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August 17, 2017

Serial: BSEP 17-0069

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
Seismic Mitigating Strategies Assessment (MSA) Report for the Reevaluated Seismic Hazard Information – NEI 12-06, Appendix H, Revision 2, H.4.4 Path 4: GMRS < 2xSSE

References:

1. Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide,* Revision 2, dated December 2015, Agencywide Documents Access and Management System (ADAMS) Accession Number ML16005A625
2. Nuclear Regulatory Commission (NRC) Interim Staff Guidance JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, Revision 1, dated January 22, 2016, ADAMS Accession Number ML15357A163
3. Duke Energy Letter, Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, *Notification of Full Compliance with Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation" for BSEP, Units 1 and 2,* dated May 19, 2016, ADAMS Accession Number ML16146A604
4. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 - Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF0975, MF0976, MF0973, and MF0974)*, dated December 14, 2016, ADAMS Accession Number ML16335A031

Ladies and Gentlemen:

The purpose of this letter is to provide the results of the mitigating strategies assessment (MSA) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, to demonstrate that the Diverse and Flexible Coping Strategies (FLEX) developed, implemented, and maintained in accordance with Nuclear Regulatory Commission (NRC) Order EA-12-049 can be implemented considering the impacts of the reevaluated seismic hazard. The assessment was performed in accordance with the guidance provided in Appendix H, Section H.4.4, of Nuclear Energy

Institute (NEI) 12-06 Revision 2 (i.e., Reference 1), which was endorsed by the NRC (i.e., Reference 2).

Based upon the mitigating strategies assessment provided in the enclosure, the mitigating strategies for BSEP considering the impacts of the reevaluated seismic hazard are acceptable as described in Reference 3 and Reference 4.

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 August 17, 2017.

Sincerely,

William R. Gideon

Enclosure:

Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2, Mitigating Strategies Assessment Report, NEI 12-06 Appendix H – Seismic "Path 4"

cc (with enclosure):

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Enclosure

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

Mitigating Strategies Assessment Report
NEI 12-06, Appendix H – Seismic "Path 4"

Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2,
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Note: References are provided in Section 6 of this enclosure.

1. Background

Brunswick Steam Electric Plant (BSEP) has completed a mitigating strategies assessment (MSA) for the impacts of the reevaluated seismic hazard to determine if the mitigating Diverse and Flexible Coping (FLEX) strategies developed, implemented, and maintained in accordance with Nuclear Regulatory Commission (NRC) Order EA-12-049 remain acceptable at the reevaluated seismic hazard levels. The MSA was performed in accordance with the guidance provided in Appendix H of Nuclear Energy Institute (NEI) 12-06 Revision 2 (i.e., Reference 1) which was endorsed by the NRC (i.e., Reference 2).

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the reevaluated seismic hazard information at BSEP, developed using the Probabilistic Seismic Hazard Analysis (PSHA). The MSSHI includes a performance-based Ground Motion Response Spectrum (GMRS), Uniform Hazard Response Spectra (UHRS) at various annual probabilities of exceedance, and a family of seismic hazard curves at various frequencies and fractiles developed at the BSEP control point elevation. BSEP submitted the reevaluated seismic hazard information including the UHRS, GMRS, and the hazard curves to the NRC on March 31, 2014 (i.e., Reference 3). The NRC staff concluded that the GMRS that was submitted adequately characterizes the reevaluated seismic hazard for the BSEP site (i.e., Reference 4).
Section 6.1.1 of Reference 2 identifies BSEP as a Path 3 plant; however, the plant used Path 4 per the justification below, in accordance with the method described in Section H.4.4 of Reference 1, as applicable to BSEP.

2. Assessment to MSSHI

Consistent with Section H.4.4 (i.e., Path 4) of Reference 1, the BSEP GMRS has spectral accelerations greater than the safe shutdown earthquake (SSE) but no more than 2 times the SSE anywhere in the 1 to 10 Hz frequency range, except as noted below. As described in the FLEX Final Integrated Plan (FIP) (i.e., References 14 and 15), the plant equipment relied on for FLEX strategies have previously been evaluated as seismically robust to the SSE levels. The basic elements within the MSA of Path 4 systems, structures, and components (SSCs) are described in Reference 1.

Path 4 is used for plants where the new GMRS exceeds the SSE in the 1 to 10 Hz range but does not exceed two times the SSE. BSEP has a maximum GMRS to SSE ratio of 2.19 with a narrow exceedance (<10%) from the 7 to 10 Hz range.

The Individual Plant Examination of External Events (IPEEE) Hazard Spectrum (IHS) for BSEP envelops the GMRS between 1 and 10 Hz, with small narrow band exceedances that meet the criteria of Section 3.2.1.2 of Electric Power Research Institute (EPRI) 1025287, Screening, Prioritization and Implementation Details (SPID), (i.e., Reference 11) and was documented in the March 31, 2014, Seismic Hazard and Screening Report (i.e., Reference 3). Per NEI 12-06 Appendix H (i.e., Reference 1), an MSA of the impacts of MSSHI on FLEX strategies using

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H.4.3 for Path 3 is acceptable. However, licensees may elect to perform an MSA using H.4.4 for Path 4, if the GMRS is ≤ 2xSSE in the 1 to 10 Hz frequency range.

Following the criteria of NEI 12-06 Appendix H (i.e., Reference 1), BSEP elected to perform a MSA using H.4.4 for Path 4. In nearly the entire 1 to 10 Hz region, the 2xSSE at the control point exceeds the GMRS, except for a small exceedance near 10 Hz.

The screening criteria developed per NEI 12-06 Appendix H (i.e., Reference 1) for screening inherently rugged and sufficiently rugged items applies to the EPRI NP-6041-SL (i.e., Reference 12) 1st screening lane (i.e., <0.8g) for all Path 4 MSA plants. This is because Path 4 is limited to 2xSSE, which always has a GMRS peak spectral acceleration (PSA) less than 0.8g. Per Reference 3, the PSA of the GMRS is 0.563g, well below 0.8g. The small narrow band exceedance is not significant with respect to the 1st screening lane requirements. Hence, it is concluded that using Path 4 MSA does indeed satisfy the requirements of NEI 12-06 Appendix H (i.e., Reference 1) and, therefore, Path 4 was used for the BSEP site.

Furthermore, the small narrow band exceedance was further investigated and was validated against the requirements of EPRI 1025287 Section 3.2.1.2 (i.e., Reference 11). The magnitude of the exceedance is calculated, as well as an investigation of the adjacent 1/3 octave bandwidth of the exceedance. At 10 Hz, the GMRS has a spectral acceleration of 0.56g while 2xSSE has a spectral acceleration of 0.51g (i.e., Reference 3). This translates into an exceedance of 9.8% which is within the 10% limit required by the SPID. The SPID also requires that the average ratio in the adjacent 1/3 octave bandwidth (i.e., 1/6 on either side) is less than unity. Since the seismic risk evaluation screening in the SPID is limited to the 1 to 10 Hz region, only the 1/6 octave bandwidth ($(10\ Hz)/2^{(1/6)} = 8.91$ Hz) below 10 Hz is evaluated. The area created between the GMRS and 2xSSE satisfies the SPID requirements. Therefore, the average ratio of the GMRS to 2xSSE is less than unity and this exceedance is considered acceptable.

Implementation of each of these basic Path 4 elements for the BSEP site is summarized below.

2.1. Scope of MSA Plant Equipment

The scope of SSCs considered for the Path 4 MSA was determined following the guidance used for the expedited seismic evaluation process (ESEP) defined in EPRI 3002000704 (i.e., Reference 9). FLEX SSCs excluded from consideration in the ESEP were added to the MSA equipment scope (i.e., Reference 24). In addition, SSC failure modes not addressed in the ESEP that could potentially affect the FLEX strategies were added and evaluated.

SSCs associated with the FLEX strategy that are inherently rugged or sufficiently rugged are discussed in Section 2.3 below and identified in Section H.4.4 (i.e., Path 4) of Reference 1. These SSCs were not explicitly added to the scope of MSA plant equipment.

2.2. Step 1 – ESEP Review

Equipment used in support of the FLEX strategies has been evaluated to demonstrate seismic adequacy following the guidance in Section 5 of NEI 12-06 (i.e., Reference 1). As stated in Appendix H of NEI 12-06, previous seismic evaluations should be credited to the extent that they apply for the assessment of the MSSHI. This includes the ESEP evaluations

(i.e., Reference 10) for the FLEX strategies which were performed in accordance with EPRI 3002000704 (i.e., Reference 9). The ESEP evaluations remain applicable for this MSA since these evaluations directly addressed the most critical 1 Hz to 10 Hz part of the new seismic hazard using seismic responses from the scaling of the design basis analyses. In addition, separate evaluations are performed to address high frequency exceedances under the high frequency sensitive equipment assessment process, as required, and are documented in Section 4 of this enclosure and Attachment 1 (i.e., page 10 of 10) to this enclosure.

2.3. Step 2 – Inherently/Sufficiently Rugged Equipment

The qualitative assessment of certain SSCs not included in the ESEP was accomplished using (1) a qualitative screening of "inherently rugged" SSCs and (2) evaluation of SSCs to determine if they are “sufficiently rugged.” Reference 1 documents the process and the justification for this ruggedness assessment. SSCs that are either inherently rugged or sufficiently rugged are described in Reference 1 and no further evaluations for these rugged SSCs are required under the MSA. The qualitative assessment is presented in detail in Reference 18.

2.4. Step 3 – Evaluations Using Section H.5 of Reference 1

Step three for Path 4 plants includes the evaluations of:

1. FLEX equipment storage buildings and Non-seismic Class 1 structures that could impact FLEX implementation
2. Operator pathways
3. Tie down of FLEX portable equipment
4. Seismic Interactions not included in ESEP that could affect FLEX strategies
5. Haul paths

The results of the reviews of each of these five areas are described in the sections below.

2.4.1. FLEX Equipment Storage Buildings

BSEP utilizes two enclosures for storage of equipment associated with their FLEX response. The Permanent FLEX Storage Building (PFSB) is a concrete dome that is supported on a mat foundation at elevation 28.0 feet underlain by improved natural ground. The Diesel Generator Hardened Enclosure is a steel frame structure located on the roof of the 4-Day Tank Chamber which is a Seismic Class I structure. Both structures were originally designed in accordance with ASCE 7-10 seismic adequacy but were evaluated for GMRS level earthquake in accordance with Appendix H, Section 5 for the $C_{10\%}$ seismic capacity level in Reference 20. The seismic input was the Foundation Input Response Spectrum (FIRS) estimated from the GMRS, and applicable in the proximity of each structure. The $C_{10\%}$ capacity exceeds the GMRS for both enclosures.

Non-Seismic Class 1 Structures

Non-seismic Class 1 structures that would be expected to impact the operator pathways at the GMRS level were identified as the Turbine Building. The pipe and electrical tunnel below the control building was designed as a Seismic Class I structure because it partially supports the Class I control building and screens out. The $C_{10\%}$ seismic capacity level was assessed per Reference 18 and was concluded to exceed the GMRS. Hence,

the BSEP Turbine Building was screened out for MSA Path 4 and does not adversely affect the implementation of the FLEX strategy. Hence, Non-seismic Class 1 structures are concluded to be adequate.

2.4.2. Operator Pathways

Pre-determined operator pathways have been previously identified and documented per the FLEX Support Guidelines (FSGs) documented per Table 4-1 of Reference 21. The primary operator pathways were reviewed and walked-down as documented in Reference 23. BSEP verified that the operator pathways are not impacted by the MSSHI. Considerations for this review included:

- Multiple available pathways or multiple FLEX components
- Pathway includes only Seismic Class 1 structures with previous reviews for seismic ruggedness
- Debris removal capabilities for moderate to smaller seismic interactions
- Available time for operator actions
- Operator pathways were reviewed during a walkdown to assess seismic interactions associated with a GMRS level seismic event

2.4.3. Tie Down of FLEX Portable Equipment

The FLEX equipment includes a variety of components including high, medium, and low-pressure pumps, diesel generators, air compressors, and trailers containing hoses and other light weight equipment. Table 3-1 of Reference 21 provides a list of portable equipment and commodities required to support the FLEX strategies. BSEP stored equipment were evaluated (i.e., for stability and restraint as required/necessary) and protected from seismic interactions to the SSE level as part of the FLEX design process to ensure that unsecured and/or non-seismic components do not damage the FLEX equipment. In addition, large FLEX equipment such as pumps and power supplies were secured as necessary to protect them during a SSE seismic event.

In general, the FLEX portable equipment have been evaluated for tie down requirements and were found to be acceptable without tie-downs as noted in Reference 23 and because:

- These types of equipment have a low aspect ratio and will not overturn when subjected to the FIRS estimated from the GMRS
- These types of equipment are not adversely affected by overturning/sliding during the GMRS seismic event (e.g., hoses, pipe fittings, etc.)

BSEP has reviewed the storage requirements, including any tie-down or restraint devices, in effect for FLEX portable equipment and verified that the equipment has no adverse interactions or significant damage that could impair the ability of the equipment to perform its mitigating strategy function during or following the GMRS level seismic event using the methods described in Section H.5 of NEI 12-06 (i.e., Reference 1).

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2.4.4. Additional Seismic Interactions

Seismic interactions that could potentially affect the FLEX strategies and were not previously reviewed as part of the ESEP program (e.g., flooding from non-seismically robust tanks, interactions to distributed systems associated with the ESEP equipment list, etc.) were reviewed for BSEP. No Piping attached to buried tanks within the FLEX strategy exists.

This assessment was conducted by a walkdown of ESEP items and non-ESEP MSA items which identified that credible seismic interactions are not present (i.e., Reference 23).

The walkdown identified the masonry block walls as a potential impact hazard to FLEX equipment and to operator pathways. However, masonry block walls were included in the IPEEE evaluation and a High Confidence of Low Probability of Failure (HCLPF) greater than the GMRS peak ground acceleration was identified, from which they were screened and found to have sufficient capacity to withstand the GMRS level.

BSEP has reviewed the additional seismic interactions, as discussed in Reference 22, and verified that the Mitigation Strategy is not adversely impacted by the GMRS.

2.4.5. Haul Path

Pre-determined deployment routes have been previously identified and documented in the FSGs (i.e., Reference 21). The normal deployment path for FLEX equipment is from the FLEX Storage Building through the Technical and Administration Center (TAC) and Emergency Operating Facility (EOF) parking lots, the 'contractor' parking lot, sally port, between the maintenance shop and Service Building to the Hale pump deployment location or the air compressor deployment location. These haul paths have been previously reviewed for potential soil liquefaction and have been determined to be stable following a seismic event per Reference 18. Additionally, the haul paths attempt to avoid areas with trees, power lines, narrow passages, etc. when practical. However, high winds can cause debris from distant sources to interfere with planned haul paths. Debris removal equipment is stored inside the FLEX storage building and the Turbine Building Railway Bay to be protected from the severe storm and high wind hazards. Therefore, at least one piece of equipment remains functional and deployable to clear obstructions from the pathway between the FLEX storage buildings and its deployment location(s).

BSEP has reviewed the haul paths and verified that the haul paths are not adversely impacted by the MSSHI. The haul path was walked-down as described in Reference 23, and the walk-down concentrated on assuring that sufficient space is available to maneuver around any potential debris from Non-Seismic Class I structures maintaining the determined haul paths. The walkdowns concluded that excess space is available and even if debris exists, the haul paths are maintained and no seismic interactions are considered credible.

The Off-Gas Plant Stack was also identified as an interaction hazard that could block the deployment paths if it falls under the GMRS level earthquake. A seismic evaluation of the stack is conducted in Reference 20, and a $C_{10\%}$ capacity was calculated to be greater than the GMRS and was concluded to be adequate.

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3. Spent Fuel Pool Cooling Review

Spent Fuel Pool Cooling Evaluation

The evaluation of spent fuel pool (SFP) cooling for BSEP was performed based on the initial conditions established in NEI 12-06 (i.e., Reference 1) for spent fuel cooling coping in the event of an extended loss of AC power (ELAP)/loss of ultimate heat sink (LUHS). The evaluation also used the results of pool heat-up analyses from the ELAP evaluation as input.

The FLEX strategy for SFP cooling utilizes SFP level monitoring and make-up capability as described in the BSEP Final Integrated Plan (FIP) (i.e., Reference 14). SFP make-up capability is provided using a portable FLEX pump taking suction though a portable flexible hose and discharging either through a permanently installed FLEX makeup connection tie-in to the SFP emergency make-up piping or through a flexible hose directly to the SFP. The source of make-up water is the plant Condensate Storage Tank (CST).

The permanently installed plant equipment relied on for the implementation of the SFP cooling FLEX strategy has been designed and installed, or evaluated to remain functional, in accordance with the plant design basis to the SSE loading conditions. The spent fuel pool integrity evaluations demonstrated inherent margins of the spent fuel pool structure and interfacings plant equipment above the SSE to a peak spectral acceleration of 0.8g (i.e., References 16 and 17). The portable FLEX equipment availability, including its storage and deployment pathways, was evaluated to the FLEX storage facility FIRS estimated from the GMRS, including equipment associated with SFP cooling. The permanently installed plant equipment needed to accomplish SFP cooling has been evaluated to the GMRS (i.e., Reference 18). Furthermore, the permanently installed plant equipment needed to accomplish SFP level monitoring has been evaluated and found to be seismically rugged for seismic levels up to 2xSSE (i.e., Reference 18). It was therefore concluded that the equipment relied on for the implementation of the SFP cooling FLEX strategy has adequate capacity to withstand the GMRS.

4. High Frequency Review

The high frequency review is included as Attachment 1 (i.e., page 10 of 10) to this enclosure.

The selection process for high frequency evaluation is described in detail in "Selection of Relays and Switches for NEI 12-06 Appendix H High Frequency Seismic Evaluation at Brunswick Steam Electric Plant" Report (i.e., Reference 19). The analysis described in this report functionally screened out all devices in these categories, and thus there were no devices selected for further evaluation.

5. Conclusion

Therefore, the FLEX strategies for BSEP as described in the FIP (i.e., Reference 14) are acceptable as specified and no further seismic evaluations are necessary.

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6. References

1. Nuclear Energy Institute (NEI) 12-06, *Diverse and Flexible Coping Strategies (FLEX) Implementation Guide*, Revision 2, December 2015, Agencywide Documents Access and Management System (ADAMS) Accession Number ML16005A625

2. Nuclear Regulatory Commission (NRC) Interim Staff Guidance JLD-ISG-2012-01, *Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events*, Revision 1, dated January 22, 2016, ADAMS Accession Number ML15357A163

3. Duke Energy Letter, *Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, dated March 31, 2014, ADAMS Accession Number ML14106A461

4. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 - Staff Assessment of Information provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated March 1, 2016, ADAMS Accession Number ML16041A435

5. Duke Energy Letter, *High Frequency Supplement to Seismic Hazard Screening Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, dated December 15, 2016, ADAMS Accession Number ML16365A024

6. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 - Staff Review of High Frequency Confirmation Associated with Reevaluated Seismic Hazard in Response to March 12, 2012, 50.54(f) Request for Information, dated* April 20, 2017, ADAMS Accession Number ML17107A277

7. Electric Power Research Institute (EPRI) 3002004396, *High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation*, Final Report, July 2015, ADAMS Accession Number ML15223A102

8. NRC Letter, *Endorsement of Electric Power Research Institute Final Report 3002004396, High Frequency Program: Application Guidance for Functional Confirmation and Fragility*, dated September 17, 2015, ADAMS Accession Number ML15218A569

9. EPRI 3002000704, *Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, dated April 2013, ADAMS Accession Number ML13107B387

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10. Duke Energy Letter, *Expedited Seismic Evaluation Process (ESEP) Report for Brunswick Steam Electric Plant, Unit Nos. 1 and 2*, dated December 18, 2014, ADAMS Accession Number ML15005A074

11. EPRI 1025287, *Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, dated November, 2012, ADAMS Accession Number ML12333A170

12. EPRI, *EPRI NP-6041-SL: A Methodology for Assessment of Nuclear Plant Seismic Margin,* Revision 1, August, 1991.

13. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 – Staff Review of Interim Evaluation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1*, dated November 19, 2015, ADAMS Accession Number ML15313A245

14. Duke Energy Letter, *Notification of Full Compliance with Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond Design Basis External Events" and Order EA-12-051, "Order to Modify Licenses With Regard To Reliable Spent Fuel Pool Instrumentation" for BSEP, Units 1 and 2*, dated May 19, 2016, ADAMS Accession Number ML16146A604

15. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 - Safety Evaluation Regarding Implementation of Mitigating Strategies and Reliable Spent Fuel Pool Instrumentation Related to Orders EA-12-049 and EA-12-051 (CAC Nos. MF0975, MF0976, MF0973, and MF0974)*, dated December 14, 2016, ADAMS Accession Number ML16335A031

16. Duke Energy Letter, *Spent Fuel Pool Evaluation Supplemental Report, Response to NRC Request for Information Pursuant to 10CFR50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident*, dated December 15, 2016, ADAMS Accession Number ML16365A025

17. NRC Letter, *Brunswick Steam Electric Plant, Units 1 and 2 - Staff Review of Spent Fuel Pool Evaluation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendation 2.1 (CAC Nos. MF3824 and MF3825)*, dated February 2, 2017, ADAMS Accession Number ML17031A001

18. BSEP, Stevenson & Associates 16C4425-RPT-002, Revision 0, *Screening of Selected SSC for MSA – NEI 12-06 Appendix H Path 4*

19. BSEP, Stevenson & Associates 16C4425-RPT-005, Revision 0, *Selection of Relays and Switches for NEI 12-06 Appendix H High Frequency Seismic Evaluation at Brunswick Steam Electric Plant*

20. BSEP, Stevenson & Associates 16C4425-CAL-001, Revision 0, *Seismic Capacity Calculations for FLEX Buildings*

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21. BSEP, CSD-EG-BNP-8888, *Diverse and Flexible Coping Strategies (FLEX) Program Document – Brunswick Nuclear Plant*, Revision 1.

22. BSEP, Stevenson & Associates 16C4425-CAL-002, Revision 0, *NEI 12-06 Appendix H Path 4 Seismic Evaluations*

23. BSEP, Stevenson & Associates 16C4425-RPT-003, Revision 0, *Walkdown Results for MSA - NEI 12-06 Appendix H Path 4*

24. BSEP, Stevenson & Associates 16C4425-RPT-001, Revision 0, *Selection of Scope of Mechanical Plant Equipment for MSA - NEI 12-06 Appendix H Path 4*

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Attachment 1 – High Frequency Review Consistent with Path 2

For Path 4 plants, NEI 12-06 Section H.4.4 (i.e., Reference 1) requires licensees with GMRS exceedances of the SSE above 10 Hz to perform a high frequency evaluation of relays in accordance with the methodology described in NEI 12-06 Section H.4.2. This section describes the selection process for high frequency evaluation as focusing on moving-contact electrical control devices subject to intermittent states (i.e., predominantly relays and contactors) in the control systems of components in four categories:

1. Relays and contactors whose chatter could cause malfunction of a reactor SCRAM.
2. Relays and contactors in seal-in or lockout circuits whose chatter could cause a reactor coolant system (RCS) leakage pathway that was not considered in the FLEX strategies. Examples include the automatic depressurization system (ADS) actuation relays in boiling-water reactors (BWRs) and relays that could actuate pressurizer power-operated relief valves (PORVs).
3. Relays and contactors that may lead to circuit seal-ins or lockouts that could impede the Phase 1 FLEX capabilities, including buses fed by station batteries through inverters.
4. Relays and contactors that may lead to circuit seal-ins or lockouts that could impede FLEX capabilities for mitigation of seismic events in permanently installed Phase 2 SSCs that have the capability to begin operation without operator manual actions.

The selection process for each of these categories is described in detail in "Selection of Relays and Switches for NEI 12-06 Appendix H High Frequency Seismic Evaluation at Brunswick Steam Electric Plant" Report (i.e., Reference 19). The analysis described in this report functionally screened out all devices in these categories, and thus there were no devices selected for further evaluation.