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Edwin I. Hatch Nuclear Plant – Units 1 and 2
NEI 12-06, Rev. 4, Appendix H, H.4.4 Path 4: GMRS < 2xSSE
Mitigating Strategies Assessment (MSA) Report

References:

1. NEI 12-06, Revision 4, Diverse and Flexible Coping Strategies(FLEX) Implementation Guide, December 2016 (ML16354B421).
2. NRC Letter, Revision 2 to 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 Event," dated February 2017 (ML17005A188).
3. Letter to NRC, Edwin I. Hatch Nuclear Plant – Units 1 and 2, Notification of Full Compliance of Required Action for NRC Order EA-12-049 Mitigation Strategies for Beyond-Design-Basis External Events, February 13, 2017 (ML17045A597).
4. NRC Letter, "Edwin I. Hatch Nuclear 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," dated August 4, 2017 (ML17179A286).

Ladies and Gentlemen:

The purpose of this letter is to provide the results of the assessment for Edwin I. Hatch Nuclear Plant – Units 1 and 2 (Plant Hatch) 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 Revision 2 to JLD-ISG-2012-01 (Reference 2). Formal endorsement is pending review, thus SNC is taking an exception to the formally endorsed Revision 2 of NEI 12-06 to incorporate the elements of NEI 12-06 Revision 4 Appendix H. Plant Hatch's Final Integrated Plan (FIP) was submitted on February 13, 2017 as described in Reference 3 with the NRC Safety Evaluation described for Plant Hatch FLEX in Reference 4.

Based upon the mitigating strategies assessment provided in the enclosures 1 and 2 to this letter, the Mitigating Strategies for Plant Hatch can be implemented as designed when considering the impacts of the reevaluated seismic hazard.

Enclosure 1 provides the assessment of the Structures, Systems, and Components (SSCs) relied on for FLEX strategies. Enclosure 2 provides the high frequency evaluation of the components relied on for FLEX strategies.

This letter contains no new NRC commitments. If you have any questions, please contact Matt Euten at 205.992.7673.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 28th day of August 2017.

Respectfully submitted,

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JTW/MRE/GLS

Enclosure: 1. NEI 12-06 Appendix H Path 4 Seismic MSA Report
2. NEI 12-06 Appendix H Path 4 Seismic MSA High Frequency Report

cc: Regional Administrator, Region II
NRR Project Manager – Hatch
Senior Resident Inspector – Hatch
Director, Environmental Protection Division – State of Georgia
RType: CHA02.004

Edwin I. Hatch Nuclear Plant – Units 1 and 2
NEI 12-06, Rev. 4, Appendix H, H.4.4 Path 4: GMRS < 2xSSE
Mitigating Strategies Assessment (MSA) Seismic

Enclosure 1
NEI 12-06 Appendix H Path 4 Seismic MSA Report for Plant Hatch
(10 pages)

Executive Summary

Edwin I Hatch Nuclear Plant Units 1 and 2 (Plant Hatch) has completed a mitigating strategies assessment (MSA) of the reevaluated seismic hazard to determine if the mitigating (FLEX) strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 [Reference 20] 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 Plant Hatch FLEX Mitigating Strategies are described in Reference 5. The Safety Evaluation of the Mitigating Strategies is provided in Reference 18.

This report describes the evaluation of the Plant Hatch MSA for the impacts of the reevaluated seismic hazard, except for the High Frequency Review. The report for the High Frequency Review is provided in Enclosure 2. Specifically, the items addressed in this report/enclosure include the following:

- Assessment to MSSHI
  - Step 1 – Scope of MSA Plant Equipment
  - Step 2 – ESEP Review
  - Step 3 – Inherently/Sufficiently Rugged Equipment
  - Step 4 – Evaluations Using Section H.5 of NEI 12-06 Appendix H
    - FLEX Equipment storage buildings and Non-Seismic Category I Structures that could impact FLEX implementation
    - Operator Pathways
    - Tie down of FLEX portable equipment
    - Seismic Interactions not included in the ESEP that could affect FLEX strategies
    - Haul Paths
- Spent Fuel Pool Cooling Review

All steps for the assessment to the Mitigating Strategies Seismic Hazard Information (MSSHI) and the spent fuel pool cooling review followed the guidance of Appendix H, section H.4.4 of NEI 12-06 Revision 4 [Reference 1]. Evaluation of these potential failure modes of SSCs are documented in individual calculations and reports as noted in References 9, 12, 13, 14, 16 and 19. This report provides the results of those assessments.

In summary, as discussed in Section 5 of this report "Conclusions", the FLEX strategies for Plant Hatch as described in the FIP [Reference 5] are acceptable as specified and no further seismic evaluations are necessary.

1.0 Background

Edwin I. Hatch Nuclear Plant Units 1 and 2 (Plant Hatch) 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 (Reference 20) 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 Revision 2 to JLD-ISG-2012-01 [Reference 2]. Formal endorsement is pending review, thus SNC is taking an exception to the formally endorsed Revision 2 of NEI 12-06 to incorporate the elements of NEI 12-06 Revision 4 Appendix H. The Plant Hatch FLEX Mitigating Strategies are described in Reference 5. The Safety Evaluation of the Mitigating Strategies is provided in Reference 18.

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the reevaluated seismic hazard information at Plant Hatch, 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 Plant Hatch control point elevation. Plant Hatch submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on March 31, 2014 (Reference 3). The NRC concluded that the GMRS that was submitted adequately characterizes the reevaluated seismic hazard for the Plant Hatch 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 Plant Hatch.

2.0 Assessment to MSSHI

Consistent with Section H.4.4 (Path 4) of Reference 1, the Plant Hatch 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. As described in the Final Implementation Plan (FIP) (References 5 and 18), 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 Plant Hatch 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 6), NEI 12-06 (Reference 1), and the Seismic MSA industry template for Path 4 plants. FLEX SSCs not included in the ESEP were considered for the Seismic MSA. In addition, failure modes not addressed in the ESEP guidance were evaluated if they could potentially affect the FLEX strategies (e.g., soil liquefaction and seismic interactions with FLEX equipment).

As discussed in Section H.4.4 (Path 4) of Reference 1 and Section 2.3 below, FLEX SSCs that are inherently rugged or sufficiently rugged 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 was previously evaluated to demonstrate seismic adequacy following the guidance in Section 5 of NEI 12-06 (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 expedited seismic evaluation process (ESEP) evaluations (References 7 and 8) for the FLEX strategies which were performed in accordance with EPRI 3002000704 (Reference 6). 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 based on the GMRS (for the condensate storage tanks) or the Plant Hatch Seismic Margin Earthquake ground motion, which was at least twice the Plant Hatch Unit 1 and 2 Design Basis Earthquakes (for all other equipment). In addition, separate evaluations are performed to address high frequency exceedances under the high frequency (HF) sensitive equipment assessment process, as required. See Section 4 of this report.

2.3. Step 3 – Inherently/Sufficiently Rugged Equipment

In accordance with Section H.4.4 of NEI 12-06 (Reference 1), the qualitative assessment of FLEX-related 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

Based on the discussion in Sections 2.1 through 2.3 above, Path 4 plant Seismic MSAs include evaluation of:

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

Detailed MSA evaluations of these items are documented in individual calculations (i.e., References 9, 12, 13, 14, 16, and 19). The results of the reviews of each of these five areas are described in the sections below.

2.4.1. *FLEX Equipment Storage Building and Non-Seismic Category I Structures*

FLEX Equipment Storage Building (Dome)

As stated in Reference 5, portable FLEX equipment at Plant Hatch is stored in a single, 12,000 ft^2 reinforced concrete, tornado-missile protected structure referred to as the FLEX storage building (Dome). Reference 10 documents the seismic acceptability of the FLEX storage building (Dome) in accordance with Section 5 of Reference 1.

Per NEI 12-06, the FLEX storage building (Dome) was designed in accordance with ASCE 7-10, ACI 349-06, ANSI/AISC N690-06, and ACI 318-11. The FLEX storage building (Dome) seismic design response spectrum was specified as the envelope of the Unit 1 design basis earthquake (DBE), the Unit 2 DBE, and the ½ seismic margin earthquake (SME). These spectra, along with the Reference 3 GMRS are shown below in Figure 2-1.

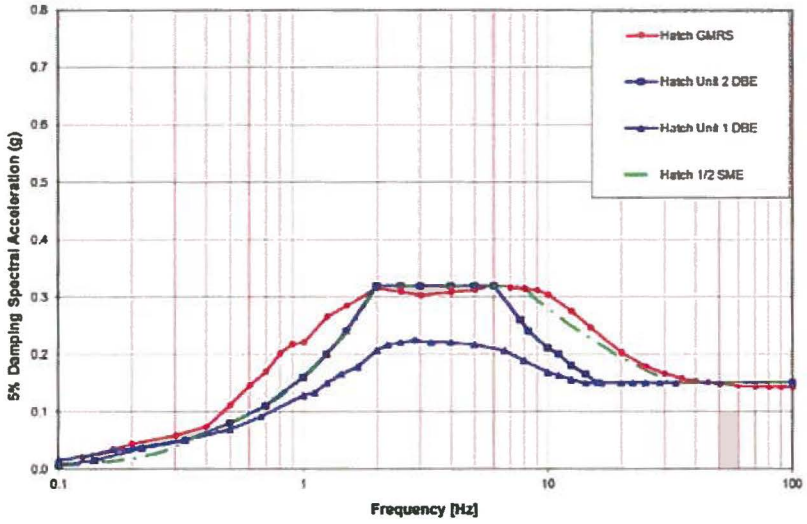

Figure 2-1. Plant Hatch Horizontal Design Spectra and GMRS

Reference 9 documents the evaluation of the FLEX storage building (Dome) for the GMRS. Per Section H.5 of Reference 1, a 10% probability of unacceptable performance (C10%) is judged to be an acceptable seismic performance goal for demonstrating seismic robustness for the FLEX strategies. Table H.1 in Reference 1 provides recommended values for the C10%/C1% ratio where the C1% capacity corresponds to a mean confidence of a 1% probability of failure, equivalent to a HCLPF. The FLEX storage building (Dome) falls under the SSC type listed in the first row of Table H.1 (Structures & Major Passive Mechanical Components Mounted on Ground or at Low Elevation within Structures) where the appropriate C10%/C1% ratio is 1.44. Based on the analysis and design performed in Reference10, the C1% capacity of the FLEX storage building (Dome) is judged to be greater than the ½ SME spectrum. Therefore, the C10% capacity of the FLEX storage building (Dome) is judged to exceed the "1.44 * ½ SME" curve shown below in Figure 2-2.

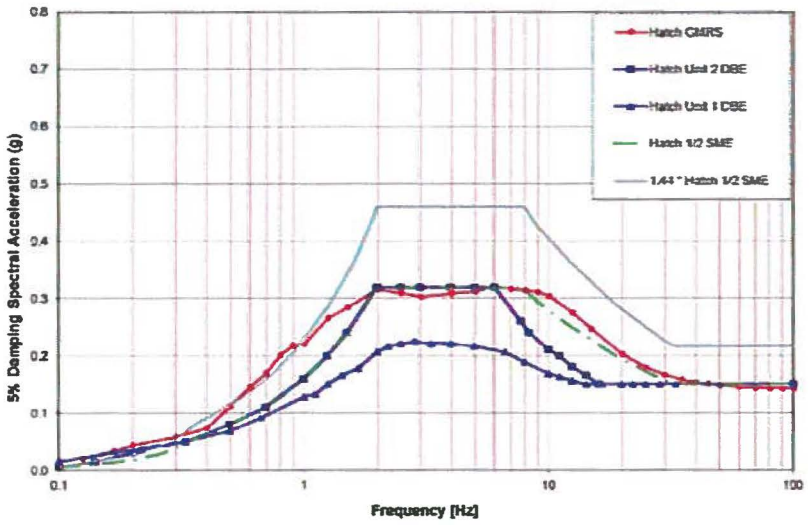

Figure 2-2. Plant Hatch Horizontal Design Spectra, GMRS, and $C_{10\%}$ Spectrum

Figure 2-2 shows that the C10% capacity (1.44 * Hatch ½ SME) bounds the GMRS at frequencies above 1 Hz. Below 1 Hz, the GMRS is slightly higher (approximately 0.02g) at some frequencies. The highest GMRS acceleration in that range is approximately 0.22g, which is considered a non-damaging level of ground motion.

Per Reference 10, Section D, Part 15.0, the FLEX storage building (Dome) natural frequencies for the building founded on non-mobilized soil are 13.3 Hz (horizontal mode) and 13.1 Hz (vertical mode). Considering soil structure interaction (SSI), the fundamental frequencies of the building could be lower than 13 Hz; however, they are expected to remain above 1 Hz based on engineering judgment. Reference 11 states that the fundamental frequencies from the SSI analysis were 5.5 Hz (horizontal) and 6.5 Hz (vertical).

Given the inherent conservatisms in the existing structural design analysis (Reference 10) and the natural frequencies of the building discussed above, the slight exceedance of the C10% spectrum by the GMRS between 0.5 Hz and 1 Hz is judged to have no significant impact on the structural adequacy of the FLEX storage building (Dome). Therefore, it is concluded that the C10% capacity of the FLEX storage building is adequate for the MSSHI.

In addition, it should be noted that the FLEX storage building is a surface-founded structure on soil. The potential for soil liquefaction of the foundation soil was evaluated as part of the Plant Hatch seismic probabilistic risk assessment (SPRA) (Reference 15). It was concluded that soil liquefaction can be screened out as a credible failure mode for the FLEX storage building.

Non-Seismic Category I Structures

As discussed in Sections 2.4.2 and 2.4.5 below, the FLEX operator pathways and haul paths were reviewed for potential seismic interactions resulting from a GMRS-level earthquake. Based on those reviews, no non-seismic category I structures would be expected to impact the operator pathways or haul paths.

2.4.2. Operator Pathways

As described in Reference 12, a walkdown was performed in the following areas to determine: (1) whether operators would be able to access certain areas where actions need to be taken, and (2) whether there is the potential for damage to installed FLEX connections due to seismic interactions.

- The primary haul path
- The Mobile Diesel Fuel Transfer Tank (MDFTT) primary staging area
- The Phase 2 pump primary staging area
- The 600V Generator primary staging area
- The Unit 1 air compressor staging area
- The Unit 2 air compressor staging area
- Condensate Storage Tank (CST) connections near valve P11-F109 for Unit 1 and Unit 2
- Reactor Building penetrations X-161 (Unit 1) and X-138 (Unit 2)
- Reactor Building penetrations X-165 (Unit 1) and X-174 (Unit 2)
- Reactor Building doors 1L48R23A (Unit 1) and 2L482R28 (Unit 2)

These determinations were made by assessing potential seismic interactions associated with a GMRS level earthquake and considering the on-site capability to remove debris and the available time for operator actions. As stated in Reference 12, the seismic capability engineers (SCEs) who performed the walkdown concluded that there were no locations along these operator pathways that could prevent FLEX strategy implementation as a result of a GMRS-level ground motion. There is high confidence that operator pathways inside the Seismic Category I reactor buildings will be maintained due to the seismic ruggedness of those structures.

The Plant Hatch FLEX strategy relative to operator pathways has been reviewed and verified that the operator pathways are not impacted by the MSSHI.

2.4.3. Tie Down of FLEX Portable Equipment

As discussed in Reference 13, a walkdown was performed to determine the need for or adequacy of tie downs for portable FLEX equipment. During the walkdown, some portable equipment was identified as not susceptible to overturning/sliding (e.g., hoses). Other portable equipment was measured to determine whether its aspect ratio was low enough to prevent overturning and whether friction would be sufficient to prevent sliding-related damage.

The Plant Hatch FLEX strategy relative to storage requirements (including any tie-down or restraint devices) in effect for FLEX portable equipment has been reviewed and verified that the equipment has sufficient stability to ensure no adverse interactions or significant damage potential that could impair the ability of the equipment to perform its mitigating strategy function during or following a GMRS-level seismic event.

2.4.4. Additional Seismic Interactions

Seismic interactions that could potentially affect the FLEX strategies were reviewed as part of the ESEP program (References 7 and 8). Although not specifically required by Reference 6, this information, which included evaluation of potential spray or flood of ESEP items, was gathered during the ESEP walkdowns and documented in the Screening and Evaluation Work Sheets (SEWS) for Plant Hatch Units 1 and 2.

The Plant Hatch FLEX strategy relative to additional seismic interactions has been reviewed and verified that the Mitigating Strategy is not adversely impacted by the GMRS.

2.4.5. Haul Path

Per the FIP (Reference 5), multiple haul paths are available from the FLEX storage building (Dome) to equipment staging areas. The equipment being transported for Phase 2 strategies will be towed by a heavy duty pickup truck, a small semi-tractor, or a medium wheeled loader. These vehicles and trailers have large commercial/military grade tires that are designed to withstand small debris punctures and razor cuts/penetration. The medium wheeled loader can also be used to remove large debris (e.g., automobiles, trees, pieces of buildings, switchyard structures, and concrete barriers) and provide timely access along critical travel paths.

As described in Reference 12, the primary haul path was walked down to identify potential seismic interactions that could impact the ability to deploy FLEX portable equipment. The Seismic Capability Engineers (SCEs) concluded that there were no locations along the primary haul path that could prevent FLEX equipment deployment for FLEX strategy implementation as a result of a GMRS-level ground motion.

As discussed in Reference 14, a soil hazards review performed for the Plant Hatch seismic probabilistic risk assessment (SPRA) included an evaluation of the potential for liquefaction along the haul paths (Reference 15). That evaluation considered the controlling magnitude/distance pairs for the mean annual frequency of exceedance (MAFE) values of 10^{-4}, 10^{-5}, and 10^{-6}, and conservatively calculated a maximum vertical settlement of approximately 5 inches for MAFE of 10^{-6} and no significant vertical settlement at MAFE of 10^{-4}. The Plant Hatch GMRS is only about 14-16% higher in spectral acceleration than the MAFE of 10^{-4} ground motion. Reference 15 concluded that even with the maximum vertical displacement associated with the MAFE of 10^{-6} and assuming it is fully expressed at the surface, the large wheels/tires on the transport vehicles would be able to traverse the roadways and deliver FLEX equipment to the staging areas.

The Plant Hatch FLEX strategy relative to haul paths has been reviewed and verified that the haul paths are not adversely impacted by the MSSHI.

3.0 Spent Fuel Pool Cooling Review

The evaluation of spent fuel pool (SFP) cooling for Plant Hatch 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.

Per the Plant Hatch FIP (Reference 5), the basic FLEX strategy for maintaining SFP cooling is to monitor SFP level utilizing the SFP level instrumentation and initiate SFP makeup as required. Two options exist to deliver makeup water from the FLEX pump at the intake structure at the Altamaha River:

1. FLEX hoses can be connected to the discharge of the FLEX pump at the intake structure to route makeup water all the way to the SFPs with the discharge ends positioned over the edge of the pool or connected to nozzles that spray the water over the spent fuel; or
2. A FLEX hose can be connected from the FLEX pump via the residual heat removal service water (RHRSW) system piping at the intake structure to the plant service water (PSW) piping, which provides an emergency fill connection to the SFP cooling system makeup piping.

The spent fuel pool integrity evaluations for Plant Hatch demonstrated inherent margins of the spent fuel pool structure and interfacing plant equipment to a peak spectral acceleration of 0.8g (Reference 17), which bounds the Plant Hatch GMRS. Since Plant Hatch's FLEX strategy for SFP cooling includes an option to run flexible hoses directly from the FLEX pump discharge to the SFPs, no additional evaluation of permanently installed FLEX piping or SFP emergency make-up piping is required.

As described in Reference 16, the SFP level instrumentation, including its anchorage, has been shown to have adequate seismic capacity to withstand the MSSHI.

4.0 High Frequency Review

The high frequency review is being submitted in Enclosure 2 of the SNC transmittal letter.

5.0 Conclusion

Based on the discussion above, it is concluded that the FLEX strategies for Plant Hatch as described in the FIP (Reference 5) are acceptable as specified given the Plant Hatch MSSHI, and no further seismic evaluations are necessary.

6.0 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. SNC Letter NL-14-0343, Edwin I. Hatch Nuclear Plant Units 1 and 2 Seismic Hazard and Screening Report for CEUS Sites, March 31, 2014, ADAMS Accession Number ML14092A017.
4. NRC Letter, Edwin I. Hatch Nuclear 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 Relating to Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, April 27, 2015, ADAMS Accession Number ML15097A424.
5. SNC Letter NL-17-0001, Edwin I. Hatch Nuclear Plant Units 1 and 2 Notification of Full Compliance of Required Action for NRC Order EA-12-049 Mitigation Strategies for Beyond-Design-Basis External Events, February 13, 2017, ADAMS Accession Number ML17045A597.
6. 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, May 2013.
7. SNC Letter NL-14-1989, Edwin I. Hatch Nuclear Plant – Units 1 and 2 Expedited Seismic Evaluation Process Report – Fukushima Near-Term Task Force Recommendation 2.1, December 30, 2014, ADAMS Accession Number ML15049A502.
8. SNC Letter NL-16-2466, Edwin I. Hatch Nuclear Plant – Units 1 and 2 Fukushima Near-Term Task Force Recommendation 2.1 Expedited Seismic Evaluation Process Report Completion, December 15, 2016, ADAMS Accession Number ML16350A329.
9. MPR Calculation 0380-0064-CALC-002, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Evaluation for Plant Hatch FLEX Storage Building (Dome).
10. Engineering System Solutions (ES2) Structural Calculations for FLEX Equipment Storage Building, Plant Hatch, Project No. IND13145, November 19, 2014.
11. Email from Don Moore to Kimberly Keithline, Subject: Fwd: Hatch MSA NEI 12-06 App. H Path 4 Questions, April 7, 2017, 12:48 PM, including email from Mike Gibbs to Dave Grubic on April 5, 2017, 4:49 PM.
12. MPR Report 0380-0064-RPT-001, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Walkdown Report for Plant Hatch.
13. MPR Calculation 0380-0064-CALC-003, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Evaluation for Plant Hatch FLEX Portable Equipment Tie-Down.
14. MPR Calculation 0380-0064-CALC-001, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Liquefaction Evaluation for Plant Hatch Haul Path and Dome Storage Building.
15. SNC Calculation H-RIE-SEIS-U00-006-012, Version 3, Review of Soil Hazards – Special Considerations – Hatch Seismic PRA, June 24, 2017.
16. MPR Calculation 0380-0064-CALC-004, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Evaluation for Plant Hatch Spent Fuel Pool Level Instrumentation.

17. SNC Letter NL-16-2494, Edwin I. Hatch Nuclear Plant – Units 1 and 2 Spent Fuel Pool Evaluation Supplemental 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, December 15, 2016, ADAMS Accession Number ML16350A350.
18. NRC Letter, Edwin I. Hatch Nuclear 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. MF0712, MF0713, MF0721, and MF0722), August 4, 2017, ADAMS Accession Number ML17179A286.
19. MPR Report 0380-0064-RPT-002, Revision 0, NEI 12-06 Appendix H Path 4 Seismic MSA Report for Plant Hatch.
20. NRC (E. Leeds) Letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status. EA-12-049. "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." March 12, 2012, ADAMS Accession Number ML12054A735.

Edwin I. Hatch Nuclear Plant – Units 1 and 2
NEI 12-06, Rev. 4, Appendix H, H.4.4 Path 4: GMRS < 2xSSE
Mitigating Strategies Assessment (MSA) Seismic

Enclosure 2
NEI 12-06 Appendix H Path 4 Seismic MSA High Frequency Report for Plant Hatch
(10 pages)

EXECUTIVE SUMMARY

Edwin I Hatch Nuclear Plant Units 1 and 2 (Plant Hatch) has completed a mitigating strategies assessment (MSA) of the reevaluated seismic hazard to determine if the mitigating (FLEX) strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 [Reference 8] 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. The Plant Hatch FLEX Mitigating Strategies are described in Reference 3. The Safety Evaluation of the Mitigating Strategies is provided in Reference 4.

Specifically, this report describes the evaluation of the Plant Hatch MSA for the impacts of the reevaluated seismic hazard in the high frequency range (> 10 Hz).

This report describes the Mitigating Strategies Assessment undertaken for Plant Hatch, implemented using the methodologies in NEI 12-06 [Reference 1], Appendix H, which in turn specifies the methodologies from EPRI 3002004396, "High Frequency Program, Application Guidance for Functional Confirmation and Fragility Evaluation" [Reference 7].

In summary, as discussed in Section 2.5 of this report "Summary of Selected Components", no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already addressed as part of the Expedited Seismic Evaluation Process [References 11, 12, 13]. Therefore, no additional seismic evaluations of components are required for the Plant Hatch seismic high frequency confirmation for the mitigating strategies assessment (MSA) of the reevaluated seismic hazard.

1 INTRODUCTION

1.1 BACKGROUND

Edwin I Hatch Nuclear Plant Units 1 and 2 (Plant Hatch) has completed a mitigating strategies assessment (MSA) of the reevaluated seismic hazard to determine if the mitigating (FLEX) strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 [Reference 8] 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 Revision 2 to JLD-ISG-2012-01 [Reference 2]. Formal endorsement is pending review, thus SNC is taking an exception to the formally endorsed Revision 2 of NEI 12-06 to incorporate the elements of NEI 12-06 Revision 4 Appendix H. The Plant Hatch FLEX Mitigating Strategies are described in Reference 3. The Safety Evaluation of the Mitigating Strategies is provided in Reference 4.

Plant Hatch is a Path 4 plant. Additionally, the GMRS exceeds the SSE at frequencies greater than 10 Hz; therefore, the guidance of Reference 1, Appendix H, Section H.4.4 directs the assessment to follow section H.4.2 (i.e., Path 2), which requires that high frequency sensitive plant equipment; namely, electrical contact devices, be evaluated for effects of the MSSHI.

This report describes the Mitigating Strategies Assessment undertaken for Plant Hatch, implemented using the methodologies in NEI 12-06 [Reference 1], Appendix H, which in turn specifies the guidance from EPRI 3002004396, "High Frequency Program, Application Guidance for Functional Confirmation and Fragility Evaluation" [Reference 7].

The objective of this report is to provide summary information describing the assessment for Plant Hatch to demonstrate that the FLEX strategies developed, implemented and maintained in accordance with NRC Order EA-12-049 [Reference 8] can be implemented considering the high frequency impacts of the reevaluated seismic hazard. As described in the Final Integrated Plan (FIP) [Reference 3], the plant equipment relied on for FLEX strategies have previously been evaluated as seismically robust to the SSE levels. The level of detail provided in the report is intended to enable NRC to understand the inputs used, the evaluations performed, and the decisions made as a result of the evaluations.

1.2 APPROACH

NEI 12-06 [Reference 1], Appendix H Section H.4.2 refers to EPRI 3002004396 [Reference 7] for the high-frequency contact device analysis approach. References 1, 3, and 14 were used for the Plant Hatch engineering evaluations described in this report. Acceptance criteria for the evaluations are found in Reference 1, Appendix H, Section H.5. In accordance with References 1 and 7, the following topics are typically addressed in the subsequent sections of this report:

- Plant SSE and GMRS Information
- Selection of components and a list of specific components for high-frequency confirmation
- Estimation of seismic demand for subject components
- Estimation of seismic capacity for subject components

- Summary of subject components' high-frequency evaluations
- Summary of Results

Appendix H, section H.4.4 of NEI 12-06 [Reference 1] states previous seismic evaluations should be credited to the extent that they apply. This includes the Expedited Seismic Evaluation Process (ESEP) [References 11, 12, 13]. The ESEP high frequency sensitive equipment evaluations remain applicable for this MSA since the ESEP seismic demand was based on the Plant Hatch Seismic Margin Earthquake (SME) ground motion which was at least twice the Plant Hatch Units 1 and 2 Design Basis Earthquakes and bounds the GMRS.

As discussed in Section 2.5 of this report "Summary of Selected Components", no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already evaluated as part of the ESEP [References 11, 12, 13]. Therefore, no additional seismic evaluations are required for the Plant Hatch seismic high frequency confirmation for the mitigating strategies assessment (MSA) of the reevaluated seismic hazard.

1.3 PLANT SCREENING

The Mitigating Strategies Seismic Hazard Information (MSSHI) is the licensee's reevaluated seismic hazard information at Plant Hatch, developed using 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 Plant Hatch control point elevation. Plant Hatch submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on March 31, 2014 [Reference 5]. The NRC summarized their screening evaluations in Reference 6 dated October 27, 2015.

2 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 8] can be implemented considering the impacts of the reevaluated seismic hazard. The NEI 12-06, Appendix H Path 4 process utilities the Path 2 process for selection of components. Within the applicable functions identified in Section H.4.2 (Path 2) [Reference 1], the components that would need a high frequency evaluation are contact control devices subject to intermittent states in seal-in or lockout (SILO) circuits. Plants in Path 2 are required to evaluate SILO devices in the control systems of four specific categories: (1) Reactor Trip/Scram, (2) Reactor Vessel Coolant Inventory leakage pathways, (3) FLEX Phase 1 Components, and (4) Automatically Operated FLEX Phase 2 Components to ensure those functions perform as necessary in the FLEX strategies. The equipment selection process for each of those categories is detailed in Reference 14. The process is summarized in the following sections.

2.1 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 [Reference 7] 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.

2.2 REACTOR VESSEL INVENTORY CONTROL

The primary concern 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 mitigation strategies and lead to core damage.

Plant Hatch systems that interfaced with the Reactor Coolant System (RCS) were reviewed to identify if a potential pathway for inventory loss was omitted from the original FLEX strategies. Leakage pathways were analyzed for these applicable systems. Analysis of the circuits, relays, and contactors associated with components in these systems determined that control circuits for one (1) component in each unit – the HPCI Turbine Steam Supply Valve – could pose a SILO concern for the inventory leakage pathway that was not already addressed by the ESEP. However, leakage through that pathway is prevented by implementing procedures associated with the FLEX strategies.

The Mitigation Strategy related components associated with Reactor Vessel Inventory Control are noted in Attachment A of Reference 14. No additional seismic evaluations were required for these components due to previous evaluations under ESEP and FLEX.

2.3 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-in or lockout 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 the plant has no AC

power 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.

FLEX Strategies specific to a seismic event response or common to all external event responses were examined to identify flow paths, electrical distribution and instrumentation relied upon to accomplish the reactor and containment safety functions identified in NEI 12-06 [Reference 1], omitting response strategies only valid in an outage.

Equipment containing FLEX Phase 1 contact devices was identified as part of the ESEP. Results of the reviews were summarized in the Edwin I. Hatch Nuclear Plant – Units 1 and 2 Fukushima Near-Term Task Force Recommendation 2.1 Expedited Seismic Evaluation Process Report [Reference 11, 12]. The NRC concluded the Hatch implementation of the ESEP met the intent of the guidance [Reference 13].

In addition, comparison of the FLEX strategies identified in the Final Integrated Plan [Reference 3] with the ESEP report [Reference 11, 12, 13] determined there were no changes in the FLEX strategies at Hatch which would affect the credited equipment list in the ESEP report. A comparison of current revisions of the Piping and Instrumentation Drawings (P&IDs) and Elementary Diagrams to those revisions cited in the ESEP reports was performed and indicated no modification that might add new components to the credited equipment lists in the ESEP reports [Reference 11, 12, 13].

Therefore, there are no new relays and contactors that may lead to circuit seal-in or lockout that could impede the Phase 1 FLEX capabilities not already evaluated under the Plant Hatch ESEP [Reference 11, 12, 13].

2.4 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, Phase 2 SSCs are 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. Plant Hatch credits a portable FLEX generator for Phase 2 response, and the operator actions necessary to install and connect the generator excludes any devices from being identified in this category.

Therefore, this review of the FIP [Reference 3] determined that automatic operation of Phase 2 FLEX equipment is not possible and thus identifies no new components to be evaluated.

2.5 Summary of Selected Components

As detailed in Reference 14 no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already evaluated under the Expedited Seismic Evaluation Process [References 11, 12, 13]. Therefore, no additional seismic evaluations were required for the Plant Hatch seismic high frequency confirmation for the mitigating strategies assessment (MSA) of the reevaluated seismic hazard.

3 SEISMIC EVALUATION

As discussed in Section 2.5 "Summary of Selected Components" no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already evaluated under the Plant Hatch ESEP [Reference 11, 12, 13]. Therefore, no additional seismic demand determinations are required.

4 CONTACT DEVICES EVALUATION

As discussed in Section 2.5 "Summary of Selected Components" no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already evaluated under the Plant Hatch ESEP [Reference 11, 12, 13]. Therefore, no additional high frequency evaluations are necessary.

5 CONCLUSIONS

As detailed in Reference 14 no contact control devices subject to intermittent states (e.g., relays and contactors that could chatter) in seal-in and lockout circuits were identified that were not already evaluated under the Expedited Seismic Evaluation Process [References 11, 12, 13]. Therefore, no additional seismic evaluations were required for the Plant Hatch seismic high frequency confirmation for the mitigating strategies assessment (MSA) of the reevaluated seismic hazard.

5.1 GENERAL CONCLUSIONS

Plant Hatch 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 evaluation confirm that the FLEX strategies for Plant Hatch can be implemented as designed and no further seismic evaluations are necessary.

5.2 IDENTIFICATION OF FOLLOW-UP ACTIONS

No follow-up actions are required.

6 REFERENCES

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

2 NRC Letter, Revision 2 to 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 Event," February 2017, ADAMS Accession Number ML17005A188.

3 SNC Letter NL-17-0001, Edwin I. Hatch Nuclear Plant – Units 1 and 2, Notification of Full Compliance of Required Action for NRC Order EA-12-049 Mitigation Strategies for Beyond-Design-Basis External Events, February 13, 2017, ADAMS Accession Number ML17045A597.

4 NRC letter, Edwin I. Hatch Nuclear 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, August 4, 2017, ADAMS ML17179A286.

5 Seismic Hazard and Screening Report in Response to the 50.54(f) Information Request Regarding Fukushima Near-Term Task Force Recommendation 2.1: Seismic for Plant Hatch, March 31, 2014, NL-14-0343, ADAMS Accession Number ML14092A017.

6 NRC (W. Dean) Letter to the Power Reactor Licensees on the Enclosed List. "Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident." October 27, 2015, ADAMS Accession Number ML15195A015.

7 EPRI 3002004396. "High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation." July 2015.

8 NRC (E. Leeds) Letter to All Power Reactor Licensees and Holders of Construction Permits in Active or Deferred Status. EA-12-049. "Issuance of Order to Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events." March 12, 2012, ADAMS Accession Number ML12054A735.

9 SNC Letter NL-17-1255, Edwin I. Hatch Nuclear Plant – Units 1 and 2, Submittal for the NTTF 2.1 Seismic High Frequency Confirmation Evaluation, August 22, 2017.

10 NRC (Govan) Letter to Hatch (Pierce). "Edwin I. Hatch Nuclear 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 Relating to Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident (TAC Nos. MF3772 AND MF3773)." April 27, 2015, ADAMS Accession Number ML15097A424.

11 SNC Letter NL-14-1989, Edwin I. Hatch Nuclear Plant – Units 1 and 2 Expedited Seismic Evaluation Process Report – Fukushima Near-Term Task Force Recommendation 2.1, December 30, 2014, ADAMS Accession Number ML15049A502.

12 SNC Letter NL-16-2466, Edwin I. Hatch Nuclear Plant Units 1 and 2, Fukushima Near-Term Task Force Recommendation 2.1 Expedited Seismic Evaluation Process Report Completion, December 15, 2016, ADAMS Accession Number ML16350A329.

13 NRC (Vega) to Hatch (Pierce), "Staff Review of Interim Evaluation Associated with Reevaluated Seismic Hazard Implementation of Near-Term Task Force Recommendation 2.1 (TAC Nos. MF5243 and MF5244)", July 22, 2015, ADAMS Accession Number ML15201A474.

14 ENERCON report, "NEI 12-06 Appendix H High Frequency Equipment Selection for Seismic Mitigating Strategies Assessment for Plant Hatch", Report No. SNCH00222-REPT-001, Rev 0, August 8, 2017.

A Components Identified for High Frequency Evaluation

Table A-1: Components Identified for High Frequency Evaluation

No.	Unit	Component			Enclosure Type	Building	Component Evaluation Result
		ID	Type	System Function			
No components are identified for review/evaluation. See Sections 2.5 and 5 for additional details.							