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April 11, 2017

L-MT-17-025
10 CFR 50.54(f)

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

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

References:

1) NRC Letter, "Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," dated March 12, 2012. (ADAMS Accession No. ML12053A340)

2) NRC Letter, "Electric Power Research Institute Final Draft Report XXXXXX, 'Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic,' As An Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations," dated May 7, 2013. (ADAMS Accession No. ML13106A331)

3) NSPM letter, "Request Commitment Change for Response to NRC Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," L-MT-14-027, dated March 31, 2014. (ADAMS Accession No. ML14090A297)

4) NSPM letter, "Interim Evaluation in Response to the NRC Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," L-MT-14-035, dated April 3, 2014. (ADAMS Accession No. ML14093B361)

5) NSPM letter, “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 Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,” L-MT-14-045, dated May 14, 2014. (ADAMS Accession No. ML14136A288)

6) NRC Letter, “Screening and Prioritization Results Regarding Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident,” dated May 9, 2014. (ADAMS Accession No. ML14111A147)

7) NEI Letter, “Request for NRC Endorsement of High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation (EPRI 3002004396),” dated July 30, 2015. (ADAMS Accession Nos. ML15223A100 and ML15223A102)

8) NRC Letter, “Endorsement of Electric Power Research Institute Final Draft Report 3002004396: "High Frequency Program: Application Guidance for Functional Confirmation and Fragility," dated September 17, 2015. (ADAMS Accession No. ML15218A569)

9) NRC Letter, “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,” dated October 27, 2015. (ADAMS Accession No. ML15194A015)

10) NSPM Letter, “Monticello Nuclear Generating Plant: Expedited Seismic Evaluation Process (ESEP) – Augmented Approach to Post-Fukushima Near-Term Task Force (NTTF) 2.1 – Response to Requests for Additional Information,” L-MT-15-030, dated May 22, 2015. (ADAMS Accession No. ML15142A862)

11) NSPM Letter, “Monticello Nuclear Generating Plant: Expedited Seismic Evaluation Process (ESEP) – Augmented Approach to Post-Fukushima Near-Term Task Force (NTTF) 2.1 – Proposed Resolution for Components Requiring Action,” L-MT-16-025, dated July 22, 2016. (ADAMS Accession No. ML16204A159)

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 High Frequency Confirmation Evaluation Report.

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a Request for Information per 10 CFR 50.54(f) (Reference 1) to all power reactor licensees. The required response section of Enclosure 1 of Reference 1 indicated that licensees should provide a

Seismic Hazard Evaluation and Screening Report within 1.5 years from the date of the letter for Central and Eastern United States (CEUS) nuclear power plants. By NRC letter dated May 7, 2013 (Reference 2), the date to submit the report was extended to March 31, 2014.

By letter dated March 31, 2014 (Reference 3), NSPM requested an extension for completing the Seismic Hazard Evaluation and Screening Report until May 16, 2014. By letter dated April 3, 2014 (Reference 4), NSPM confirmed the commitment to provide the completed Seismic Hazard Evaluation and Screening Report by May 16, 2014, and also reported that an interim evaluation revealed that the plant can cope with the reevaluated hazard while the expedited approach and risk evaluations are conducted. In addition, NSPM reported that the current seismic design of MNGP continues to provide a safety margin to withstand potential earthquakes exceeding the seismic design basis.

By letter dated May 9, 2014 (Reference 6), the NRC transmitted the results of the screening and prioritization review of the interim seismic hazards reevaluation for MNGP submitted on April 3, 2014 (Reference 4). The final Seismic Hazard Evaluation and Screening Report was submitted to the NRC on May 14, 2014 (Reference 5) which confirmed the interim reported findings. As noted in the May 9, 2014 letter from the NRC, NSPM is to conduct a limited scope High Frequency Evaluation (Confirmation) for MNGP.

Within the May 9, 2014 letter (Reference 6), the NRC acknowledged that these limited scope evaluations would require additional development of the assessment process. By Reference 7, the Nuclear Energy Institute (NEI) submitted an Electric Power Research Institute (EPRI) report entitled, High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation (EPRI 3002004396) for NRC review and endorsement. NRC endorsement was provided by Reference 8. Reference 9 provided the NRC's final seismic hazard evaluation screening determination results and the associated schedules for submittal of the remaining seismic hazard evaluation activities. This letter included an action for NSPM to submit a High Frequency Limited-Scope Evaluation for MNGP by August 31, 2017.

The High Frequency Evaluation Confirmation Report for MNGP, provided in the enclosure to this letter, shows that all high frequency susceptible equipment evaluated within the scoping requirements and using evaluation criteria of Reference 7 for seismic demands and capacities, are acceptable. The report identifies six components that NSPM is planning to install as replacement items to ensure acceptable seismic capabilities for Beyond Design Basis required equipment. These components – instruments that provide isolation of the steam supply to the Reactor Core Isolation Cooling system – were previously identified to the NRC as requiring replacement during the MNGP 2017 refueling outage (References 10 and 11). Reference 10 tracks the component replacements via an NRC commitment.

This transmittal completes the High Frequency Confirmation scope of work described in Sections 4.2 and 6.0 of the report included in Reference 5 for MNGP.

Please contact John Fields, 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 or perjury, that the foregoing is true and correct.

Executed on April 11, 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, USNRC
Resident Inspector, Monticello, USNRC

ENCLOSURE

MONTICELLO NUCLEAR GENERATING PLANT

HIGH FREQUENCY CONFIRMATION REPORT FOR MONTICELLO NUCLEAR GENERATING PLANT IN RESPONSE TO NEAR TERM TASK FORCE (NTTF) 2.1 RECOMMENDATION

63 pages follow

Document ID: 16Q0391-RPT-002 Title: High Frequency Confirmation Report for Monticello Nuclear Generating Plant in Response to Near Term Task Force (NTTF) 2.1 Recommendation

Document Type:

Criteria ☐ Interface ☐ Report ☒ Specification ☐ Other ☐ Drawing ☐

Project Name: MNGP NTTF R2.1 and NEI 12-06, Appendix H Assessments
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:

Initial Issue (Rev. 0)		
Originated by: F. Ganatra	[signature]	Date: 11/28/2016
Checked by: M. Wodarcyk	[signature]	Date: 02/03/2017
Approved by: M. Delaney	[signature]	Date: 02/03/2017

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S&A Stevenson & Associates	DOCUMENT APPROVAL SHEET Figure 2.8	PROJECT NO. 16Q0391

Executive Summary

The purpose of this report is to provide information as requested by the Nuclear Regulatory Commission (NRC) in its March 12, 2012 letter issued to all power reactor licensees and holders of construction permits in active or deferred status [1]. In particular, this report provides information requested to address the High Frequency Confirmation requirements of Item (4), Enclosure 1, Recommendation 2.1: Seismic, of the March 12, 2012 letter [1].

Following the accident at the Fukushima Dai-ichi nuclear power plant resulting from the March 11, 2011, Great Tohoku Earthquake and subsequent tsunami, the Nuclear Regulatory Commission (NRC) established a Near Term Task Force (NTTF) to conduct a systematic review of NRC processes and regulations and to determine if the agency should make additional improvements to its regulatory system. The NTTF developed a set of recommendations [15] intended to clarify and strengthen the regulatory framework for protection against natural phenomena. Subsequently, the NRC issued a 50.54(f) letter on March 12, 2012 [1], requesting information to assure that these recommendations are addressed by all U.S. nuclear power plants. The 50.54(f) letter requests that licensees and holders of construction permits under 10 CFR Part 50 reevaluate the seismic hazards at their sites against present-day NRC requirements and guidance. Included in the 50.54(f) letter was a request that licensees' perform a "confirmation, if necessary, that SSCs [structures, systems, and components], which may be affected by high-frequency ground motion, will maintain their functions important to safety."

EPRI 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic" [6] provided screening, prioritization, and implementation details to the U.S. nuclear utility industry for responding to the NRC 50.54(f) letter. This report was developed with NRC participation and was subsequently endorsed by the NRC. The SPID included guidance for determining which plants should perform a High Frequency Confirmation and identified the types of components that should be evaluated in the evaluation.

Subsequent guidance for performing a High Frequency Confirmation was provided in EPRI 3002004396, "High Frequency Program, Application Guidance for Functional Confirmation and Fragility Evaluation," [8] and was endorsed by the NRC in a letter dated September 17, 2015 [3]. Final screening identifying plants needing to perform a High Frequency Confirmation was provided by NRC in a letter dated October 27, 2015 [2].

This report describes the High Frequency Confirmation evaluation undertaken for Monticello Nuclear Generating Plant (MNGP). The objective of this report is to provide summary information describing the High Frequency Confirmation evaluations and results. 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.

EPRI 3002004396 [8] is used for the MNGP engineering evaluations described in this report. In accordance with Reference [8], the following topics are addressed in the subsequent sections of this report:

- Process of selecting components and a list of specific components for high-frequency confirmation

- Estimation of a vertical ground motion response spectrum (GMRS)
- Estimation of in-cabinet seismic demand for subject components
- Estimation of in-cabinet seismic capacity for subject components
- Summary of subject components' high-frequency evaluations

1 Introduction

1.1 Purpose

The purpose of this report is to provide information as requested by the NRC in its March 12, 2012 50.54(f) letter issued to all power reactor licensees and holders of construction permits in active or deferred status [1]. In particular, this report provides requested information to address the High Frequency Confirmation requirements of Item (4), Enclosure 1, Recommendation 2.1: Seismic, of the March 12, 2012 letter [1].

1.2 Background

Following the accident at the Fukushima Dai-ichi nuclear power plant resulting from the March 11, 2011, Great Tohoku Earthquake and subsequent tsunami, the Nuclear Regulatory Commission (NRC) established a Near Term Task Force (NTTF) to conduct a systematic review of NRC processes and regulations and to determine if the agency should make additional improvements to its regulatory system. The NTTF developed a set of recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. Subsequently, the NRC issued a 50.54(f) letter on March 12, 2012 [1], requesting information to assure that these recommendations are addressed by all U.S. nuclear power plants. The 50.54(f) letter requests that licensees and holders of construction permits under 10 CFR Part 50 reevaluate the seismic hazards at their sites against present-day NRC requirements and guidance. Included in the 50.54(f) letter was a request that licensees' perform a "confirmation, if necessary, that SSCs, which may be affected by high-frequency ground motion, will maintain their functions important to safety."

EPRI 1025287, "Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic" [6] provided screening, prioritization, and implementation details to the U.S. nuclear utility industry for responding to the NRC 50.54(f) letter. This report was developed with NRC participation and is endorsed by the NRC. The SPID included guidance for determining which plants should perform a High Frequency Confirmation and identified the types of components that should be evaluated in the evaluation.

Subsequent guidance for performing a High Frequency Confirmation was provided in EPRI 3002004396, "High Frequency Program, Application Guidance for Functional Confirmation and Fragility Evaluation," [8] and was endorsed by the NRC in a letter dated September 17, 2015 [3]. Final screening identifying plants needing to perform a High Frequency Confirmation was provided by NRC in a letter dated October 27, 2015 [2].

On May 14, 2014, MNGP submitted a reevaluated seismic hazard to the NRC as a part of the Seismic Hazard and Screening Report [4]. By letter dated October 27, 2015 [2], the NRC transmitted the results of the screening and prioritization review of the seismic hazards reevaluation.

This report describes the High Frequency Confirmation evaluation undertaken for MNGP using the methodologies in EPRI 3002004396, "High Frequency Program, Application Guidance for

Functional Confirmation and Fragility Evaluation," as endorsed by the NRC in a letter dated September 17, 2015 [3].

The objective of this report is to provide summary information describing the High Frequency Confirmation evaluations and results. The level of detail provided in the report is intended to enable NRC to understand the inputs used, the evaluations performed, and the conclusions made as a result of the evaluations.

1.3 APPROACH

EPRI 3002004396 [8] is used for the MNGP engineering evaluations described in this report. Section 4.1 of Reference [8] provided general steps to follow for the high frequency confirmation component evaluation. Accordingly, the following topics are addressed in the subsequent sections of this report:

- MNGP Safe Shutdown Earthquake (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

1.4 PLANT SCREENING

MNGP submitted reevaluated seismic hazard information including GMRS and seismic hazard information to the NRC on May 14, 2014, [4]. In a letter dated July 8, 2015, the NRC staff concluded that the submitted GMRS adequately characterizes the reevaluated seismic hazard for the MNGP site [14].

The NRC final screening determination letter concluded [2] that the MNGP GMRS to SSE comparison resulted in a need to perform a High Frequency Confirmation in accordance with the screening criteria in the SPID [6].

1.5 REPORT DOCUMENTATION

Section 2 describes the selection of devices. The identified devices are evaluated in Reference [17] for the seismic demand specified in Section 3 using the evaluation criteria discussed in Section 4. The overall conclusion is discussed in Section 5.

Table B-1 lists the devices identified in Section 2 and provides the results of the evaluations performed in accordance with Section 3 and Section 4.

2 Selection of Components for High-Frequency Screening

The fundamental objective of the high frequency confirmation review is to determine whether the occurrence of a seismic event could cause credited FLEX/mitigating strategies equipment to fail to perform as necessary. An optimized evaluation process is applied that focuses on achieving a safe and stable plant state following a seismic event. As described in Reference [8], this state is achieved by confirming that key plant safety functions critical to immediate plant safety are preserved (reactor trip, reactor vessel inventory and pressure control, and core cooling) and that the plant operators have the necessary power available to achieve and maintain this state immediately following the seismic event (Alternating Current/Direct Current (AC/DC) power support systems).

Within the applicable functions, the components that would need a high frequency confirmation are contact control devices subject to intermittent states in seal-in or lockout circuits. Accordingly, the objective of the review as stated in Section 4.2.1 of Reference [8] is to determine if seismic induced high frequency relay chatter would prevent the completion of the following key functions.

2.1 Reactor Trip/SCRAM

The reactor trip/SCRAM function is identified as a key function in Reference [8] to be considered in the High Frequency Confirmation. The same report also states 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."

2.2 Reactor Vessel Inventory Control

The reactor coolant system/reactor vessel inventory control systems were reviewed for contact control devices in seal-in and lockout (SILO) circuits that would create a Loss of Coolant Accident (LOCA). The focus of the review was contact control devices that could lead to a significant leak path. Check valves in series with active valves would prevent significant leaks due to misoperation of the active valve; therefore, SILO circuit reviews were not required for those active valves.

The process/criteria for assessing potential reactor coolant leak path valves is to review all Piping and Instrumentation Diagrams (P&ID's) attached to the Reactor Coolant System (RCS) and include all active isolation valves and any active second valve upstream or downstream that is assumed to be required to be closed during normal operation or close upon an initiating event (LOCA or Seismic). A table with the valves and associated P&ID is included in Table B-2 of this report.

Manual valves that are normally closed are assumed to remain closed and a second simple check valve is assumed to function and not be a Multiple Spurious Failure.

On BWR's the instrument lines that are 1" or less, in general, are assumed to have restricting orifices that are designed to mitigate any leakage due to make up.

The EPRI High Frequency Confirmation guidance [8] assumes AC power is available, and thus control devices for AC powered valves are included. The discussion of DC powered valves in this section applies. This section describes the analysis of devices controlling the valves listed in Attachment B, Table B-2 of this report. Based on this analysis, there are four valves that meet the criteria for selection in this category.

Table B-2 contains a list of valves analyzed and the resultant devices selected which are also identified below. Devices controlling the valves listed in Table B-1 were selected based on the analysis detailed below.

Nuclear Steam Supply Shutoff Valves

Reactor Head Vent Valve CV-2371

This valve is normally closed and is controlled by Reactor Vent Valve 2-17 [23]. Control of 2-17 is via relay SOL 2-17. There is no seal-in circuit with this relay so the valve is not affected by SILO.

Safety Relief Valves RV-2-71A/B/C/D/E/F/G/H

Electrical control for RV-2-71A/C/D is via relays SV2-71A/C/D [24]. In order to energize these relays, relays 2E-K6A/B or 2E-K7A/B need to be energized. These relays are protected from seal-in condition by relays 2E-K10A/B and 2E-K12A/B, which cannot seal-in. Thus, these valves are not affected by SILO.

Electrical control for RV-2-71B is via a rugged hand control switch 2E-S4B. Thus, this valve is not affected by SILO.

Electrical control for RV-2-71E/G/H is via relays SV2-71J/K/L [25, 26]. There are no pathways in which chatter could cause a seal-in and prevent the valve from closing. Thus, these valves are not affected by SILO.

Electrical control for RV-2-71F is via relay SV2-71M [27]. This relay is protected by rugged hand switches S22, HS-S22A, and JS-S43, and thus is not affected by SILO [26].

Main Steam Line Drain Valve MO-2373

The desired state of this valve is closed and there is no seal-in circuit on the OPEN circuit. There is a seal-in circuit on the CLOSE circuit, but it would take the valve into the desired state [28]. Thus, this valve is not affected by SILO.

Main Steam Isolation Valves AO-2-80A/B/C/D

These valves are normally closed and their desired position is closed. There is no seal-in circuitry that could cause them to stay open [29]. Thus, these valves are not affected by SILO.

Reactor Water Clean-Up (RWCU) Valves

RWCU Inlet Inboard Isolation Valve MO-2397

The desired state of this valve is closed and there is no seal-in circuit on the OPEN circuit. There is a seal-in circuit on the CLOSE circuit, but it would take the valve into the desired state [30]. Thus, this valve is not affected by SILO.

Reactor Core Isolation Cooling (RCIC) Valves

RCIC Steam Supply Isolation Valve MO-2075

This valve is normally open and needs to stay open. There is seal-in circuitry in the CLOSE circuit but none in the OPEN circuit [31]. The seal-in is controlled by RCIC Auto Isolation logic via relays 13A-K32 and 13A-K22 [19, 20]. Both of these relays are prone to seal-in if contact chattering happens on any of their logic. The seal-in will continue until limit switch LS-8 pops open when the valve is fully closed. Opening the valve after it has been closed requires manual action via switch 13A-S1 [31]. Thus, this valve is affected by SILO.

DC RCIC Steam Supply Isolation Valve MO-2076

This valve is normally open and needs to stay open. There is seal-in circuitry in both the CLOSE and OPEN circuit [32]. The CLOSE seal-in is controlled by RCIC Auto Isolation logic via relays 13A-K32 and 13A-K22 [19, 20]. Both of these relays are prone to seal-in if contact chattering happens on any of their logic, consequentially causing the valve to spuriously close. A seal-in on 13A-K22 will prevent the valve from being opened even after the chatter has ceased. Thus, this valve is affected by SILO.

Residual Heat Removal (RHR) Valves

RHR Suction Line Equalizer Valve MO-4086

Neither open nor close circuits have seal-in circuitry. In addition, this valve is operated solely by rugged hand switches [33]. Thus, it is not affected by SILO.

RHR Discharge Lines Equalizer Valves MO-4085A/B

These valves' desired state is closed so a seal-in should not happen on the OPEN circuit. A seal-in exists in the CLOSE circuit but this will take the valve to the desired position. There is no path for a seal-in of the OPEN circuit [33]. Thus, these valves are not affected by SILO.

RHR Shutdown Cooling Isolation Valve MO-2029

This motor-operated valve is normally closed but can be opened if manual switch contact 16A-S9 and contact 16A-K29 are closed simultaneously [34]. However, there is no seal-in circuit, so the valve will reclose after the period of chatter. Seal-in in the CLOSE circuit is protected by rugged limit switch LS-8 and torque switch TS-17, which open when the valve is fully closed and torqued, respectively. Thus, this valve is not affected by SILO.

Testable Check Valves AO-10-46A/B

Note 8 on the P&ID tells us that "solenoid valve SV-2016, actuator, limit switches and air lines associated with valve AO-10-46A have been abandoned in place" [35]. Note 7 on the P&ID tells us that "solenoid valve SV-2017, actuator, limit switches and air lines associated with valve AO-10-46B have been abandoned in place" [36]. Thus, they act as check valves and are insensitive to chatter.

Core Spray Valves

Testable Check Valves AO-14-13A/B

Note 2 and Note 3 on the Core Spray System P&ID state that all electronic controls of these valves have been abandoned in place [37]. Thus, they act as check valves and are considered insensitive to chatter.

High Pressure Core Injection (HPCI) Valves

HPCI Steam Supply Line Isolation Valve MO-2034

This valve is normally open and needs to be open to support HPCI operation. There is seal-in circuitry in the CLOSE circuit but none in the OPEN circuit [38]. The CLOSE seal-in is controlled by HPCI Auto Isolation logic via relays 23A-K27/35 [39]. These relays are prone to seal-in if contact chattering happens in any of its logic, consequentially causing the valve to spuriously close. Opening the valve is only possible if switch 23A-S2 is turned to the open position. Since this is a manual switch requiring operator action, this valve is affected by SILO and may not open.

DC HPCI Steam Supply Line Isolation Valve MO-2035

This valve is normally open and needs to be open. Relays 23A-K27/35, controlled by HPCI Auto Isolation logic, are prone to seal-in if contact chattering happens in any of their logic, consequentially causing the valve to spuriously close [39]. Opening the valve is only possible if switch 23A-S3 is turned to the open position [38]. Since this is a manual switch requiring operator action, this valve is affected by SILO and may not open.

2.3 Reactor Vessel Pressure Control

The reactor vessel pressure control function is identified as a key function in Reference [8] to be considered in the High Frequency Confirmation. However, the same report also states that "required post event pressure control is typically provided by passive devices" and that "no specific high frequency component chatter review is required for this function."

2.4 Core Cooling

EPRI 3002004396 [8] requires confirmation that one train of AC-independent cooling is not challenged by a SILO device. Since the FLEX Phase 1 response includes the steam turbine-driven RCIC pump and its ancillary components, this requirement is a subset of components covered by the NEI 12-06 Appendix H [16] FLEX Phase 1 Category.

NEI 12-06 Appendix H [16] requires the analysis of relays and contactors that may lead to circuit seal-ins or lockouts that could impede the Phase 1 FLEX capabilities, including vital buses fed by station batteries through inverters. Phase 1 of the FLEX Strategy is defined in NEI 12-06 [16] 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.

In order to select the Phase 1 SILO devices, an Expedited Seismic Equipment List (ESEL) specific to FLEX Phase 1 was derived in Calculation 14-053 [21, 22] from installed permanent plant equipment identified in the plant-specific Overall Integrated Plan (OIP) [105] and periodic updates [106, 107, 108, 109, 110, 111, 112], using the EPRI Seismic Evaluation Guidance [104].

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 [16], omitting response strategies only valid in an outage.

The ESEL 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 [105, 106, 107, 108, 109, 110, 111, 112] 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.

For the Phase 1 FLEX response, Monticello credits their steam turbine-driven Reactor Core Isolation Cooling (RCIC) Pump and High Pressure Coolant Injection (HPCI) Pump to provide core decay-heat cooling. However, after the initial automatic initiation and trip of RCIC and HPCI, RCIC will be used as the primary strategy to provide makeup water to the reactor [105]. For this effort, the flow paths credited include: (1) Steam from the reactor pressure vessel to the RCIC turbine and exhausted to the suppression pool; (2) Coolant from the suppression pool to the reactor via the RCIC pump; and (3) Steam from the reactor pressure vessel vented to the suppression pool via the Safety Relief Valves (SRVs).

For every FLEX Phase 1 item on the ESEL requiring control, the associated control diagrams were reviewed and the control cabinets or panels critical to the item's control were included on the ESEL. Power sources for the required control circuits were traced and any power distribution component necessary for the control circuits (and not already identified) was added as well. Relay control logic was analyzed and relays or switches that could cause seal-in or lockout and leave the circuit in a state other than what would be desired for FLEX response were identified and added to the ESEL. The criteria for inclusion specific to the ESEL is as follows:

(Criterion 1)

The Phase 1 FLEX Strategy for Monticello, as described in the Overall Integrated Plan [105] and its updates [106, 107, 108, 109, 110, 111, 112], relies on permanent plant equipment in the steam turbine-driven RCIC and SRV systems. Control elementary diagrams, piping and instrumentation diagrams, and system technical manuals were reviewed as necessary to determine which relays and switches have an impact on the operation of these systems. Any impact to AC powered valves in these systems was ignored as loss of AC power is a requirement for entry into FLEX.

(Criterion 2)

Before entry into FLEX a site must first (in this case) experience a beyond design-basis seismic event coupled with an Extended Loss of AC Power (ELAP) and Loss of Ultimate Heat Sink (LUHS). In this event scenario the site would need time to assess plant conditions before it would declare itself in an ELAP/LUHS condition. By the time this condition is declared it is expected the period of strong shaking would be over and thus any temporary effect of relay chatter would be cleared before entry into FLEX. In some control circuits, however, contacts are fed back into the control to electrically seal-in and cause a sustained change of state in the control circuit. This circuit seal-in may cause valves to change position, pumps to change state, or controls to lock-out operation of systems or components. Control elementary diagrams, piping and instrumentation diagrams, and system technical manuals were reviewed as necessary to determine the potential of chatter (in the relays and switches identified by Criterion 1) to cause a seal-in or lock-out. Only those relays and switches with the potential to cause seal-in or lock-out were screened-in for evaluation, relays and switches with only the potential to cause temporary conditions that clear on their own before entry into FLEX were screened out.

(Criterion 3)

In some cases spurious chatter leads to a circuit seal-in or lock-out that either has no effect on the FLEX Response, or has a beneficial effect on the FLEX Response (for example the unintentional change of state in a valve that aids in aligning a credited flow path). Contact chatter having no system effect or beneficial system effects allow a relay or switch to be functionally screened out of consideration for this category. Control elementary diagrams, piping and instrumentation diagrams, and system technical manuals were reviewed as necessary to determine the potential impact of chatter (in the relays and switches identified by Criterion 2) on the operation of the Phase 1 systems. Only those relays and switches which could cause an undesirable effect on these systems were screened-in.

The core cooling systems were reviewed for contact control devices in seal-in and lockout circuits that would prevent at least a single train of non-AC power driven decay heat removal from functioning.

The selection of contact devices for the Safety Relief Valves (SRVs) overlaps with the RCS/Reactor Vessel Inventory Control Category. Refer to Section 2.2 for more information on the analysis of contact devices for these valves.

The selection of contact devices for RCIC was based on the premise that RCIC operation is desired, thus any SILO which would lead to RCIC operation is beneficial and thus does not meet the criteria for selection. Only contact devices which could render the RCIC system inoperable were considered.

The largest vulnerability to RCIC operation following a seismic event is contact chatter leading to a false RCIC Isolation Signal or false Turbine Trip. A false steam line break trip has the potential to delay RCIC operation while confirmatory inspections are being made. Chatter in the contacts of RCIC Isolation Signal Relay 13A-K22 or Steam Line High Differential Pressure Time Delay Relays 13A-K7 and 13A-K31; or coincident chatter in the Steam Line High Area Temperature Isolation Relays 13A-K3, 13A-K5, 13A-K29, and 13A-K30, or Steam Supply Low Pressure Relay 13A-K10; may lead to a RCIC Isolation Signal and seal-in of 13A-K22 [19]. This would cause the RCIC Isolation Valves (MO-275 and MO-276) to close and the RCIC Trip and Throttle Valve (MO-2080) to trip. Similar chatter in the contact devices that drive those relays could also lead to seal-in: dPIS-13-83, dPIS-13-84, TS-13-79(A-D), TS-13-80(A-D), TS¬13-81(A-D), and TS-13-82(A-D) [19, 20].

Any chatter that may lead to the energization of the Trip and Throttle Valve (MO-2080) Remote Trip Circuit is considered as SILO as it will close the valve and require a manual reset prior to restoration of the RCIC system. Chatter in Turbine Trip Auxiliary Relay 13A-K11, or in the devices which control this relay; the Turbine Exhaust High Pressure Relay 13A-K17, the Pump Suction Low Pressure Relay 13A-K14, and the Isolation Signal Relay 13A-K22 [19]. Similar chatter in the contact devices that drive those relays (and not already covered in the RCIC Isolation Signal analysis) could also lead to a turbine trip: PS-13-87(A-D) [19, 20].

Monticello ESEL development is documented in Calculation 14-053 [21, 22]. The contact devices selected as part of that effort appear in Table B-1.

2.5 AC/DC Power Support Systems

The AC and DC power support systems were reviewed for contact control devices in seal-in and lockout circuits that prevent the availability of DC and AC power sources. The following AC and DC power support systems were reviewed:

- Emergency Diesel Generators (EDGs),
- Battery Chargers,
- Inverters,
- EDG Ancillary Systems, and
- Switchgear, Load Centers, and Motor Control Centers (MCCs).

Electrical power, especially DC, is necessary to support achieving and maintaining a stable plant condition following a seismic event. DC power relies on the availability of AC power to recharge the batteries. The availability of AC power is dependent upon the Emergency Diesel Generators (EDGS) and their ancillary support systems. EPRI 3002004396 [8] requires confirmation that the supply of emergency power is not challenged by a SILO device. The tripping of lockout devices or circuit breakers is expected to require some level of diagnosis to determine if the trip was spurious due to contact chatter or in response to an actual system fault. The actions taken to diagnose the fault condition could substantially delay the restoration of emergency power.

In order to ensure contact chatter cannot compromise the emergency power system, control circuits were analyzed for the Emergency Diesel Generators, Battery Chargers, Vital AC Inverters, and Switchgear/Load Centers/MCCs as necessary to distribute power from the EDGs to the Battery Chargers and EDG Ancillary Systems.

General information on the arrangement of safety-related AC and DC systems, as well as operation of the EDGs, was obtained from Monticello's USAR. Monticello has two (2) EDGs which provide emergency power for the unit. Monticello has two (2) divisions of Class 1E loads with one EDG for each division. The Class 1E AC distribution scheme is shown on one-line drawing NF-36298-1 [40]. The Class 1E DC distribution scheme is described in the USAR Section 8.4 [41] and shown on one-line drawing NF-36298-2 [42].

The analysis necessary to identify contact devices in this category relies on conservative worse-case initial conditions and presumptions regarding event progression. The analysis considers the reactor is operating at power with no equipment failures or LOCA prior to the seismic event. The Emergency Diesel Generators are not operating but are available. The seismic event is presumed to cause a Loss of Offsite Power (LOOP) and a normal reactor SCRAM.

In response to bus undervoltage relaying detecting the LOOP, the Class 1E control systems must automatically shed loads, start the EDGs, and sequentially load the diesel generators as designed. Ancillary systems required for EDG operation as well as Class 1E battery chargers and inverters must function as necessary. The goal of this analysis is to identify any vulnerable contact devices which could chatter during the seismic event, seal-in or lock-out, and prevent these systems from performing their intended safety-related function of supplying electrical power during the LOOP.

The following sections contain a description of the analysis for each element of the AC/DC Support Systems. Contact devices are identified by description in this narrative and apply to all divisions. The contact devices selected as part of that effort appear in Table B-1.

Emergency Diesel Generators

The analysis of the Emergency Diesel Generators, G-3A and G-3B, is broken down into the generator protective relaying and diesel engine control. General descriptions of these systems and controls appear in the USAR Section 8.4 [41].

Generator Protective Relaying

The control circuit for the G-3A Output Circuit Breaker (105-502) includes interlocking contacts in the breaker closing logic [43]. The Diesel Generator Lockout relay (186-502) will prevent remote manual or automatic closure of the breaker if tripped. This relay would have to be mechanically reset. In addition to chatter tripping 186-502, it could also be tripped by tripping the Phase Overcurrent relay (151V-502), Differential Current relay (187-502), or the Anti-Motoring relay (167-502). In addition, the Bus Lockout relay (186-5) could prevent remote manual or automatic closure [44].

Diesel Engine Control

Chatter analysis for the diesel engine control was performed on the start and shutdown circuits of each EDG [43, 45, 46, 47, 48, 49, 50] [51, 52, 53, 54, 55, 56, 57, 58, 59] (G-3A and G-3B). Two conditions were considered for EDG starting: Emergency Response due to LOOP and Manual Start. In both conditions, tripping of the Overspeed Trip Limit Relay (OTR) will prevent starting the EDG. This relay could be sealed in by chattering of the Over Speed Limit Trip Switch (OTLS), which must be mechanically reset. Chattering on other diesel control panel internal relays could cause transient starting problems and inaccurate indications but would resolve once the period of shaking is complete (none of the start sequence relays will seal in once speed sensing is regained). In the automatic starting circuit for the EDGs, chatter in the automatic starting logic relays could only provide an automatic start signal, not prevent one.

The EDGs do not have any automatic circuitry shutdowns outside of the mechanical overspeed trip.

Battery Chargers

Analysis of 125 VDC battery chargers D10, D20, and D40, was performed using information from Section 8.5 of the USAR [60] as well as vendor schematic diagrams [61, 62, 63]. Each battery charger has a high-voltage shutdown (HVSD) feature, and alarms for charger supply undervoltage and 125 VDC bus high/low voltage conditions. Since the HVSD circuit is located inside the charger, chatter will not induce an unwanted high voltage shutdown of these chargers.

Chatter Analysis on the 250 VDC battery chargers D52, D53, D54, D70, D80, and D90, was performed using information from Section 8.5 of the USAR as well as vendor schematic diagrams [64, 65, 66, 67, 68]. Under and overvoltage relays provide alarms if voltage on the bus increases or decreases below preset values. The internal high voltage shutdown circuit of the chargers D52, D53, D70, and D80 was replaced by overvoltage relays outside of the charger that will shut them down if energized. Chargers D54 and D90 have spare HVSD contacts that are not connected. Chatter in overvoltage relays 59-1 will cause a shutdown in battery chargers D52 and D70. Chatter in overvoltage relays 59-2 will cause a shutdown in battery chargers D53 and D80.

Inverters

Analysis of the schematics for the Division I and II 120V inverters (Y71 and Y81) [69] revealed no vulnerable contact devices and thus chatter analysis is unnecessary.

EDG Ancillary Systems

In order to start and operate the Emergency Diesel Generators, a number of components and systems are required. For the purpose of identifying electrical contact devices, only systems and components which are electrically controlled are analyzed.

Starting Air

The starting air system consists of two independent banks of three storage tanks, also referred to as receivers, having sufficient capacity to start the diesel engine five times without recharging from the air compressor. The system is passive with the exception of the air start solenoids which enable the air start motors. The air start solenoids are covered under the EDG engine control analysis discussed previously in this section.

Combustion Air Intake and Exhaust

The combustion air intake is a passive system taking outside air from the roof and filtering the air intake, removing materials down to 100 microns prior to entering the engine. The system is a passive system and not subject to high frequency failures.

The exhaust system consists of piping and a roof mounted exhaust silencer. The system is a passive system and not subject to high frequency failures [70].

Lube Oil

The lube oil system contains lube oil pumps, filters, and a turbocharger lube oil pump. The system supplies lubricating oil continuously to the turbocharger, and crankshaft. The Emergency Diesel Generators (G-3A and G-3B) utilize engine-driven mechanical lubrication oil pumps which do not rely on electrical control.

Fuel Oil

The Diesel Generator Fuel Oil System is described in the USAR Section 8.4 [41]. The Diesel Generators utilize engine-driven mechanical pumps and DC-powered auxiliary pumps to supply fuel oil to the engines from the day tanks. The day tanks are re-supplied using AC-powered Diesel Oil Transfer Pumps. Electric driven fuel oil transfer pumps (P-160A/B/C/D) maintain fuel level in the Standby Diesel Generator Day Tanks (T-45A and T-45B). Analysis of the ESW pump circuit breaker control circuits [71, 72] indicates the auto-start has been disabled. Manual control revealed no contacts susceptible to SILO.

Cooling Water

The Emergency Diesel Generator Emergency Service Water System (EDG-ESW) is described in the USAR Section 10.4 [73]. The EDG-ESW system provides cooling water to the EDG. The EDG-

ESW system provides river water to the EDG heat exchangers. The EDG-ESW system gets an auto start signal when the associated EDG reached 125 RPM.

Two ESW pumps, P-111A and P-111B, provide cooling water to the heat exchangers associated with the two EDGs [74, 75]. In automatic mode these pumps are started when the EDG reaches 125rpm [56]. Therefore, these pumps rely on the EDGs being started via the EDG Start Signal. Chatter analysis of the EDG start signal is discussed previously in this section.

Ventilation

The Diesel Generator Enclosure Ventilation System is described in the USAR Section 8.4 [41].The EDG room ventilation consists of a supply fan, and a set of exhaust fans and a recirculation damper for each EDG room.

The EDG room supply fans (V-SF-9 and V-SF-10) shall automatically be capable of removing heat from the EDG rooms to maintain ambient air temperature during EDG operation. In automatic mode, V-SF-9 and V-SF-10 are started via the EDG start signal. Chatter analysis of the EDG start signal is discussed previously in this section. Apart from the SILO devices identified for the EDG start signal, chatter analysis of the control circuits for the supply fans [76, 77] concluded that they do not include SILO devices.

Note: For long-term operation of an EDG, EDG-ESW and ventilation systems are required.

Switchgear, Load Centers, and MCCs

Power distribution from the EDGs to the necessary electrical loads (Battery Chargers, Inverters, Fuel Oil Pumps, and EDG Ventilation Fans) was traced to identify any SILO devices which could lead to a circuit breaker trip and interruption in power. This effort excluded control circuits for the EDG circuit breakers, which are discussed previously in this section, and the ESW Pump breakers which are molded-case (see discussion below), as well as component-specific contactors and their control devices, which are covered in the analysis of each component above. Those medium- and low-voltage circuit breakers in 4160V Essential Safeguards (ESF) Busses and 480V AC Load Centers supplying power to loads identified in this section (battery chargers, EDG ancillary systems, etc.) have been identified for evaluation: 152-502, 152-509, 152-602, 152-609, 52-301, 52-302, 52-304, 52-308, 52-401, 52-403, 52-404, 52-408, 152-408, 152-407, 52-201, and 52-202.

DC Distribution and low voltage Motor Control Center buckets use either Molded-Case Circuit Breakers (MCCBs) or fused disconnects which are both seismically rugged [4, 78, 79, 80, 81, 82, 83, 84, 85, 86] [87, 88, 89, 90, 91, 92, 93]. The only circuit breakers affected by external contact devices not already mentioned were those that distribute power from the 4160V ESF Busses to the 4160/480V step-down transformers (X20, X30, and X40), and from the 4160/480V step-down transformers to the 480V Load Centers. A chatter analysis of the control circuits for these circuit breakers [44, 94, 95, 96, 97] indicates the phase overcurrent relays 151-401, 151-402, 151-308, 151-511, 151-408, 151-610, 150/151-407, 150/151-509, 151-509, 150/151-609, and 151-609; ground fault relays 151N-401, 151N-402, 151N-308, 151N-408, 150G-407, 150G-509, and 150G-609; and bus lockout relays 186-4, 186-5, and 186-6 all could trip the transformer primary or secondary circuit breakers following the seismic event.

2.6 SUMMARY OF SELECTED COMPONENTS

The investigation of high-frequency contact devices as described above was performed in Ref. [18]. A list of the contact devices requiring a high frequency confirmation is provided in Appendix B, Table B-1. The identified devices are evaluated in Ref. [17] per the methodology and description of Section 3 and 4. Results are presented in Section 5 and Table B-1.

3 Seismic Evaluation

3.1 Horizontal Seismic Demand

Per Reference [8], Sect. 4.3, the basis for calculating high-frequency seismic demand on the subject components in the horizontal direction is the MNGP horizontal ground motion response spectrum (GMRS), which was generated as part of the MNGP Seismic Hazard and Screening Report [4] submitted to the NRC on May 14, 2014, and accepted by the NRC on July 8, 2015 [14].

It is noted in Reference [8] that a Foundation Input Response Spectrum (FIRS) may be necessary to evaluate buildings whose foundations are supported at elevations different than the Control Point elevation. Per Ref. [8], p. 3-8, soil layers at soil-founded sites typically shift the frequency range of GMRS-to-foundation input toward the lower-frequency part of the response spectrum. Therefore, the use of the GMRS as a surrogate site motion is acceptable for high-frequency evaluations.

Per Ref. [4], p. 21, MNGP is soil-founded site. The horizontal GMRS values are provided in Table 3-2 of this report.

3.2 Vertical Seismic Demand

As described in Section 3.2 of Reference [8], the horizontal GMRS and site soil conditions are used to calculate the vertical GMRS (VGMRS), which is the basis for calculating high-frequency seismic demand on the subject components in the vertical direction.

The site’s soil mean shear wave velocity vs. depth profile is provided in Reference [4], Table 2.3.2-1 and reproduced on the following page in Table 3-1.

Table 3-1: Soil Mean Shear Wave Velocity Vs. Depth Profile

Layer	Depth (ft)	Depth (m)	Thickness, d_i (ft)	Vs_i (ft/sec)	d_i/Vs_i	Σ [d_i/Vs_i]	Vs30 (ft/s)
1	5	1.52	5	700	0.00714	0.00714	1491
2	10	3.05	5	700	0.00714	0.01429	
3	15	4.57	5	1,400	0.00357	0.01786	
4	20	6.10	5	1,400	0.00357	0.02143	
5	25	7.62	5	1,400	0.00357	0.02500	
6	30	9.14	5	1,400	0.00357	0.02857	
7	35	10.67	5	1,400	0.00357	0.03214	
8	40	12.19	5	1,400	0.00357	0.03571	
9	45	13.72	5	1,400	0.00357	0.03929	
10	50	15.24	5	1,400	0.00357	0.04286	
11	55	16.76	5	1,400	0.00357	0.04643	
12	60	18.29	5	1,400	0.00357	0.05000	
13	65	19.81	5	2,500	0.00200	0.05200	
14	70	21.34	5	2,500	0.00200	0.05400	
15	75	22.86	5	2,500	0.00200	0.05600	
16	80	24.38	5	2,500	0.00200	0.05800	
17	85	25.91	5	2,500	0.00200	0.06000	
18	90	27.43	5	2,500	0.00200	0.06200	
19	95	28.96	5	2,500	0.00200	0.06400	
20	100	30.48	5	2,500	0.00200	0.06600	

Using the shear wave velocity vs. depth profile, the velocity of a shear wave traveling from a depth of 30m (98.43ft) to the surface of the site (Vs30) is calculated per the methodology of Reference [8], Section 3.5.

- The time for a shear wave to travel through each soil layer is calculated by dividing the layer depth (d_i) by the shear wave velocity of the layer (Vs_i).
- The total time for a wave to travel from a depth of 30m to the surface is calculated by adding the travel time through each layer from depths of 0m to 30m ($\Sigma[d_i/Vs_i]$).
- The velocity of a shear wave traveling from a depth of 30m to the surface is therefore the total distance (30m) divided by the total time;
  i.e., $Vs30 = (30m)/\Sigma[d_i/Vs_i]$.
- Note: The shear wave velocity is calculated based on time it takes for the shear wave to travel 30.48m (100ft) instead of 30m (98.43ft). This small change in travel distance will have no impact on identifying soil class type.

The site's soil class is determined by using the site's shear wave velocity (Vs30) and the peak ground acceleration (PGA) of the GMRS and comparing them to the values within Reference [8], Table 3-1. Based on the PGA of 0.153g and the shear wave velocity of 1491ft/s, the site soil class is A-Intermediate.

Once a site soil class is determined, the mean vertical vs. horizontal GMRS ratios (V/H) at each frequency are determined by using the site soil class and its associated V/H values in Reference [8], Table 3-2.

The vertical GMRS is then calculated by multiplying the mean V/H ratio at each frequency by the horizontal GMRS acceleration at the corresponding frequency. It is noted that Reference [8], Table 3-2 values are constant between 0.1Hz and 15Hz.

The V/H ratios and VGMRS values are provided in Table 3-2 of this report.

Figure 3-1 of this report provides a plot of the horizontal GMRS, V/H ratios, and vertical GMRS for MNGP.

Table 3-2: Horizontal and Vertical Ground Motions Response Spectra

Frequency (Hz)	HGMRS (g)	V/H Ratio	VGMRS (g)
100	0.153	0.78	0.119
90	0.154	0.82	0.126
80	0.155	0.86	0.133
70	0.158	0.91	0.144
60	0.167	0.93	0.155
50	0.187	0.95	0.178
40	0.220	0.91	0.200
35	0.237	0.86	0.204
30	0.259	0.79	0.205
25	0.284	0.72	0.204
20	0.321	0.67	0.215
15	0.339	0.67	0.227
12.5	0.327	0.67	0.219
10	0.324	0.67	0.217
9	0.313	0.67	0.210
8	0.302	0.67	0.202
7	0.294	0.67	0.197
6	0.263	0.67	0.176
5	0.215	0.67	0.144
4	0.184	0.67	0.123
3.5	0.164	0.67	0.110
3	0.143	0.67	0.096
2.5	0.119	0.67	0.080
2	0.091	0.67	0.061
1.5	0.060	0.67	0.040
1.25	0.048	0.67	0.032
1	0.038	0.67	0.025
0.9	0.036	0.67	0.024
0.8	0.035	0.67	0.024
0.7	0.035	0.67	0.023
0.6	0.034	0.67	0.023
0.5	0.032	0.67	0.022
0.4	0.026	0.67	0.017
0.35	0.023	0.67	0.015
0.3	0.019	0.67	0.013
0.25	0.016	0.67	0.011
0.2	0.013	0.67	0.009
0.15	0.010	0.67	0.006
0.125	0.008	0.67	0.005
0.1	0.006	0.67	0.004

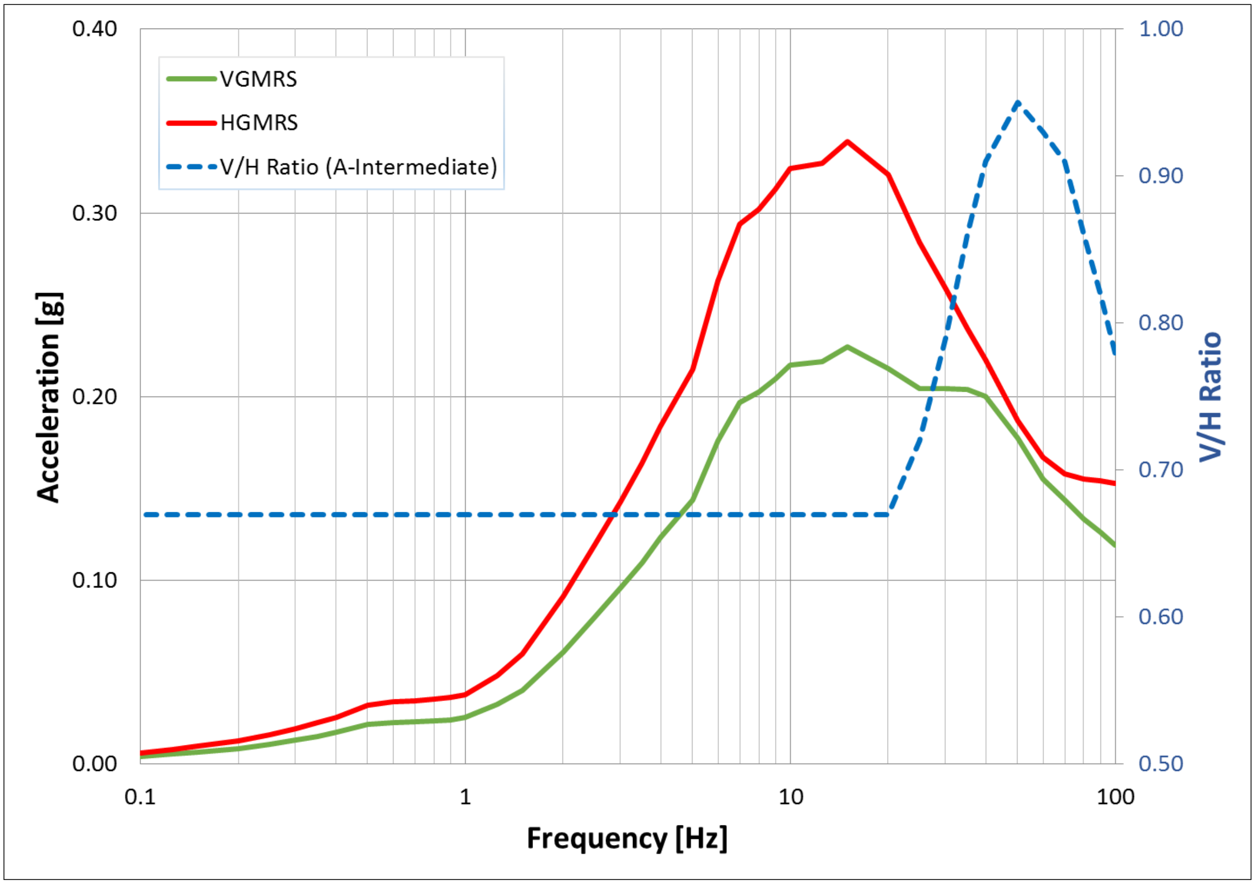

Figure 3-1 Plot of the Horizontal and Vertical Ground Motions Response Spectra and V/H Ratios

3.3 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 [8]. The in-cabinet vertical amplification factor, AF_c is derived in Reference [8] and is 4.7 for all cabinet types.

3.4 COMPONENT HORIZONTAL SEISMIC DEMAND

Per Reference [8] 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 [8]. The in-cabinet horizontal amplification factor, AF_c is associated with a given type of cabinet construction. The three general cabinet types are identified in Reference [8] and Appendix I of EPRI NP-7148-SL [13] assuming 5% in-cabinet response spectrum damping. EPRI NP-7148-SL [13] classified the cabinet types as high amplification structures such as switchgear panels and other similar large flexible panels, medium amplification structures such as control panels and control room benchboard panels, and low amplification structures such as motor control centers.

All of the electrical cabinets containing the components subject to high frequency confirmation (see Table B-1 in Appendix B) can be categorized into one of the in-cabinet amplification categories in Reference [8] as follows:

- Motor Control Centers are typical motor control center cabinets consisting of a lineup of several interconnected sections. Each section is a relatively narrow cabinet structure with height-to-depth ratios of about 4.5 that allow the cabinet framing to be efficiently used in flexure for the dynamic response loading, primarily in the front-to-back direction. This results in higher frame stresses and hence more damping which lowers the cabinet response. In addition, the subject components are not located on large unstiffened panels that could exhibit high local amplifications. These cabinets qualify as low amplification cabinets.
- Switchgear cabinets are large cabinets consisting of a lineup of several interconnected sections typical of the high amplification cabinet category. Each section is a wide box-type structure with height-to-depth ratios of about 1.5 and may include wide stiffened panels. This results in lower stresses and hence less damping which increases the enclosure response. Components can be mounted on the wide panels, which results in the higher in-cabinet amplification factors.

- Control cabinets are in a lineup of several interconnected sections with moderate width. Each section consists of structures with height-to-depth ratios of about 3 which results in moderate frame stresses and damping. The response levels are mid-range between MCCs and switchgear and therefore these cabinets can be considered in the medium amplification category.

4 Contact Device Evaluations

Per Reference [8], seismic capacities (the highest seismic test level reached by the contact device without chatter or other malfunction) for 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 [7], then the component seismic capacity from this program is used.

(2) If a contact device was not tested as part of [7], 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 [9], [10], [11], and [12].

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

  (d) Station A-46 program reports.

(3) The station A-46 program reports are also used to determine if operator action can resolve any inadvertent actuation of the essential components.

The high-frequency capacity of each device was evaluated with the component mounting point demand from Section 3 using the criteria in Section 4.5 of Reference [8]

A summary of the high-frequency evaluation conclusions is provided in Table B-1 in Appendix B of this report.

5 Conclusions

5.1 General Conclusions

MNGP has performed a High Frequency Confirmation evaluation in response to the NRC's 50.54(f) letter [1] using the methods in EPRI report 3002004396 [8].

The evaluation identified a total of 160 components that required seismic high frequency evaluation. As summarized in Table B-1 in Appendix B:

- 149 of the components have adequate seismic capacity.
- Six (6) of the components will have adequate seismic capacity following a previously-planned replacement (see notes below and Section 5.2 of this report).
- One (1) component (13A-K26) has inadequate seismic capacity, but chatter in this device due to a seismic event was found to not negatively affect the station's response to the seismic event.
- The remaining four (4) components are adequate despite their seismic capacities' being less than seismic demand, because any chatter in these four (4) components can be resolved by MNGP operator actions.

Notes

- The components' dPIS-13-83 and dPIS-13-84 manufacturer and model as shown in Table B-1 are the manufacturer and model of proposed replacement switches (Barton Instrument Systems 288A). The adequacy of the dPIS-13-83 and dPIS-13-84 components are only valid following the replacement of the existing switches with the Barton 288A switches shown in Table B-1.
- The components' PS-13-87A, PS-13-87B, PS-13-87C, and PS-13-87D manufacturer and model as shown in Table B-1 are the manufacturer and model of proposed replacement switches (SOR 6RT-B3-U8-C1A-JJTTNQ). The adequacy of the PS-13-87A, PS-13-87B, PS-13-87C, and PS-13-87D components are only valid following the replacement of the existing switches with the SOR 6RT-B3-U8-C1A-JJTTNQ switches shown in Table B-1.

5.2 Identification of Follow-up Actions

Existing components dPIS-13-83 and dPIS-13-84 shall be replaced with Barton 288A model switches to ensure that this report's conclusions regarding these components are valid.

Existing components PS-13-87A, PS-13-87B, PS-13-87C, and PS-13-87D shall be replaced with SOR 6RT-B3-U8-C1A-JJTTNQ model switches to ensure that this report's conclusions regarding these components are valid.

6 References

1 NRC (E. Leeds and M. Johnson) Letter to All Power Reactor Licensees et al., “Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3 and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident,” March 12, 2012, ADAMS Accession Number ML12053A340

2 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 ML15194A015

3 NRC (J. Davis) Letter to Nuclear Energy Institute (A. Mauer). “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

4 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 dated May 14, 2014, ADAMS Accession Number ML14136A288 and ML14136A289

5 EPRI 1015109. “Program on Technology Innovation: Seismic Screening of Components Sensitive to High-Frequency Vibratory Motions.” October 2007

6 EPRI 1025287. “Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic.” February 2013

7 EPRI 3002002997. “High Frequency Program: High Frequency Testing Summary.” September 2014

8 EPRI 3002004396. “High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation.” July 2015

9 EPRI NP-7147-SL. “Seismic Ruggedness of Relays.” August 1991

10 EPRI NP-7147-SLV2, Addendum 1, “Seismic Ruggedness of Relays”, September 1993

11 EPRI NP-7147-SLV2, Addendum 2, “Seismic Ruggedness of Relays”, April 1995

12 EPRI NP-7147 SQUG Advisory 2004-02. “Relay GERS Corrections.” September 10, 2004

13 EPRI NP-7148-SL, “Procedure for Evaluating Nuclear Power Plant Relay Seismic Functionality”, 1990

14 NRC (F. Vega) Letter to Monticello Nuclear Generating Plant (P. Gardner). “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 NOS. MF3958).” July 8, 2015, ADAMS Accession Number ML15175A336

15 Recommendations For Enhancing Reactor Safety in the 21st Century, "The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident" July 12, 2011, ADAMS Accession Number ML111861807
16 NEI 12-06, Rev. 2. "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide"
17 16Q0391-CAL-001, Rev. 0, "High Frequency Functional Confirmation and Fragility Evaluation of Components."
18 16Q0391-RPT-001, Rev. 0, "Selection of Relays and Switches for High Frequency Seismic Evaluation."
19 Monticello Drawing NX-7822-22-2 Rev 76, "RCIC System".
20 Monticello Drawing NX-7822-22-3 Rev 77, "RCIC System Shutdown".
21 Calculation 14-053 Rev 1, "Monticello FLEX Expedited Seismic Equipment List (ESEL)".
22 Calculation 14-053 Rev 1A, "Monticello FLEX Expedited Seismic Equipment List (ESEL)".
23 Monticello Drawing NH-36241 Rev. 88, "Nuclear Boiler System-Steam Supply P&ID".
24 Monticello Drawing NX-7831-143-2 Rev. 75, "Rev Q - Elementary Diagram – Automatic Blowdown System".
25 Monticello Drawing NF-95916-3 Rev. 77, "Blowdown Control System Division 11 Elementary Diagram".
26 Monticello Drawing NF-95916-2 Rev. 76, "Blowdown Control System Division II Elementary Diagram".
27 Monticello Drawing NF-95916-5 Rev. 76, "Blowdown Control System Division II Elementary Diagram".
28 Monticello Drawing NX-7823-4-9 Rev. 81, "Elementary Diagram Primary Containment Isolation System".
29 Monticello Drawing NX-7831-446 Rev. 75, "Rev C - Schem. Pneumatic Control Panel - MSIV".
30 Monticello Drawing NX-7823-4-13A Rev. 75, "Rev A - RWCU Inlet Inboard Isol MO¬2397, Scheme B3328".
31 Monticello Drawing NX-7822-22-5A Rev. 75, "Rev A - RCIC Steam Supply Isolation MO-2075 Scheme B3340".
32 Monticello Drawing NX-7822-22-5B Rev. 78, "RCIC Steam Supply Line Isolation MO¬2076 Scheme D31104".
33 Monticello Drawing NX-7831-80-6 Rev. 77, "RHR Suction Line EQ Valve MOV-4086 RHR Discharge Lines EQ Valve MOV-4085A".
34 Monticello Drawing NX-7823-4-11C Rev. 76, "RHR Shutdown Cooling Supply Inboard Isolation Valve MO-2029 – Scheme B3333".
35 Monticello Drawing NH-36247 Rev. 86, "P&ID Residual Heat Removal System".
36 Monticello Drawing NH-36246 Rev. 85, "P&ID Residual Heat Removal System".
37 Monticello Drawing NH-36248 Rev. 85, "P&ID Core Spray System".
38 Monticello Drawing NX-8292-12-5 Rev. 77, "Elementary Diagram – HPCI System".
39 Monticello Drawing NX-8292-12-2 Rev. 78, "HPCI System Shutdown".
40 Monticello Drawing NF-36298-1 Rev. 111, "Electrical Load Flow One Line Diagram".
41 Monticello USAR-8.04, Rev. 33, "Plant Electrical Systems - Plant Standby Diesel Generator Systems".
42 Monticello Drawing NF-36298-2 Rev. 90, "DC Electrical Load Distribution One Line Diagram".
43 Monticello Drawing NE-36403-2 Rev. 77, "Standby Diesel Generator ACB 152-502 Control.".

44 Monticello Drawing NE-36399-3B Rev. 76, "#14 & 15 4.16 KV Bus Lockout Relay".
45 Monticello Drawing NE-36403-2A Rev. 78, "Standby Diesel Generator ACB 152-602 Control".
46 Monticello Drawing NE-36403-3 Rev. 76, "Schematic Diagrams Standby Diesel Generators".
47 Monticello Drawing NE-36403-3A Rev. 76, "#12 Standby Diesel Generator, Start Circuits 1 & 2 Schematic Diagrams".
48 Monticello Drawing NE-36403-4 Rev. 76, "#11 Standby Diesel Generator Control Scheme G30".
49 Monticello Drawing NE-36403-5 Rev. 75, "Rev K - Standby Diesel Generators Control & Air Compressor Units Control".
50 Monticello Drawing NE-36403-4A Rev. 76, "Standby Diesel Generator #12 Control Scheme G40".
51 Monticello Drawing NX-9216-5-1 Rev. 80, "Physical Schematic & Field Connection Model 999 #11 EDG".
52 Monticello Drawing NX-9216-5-1A Rev. 82, "Physical Schematic & Field Connections Model 999 - #12 EDG".
53 Monticello Drawing NX-9216-5-2 Rev. 76, "Physical Schematic & Field Connections-Model 999 #11 EDG".
54 Monticello Drawing NX-9216-5-2A Rev. 76, "Physical Schematic & Field Connections Model 999 - #12 EDG".
55 Monticello Drawing NX-9216-5-3 Rev. 77, "Physical Scheme & Field Connections Model #999 - #11 EDG".
56 Monticello Drawing NX-9216-5-3A Rev. 77, "Physical Schematic & Field Connections Model #999 - #12 EDG".
57 Monticello Drawing NX-9216-5-4 Rev. 78, "Physical Schematic & Field Connections Model 999 - 11 EDG".
58 Monticello Drawing NX-9216-5-4A Rev. 80, "Physical Schematic & Field Connections-Model 999 #12 EDG".
59 Monticello Drawing NF-157308 Rev. 77, "Wiring - #11 Standby Diesel Generator Engine Control Cabinet C93".
60 Monticello USAR-8.05, Rev. 31, "Plant Electrical Systems – DC Power Supply Systems".
61 Monticello Drawing NX-9173-18-1 Rev. 2, "Wiring Diagram 125VDC C & D Battery Chargers (D10, D20, D40)".
62 Monticello Drawing NX-9173-18-2 Rev. 1, "Wiring Diagram 125VDC C & D Battery Chargers (D10, D20, D40)".
63 Monticello Drawing NX-9173-18-3 Rev. 2, "C & D Battery Chargers (D10, D20, D40)".
64 Monticello Drawing NX-20009-7 Rev. 76, "Schematic Diagram 250VDC Batt Charger".
65 Monticello Drawing NE-36640-4-1 Rev. 78, "Battery Chargers D52, D53, D54 & Schemes B3431, 3433 & 3434".
66 Monticello Drawing NE-36640-4-3 Rev. 75, "Rev G - 125/250V DC Alarm System Panel D102 Scheme D10201".
67 Monticello Drawing NE-93523-5 Rev. 75, "Rev E - 125/250 DC Alarm System Panel D101".
68 Monticello Drawing NE-93523-2 Rev. 78, " Schematic Metering & Relaying Diagram 125/250V D.C. Dist. Channel 2".
69 Monticello Drawing NE-100344 Rev. 76, "Schematic Diagram Div. I & Div. II 120V Instrument AC UPS".

70 Monticello Drawing NF-36672 Rev. 79, "Standby Diesel Generators Arrangement & Piping".
71 Monticello Drawing NE-36438-9 Rev. 82, "11 EDG Oil Pumps A and C, P-160A and P¬160C, Pumphouse Xfmr XP54 & Heating Boiler TK T-46 Valve SV-1531 Control".
72 Monticello Drawing NE-36438-9-1 Rev. 0, "Diesel Oil Pumps, P-160B & P-160D Control Schematic".
73 Monticello USAR-10.4, Rev. 32, "Plant Auxiliary Systems – Plant Cooling System".
74 Monticello Drawing NE-36394-18 Rev. 76, "Emergency Service Water Pumps".
75 Monticello Drawing NE-36394-18A Rev. 75, "Rev F - Emergency Service Water Pump P-111B Scheme B4319".
76 Monticello Drawing NE-36375-19A Rev. 75, "Rev A - Emerg. Diesel Gen. #11 Room Supply Fan V-SF-10 & Scheme B3474".
77 Monticello Drawing NE-36375-19 Rev. 76, "H&V Schematic Diagrams for V-UH-39 and V-SF-9".
78 Monticello Drawing NE-36347-4 Rev. 86, "#121 - 480V MCC B21".
79 Monticello Drawing NE-36640-2 Rev. 80, "125V DC Distribution Electrical Scheme".
80 Monticello Drawing NE-36640-3 Rev. 84, "Schematic Diagrams 125, 250 & 24 Volt DC Systems".
81 Monticello Drawing NE-36640-5 Rev. 76, "250V DC MCC Schedule D311 D312 and D313".
82 Monticello Drawing NE-36640-4 Rev. 76, "250V DC & Panel Schedule D31, D33".
83 Monticello Drawing NE-36640-8 Rev. 76, "Schematic Diagram 250VDC Battery #17 & Distribution Panel D71".
84 Monticello Drawing NE-36640-4-2 Rev. 75, "Rev F - 125/250V DC Distribution Cab. D31 Scheme No. D3".
85 Monticello Drawing NE-93523-3 Rev. 75, "Rev F - Schematic Metering & Relay Diagram 125/250V D.C. Dist. Channel 2".
86 Monticello Drawing NE-93523-4 Rev. 75, "Rev E - Battery Chargers Trouble Alarms & Cab. D100 Schedule".
87 Monticello Drawing NE-36347-6 Rev. 87, "#131 – 480V MCC B31".
88 Monticello Drawing NE-36347-8 Rev. 81, "#133 – 480V MCC B33".
89 Monticello Drawing NE-36347-10 Rev. 81, "#142 – 480V MCC B42".
90 Monticello Drawing NE-36347-11 Rev. 85, "#143 – 480V MCC B43".
91 Monticello Drawing NE-36347-13 Rev. 78, "#133 & #143 – 480V MCC B33 & B43".
92 Monticello Drawing NE-36347-15 Rev. 83, "#134 – 480V MCC B34".
93 Monticello Drawing NE-36347-16 Rev. 80, "#144 – 480V MCC B44".
94 Monticello Drawing NE-36399-3C Rev. 75, "Rev F - #16 4.16 kV Bus Lockout Relay".
95 Monticello Drawing NE-36402-2C Rev. 75, "Rev E - #102 Load Center Primary ACB No. 152-407 Control".
96 Monticello Drawing NE-36402-2 Rev. 76, "#103 – Load Center Primary ACB No. 152¬509 Control.".
97 Monticello Drawing NE-36402-2A Rev. 76, "#104 – Load Center Primary ACB #152¬609 Control.".
98 Monticello Drawing NH-36251 Rev. 80, "P&ID RCIC (Steam Side)".
99 Monticello Drawing NH-36249 Rev. 82, "P&ID (Steam Side) High Pressure Coolant Injection System".
100 Monticello Drawing NX-8292-12-1 Rev. 78, "HPCI System Shutdown".
101 Monticello Drawing NH-36252 Rev. 80, "P&ID RCIC (Water Side)".

102 Monticello Drawing NE-36402-3B Rev. 75, "Rev C - Load Center B3 Schematic B301 Main Breaker 301".

103 Monticello Drawing NE-36402-3C Rev. 75, "Rev D - Load Center B3 Schematic Diagram B302 & B303 Feeder MCC's 131 & 132".

104 EPRI 3002000704, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," Final Report, May 2013.

105 Letter L-MT-13-017 from NSPM to NRC (ML13066A066), "Monticello Nuclear Generating Plant's Overall Integrated Plan in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," February 28, 2013.

106 Letter L-M-MT-13-079 from NSPM to NRC (ML 13241A200), "Monticello's First Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," August 28, 2013.

107 Letter L-MT-14-014 from NSPM to NRC (ML 14065A037), "Monticello's Second Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," February 28, 2014.

108 Letter L-MT-14-073 from NSPM to NRC (ML14241A260), "Monticello's Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-121-049)," August 28, 2014.

109 Letter L-MT-15-004 from NSPM to NRC (ML15055A599), "Monticello's Fourth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," February 24, 2015.

110 Letter L-MT-15-059 from Monticello to NRC (ML15232A553), "Monticello Nuclear Generating Plant's Fifth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," August 19, 2015.

111 Letter L-MT-16-009 from Monticello to NRC (ML16053A454), "Monticello Nuclear Generating Plant's Sixth Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," February 22, 2016.

112 Letter L-MT-16-038 from Monticello to NRC (ML16235A005), "Monticello Nuclear Generating Plant's Seventh Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049)," August 19, 2016.

A Representative Sample Component Evaluations

The following sample calculation is extracted from Reference [17].

Notes:

1. Reference citations within the sample calculation are per the Ref. [17] reference section shown on the following page. Attachment citations within the sample calculation also refer to attachments to Ref. [17], not to attachments to this report.

2. This sample calculation contains evaluations of sample high-frequency-sensitive components per the methodologies of both the EPRI high-frequency guidance [8] and the flexible coping strategies guidance document NEI 12-06 [16].

6 REFERENCES

1. Codes, Guidance, and Standards
   1.1. EPRI 3002004396. "High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation." July 2015.
   1.2. EPRI 3002002997. "High Frequency Program: High Frequency Testing Summary." September 2014.
   1.3. EPRI NP-7148-SL, "Procedure for Evaluating Nuclear Power Plant Relay Seismic Functionality." December 1990.
   1.4. NEI 12-06, Appendix H, Rev. 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide."
   1.5. IEEE 344-1975, "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations."
   1.6. SQUG GIP 3A, "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment." December 2001.
   1.7. EPRI NP-7147-SL, "Seismic Ruggedness of Relays." August 1991.
   1.8. EPRI NP-5223-SL, Rev. 1, "Generic Seismic Ruggedness of Power Plant Equipment."
   1.9. EPRI NP-7147-SL, SQUG Advisory 2004-02. "Relay GERS Corrections." September 10, 2004.
   1.10. ANSI/IEEE C37.98-1987, "An American National Standard IEEE Standard Seismic Testing of Relays." January 15, 1988
   1.11. EPRI NP-6041-SL, Rev. 1, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", August 1991
   1.12. EPRI NP-7147-SLV2, Addendum 2, "Seismic Ruggedness of Relays", April 1995
   1.13. IEEE 323-1974, "IEEE Standard for Qualifying Class 1E Equipment for Nuclear Generating Stations."

2. Nuclear Regulatory Commission Documents
   2.1. 14C4229-RPT-001, Rev. 3, "Monticello Nuclear Generating Plant Seismic Hazard and Screening Report." May 12, 2014, ADAMS Accession Number ML14136A289

3. Station Documents

   3.1. Reports
      3.1.1. MNGP A-46, Final Report, dated 11/1995, "USNRC USI A-46 Resolution - Relay Evaluation Report - Monticello Nuclear Generating Plant."

   3.2. Drawings
      3.2.1. Monticello Drawing NX-7822-22-2, Rev. 76, "RCIC System."
      3.2.2. Monticello Drawing NX-7822-22-3, Rev. 77, "RCIC System Shutdown."
      3.2.3. Monticello Drawing NX-8292-12-1, Rev. 78, "HPCI System Shutdown."
      3.2.4. Monticello Drawing NX-8292-12-2, Rev. 78, "HPCI System Shutdown."
      3.2.5. Monticello Drawing NF-36305, Rev. 75, "Rev. D - Reactor Building Floor Plan at Elev. 896'-3"."
      3.2.6. Monticello Drawing NF-36306, Rev. 76, "Reactor Building Floor Plan at EL. 935'-0"."
      3.2.7. Monticello Drawing NX-7828-76, Rev. 77, "Arrgt. Panel 9-30."
      3.2.8. Monticello Drawing NX-7828-86, Rev. 77, "Arrgt. Panel 9-33."
      3.2.9. Monticello Drawing NX-7828-75, Rev. 76, "Arrgt. Panel 9-39."
      3.2.10. Monticello Drawing NX-7828-32, Rev. 76, "Arrgt. Panel 9-41, 9-42."
      3.2.11. Monticello Drawing NF-36298-1, Rev. 111, "Electrical Load Flow One Line Diagram."
      3.2.12. Monticello Drawing NX-32610-8, Rev. 75, "Rev. A - 480V LC101, LC102, LC103 & LC104 XFMRS TX10, TX20, TX30, and TX40 TX Spare Outline & Detail."

3.2.13. Monticello Drawing NX-32610-3, Rev. 75, "Rev. A - 480V LC101 & LC102 XFMR's TX10 & TX20 Nameplate."

3.2.14. Monticello Drawing NX-32610-7, Rev. 76, "Rev. A - 480V LC103 & LC104 XFMRS TX30, TX40, TX Spare Outlines & Detail."

3.3. Other Station Documents

3.3.1. Not Used.

3.3.2. Not Used.

3.3.3. Monticello NGP Screening Evaluation Work Sheet (SEWS). "LC-103." 11/7/1995.

3.3.4. Monticello NGP Screening Evaluation Work Sheet (SEWS). "LC-104." 11/7/1995.

3.3.5. 98-012, Rev. 0, "Barton Pressure Switches 580A-0, 580A-1 (50.49)."

3.3.6. 82-452, Rev. 0 (inc. Minor Rev. 0A), "Evaluation of the Existing Anchorage of the Instrument Racks."

3.3.7. 98-078, Rev. 0, "PEI/FENWAL Temperature Switch (50.49)."

3.3.8. Monticello NGP Screening Evaluation Work Sheet (SEWS). "C-30." 11/7/1995.

3.3.9. Monticello NGP Screening Evaluation Work Sheet (SEWS). "C-33." 11/4/1995.

3.3.10. Monticello NGP Screening Evaluation Work Sheet (SEWS). "C-39." 11/4/1995.

3.3.11. Monticello NGP Screening Evaluation Work Sheet (SEWS). "C-41." 11/7/1995.

3.3.12. NX-17114, Rev. 2, "480V Load Center / Panel Transformers LC-101 through LC-108 / XP-91 and XP-92."

3.4. Station Information

3.4.1. Design Information Transmittal DIT 27309-01, Rev. 1, "High Frequency Seismic Evaluation – Equipment Information."

3.4.2. Design Information Transmittal DIT 27309-04, Rev. 0, "High Frequency Seismic Evaluation – Additional Equipment Information (LC-103 & LC-104)."

3.4.3. Design Information Transmittal DIT 27309-03, Rev. 0, "High Frequency Seismic Evaluation – Additional Equipment Information."

4. S&A Documents

4.1. 16Q0391-RPT-001, Rev. 0, "Selection of Relays and Switches for High Frequency Seismic Evaluation."

4.2. 15Q4327-RPT-001, Rev. 0, "Analysis of Relays and Switches for ESEP."

4.3. 15Q4327-CAL-003, Rev. 1, "Generation of RRS for Seismic Testing of Replacement Switches."

4.4. 15Q4327-CAL-002, Rev. 2, "ESEP HCLPFs for Relays."

5. Other Documents

5.1. SOR Report 9058-102, Rev. 1, "Nuclear Qualification Test Report for SOR Pressure, Vacuum, and Temperature Switches." (See Attachment D for select pages)

5.2. PEI TR-831200-1, Rev. A, "Final Report on the Qualification of a Patel Engineers Modified Fenwal Temperature Switch Manufactured by Fenwal, Inc." (See Attachment E for select pages)

5.3. QualTech NP Report No. S1220.0, Rev. 0, "Seismic Test Report for a Mallory Capacitor, Barksdale Pressure Switch, and ASUS LED Monitor." (See Attachment F for select pages)

5.4. GE Multilin IAC Time-Overcurrent Brochure, "Time-overcurrent protection of AC circuits and apparatus." (See Attachment G for select pages)

5.5. GE Multilin HEA Multicontact Auxiliary Brochure, "High-speed multicontact relays to perform auxiliary functions on AC and DC circuits." (See Attachment H for select pages)

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand

Calculate the high-frequency seismic demand on the components per the methodology from Ref. 1.1.

Sample calculations for the high-frequency seismic demand of components dPIS-13-83 and dPIS-23-76A are presented below. A table that calculates the high-frequency seismic demand for all of the subject components listed in Attachment A, Table A-1 of this calculation is provided in Attachment A, Table A-2 of this calculation.

8.2.1 Horizontal Seismic Demand

The horizontal site-specific GMRS for Monticello is per Ref. 2.1. GMRS data can be found in Attachment B of this calculation.

Determine the peak acceleration of the horizontal GMRS between 15 Hz and 40 Hz.

Peak acceleration of horizontal GMRS between 15 Hz and 40 Hz (Ref. 2.1; see Attachment B of this calculation): $SA_{GMRS} := 0.339g$ (at 15 Hz)

Calculate the horizontal in-structure amplification factor based on the distance between the control point elevation and the subject floor elevation. Per Ref. 2.1, Section 3.2, the SSE control point elevation is defined at the surface, EL. 930'-0".

Control Point Elevation (Ref. 2.1, Section 3.2) $El_{cp} := 930 \cdot ft$

Component Floor Elevation (Ref. 3.4.1, Attachment 1, p. 1): $EL_{comp} := 935 \cdot ft$

Components dPIS-13-83 and dPIS-23-76A are both located in the Reactor Building at elevation 935'-0".

Distance Between Component Floor and Control Point: $h_{comp} := EL_{comp} - El_{cp} = 5.00 \cdot ft$

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand (cont'd)

8.2.1 Horizontal Seismic Demand (cont'd)

Work the distance between the component floor and control point with Ref. 1.1, Fig. 4-3 to calculate the horizontal in-structure amplification factor.

Slope of Amplification Factor Line, $0ft < h_{comp} < 40ft$

$$m_h := \frac{2.1 - 1.2}{40ft - 0ft} = 0.0225 \cdot \frac{1}{ft}$$

Intercept of Amplification Factor Line, $0ft < h_{comp} < 40ft$

$$b_h := 1.2$$

Horizontal In-Structure Amplification Factor:

$$AF_{SH}(h_{comp}) := \begin{cases} (m_h \cdot h_{comp} + b_h) & \text{if } h_{comp} \le 40ft \\ 2.1 & \text{otherwise} \end{cases}$$

$$AF_{SH}(h_{comp}) = 1.31$$

Calculate the horizontal in-cabinet amplification factor based on the type of cabinet that contains the subject component.

Type of Cabinet (per Ref. 1.1, 1.3, and 4.3) (enter "MCC", "Switchgear", "Control Cabinet", or "Rigid"): cab := "Control Cabinet"

Horizontal In-Cabinet Amplification Factor (Ref. 1.1, p. 4-13):

$$AF_{c.h}(cab) := \begin{cases} 3.6 & \text{if } cab = \text{"MCC"} \\ 7.2 & \text{if } cab = \text{"Switchgear"} \\ 4.5 & \text{if } cab = \text{"Control Cabinet"} \\ 1.0 & \text{if } cab = \text{"Rigid"} \end{cases}$$

$$AF_{c.h}(cab) = 4.5$$

Note: See Group 1 and Group 2 in Attachment A for further explanation on why Control Cabinet configuration was selected for components dPIS-13-83 and dPIS-23-76A.

Multiply the peak horizontal GMRS acceleration between by the horizontal in-structure and in-cabinet amplification factors to determine the in-cabinet response spectrum demand on the components.

Horizontal In-Cabinet Response Spectrum (Ref. 1.1, p. 4-12, Eq. 4-1a):

$$ICRS_{c.h} := AF_{SH}(h_{comp}) \cdot AF_{c.h}(cab) \cdot SA_{GMRS} = 2.002 \cdot g$$

Note that the horizontal seismic demand is the same for both components dPIS-13-83 and dPIS-23-76A.

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand (cont'd)

8.2.2 Vertical Seismic Demand

Determine the peak acceleration of the horizontal GMRS between 15 Hz and 40 Hz.

Peak Acceleration of Horizontal GMRS Between 15 Hz and 40 Hz (See Sect. 8.2.1 of this Calculation) $SA_{GMRS} = 0.339 \cdot g$ (at 15 Hz)

Obtain the peak ground acceleration (PGA) of the horizontal GMRS from Ref. 2.1 (See Attachment B of this calculation).

Peak Ground Acceleration (GMRS): $PGA_{GMRS} := 0.153g$

Calculate the shear wave velocity traveling from a depth of 30m to the surface of the site (V_{s30}) from Ref. 1.1 and Attachment C.

Shear Wave Velocity:

$$V_{s30} = \frac{(30m)}{\Sigma\left(\frac{d_i}{V_{si}}\right)}$$

where,
d_i: Thickness of the layer (ft)
V_{si}: Shear wave velocity of the layer (ft/s)

Per Attachment C, the total time for a shear wave to travel from a depth of 30m to the surface of the site is 0.0660 sec.

Shear Wave Velocity:

$$V_{s30} := \frac{30m}{0.0660sec} = 1491 \cdot \frac{ft}{sec}$$

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand (cont'd)

8.2.2 Vertical Seismic Demand (cont'd)

Work the PGA and shear wave velocity with Ref. 1.1, Table 3-1 to determine the soil class of the site. Based on the PGA of 0.153g and shear wave velocity of 1491ft/sec at Monticello, the site soil class is A-Intermediate.

Work the site soil class with Ref. 1.1, Table 3-2 to determine the mean vertical vs. horizontal GMRS ratios (V/H) at each spectral frequency. Multiply the V/H ratio at each frequency between 15Hz and 40Hz by the corresponding horizontal GMRS acceleration at each frequency between 15Hz and 40Hz to calculate the vertical GMRS.

See Attachment B for a table that calculates the vertical GMRS (equal to (V/H) x horizontal GMRS) between 15Hz and 40Hz.

Determine the peak acceleration of the vertical GMRS (SA_{VGMRS}) between frequencies of 15Hz and 40Hz. (By inspection of Attachment B, the SA_{VGMRS} occurs at 15Hz.)

V/H Ratio at 15Hz (See Attachment B of this calculation):	$VH := 0.67$
Horizontal GMRS at Frequency of Peak Vertical GMRS (at 15Hz) (See Attachment B of this calculation):	$HGMRS := 0.339g$
Peak Acceleration of Vertical GMRS Between 15 Hz and 40 Hz:	$SA_{VGMRS} := VH \cdot HGMRS = 0.227 \cdot g$ (at 15 Hz)

A plot of horizontal and vertical GMRS is provided in Attachment B of this calculation.

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand (cont'd)

8.2.2 Vertical Seismic Demand (cont'd)

Calculate the vertical in-structure amplification factor based on the distance between the control point elevation and the subject floor elevation.

Distance Between Component Floor and Control Point (See Sect. 8.2.1 of this Calculation): $h_{comp} = 5.00 \cdot ft$

Work the distance between the component floor and control point with Ref. 1.1, Fig. 4-4 to calculate the vertical in-structure amplification factor.

Slope of Amplification Factor Line: $m_v := \frac{2.7 - 1.0}{100ft - 0ft} = 0.017 \cdot \frac{1}{ft}$

Intercept of Amplification Factor Line: $b_v := 1.0$

Vertical In-Structure Amplification Factor: $AF_{SV} := m_v \cdot h_{comp} + b_v = 1.09$

Per Ref. 1.1, the vertical in-cabinet amplification factor is 4.7 regardless of cabinet type.

Vertical In-Cabinet Amplification Factor: $AF_{c.v} := 4.7$

Multiply the peak vertical GMRS acceleration between by the vertical in-structure and in-cabinet amplification factors to determine the in-cabinet response spectrum demand on the component.

Vertical In-Cabinet Response Spectrum (Ref. 1.1, p. 4-12, Eq. 4-1b): $ICRS_{c.v} := AF_{SV} \cdot AF_{c.v} \cdot SA_{VGMRS} = 1.16 \cdot g$

Note that the vertical seismic demand is the same for both components dPIS-13-83 and dPIS-23-76A.

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity

A sample calculation for the high-frequency seismic capacity of components dPIS-13-83 and dPIS-23-76A is presented here. A table that calculates the high-frequency seismic capacities for all of the subject components listed in Attachment A, Table A-1 of this calculation is provided in Attachment A, Table A-2 of this calculation.

8.3.1 Seismic Test Capacity

The high frequency seismic capacity of a component can be determined from the EPRI High Frequency Testing Program (Ref. 1.2) or other broad banded low frequency capacity data such as the Generic Equipment Ruggedness Spectra (GERS) or other qualification reports.

dPIS-13-83 Capacity

The model for component dPIS-13-83 is a Barton Instrument Systems differential pressure switch, Model 288A mounted on instrumentation rack C-122 in the Reactor Building (RB), EL. 935'-0". The location and elevation for rack in Group 1 is provided in Ref. 3.1.1.

This model switch was analyzed in the EPRI high-frequency testing program (Ref. 1.2) with a minimum capacity of 6.3g. Per Ref. 1.2, pg. 5-2, this pressure switch was tested to its fragility threshold; therefore, a knockdown factor (F_k) of 1.56 is used per Ref. 1.1, Table 4-2. All EPRI high-frequency relays are tested at 5% damping per Ref. 1.2.

dPIS-23-76A Capacity

The model for component dPIS-23-76A is a Barton Instrument Systems differential pressure switch, Model 580A-0 mounted on instrumentation rack C-122 in the Reactor Building (RB), EL. 935'-0". As explained in Group 1, an effective amplification factor of 4.5 is used for components mounted on rack C-122. The location and elevation for rack in Group 2 is provided in Ref. 3.1.1.

Seismic qualification of the pressure switch 580A-0 is provided in Ref. 3.3.5. Per pg. 28 of Ref. 3.3.5, the SSE level seismic capacity is 12.5g. The testing for pressure switch Model 580A-0 is conducted in accordance with IEEE Standard 323-1974 (Ref. 1.13). The damping value for Model 580A-0 test was not provided in Ref. 3.3.5. The IEEE standard (Ref. 1.5) for seismic testing is for 5% damping. Therefore, it is reasonable to consider that the seismic capacity of 12.5g is for 5% damping.

Seismic Test Capacity (SA*): $$SA' := \begin{pmatrix} 6.3 \\ 12.50 \end{pmatrix} g \qquad \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity (cont'd)

8.3.2 Effective Spectral Test Capacity

Component dPIS-13-83 was tested as part of Ref. 1.2 and tested to the relay's fragility threshold. Per Ref. 1.1, p. 4-16, add half of the test level increment of 1.25g to the seismic test capacity to calculate the effective spectral test capacity.

Component dPIS-23-76A's qualification report was used as the basis for its seismic capacity; therefore, there is no spectral acceleration increase and the effective spectral test capacity is equal to the seismic test capacity.

Effective Spectral Test Capacity (Ref. 1.1, p. 4-16):

$$SA_T := \begin{bmatrix} SA'_1 + \left(\frac{1.25g}{2}\right) \\ SA'_2 \end{bmatrix} = \begin{pmatrix} 6.92 \\ 12.50 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

8.3.3 Seismic Capacity Knockdown Factor

Determine the seismic capacity knockdown factor for the subject component based on the type of testing used to determine the seismic capacity of the component.

Using Table 4-2 of Ref. 1.1 and the capacity sources from Section 8.3.1 of this calculation, the knockdown factors are chosen as:

Seismic Capacity Knockdown Factor:

$$F_k := \begin{pmatrix} 1.56 \\ 1.20 \end{pmatrix} \qquad \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

8.3.4 Seismic Testing Single-Axis Correction Factor

Determine the seismic testing single-axis correction factor of the subject component, which is based on whether the equipment housing to which the component is mounted has well-separated horizontal and vertical motion or not.

Per Ref. 1.1, pp. 4-18, conservatively take the F_{MS} value as 1.0.

Single-Axis Correction Factor (Ref. 1.1, pp. 4-17 to 4-18):

$$F_{MS} := 1.0$$

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity for Ref. 1.1 Components (cont'd)

8.3.5 Effective Wide-Band Component Capacity Acceleration

Calculate the effective wide-band component capacity acceleration per Ref. 1.1, Eq. 4-5.

Effective Wide-Band Component Capacity Acceleration (Ref. 1.1, Eq. 4-5):

$$TRS := \left(\frac{SA_T}{F_k}\right) \cdot F_{MS} = \begin{pmatrix} 4.439 \\ 10.417 \end{pmatrix} \cdot g \quad \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

8.4 High-Frequency Seismic Capacity for Ref. 1.4, Appendix H Components

8.4.1 Effective Wide-Band Component Capacity Acceleration

Per a review of the capacity generation methodologies of Ref. 1.1 and Ref. 1.4, App. H, Section H.5, the capacity of a Ref. 1.4 component is equal to the Ref. 1.1 effective wide-band component capacity multiplied by a factor accounting for the difference between a 1% probability of failure ($C_{1\%}$, Ref. 1.1) and a 10% probability of failure ($C_{10\%}$, Ref. 1.4).

Per Ref. 1.4, App. H, Table H.1, use the $C_{10\%}$ vs. $C_{1\%}$ ratio from the Realistic Lower Bound Case for components.

$C_{10\%}$ vs. $C_{1\%}$ ratio

$$C_{10} := 1.36$$

Effective wide-band component capacity acceleration (Ref. 1.4, App. H, Sect. H.5)

$$TRS_{1.4} := TRS \cdot C_{10} = \begin{pmatrix} 6.037 \\ 14.167 \end{pmatrix} \cdot g \quad \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

8 ANALYSIS (cont'd)

8.5 Component (Ref. 1.1) High-Frequency Margin

Calculate the high-frequency seismic margin for components per Ref. 1.1, Eq. 4-6.

A sample calculation for the high-frequency seismic demand of components dPIS-13-83 and dPIS-23-76A is presented here. A table that calculates the high-frequency seismic margin for all of the subject components listed in Attachment A, Table A-1 of this calculation is provided in Attachment A, Table A-2 of this calculation.

Horizontal seismic margin (Ref. 1.1, Eq. 4-6): $$\frac{TRS}{ICRS_{c.h}} = \begin{pmatrix} 2.217 \\ 5.203 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

Vertical seismic margin (Ref. 1.1, Eq. 4-6): $$\frac{TRS}{ICRS_{c.v}} = \begin{pmatrix} 3.833 \\ 8.993 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

Both the horizontal and vertical seismic margins for dPIS-13-83 and dPIS-23-76A are greater than 1.00; indicating that these components are adequate for high frequency seismic spectral ground motion for their Ref. 1.1 functions.

8.6 Component (Ref. 1.4) High-Frequency Margin

Calculate the high-frequency seismic margin for Ref. 1.4 components per Ref. 1.1, Eq. 4-6.

A sample calculation for the high-frequency seismic demand of component components dPIS-13-83 and dPIS-23-76A is presented here. A table that calculates the high-frequency seismic margin for all of the subject components listed in Attachment A, Table A-1 of this calculation is provided in Attachment A, Table A-2 of this calculation.

Horizontal seismic margin (Ref. 1.1, Eq. 4-6): $$\frac{TRS_{1.4}}{ICRS_{c.h}} = \begin{pmatrix} 3.015 \\ 7.075 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

Vertical seismic margin (Ref. 1.1, Eq. 4-6): $$\frac{TRS_{1.4}}{ICRS_{c.v}} = \begin{pmatrix} 5.212 \\ 12.231 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{dPIS-13-83} \\ \text{dPIS-23-76A} \end{pmatrix}$$

Both the horizontal and vertical seismic margins for dPIS-13-83 and dPIS-23-76A are greater than 1.00; therefore, these components are adequate for high-frequency seismic spectral ground motion for their Ref. 1.4 functions.

B Components Identified for High Frequency Confirmation

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
1	dPIS-13-83[2]	Process Switch	Core Cooling	RCIC High Steam Flow Isolation	BARTON INSTRUMENT SYSTEMS	288A	C-122 (25-52)	Instrument Rack	RB	935	EPRI HF Test	Cap > Dem
2	dPIS-13-84[2]	Process Switch	Core Cooling	RCIC High Steam Flow Isolation	BARTON INSTRUMENT SYSTEMS	288A	C-122 (25-52)	Instrument Rack	RB	935	EPRI HF Test	Cap > Dem
3	dPIS-23-76A	Process Switch	RV Inventory Control	Steam Line High Pressure 300% Flow	BARTON INSTRUMENT SYSTEMS	580A-0	C-122 (25-52)	Instrument Rack	RB	935	Qualification Test	Cap > Dem
4	dPIS-23-76B	Process Switch	RV Inventory Control	Steam Line High Pressure	BARTON INSTRUMENT SYSTEMS	580A-0	C-122 (25-52)	Instrument Rack	RB	935	Qualification Test	Cap > Dem
5	PS-13-67A	Process Switch	Core Cooling	RCIC Low Pump Suction Pressure Turbine Trip	STATIC-O-RING (SOR)	54RT-BB118-M4-C2A-TTNQ	C-128 (25-58)	Instrument Rack	RB	896	Qualification Test	Cap > Dem
6	PS-13-87A[2]	Process Switch	RV Inventory Control & Core Cooling	RCIC Turbine Steam Supply Low Press Isolation	STATIC-O-RING (SOR)	6RT-B3-U8-C1A-JJTTNQ	C-215 (25-1B)	Instrument Rack	RB	935	Qualification Test	Cap > Dem
7	PS-13-87B[2]	Process Switch	RV Inventory Control & Core Cooling	RCIC Turbine Steam Supply Low Press Isolation	STATIC-O-RING (SOR)	6RT-B3-U8-C1A-JJTTNQ	C-215 (25-1B)	Instrument Rack	RB	935	Qualification Test	Cap > Dem
8	PS-13-87C[2]	Process Switch	RV Inventory Control & Core Cooling	RCIC Turbine Steam Supply Low Press Isolation	STATIC-O-RING (SOR)	6RT-B3-U8-C1A-JJTTNQ	C-215 (25-1B)	Instrument Rack	RB	935	Qualification Test	Cap > Dem
9	PS-13-87D[2]	Process Switch	RV Inventory Control & Core Cooling	RCIC Turbine Steam Supply Low Press Isolation	STATIC-O-RING (SOR)	6RT-B3-U8-C1A-JJTTNQ	C-215 (25-1B)	Instrument Rack	RB	935	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
10	PS-13-72A	Process Switch	Core Cooling	RCIC High Turbine Exhaust Pressure Turbine Trip	BARKSDALE INC	D2H-M150SS	C-128 (25-58)	Instrument Rack	RB	896	Qualification Test	Cap > Dem
11	PS-13-72B	Process Switch	Core Cooling	RCIC High Turbine Exhaust Pressure Turbine Trip	BARKSDALE INC	D2H-M150SS	C-128 (25-58)	Instrument Rack	RB	896	Qualification Test	Cap > Dem
12	TS-13-79A-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
13	TS-13-79A-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
14	TS-13-79B-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
15	TS-13-79B-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling above INS. TOR	Rigid	RB	935[3]	Qualification Test	Cap > Dem
16	TS-13-79C-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
17	TS-13-79C-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
18	TS-13-79D-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
19	TS-13-79D-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
20	TS-13-80A-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
21	TS-13-80A-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
22	TS-13-80B-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
23	TS-13-80B-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
24	TS-13-80C-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
25	TS-13-80C-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
26	TS-13-80D-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
27	TS-13-80D-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
28	TS-13-81A-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
29	TS-13-81A-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
30	TS-13-81B-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
31	TS-13-81B-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
32	TS-13-81C-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
33	TS-13-81C-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
34	TS-13-81D-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
35	TS-13-81D-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
36	TS-13-82A-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
37	TS-13-82A-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner Wall)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
38	TS-13-82B-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
39	TS-13-82B-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Attached to ceiling (NW Corner)	Rigid	RB	935[3]	Qualification Test	Cap > Dem
40	TS-13-82C-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
41	TS-13-82C-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Halfway up RCIC Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
42	TS-13-82D-1	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
43	TS-13-82D-2	Process Switch	RV Inventory Control & Core Cooling	RCIC Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On Pump Room Ceiling	Rigid	RB	935[3]	Qualification Test	Cap > Dem
44	TS-23-101A-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
45	TS-23-101A-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
46	TS-23-101B-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
47	TS-23-101B-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
48	TS-23-101C-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
49	TS-23-101C-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
50	TS-23-101D-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
51	TS-23-101D-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
52	TS-23-102A-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
53	TS-23-102A-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
54	TS-23-102B-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
55	TS-23-102B-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
56	TS-23-102C-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
57	TS-23-102C-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
58	TS-23-102D-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
59	TS-23-102D-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
60	TS-23-103A-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
61	TS-23-103A-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
62	TS-23-103B-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
63	TS-23-103B-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
64	TS-23-103C-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
65	TS-23-103C-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
66	TS-23-103D-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
67	TS-23-103D-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
68	TS-23-104A-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
69	TS-23-104A-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Right of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
70	TS-23-104B-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
71	TS-23-104B-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Left of HPCI Door Up on Wall	Rigid	RB	935[3]	Qualification Test	Cap > Dem
72	TS-23-104C-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
73	TS-23-104C-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	On East Wall Over Steam Line	Rigid	RB	935[3]	Qualification Test	Cap > Dem
74	TS-23-104D-1	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
75	TS-23-104D-2	Process Switch	RV Inventory Control	HPCI Steam Line High Area Temperature Isolation	FENWAL CONTROLS	01-170230-090	Ceiling-Ladder Halfway Down Stairs	Rigid	RB	935[3]	Qualification Test	Cap > Dem
76	13A-K3	Auxiliary Relay	RV Inventory Control & Core Cooling	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-30 (9-30)	Control Cabinet	PAB	939	GERS	Cap > Dem
77	13A-K5	Auxiliary Relay	RV Inventory Control & Core Cooling	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-30 (9-30)	Control Cabinet	PAB	939	GERS	Cap > Dem
78	13A-K14	Auxiliary Relay	Core Cooling	Pump Low Suction Pressure Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-30 (9-30)	Control Cabinet	PAB	939	GERS	Cap > Dem
79	13A-K17	Auxiliary Relay	Core Cooling	Turbine Exhaust High Pressure Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-30 (9-30)	Control Cabinet	PAB	939	GERS	Cap > Dem
80	13A-K29	Auxiliary Relay	RV Inventory Control & Core Cooling	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-33 (9-33)	Control Cabinet	PAB	939	GERS	Cap > Dem
81	13A-K30	Auxiliary Relay	RV Inventory Control & Core Cooling	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-33 (9-33)	Control Cabinet	PAB	939	GERS	Cap > Dem
82	23A-K5	Auxiliary Relay	RV Inventory Control	Manual Isolation Signal Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-39 (9-39)	Control Cabinet	PAB	939	GERS	Cap > Dem
83	23A-K6	Auxiliary Relay	RV Inventory Control	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-39 (9-39)	Control Cabinet	PAB	939	GERS	Cap > Dem
84	23A-K8	Auxiliary Relay	RV Inventory Control	Steam Line Area High Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-39 (9-39)	Control Cabinet	PAB	939	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
85	23A-K32	Auxiliary Relay	RV Inventory Control	Steam Line Area Excess Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11J52	C-41 (9-41)	Control Cabinet	PAB	939	GERS	Cap > Dem
86	23A-K33	Auxiliary Relay	RV Inventory Control	Steam Line Area Excess Temperature Relay	GENERAL ELECTRIC NUCLEAR	12HGA11J52	C-41 (9-41)	Control Cabinet	PAB	939	GERS	Cap > Dem
87	13A-K26	Auxiliary Relay	Core Cooling	Auto Isolation Signal Relay	GENERAL ELECTRIC NUCLEAR	12HGA11A52F	C-30 (9-30)	Control Cabinet	PAB	939	N/A	Chatter Acceptable
88	59-1/D6A	Overvoltage Relay	AC/DC Power Support Systems	Overvoltage Relays	C&D Batteries	MBC-3200	D101	Alarm Panel	EFT	932.83	N/A	Operator Action
89	59-1/D3A	Overvoltage Relay	AC/DC Power Support Systems	Overvoltage Relays	C&D Batteries	MBC-3200	D102	Alarm Panel	PAB	928	N/A	Operator Action
90	59-2/D6B	Overvoltage Relay	AC/DC Power Support Systems	Overvoltage Relays	C&D Batteries	MBC-3200	D101	Alarm Panel	EFT	932.83	N/A	Operator Action
91	59-2/D3B	Overvoltage Relay	AC/DC Power Support Systems	Overvoltage Relays	C&D Batteries	MBC-3200	D102	Alarm Panel	PAB	928	N/A	Operator Action
92	13A-K6	Auxiliary Relay	RV Inventory Control	MO-2078 Position Monitor Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-30 (9-30)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
93	13A-K10	Auxiliary Relay	RV Inventory Control & Core Cooling	Steam Line Low Pressure Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-30 (9-30)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
94	13A-K11	Auxiliary Relay	Core Cooling	Turbine Trip Auxiliary Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-30 (9-30)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
95	13A-K22	Auxiliary Relay	RV Inventory Control & Core Cooling	Auto Isolation Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-30 (9-30)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
96	13A-K32	Auxiliary Relay	RV Inventory Control & Core Cooling	RCIC Auto Isolation Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-33 (9-33)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
97	23A-K2	Auxiliary Relay	RV Inventory Control	Reactor Vessel Low Water Level Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-39 (9-39)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
98	23A-K4	Auxiliary Relay	RV Inventory Control	High Drywell Pressure Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-39 (9-39)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
99	23A-K27	Auxiliary Relay	RV Inventory Control	HPCI Auto Isolation Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-39 (9-39)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
100	23A-K35	Auxiliary Relay	RV Inventory Control	HPCI Auto Isolation Relay	GENERAL ELECTRIC NUCLEAR	12HFA151A2F	C-41 (9-41)	Control Panel	PAB	939	EPRI HF Test	Cap > Dem
101	13A-K7	Timing Relay	RV Inventory Control & Core Cooling	RCIC Steam Line High DP (Pressure) – Steam Line Break Relay	AGASTAT RELAY CO	E7014PB001	C-30 (9-30)	Control Panel	PAB	939	GERS	Cap > Dem
102	13A-K31	Timing Relay	RV Inventory Control & Core Cooling	Steam Line High DP (Line Break) Relay	AGASTAT RELAY CO	E7014PB001	C-33 (9-33)	Control Panel	PAB	939	GERS	Cap > Dem
103	13A-K33	Timing Relay	Core Cooling	RCIC Turbine Exhaust High Pressure TD Relay	AGASTAT RELAY CO	E7012PD	C-30 (9-30)	Control Panel	PAB	939	GERS	Cap > Dem
104	23A-K9	Time Delay Relay	RV Inventory Control	Steam Line High Pressure Relay	AGASTAT RELAY CO	ETR14D3B004	C-39 (9-39)	Control Panel	PAB	939	GERS	Cap > Dem
105	23A-K34	Time Delay Relay	RV Inventory Control	Steam Line High Pressure 300% Flow Relay	AGASTAT RELAY CO	ETR14D3B	C-41 (9-41)	Control Panel	PAB	939	GERS	Cap > Dem
106	152-502	Circuit Breaker	AC/DC Power Support Systems	G-3A (11 DG) to 15 Bus 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem

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No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
107	152-509	Circuit Breaker	AC/DC Power Support Systems	15 BUS to X-30 (LC-103) 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
108	152-602	Circuit Breaker	AC/DC Power Support Systems	G-3B (12 DG) to 16 Bus 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
109	152-609	Circuit Breaker	AC/DC Power Support Systems	16 Bus to X-40 (LC-104) 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
110	152-408	Circuit Breaker	AC/DC Power Support Systems	14 Bus to 16 Bus 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
111	152-407	Circuit Breaker	AC/DC Power Support Systems	14 Bus to X-20 (LC-102) 4kV Supply	GENERAL ELECTRIC NUCLEAR	Magne-Blast Breaker GE-AMH-4.16-250	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
112	52-301[4]	Circuit Breaker	AC/DC Power Support Systems	LC-103 Main Breaker Cubicle	ASEA BROWN BOVERI INC	K-3000S	LC-103	Switchgear	Turb	911	SQUG Report	Cap > Dem
113	52-302[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-131 Feeder Breaker Cubicle - Load Shed	ASEA BROWN BOVERI INC	K-1600S	LC-103	Switchgear	Turb	911	SQUG Report	Cap > Dem
114	52-304[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-133A Feeder Breaker Cubicle - Essential	ASEA BROWN BOVERI INC	K-1600S	LC-103	Switchgear	Turb	911	SQUG Report	Cap > Dem
115	52-308[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-134 Feeder Breaker Cubicle - Essential	ASEA BROWN BOVERI INC	K-1600S	LC-103	Switchgear	Turb	911	SQUG Report	Cap > Dem
116	52-401[4]	Circuit Breaker	AC/DC Power Support Systems	LC-104 Main Breaker Cubicle	ASEA BROWN BOVERI INC	K-3000S	LC-104	Switchgear	Turb	931	SQUG Report	Cap > Dem
117	52-403[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-142A & B Feeder Breaker Cubicle - Essential	ASEA BROWN BOVERI INC	K-1600S	LC-104	Switchgear	Turb	931	SQUG Report	Cap > Dem

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No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
118	52-404[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-143A Feeder Breaker Cubicle - Essential	ASEA BROWN BOVERI INC	K-1600S	LC-104	Switchgear	Turb	931	SQUG Report	Cap > Dem
119	52-408[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-144 Feeder Breaker Cubicle - Essential	ASEA BROWN BOVERI INC	K-1600S	LC-104	Switchgear	Turb	931	SQUG Report	Cap > Dem
120	52-201[4]	Circuit Breaker	AC/DC Power Support Systems	LC-102 Main Breaker Cubicle	GENERAL ELECTRIC NUCLEAR	AK-2A-75S-2	LC-102	Switchgear	Turb	931	SQUG Report	Cap > Dem
121	52-202[4]	Circuit Breaker	AC/DC Power Support Systems	MCC-121 Feeder Breaker Cubicle	GENERAL ELECTRIC NUCLEAR	AK-2A-25-1	LC-102	Switchgear	Turb	931	SQUG Report	Cap > Dem
122	186-4	Lock-Out Relay	AC/DC Power Support Systems	Bus #14 Bus Lockout Relay	GENERAL ELECTRIC NUCLEAR	12HEA	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
123	186-5	Lock-Out Relay	AC/DC Power Support Systems	Bus #15 Bus Lockout Relay	GENERAL ELECTRIC NUCLEAR	12HEA	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
124	186-6	Lock-Out Relay	AC/DC Power Support Systems	Bus #16 Bus Lockout Relay	GENERAL ELECTRIC NUCLEAR	12HEA	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
125	186-502	Lock-Out Relay	AC/DC Power Support Systems	Diesel Generator Lockout	GENERAL ELECTRIC NUCLEAR	12HEA	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
126	186-602	Lock-Out Relay	AC/DC Power Support Systems	Diesel Generator Lockout	GENERAL ELECTRIC NUCLEAR	12HEA	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
127	151-401-A 151-401-B 151-401-C	Overcurrent Relay	AC/DC Power Support Systems	Bus #14 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC51A101A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
128	151-402-A 151-402-B 151-402-C	Overcurrent Relay	AC/DC Power Support Systems	Bus #14 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC51A101A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem

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No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
129	151N-401	Protective Relay	AC/DC Power Support Systems	Bus #14 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A10A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
130	151N-402	Protective Relay	AC/DC Power Support Systems	Bus #14 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A10A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
131	151-308-A 151-308-B 151-308-C	Protective Relay	AC/DC Power Support Systems	Bus #15 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A101A	BUS-13	Switchgear	Turb	911	GERS	Cap > Dem
132	151-511-A 151-511-B 151-511-C	Protective Relay	AC/DC Power Support Systems	Bus #15 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A101A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
133	151N-308	Protective Relay	AC/DC Power Support Systems	Bus #15 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A10A	BUS-13	Switchgear	Turb	911	GERS	Cap > Dem
134	151-408-A 151-408-B 151-408-C	Protective Relay	AC/DC Power Support Systems	Bus #16 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A101A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
135	151-610-A 151-610-B 151-610-C	Protective Relay	AC/DC Power Support Systems	Bus #16 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A101A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
136	151N-408	Protective Relay	AC/DC Power Support Systems	Bus #16 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12IAC53A10A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
137	150/151-407-A 150/151-407-B 150/151-407-C	Protective Relay	AC/DC Power Support Systems	Load Center 102 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC77B36A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
138	150/151-509-A 150/151-509-B 150/151-509-C	Protective Relay	AC/DC Power Support Systems	Load Center 103 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC77B36A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
139	151-509-A 151-509-B 151-509-C	Protective Relay	AC/DC Power Support Systems	Load Center 103 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC77A11A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem

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No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
140	150/151-609-A 150/151-609-B 150/151-609-C	Protective Relay	AC/DC Power Support Systems	Load Center 104 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC77B36A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
141	151-609-A 151-609-B 151-609-C	Protective Relay	AC/DC Power Support Systems	Load Center 104 Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IAC77A11A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
142	150G-407	Protective Relay	AC/DC Power Support Systems	Load Center 102 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12PJC11AV1A	BUS-14	Switchgear	Turb	931	GERS	Cap > Dem
143	150G-509	Protective Relay	AC/DC Power Support Systems	Load Center 103 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12PJC11AV1A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
144	150G-609	Protective Relay	AC/DC Power Support Systems	Load Center 104 Ground Fault Relay	GENERAL ELECTRIC NUCLEAR	12PJC11AV1A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
145	151V-502-A	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
146	151V-502-B	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
147	151V-502-C	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
148	151V-602-A	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
149	151V-602-B	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
150	151V-602-C	Protective Relay	AC/DC Power Support Systems	Phase Overcurrent Relay	GENERAL ELECTRIC NUCLEAR	12IJCV51A13A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem

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No.	Component						Enclosure		Building[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
151	187-502-A	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
152	187-502-B	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
153	187-502-C	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-15	Switchgear	Turb	911	GERS	Cap > Dem
154	187-602-A	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
155	187-602-B	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
156	187-602-C	Protective Relay	AC/DC Power Support Systems	Differential Current Relay	GENERAL ELECTRIC NUCLEAR	12IJD52A11A	BUS-16	Switchgear	Turb	931	GERS	Cap > Dem
157	167-502	Protective Relay	AC/DC Power Support Systems	Anti-Motoring Relay	GENERAL ELECTRIC NUCLEAR	12ICW52A1A	BUS-15	Switchgear	Turb	911	Qualification Test	Cap > Dem
158	167-602	Protective Relay	AC/DC Power Support Systems	Anti-Motoring Relay	GENERAL ELECTRIC NUCLEAR	12ICW52A1A	BUS-16	Switchgear	Turb	931	Qualification Test	Cap > Dem
159	DG1-OST-11	Limit Switch	AC/DC Power Support Systems	Overspeed Limit Trip Switch	Square D Company	Class 9007, Series A LV, Type B51B-S1	G-3A	Diesel Generator	EDG	931	Not Vulnerable[5]	Cap > Dem
160	DG2-OST-12	Limit Switch	AC/DC Power Support Systems	Overspeed Limit Trip Switch	Square D Company	Class 9007, Series A LV, Type B51B-S1	G-3B	Diesel Generator	EDG	931	Not Vulnerable[5]	Cap > Dem

Note 1:
Building Key: RB = Reactor Building, PAB = Plant Administration Building, Turb = Turbine Building, EDG = Emergency Diesel Generator Room

Note 2:

a. The components' dPIS-13-83 and dPIS-13-84 manufacturer and model as shown in Table B-1 are the manufacturer and model of proposed replacement switches (Barton Instrument Systems 288A). The adequacy of the dPIS-13-83 and dPIS-13-84 components are only valid following the replacement of the existing switches with the Barton 288A switches shown in Table B-1.
b. The components' PS-13-87A, PS-13-87B, PS-13-87C, and PS-13-87D manufacturer and model as shown in Table B-1 are the manufacturer and model of proposed replacement switches (SOR 6RT-B3-C1A-JJTTNQ). The evaluation of the PS-13-87A, PS-13-87B, PS-13-87C, and PS-13-87D components are only valid following the replacement of the existing switches with the SOR 6RT-B3-C1A-JJTTNQ switches shown in Table B-1.

Note 3:
Per Ref. [17], these temperature switches are mounted at various MNGP elevations up to 935'. These switches were conservatively evaluated in Ref. [17] at 935', since the seismic demand at the highest elevation of the group of switches would envelop the seismic demand of the rest of the switches.

Note 4:
The component IDs are cubicle IDs within which the circuit breakers are located. The circuit breaker IDs and the manufacturer/model information for the circuit breakers within these cubicles are provided in Ref. [17].

Note 5:
Seismic capacities for these components are not available. Per Ref. [7], Section 6.2, all limit switches were shown to be rugged in the high-frequency region. Therefore, all limit switches such as Square D 9007 switches can be screened out.

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation

VALVE ID	P&ID	Sheet	Note	Included
MO-1614	NH-36237	N/A	Not a leak path FW-97-1 & FW-97-2 (Simple Check Valves upstream will prevent Leakage).	No
MO-1615	NH-36237	N/A	Not a leak path FW-97-1 & FW-97-2 (Simple Check Valves upstream will prevent Leakage).	No
FW-97-2	NH-36241	N/A	Simple Check Valve	No
FW-97-1	NH-36241	N/A	Simple Check Valve	No
RV-2-71H	NH-36241	N/A	H SRV	Yes*
RV-2-71C	NH-36241	N/A	C SRV	Yes*
RV-2-71D	NH-36241	N/A	D SRV	Yes*
RV-2-71F	NH-36241	N/A	F SRV	Yes*
RV-2-71E	NH-36241	N/A	E SRV	Yes*
RV-2-71A	NH-36241	N/A	A SRV	Yes*
RV-2-71B	NH-36241	N/A	B SRV	Yes*
RV-2-71G	NH-36241	N/A	G SRV	Yes*
AO-2-80A	NH-36241	N/A		Yes*
AO-2-80B	NH-36241	N/A		Yes*
AO-2-80C	NH-36241	N/A		Yes*
AO-2-80D	NH-36241	N/A		Yes*
AO-2-86A	NH-36241	N/A	Only if AO-2-8OA fails to be closed	No – Valve AO-2-8OA, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve AO-2-86A did not require evaluation in Ref. [18].

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation

VALVE ID	P&ID	Sheet	Note	Included
AO-2-86B	NH-36241	N/A	Only if AO-2-8OB fails to be closed	No – Valve AO-2-8OB, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve AO-2-86B did not require evaluation in Ref. [18].
AO-2-86C	NH-36241	N/A	Only if AO-2-8OC fails to be closed	No – Valve AO-2-8OC, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve AO-2-86C did not require evaluation in Ref. [18].
AO-2-86D	NH-36241	N/A	Only if AO-2-8OD fails to be closed	No – Valve AO-2-8OD, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve AO-2-86D did not require evaluation in Ref. [18].
MO-2373	NH-36241	N/A		Yes*
MO-2374	NH-36241	N/A	Only if MO-2373 fails to be closed	No – Valve MO-2373, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-2374 did not require evaluation in Ref. [18].
CV-2371	NH-36241	N/A		Yes*
CV-2372	NH-36241	N/A	Only if CV-2371 fails to be closed	No – Valve CV-2371, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve CV-2372 did not require evaluation in Ref. [18].
MO-2-43A	NH-36243	N/A	Closed loop	No
MO-2-43B	NH-36243	N/A	Closed loop	No
MO-2-53A	NH-36243	N/A	Closed loop	No
MO-2-53B	NH-36243	N/A	Closed loop	No
CRD-31	NH-36244	N/A	Simple Check Valve	No
AO-10-46B	NH-36246	N/A		Yes*
MO-2015	NH-36246	N/A	Only if AO-10-46B fails to be closed	No – Valve AO-10-46B, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-2015 did not require evaluation in Ref. [18].
MO-4085B	NH-36246	N/A		Yes*
AO-10-46A	NH-36247	N/A		Yes*

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation

VALVE ID	P&ID	Sheet	Note	Included
MO-2014	NH-36247	N/A	Only if AO-10-46A fails to be closed	No – Valve AO-10-46A, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-2014 did not require evaluation in Ref. [18].
MO-4085A	NH-36247	N/A		Yes*
MO-2029	NH-36247	N/A		Yes*
MO-2030	NH-36247	N/A	Only if MO-2029 fails to be closed	No – Valve MO-2029, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-2030 did not require evaluation in Ref. [18].
MO-4086	NH-36247	N/A		Yes*
MO-1751	NH-36248	N/A	Only if MO-1753 fails to be closed	No – Valve AO-14-13A, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-1753 did not require evaluation in Ref. [18], and therefore this valve did not require evaluation in Ref. [18].
MO-1752	NH-36248	N/A	Only if MO-1754 fails to be closed	No – Valve AO-14-13B, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-1754 did not require evaluation in Ref. [18], and therefore this valve did not require evaluation in Ref. [18].
MO-1753	NH-36248	N/A	Only if AO-14-13A fails to be closed	No – Valve AO-14-13A, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-1753 did not require evaluation in Ref. [18].
MO-1754	NH-36248	N/A	Only if AO-14-13B fails to be closed	No – Valve AO-14-13B, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-1754 did not require evaluation in Ref. [18].
AO-14-13A	NH-36248	N/A		Yes*
AO-14-13B	NH-36248	N/A		Yes*
MO-2035	NH-36249	N/A	Only if MO-2034 fails to be closed	Yes*
MO-2034	NH-36249	N/A		Yes*

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation

VALVE ID	P&ID	Sheet	Note	Included
MO-2068	NH-36250	N/A	Not a leak path FW-97-1 & FW-97-2 (Simple Check Valves upstream will prevent Leakage).	No
MO-2075	NH-36251	N/A		Yes*
MO-2076	NH-36251	N/A	Only if MO-2075 fails to be closed	Yes*
MO-2107	NH-36252	N/A	Not a leak path FW-97-1 & FW-97-2 (Simple Check Valves upstream will prevent Leakage.	No
MO-2397	NH-36254	N/A		Yes*
MO-2398	NH-36254	N/A	Only if MO-2397 fails to be closed	No – Valve MO-2397, as evaluated in Ref. [18], will not fail to be closed during a seismic event. Therefore, valve MO-2398 did not require evaluation in Ref. [18].

* Note: the evaluation of this valve is discussed in Section 2.2 of this report as well as in report 16Q0391-RPT-001 (Ref. 18).