2807 West County Road 75
Monticello, MN 55362

800.895.4999
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July 26, 2017

L-MT-17-055
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ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Monticello Nuclear Generating Plant
Docket No. 50-263
Renewed Facility Operating License No. DPR-22

Monticello Nuclear Generating Plant: Seismic Mitigating Strategies Assessment (MSA) Report for the Reevaluated Seismic Hazard Information – NEI 12-06, Revision 4, Appendix H, H.4.4, Path 4

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)

With this letter, Northern States Power Company, a Minnesota corporation (NSPM), doing business as Xcel Energy, hereby submits the Monticello Nuclear Generating Plant (MNGP) Seismic Mitigating Strategies Assessment Report. The purpose of the Seismic Mitigating Strategies Assessment Report is 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, Path 4 of NEI 12-06, Revision 4 (Reference 1), which was endorsed by the NRC (Reference 2).

Based upon the mitigating strategies assessment in the Enclosure, the mitigating strategies for MNGP, considering the impacts of the reevaluated seismic hazard, are found to be acceptable.

Please contact John Fields, Fukushima Response Licensing, at 763-271-6707, if additional information or clarification is required.

Summary of Commitments

This letter makes no new commitments and no revisions to existing commitments.

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

Executed on July 26, 2017.

Peter A. Gardner
Site Vice President, Monticello Nuclear Generating Plant
Northern States Power Company - Minnesota

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Monticello Nuclear Generating Plant, USNRC
Resident Inspector, Monticello Nuclear Generating Plant, USNRC

ENCLOSURE

MONTICELLO NUCLEAR GENERATING PLANT

SEISMIC MITIGATING STRATEGIES ASSESSMENT REPORT FOR

MONTICELLO NUCLEAR GENERATING PLANT

IN RESPONSE TO NRC ORDER EA-12-049

22 pages follow

Document ID: 16Q0391-RPT-003 Title: Seismic Mitigating Strategies Assessment Report for Monticello Nuclear Generating Plant in Response to NRC Order EA-12-049

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Job No.: 16Q0391
Client: Monticello Nuclear Generating Plant

This document has been prepared in accordance with the S&A Quality Assurance Program Manual, Revision 18 and project requirements:

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Originated by: M. Wodarcyk *[signature]*	Date: 6/16/2017
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ATTACHMENT

Northern States Power Company – Minnesota
(dba Xcel Energy)

Monticello Nuclear Generating Plant (MNGP)

Docket No. 50-263

Renewed Facility Operating License No. DPR-22

Mitigating Strategies Assessment for MNGP

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

1. BACKGROUND

Monticello Nuclear Generating Plant (MNGP) 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 MNGP, 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 MNGP control point elevation. MNGP submitted the reevaluated seismic hazard information including the UHRS, GMRS and the hazard curves to the NRC on May 14, 2014 [Reference 3]. The NRC staff concluded that the GMRS that was submitted adequately characterizes the reevaluated seismic hazard for the MNGP 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 MNGP.

2. ASSESSMENT TO MSSHI

Consistent with Section H.4.4 (Path 4) of Reference 1, the MNGP 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. 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 MNGP 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 4 for Path 4 plants includes the evaluations of:

1. FLEX equipment storage buildings and Non-Seismic Category 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

1. Per p. 18 of the MNGP FLEX program document [Ref. 19.11]:

   “Portable equipment, vehicles and tools are maintained in the FLEX Building... The stand-alone FLEX Building has been designed to ASCE 7-10… requirements.”

   The “stand-alone FLEX Building” is referred to in this report hereafter as the “New FLEX Building” and is the MNGP FLEX equipment storage building that is relied upon for GMRS-level seismic adequacy.

2. The New FLEX Building is a steel frame structure with light-gage, coated steel cladding (see Reference 19.1, p. 271).

3. The New FLEX Building’s seismic design criteria are per ASCE 7-10 [Reference 18] using the ASCE 7-10 mapped spectral response (S_s = 0.06g, S_1 = 0.03g) at the building’s location as input (see Reference 19.1, p. 271).

4. By analysis (see Reference 19.4), using the ASCE 7-10 acceptance criteria, the New FLEX Building has the capacity to withstand the GMRS by comparison to the ASCE 7-10 wind loads to which it was originally designed; i.e., the demands on the New FLEX Building due to wind loads exceed the demands on the building due to GMRS-level seismic loads.

Non-Seismic Category 1 Structures

The following are the Non-Seismic Category 1 Structures that could affect the operator pathways, portable equipment pathways, and/or otherwise negatively affect the station’s ability to execute its FLEX strategies during and/or after a GMRS-level seismic event:

- Hardened Pipe Vent (HPV) Tornado Missile Barrier
- Plant Administration Building (Addition)
- Radwaste Building Railroad Car Shelter
- Reactor Building (above EL 1027’-8”; i.e., Refueling Floor)
- Turbine Building Railroad Car Shelter
- Turbine Building (above EL 951’-0”; i.e., Operating Floor)

By walkdowns (documented in Reference 19.7) and an analysis [Reference 19.5] using the guidance and acceptance criteria found in Reference 1, Section H.5, the above buildings have the capacity to withstand the GMRS-level seismic event.

2.4.2 Operator Pathways

The Operator pathways included in the FLEX strategy include hose and cable deployment pathways for the portable FLEX equipment. These hose and cable routes are described in detail in Reference 19.7. In addition to these deployment routes, access routes to the components identified and evaluated as part of the ESEP or as part of FLEX procedures are essential to FLEX implementation. MNGP 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
- Evaluation of the seismic ruggedness for the structures which contain operator pathways
- Operator pathways were reviewed during a walkdown to assess seismic interactions associated with a GMRS level seismic event
- Debris removal capabilities for moderate to smaller seismic interactions

Two procedure changes [References 19.8 and 19.9] were written to ensure that portable tools necessary for operators to execute FLEX strategies during and after a GMRS-level seismic event can be found in areas of the plant that are seismically-robust and accessible via seismically-robust pathways. See Reference 19.7 for further information. Note that the subject portable tools are stored in multiple areas of the site, with the procedure changes written to ensure that the procedures direct operators to tools stored in seismically-robust areas.

References 19.5 and 19.7 provide the detailed documentation associated with the walkdowns and evaluation of these operator pathways and verify that the operator pathways are not negatively affected by the GMRS-level seismic event.

2.4.3 Tie Down of FLEX Portable Equipment

The list of FLEX equipment stored in the New FLEX Building is provided in Attachment 1 of MNGP Procedure OSP-FIR-1489 [Reference 19.2]. The portable equipment from this list not stored in a cabinet or other enclosure is provided in the table below:

Component EPN	Component Description(1)
FPDV14-007	Fire Pump
G-101	#11 120V Portable Diesel Generator
G-507	#12 FLEX 480V Portable Diesel Generator
G34192	Freightliner #1 Truck
P-507	#12 Portable Diesel Water Pump
TRL-2	16 foot BDB Trailer
---	Cartcaddy Trailer Mover
---	Caterpillar 924H Front-End Loader(2)

Notes:
1. Supporting components (hoses, cables, tools, etc.) are stored within or on these components as necessary; see Reference 19.2, Attachment 1 for further information.
2. This component is not listed in the New FLEX Building's inventory in Ref. 19.2, but is described in Refs. 19.3 and 19.5.

Stored equipment was 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.

A detailed evaluation of the tie down of FLEX portable equipment is provided in Reference 19.5. To justify the acceptability of the restraint (or 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.)
- The friction between the equipment and New FLEX Building floor prevents sliding during the GMRS seismic event

MNGP has reviewed the storage requirements (including any tie-down or restraint devices) (see Reference 19.5) 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.

2.4.4 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 MNGP. There are no buried tanks or piping attached to buried tanks within the MNGP FLEX strategy that could be affected by soil failure.

A sampling walkdown of ESEP components and distributed systems attached to ESEP components was performed and documented in References 19.5 and 19.7.

MNGP has reviewed the additional seismic interactions and verified that the Mitigation Strategy is not adversely impacted by the GMRS-level seismic event.

2.4.5 Haul Path

Descriptions of the portable FLEX equipment's haul paths can be found in References 19.5 and 19.7.

Per Reference 19.5, there are no soil liquefaction, slope stability, or seismic interaction issues at MNGP. In addition, on-site capabilities for debris removal to reestablish a haul path following a BDB seismic event exist and are documented in Reference 19.3.

MNGP has thus reviewed the haul paths and verified that the haul paths are not adversely impacted by the BDB seismic event.

3. SPENT FUEL POOL COOLING REVIEW

Spent Fuel Pool Cooling Evaluation

The evaluation of spent fuel pool cooling for MNGP 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 heat-up 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 the MNGP FLEX program document [Reference 19.11] and Letter L-MT-15-047 [Reference 26]. Seismically-robust SFP make-up capabilities are provided using the 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 Fire Protection piping makeup route described in Section CI 3.2.1.4.A of Reference 26 is not seismically-robust and is therefore not considered here.) The seismically-robust sources of make-up water are either the MNGP intake structure or discharge canal.

Makeup Capability

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 [Reference 16]. 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 of this report (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 for the BDB seismic demand.

Level Instrumentation

Per Reference 19.10 and Section 6.4 of Reference 19.7, several components were installed to provide level indication for the SFP in response to NRC Order EA-12-051 [Reference 20] and are relied upon for FLEX implementation. The known test response spectra of these components are determined in Section 8.2.3 of Reference 19.5 to exceed the required GMRS demand. The SFP makeup capability and SFP level instrumentation equipment needed to accomplish SFP cooling strategies are acceptable for the MSA using the guidance of Section H.4.4 of Reference 1. The level instrumentation’s supports are acceptable for design-basis seismic loads per Reference 27.

4. HIGH FREQUENCY REVIEW

The high frequency review is included as Enclosure 1 to this attachment. Section H.4.4 of Reference 1, also referred to as "Path 4," refers to Section H.4.2 of Reference 1 for the methodology and criteria to be applied to the high frequency evaluation required to be performed under Path 4. Therefore, the Enclosure 1 high frequency review was performed using the methodology and criteria described in Section H.4.2 of Reference 1.

MNGP 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 MNGP can be implemented as designed and no further seismic evaluations are necessary.

5. CONCLUSION

Therefore, the FLEX strategies for MNGP as described in the MNGP FLEX program document [Reference 19.11] and Letter L-MT-15-047 [Reference 26] are acceptable as specified and no further seismic evaluations are necessary.

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. MNGP Letter L-MT-14-045, "MNGP Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," May 14, 2014 (ADAMS Accession Numbers ML14136A288 (transmittal letter) and ML14136A289 (attached report)).
4. NRC Letter, "Monticello Nuclear Generating Plant- 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. MF3958)," July 8, 2015 (ADAMS Accession Number ML15175A336).
5. MNGP Letter L-MT-17-025, "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," April 11, 2017 (ADAMS Accession Number ML17101A598).
6. Not used.
7. EPRI 3002004396, Final Report, "High Frequency Program Application Guidance for Functional Confirmation and Fragility Evaluation," July 2015 (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,'" 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," Palo Alto, CA, April 2013.
10. MNGP Letter L-MT-14-093, "Monticello Nuclear Generating Plant: Expedited Seismic Evaluation Process (ESEP) – Augmented Approach to Post-Fukushima Near-Term Task Force (NTTF) 2.1," December 23, 2014, (ADAMS Accession Number ML14357A280).
11. Not used.
12. Not used.
13. Not used.
14. Letter L-MT-17-043, "Monticello Nuclear Generating Plant: Expedited Seismic Evaluation Process (ESEP) – Augmented Approach to Post-Fukushima Near-Term Task Force (NTTF) 2.1 – Commitment Completion," June 14, 2017.
15. Not used.

16. Letter L-MT-16-053, "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," October 28, 2016, (ADAMS Accession Number ML16302A246).
17. 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 No. ML12054A735).
18. ASCE Standard 7-10, "Minimum Design Loads for Buildings and Other Structures," 2013.
19. MNGP Station- and Vendor-Provided Documents
    - 19.1. Vendor Technical Manual NX-259040, Rev. 0, "FLEX Building."
    - 19.2. Procedure OSP-FIR-1489, Rev. 19, "B.5.B./FLEX Equipment Inventory."
    - 19.3. Procedure C.5-4102, Rev. 0, "FLEX Debris Removal."
    - 19.4. Calculation 16-056 (S&A Calculation 16Q0391-CAL-002), Rev. 0, "Evaluation of New Steel Framed Butler FLEX Building for Design Basis and GMRS Seismic Loads."
    - 19.5. Calculation 17-002 (S&A Calculation 16Q0391-CAL-003), Rev. 1, "Seismic Evaluation of FLEX Systems, Structures and Components."
    - 19.6. Calculation 16-076 (S&A Report 16Q0391-RPT-001), Rev. 0, "Selection of Relays and Switches for High Frequency Seismic Evaluation."
    - 19.7. S&A Report 16Q0391-RPT-007, Rev. 2, "Selection of Structures, Systems, and Components for Seismic Mitigation Strategies Assessment."
    - 19.8. Action Request (AR) 01559655, "B.08.04.03-05, Rev. 29, EC27309."
    - 19.9. Action Request (AR) 01559856, "A.08-06.04, Rev. 1, EC27309."
    - 19.10. Engineering Change (EC) 23419, "Fukushima Response Spent Fuel Pool Instrumentation." Closed 7/20/2015.
    - 19.11. Reference Document FLEX, Rev. 2, "Diverse and Flexible Coping Strategies (FLEX) Program Document."

20. NRC (E. Leeds) Letter to All Power Licensees and Holders of Construction Permits in Active or Deferred Status. EA-12-051, "Order Modifying Licenses with Regard to Reliable Spent Fuel Pool Instrumentation (Effective Immediately)," March 12, 2012 (ADAMS Accession No. ML12056A044).
21. EPRI 3002002997, Final Report, "High Frequency Program: High Frequency Testing Summary," September 2014.
22. EPRI NP-7147-SL, "Seismic Ruggedness of Relays," August 1991.
23. EPRI NP-7147-SLV2, Addendum 1, "Seismic Ruggedness of Relays," September 1993.
24. EPRI NP-7147-SLV2, Addendum 2, "Seismic Ruggedness of Relays," April 1995.
25. EPRI NP-7147, SQUG Advisory 2004-02, "Relay GERS Corrections," September 10, 2004.
26. Letter L-MT-15-047, "Monticello Nuclear Generating Plant: Update of Information to NRC Order EA-12-049 Mitigation Strategies for Beyond-Design-Basis External Events (TAC No. MF0923)," October 12, 2015 (ADAMS Accession Number ML15288A132).
27. Letter L-MT-15-046, "Monticello Nuclear Generating Plant Completion of Required Action by NRC Order EA-12-051 Reliable Spent Fuel Pool Instrumentation (TAC No. MF0924)," July 28, 2015, (ADAMS Accession Number ML15212A114).

ENCLOSURE 1 – HIGH FREQUENCY REVIEW CONSISTENT WITH NEI 12-06, SECTION H.4.2

Refer to Section 1 and 2 of the main body of this submittal attachment for discussion on background and assessment to the MSSHI. Reference numbers used in this enclosure are consistent with the references listed in Section 6 of the main body of this submittal.

As discussed in Section 4 of the main body of this submittal attachment, the Path 4 scope described in Section H.4.4 of Reference 1 includes the requirement for a high frequency evaluation to be performed in accordance with Section H.4.2 of Reference 1. Therefore, the high frequency review for MNGP was performed using the methodology and criteria described in Section H.4.2 of Reference 1.

Note: The selection of components is provided in Reference 19.6.

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 17] can be implemented considering the impacts of the reevaluated seismic hazard. Within the applicable functions identified in Section H.4.2 [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 4 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 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 [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.

1.2 Reactor Vessel Inventory Control

The equipment in the Reactor Vessel Inventory Control function are the same equipment evaluated in the MNGP 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 mitigation strategies and lead to core damage. Control circuits for the Safety Relief Valves (SRV) as well as other Reactor Coolant System (RCS) valves were analyzed as part of the MNGP submittal to address NTTF 2.1 recommendations [Reference 5]. The components covered in this category are a subset of those covered in the RCS/Reactor Vessel Inventory Control category of EPRI 3002004396 MNGP submittal [Reference 5].

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-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. The selected equipment is a subset of equipment relied upon to establish the credited flow paths, electrical distribution, and instrumentation identified in the FLEX responses examined. Permanent plant equipment required for implementation of Phase 1 of the FLEX Strategy was identified by reviewing the FLEX Strategy, FLEX support documents, and associated flow path Piping and Instrumentation Diagrams (P&IDs), instrument elementary diagrams, and electrical distribution one-line diagrams.

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, 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. MNGP credits a portable FLEX generator for Phase 2 response, and the operator actions necessary to install and connect the generator exclude any devices from being identified in this category.

1.5 Summary of Selected Components

A list of the contact devices requiring a high frequency evaluation is provided in Appendix A, Table A-1 of this enclosure.

2. SEISMIC EVALUATION

2.1 Horizontal Seismic Demand

MNGP performed a High Frequency Confirmation using the criteria in Reference 7, which is the same criteria specified for the MSA evaluation specified in Section H.4.2 of Reference 1. The horizontal ground motion applicable to the MSA high frequency evaluation is the same horizontal ground motion identified in the MNGP seismic hazard and screening submittal [Reference 5].

2.2 Vertical Seismic Demand

MNGP performed a High Frequency Confirmation using the criteria in Reference 7, which is the same criteria specified for the MSA Path 2 evaluation [Reference 1]. The vertical ground motion applicable to the MSA Path 2 evaluation is the same vertical ground motion identified in MNGP seismic hazard and screening submittal [Reference 5].

2.3 Component Horizontal Seismic Demand

Per Reference 7, the peak horizontal acceleration is amplified using the following two factors to determine the horizontal in-cabinet response spectrum:

- Horizontal in-structure amplification factor AF_{SH} to account for seismic amplification at floor elevations above the host building's foundation
- Horizontal in-cabinet amplification factor AF_c to account for seismic amplification within the host equipment (cabinet, switchgear, motor control center, etc.)

The in-structure amplification factor AF_{SH} is derived from Figure 4-3 in Reference 7. The in-cabinet amplification factor, AF_c is associated with a given type of cabinet construction, as listed in Equations 4-2a, 4-2b, and 4-2c in Reference 7. The three general cabinet types are identified in the above Reference 7 equations as motor control centers (AF_c = 3.6), switchgear (flexible panels) (AF_c = 7.2), and control cabinets (such as Control Room electrical panels and benchboards) (AF_c = 4.5).

All devices identified for High Frequency Review in Section 1.5 of Enclosure 1 were previously evaluated as part of MNGP's high-frequency submittal report [Reference 5]. Consistent with the evaluations provided as part of this high-frequency submittal report, the enclosures for the components subject to both high frequency confirmation and a seismic mitigating strategies assessment (see Table A-1 of this enclosure) are realistically or conservatively categorized as one of the following:

Table A-1 Enclosure Type	Reference 7 Enclosure Type	AF_c
Instrument Rack, Control Cabinet, or Control Panel	Control Cabinet	4.5
Rigid (see note on following page)	N/A	1.0

Note: Per MNGP's high-frequency submittal report [Reference 5], the racks supporting the TS-13-series and TS-23-series switches were determined to be rigid; i.e., the seismic demands at the points to which the racks are mounted to the MNGP civil structure are equivalent to the seismic demands at the points to which the switches are mounted to the racks. Therefore, there is no seismic amplification due to enclosure structure for these components; i.e., $AF_c = 1.0$.

2.4 Component Vertical Seismic Demand

The component vertical demand is determined using the peak acceleration of the VGMRS between 15 Hz and 40 Hz and amplifying it using the following two factors:

- Vertical in-structure amplification factor AF_{SV} to account for seismic amplification at floor elevations above the host building's foundation
- Vertical in-cabinet amplification factor AF_c to account for seismic amplification within the host equipment (cabinet, switchgear, motor control center, etc.)

The in-structure amplification factor AF_{SV} is derived from Figure 4-4 in Reference 7. The in-cabinet amplification factor, AF_c is derived in Reference 7 and is 4.7 for all cabinet types.

3. CONTACT DEVICES EVALUATION

Per Reference 7, seismic capacities (the highest seismic test level reached by the contact device without chatter or other malfunction) of each subject contact device are determined by the following procedures:

(1) If a contact device was tested as part of the EPRI High Frequency Testing program [Reference 21], then the component seismic capacity from this program is used.

(2) If a contact device was not tested as part of Reference 21, then one or more of the following means to determine the component capacity were used:

(a) Device-specific seismic test reports (either from the station or from the SQURTS testing program).

(b) Generic Equipment Ruggedness Spectra (GERS) capacities per References 22 through 25.

(c) Assembly (e.g. electrical cabinet) tests where the component functional performance was monitored.

(d) Station A-46 program reports.

The high-frequency capacity of each device was evaluated with the component mounting point demand from Section 2 using the criteria in Section 4.5 of Reference 7 and the acceptance criteria in Section H.5 of Reference 1.

A summary of the high-frequency evaluation results is provided in Table A-1 of this enclosure.

A. APPENDIX A – COMPONENTS IDENTIFIED FOR HIGH FREQUENCY EVALUATION

Table A-1: Components Identified for High Frequency Evaluation

No.	Component ID	Component Type	Component System Function	Enclosure Type	Building (Note 1)	Component Evaluation Result (Note 2)
1	dPIS-13-83 (Note 3)	Process Switch	FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
2	dPIS-13-84 (Note 3)	Process Switch	FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
3	dPIS-23-76A	Process Switch	RV Inventory Control	Instrument Rack	RB	Capacity > Demand
4	dPIS-23-76B	Process Switch	RV Inventory Control	Instrument Rack	RB	Capacity > Demand
5	PS-13-67A	Process Switch	FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
6	PS-13-87A (Note 3)	Process Switch	RV Inventory Control & FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
7	PS-13-87B (Note 3)	Process Switch	RV Inventory Control & FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
8	PS-13-87C (Note 3)	Process Switch	RV Inventory Control & FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
9	PS-13-87D (Note 3)	Process Switch	RV Inventory Control & FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
10	PS-13-72A	Process Switch	FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
11	PS-13-72B	Process Switch	FLEX Phase 1	Instrument Rack	RB	Capacity > Demand
12	TS-13-79A-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
13	TS-13-79A-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
14	TS-13-79B-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
15	TS-13-79B-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
16	TS-13-79C-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
17	TS-13-79C-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
18	TS-13-79D-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
19	TS-13-79D-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
20	TS-13-80A-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand

No.	Component ID	Component Type	Component System Function	Enclosure Type	Building (Note 1)	Component Evaluation Result (Note 2)
21	TS-13-80A-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
22	TS-13-80B-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
23	TS-13-80B-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
24	TS-13-80C-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
25	TS-13-80C-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
26	TS-13-80D-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
27	TS-13-80D-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
28	TS-13-81A-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
29	TS-13-81A-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
30	TS-13-81B-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
31	TS-13-81B-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
32	TS-13-81C-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
33	TS-13-81C-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
34	TS-13-81D-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
35	TS-13-81D-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
36	TS-13-82A-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
37	TS-13-82A-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
38	TS-13-82B-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
39	TS-13-82B-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
40	TS-13-82C-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
41	TS-13-82C-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
42	TS-13-82D-1	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand
43	TS-13-82D-2	Process Switch	RV Inventory Control & FLEX Phase 1	Rigid	RB	Capacity > Demand

No.	Component ID	Component Type	Component System Function	Enclosure Type	Building (Note 1)	Component Evaluation Result (Note 2)
44	TS-23-101A-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
45	TS-23-101A-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
46	TS-23-101B-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
47	TS-23-101B-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
48	TS-23-101C-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
49	TS-23-101C-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
50	TS-23-101D-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
51	TS-23-101D-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
52	TS-23-102A-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
53	TS-23-102A-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
54	TS-23-102B-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
55	TS-23-102B-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
56	TS-23-102C-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
57	TS-23-102C-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
58	TS-23-102D-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
59	TS-23-102D-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
60	TS-23-103A-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
61	TS-23-103A-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
62	TS-23-103B-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
63	TS-23-103B-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
64	TS-23-103C-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
65	TS-23-103C-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
66	TS-23-103D-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
67	TS-23-103D-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
68	TS-23-104A-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand

No.	Component ID	Component Type	Component System Function	Enclosure Type	Building (Note 1)	Component Evaluation Result (Note 2)
69	TS-23-104A-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
70	TS-23-104B-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
71	TS-23-104B-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
72	TS-23-104C-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
73	TS-23-104C-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
74	TS-23-104D-1	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
75	TS-23-104D-2	Process Switch	RV Inventory Control	Rigid	RB	Capacity > Demand
76	13A-K3	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
77	13A-K5	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
78	13A-K14	Auxiliary Relay	FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
79	13A-K17	Auxiliary Relay	FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
80	13A-K29	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
81	13A-K30	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Cabinet	PAB	Capacity > Demand
82	23A-K5	Auxiliary Relay	RV Inventory Control	Control Cabinet	PAB	Capacity > Demand
83	23A-K6	Auxiliary Relay	RV Inventory Control	Control Cabinet	PAB	Capacity > Demand
84	23A-K8	Auxiliary Relay	RV Inventory Control	Control Cabinet	PAB	Capacity > Demand
85	23A-K32	Auxiliary Relay	RV Inventory Control	Control Cabinet	PAB	Capacity > Demand
86	23A-K33	Auxiliary Relay	RV Inventory Control	Control Cabinet	PAB	Capacity > Demand
87	13A-K26	Auxiliary Relay	FLEX Phase 1	Control Cabinet	PAB	Chatter Acceptable (Note 4)
88	13A-K6	Auxiliary Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
89	13A-K10	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Panel	PAB	Capacity > Demand
90	13A-K11	Auxiliary Relay	FLEX Phase 1	Control Panel	PAB	Capacity > Demand
91	13A-K22	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Panel	PAB	Capacity > Demand
92	13A-K32	Auxiliary Relay	RV Inventory Control & FLEX Phase 1	Control Panel	PAB	Capacity > Demand

No.	Component ID	Component Type	Component System Function	Enclosure Type	Building (Note 1)	Component Evaluation Result (Note 2)
93	23A-K2	Auxiliary Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
94	23A-K4	Auxiliary Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
95	23A-K27	Auxiliary Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
96	23A-K35	Auxiliary Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
97	13A-K7	Timing Relay	RV Inventory Control & FLEX Phase 1	Control Panel	PAB	Capacity > Demand
98	13A-K31	Timing Relay	RV Inventory Control & FLEX Phase 1	Control Panel	PAB	Capacity > Demand
99	13A-K33	Timing Relay	FLEX Phase 1	Control Panel	PAB	Capacity > Demand
100	23A-K9	Time Delay Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand
101	23A-K34	Time Delay Relay	RV Inventory Control	Control Panel	PAB	Capacity > Demand

Notes:

(1) MNGP Building Name Abbreviations:
(a) RB: Reactor Building
(b) PAB: Plant Administration Building

(2) Seismic demands and capacities for these components can be found in Reference 5.

(3) It was stated in Reference 5 that the high-frequency seismic adequacy (i.e., seismic capacity greater than seismic demand) of this component is only valid following MNGP's planned replacement of the existing component. This replacement has since occurred [Reference 14], and thus this component, as now installed at MNGP, has a seismic capacity greater than its seismic demand.

(4) Chatter in component 13A-K26 due to a seismic event was found to not negatively affect the station's response to the seismic event (see References 5 and 14).

(5) High-frequency confirmation components listed in Table B-1 of Reference 5 that are part of AC/DC Power Support Systems are not included in this table, as these components would be lost during an Extended Loss of AC Power (ELAP) and thus are not within the scope of a seismic mitigating strategies assessment per Reference 1.