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December 15, 2016

Serial: BSEP 16-0111

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

Subject: Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
NRC Docket Nos. 50-325 and 50-324
Fifth Six-Month Status Report 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. Nuclear Regulatory Commission (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, Agencywide Documents Access and Management System (ADAMS) Accession Number ML13143A321.
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, ADAMS Accession Number ML13304B836.
3. 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 30, 2015, ADAMS Accession Number ML15104A118.
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, ADAMS Accession Number ML15113B318.
5. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *Duke Energy's 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 17, 2013, ADAMS Accession Number ML13191A567.
6. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *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 26, 2014, ADAMS Accession Number ML14191A687.
7. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *First Six-Month Status Report 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, ADAMS Accession Number ML14364A029.

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8. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *Second Six-Month Status Report 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 25, 2015, ADAMS Accession Number ML15196A035.

9. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *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 December 11, 2015, ADAMS Accession Number ML16020A064.

10. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *Fourth-Six Month Status Report 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 28, 2016, ADAMS Accession Number ML16190A111.

11. NRC Letter, *Brunswick Steam Electric Plant, 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. MF4467 and MF4468)*, dated March 10, 2015, ADAMS Accession Number ML15049A266.

12. NRC Letter, *Brunswick Steam Electric Plant, 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) (CAC Nos. MF4467 and MF4468)*, dated August 17, 2016, ADAMS Accession Number ML16223A725.

Ladies and Gentlemen:

On June 6, 2013, the Nuclear Regulatory Commission (NRC) issued 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* (i.e., Reference 1) to Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. Reference 1 was immediately effective and directs all boiling water reactors (BWRs) with Mark I and Mark II containments to take certain actions to ensure that these facilities have a hardened containment venting system (HCVS) to support strategies for controlling containment pressure and preventing core damage following an event that causes a loss of heat removal systems, such as an Extended Loss of AC Power (ELAP), while ensuring the venting functions are also available during severe accident (SA) conditions. BSEP, Unit Nos. 1 and 2, have Mark I containments. Specific requirements are outlined in Attachment 2 of Reference 1.

Reference 1 requires 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 (i.e., References 2 and 3) provides direction regarding the content of the OIP for Phase 1 and Phase 2. Reference 3 endorses industry guidance document NEI 13-02, Revision 1 (i.e., Reference 4), with clarifications and exceptions identified in Reference 3. Reference 5 provided the Duke Energy initial status report regarding reliable hardened containment vents capable of operation under severe accident conditions. Reference 6 provided the BSEP, Units 1 and 2, Phase 1 OIP. References 7 and 8 provided the first and second six-month status reports pursuant to Section IV, Condition D.3 of Reference 1 for BSEP, Units 1 and 2, respectively.

Reference 9 provided both the third six-month status report for Phase 1 of the Order pursuant to Section IV, Condition D.3, of Reference 1, and the OIP for Phase 2 of the Order pursuant to Section IV, Condition D.2 of Reference 1, for BSEP, Units 1 and 2, in a combined Phase 1 and Phase 2 OIP. Reference 10 provided the fourth six-month status report pursuant to Section IV, Condition D.3 of Reference 1 for BSEP, Units 1 and 2.

The purpose of this letter is to provide the fifth six-month status report pursuant to Section IV, Condition D.3 of Reference 1 for BSEP, Units 1 and 2. This six-month status report provides the updates for both Phase 1 and Phase 2 OIP implementation including Phase 1 OIP open items, Phase 1 Interim Staff Evaluation (ISE) open items contained in Reference 11 and Phase 2 NRC ISE open items contained in Reference 12.

This letter contains no new regulatory commitments.

If you have any questions regarding this submittal, please contact Mr. Lee Grzeck, Manager - Regulatory Affairs, at (910) 457-2487.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 15, 2016.

Sincerely,

William R. Gideon

Enclosure:
Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

cc (with enclosure):

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Enclosure

Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2

Fifth Six-Month Status Report 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)

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

1 Introduction

Note: References are provided in Section 10 of this enclosure.

Brunswick Steam Electric Plant (BSEP) developed an Overall Integrated Plan (OIP) (i.e., Reference 1) documenting the installation of a Hardened Containment Vent System (HCVS) in response to NRC Order EA-13-109 (i.e., Reference 2). The OIP was submitted to the NRC on June 6, 2014. The first six-month update was submitted to the NRC on December 17, 2014 (i.e., Reference 4). The second six-month update was submitted to the NRC on June 25, 2015 (i.e., Reference 5). Reference 6 provided both the third six-month update for Phase 1 of the Order and the OIP for Phase 2 of the Order, for BSEP, Units 1 and 2, on December 11, 2015. The fourth six-month update was submitted to the NRC on June 28, 2016 (i.e., Reference 7).

This enclosure provides an update of milestone accomplishments including any changes to the compliance method, schedule, or need for relief/relaxation and the basis, if any, for both Phase 1 and Phase 2 OIP implementation that occurred during the period between June 1, 2016, and November 30, 2016, hereafter referred to as the update period.

2 Milestone Accomplishments

The following milestones were completed during the update period:

- Submit 6-Month Status Report (Phase 1 and 2 combined update)
- U2 Design Engineering On-site/Complete (Phase 1)

3 Milestone Schedule Status

The following provides an update to the Milestone Schedule of the 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.

The revised milestone target completion dates do not impact the order implementation date.

Phase 1 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
Hold preliminary/conceptual design meeting.	Jun. 2014	Complete	Date not revised.
Submit Overall Integrated Plan.	Jun. 2014	Complete	Date not revised.
Submit 6 Month Status Report.	Dec. 2014	Complete	Date not revised.

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
Fifth Six-Month Status Report 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)

Phase 1 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
Submit 6 Month Status Report.	Jun. 2015	Complete	Date not revised.
Submit 6-Month Status Report.	Dec. 2015	Complete	Simultaneous with Phase 2 OIP.
U2 Design Engineering On-site/Complete.	Jun. 2016	***Complete**	Date not revised.
Storage Plan.	***Mar. 2017**	Started	***Date revised to Mar 2017.**
Staffing analysis completion.	***Mar. 2017**	Started	***Date revised to Mar 2017.**
Long term use equipment acquisition timeline.	***Mar. 2017**	Started	***Date revised to Mar 2017.**
Submit 6-Month Status Report.	Jun. 2016	Complete	Date not revised.
Operations Procedure Changes Developed.	***Mar. 2017**	Started	***Date revised to Mar 2017.**
Site Specific Maintenance Procedure Developed.	***Mar. 2017**	Started	***Date revised to Mar 2017.**
Submit 6-Month Status Report.	Dec. 2016	***Complete**	Date not revised.
Training Complete.	Feb. 2017	Started	Date not revised.
U2 Implementation Outage.	Mar. 2017	Not Started	Date not revised.
Procedure Changes Active.	Mar. 2017	Not Started	Date not revised.
U2 Walk Through Demonstration/Functional Test.	Mar. 2017	Not Started	Date not revised.
U1 Design Engineering On-site/Complete.	Mar. 2017	***Started**	Date not revised.
Submit 6-Month Status Report.	Jun. 2017	Not Started	Date not revised.
Submit 6-Month Status Report.	Dec. 2017	Not Started	Date not revised.
U1 Implementation Outage.	Feb. 2018	Not Started	Date not revised.
U1 Walk Through Demonstration/Functional Test.	Mar. 2018	Not Started	Date not revised.

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

Phase 1 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
Submit Completion Report.	May 2018	Not Started	Date not revised.

Phase 2 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
Hold preliminary/conceptual design meeting.	Oct. 2015	Complete	Date not revised.
Submit Overall Integrated Implementation Plan.	Dec. 2015	Complete	Third 6-month update included Phase 2 OIP (i.e., Reference 6).
Submit 6-Month Status Report.	Jun. 2016	Complete	Date not revised.
Submit 6-Month Status Report.	Dec. 2016	***Complete**	Date not revised.
Submit 6-Month Status Report.	Jun. 2017	Not Started	Date not revised.
U1 Design Engineering On-site/Complete.	Mar. 2017	***Started**	Date not revised.
Submit 6-Month Status Report.	Dec. 2017	Not Started	Date not revised.
Operations Procedure Changes Developed.	Dec. 2017	Started	Date not revised.
Site Specific Maintenance Procedure Developed.	Dec. 2017	***Started**	Date not revised.
Training Complete.	Feb. 2018	***Started**	Date not revised.
U1 Implementation Outage.	Mar. 2018	Not Started	Date not revised.
Procedure Changes Active.	Mar. 2018	Not Started	Date not revised.
U1 Walk Through Demonstration/Functional Test.	Mar. 2018	Not Started	Date not revised.
U2 Design Engineering On-site/Complete.	Mar. 2018	Not Started	Date not revised.
Submit 6-Month Status Report.	Jun. 2018	Not Started	Date not revised.
Submit 6- Month Status Report.	Dec. 2018	Not Started	Date not revised.

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

Phase 2 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
U2 Implementation Outage.	Mar. 2019	Not Started	Date not revised.
U2 Walk Through Demonstration/Functional Test.	Mar. 2019	Not Started	Date not revised.
Submit Completion Report.	July 2019	Not Started	Date not revised.

4 Changes to Compliance Method

No changes to the Phase 1 or Phase 2 Overall Integrated Plan (i.e., Reference 6) have been made during this 6-month update period.

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

There are no changes to the need for relief/relaxation during this fifth update period. BSEP expects to comply with the order implementation date.

6 Open Items from Phase 1 Overall Integrated Plan and Phase 1 Interim Staff Evaluation

Tables 6a and 6b provide a summary status of Open Items. Table 6a provides the open items that were previously identified in the original OIP (i.e., Reference 1) submitted on June 6, 2014. Table 6b provides the open items that were previously identified in the Phase 1 Interim Staff Evaluation (ISE) (i.e., Reference 3). No new open items are identified or added during this update period.

Table 6a. Phase 1 Overall Integrated Plan Open Items

Table 6a - Overall Integrated Plan Open Items		
#	**Open Item**	**Status**
***Indicates a change since last 6-month update**		
1	Evaluate, design, and implement missile protection as required for the HCVS piping external to the reactor building.	Complete
	Evaluation of the pipe robustness was performed in EC 299559 Attachment Z01. This evaluation concluded that the pipe is robust with respect to all applicable hazards including wind-borne missiles. This evaluation was submitted as part of the response to order EA-12-049. The staff's review of this evaluation was documented in the Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool	

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

Table 6a - Overall Integrated Plan Open Items		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
	Instrumentation Related to Orders EA-12-049 and EA-12-051, dated March 31, 2015, ADAMS Accession Number ML 15082A155, paragraph 3.4, stating that the analogous open item for EA-12-049 was closed. As part of the additional modifications being performed for EA-13-109, the piping modifications are being designed to two times the safe shutdown seismic acceleration (2XSSE).	
2	Finalize location of the Remote Operating Station (ROS).	***Complete.***
	The ROS for both units will be located on the Reactor Building 50' elevation, near an airlock door to the Radwaste Building Roof. This area has been evaluated for acceptable dose and temperature during a severe accident and found to be acceptable for the minimal operator actions necessary which are to unlock and open three manual valves that will port nitrogen to the valves actuators that open the HCVS vent path.	
3	Finalize and design means to address flammable gases in the HCVS.	***Complete.***
	BSEP has chosen option 5 of HCVS-WP-03 which is to install a check valve near the end of the HCVS vent pipe. This valve will prevent air from migrating into the vent pipe after a period of venting when there may still be hydrogen present. Preventing air from mixing with any remaining hydrogen will prevent a detonable mixture from occurring in the pipe.	
4	Evaluate location of FLEX DG for accessibility under Severe Accident conditions.	***Complete.***
	For both units, the HCVS vent pipe is located on the west side of the Reactor Building. The FLEX Diesel Generators (DG) are in the FLEX DG enclosure which is on the east side of the Reactor Buildings. Operating and refueling the FLEX DGs are performed on the east side of the Reactor Buildings where the actions and equipment are protected by the distance from the pipe as well as the intervening structures and equipment which act as installed shielding.	
5	Develop procedures for BDBEE and severe accident vent operation (load shedding, power supply transfer, and vent valve operation from the Main Control Room and ROS), vent support functions for sustained operation and portable equipment deployment (FLEX DG supply to the 24/48VDC battery system, and makeup to the nitrogen backup system).	Started.
	The procedure changes have been drafted and are in the review cycle.	
6	Confirm suppression pool heat capacity. Initial results from GE report 0000-0165-0656-R0 for BSEP indicate the suppression pool reaches the heat capacity temperature limit (HCTL) in 2.11 hours.	Complete.
	Calculation BNP-MECH-FLEX-0002 demonstrates that, with RCIC in operation per approved BSEP procedures, HCTL will be reached in about 3.2 hours. This is based on an RPV pressure of 300 psig which is the high end of the range operators maintain during an ELAP with RCIC in operation.	
7	Finalize location of supplemental N2 bottle connection.	Deleted.

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

Table 6a - Overall Integrated Plan Open Items		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
	The FLEX air compressor will be used for pneumatic makeup per the OIP revision. The FLEX air compressors are connected to the backup nitrogen system for long-term makeup for pneumatics. The FLEX primary and alternate makeup connection locations were evaluated to be robust with respect to the external hazards as part of EA-12-049 response and were found acceptable. The primary connection point will be evaluated for personnel access during a severe accident. The FLEX air compressor has adequate pressure and capacity to supply the HCVS valves and the FLEX strategy includes equipment refueling procedures for sustained (long-term) equipment operation.	
8	Establish programs and processes for control of HCVS equipment functionality, out-of-service time, and testing.	Started.
	0PLP-01.4, Fukushima FLEX System Availability, Action, and Surveillance Requirements, was placed in service for NRC Order EA-12-049 compliance, and is being modified to incorporate guidance for NRC Order EA-13-109 compliance.	
9	Confirm Wetwell vent capacity is sufficient at the containment design pressure (62 psig). Existing calculation 0D12-0009 calculates a wetwell vent capacity at the primary containment pressure limit (PCPL, 70 psig).	***Complete.***
	Calculation 0FLEX-0035, Revision 0, documents that the HCVS flow capacity is greater than 1% of licensed thermal power at containment design pressure with the assumption that the new HCVS check valve has a Cv greater than 673. The valve manufacturer has documented that the Cv is approximately 4000, thus confirming that the vent capacity is sufficient to meet the order requirement at containment design pressure.	

Table 6b. Interim Staff Evaluation Open Items (Phase 1)

Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
1	Make available for NRC staff audit the site specific controlling document for HCVS out of service and compensatory measures.	***Started.***
	The HCVS out of service and compensatory measures will be included in a revision to 0PLP-01.4, Fukushima FLEX System Availability, Action, and Surveillance Requirements. The 0PLP-01.4 revision will be issued concurrently with Revision 3 to the Severe Accident Guidelines during the Spring 2017 Unit 2 refueling outage. This procedure will be revised to incorporate Unit 1 HCVS requirements when that unit's HCVS modifications are installed in accordance with the milestone schedule reported in the BSEP Overall Integrated Plan. ***The 0PLP-01.4 procedure markup is available for review on the ePortal.***	

Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
2	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.	***Complete.***
	0FLEX-0035, Flow Capacity of BNP Hardened Wetwell Vent Units 1 & 2 at 1% Rated Power, provides the calculation showing that both units' hardened vents' flow capacity is greater than 1% thermal power at design pressure which is lower than the primary containment pressure limit. This is documented in the results paragraph 4.4 on page 9 of 9. This calculation assumes that the new discharge check valve has a Cv of at least 673. The full open Cv of the check valve is approximately 4000. Therefore, the vent pipe will pass at least 1% thermal power equivalent. ***BNP-MECH-FLEX-002, Brunswick Nuclear Plant Containment Analysis of FLEX Strategies, is a MAAP calculation of the BSEP response to an extended loss of AC power (ELAP) event initiated from full power. The MAAP results also show that containment pressure is rapidly reduced and is maintained below design pressure and primary containment pressure limit (PCPL). This is best seen in the graph on page 4 of Appendix 7 (pdf page 55) which is a plot of Run 1 containment response. Run 1 models the BSEP procedural guidance for the FLEX event.*** ***Support documents are available for review on the ePortal.***	
3	Make available for NRC staff audit confirmation of the time it takes the suppression pool to reach the heat capacity temperature limit during ELAP with RCIC in operation.	***Complete.***
	BNP-MECH-FLEX-0002, provides the suppression pool (SP) response to the ELAP with operator actions. Initially, in this analysis, reactor core isolation cooling (RCIC) is aligned to the suppression pool (SP). In this analysis, after 1 hour, the SP is approaching the heat capacity temperature limit (HCTL), although it has not yet reached it. At this point, 1 hour, the operators begin a controlled cooldown to 450 psig using one safety relief valve (SRV). This reduces primary pressure while heating up the SP, but the net result is that the SP stays below the HCTL. ***At 2 hours, the operators further depressurize the reactor pressure vessel (RPV) to 150-300 psig, which initially maintains the SP below HCTL. The exact time of reaching HCTL depends on the timing of SP heatup and the cycling of RPV pressure between 150 and 300 psig since the actual limit is a function of RPV pressure.*** ***Since pressure is cycled between 150 psig and 300 psig after hour 2, it is conservative to determine the time at which the SP temperature and level reach the***	

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Fifth Six-Month Status Report 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)

Table 6b - Interim Staff Evaluation Open Items (Phase 1)

#	Open Item	Status
	****Indicates a change since last 6-month update***	
	HCTL at 300 psig using the 0EOP-01-NL, HCTL curve. During this time, SP level is slowly increasing as shown in BNP-MECH-FLEX-0002, but is about -2.4 feet. This puts the HCTL temperature at about 193°F in the SP, which is reached at about 3.2 hours.	

The following table is taken from the output of BNP-MECH-FLEX-0002:

TIME (HRS)	***PRIMARY PRESSURE (PSIG)***	***SP LEVEL (FT)***	***SP WATER TEMP (°F)***
1	***1035***	***-2.3***	***140***
2	***390***	***-2.5***	***166***
3	***300***	***-2.45***	***191***
4	***300***	***-2.3***	***200***

Support documents are available for review on the ePortal.

#	Open Item	Status
4	Make available for NRC staff audit a description of the final ROS location.	****Complete.***
	****The location for the remote operating station (ROS) is in the southeast corner of the Reactor Building (RB) 50'-0" elevation for Unit 1, and the northeast corner of the RB 50'-0" elevation for Unit 2. The ROS locations inside the RB are in a corridor just inside a door to the outside of the RB that will be blocked open in an ELAP. This door access provides a direct path to the Main Control Room (MCR) via the Radwaste Building roof.*** ***The evaluation of the ROS for temperature and radiation concerns is contained in the response to ISE open item 10.***	
5	Make available for NRC staff audit documentation that demonstrates adequate communication between the remote HCVS operation locations and the HCVS decision makers during ELAP and severe accident conditions.	****Complete.***
	****The primary operating station for the HCVS is and remains in the Main Control Room (MCR) with the implementation of order EA-13-109. For each unit, the alternate operating station (also called the Remote Operating Station or ROS) is located just inside the Reactor Building (RB) at the 50-foot elevation, adjacent to a door to the outside. The door is in the southeast section of the RB for Unit 1 and in the northeast section for Unit 2. The MCR will direct operators to this alternate control location if required due to an inability to operate the HCVS valves from the MCR. In addition, operators will be dispatched to the backup pneumatic connections on each unit in order to connect the backup air compressor before the 24-hour nitrogen supply is exhausted. These HCVS activities may require communication with the MCR.***	

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
Fifth Six-Month Status Report 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)

Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	**Open Item**	**Status**
	****Indicates a change since last 6-month update***	
	As part of the response to NRC Order EA-12-049, BSEP assumed that permanently installed plant communications systems would not be available during an extended loss of AC power (ELAP). Instead, BSEP primarily utilizes an 800 MHz radio system consisting of 500 hand-held radios for onsite communications. These radios are stored in reasonably protected buildings, including the FLEX Storage Building, to meet the requirements of EA-12-049. This information was provided in response to NTTF Recommendation 9.3, by a letter dated October 31, 2012 (ADAMS Accession No. ML12311A299) and supplemented by a letter dated February 22, 2013, Carolina Power & Light Company's and Florida Power Corporation's Response to Follow-Up Letter on Technical Issues for Resolution Regarding Licensee Communication Submittals Associated with Near-Term Task Force Recommendation 9.3 (ADAMS Accession No. ML13058A045). This information was assessed by the NRC staff and a Staff Evaluation was issued for this assessment. This was provided in Brunswick Steam Electric Plant, Units 1 and 2 – Staff Assessment in Response to Information Request Pursuant to 10 CFR 50.54(f) – 9.3, Communication Assessment, dated April 4, 2013 (ADAMS Accession No. ML13093A341). The radios will enable the MCR to communicate with operators in the field at any HCVS operation locations.	
6	Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	****Complete.***
	****HCVS-WP-03, Hydrogen/Carbon Monoxide Control Measures (ADAMS Accession No. ML14302A066), on page 2, lists the information that licensees shall provide with respect to strategies and options that "ensure the flammability limits of gases passes through the system are not reached." From HCVS-WP-03, page 2: 1. Declare option or options selected (valid for use of Options 3, 4 and/or 5) 2. List any deviations relative to the selected option(s) along with justification 3. Synopsis of venting operation and design 4. Sketch of vent path from associated PCIVs to release point, with delineation of which option applies to each portion of the vent system The information is provided below and was included in the December 2015 six-month update to the Overall Integrated Plan (ADAMS Accession No. ML16020A064). 1. BSEP has chosen option 5 which is to install a downstream check valve to prevent air from being drawn into the vent pipe when venting is stopped. 2. BSEP is not planning any deviations relative to option 5. 3. BSEP procedures contain guidance to open the hardened vent if plant conditions require it to prevent containment pressure exceeding the Primary Containment Pressure Limit. The vent will remain open until alternate reliable containment heat***	

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
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Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	**Open Item**	**Status**
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	removal is established unless there is some condition or event that would require it be closed. There are no procedure steps that direct the vent be cycled to maintain a certain containment pressure band. The vent design is described in the BSEP OIP. 4. The sketch of the vent path with delineation of which option applies is available for review on the ePortal. Piping downstream of the second containment isolation valve, CAC-V216, is protected by the check valve (Option 5). The final HCVS design installs a check valve in the piping slightly below the Reactor Building roof as discussed in item 5 of the table on page 12 of HCVS-WP-03. The check valve will be mounted near the roof to minimize seismic effects, and will be less than 30 pipe diameters from the end as discussed in HCVS-WP-03 page 35. The BSEP check valve will minimize leakage of air into the HCVS piping such that a flammable mixture will not occur while venting has been stopped without alternate containment heat removal. Just downstream of the check valve, BSEP will install a low pressure, 13 psig, rupture disk that will allow check valve testing, but will not prevent containment venting to avoid the primary containment pressure limit (PCPL). As part of the modifications, the new check valve will have test ports above and below it that will allow testing to verify that the valve opens and allow testing to verify that the valve leaks less than an amount that would allow a combustible mixture to occur in the pipe. Support documents, including a sketch of the vent path with delineation of which option applies, are available for review on the ePortal.	
7	Make available for NRC staff audit seismic and tornado missile final design criteria for the HCVS stack.	***Complete.***
	****BSEP evaluated the HCVS stack for all Beyond-Design-Basis-External Events in Engineering Change (EC) 299559, Evaluation of the Hardened Wetwell Vent for Beyond-Design-Basis External Events, attachment Z01R0. This evaluation is available for review on the ePortal. This evaluation was provided as part of the BSEP FLEX audit in 2014, and was accepted for the tornado missile hazard disposition in section 3.4 of Brunswick Steam Electric Plant, Units 1 and 2 – Report for the Audit Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051, March 31, 2015 (ADAMS Accession No. ML15082A155). The HCVS stack is part of the Hardened Wetwell Vent system that is evaluated in EC 299559. Sections 3.1.1 and 3.1.2 state the seismic design input and hazard criteria. Section 3.2.1 dispositions the seismic hazard. Section 3.1.5 states the design criteria for the tornado missile hazard (along with the high wind hazard). Section 3.2.4 dispositions the tornado missile hazard (along with the high wind hazard).***	

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	Support documents are available for review on the ePortal.	
8	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	***Complete.**
	Calculation 0RNA-0001, Instrument Air Nitrogen Backup System Volume Requirements, provides the backup nitrogen system usage calculation and adequacy verification. On pages 5 and 6, the base calculation determines usage by the Safety-Relief Valves (SRVs), the Reactor Building to Suppression Chamber vacuum breaker valves, the Hardened Wetwell Vent Valves, and leakage. The total usage is determined to be 910 standard cubic feet against an available volume of 961 cubic feet (page 4). However, this usage was over a 22-hour period, vice the 24-hour period required by EA-13-109.** **As part of the BSEP response to EA-13-109, 2 bottles were added to each unit's Backup Nitrogen System, on each of 2 divisions. Appendix A of this calculation was created to demonstrate that the system has 24 hours' worth of capacity. Appendix A shows that, with the additional bottles being added, there is enough nitrogen in Division 2 alone to supply 24 hours of nitrogen including leakage assumptions, HCVS valve cycling, SRV cycling, and containment vacuum breaker cycling.** **The safety-related Backup Nitrogen System bottles are located in seismically-qualified racks (sections B.5.5 and B.5.10 of ECs 290410, Hardened Containment Vent System – Backup Nitrogen Bottles Unit 2, and 292338, Hardened Containment Vent System – Backup Nitrogen Bottles Unit 1) on the 50' elevation of the Reactor Building. The locations are shown on drawing F-02503 for Unit 2 and F-25003 for Unit 1. These bottles are always lined up to supply the HCVS vent valves if required so that no operator actions are required at the bottle racks. If the HCVS valves cannot be operated electrically, the operators can open them from the Remote Operating Station, located as shown on drawing F-02503, without approaching primary containment or the vent valves themselves (which are approximately 60 feet below the ROS, and in the area of the vent pipe, across the Reactor Building from the ROS).** **For pneumatic makeup after the backup bottles are depleted (later than 24 hours), the FLEX air compressor will be connected to the Backup Nitrogen System.	
9	Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.	***Complete.**
	As described in 31116-CALC-E-001, FLEX Diesel Generator Sizing Calculation, the bounding expected load for the FLEX DGs is 367.4 kW. Taking a 25% margin, the required maximum output of the Flex DG must be at least 460 kW. A nominal 500 kW FLEX DG meets this requirement. As discussed in this calculation, the major load is the battery chargers, and they have completed re-charging the batteries within 11	

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	hours. The battery chargers represent 288 KW of the 367.4 kW maximum load. ***The majority of the loads initially aligned to the FLEX DGs are battery chargers and UPS, as described in Calculation 31116-CALC-E-001. The FLEX DGs are oversized for the load profile which helps minimize any effects from non-linear loading. This can be seen since the diesel generators are rated 500kW, but the maximum draw, for FLEX critical loads, including the non-linear loading will be less than 380kW. The non-linear loading from the battery chargers quickly drops off after batteries are fully recharged. This can be seen from the load profiles in Calculation 31116-CALC-E-001 where the power draw to the chargers drops below 20% of rated load after 6 hours.*** ***While the exact loading of the HCVS has not been incorporated into the FLEX DG loading calculations above, inspection of the HCVS power supply demonstrates that the HCVS load is insignificant to the FLEX DGs given the amount of load margin available. Calculation BNP-E-6.076-ICC-001, Hardened Containment Vent System – Unit 2 Power Distribution, adds the HCVS Radiation Monitor to the loading of the associated battery, 1.124 amps at 24 VDC as shown on page 3 of Attachment 1 of BNP-E-6.076-ICC-001. Calculation BNP-E-6.125, 24/48 VDC Battery Allowable Discharge Rate for HCVS during an ELAP, contains the additional loading of the three instrument loops that will be powered by the HCVS distribution. These three instrument loops total 0.06 amps at 24VDC as shown on page 1-1 of BNP-E-6.125. Therefore, the total load of the HCVS distribution is approximately 1.184 amps at 24 VDC or a little more than 28 watts. The 28 watts is insignificant to the FLEX DG load since the margin available in the FLEX DGs, even when the safety-related battery chargers are in service is approximately 132.6 KW.*** ***The full one-hour load on the Division 2 24/48 VDC batteries is approximately 20 amps per BNP-E-6.076-ICC-0001. This represents a load of 20 A x 24 VDC = 480 watts. Assuming the FLEX DGs are required to carry the full load of the Division 2 24/48 VDC batteries through the charger, the additional 480 watts is also insignificant to the 132.6 kW of available capacity. Therefore, the FLEX DGs are fully capable of carrying the HCVS loads at any time they are energized.***	
10	Make available for NRC staff audit an evaluation of temperature and radiological conditions to ensure that operating personnel can safely access and operate control and support equipment.	****Complete.***
	****Operator actions for HCVS may be required at the following operating locations during an ELAP (see "Operator Action Maps.pdf" available for review on the ePortal):*** ***1. Main Control Room (MCR) (primary operating location)*** ***2. Control Building 49' elevation (location of HCVS power supply transfer switches)*** ***3. Outside of the RB, FLEX instrument air supply and refueling of FLEX compressor***	

Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	Open Item	Status
	*Indicates a change since last 6-month update	
	for long-term pneumatic supply ***4. Outside of the RB, FLEX Diesel Generator (DG) enclosure to refuel the FLEX DGs for long-term electrical supply*** ***5. Reactor Building (RB) – 50' elevation at the Remote Operating Station (ROS)*** ***<u>Main Control Room and Control Building 49' – Temperature Evaluation</u>*** ***Calculation RWA-L-1312-003, BNP Control Building (CB) FLEX Room Heat-up Analysis, contains a Control Building GOTHIC room heatup analysis for the ELAP event. This analysis takes no credit for operator action for the first six hours (other than opening panel doors) at which time the outside doors to the Control Building are opened and fans are started to force outside air through the building. This is a FLEX action evaluated as acceptable in response to NRC Order EA-12-049. This action is represented by Case 4 as shown in Table 7 on page 18 of 51. The results are tabulated on page 19 of 51 in Table 8. The results show ambient temperatures being maintained below 124°F for all spaces in which there may be operator actions for HCVS. Per HCVS-FAQ-06 in NEI 13-02 Appendix J, FLEX strategies that are not specific to HCVS can be credited as previously evaluated for FLEX. This temperature is judged acceptable for the simple and non-physical operator actions (i.e., switch manipulation, meter reading) required for HCVS operation during an ELAP event.*** ***<u>Main Control Room and Control Building 49' – Radiation Evaluation</u>*** ***The MCR and CB 49' (49' is adjacent to the MCR and inside the MCR boundary) are acceptable for radiological conditions without further evaluation for HCVS actions per NEI 13-02, Rev.1, HCVS-FAQ-01.*** ***<u>Outside Areas for Pneumatic Makeup, Electrical Supply, and Refueling Activities</u>*** ***<u>Pneumatic makeup location</u>*** ***The pneumatic supply for the first 24 hours of the ELAP event comes from the safety-related Backup Nitrogen System. No operator actions are required to supply pneumatics in the first 24 hours. On both units, there is a makeup station for the backup nitrogen system in the seismic isolation space between the Reactor Building (RB) and Turbine Building (TB) (see Operator Action Maps.pdf available for review on the ePortal). Per the response to order EA-12-049, portable FLEX compressors will be moved to outside locations near these makeup stations. Since the locations are outside the RB, there is no possible effect from RB heatup due to the ELAP. The compressors can be safely operated and refueled from this outside location as they will be shielded from the vent pipe by at least two of the RB concrete walls (three***	

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	feet thick each) and no actions are required in the RB to supply the long-term pneumatic supply. ***The makeup connections in the seismic isolation spaces are near the vent pipes (more so on Unit 2 than Unit 1) and possibly subject to gamma dose from the pipe once venting starts. Therefore, the connections of hose to the makeup stations in the seismic isolation space will be made before venting starts at approximately 17.7 hours.*** ***<u>Electrical makeup location</u>*** ***The HCVS electrical supply for the first 24 hours is from the station 24/48VDC battery system. This backup power supply is aligned at the 49-foot elevation of the Control Building adjacent to the MCR. As previously stated, this location is in the Control Building inside the MCR boundary and is acceptable for the duration of the event.*** ***The long-term electrical supply for the HCVS is from the FLEX Diesel Generators which can repower the normal supply buses to the HCVS controls and instruments or re-power the 24/48 VDC battery chargers. The FLEX Diesel Generators are located in the FLEX DG enclosure which is east of the RBs and the Emergency Diesel Generator (EDG) building (see Operator Action Maps.pdf available for review on ePortal). The location is on the opposite side of the RBs from the HCVS pipes and outside the RBs so that there are no concerns with operation of the FLEX DGs including refueling operation. No electrical lineups need be made in the RB for the FLEX DG to supply the needed HCVS components, only inside the EDG Building which is not a dose or temperature concern area.*** ***<u>Remote Operating Station – Temperature Evaluation</u>*** ***Calculation BNP-MECH-FLEX-0001 documents the Reactor Building Heatup Analysis under ELAP conditions in which all ventilation, heating and cooling are de-energized. This analysis was used for development of the FLEX actions per order EA-12-049, but since the same Extended Loss of AC Power (ELAP) conditions apply to the EA-13-109 order, this analysis can be used to estimate the temperature at the ROS for HCVS purposes. Even though EA-13-109 requires the consideration of a severe accident, the existence of core damage and possible vessel breach will have no effect on the temperature at the ROS.*** ***The applicable case in BNP-MECH-FLEX-0001 is case 1 which models the operator actions in an ELAP. The GOTHIC analysis results in Table 4 (page 23) show that the maximum temperature on the 50' elevation is 121°F. The actions at the ROS will be to open or close a maximum of three ½ inch valves so that they are expected to take***	

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#	Open Item	Status
	****Indicates a change since last 6-month update***	
	less than 5 minutes. Furthermore, the operator will be entering the RB through the 50' door near the ROS so that the local temperature will be close to ambient outside the RB. These temperatures, coupled with the short duration of action, are judged acceptable. ***<u>Remote Operating Station – Radiation Evaluation</u>*** ***The bottom of the active core region is at 51' elevation. Therefore, an operator would be roughly at core elevation while at the ROS. The shielding provided by the vessel, bio-shield, Primary Containment (PC), and distance from the core results in the 50' door location being a low-dose-rate-waiting area during normal full-power operation. The Primary Containment wall alone provides six feet of concrete shielding. Since the core is shutdown for the ELAP event, the dose rates from the core area will be lower than during operation.*** ***The existence of core damage with possible reactor pressure vessel breach will not raise the dose levels at the ROS. If the core were to melt through the lower vessel head, there would be loss of shielding from the vessel, however there would be additional distance to the ROS and additional concrete shielding provided by the pedestal. Any gap release to the suppression pool will contribute to RB dose rates, however the ROS is on the 50' elevation, two floors above the torus. Therefore, the dose rate at the ROS due to the torus will be insignificant due to the 5 feet of concrete below the ground floor as well as the additional concrete and distance afforded by the location being on the 50-foot elevation. Likewise, any gap release that migrates back to the Primary Containment, will be shielded from the ROS by the 6' thick Primary Containment wall. In addition, the ROS is approximately 50 feet away from the PC wall.*** ***Support documents, including the Operator Action Maps.pdf, are available for review on the ePortal.***	
11	Make available for NRC staff audit descriptions of all instrumentation and controls (existing and planned) necessary to implement this order including qualification methods.	****Complete.***
	****A list of instruments and controls necessary to implement EA-13-109 with their descriptions and qualification methods is shown below.***	

Description	*Tag Number*	*Make/Model*	*Qualification Method*
HCVS effluent temperature	*CAC-TE-7993*	*Weed N9013 surface type T thermocouple*	*IEEE-344-1975*
24/48VDC battery voltage	*XU-54-VM*	*Weschler K-241, 0-30 VDC*	*IEEE-323-2003, IEEE-344-2004*

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#	Open Item	Status
	***Indicates a change since last 6-month update**	

Div. II N2 Backup supply pressure	***RNA-PT-5268***	***Rosemount 1153 series B***	***IEEE 323-1974 and 1983, IEEE-344-1975***
Drywell pressure	***CAC-PT-1230***	***Rosemount 1153 series B***	***IEEE 323-1974 and 1983, IEEE-344-1975***
Torus level	***CAC-LT-2601***	***Rosemount 1153 series B***	***IEEE 323-1974 and 1983, IEEE-344-1975***
Inboard wetwell purge exhaust valve position	***CAC-V7***	***Namco EA180-31302 and 32302 limit switches***	***IEEE 323-1974 and IEEE 344-1975***
Hardened wetwell vent isolation valve position	***CAC-V216***	***Namco EA180-31302 and 32302 limit switches***	***IEEE 323-1974 and IEEE 344-1975***
Wetwell vent radiation monitor processor	***CAC-RM-1000***	***General Atomic HCVS digital radiation processor RM-1000***	***IEEE-344-1975 (mild environment, seismic only)***
Wetwell vent radiation monitor detector	***CAC-RD-2B***	***General Atomics HCVS detector RD-2B***	***IEEE-323-1974, IEEE-344-1975***
Power transfer switches	***CAC-CS-7984, 7985, 7986, 7987, 7988***	***Eaton 10250T - Two deck key-lock transfer switches***	***IEEE 344 -1975, IEEE 323-1974***
Limit Switch Test Jacks	***N/A***	***Pomono - Test Jacks***	***IEEE 344 -1975, IEEE 323-1974***
Valve solenoid	***CAC-SV-V216***	***ASCO NP8321A1E, 3-way solenoid-actuated valve***	***IEEE 323-1974, IEEE 344-1975, and IEEE 382-1972 (or 1980)***
Valve solenoid	***CAC-SV-V7***	***ASCO NPL8344A73E, 4-way solenoid-actuated valve***	***IEEE 323-1974, IEEE 344-1975, and IEEE 382-1972 (or 1980)***
ROS pneumatic shuttle valves	***CAC-V5061, CAC-V5062***	***AVCO 3-way and 4-way pneumatically actuated shuttle valves***	***IEEE-344-1975, IEEE-382-1980 and 1985***

#	Open Item	Status
12	Clarify whether the seismic reliability demonstration of instruments, including valve position indication, vent pipe temperature instrumentation, radiation monitoring, and support system monitoring will (*be*) via methods that predict performance described in IEEE-344-2004 or provide justification for using a different revision of the standard.	***Complete.**

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	Existing equipment installed prior to RG 1.97 is qualified in accordance with original licensing basis and IEEE 344-1971. Equipment installed after RG 1.97 is qualified to IEEE 344-1975. Therefore, the BSEP HCVS instruments will be qualified to IEEE 344-1971 or 1975. The exception is the new 24VDC voltmeter being installed for EA-13-109 response is qualified to IEEE-344-2004 as this vendor only provides qualification to that version.** ***See ISE Open Item 14 for more details on the instrument qualifications.	
13	Make available for NRC staff audit a justification for not monitoring HCVS system pressure as described in NEI 13-02.	***Complete.***
	While NEI 13-02 paragraph 4.2.4.5 provides an acceptable approach for HCVS monitoring that includes vent pipe pressure, BSEP has not included HCVS vent pipe pressure. If the HCVS is not in service, a vent pipe pressure indicator would not provide useful information. If the HCVS is placed in service, BSEP has several indicators that will reliably indicate the status of containment and of the HCVS. The following indicators are already qualified for post-accident conditions or are qualified per the requirements of EA-13-109.** ***1. Drywell pressure ***2. HCVS valve position indication*** ***3. HCVS pipe temperature*** ***4. HCVS pipe radiation level*** ***5. Suppression Pool level*** ***These five instruments provide sufficient information for the operators to monitor the status of the vent system without the addition of a vent pipe pressure indicator.***	
14	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.	***Complete.***
	The list of components and their evaluations is available for review on the ePortal in spreadsheet HCVS ISE OPEN ITEM 14.xlsx. The components in the table boxes with <u>no background color</u> are new for EA-13-109 compliance. The components with the <u>blue background color</u> are existing plant equipment that meet the current design basis of the plant. All components are evaluated for temperature, humidity, integrated radiation, and seismic adequacy.** ***The estimates of temperature in the Reactor Building at the various locations are based on GOTHIC analyses of the ELAP event for the Reactor Building. Reactor Building humidity is assumed to rise to 100% due to boiling from the spent fuel pool	

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	in less than 7 days. For the Control Building, the temperature estimates are based on a GOTHIC analysis that assumes zero humidity, thereby maximizing temperature response. The Control Building humidity is assumed to reach a maximum of 91% which is based on the historic maximum humidity of the ambient air (used to ventilate the Control Building in the FLEX strategies) from UFSAR Table 2-24. ***All components are either seismically qualified to IEEE-344-1975 (the battery voltmeter is new and is qualified to IEEE-344-2004) or have been evaluated as seismically rugged so that they will perform their function following a seismic event.*** ***The estimate of radiation dose at any component is based on the results presented in Table 2 of HCVS-WP-02 as scaled to BSEP plant specifics. For this evaluation of components, the 4-hour time step was chosen for the pipe dose rates and the dose rate is held constant rather than accounting for decay. In the BSEP MAAP analysis 4 hours is before the vent would be opened to avoid PCPL. Since the dose rate decreases after the 4-hour time step, it is conservative to use this dose rate.*** ***For valves and other components that are in or on the pipe, the 1' dose is used and integrated over a 7-day period. For other components in the Reactor Building such as pressure transmitters, the 3' dose is used. This is conservative because these instruments are, in fact, not near the vent pipe and are shielded from the vent pipe by the 3' thick Reactor Building wall or the Primary Containment wall. The Primary Containment wall also shields these instruments from the airborne activity in the Primary Containment. As with the 1' dose components, this 3' dose is integrated over the 168-hour period with no allowance for decay. The resulting total integrated dose (TID) are then compared to the qualification total integrated dose for each susceptible component.*** ***All components are confirmed capable of performing their functions during ELAP and severe accident conditions.*** ***Support documents, including spreadsheet HCVS ISE OPEN ITEM 14.xlsx, are available for review on the ePortal.***	
15	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.	***Complete.**
	BSEP procedure 0EOP-02-PCCP, Primary Containment Control Procedure, directs opening the hardened wetwell vent valves before reaching the primary containment pressure limit (PCPL) of 70 psig. Therefore, the maximum opening d/p is 70 psid (containment to atmosphere). Calculation BNP-MECH-AOV-DP-CAC, in the table in section 4.0, page 12 of this calculation, confirms that 70 psid is the maximum	

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	**Indicates a change since last 6-month update*	
	expected opening differential pressure. ***BNP-MECH-1-CAC-V7-AO and BNP-MECH-2-CAC-V7-AO contain the Air Operated Valve (AOV) calculations for the inboard wetwell purge valve on each unit. Section 4.1.1 contains a table of minimum margins for these valves. The minimum opening margin for 1-CAC-V7 is 12.7%, and for 2-CAC-V7 is 19.5%*** ***BNP-MECH-1-CAC-V216-AO and BNP-MECH-2-CAC-V216-AO contain the Air Operated Valve (AOV) calculations for the hardened wetwell vent valve on each unit. Section 4.1.1 contains a table of minimum margins for these valves. The minimum opening margin for 1-CAC-V216 is 33.8%, and for 2-CAC-V7 is 25.7%.***	
16	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.	***Complete.***
	****As shown and described in the BSEP OIP, the HCVS pipe taps off a 20-inch torus purge pipe, is routed outside the Reactor Building (RB) into the seismic isolation space between the RB and Turbine Building (TB), is routed up the outside of the RB, re-enters the RB at the 120' elevation, then exits through the RB roof. There is no penetration into any other building.*** ***The only interface between HCVS and any other system is through valves CAC-V8 and CAC-V172. These two valves connect the purge system to the Standby Gas Treatment System (located inside the RB) and are primary containment isolation valves (PCIV). Since they are PCIVs they are tested for leakage per 10 CFR 50 Appendix J. This testing methodology has been endorsed as an acceptable testing means in HCVS-FAQ-05. Therefore, it is expected that the potential for hydrogen gas migration to the SBGT system, which could lead to leakage into the RB, is minimized.*** ***As shown in Sketch 1 of the BSEP OIP (ADAMS Accession No. ML14191A687), the HCVS pipe is routed to the RB roof without any further connections to the RB atmosphere, to any system other than SBGT, or to any other building. This portion of the HCVS shall be leak tested in accordance with NEI 13-02. Since the pipe does not enter any other station building, there is no possibility of hydrogen gas migration into any other building.*** ***The HCVS piping is constructed of seamless type 304 stainless steel piping. The piping joints are a combination of welded and flanged connections. The piping was designed, fabricated and installed in accordance with ANSI B31.1 and is tested per NEI 13-02. Therefore, the HCVS piping can be considered leak tight and there is minimal potential for hydrogen to leak into the Reactor Building.***	

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	The BSEP HCVS pipe is a connection off the wetwell purge line. The other branch connections from this purge line contain automatic, fail-closed, containment isolation valves that are tested as part of 10CFR50, Appendix J, testing to ensure leakage is within limits (per HCVS-FAQ-05). The rest of the HCVS pipe is not connected to any other system and does not traverse any building other than the same unit Reactor Building. The HCVS pipe is sealed with flanges and closed valves, was pressure tested when initially installed and will additionally be tested after modifications for EA-13-109 compliance to ensure it is leak-tight.	

7 Interim Staff Evaluation (ISE) Impacts (Phase 1 only)

There are no new Phase 1 ISE impacts.

8 Open Items from Phase 2 Overall Integrated Plan and Phase 2 Interim Staff Evaluation

There were no open items reported in the Phase 2 OIP submitted on December 11, 2015 (i.e., Reference 6). Table 8 provides the open items that were identified in the Phase 2 Interim Staff Evaluation (i.e., Reference 8).

Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	Open Item	Status
	Indicates a change since last 6-month update	
1	***Licensee to confirm through analysis, the temperature and radiological conditions to ensure that operating personnel can safely access and operate controls and support equipment.***	***Started***
2	***Licensee to provide the site-specific MAAP evaluation that establishes the initial SAWA flow rate.***	***Started***
3	***Licensee to demonstrate how 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.***	***Started***
4	***Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.***	***Started***
5	***Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.***	***Started***
6	***Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions.***	***Started***

9 Interim Staff Evaluation (ISE) Impacts (Phase 2 only)

None

10 References

The following references support updates to the Phase 1 and Phase 2 Overall Integrated Plan described in this enclosure.

1. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *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 26, 2014, ADAMS Accession Number ML14191A687.

2. Nuclear Regulatory Commission (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, Agencywide Documents Access and Management System (ADAMS) Accession Number ML13143A321.

3. NRC Letter, *Brunswick Steam Electric Plant, 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. MF4467 and MF4468)*, dated March 10, 2015, ADAMS Accession Number ML15049A266.

4. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *First Six Month Status Report 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, ADAMS Accession Number ML14364A029.

5. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *Second Six Month Status Report 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 25, 2015, ADAMS Accession Number ML15196A035.

6. Duke Energy Letter, BSEP, Unit Nos. 1 and 2, *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 December 11, 2015, ADAMS Accession Number ML16020A064.

7. Duke Energy Letter, *BSEP, Unit Nos. 1 and 2, Fourth Six-Month Status Report 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 28, 2016, ADAMS Accession Number ML16190A11.

8. NRC Letter, *Brunswick Steam Electric Plant, 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) (CAC Nos. MF4467 and MF4468)*, dated August 17, 2016, ADAMS Accession Number ML16223A725.