turbine building, the smaller will be the scattered dose rate from activity within the HCVS vent pipe. If the refueling station is near the Unit 2 diesel generator location near the reactor building equipment access lock, then the direct dose rate will be similar to the reported dose rates for the Unit 2 diesel generator.

Combined Phases 1 and 2 OIP Open Item	Status

Table 8-3 Operator Transit Pathway Dose Rates

Location	Distance from Vent Pipe	Concrete Shield Thickness (inches)	Peak Event Dose Rate (R/hr)
Access Pathway to ROS, Reactor Building Northeast Stairwell, EL. 165'-0" to 135'-0"	>100 ft	(2)	(2)
Turbine Building/Reactor Building Second Floor, EL. 165'-0"	>100 ft	42	4.493E-03
Reactor Building[1] Near Row J, EL. 135'-0"	>100 ft	>60 (vent pipe) 2'-8" (wetwell)	2.232E+01
Service Road[1] West of Reactor Building	38 ft	0 (vent pipe) 2'-8" (wetwell)	5.612E+02[3]

(1) Dose rate contribution from wetwell included.

(2) Refer to the evaluation in Section 7.8 of this calculation. The dose rate in the stairwell is due to severe accident activity within the torus. The stairwell is above the corner rooms in the torus area. Radiation shine from the torus into the stairwell and the stairwell enclosure on EL 135' is shielded by the 2'-8" thick concrete floor above the torus at EL 135' and radiation shine from the torus through a hatch in the floor above the torus. The stairwell enclosure has a 10" thick concrete wall and there is a doorway into the stairwell enclosure.
The dose rate in the stairwell enclosure is estimated to be be in the range of 0.5 R/hr to 11 R/hr and the dose rate on the stairs is estimated to range from 30 to 11 R/hr with the highest dose rate due to shine through the floor hatch into the stairwell.

(3) Use of the service road west of the reactor building as a travel pathway vollowing HCVS vent initiation is not viable due to the large dose rates.

Phase 1 Interim Staff Evaluation Open Item	Status
ISE-1. Make available for NRC staff audit guidelines and procedures for HCVS operation. (Section 3.2.3.1)	Complete – guidelines and procedures for HCVS operation are complete and posted to the ePortal. A list of the guidelines and procedures for HCVS operation is provided below: - AO 56E.2-3, Rev 013, E134-T-B, E134-W-A, AND E-13A4-EC-A MOTOR CONTROL CENTERS OR E134 AND E13A4 EMERGENCY - AO 56E.4-2, Rev 019, E324-R-B, E324-R-D, E324-D-A, E324-T-B OR E324-O-A MOTOR CONTROLCENTERS OR E324 EMERGENC - CC-PB-118, Rev 003, PEACH BOTTOM IMPLEMENTATION OF DIVERSE AND FLEXIBLE COPING STRATEGIES (FLEX) AND SP - FSG-010-2, Rev 001, ALIGNING FLEX GENERATOR TO PANEL 2AS1061 AND FOR FUEL OIL TRANSFER - FSG-010-3, Rev 001, ALIGNING FLEX GENERATOR TO PANEL 3AS1061 - FSG-011-2, Rev 0000, ALIGNING FLEX GENERATOR TO PANEL 2BS1061 AND FOR FUEL OIL TRANSFER - FSG-011-3, Rev 001, ALIGNING FLEX GENERATOR TO PANEL 3BS1061 - FSG-013-2, Rev 0000, ELAP AC LOAD ALIGNMENT - FSG-013-3, Rev 001, ELAP AC LOAD ALIGNMENT - GP-2-2, Rev 008, NORMAL PLANT START-UP - OP-PB-108-103-2, Rev 007, LOCKED VALVE LIST - PBAPS UNIT 2 - PF-72H, Rev 007, RADWASTE BLDG RADWASTE COMPACTING AND STORAGE - ELEVATION 135'-0" - PF-75, Rev 006, RADWASTE BLDG RADWASTE CONTROL ROOM DECON AND MEDICAL STATION ELEVATION 135'-0" - RT-M-07B-950-2, Rev 003, TORUS HARDENED VENT RUPTURE DISC INTEGRITY TEST - RT-O-07K-900-2, Rev 0000, CONTAINMENT EMERGENCY VENT SYSTEM BOTTLE PRESSURE VERIFICATION TEST - RT-O-57P-100-2, Rev 0000, CONTAINMENT EMERGENCY VENT SYSTEM COMPONENT OPERATION TEST - RT-O-57P-745-2, Rev 0000, CONTAINMENT EMERGENCY VENT BATTERY MONTHLY INSPECTION - RT-O-57P-746-2, Rev 0000, CONTAINMENT EMERGENCY VENT BATTERY QUARTERLY INSPECTION - RT-O-100-505-2, Rev 040, EMERGENCY OPERATING PROCEDURE TOOL INVENTORY - SE-4 BASES, Rev 031, FLOOD – BASES - SE-4 PROCEDURE, Rev 041, FLOOD – PROCEDURE - SE-11 BASES, Rev 022, LOSS OF OFF-SITE POWER – BASES - SO 7B.1.A-2 COL, Rev 011, CONTAINMENT ATMOSPHERE INERTING - SO 7K.1.A-2 COL, Rev 0000, CONTAINMENT EMERGENCY VENT ARGON RUPTURE PURGE - SO 16C.1.A-2 COL, Rev 001, BACKUP INSTRUMENT NITROGEN TO HARDENED CONTAINMENT VENT SYSTEM - SO 57P.1 COL, Rev 0000, CONTAINMENT EMERGENCY VENT SYSTEM - SO 57P.1, Rev 001, HARDENED CONTAINMENT VENT SYSTEM BATTERY CHARGER STARTUP AND NORMAL OPERATIONS - SO 58C.1.A COL, Rev 047, NORMAL 120 VAC SYSTEM COMMON PLANT - ST/LLRT 20.07B.11, Rev 003, TORUS 18 INCH VENT ISOLATION VALVES TO S.B.G.T. O-RING SEALS OF AO-2-07B-2511 - ST-M-16B-250-2, Rev 019, SAFETY GRADE INSTRUMENT GAS SYSTEM FUNCTIONAL AND INSERVICE TEST - T-200-2, Rev 014, PRIMARY CONTAINMENT VENTING - T-200J-2, Rev 004, CONTAINMENT VENTING VIA THE TORUS HARDENED VENT - TQ-PB-201-0113, Rev 008, PEACH BOTTOM TRAINING DEPARTMENT SIMULATOR EXAMINATION SECURITY

<table>
<tr><th>Phase 1 Interim Staff Evaluation Open Item</th><th>Status</th></tr>
<tr><td>ISE-2. Make available for the NRC staff audit the site specific controlling document for HCVS out of service and compensatory measures. (Section 3.4.1)</td><td>Complete – Procedure CC-PB-118 contains HCVS out of service requirements and is posted to the ePortal. Out of service requirements are described below:
<table>
<tr><th colspan="4">Hardened Containment Vent System (HCVS)</th></tr>
<tr><td colspan="4">Applicability: Modes 1, 2, and 3</td></tr>
<tr><td colspan="4">Note: Multiple Condition entry is allowed for each piece of equipment.</td></tr>
<tr><td></td><td>Condition</td><td>Required Action</td><td>Completion Time</td></tr>
<tr><td>A.</td><td>Primary control and monitoring elements[1]
OR
Alternate valve control elements[1]</td><td>Restore capability.</td><td>90 days</td></tr>
<tr><td>B.</td><td>Primary control and monitoring elements
AND
Alternate valve control elements</td><td>Restore primary control and monitoring elements.
OR
Restore alternate valve control elements.</td><td>30 days</td></tr>
<tr><td>C.</td><td>Required Action A or B and associated Completion Time Not Met.</td><td>Initiate an IR to enter the condition into CAP.
Determine the cause of the non-functionality.
Determine the actions to be taken and the schedule for restoring the system to functional status and prevent recurrence.
Initiate action to implement appropriate compensatory actions.
Restore full HCVS functionality at the earliest opportunity not to exceed one full operating cycle.</td><td>Immediately</td></tr>
</table>
[1]The HCVS is functional when piping, valves, instrumentation and controls including motive force necessary to support system operation are available.

The HCVS primary control and monitoring elements includes the following:
• Argon and nitrogen bottle banks
• MCR controls
• MCR indications of HCVS argon header pressure, vent line temperature, and vent path valve position indication.
• HCVS Battery and Battery Charger
• Capability to cycle open and close vent path valves from the MCR

The HCVS alternate control elements include:
• Argon and nitrogen bottle banks
• Capability to cycle open and close vent path valves from the Remote Operating Station (ROS), RW 135'</td></tr>
<tr><td>ISE-3. Make available for NRC staff audit a technical justification for use of jumpers in the HCVS strategy. (Section 3.1.3)</td><td>Complete - The design of the HCVS includes a control switch in the MCR for transferring power to the solenoid valve (SV) that does not include a PCIS isolation signal, eliminating the need for jumpers. Applicable Unit 2 drawings (M-1-S-23, Sheet 34B and E-403, Sheet 5) and Unit 2 ECR package 15-00148 have been uploaded to the ePortal.</td></tr>
</table>

Phase 1 Interim Staff Evaluation Open Item	Status
ISE-4. Make available for NRC staff audit analyses demonstrating that the 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. (Sections 3.2.2.1 and 3.2.2.2)	Complete - Calculation PM-0546, Torus Hardened Vent-Flow demonstrates that the HCVS has the capacity to vent the steam/energy equivalent of one percent licensed/rated thermal power. The primary containment design pressure is 56 psig (UFSAR 5.2.3.1). The primary containment pressure limit is 60 psig (UFSAR 5.2.3.6). PM-0546 shows that the HCVS capacity exceeds one percent of licensed/rated thermal power at the lower of these values. Calculation PM-0546 has been uploaded to the ePortal. Additionally, MAAP calculation PB-MISC-025 was developed using MAAP 4.0.6 to investigate the response of Peach Bottom Unit 2 and Unit 3 containment venting using the HCVS vent parameters and the use of RPV alternate injection with assumed immediate RCIC failure. The MAAP analysis demonstrates 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. Calculation PB-MISC-025 has been uploaded to the ePortal.
ISE-5. Make available for NRC staff audit descriptions or diagrams of reactor building ventilation including exhaust dampers failure modes to support licensee justification for the HVAC release point being below and 150 feet from the reactor building ventilation release point. (Section 3.2.2.3)	Complete - Reference drawing M-395: The Reactor Building Exhaust System. The RB Exhaust System Fans, including the Refuel Floor Exhaust Fans, RB Exhaust Fans, and RB Equipment Exhaust Fans, have Fail-Close dampers in exhaust ducts to prevent uncontrolled or unmonitored release from the RB in the event of loss of power to the solenoid valves associated with the dampers. Fail-Close dampers will eliminate pathway into the RB in the event of use of the HCVS in an ELAP. Drawing M-395 has been uploaded to the ePortal.

<table>
<tr><th>Phase 1 Interim Staff Evaluation Open Item</th><th>Status</th></tr>
<tr><td>ISE-6. Make available for NRC staff audit details to justify the deviation from tornado protection standards provided in NEI 13-02 or make available a description of how the HCVS will comply with the tornado protection standards provided in NEI-13-02. (Section 3.2.2.3)</td><td>Complete – Exelon has prepared a Tornado Missile TORMIS analysis (ARA-002611) which calculated probabilities of damage to the external piping that would crimp the pipe to a point of not being able to perform as expected under severe accident conditions following an ELAP event. The conclusions of the analysis are provided below:

The table below summarizes the arithmetic sum and Boolean union of hit and damage frequencies per year for each of the targets that comprise the Unit 2 and Unit 3 Hardened Vents. The Boolean union is lower than the arithmetic sum of the frequencies because it eliminates double counting when multiple segments of a single vent are hit (or damaged) in the same event. Frequencies for the Hardened Vent targets for each unit are lower than the threshold frequency of 1.0E-06 per year established in the USNRC (1983b).

Mean Damage Frequency (per Year) for PBAPS Hardened Vent Targets
<table>
<tr><th rowspan="2">Target</th><th colspan="2">Hit Probability (per year)</th><th colspan="2">Damage Probability (per year)</th></tr>
<tr><th>Sum</th><th>Union</th><th>Sum</th><th>Union</th></tr>
<tr><td>U2 Hardened Vent</td><td>4.60E-05</td><td>3.00E-05</td><td>1.09E-07</td><td>1.05E-07</td></tr>
<tr><td>U3 Hardened Vent</td><td>1.36E-04</td><td>7.02E-05</td><td>1.31E-07</td><td>1.26E-07</td></tr>
</table>
In addition, compensatory measures are available in the event the HCVS external piping does become crimped. This analysis has been reviewed by the NRC and determined to be acceptable based on the probability values provided in the analysis and the qualitative reasonable assurance argument provided. TORMIS analysis ARA-002611 has been posted to the ePortal.</td></tr>
<tr><td>ISE-7. 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 condition. (Section 3.2.2.5)</td><td>Complete – FLEX modification ECR 15-00126 improved the PBAPS communication system to be functional in the event of an ELAP. This modification provided equipment and connections to form a workable system to provide in-plant communications during and after an ELAP/BDBEE. The existing 3-way antenna coupler located in the northeast corner of the reactor building at El. 135'-0", was replaced with a 4-way coupler to accommodate a new connection installed from a new cabinet to power the existing plant antenna network. The new cabinet is located in the same area and was vendor supplied with all equipment as required. The cabinet houses an 8-hour rectifier power system and associated batteries, radio repeater that duplicates the frequency of the operations channel 1 (ops 1), a radio frequency duplexer to control the signals to and from the portable radio antenna and associated cabling that will be deployed after the event. The cabinet is powered from a division 1 power source which will be powered from the FLEX portable diesel during an ELAP. The permanently installed equipment in the reactor building along with all conduits for the cabling are seismically mounted. This system is deployed using procedure FSG-020.

Operators in the remote HCVS operating location (Radwaste Building El. 135') will utilize this system to communicate with the Main Control Room staff. ECR 15-00126 and procedure FSG-020 have been uploaded to the ePortal.</td></tr>
<tr><td>ISE-8. Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration. (Section 3.2.2.6)</td><td>Complete – Peach Bottom will utilize an Argon purge system to address combustible gases in the HCVS piping. A summary of the design features is included in the December 2015 OIP.</td></tr>
</table>

Phase 1 Interim Staff Evaluation Open Item	Status
ISE-9. 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. (Sections 3.2.1, 3.2.2.3, 3.2.2.4, 3.2.2.5, 3.2.2.10, 3.2.4.1, 3.2.4.2, 3.2.5.2, and 3.2.6)	Complete – Temperature and radiological conditions have been evaluated. The evaluated conditions support safe access and operation of control and supporting equipment by operating personnel. Temperature conditions are evaluated in Section 3.14 of ECR 15-00148 and radiological conditions are evaluated in Calculation PM-1190. Unit 2 ECR 15-00148 and Calculation PM-1190 have been posted to the ePortal.
ISE-10. Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods. (Sections 3.2.2.9 and 3.2.2.10)	Complete – Descriptions of all instrumentation and controls necessary to implement this order including qualification methods are provided in ECR 15-00148, Section 3.2, 3.5, 3.14, 3.15 & 3.39. ECR 15-00148 has been posted to the ePortal.
ISE-11. Make available for NRC staff audit the final sizing evaluation for HCVS batteries/battery charger including incorporation into FLEX DG loading calculation. (Sections 3.2.2.4, 3.2.3.1, 3.2.3.2, 3.2.4.1, 3.2.4.2, 3.2.5.1, 3.2.5.2, and 3.2.6)	Complete – Final sizing evaluation for HCVS battery/battery charger is contained in Calculation PE-0308. Incorporation of HCVS loading to FLEX DG loading is contained in Calculation PE-0301. Calculations PE-0308 and PE-0301 have been posted to the ePortal.

Phase 1 Interim Staff Evaluation Open Item	Status
ISE-12. 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. (Sections 3.2.2.3, 3.2.2.5, 3.2.2.9, and 3.2.2.10)	Complete – Descriptions of local conditions and confirmation that components required for HCVS venting are capable of performing their functions during ELAP and severe accident conditions are contained in ECR 15-00148, Sections 3.14 & 3.15. Unit 2 ECR 15-00148 has been posted to the ePortal.
ISE-13. Make available for NRC staff audit documentation of an evaluation verifying the existing containment isolation valves, relied upon for the HCVS, will open under the maximum expected differential pressure during BDBEE and severe accident wetwell venting. (Section 3.2.2.9)	Complete – Documentation that the existing containment isolation valves, which are relied upon for HCVS, will open under the maximum expected differential pressure during BDBEE and severe accident wetwell venting (60 psig) is provided in specification M-00117 and valve data sheet DS-FP, Sheet 1161. Specification M-00117 requires that PCIV AO-2(3)-07B-2(3)511 be able to operate with a 62 psig pressure differential and valve data sheet DS-FP, Sheet 1161 states that the design pressure of PCIV AO-2(3)-07b-8(9)0290 is 150 psig. Specification M-00117 and valve data sheet DS-FP, Sheet 1161 have been posted to the ePortal.
ISE-14. 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. (Section 3.2.2.6 and 3.2.2.7)	Completed - As described in the OIP, the HCVS torus vent path in each unit, starting at and including the downstream PCIV, will be a dedicated HCVS flow path. There are no interconnected systems downstream of the downstream, dedicated HCVS PCIV. Interconnected systems are upstream of the downstream HCVS PCIV and are isolated by normally shut, fail shut PCIVs which, if open, would shut on an ELAP. There is no shared HCVS piping between the two units. The vent path will rely on an Argon purge system to prevent the formation of a combustible gas mixture in the vent line.

Phase 1 Interim Staff Evaluation Open Item	Status
ISE-15. Make available for NRC audit documentation confirming that HCVS will remain isolated from standby gas treatment system during ELAP and severe accident conditions. (Section 3.2.2.7)	Complete – The Hardened Containment Vent is isolated from the SGTS by valve AO-2-07B-2512 (Unit 2) and AO-3-07B-3512 (Unit 3). The boot seal of AO-2(3)-07B-2(3)512 will be maintained inflated from the dedicated HCVS nitrogen supply to ensure that AO-2(3)-07B-2(3)512 remains closed/isolated. Unit 2 ECR 15-00148 has been posted to the ePortal.

Phase 2 Interim Staff Evaluation Open Item	Status
ISE-1. Licensee to demonstrate the SAWA equipment and controls, as well as ingress and egress paths for the expected severe accident conditions (temperature, humidity, radiation) for the sustained operating period. (Section 3.3.2.3)	Started.
ISE-2. Licensee to demonstrate that instrumentation and equipment being used for SAWA and supporting equipment is capable to perform for the sustained operating period under the expected temperature and radiological conditions. (Section 3.3.2.3)	Started.

Phase 2 Interim Staff Evaluation Open Item	Status
ISE-3 Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions. (Section 3.3.3)	Started.
ISE-4 Licensee shall demonstrate whether a site specific MAAP evaluation will be used to determine an initial SAWA flow rate. If the evaluations performed in BWROG TP-15-011 is considered, provide a description of 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. (Section 3.3.3.10)	Started.
ISE-5 Licensee to demonstrate that there is adequate communication between the MCR and the Intake Structure operator at the FLEX manual valve during severe accident conditions. (Section 3.3.3.4)	Started.

Phase 2 Interim Staff Evaluation Open Item	Status
ISE-6 Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions. (Section 3.3.3.4)	Started.

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. Peach Bottom Atomic Power Station, Units 2 and 3, Overall Integrated Plan in Response to June 6, 2013 Commission Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109)," dated June 30, 2014.

2. NRC Order Number EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions" dated June 6, 2013.

3. NEI 13-02, "Industry Guidance for Compliance with NRC Order EA-13-109, 'To Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions," Revision 1, dated April 2015.

4. NRC Interim Staff Guidance JLD-ISG-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. Peach Bottom Atomic Power Station, Units 2 and 3, Combined 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, 2015.

7. 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).

8. Peach Bottom Atomic Power Station, Units 2 and 3, Fourth Six-Month Status Report for Phase 1 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 June 30, 2016 (RS-16-109).

9. HCVS-WP-02, Rev. 0, Sequences for HCVS Design and Method for Determining Radiological Dose from HCVS Piping, dated October 23, 2014.

10. EPRI Severe Accident Management Guidance Technical Basis Report, Volume 2: The Physics of Accident Progression, dated October 2012.

11. PB-MISC-025, Rev. 0, MAAP Analysis to Support HCVS Design: Containment Vent Cycling, dated October 12, 2016.