DUKE ENERGY.

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June 19, 2017

Serial: BSEP 17-0043

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
Sixth 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.

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. Duke Energy Letter, 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)*, dated December 15, 2016, ADAMS Accession Number ML16365A007.
12. 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.
13. 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 and Reference 11 provided the fifth 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 sixth 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 12, and Phase 2 NRC ISE open items contained in Reference 13.

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) 832-2487.

I declare under penalty of perjury that the foregoing is true and correct.
Executed on June 19, 2017.

Sincerely,

William R. Gideon

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

Sixth 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)

Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
Sixth 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). The fifth six-month update was submitted to the NRC on December 15, 2016 (i.e., Reference 8).

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 December 1, 2016, and May 31, 2017, hereafter referred to as the update period.

2 Milestone Accomplishments

The following Phase 1 milestones were completed during the update period:

- (Phase 1 and 2 combined update) Submit 6-Month Status Report
- (Phase 1) Operations Procedure Changes Developed
- (Phase 1) Site Specific Maintenance Procedure Developed
- (Phase 1) Training Complete
- (Phase 1) U2 Implementation Outage
- (Phase 1) Procedure Changes Active
- (Phase 1) U2 Walk Through Demonstration/Functional Test

The following Phase 2 milestones were completed during the update period:

- (Phase 1 and 2 combined update) Submit 6-Month Status Report
- (Phase 2) U1 Design Engineering On-site/Complete.

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

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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.
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.	Dec. 2016	***Complete**	Date not revised.
Staffing analysis completion.	Dec. 2016	***Complete**	Date not revised
Long term use equipment acquisition timeline.	Dec. 2016	***Complete**	Date not revised.
Submit 6-Month Status Report.	June 2016	Complete	Date not revised.
Operations Procedure Changes Developed.	Dec. 2016	***Complete**	Date not revised.
Site Specific Maintenance Procedure Developed.	Dec. 2016	***Complete**	Date not revised.
Submit 6-Month Status Report.	Dec. 2016	Complete	Date not revised.
Training Complete.	Feb. 2017	***Complete**	Date not revised.
U2 Implementation Outage.	Mar. 2017	***Complete**	Date not revised.
Procedure Changes Active.	Mar. 2017	***Complete**	Date not revised.
U2 Walk Through Demonstration/Functional Test.	Mar. 2017	***Complete**	Date not revised.

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Phase 1 Milestone Schedule	Target Completion Date	Activity Status	Comments and Date Changes
***Indicates a change since last 6-month update**			
U1 Design Engineering On-site/Complete.	Mar. 2017	***Complete**	Date not revised.
Submit 6-Month Status Report.	June 2017	***Complete**	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.
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	***Complete**	Date not revised.
U1 Design Engineering On-site/Complete.	Mar. 2017	***Complete**	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.

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

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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 sixth 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 26, 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
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
2	Finalize location of the Remote Operating Station (ROS).	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
3	Finalize and design means to address flammable gases in the HCVS.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
4	Evaluate location of FLEX DG for accessibility under Severe Accident conditions.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	

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Table 6a - Overall Integrated Plan Open Items		
#	**Open Item**	**Status**
***Indicates a change since last 6-month update**		
5	Develop procedures for BDBEE and severe accident vent operation (i.e., 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 24/48 VDC battery system, and makeup to the nitrogen backup system).	***Complete**
	***The procedure changes are complete and issued.**	
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
	***The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).**	
7	Finalize location of supplemental N2 bottle connection.	Deleted
	***The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).**	
8	Establish programs and processes for control of HCVS equipment functionality, out-of-service time, and testing.	***Complete**
	0PLP-01.4, Fukushima FLEX System Availability, Action, and Surveillance Requirements was placed in service for NRC Order EA-12-049 compliance, and ***has been 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.
	***The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).**	

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.	***Complete**

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Table 6b - Interim Staff Evaluation Open Items (Phase 1)		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
	The HCVS out of service and compensatory measures were included in a revision to 0PLP-01.4, Fukushima FLEX System Availability, Action, and Surveillance Requirements. The 0PLP-01.4 revision was 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 ***revision that incorporates Unit 2 HCV*** is available for review on the ePortal.	
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 (i.e., 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
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
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
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
4	Make available for NRC staff audit a description of the final ROS location.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007)..	
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 information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
6	Provide a description of the final design of the HCVS to address hydrogen detonation and deflagration.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
7	Make available for NRC staff audit seismic and tornado missile final design criteria for the HCVS stack.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007)..	

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Sixth 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	
8	Make available for NRC staff audit documentation of the HCVS nitrogen pneumatic system design including sizing and location.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
9	Make available for NRC staff audit documentation of HCVS incorporation into the FLEX diesel generator loading calculation.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
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
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
11	Make available for NRC staff audit descriptions of all instrumentation and controls (i.e., existing and planned) necessary to implement this order including qualification methods.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
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
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
13	Make available for NRC staff audit a justification for not monitoring HCVS system pressure as described in NEI 13-02.	Complete
	The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	
14	Make available for NRC staff audit the descriptions of local conditions (i.e., temperature, radiation and humidity) anticipated during ELAP and severe accident for the components (e.g., 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 information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).	

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**
***Indicates a change since last 6-month update**		
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
	***The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).**	
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
	***The information was provided in the December 2016 Six-Month Status Report by letter dated December 15, 2016 (i.e., ADAMS Accession No. ML16365A007).**	

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 9).

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.	***Complete**
	Operator actions may be required at the following operating locations during an ELAP (see "Operator Action Maps.pdf" located on the ePortal):** 1. ***Main Control Room (MCR) (i.e., primary operating location) 2. ***Control Building 49' level (i.e., location of HCVS power supply transfer switches)*** 3. ***Outside of the Reactor Building (RB), FLEX instrument air supply and refueling of FLEX compressor for long-term pneumatic supply*** 4. ***Outside of the RB, at the FLEX Diesel Generator (DG) enclosure to refuel the FLEX DGs for long-term electrical supply***	

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	Open Item	Status
	**Indicates a change since last 6-month update*	
	5. Reactor Building (RB) – 50' level at the Remote Operating Station (ROS) ***6. East of the RB near the Condensate Storage Tanks (CST) to connect a hose for FLEX/Severe Accident Water Addition (SAWA) and stage the FLEX/SAWA pump.*** ***7. At the outside wall of the RB (i.e., north for Unit 1 and south for Unit 2) at the FLEX core bore for FLEX/SAWA pump discharge*** ***8. Inside the RB at the 20' elevation (i.e., ground)*** ***<u>Main Control Room and Control Building 49' – Temperature Evaluation:</u>*** ***Vendor calculation RWA-L-1312-003, BNP CB FLEX Room Heat-up Analysis, contains a Control building GOTHIC room heatup analysis for the ELAP event (i.e., Reference EC 289577 Attachment Z52). This analysis takes no credit for operator action for the first six hours (i.e., 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 120°F for all spaces except the electrical equipment rooms in which there are no 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 operator action during an ELAP event.*** ***<u>Main Control Room, Control Building 49', and Control Building (Battery Rooms) – Radiation Evaluation:</u>*** ***The MCR and CB 49' (i.e., 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>Areas for SAWA Injection, Pneumatic Makeup, Electrical Supply, and Refueling Activities</u>*** ***<u>SAWA Locations</u>*** ***The source of water for SAWA is the Condensate Storage Tanks (CST), which were qualified for all external hazards for EA-12-049 response. Operators will connect a suction hose, stored with the pump in the FLEX Storage Building (FSB), to the tank and then to the pump. The pumps are staged outside and east of the RBs. From the pumps, hoses are run to the FLEX core bores on the outside of the RBs (north wall***	

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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	Open Item	Status
	**Indicates a change since last 6-month update*	
	for Unit 1 and south wall of Unit 2). The Severe Accident Water Mitigation (SAWM) flow instrumentation is mounted on the pump itself. ***Since the pumps are outside the RB, there are no ambient temperature concerns for personnel action. Also since the pumps are outside the RB and on the opposite side of the RBs from the vent pipes, there is no concern for the radiation levels at the pumps from the vent pipe or damaged core which would still be inside the primary containment.*** ***Likewise, the long term makeup for the CST is from the discharge canal weir. The pump staging location and hose runs for this makeup path are far from the RBs and the vent pipes, so there are no radiological concerns for CST makeup.*** ***Inside the RB, the SAWA pipe is aligned by opening three valves at the 20' (i.e., ground) level of the RB. These valves will be opened within the first hour after the start of the ELAP before there is any core damage or significant RB heatup. The use of the hard pipe eliminates the need for the operators to run hoses inside the RB during an event. In the case of a seismically-initiated event, the operators will also close one valve on the 80' level of the RB, so at most four valves need be operated to align the SAWA flow path inside the RB.*** ***Pneumatic makeup location*** ***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 as the backup nitrogen system automatically aligns itself. On both units, there is a makeup station for the backup nitrogen system in the seismic isolation space between the RB and Turbine Building (TB) (i.e., see Operator Action Maps.pdf). 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 ambient temperature concern for personnel actions. The staging location is shielded from the vent pipe by a minimum of six feet of concrete, so that the vent pipe radiation is mitigated. Therefore, the compressors can be safely operated and refueled from this outside location. 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 hose connections to the makeup stations in the seismic isolation space will be made before venting starts at approximately***	

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	7-8 hours. The hose connections will be fitted with quick disconnects to aid in making this a simple action during event response. The hose connection timing will be validated per HCVS-FAQ-13. ***Electrical makeup location*** ***The HCVS electrical supply for the first 24 hours is from the station 24/48 VDC battery system. This backup power supply is aligned at the 49 foot level of the control building at the same panel as the HCVS Radiation Monitor, 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 re-power the normal supply buses to the HCVS controls and instruments or re-power the 24/48 VDC battery chargers. The FLEX generators are located in the FLEX DG enclosure which is east of the RBs and the Emergency Diesel Generator (EDG) building (i.e., see Operator Action Maps.pdf). 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.*** ***Remote Operating Station – Temperature Evaluation:*** ***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 (i.e., Page 23 of 76) 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 less than 5 minutes. Furthermore, the operator will be entering the RB from outside through the 50' airlock door near the ROS so that the local temperature will be close to ambient outside the RB. These temperatures, coupled***	

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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	Open Item	Status
	**Indicates a change since last 6-month update*	
	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 area during normal full-power operation. The primary containment wall alone provides six feet of concrete shielding (i.e., drawing F-01132). 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' level, two floors above the torus. Therefore, the dose rate at the ROS due to the torus will be insignificant due to the five feet of concrete below the ground floor (i.e., drawing F-01787) as well as the additional concrete and distance afforded by the location being on the 50' elevation. Likewise, any gap release that migrates back to the primary containment, will be shielded from the ROS by the six foot thick PC wall. In addition, the ROS is some 50 feet away from the PC wall.***	
2	Licensee to provide the site-specific MAAP evaluation that establishes the initial SAWA flow rate.	****Complete***
	****BNP-MECH-FLEX-0005 documents the BSEP specific MAAP evaluation that verifies that an initial SAWA flow rate of 300 gpm is sufficient to protect containment as described in NEI 13-02, Rev.1. Cases 1 and 2 are the cases that compare the containment response with a 300 gpm initial flow rate to the response with an initial flow rate of 500 gpm which is the maximum flow rate required by NEI 13-02. Section 7 starting on Page 25 of 178 presents the results of both analyses and compares them in Table 7-1 and Figures 7-1 to 7-5. As can be seen in these results, there is no significant difference between the two initial flow rates.*** ***The site-specific MAAP evaluation for SAWA, BNP-MECH-FLEX-0005, is available for review on the ePortal.***	
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.	****Complete***

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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	**Open Item**	**Status**
	***Indicates a change since last 6-month update**	
	***The instrumentation required for SAWA performance and monitoring consists of drywell pressure, torus level and the SAWA flow instrument. The only operating equipment for SAWA is the SAWA pump.** ***The drywell pressure instruments are CAC-PT-1230 (i.e., one for each unit). The torus level instruments are CAC-LT-2601 (i.e., one for each unit). These instruments are safety-related and qualified to IEEE-323-1974 and IEEE-344-1975. They are qualified to 148.8°F but are expected to see no more than 132°F during the ELAP. They are qualified to 8.36E6 R total integrated dose and expected to receive no more than 9.13E5 R total integrated dose in the first seven days after the event starts. Therefore, both instruments are qualified for the conditions they would see during a severe accident.** ***The drywell pressure and torus level instruments are powered from safety-related instrument buses that will be re-powered by the FLEX generators so that they will remain in service without offsite power or Emergency Diesel Generators. In the case that the FLEX generators are not initially available, both instruments can be re-powered from the station's division two 24 VDC battery for at least 24 hours.** ***The SAWA flow instrument is mounted on the FLEX/SAWA pump and is powered by the pump's generator. The SAWA pumps are stored in the FLEX Storage Building so that they will be available after the event. The SAWA pump is moved to the area outside of the RB, near the CST. This area is on the opposite side of the RB from the vent pipe so that radiation is not a concern. Additionally, since the pump is outside, it will not be in an area of excessive temperature due to the accident.** ***The FLEX/SAWA pumps are refueled in accordance with BSEP's FLEX Support Guidelines developed in response to EA-12-049.**	
4	Licensee to demonstrate that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.	***Complete**
	***BNP-MECH-FLEX-0005 documents the MAAP calculation of containment response over a 7 day period during a severe accident with only Severe Accident Water Addition and the wetwell vent in service for containment protection. This analysis demonstrates that the containment pressure remains below the Primary Containment Pressure Limit (PCPL) and the temperatures remain low enough that failure due to high temperatures is avoided.** ***The base case is Case 1 in this report. Table 7-1 on Page 26 of 178 contains a table of results. The peak drywell airspace pressure is shown as 89.9 psia. This is the pressure at the time of vent opening. The MAAP program was set to initiate the vent**	

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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	**Open Item**	**Status**
	Indicates a change since last 6-month update	
	based on wetwell pressure at PCPL of 84.7 psia. The drywell pressure is slightly higher based on the differential pressure across the wetwell water. However, it is clear from the graph of drywell pressure (PRB(2)) on Page 66 of 178 that the pressure drops rapidly when the vent is opened and never returns to a pressure near the PCPL. ***The peak drywell temperature is shown as 581°F on Table 7-1 on Page 26 of 178. As seen in the Figure 7-2 graph on Page 28 of 178, the drywell temperature (TGRB(2)) rapidly decreases when the vent is opened and never increases for the rest of the 7 day analysis period.*** ***The site-specific MAAP evaluation for SAWA, BNP-MECH-FLEX-0005, is available for review on the ePortal.***	
5	Licensee to demonstrate that there is adequate communication between the MCR and the operator at the FLEX pump during severe accident conditions.	***Complete**
	During a severe accident in which the SAWA/FLEX pump is in use to add water to containment, the pump will be located between the CST and the Reactor Building (RB). The primary accident communication means will be the 800 MHz radio system. ***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 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 (ML13058A045). This information was assessed by the NRC staff and a Staff Evaluation was issued for this assessment. This was provided in ML13093A341, 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.*** ***The radios will enable the MCR to communicate with operators in the field at the SAWA/FLEX pump locations.***	
6	Licensee to demonstrate the SAWM flow instrumentation qualification for the expected environmental conditions.	Started

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Table 8 – Interim Staff Evaluation Phase 2 Open Items		
#	Open Item	Status
*Indicates a change since last 6-month update		
	***The SAWM flow instrumentation (i.e., sensor and meter) will be permanently installed on each SAWA/FLEX pump. Electrical power is provided by the pump's 12 VDC electrical system.** ***The flow instrumentation is qualified for use on fire pumps in outside ambient conditions. SAWA pumps are staged outside for use, between the CST and Reactor Building.**	

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

None

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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. Duke Energy Letter, *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*

Enclosure, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
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Containment Vents Capable of Operation Under Severe Accident Conditions (Order Number EA-13-109), dated December 15, 2016, ADAMS Accession Number ML16365A007.

9. 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.