NEXTera ENERGY SEABROOK

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

Seabrook Station

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

References:

1. NEI 12-06, Revision 4, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, December 2016, ADAMS Accession Number ML16354B421

2. JLD-ISG-2012-01, Revision 2, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, February 2017, ADAMS Accession Number ML17005A188

The purpose of this letter is to provide the results of the assessment for Seabrook Station to demonstrate that the FLEX strategies developed, implemented and maintained in accordance with 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 NEI 12-06 Revision 4 [Reference 1] which was endorsed by the NRC [Reference 2].

Seabrook Station is currently performing the Spent Fuel Pool (SFP) assessments to satisfy the requirements of the Near-Term Task Force Recommendation 2.1 (NTTF 2.1). The conclusion of this evaluation will be provided in a separate submittal.

The enclosure to this letter provides the Mitigating Strategies Assessment (MSA) for the reevaluated seismic hazard. Based upon the MSA, the mitigating strategies for Seabrook Station considering the impacts of the reevaluated seismic hazard are acceptable as described in References 14 & 15 (FIP & NRC Endorsement) pending further evaluation of components described in the Commitments below.

This letter contains two new regulatory commitments:

1. NextEra Energy Seabrook will perform a detailed analysis of the B Diesel Generator Fuel Oil Storage Tank (1-DG-TK-26B) to determine if the component's supports have sufficient capacity to resist the reevaluated seismic demand by August 31, 2018.

2. NextEra Energy Seabrook will perform a detailed analysis of two of the Safety Injection (SI) accumulator discharge valves (1-SI-V-32 and 1-SI-V-47) to determine if the components' motor operator yokes and associated bolting have sufficient capacity to resist the reevaluated seismic demand by August 31, 2018.

Should you have any questions concerning this submittal, please contact Mr. Kenneth Browne, Licensing Manager, at (603) 773-7932.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on August 28, 2017.

Sincerely,

NextEra Energy Seabrook, LLC

Eric McCartney
Regional Vice President – Northern Region

Enclosure

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Enclosure to Letter SBK-L-17135

NextEra Energy Seabrook, LLC

Seabrook Station

Seismic Mitigating Strategies Assessment

NEI 12-06 Appendix H – Seismic “Path 4”

1. BACKGROUND

Seabrook Station has completed a mitigating strategies assessment (MSA) for the impacts of the reevaluated seismic hazard to determine if the mitigating (FLEX) strategies developed, implemented and maintained in accordance with 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 NEI 12-06 Revision 4 [Reference 1] which was endorsed by the NRC [Reference 2].

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the reevaluated seismic hazard information at Seabrook Station, 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 Seabrook Station control point elevation. Seabrook Station submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on March 27, 2014 [Reference 3]. The NRC staff concluded that the GMRS that was submitted adequately characterizes the reevaluated seismic hazard for the Seabrook Station site [Reference 4]. Section 6.1.1 of Reference 2 identifies the method described in Section H.4.4 of Reference 1 as applicable to Seabrook Station.

2. ASSESSMENT TO MSSHI

Consistent with Section H.4.4 (Path 4) of Reference 1, the Seabrook Station GMRS has spectral accelerations greater than the safe shutdown earthquake (SSE) but no more than 2 times the Safe Shutdown Earthquake (SSE) anywhere in the 1 to 10 Hz frequency range. As described in the Final Implementation Plan (FIP) [References 14, 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 SSCs are described in Reference 1. Implementation of each of these basic Path 4 elements for the Seabrook Station site is summarized below.

2.1 Step 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 [Reference 9]. FLEX SSCs excluded from consideration in the ESEP were added to the MSA equipment scope. 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 (Path 4) of Reference 1. These SSCs were not explicitly added to the scope of MSA plant equipment.

2.2 Step 2 – 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. 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 expedited seismic evaluation process (ESEP) evaluations [Reference 10] for the FLEX strategies which were performed in accordance with

EPRI 3002000704 [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 (HF) sensitive equipment assessment process, as required, and are documented in Section 4 of this attachment.

2.3 Step 3 – 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.

2.4 Step 4 – Evaluations Using Section H.5 of Reference 1

Step four for Path 4 plants includes the evaluations of:

1. FLEX SSCs not included in ESEP
2. FLEX equipment storage buildings and Non-Seismic Category 1 Structures that could impact FLEX implementation
3. Operator Pathways
4. Tie down of FLEX portable equipment
5. Seismic Interactions not included in ESEP that could affect FLEX strategies
6. Haul Paths

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

2.4.1 FLEX SSCs Not Included in ESEP

Several SSCs, part of the mitigating strategy assessment, were not included within the ESEP review and cannot be justified as inherently rugged or sufficiently rugged. They can be grouped into the following types of equipment:

- Boric acid filter
- Valves
- Battery chargers
- Motor control centers
- Spent fuel pool level instrumentations
- Buried pipe line and access vault
- Boric acid storage tanks
- Oil day storage tank
- Diesel generator fuel oil storage tank
- SEPS components

These SCCs were first reviewed during a walkdown in order to identify seismic interactions associated with a GMRS level seismic level. In addition, each component was evaluated using the guidance provided in Section H.5 of Reference 1. Considerations for this review included:

- Demonstrating that a $C_{10\%}$ capacity of the haul path exceeds the GMRS
  Review and scaling of existing design calculations to justify the capacity of the SSCs to withstand the GMRS

The evaluations of these items are presented in References 18, 19, and 21. Per Reference 18, the C10% weld capacity of the 'B' diesel generator fuel storage tank saddles, calculated using the guidance provided in Section H.5 of Reference 1, does not exceed the demand from the GMRS. The original calculation (Ref. 29) modeled the tank and saddles separately. A finite element analysis of the shell only was performed to determine the loads considering the saddles as rigid supports. A hand-calculation was then performed for the saddles to determine the seismic loads considering a rigid tank on flexible supports. The loads from the two calculations were simply summed together and used as the support design loads. This results in highly conservatively stresses in the saddle supports.

The evaluation of the tank against the GMRS in Reference 18 is based on the scaling of the SSE results. Because of the large spectral accelerations contained in the GMRS between 10 to 20 Hz, the corresponding seismic loading had to be scaled by large factors up to 1.78. In conclusion, because of the small existing margins in the existing calculation and the large increase of the seismic load, several components of the saddles were found to be overstressed. A new finite element analysis is required to determine a more realistic response to the GMRS.

Moreover, per Reference 21, the C10% capacities of the two valves 1-SI-V-32 and 1-SI-V-47 do not exceed the demand from the GMRS. The evaluation of the SI valves against GMRS is based on the current piping evaluation against SSE in addition to the nominal acceleration capacity of the valves. The current evaluation against SSE of the valves shows a large interaction ratio of the bolt connecting the yoke to the bonnet of the valves. The evaluation of the valves against the GMRS is based on a simple scaling of the maximum accelerations obtained through a response spectrum analysis of the piping system. Because of the large spectral accelerations contained in the GMRS between 10 to 20 Hz, the corresponding seismic loading had to be scaled by a large factor for both the horizontal and vertical directions. Therefore, the small existing margin coupled with the conservative but necessary increase in the seismic loading, the bolted connections were found to be overstressed. A new piping analysis is required to determine a more realistic response to the GMRS.

Seabrook Station has reviewed the rest of SSCs not included in the ESEP and verified that these components have sufficient capacity to withstand the GMRS-induced loading. Moreover, Seabrook Station has verified that no adverse interactions could impair the ability of the equipment to perform its mitigating strategy function during and following the GMRS-level seismic event. The methods described in Section H.5 of NEI 12-06 were used to perform these verifications.

2.4.2 FLEX Equipment Storage Buildings

The Service Water Pumphouse (SWPH) is used as the main FLEX equipment storage building. The SWPH is located East of the containment structure. This building is a reinforced concrete structure. The SWPH is a Seismic Category 1 structure. Therefore, the SWPH does not need to be evaluated and is judged to have adequate seismic capacity to withstand the GMRS.

The Control Building (CB), the Primary-Auxiliary Building (PAB), and the Emergency Feedewater Pump Building (EFP) are also used to store few miscellaneous FLEX components. The CB is a reinforced concrete structure located West of the containment structure. The CB is a Category 1 structure. The PAB is a reinforced concrete structure located West of the containment structure. The PAB is a Category 1 structure. The EFP is a reinforced concrete structure adjacent to the containment structure. The EFP is a Category 1 structure. Therefore, these three structures do not need to be evaluated and are judged to have adequate seismic capacity to withstand the GMRS [Reference 22].

Non-Seismic Category 1 Structures

The following are the Non-Seismic Category 1 structures which could impact the operator pathways, equipment haul paths, and deployment pathways at the GMRS level:

- Turbine Building
- Main Steam and Feedwater Pipe Bridge

The two structures listed above have been evaluated in Reference 20 using the guidance provided in Section H.5 of Reference 1. Information provided in the existing design basis calculations for these structures, as well as the $C_{10\%}/C_{1\%}$ ratios provided in Table H.1 of Appendix H of Reference 1, were used to determine the $C_{10\%}$ capacity of each structure. All the structures listed above have been shown to have a $C_{10\%}$ capacity which exceeds the GMRS demand.

The impact of Non-Seismic Category 1 structures at the GMRS level on the haul paths has been evaluated via walkdown and engineering calculation [Reference 20]. Alternate pathways and debris removal capabilities have been credited to verify that Non-Seismic Category 1 structures prevent the implementation of the FLEX haul path strategies.

2.4.3 Operator Pathways

The operator pathways included in the FLEX strategies consist of hose and cable deployment pathways for the portable FLEX equipment. These hose and cable routes are described in detail in Reference 17. In addition to the deployment routes, the access routes leading to the stored ESEP components are also considered essential to the FLEX implementation. Seabrook Station has reviewed the operator pathways and 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 Category 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

Reference 20, provides the detailed documentation associated with the walkdown and evaluation of the operator pathways per Section H.5 [Reference 1] and provides the verification that the operator pathways are not impacted by the MSSHI.

2.4.4 Tie Down of FLEX Portable Equipment

The list of FLEX portable equipment is provided in Figure 4-1 of Seabrook Station "Diverse and Flexible Coping Strategies (FLEX) Program" [Reference 17]. The portable FLEX equipment can be grouped into the following types of equipment:

- Hoses/cables
- 480 V Diesel generators
- Pumps
- Submersible pump
- Fuel oil transfer pumps
- Refueling cart
- Portable light towers
- Debris removal tractor
- Super duty vehicles
- Fluke multifunction calibrator

Stored items were evaluated (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.

The adequacy of the existing tie-down of the FLEX portable equipment along with the adequacy of the anchorage of the storage lockers used to store small FLEX equipment are provided in Reference 21.

In order to justify the acceptability of the restraint (of lack thereof) for a given component, at least one of the following was shown:

- These types of equipment have a low aspect ratio and will not overturn when subjected to the GMRS seismic loadings
- These types of equipment are not adversely affected by overturning/sliding during the GMRS seismic event (e.g. hoses, pipe fittings, etc.)
- These types of equipment tie downs were evaluated based on demonstrating that the calculated C10% capacities exceeded the GMRS
- The stability of the component has previously been evaluated under SSE loading and the GMRS demand is smaller than the SSE for the frequency range of interest

Seabrook Station 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.

2.4.5 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 Seabrook Station. There is no piping attached to buried tanks within the FLEX strategy and that could be affected by soil failure were also reviewed as part of this seismic MSA.

The ESEP does not specifically require a review for seismic interactions except for masonry block wall interactions. However, the walkdowns performed at the Seabrook Station as part of the ESEP comprised a review of all credible seismic interactions. The conclusions of the walkdowns are documented in Reference 22 Section 6. Upon review of the seismic interactions listed as part of the ESEP walkdown, the following were deemed necessary to be reviewed and addressed:

- Control room ceiling
- Valve 1-CC-V-447 operator located close to adjacent pipe line

The rest of the seismic interactions identified as part of the ESEP were addressed by modifications performed as part of the ESEP resolutions. This specific aspect of the ESEP is discussed in Reference 22 Section 6.

In order to assess seismic interaction, a sampling of the walkby-areas was performed to verify that credible seismic interactions are not present. During this inspection, no additional seismic interaction was discovered [References 20 and 21].

Seabrook Station has reviewed the additional seismic interactions and verified that the mitigating strategies are not adversely impacted by the GMRS [References 20, 21].

2.4.6 Haul Path

The primary and backup haul path routes included in the FLEX strategy are identified in Figure 4-6 and 4-7 of Reference 17. The primary path connects the tornado door of the FLEX storage (Service Water Pump House) to the Primary Auxiliary Building and the Residual-Heat Removal Vault by using the access roads located on the south and west side of the containment structure. This path also connects the FLEX storage building to the Emergency Feedwater Pump House using the road located east of the containment structure.

The haul paths were reviewed during a walkdown [Reference 20] in order to identify seismic interactions associated with a GMRS level seismic event. Considerations for this review [Reference 20] included:

- Justifying that liquefaction stability failure of the deployment path is highly unlikely regardless of the magnitude of the earthquake at Seabrook Station given the state of the topography and soil profile
- A walkdown to assess seismic interactions associated with a GMRS level seismic event
- Crediting multiple haul paths which will not have seismically correlated failure modes
- Crediting on-site capabilities for debris removal to reestablish a haul path following a beyond-design-basis earthquake
- Demonstrating that a C10% capacity of the haul path exceeds the GMRS

Seabrook Station has reviewed the haul paths and verified that the haul paths are not adversely impacted by the MSSHI.

2.4.7 Overview of Step 4

As detailed in Section 2.4.1, the 'B' Diesel Generator Fuel Oil Storage Tank (1-DG-TK-26B) saddle supports and the valve yokes and associated bolting of 1-SI-V-32 and 1-SI-V-47 do not have sufficient capacity to resist the GMRS-induced loading. New analyses for these components are required to determine a more realistic response to the GMRS.

3. SPENT FUEL POOL COOLING REVIEW

Spent Fuel Pool Cooling Evaluation

The evaluation of spent fuel pool cooling for Seabrook Station was performed based on the initial conditions established in NEI 12-06 [Reference 1] for spent fuel cooling coping in the event of an ELAP/LUHS. The evaluation also used the results of pool heatup analyses from the ELAP evaluation as input.

The FLEX strategy for spent fuel pool (SFP) cooling utilizes SFP level monitoring and make-up capability as described in Seabrook Station Final Integrated Plan (FIP) [Reference 14]. SFP make-up capability is provided using a gravity drain through a permanently installed pipe line connected to the SFP [Reference 22]. The source of make-up water is the plant Refueling Water Storage Tank (RWST).

The permanently installed plant equipment relied on for the implementation of the SFP Makeup FLEX strategy has been designed and installed, or evaluated to remain functional, in accordance with the plant design basis to the SSE loading conditions. Seabrook Station is currently performing the Spent Fuel Pool (SFP) assessments to satisfy the requirements of the Near-Term Task Force Recommendation 2.1 (NTTF 2.1). The conclusion of this evaluation will be provided in a separate submittal. The portable FLEX equipment availability, including its storage and deployment pathways, and the permanently installed plant equipment needed to accomplish SFP cooling have subsequently been evaluated considering the GMRS-consistent loading conditions via a review of Section 2, which verifies the availability of the FLEX components after a GMRS seismic event. As such, makeup capability of the SFP is shown to be seismically adequate against the GMRS demand.

Level Instrumentations

As described in Reference 23 and in Section 4.11 of Reference 17, several components were installed to provide level indication of the SFP (modification in response to NRC order EA-12-051 [Reference 24]). This set of instrumentations is relied upon for FLEX implementation. The $C_{10\%}$ capacities of the equipment involved in the SPF level monitoring are determined, in Reference 21, to exceed the GMRS demand.

Spent Fuel Pool Makeup Conclusion

The SFP makeup capability and SFP level instrumentation equipment needed to accomplish SFP cooling strategies are acceptable for the MSA using guidance of Section H.4.4 of Reference 1 but needs to be confirmed by the results of the Spent Fuel Pool (SFP) assessments to satisfy the requirements of the Near-Term Task Force Recommendation 2.1 (NTTF 2.1).

4. HIGH FREQUENCY REVIEW

The high frequency review is included as Attachment 1 of this enclosure.

Seabrook Station completed the evaluation of potentially sensitive contact devices in accordance with NEI 12-06 [Reference 1], Appendix H Section H.4.2 and EPRI 3002004396 [Reference 7]. The results of the high-frequency evaluation confirm that the FLEX strategies for Seabrook Station can be implemented as designed and no further seismic evaluations are necessary.

5. CONCLUSION

The FLEX strategies for Seabrook Station as described in the FIP [Reference 14] are acceptable as specified with the supplemental evaluations/modifications discussed above. As detailed in Section 2.4.1, the 'B' Diesel Generator Fuel Oil Storage Tank (1-DG-TK-26B) saddle supports and the valve yokes and associated bolting of 1-SI-V-32 and 1-SI-V-47 do not have sufficient capacity to resist the GMRS-induced loading. New analyses for these components are required to determine a more realistic response to the GMRS.

6. REFERENCES

1. NEI 12-06, Revision 4, Diverse and Flexible Coping Strategies (FLEX) Implementation Guide, December 2016, ADAMS Accession Number ML16354B421
2. JLD-ISG-2012-01, Revision 2, Compliance with Order EA-12-049, Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events, February 2017, ADAMS Accession Number ML17005A188
3. Seabrook Letter, SBK-L-14052, “NextEra Energy Seabrook, LLC Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.549f) Regarding Recommendations 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident”, March 27, 2014, ADAMS Accession Number ML14092A413
4. NRC (F. Vega) Letter to NextEra Energy Seabrook (D. Curtland), “Seabrook Station, Unit 1 – 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 (TAC NO. MF3921)”, August 12, 2015, ADAMS Accession Number ML15208A049
5. Not Used
6. Not Used
7. EPRI 3002004396, Final Report, July 2015, High Frequency Program Application Guidance for Functional Confirmation and Fragility Evaluation, ADAMS Accession Number ML15223A102
8. NRC Letter, Endorsement of Electric Power Research Institute Final Draft Report 3002004396, “High Frequency Program: Application Guidance for Functional Confirmation and Fragility”, dated September 17, 2015, ADAMS Accession Number ML15218A569
9. EPRI, “Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic”, Report Number 3002000704, Palo Alto, CA, April, 2013

10. Seabrook Letter, SBK-L-14229, "NextEra Energy Seabrook, LLC Expedited Seismic Evaluation Process Report (CEUS Sites) Related to the 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", December 19, 2014, ADAMS Accession Number ML14360A016
11. EPRI, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic", Report Number 1025287, Palo Alto, CA, November, 2012
12. EPRI, "EPRI NP-6041-SL Revision 1: A Methodology for Assessment of Nuclear Plant Seismic Margin, Revision 1", Palo Alto, CA, August, 1991
13. NRC Letter, "Seabrook Station, Unit 1 – Staff Review of Interim Evaluation Associated with Reevaluated Seismic Hazard Implementing Near-Term Task Force Recommendations 2.1 (TAC NO. MF5266)", October 19, 2015, ADAMS Accession Number ML15282A019
14. Seabrook Letter, SBK-L-16108, "NextEra Energy Seabrook, LLC Status of Required Actions for EA-12-049 Order Modifying Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis External Events", July 26, 2016, ADAMS Accession Number ML16214A244
15. NRC (M. Halter) Letter to NextEra Energy Seabrook (E. McCartney), "Seabrook Station, Unit 1 – Safety Evaluation Regarding Implementation of Mitigaring Strategies and Reliable Spent Fuel Pool INstrumentation Related to Order EA-12-049 and EA-12-051 (CAC Nos. MF0836 and MF0837), December 1, 2016, ADAMS Accession Number ML16321A418
16. Not Used
17. Seabrook Document DFCS, "Diverse and Flexible Coping Strategies (FLEX) Program", Revision 1
18. Seabrook Document, FP (JENSEN HUGHES Calculation 1TCR27123-SQ-CAL-002, Revision 1), "Seismic Capacity Evaluation for Miscellaneous Tanks", Revision 0
19. Seabrook Document, FP101168 (JENSEN HUGHES Calculation 1TCR27123-SQ-CAL-003, Revision 1), "Seismic Capacity Evaluation for SEPS Components", Revision 0
20. Seabrook Document, FP101169 (JENSEN HUGHES Calculation 1TCR27123-SQ-CAL-004, Revision 1), "Seismic Evaluation for Deployment and Operator Pathways", Revision 0
21. Seabrook Document, FP101170 (JENSEN HUGHES Calculation 1TCR27123-SQ-CAL-005, Revision 0), "Seismic Capacity Evaluation for Miscellaneous Components", Revision 0
22. Seabrook Document, FP101171 (JENSEN HUGHES Report 1TCR27123-SQ-RPT-001, Revision 1), "Screened List of Structures, Systems, and Components (SSCs) for Seismic Mitigating Strategies Assessment (MSA) for Seabrook Station", Revision 0
23. EC-281849, "Spent Fuel Pool Instrumentation Upgrade for NRC Order EA-12-051", Revision 5
24. Seabrook Letter, SBK-L-15215,"NextEra Energy Seabrook, LLC's Final Compliance in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentations (Order EA-12-051)", December 15, 2012, ADAMS Access Number ML15356A102
25. NRC (E. Leeds) Letter to All Power Reactor Licensees and Holders of Construction Permits in Active of Deferred Status, EA-12-049, "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigating Strategies for Beyond-Design-Basis-External Events", March 12, 2012, ADAMS Accession Number ML12054A735

26. Seabrook Document, FP101175 (JENSEN HUGHES Report 1TCR27123-SQ-RPT-003, Revision 0), “Selection of Relays and Switches for NEI 12-06 Appendix H High Frequency Seismic Evaluation at Seabrook Nuclear Station”, Revision 0

27. Seabrook Document, EC 282825, “Fukushima SEPS Components Seismic Upgrade”, Revision 1

28. Seabrook Document, ECA-0.0, “Loss of All AC Power”, Revision 51

29. Seabrook Document, FP21572, Diesel Generator Fuel Oil Storage Tank Stress Analysis Report, Revision 3

Attachment A – High Frequency Review

Refer to Section 1 and 2 of the main body of the enclosure of this submittal for discussion on background and assessment to the MSSHI. The item selection is presented in Reference 26, this enclosure provides a summary of the methodology presented in Reference 26.

Note: the reference numbers used in this enclosure are consistent with the references listed in Section 6 of this submittal.

1. SELECTION OF COMPONENTS

The fundamental objective of the MSA evaluation is to determine whether the FLEX strategies developed, implemented, and maintained in accordance with NRC Order EA-12-049 [Reference 25] can be implemented considering the impacts of the reevaluated seismic hazard. Within the applicable function identified in Section H.4.2 [Reference 1], the components that require a high-frequency evaluation are control devices subject to intermittent states that are located in seal-in or lockout (SILO) circuits. Plants following the Path 4 are required to evaluate SILO devices in the control system of four specific categories: (1) Reactor Trip/Scram, (2) Reactor Vessel Coolant Inventory Control, (3) FLEX Phase 1 Components, and (4) Automatically Operated FLEX Phase 2 Components. The purpose of these requirements is to ensure that these four functions perform as necessary as part of the FLEX strategies. The equipment selection process for each of those categories is described below.

1.1 Reactor Trip/SCRAM

Section H.4.2 of NEI 12-06 Appendix H [Reference 1] identifies the Reactor Trip/SCRAM function as a function to be considered in the high frequency evaluation. The EPRI guidance for High Frequency Confirmation 3002004396 [Reference 7] Table 4.1 notes that the "design requirements preclude the application of seal-in or lockout circuits that prevent reactor trip/SCRAM functions" and that "No high-frequency review of the reactor trip/SCRAM systems is necessary". Therefore, no additional evaluations are necessary for the reactor trip/SCRAM function.

1.2 RCS/Reactor Vessel Inventory Control

The equipment in the Reactor Vessel Inventory Control function are the same equipment evaluated in the Seabrook Station NTTF 2.1 High Frequency Confirmation. The primary concern for both the NTTF 2.1 and MSA programs is the actuation of valves that have the potential to cause a loss-of-coolant accident (LOCA). A LOCA following a seismic event could provide a challenge to the mitigating strategies and lead to core damage. Control circuits for the Pressurizer Power Operated Relief Valves (PORV) as well as other Reactor Coolant System (RCS) valves were analyzed. In this case, the "undesirable state" criterion for selection of devices was any device that could lead to a listed valve opening and remaining open after the period of strong shaking. Loss of AC power is a basic premise of NEI 12-06, thus control devices for

AC-powered valves are not included in the NEI 12-06 Appendix H selection. The mitigating strategy related components associated with Reactor Vessel Inventory Control are noted in Table 6-1 of Reference 26 for completeness, although no additional seismic evaluations were required for these components.

1.3 FLEX Phase 1

Section H.4.2 of NEI 12-06 Appendix H [Reference 1] requires the analysis of relays and contactors that may lead to circuit seal-ins or lockouts that could impede the Phase 1 FLEX capabilities, including vital buses fed by station batteries through inverters. Phase 1 of the FLEX Strategy is defined in NEI 12-06 [Reference 1] as the initial response period where a plant is relying solely on installed plant equipment. During this phase and immediately following the seismic event, the plant has no AC power (i.e. ELAP) and is relying on batteries, steam, and air accumulators to provide the motive force necessary to operate the critical pumps, valves, instrumentation, and control circuits. The SEPS generator may be used during Phase 1 to restore AC power. However, while the generator auto-starts, it does not automatically close to the bus, therefore there will be no AC power during and immediately following the seismic event.

In response to NEI 12-06, EPRI released document 3002000704 [Reference 9], which describes an Expedited Seismic Evaluation Process (ESEP) that addresses interim evaluations of critical permanent plant equipment necessary for these mitigating strategies. The process described in EPRI 3002000704 also included the selection of switches, relays, and contactors that could affect Phase 1 capabilities. Because of this programmatic overlap, the Expedited Seismic Equipment List (ESEL) generated as part of the ESEP can be used to identify contact devices needing review for high frequency effects in this category. Upon application of these device selection criteria in Section 6.3 of Reference 26, it is shown that there are no contact devices that meet the criteria for selection in this category.

1.4 FLEX Phase 2 Automatic Operation

NEI 12-06 Appendix H [Reference 1] requires the inclusion of SILO relays and contactors 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.

With the loss of AC power, the Phase 2 SSCs would be limited to any permanently installed FLEX generator and, if allowed to automatically start, any electrical components powered by the FLEX generator and relied upon for Phase 2 of the FLEX Strategy. Seabrook Station credits a portable FLEX generator for their Phase 2 response, and the operator action to install and connect that generator eliminates any devices from being identified in this category.

The SEPS generator may also be used during this phase. As mentioned above in Section 1.3, the generator auto-starts following the seismic event but does not automatically close to the bus.

1.5 SEPS Components

The electrical components part of the SEPS were not included in the scope of Reference 26. As part of the high frequency confirmation effort of NEI 12-06 Appendix H [Reference 1], the electrical components part of the SEPS are required to be evaluated against seal-in and lockout. Seabrook Station has performed an assessment of the electrical components involved in the SEPS components list. As presented per Section 2.5.2 of Reference 27, several relays and contactors were identified as being vulnerable to high-frequency seismic motion. The SEPS are manually started following a Beyond Design Basis External Event (BDBEE) and as part of this procedure, it is required to reset the relays. The detailed procedure is presented in Attachment P of Reference 28. In conclusion, the standard plant procedure is sufficient for the SEPS components to function following a BDBEE.

1.6 Summary of Selected Components

Based on the component selection process above, there are no components identified for further evaluation.