POINT BEACH

August 2, 2017

NRC 2017-0037
10 CFR 50.54(f)

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

Point Beach Nuclear Plant, Units 1 and 2
Docket 50-266 and 50-301
Renewed License Nos. DPR-24 and DPR-27

NextEra Energy Point Beach, LLC, High Frequency Seismic Evaluation Confirmation Report

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 (ML12073A348)
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 (ML13106A331)
3. NextEra Energy Point Beach, LLC Seismic Hazard and Screening Report (CEUS Sites), 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 Dia-ichi Accident, dated March 31, 2014 (ML14090A275)
4. NextEra Energy Point Beach, LLC's Expedited Seismic Evaluation Process Report (CEUS Sites), Response [to] NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated December 22, 2014 (ML14356A426)
5. Nuclear Energy Institute to NRC, Request for NRC Endorsement of High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation (EPRI Report 3002004396), dated July 30, 2015 (ML15223A100)
6. NRC Letter to Nuclear Energy Institute, "Endorsement of Electric Power Research Institute Final Draft Report 3002004396, High Frequency Program: Application Guidance for Functional Confirmation and Fragility," dated September 17, 2015 (ML15218A569)

7. 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 (ML15194A015)

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a 10 CFR 50.54(f) letter to all power reactor licensees and holders of construction permits in active or deferred status. Reference 1, Enclosure 1, requested each addressee located in the Central and Eastern United States (CEUS) to submit a Seismic Hazard Evaluation and Screening Report within 1.5 years from the date of the letter. By letter dated May 7, 2013 (Reference 2), the date to submit the report was extended to March 31, 2014. NextEra Energy Point Beach, LLC (Point Beach) submitted a seismic hazard and screening report on March 31, 2014 (Reference 3) and submitted an expedited seismic evaluation process report on December 22, 2014 (Reference 4).

By letter dated October 27, 2015 (Reference 7), the NRC identified those plants required to perform a limited-scope high frequency evaluation. This letter transmits the results of a limited-scope high frequency evaluation for Point Beach. The evaluation was performed in accordance with the guidance in EPRI Report 3002004396 (References 5, 6).

The high frequency evaluation performed for Point Beach identified 166 components requiring evaluation using the methodologies in EPRI Report 3002004396. 162 components were identified as having adequate seismic capacity. The remaining four components will obtain adequate seismic capacity by a planned modification. The summary report is included as an enclosure to this letter.

This letter contains no new regulatory commitments.

If you have any questions please contact Mr. Eric Schultz, Licensing Manager, at (920) 755-7854.

I declare under penalty of perjury that the foregoing is true and correct. Executed on August 2, 2017.

Sincerely,

NextEra Energy Point Beach, LLC

Robert Coffey
Site Vice President

cc: Director, Office of Nuclear Reactor Regulation
Administrator, Region III, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC

Enclosure: Document 16Q0390-RPT-003, Revision 0, 50.54(f) NTTF 2.1 Seismic High-Frequency Confirmation Report for Point Beach Nuclear Plant

ENCLOSURE

DOCUMENT 16Q0390-RPT-003, REVISION 0

50.54(f) NTTF 2.1 SEISMIC HIGH-FREQUENCY CONFIRMATION REPORT FOR POINT BEACH NUCLEAR PLANT

(62 pages follow)

Document ID: 16Q0390-RPT-003 Title: 50.54(f) NTTF 2.1 Seismic High-Frequency Confirmation Report for Point Beach Nuclear Plant

Document Type:

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

Project Name: Point Beach Nuclear Plant SFP & High Frequency Seismic Evaluation
Job No.: 16Q0390
Client: NextEra Energy – Point Beach

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: 7/20/2017
Checked by: K. Dommer	[signature]	Date: 7/20/2017
Approved by: M. Delaney	[signature]	Date: 7/20/2017

Revision Record:				
Revision No.	Originated by/ Date	Checked by/ Date	Approved by/ Date	Description of Revision

S&A Stevenson & Associates	DOCUMENT APPROVAL SHEET Figure 2.8	PROJECT NO. 16Q0390

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 Point Beach Nuclear Plant (PBNP). 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 PBNP 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 March 31, 2014, PBNP 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 PBNP 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 PBNP 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:

- PBNP 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

PBNP submitted reevaluated seismic hazard information including GMRS and seismic hazard information to the NRC on March 31, 2014 [4]. In a letter dated August 3, 2015, the NRC staff concluded that the submitted GMRS adequately characterizes the reevaluated seismic hazard for the PBNP site [14].

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

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 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 (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[1] 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[2] is assumed to function and not be a Multiple Spurious Failure. The Letdown and

[1] Active: A component in which mechanical movement or change of state must occur to accomplish the function of the component.
[2] Simple Check Valve: A valve which closes upon reverse fluid flow only.

Purification System (CV) on PWRs is a normally in-service system with the flow path open and in operation. If an event isolated a downstream valve, there are pressure relief valves that would flow water out of the RC System. There are no auto open valves in this flow path.

Table B-2 contains a list of valves analyzed. The analysis of these valves, detailed below, identifies the devices selected for seismic evaluation. A list of the devices selected for seismic evaluation is provided in Table B-1.

Reactor Coolant System Valves

Pressure Relief Valves 1/2RC-434, 1/2RC-435 (See Table B-2 for P&ID)

Based on review of the mechanical drawing for these valves [22], these valves are mechanically-operated pressure relief valves. Because they lack electrical control these valves are excluded from high frequency analysis.

Pressurizer Power Operated Relief Valves 1/2RC-430, 1/2RC-431C (See Table B-2 for P&ID)

Electrical control for the solenoid-operated pilot valves is via rugged hand switches and relays that energize on high pressurizer pressure [23, 24, 25, 26, 27, 28]. Chatter in the vulnerable devices could only lead to valve closure, and no device would prevent valve closure either via the hand switch or containment isolation signal. Thus, no devices meet the selection criteria.

Pressurizer Power Operated Relief Valve Isolation Valves 1/2RC-515, 1/2RC-516 (See Table B-2 for P&ID)

These normally-open motor-operated valves are controlled by hand switches only [29, 30, 31, 32]. Open limit switches in the opening circuit prevent seal-in of the opening contactor auxiliary contact and no contacts prevent valve closure via the control switch. Since closure is not prevented, no devices meet the selection criteria.

RCS Gas Vent Valves 1/2RC-580A/B (See Table B-2 for P&ID)

Electrical control for the solenoid-operated pilot valves is via a rugged hand control switch only. There are no chatter sensitive contact devices involved in the control of these valves [33, 34].

Primary Sample Valves

Sample Containment Isolation Valves 1/2SC-951, 1/2SC-953, 1/2SC-955 (See Table B-2 for P&ID)

Electrical control for the normally-open solenoid-operated pilot valves is via rugged hand switches and a normally energized relay that drops out upon initiation of containment isolation [35, 36]. Chatter in the vulnerable devices could only lead to valve closure, and no device would prevent valve closure either via the hand switch or containment isolation signal. Thus, no devices meet the selection criteria.

Sample Containment Isolation Valves 1/2SC-966A/B/C (See Table B-2 for P&ID)

Electrical control for the solenoid-operated pilot valves is via rugged hand switches and normally-closed relay contacts that open upon initiation of containment isolation [37, 38, 39]. If the valve is open, chatter in the vulnerable devices could only lead to valve closure, and no device would prevent valve closure either via the hand switch or containment isolation signal. If the valve is closed, open and rugged control and limit switch contacts prevent inadvertent valve opening. Thus, no devices meet the selection criteria.

Chemical and Volume Control Valves

Pressure Relief Valves 1/2CV-314, 1/2CV-203 (See Table B-2 for P&ID)

Based on review of the mechanical drawing for these valves [40, 41], these valves are mechanically-operated pressure relief valves. Because they lack electrical control these valves are excluded from high frequency analysis.

Heat Exchanger Inlet Valves 1/2CV-1299 (See Table B-2 for P&ID)

These normally-closed motor-operated valves are controlled by hand switches only [42, 43]. Simultaneous chatter in the opening contactor auxiliary contacts could lead to a seal-in of the opening circuit and unintentional valve opening. For this reason, the 42(o) contactor in MCC 1B32 compartment 7J has been selected for high frequency seismic evaluation.

Remote Operated Valves 1/2CV-200A/B/C (See Table B-2 for P&ID)

Electrical control for the normally-open solenoid-operated pilot valves is via rugged hand switches and a hold-open signal when the charging pump is operating and isolation valves are open [44, 45, 46, 47, 48, 49, 50]. Chatter in the vulnerable devices could only lead to valve closure, and no device would prevent valve closure either via the hand switch or containment isolation signal. Thus, no devices meet the selection criteria.

Excess Letdown Heat Exchanger Valves 1/2CV-285 (See Table B-2 for P&ID)

These normally-closed motor-operated valves are controlled by rugged hand switches only [51, 52]. There is no seal-in contact used for the opening contactor and thus there is no vulnerable contacts in the opening circuit which could chatter and lead to valve opening.

Remote Operated Valves 1/2CV-386 (See Table B-2 for P&ID)

Electrical control for the solenoid-operated pilot valves is via a rugged hand control switch only. There are no chatter sensitive contact devices involved in the control of these valves [53].

Safety Injection and Residual Heat Removal System Valves

Pressure Relief Valves 1/2RH-861B, 1/2SI-861A, 1/2SI-887 (See Table B-2 for P&ID)

Based on review of the mechanical drawing for these valves [54, 55], these valves are mechanically-operated pressure relief valves. Because they lack electrical control these valves are excluded from high frequency analysis.

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. 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. The steam Turbine-Driven Auxiliary Feedwater (TDAFW) pump was the train chosen for this analysis [56, 57, 58, 59, 60]. The selection of contact devices for TDAFW was based on the premise that pump operation is desired, thus any SILO which would lead to pump operation is desirable and for this reason does not meet the selection criteria. Only contact devices which could render the TDAFW system inoperative were considered.

Initiation of the TDAFW is via the opening of main steam valves 1/2MS-2019 and 1/2MS-2020. These normally-closed motor-operated valves are opened via rugged hand switches, a steam generator low-low level signal, or a bus under-voltage signal [61, 62, 63, 64, 65, 66, 67, 68]. Chatter in the opening circuit would only open the valve, which is desired. If loss of offsite power occurs at the start of strong shaking, there is a potential for these steam valves to be open before the end of strong shaking. In this case, chatter in the closing contactor seal-in contact may cause the contactor to seal in and fully close the valve. The undervoltage signal would then automatically reopen the valve. If both MS-2019 and MS-2020 close then the turbine/pump will start to coast down as the steam between the valves and turbine is used up, and then return to normal as the valves reopen. Normal operation would resume at the end of strong shaking thus no devices meet the selection criteria.

The largest vulnerability to TDAFW operation following a seismic event is contact chatter leading to closure or tripping of the trip and throttle valve 1MS-2082. Chatter in time delay relay 1/2-62-4044 could energize the trip solenoid [69, 70]. (The time delay associated with this relay prevents chatter in the contacts of devices in the relay's coil circuit from affecting a trip.) Chatter in the auxiliary contact of the closing contactor could cause this contactor to seal-in and close the valve. For this reason, contactor 42(c) in 1/2SMS-0282 is selected for high frequency seismic analysis in addition to TDR 1/2-62-4044.

To ensure proper flow of Auxiliary Feedwater, discharge valves 1/2AF-4000, 1/2AF-4001, and minimum flow valve 1/2AF-4002 were analyzed [71, 72, 73, 74, 75, 76]. The normally-open motor-operated discharge valves are controlled by rugged hand switches with no contactor seal-ins. The solenoid-operated minimum flow valve is controlled by pump flow and has no seal-in. No contact devices in the discharge and minimum flow valve control circuits meet the selection criteria.

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 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 (EDG), 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 Point Beach's UFSAR [77]. Point Beach has four (4) EDGs which provide emergency power for their two units. Each unit has two (2) divisions of Class 1E loads with one EDG for each division.

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 under-voltage 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 and Unit 1 device ID in this narrative, however the analysis applies to the identical components and devices in Unit 2. 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-01, G-02, G-03, and G-04, is broken down into the generator protective relaying and diesel engine control. General descriptions of these systems and controls appear in the UFSAR [77, pp. 8.3-3, 8.3-5]. The control circuitry for the G-01 and G-02 diesels differ substantially from the G-03 and G-04 control circuits and for that reason they are discussed separately.

Generator Protective Relaying

The control circuits for the 1A52-60 (G-01) and 2A52-67 (G-02) diesel generator circuit breakers include an 86 circuit breaker lockout relay, 51/50A/B/C overcurrent protective relays, ESTX engine stop relay[3], 86 bus lockout relay, and 87 differential protective relays [78, 79, 80, 81]. Chatter in any of these relays may prevent circuit breaker closure. In addition, the medium voltage circuit breakers associated with the generators are vulnerable and could trip during a seismic event. The anti-pump function of the breaker could prevent automatic reclosure, and for this reason, circuit breakers 1A52-60 and 2A52-67 have also been selected for high frequency seismic analysis.

[3] Chatter analysis of devices in the coil circuits of these relays is included in the diesel engine control discussion.

The control circuits for the 1A52-80 (G-03) and 2A52-93 (G-04) diesel generator circuit breakers include an 86 circuit breaker lockout relay, 51 overcurrent protective relay, R7X, R9X1, SDRX2 engine control relays, BTR breaker trip relay and its input devices, 32X reverse power auxiliary relay, 32 reverse power protective relay, 40X loss of field auxiliary relay, 40 loss of field protective relay, 51X overcurrent auxiliary relay, and 51 overcurrent protective relay; in addition to the bus-related devices, 86 bus lockout relay and 87 differential protective relays [82, 83, 84]. Chatter in any of these relays may prevent circuit breaker closure. In addition, the medium voltage circuit breakers associated with the generators are vulnerable and could trip during a seismic event. The anti-pump function of the breaker could prevent automatic reclosure, and for this reason, circuit breakers 1A52-80 and 2A52-93 have also been selected for high frequency seismic analysis.

Diesel Engine Control

Chatter analysis for the diesel engine control was performed on the start [85, 86, 87, 88] and shutdown circuits of each EDG. For G-01 and G-02, chatter which could energize the engine stop relay ESTX has the potential of locking out the generator. Relays that could energize ESTX are the engine stop delay auxiliary relay ESTR and the fault latching relay NEWX [89, 90]. The time delay associated with ESTR prevents chatter in the contacts of devices in ESTR's coil circuit from affecting ESTX. Devices in the operate coil of NEWX could latch that relay and lock out the generator. These devices are field voltage time delay relay 40T, reverse power protective relay 67RP, overcurrent protective relays 51A/B/C, and overspeed switch LS-OTLS [91, 92, 93, 94, 95, 96, 97, 98]. The time delay associated with 40T prevents chatter in the contacts of devices in 40T's coil circuit from affecting NEWX [89, 90]. Chatter in the rest of the electrical contact devices in the control circuit would only have a temporary effect during the period of strong shaking and thus do not meet the selection criteria.

For G-03 and G-04, chatter which could energize the governor shutdown solenoid or emergency voltage shutdown latching relay, or trip or lockout the generator breaker could prevent generator operation [99, 100, 101, 84]. The governor shutdown solenoid is energized by normal stop auxiliary relay TD4X and emergency safety shutdown auxiliary relay SDRX1. In turn, TD4X could be energized by normal stop time delay relay TD4. The time delay associated with TD4 prevents chatter in the contacts of devices in TD4 coil circuit from affecting the governor shutdown solenoid. Chatter of the following devices could lead to a seal-in of the emergency safety shutdown circuit and energization of the governor shutdown solenoid via SDRX1: emergency safety shutdown auxiliary relay SDRX; fail-to-start auxiliary relay R2 and its input, air start time delay relay TD1; differential auxiliary relay 87X and its input, generator differential protective relay 87; overspeed trip auxiliary relay OTR and its input, overspeed switch OTS; temperature switch TS4; and because the lube oil pressure switches are closed prior to engine start, shutdown isolation auxiliary relay TD5X and its input, shutdown isolation time delay relay TD5; idle time delay relay ITD; and normal stop auxiliary relay R7X1 and its input, normal stop time delay relay TD8. The time delay associated with TD1, TD5, ITD, and TD8 prevents chatter in the contacts of devices in the coil circuits of these time delay relays from affecting the emergency safety shutdown circuit. The emergency voltage shutdown latching relay LR could be effected by chatter in emergency safety shutdown auxiliary relay SDR, normal stop auxiliary relay R7, idle start auxiliary relay R9, and field flash time delay relay FFTD. Devices that may energize SDR and R7 are already covered by the analysis of the emergency safety shutdown circuit. R9 could be energized by chatter in the seal-in contacts of idle start auxiliary relay R9X1, which would also cause R9X1 to seal-in and trip the generator breaker. Contact chatter in other devices in the R9X1 seal-in circuit have no effect since R9X1 was determined to be sufficiently rugged. For this reason, the additional contact devices in the R9X1 seal-in circuit are not considered. The time delay associated with FFTD prevents chatter in the contacts of devices in its coil circuit from affecting LR. All other contact devices involved in engine start and engine shutdown circuits were analyzed and, other than the devices noted above, none would cause a sustained change in control state such that the diesel generator would not start after the period of strong shaking ends.

Battery Chargers

Circuit analysis of the battery charger input power control circuit indicates that, in the absence of a safety injection signal, the battery chargers are depowered upon loss of normal power and must be repowered manually [102, 103, 104, 104, 105, 106]. No SILO device prevents manual repowering. Analysis of vendor schematics for the D07, D08, D107, and D108 Battery Chargers [107, 108] revealed no contact devices in their control circuits met the selection criteria.

Inverters

Analysis of schematics for the 1/2DY-01, 1/2DY-02, 1/2DY-03, and 1/2DY-04 Static Inverters [109, 110, 111] revealed no contact devices in their control circuits met the selection criteria.

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. Information in the UFSAR [77] was used as appropriate for this analysis.

Starting Air

Based on Diesel Generator availability as an initial condition, the passive air reservoirs are presumed pressurized and the only active components in this system required to operate are the air start solenoids, which are covered under the EDG engine control analysis discussed previously in this section.

Combustion Air Intake and Exhaust

The combustion air intake and exhaust for the Diesel Generators are passive systems which do not rely on electrical control.

Lube Oil

The Diesel Generators 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 UFSAR [77, pp. 8.8-8]. 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 P-206A/B, P-207A/B [112, 113, 114]. Chatter analysis of the control circuits for the electrically-powered auxiliary pumps [89, 90, 99] concluded they do not include SILO devices. Chatter in the fuel oil transfer pump controls may lead to seal-in of the contactor (42), however the day tanks are presumed full at the start of the event, and in this condition the high-level switch will break the seal-in once strong shaking subsides [115, 116]. No devices meet the selection criteria. The mechanical pumps do not rely on electrical control.

Motor operated isolation valves FO-2930 and FO-2931 are required to open upon transfer pump start. Analysis of the control circuits for these valves [117, 118, 119] indicates that chatter in the opening circuit may cause the valves to open, which would be desired. Chatter-induced seal-in of the closing circuit is blocked by open rugged limit and torque switches. There is no contact device which could chatter and prevent valve opening, thus no devices meet the selection criteria.

Cooling Water

For generators G01 and G02, this system consists of two cooling loops, jacket water and Service Water (SW) [120, 121]. Engine driven pumps operating in the jacket water loops are credited when the engine is operating. These mechanical pumps do not rely on electrical control.

Six SW pumps, P-32A/B/C/D/E/F, provide cooling water to the heat exchangers associated with G01 and G02. Following load shed, these pumps are started on generator breaker closure or a safety injection signal [122, 123, 124, 125, 126, 127, 128, 129]. Chatter analysis of the generator breaker controls is discussed previously in this section. No SILO device in the pump circuit breaker control circuits prevents pump operation, however the low voltage circuit breakers associated with the pumps are vulnerable and could trip during a seismic event. The anti-pump function of the breaker could prevent automatic closure, and for this reason, circuit breakers 1B52-10C, 1B52-11C, 1B52-20C, 2B52-27B, 2B52-27C, and 2B52-34C have been selected for high frequency seismic analysis. Control power for the automatic backwash function of screens BS-2911 and BS-2912 drops out with any power interruption to panels RK-31 and RK-32, respectively, and requires a manual restart [130]. For this reason, the automatic screen backwash function is not included in this analysis.

Cooling for generators G03 and G04 is provided by a single jacket water loop, engine driven pump, radiator and radiator fans. In automatic mode the fan control circuits are controlled by the engine start relay [131]. Chatter analysis of the EDG start signal is discussed previously in this section. Outside of devices already selected for the generator control, there are no SILO devices which could prevent operation of the radiator fans.

Ventilation

Ventilation for each Diesel Generator Enclosure is provided via two exhaust fans [132, 133, 134]. In automatic mode these fans are controlled by room temperature. Chatter analysis of the control circuits for these fans [135, 136, 137, 138, 139, 140, 141, 142] and their associated dampers concluded they do not include SILO devices.

Switchgear, Load Centers, and MCCs

Power distribution from the EDGs to the necessary electrical loads (Battery Chargers, Batteries, Inverters, Fuel Oil Pumps, Service Water Pumps, Radiator Fans, 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 the EDG circuit breakers, which are discussed previously in this section, the Service Water Pump circuit breakers, which are discussed previously in this section, as well as component-specific contactors and their control devices, which are covered in the analysis of each component above.

Due to their high frequency sensitivity, the medium- and low-voltage circuit breakers in 4160V Busses and 480V Switchgear which are supplying power to loads identified in this section have been identified for evaluation: 1A52-58, 1A52-81, 1A52-84, 1B52-13C, 1B52-14B, 1B52-16B, 1B52-17B, 1B52-24C, 2A52-75, 2A52-89, 2A52-92, 2B52-25B, 2B52-31A, 2B52-36C, 2B52-38B, and 2B52-40B [143, 144, 145, 146, 147, 148]. The 480V AC MCCs use Molded-Case Circuit Breakers which are seismically rugged [8, pp. 2-11], and DC power distribution is via non-vulnerable fused disconnect switches.

The only circuit breakers affected by protective relaying (not already covered) were those that distribute power via stepdown transformers from the 4160 Busses to their associated 480V switchgear. A chatter analysis of the control circuits for these circuit breakers indicates the 86 lockout, 50/51 phase overcurrent, and 50G ground fault relays all could tip the circuit breaker following the seismic event. These devices are as follows: 1-86/A52-58, 1-51/50A/A52-58, 1-51/50B/A52-58, 1-51/50C/A52-58, and 1-50G/A52-58 for breaker 1A52-58 [149]; 1-86/A52-81, 1-51/A52-81, 1-50D/A52-81, and 1-50G/A52-81 for breaker 1A52-81 [150]; 1-86/A52-84, 1-51/A52-84, 1-50D/A52-84, and 1-50G/A52-84 for breaker 1A52-84 [151]; 2-86/A52-75, 2-51/50A/A52-75, 2-51/50B/A52-75, 2-51/50C/A52-75, and 2-50G/A52-75 for breaker 2A52-75 [152]; 2-86/A52-89, 2-51/A52-89, 2-50D/A52-89, and 2-50G/A52-89 for breaker 2A52-89 [151]; 2-86/A52-92, 2-51/A52-92, 2-50D/A52-92, and 2-50G/A52-92 for breaker 2A52-92 [150]. For purposes of assigning coil state and contact configuration-specific seismic capacity, under normal plant conditions the 86 lockout relays 1-86/A52-80, 1-86/A52-81, 1-86/A52-84, 2-86/A52-89, 2-86/A52-92, and 2-86/A52-93 are deenergized and normally open.

2.6 Summary of Selected Components

The investigation of high-frequency contact devices as described above (Section 2) was performed in Ref. [17]. A list of the contact devices requiring a high frequency confirmation is provided in Table B-1 of Appendix B. The identified devices are evaluated in Ref. [16] per the methodology/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 PBNP horizontal ground motion response spectrum (GMRS), which was generated as part of the PBNP Seismic Hazard and Screening Report [4] submitted to the NRC on March 31, 2014, and accepted by the NRC on August 3, 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. However, for sites founded on rock, per Ref. [8], "The Control Point GMRS developed for these rock sites are typically appropriate for all rock-founded structures and additional FIRS estimates are not deemed necessary for the high frequency confirmation effort." For sites founded on soil, the soil layers will shift the frequency range of seismic input towards the lower frequency range of the response spectrum by engineering judgment. Therefore, for purposes of high-frequency evaluations in this report, the GMRS is an adequate substitute for the FIRS for sites founded on soil.

The Seismic Hazard Evaluation and Screening Report for NextEra Energy Point Beach Nuclear Plant is attached to Ref. [4]. Per p. 19 of the Seismic Hazard Evaluation and Screening Report, PBNP is classified as a 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	$\Sigma [d_i/Vs_i]$	Vs30 (ft/s)
1	0.0	0.0	0	900	0.00000	0.00000	970
2	3.0	0.9	3	900	0.00333	0.00333	
3	8.0	2.4	5	900	0.00556	0.00889	
4	13.0	4.0	5	900	0.00556	0.01444	
5	18.0	5.5	5	900	0.00556	0.02000	
6	20.0	6.1	2	900	0.00222	0.02222	
7	28.0	8.5	8	900	0.00889	0.03111	
8	33.0	10.1	5	900	0.00556	0.03667	
9	38.0	11.6	5	1,000	0.00500	0.04167	
10	43.0	13.1	5	1,000	0.00500	0.04667	
11	48.0	14.6	5	1,000	0.00500	0.05167	
12	50.0	15.2	2	1,000	0.00200	0.05367	
13	58.0	17.7	8	1,000	0.00800	0.06167	
14	63.0	19.2	5	1,000	0.00500	0.06667	
15	68.0	20.7	5	1,000	0.00500	0.07167	
16	73.0	22.3	5	1,000	0.00500	0.07667	
17	78.0	23.8	5	1,000	0.00500	0.08167	
18	83.0	25.3	5.0	1,000	0.00500	0.08667	
19[1]	98.4	30.0	15.4	1,039	0.01482	0.10149	
20	3363.8	1025.3	3265.4	9,285	0.35169	0.45318	

[1]: The shear wave velocity in Layer 19 is calculated by interpolating shear wave velocities from Layer 18 and 20.

Using the shear wave velocity vs. depth profile, the velocity of a shear wave traveling from a depth of 30m (98.4ft) 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., $Vs30 = (30m)/\Sigma[d_i/Vs_i]$.

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 0.140g and the shear wave velocity of 970ft/s, the site soil class is A-Soft.

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 PBNP.

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

Frequency (Hz)	HGMRS (g)	V/H Ratio	VGMRS (g)
100	0.140	0.86	0.120
90	0.140	0.92	0.129
80	0.141	0.99	0.140
70	0.144	1.08	0.156
60	0.149	1.13	0.168
50	0.163	1.15	0.187
40	0.186	1.10	0.205
35	0.200	1.01	0.202
30	0.214	0.92	0.197
25	0.231	0.81	0.187
20	0.247	0.70	0.173
15	0.267	0.67	0.179
12.5	0.275	0.67	0.184
10	0.267	0.67	0.179
9	0.258	0.67	0.173
8	0.252	0.67	0.169
7	0.242	0.67	0.162
6	0.238	0.67	0.159
5	0.244	0.67	0.163
4	0.232	0.67	0.155
3.5	0.213	0.67	0.143
3	0.187	0.67	0.125
2.5	0.171	0.67	0.115
2	0.145	0.67	0.097
1.5	0.115	0.67	0.077
1.25	0.092	0.67	0.062
1	0.065	0.67	0.044
0.9	0.059	0.67	0.039
0.8	0.055	0.67	0.037
0.7	0.051	0.67	0.034
0.6	0.048	0.67	0.032
0.5	0.043	0.67	0.029
0.4	0.034	0.67	0.023
0.35	0.030	0.67	0.020
0.3	0.026	0.67	0.017
0.25	0.022	0.67	0.014
0.2	0.017	0.67	0.012
0.15	0.013	0.67	0.009
0.125	0.011	0.67	0.007
0.1	0.009	0.67	0.006

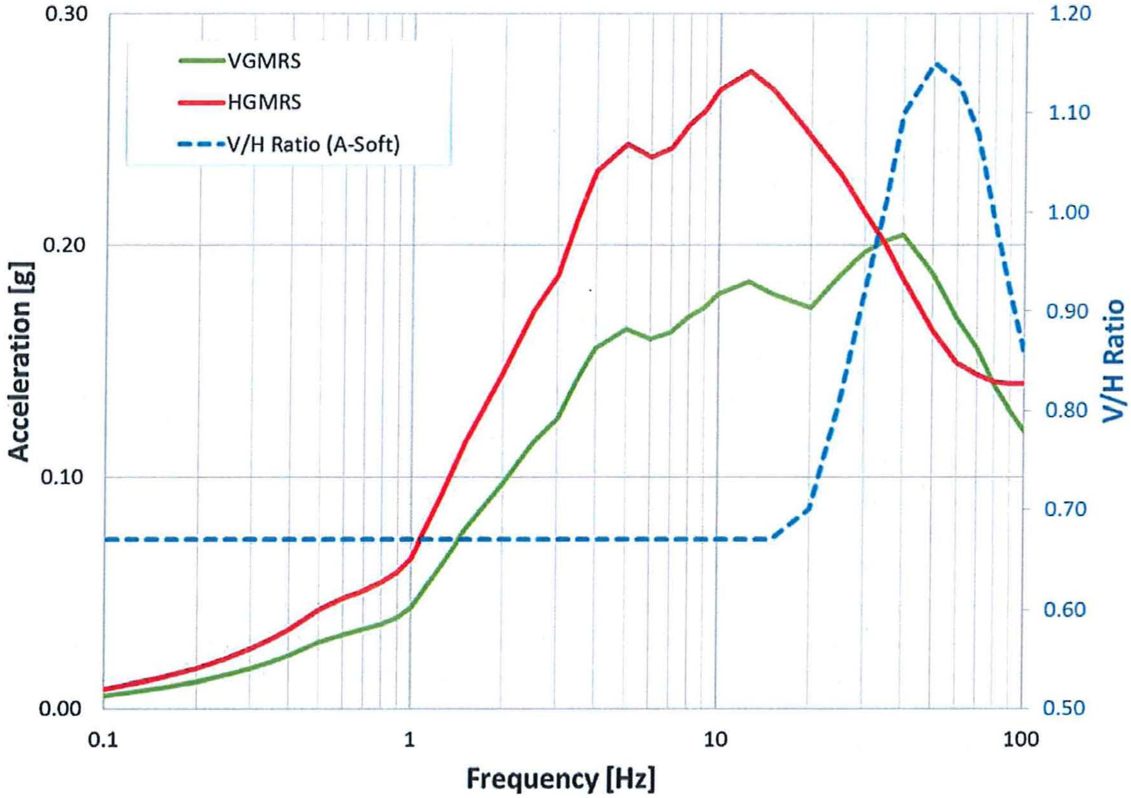

Figure 3-1 Plot of the Horizontal and Vertical Ground Motions Response Spectra and V/H Ratios

3.3 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.

3.4 Component Vertical Seismic Demand

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

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

The in-structure amplification factor AF_{SV} is derived from Figure 4-4 in Reference [8]. The in-cabinet vertical amplification factor, AF_c is derived in Reference [8] and is 4.7 for all cabinet types.

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.

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

PBNP 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 166 components that required evaluation. As summarized in Table B-1 in Appendix B:

- 162 of the devices have adequate seismic capacity.
- Four (4) of the components will have adequate capacity following a previously-planned replacement (see Section 5.2 of this report).

5.2 Identification of Follow-up Actions

Existing components 1-50G/A52-81, 1-50G/A52-84, 2-50G/A52-89, and 2-50G/A52-92 shall be replaced with ABB GKC model relays to ensure that this report's conclusions regarding these components are valid.

6 References

Note: Revision levels for referenced drawings are consistent with the revision levels used in Ref. 17.

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 Point Beach Letter, NRC 2014-0024, "NextEra Energy Point Beach, LLC Seismic Hazard and Screening Report (CEUS Sites), Response 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", March 31, 2014, ADAMS Accession Number ML14090A275

5 Not Used.

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", December 1990

14 NRC (T. Govan) Letter to NextEra Energy Point Beach (E. McCartney). "Point Beach Nuclear Plant, Units 1 and 2 – Staff Assessment of Information Provided Pursuant to Title 10 of the Code of Federal Regulations Part 50, Section 50.54(f), Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident (TAC NOS. MF3959 and MF3960)." August 3, 2015, ADAMS Accession Number ML15211A593

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 16Q0390-CAL-001, Rev. 1, "High Frequency Functional Confirmation and Fragility Evaluation of Components."

17 16Q0390-RPT-001, Rev. 1, "Selection of Relays and Switches for NTTF R2.1 High Frequency Seismic Evaluation."

18 Point Beach Drawing 541F091 Sheet 3 Rev. 19, P&ID U1 Reactor Coolant System.

19 Point Beach Drawing 541F091 Sheet 2 Rev. 40, P&ID U1 Reactor Coolant System.

20 Point Beach Drawing 541F091 Sheet 1 Rev. 54, P&ID U1 Reactor Coolant System.

21 Point Beach Drawing 541F092 Sheet 1 Rev. 38, P&ID U1 Primary Sample System.

22 Point Beach Drawing DS-C-82732 Sheet 1 Rev. 0, Mechanical Assembly Nozzle-Type Safety Valve.

23 Point Beach Drawing 499B466 Sheet 757D Rev. 10, Elementary Wiring Diagram Remotely Operated Valves.

24 Point Beach Drawing 499B466 Sheet 757A Rev. 6, Elementary Wiring Diagram 1RC-431C Reactor Coolant System Remotely Operated Valve.

25 Point Beach Drawing 499B466 Sheet 757B Rev. 6, Elementary Wiring Diagram 2RC-431C Reactor Coolant System Remotely Operated Valve.

26 Point Beach Drawing 195A778 Sheet 333 Rev. 8, Elementary Wiring Diagram Relay PC-429B-X.

27 Point Beach Drawing 195A778 Sheet 333A Rev. 6, Elementary Wiring Diagram Miscellaneous Relays.

28 Point Beach Drawing 195A778 Sheet 334 Rev. 4, Elementary Wiring Diagram Relay PC-430B-X.

29 Point Beach Drawing 499B466 Sheet 716A Rev. 10, Elementary Wiring Diagram PORV Isolation 1RC-515 T1 Pressurizer - 1RC-431C.

30 Point Beach Drawing 499B466 Sheet 716B Rev. 4, Elementary Wiring Diagram T-1 Pressurizer RC-430 PORV Isolation Valve 1RC-516.

31 Point Beach Drawing 499B466 Sheet 716P Rev. 4, Elementary Wiring Diagram 2T-1 Pressurizer 2RC-431C PORV Isolation Valve 2RC-515.

32 Point Beach Drawing 499B466 Sheet 716Q Rev. 3, Elementary Wiring Diagram 2T-1 Pressurizer RC-430 PORV Isolation Valve 2RC-516.

33 Point Beach Drawing 499B466 Sheet 562 Rev. 4, Elementary Wiring Diagram U1 1RC-580A/B Reactor Coolant System Gas Vent Valves.

34 Point Beach Drawing 499B466 Sheet 565 Rev. 5, Elementary Wiring Diagram 2RC-580A/B Reactor Coolant System Gas Vent Valves.

35 Point Beach Drawing 499B466 Sheet 787A Rev. 9, Elementary Wiring Diagram U1 1SC-951, 1SC-953, 1SC-955 and 1SC-959 Sample Containment Isolation Valves.

36 Point Beach Drawing 499B466 Sheet 787B Rev. 8, Elementary Wiring Diagram U2 2SC-951, 2SC-953, 2SC-955 and 2SC-959 Sample Containment Isolation Valves.

37 Point Beach Drawing 499B466 Sheet 785 Rev. 9, Elementary Wiring Diagram Remotely Operated Valve 1/2SC-966A-C.

38 Point Beach Drawing 499B466 Sheet 1695 Rev. 7, Elementary Wiring Diagram Containment Isolation Auxiliary Relays.

39 Point Beach Drawing 499B466 Sheet 1696 Rev. 5, Elementary Wiring Diagram

Containment Isolation Auxiliary Relays.
40 Point Beach Drawing DS-C-76788 Sheet 1 Rev. 1, Mechanical Assembly Nozzle-Type Relief Valve.
41 Point Beach Drawing H-51680 Rev. B, Mechanical Assembly Nozzle-Type Relief Valve.
42 Point Beach Drawing 499B466 Sheet 716AC Rev. 4, Elementary Wiring Diagram U1 1CV-1299 HX-4 Excess Letdown Heat Exchanger Inlet - Reactor Coolant Loop A Cold Leg.
43 Point Beach Drawing 499B466 Sheet 716AD Rev. 4, Elementary Wiring Diagram 2CV-1299 2HX-4 Excess Letdown Heat Exchanger Inlet - Reactor Coolant Loop A Cold Leg.
44 Point Beach Drawing 499B466 Sheet 762 Rev. 21, Elementary Wiring Diagram Remotely Operated Valve Unit 1 and 2.
45 Point Beach Drawing 499B466 Sheet 316A Rev. 13, Elementary Wiring Diagram U1 Charging Pump 1P-2C.
46 Point Beach Drawing 499B466 Sheet 316B Rev. 7, Elementary Wiring Diagram U1 Charging Pump 1P-2A.
47 Point Beach Drawing 499B466 Sheet 316C Rev. 9, Elementary Wiring Diagram U1 Charging Pump 1P-2B.
48 Point Beach Drawing 499B466 Sheet 720A Rev. 6, Elementary Wiring Diagram 1RC-427 Reactor Coolant Loop B Cold Leg Chemical and Volume Control Letdown Isolation.
49 Point Beach Drawing 499B466 Sheet 758 Rev. 15, Elementary Wiring Diagram 1/2ROV-371, 508, 769 and 846.
50 Point Beach Drawing 499B466 Sheet 890 Rev. 9, Elementary Wiring Diagram CV-371A Letdown Line Isolation.
51 Point Beach Drawing 499B466 Sheet 715A Rev. 3, Elementary Wiring Diagram U1 1CV-285 HX-4 Excess Letdown Heat Exchanger Outlet Valve.
52 Point Beach Drawing 499B466 Sheet 715C Rev. 5, Elementary Wiring Diagram 2CV-285-M 2HX-4 Excess Letdown Heat Exchanger Outlet Valve.
53 Point Beach Drawing 499B466 Sheet 791 Rev. 6, Elementary Wiring Diagram 1/2ROV-386.
54 Point Beach Drawing H-50913-4 Rev. 0, Mechanical Assembly Nozzle-Type Relief Valve.
55 Point Beach Drawing H-51341-1 Rev. 0, Mechanical Assembly Nozzle-Type Relief Valve. (Note: This reference was inadvertently identified as Revision 1 in Ref. 17. Revision 0 is the correct reference as there is no Revision 1 of this drawing.)
56 Point Beach Drawing M-201 Sheet 1 Rev. 62, P&ID U1 Main and Reheat Steam System.
57 Point Beach Drawing M-217 Sheet 1 Rev. 103, P&ID Auxiliary Feedwater System.
58 Point Beach Drawing M-202 Sheet 2 Rev. 55, P&ID Feedwater System.
59 Point Beach Drawing M-2201 Sheet 1 Rev. 56, P&ID U2 Main And Reheat Steam System.
60 Point Beach Drawing M-2202 Sheet 2 Rev. 57, P&ID Feedwater System.
61 Point Beach Drawing 499B466 Sheet 814C Rev. 6, Elementary Wiring Diagram 1P-29 Turbine-Driven Auxiliary Feedwater Pump Steam Supply MOV 1MS-2019.
62 Point Beach Drawing 499B466 Sheet 814B Rev. 6, Elementary Wiring Diagram 1P-29 Turbine-Driven Auxiliary Feedwater Pump Steam Supply MOV 1MS-2020.
63 Point Beach Drawing 499B466 Sheet 1523 Rev. 16, Elementary Wiring Diagram Auxiliary Feedwater Pump Control.
64 Point Beach Drawing 499B466 Sheet 1523A Rev. 8, Elementary Wiring Diagram 1P-29 Aux Feed Pump Start on Bus 1A01 and 1A02 Under Voltage.
65 Point Beach Drawing 499B466 Sheet 202 Rev. 21, Elementary Wiring Diagram 4160 V

Switchgear 1A01 Cubicle 3 Incoming Line 1A03-PT/1A01.
66 Point Beach Drawing 499B466 Sheet 204 Rev. 19, Elementary Wiring Diagram 4160V Switchgear Cubicle 16 Bus Tie to 1A-04 at 1A52-55.
67 Point Beach Drawing 499B466 Sheet 1802 Rev. 2, Elementary Wiring Diagram Steam to Turbine Driven Auxiliary Feedwater Pump Valve 2MS-02019 Unit 2.
68 Point Beach Drawing 499B466 Sheet 868 Rev. 24, Elementary Wiring Diagram Steam to Turbine Driven Auxiliary Feedwater Pump Valve 2MS-2020.
69 Point Beach Drawing 499B466 Sheet 743 Rev. 6, Elementary Wiring Diagram 1MS-2082 Turbine Driven Auxiliary Feedwater Trip and Throttle Valve.
70 Point Beach Drawing 499B466 Sheet 744 Rev. 7, Elementary Wiring Diagram U2 2MS-2082 Turbine Driven Auxiliary Feedwater Trip and Throttle Valve.
71 Point Beach Drawing 499B466 Sheet 1801 Rev. 0, Elementary Wiring Diagram Turbine Driven Auxiliary Feedwater Pump Discharge Valve 1AF-4000 Unit 1.
72 Point Beach Drawing 499B466 Sheet 813 Rev. 16, Elementary Wiring Diagram Turbine-Driven Auxiliary Feedwater Pump Discharge Valve.
73 Point Beach Drawing 499B466 Sheet 816 Rev. 16, Elementary Wiring Diagram Turbine-Driven Auxiliary Feedwater Pump Minimum Recirculation Control Valve 1AF-4002.
74 Point Beach Drawing 499B466 Sheet 867 Rev. 16, Elementary Wiring Diagram Turbine-Driven Auxiliary Feedwater Pump Discharge Valve.
75 Point Beach Drawing 499B466 Sheet 840 Rev. 1, Elementary Wiring Diagram Turbine Driven Auxiliary Feedwater Pump Discharge Valve 2MOV4001.
76 Point Beach Drawing 499B466 Sheet 869 Rev. 13, Elementary Wiring Diagram Turbine-Driven Auxiliary Feedwater Pump Minimum Recirculation Control Valve 2AF-4002.
77 Point Beach Report, "Point Beach Nuclear Plant Units 1 & 2 Final Safety Analysis Report," UFSAR 2017.
78 Point Beach Drawing 499B466 Sheet 263A Rev. 14, Elementary Wiring Diagram U1 Emergency Diesel Generator Breaker 1A52-60.
79 Point Beach Drawing 499B466 Sheet 266B Rev. 10, Elementary Wiring Diagram U1 4160V Switchgear Bus 1-A05 Undervoltage and Differential Lockout Relays.
80 Point Beach Drawing 499B466 Sheet 293B Rev. 16, Elementary Wiring Diagram Emergency Diesel Generator Breaker 2A52-67.
81 Point Beach Drawing 499B466 Sheet 296B Rev. 10, Elementary Wiring Diagram U2 4160V Switchgear Bus 2A05 Undervoltage and Differential Lockout Relays.
82 Point Beach Drawing 499B466 Sheet 269 Rev. 16, Elementary Wiring Diagram 4160V Switchgear 1-A06 (2-A06) Output Breaker 1A52-80 (2A52-93).
83 Point Beach Drawing 499B466 Sheet 225A Rev. 5, Elementary Wiring Diagram 4160V Switchgear 1-A06 (2-A06) Undervoltage and Differential Lockout Relay Scheme.
84 Point Beach Drawing 6090D11502 Sheet 1 Rev. 6, Elementary Wiring Diagram DC Protective Relay.
85 Point Beach Drawing 8413730 Sheet 3 Rev. 9, Schematic Diagram G01 Diesel Generator Start No. 1 Circuitry.
86 Point Beach Drawing 8413730 Sheet 4 Rev. 7, Schematic Diagram G01 Diesel Generator Start No. 2 Circuitry.
87 Point Beach Drawing 8413730 Sheet 22 Rev. 12, Schematic Diagram G02 Diesel Generator Start No. 1 Circuitry.
88 Point Beach Drawing 8413730 Sheet 23 Rev. 11, Schematic Diagram G02 Diesel

Generator Start No. 2 Circuitry.

89 Point Beach Drawing 8413730 Sheet 2 Rev. 9, Schematic Diagram G01 Diesel Generator DC Control.

90 Point Beach Drawing 8413730 Sheet 21 Rev. 9, Schematic Diagram G02 Diesel Generator DC Control.

91 Point Beach Drawing 8413730 Sheet 5 Rev. 7, Schematic Diagram G01 Diesel Generator Annunciation Part 1.

92 Point Beach Drawing 8413730 Sheet 6 Rev. 10, Schematic Diagram G01 Diesel Generator Annunciation Part 2.

93 Point Beach Drawing 8413730 Sheet 7 Rev. 7, Schematic Diagram G01 Diesel Generator Annunciation Part 3.

94 Point Beach Drawing 8413730 Sheet 24 Rev. 7, Schematic Diagram G02 Diesel Generator Annunciation Part 1.

95 Point Beach Drawing 8413730 Sheet 25 Rev. 12, Schematic Diagram G02 Diesel Generator Annunciation Part 2.

96 Point Beach Drawing 8413730 Sheet 26 Rev. 8, Schematic Diagram G02 Annunciation Part 3.

97 Point Beach Drawing 8413730 Sheet 1 Rev. 8, Schematic Diagram G01 Diesel Generator Relay and Metering.

98 Point Beach Drawing 8413730 Sheet 20 Rev. 14, Schematic Diagram G02 Diesel Generator Relay and Metering.

99 Point Beach Drawing 6090F02501 Sheet 1 Rev. 15, Elementary Wiring Diagram G03 (G04) Engine Control.

100 Point Beach Drawing 6090F02501 Sheet 2 Rev. 13, Elementary Wiring Diagram G03 (G04) Engine Control.

101 Point Beach Drawing 6090F02501 Sheet 3 Rev. 8, Elementary Wiring Diagram G03 (G04) Engine Control.

102 Point Beach Drawing 499B466 Sheet 550 Rev. 6, Elementary Wiring Diagram D07 Battery Charger Supply.

103 Point Beach Drawing 499B466 Sheet 553 Rev. 6, Elementary Wiring Diagram D08 Battery Charger Supply - D06 DC Station.

104 Point Beach Drawing 499B466 Sheet 554 Rev. 6, Elementary Wiring Diagram D105 DC Station Battery Charger Supply D107.

105 Point Beach Drawing 499B466 Sheet 557 Rev. 7, Elementary Wiring Diagram D106 DC Station Battery Charger Supply D108.

106 Point Beach Drawing 499B466 Sheet 1635 Rev. 8, Elementary Wiring Diagram ASIP Battery Charger Safety Injection Interlocks.

107 Point Beach Drawing 20-114030 Rev. 2, Schematic 400A Battery Charger 480VAC, 3 Phase, 60 Hz, 125VDC.

108 Point Beach Drawing 20-114031 Rev. 2, Schematic 400A Battery Charger Alarms 125Vdc.

109 Point Beach Drawing 014D36812 Sheet 1 Rev. 6, Schematic 10KVA Inverter.

110 Point Beach Drawing 014D36812 Sheet 2 Rev. 10, Schematic 10KVA Inverter 120 VAC 1-60Hz.

111 Point Beach Drawing 015D36813 Rev. 10, Schematic Static/Manual Bypass Switch.

112 Point Beach Drawing M-219 Sheet 1 Rev. 50, P&ID U1 Fuel Oil System.

113 Point Beach Drawing M-219 Sheet 2 Rev. 16, P&ID Fuel Oil System - Diesel Generator

Building.
114 Point Beach Drawing M-219 Sheet 3 Rev. 17, P&ID Fuel Oil System - Diesel Generator Building.
115 Point Beach Drawing 499B466 Sheet 669 Rev. 8, Elementary Wiring Diagram 480V MCC 1B-30 (2B-30) Fuel Oil Transfer Pump.
116 Point Beach Drawing 499B466 Sheet 664 Rev. 8, Elementary Wiring Diagram 480V MCC 1B-40 (2B-40) Fuel Oil Transfer Pump P-206B-M.
117 Point Beach Drawing 499B466 Sheet 829A Rev. 6, Elementary Wiring Diagram FO-3930 T-31A Diesel Generator Day Tank Inlet Secondary Off Isolation Valve.
118 Point Beach Drawing 499B466 Sheet 829B Rev. 4, Elementary Wiring Diagram FO-3931 Diesel Generator Day Tank Inlet Secondary Off Isolation Valve.
119 Point Beach Drawing 499B466 Sheet 1511 Rev. 12, Elementary Wiring Diagram Diesel Generator Day Tank Level Control.
120 Point Beach Drawing M-207 Sheet 1 Rev. 87, P&ID U1 Service Water System.
121 Point Beach Drawing M-207 Sheet 1A Rev. 42, P&ID Service Water System.
122 Point Beach Drawing 499B466 Sheet 364A Rev. 5, Elementary Wiring Diagram P-032A Service Water Pump 1B52-10C.
123 Point Beach Drawing 499B466 Sheet 364B Rev. 6, Elementary Wiring Diagram Normal Power to 1B311C-B854D P-32B Service Water Pump Transfer Switch.
124 Point Beach Drawing 499B466 Sheet 364C Rev. 5, Elementary Wiring Diagram Normal Power to 1B420C-B957D P-32C Service Water Pump Transfer Switch.
125 Point Beach Drawing 499B466 Sheet 394A Rev. 2, Elementary Wiring Diagram Service Water Pump P-032D.
126 Point Beach Drawing 499B466 Sheet 394B Rev. 3, Elementary Wiring Diagram Service Water Pump P-032E.
127 Point Beach Drawing 499B466 Sheet 394C Rev. 3, Elementary Wiring Diagram Service Water Pump P-032F.
128 Point Beach Drawing 110E163 Sheet 12A Rev. 21, Schematic ESF System Train A Reactor Safeguards.
129 Point Beach Drawing 110E163 Sheet 12B Rev. 21, Schematic ESF System Train B Reactor Safeguards.
130 Point Beach Drawing 48098 Rev. 4, Elementary Wiring Diagram 590A Strain-O-Matic Control Circuit for Intermittent Operation.
131 Point Beach Drawing 499B466 Sheet 651 Rev. 7, Elementary Wiring Diagram 480V MCC 1B-40 (2B-40) Radiator Fan W-181 A1-M, A2, A3, B2, B3.
132 Point Beach Drawing M-211 Sheet 1 Rev. 43, P&ID Heating and Ventilation Airflow.
133 Point Beach Drawing M-211 Sheet 3 Rev. 6, P&ID Diesel Generator Building Air Flow Diagram HVAC Systems.
134 Point Beach Drawing M-143 Rev. 19, P&ID Heating and Ventilation Temperature Control.
135 Point Beach Drawing 499B466 Sheet 596A Rev. 6, Elementary Wiring Diagram W-12A Diesel Generator Room Exhaust Fan.
136 Point Beach Drawing 499B466 Sheet 597A Rev. 6, Elementary Wiring Diagram G-01 Diesel Generator Room W-12B Exhaust Fan.
137 Point Beach Drawing 499B466 Sheet 596B Rev. 6, Elementary Wiring Diagram W-12C G-02 Room Exhaust Fan.
138 Point Beach Drawing 499B466 Sheet 597B Rev. 7, Elementary Wiring Diagram G-02

Diesel Generator Room W-12D Exhaust Fan.
139 Point Beach Drawing 499B466 Sheet 843 Rev. 4, Elementary Wiring Diagram Diesel Room Dampers Scheme No. 2Y0620 (1Y0620).
140 Point Beach Drawing 499B466 Sheet 654 Rev. 8, Elementary Wiring Diagram 480V MCC 1B-40 (2B-40) Emergency Diesel Generator G-03 (G-04) Diesel Room Exhaust.
141 Point Beach Drawing 499B466 Sheet 655 Rev. 7, Elementary Wiring Diagram 480V MCC 1B-40 (2B-40) Emergency Diesel Generator G-03 (G-04) Diesel Exhaust.
142 Point Beach Drawing 499B466 Sheet 657 Rev. 8, Elementary Wiring Diagram 480V MCC 1B-40 (2B-40) Emergency Diesel Generator G-03 (G-04) Switchgear Room Exhaust.
143 Point Beach Drawing E-11 Sheet 3 Rev. 8, Schematic Diagram 4160 V Auxiliary Relay and Metering.
144 Point Beach Drawing E-11 Sheet 4 Rev. 12, Schematic Diagram Relay and Metering Emergency Diesel Generator G03 4160V Bus 1A06.
145 Point Beach Drawing E-2011 Sheet 3 Rev. 13, Schematic Diagram 4160 V Auxiliary Relay and Metering.
146 Point Beach Drawing E-2011 Sheet 4 Rev. 11, Schematic Diagram 2A06 Emergency Diesel Generator G04 4160V Bus Relay and Metering.
147 Point Beach Drawing 541F153 Sheet 1 Rev. 32, One-Line Diagram U1 1B01/1B02/1B03/1B04 480 V.
148 Point Beach Drawing 541F153 Sheet 2 Rev. 31, One-Line Diagram U2 480 V.
149 Point Beach Drawing 499B466 Sheet 256A Rev. 4, Elementary Wiring Diagram U1 Station Service Transformer Breaker 1A52-58 4160V Switchgear Cubicle 58.
150 Point Beach Drawing 499B466 Sheet 274 Rev. 8, Elementary Wiring Diagram 4160V Switchgear 1-A06 (2-A06) Feeder Breaker 1A52-81 (2A52-92).
151 Point Beach Drawing 499B466 Sheet 275 Rev. 9, Elementary Wiring Diagram 4160V Switchgear 1-A06 (2-A06) Feeder Breaker 1A52-84 (2A52-89).
152 Point Beach Drawing 499B466 Sheet 286A Rev. 4, Elementary Wiring Diagram 4160V Switchgear 2A05.
153 Point Beach Drawing 684J741 Sheet 3 Rev. 17, P&ID Chemical and Volume Control System.
154 Point Beach Drawing 684J741 Sheet 2 Rev. 76, P&ID U1 Chemical and Volume Control System.
155 Point Beach Drawing 541F445 Sheet 3 Rev. 19, P&ID U2 Reactor Coolant System.
156 Point Beach Drawing 541F445 Sheet 2 Rev. 33, P&ID U2 Reactor Coolant System.
157 Point Beach Drawing 541F445 Sheet 1 Rev. 50, P&ID U2 Reactor Coolant System.
158 Point Beach Drawing 541F448 Sheet 1 Rev. 42, P&ID U2 Primary Sample System.
159 Point Beach Drawing 685J175 Sheet 3 Rev. 20, P&ID U2 Chemical and Volume Control System.
160 Point Beach Drawing 685J175 Sheet 2 Rev. 61, P&ID U2 Chemical and Volume Control System.

A Representative Sample Component Evaluations

The following sample calculation is extracted from Reference [16].

Notes:

1. Reference citations within the sample calculation are per the Ref. [16] reference section shown on the following page. Attachment citations within the sample calculation also refer to attachments to Ref. [16], not to attachments to this report.
2. This sample calculation contains evaluations of sample high-frequency-sensitive components per the methodologies of the EPRI high-frequency guidance [8].

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. SQUG Newsletter, Volume 3, Issue 3, "Seismic Qualification Utility Group Newsletter." October 1995. (see Attachment J)
   1.5. IEEE 344-1975 "IEEE Recommended Practices for Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations"
   1.6. SQUG GIP 2, "Generic Implementation Procedure (GIP) for Seismic Verification of Nuclear Plant Equipment." March 1993.
   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. SQUG Advisory Memorandum, "SQUG Advisory 2004-02: Relay GERS Corrections." September 7, 2004. (see Attachment K)
   1.10. ANSI/IEEE C37.98-1987, "An American National Standard IEEE Standard Seismic Testing of Relays." January 15, 1988
   1.11. EPRI NP-7147-SLV2, Addendum 2, "Seismic Ruggedness of Relays", April 1995

2. Nuclear Regulatory Commission Documents
   2.1. Point Beach Letter, NRC 2014-0024, "NextEra Energy Point Beach, LLC Seismic Hazard and Screening Report (CEUS Sites), Response 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", March 31, 2014, ADAMS Accession Number ML14090A275

3. Station Documents

   3.1. Reports
      3.1.1. Point Beach Nuclear Plant A-46 Report, Rev. 1, "USNRC Generic Letter 87-02 Unresolved Safety Issue A-46 Resolution - Relay Evaluation Report."
      3.1.2. Report No. 6090-NEQR-PANL-1, Rev. 0, "Nuclear Qualification Report of Control Panel Modification for Point Beach Nuclear Power Station."
      3.1.3. Report No. 48-65671-SS, Rev. 1, "Seismic Certification Report for Class 1E Electrical Equipment 5HK 350 Switchgear."

   3.2. Drawings
      3.2.1. Not Used

   3.3. Other Station Documents
      3.3.1. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002697, "1C-197 (Rev. 1)"
      3.3.2. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002698, "2C-197 (Rev. 1)"
      3.3.3. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000018, "1B-32 (Rev. 0)"

3.3.4. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001247, "1B-32 (Rev. 1)"
3.3.5. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001470, "1B-32 (Rev. 2)"
3.3.6. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002167, "1B-32 (Rev. 3)"
3.3.7. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002889, "1B-32 (Rev. 4)"
3.3.8. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000019, "2B-32 (Rev. 0)"
3.3.9. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001245, "2B-32 (Rev. 1)"
3.3.10. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001248, "2B-32 (Rev. 2)"
3.3.11. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001425, "2B-32 (Rev. 3)"
3.3.12. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001702, "2B-32 (Rev. 4)"
3.3.13. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002139, "2B-32 (Rev. 5)"
3.3.14. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002890, "2B-32 (Rev. 6)"
3.3.15. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000023, "1B-03 (Rev. 0)
3.3.16. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001474, "1B-03 (Rev. 1)
3.3.17. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001544, "1B-03 (Rev. 2)
3.3.18. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001531, "1B-03 (Rev. 3)
3.3.19. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002135, "1B-03 (Rev. 4)
3.3.20. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002317, "1B-03 (Rev. 5)
3.3.21. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002396, "1B-03 (Rev. 6)
3.3.22. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002535, "1B-03 (Rev. 7)
3.3.23. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003325, "1B-03 (Rev. 11)
3.3.24. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002895, "1B-03 (Rev. 9)
3.3.25. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003215, "1B-03 (Rev. 10)
3.3.26. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000025, "2B-03 (Rev. 0)"
3.3.27. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001588, "2B-03 (Rev. 1)"

3.3.28. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001532, "2B-03 (Rev. 2)"

3.3.29. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002110, "2B-03 (Rev. 3)"

3.3.30. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002476, "2B-03 (Rev. 4)"

3.3.31. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002604, "2B-03 (Rev. 5)"

3.3.32. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002796, "2B-03 (Rev. 6)"

3.3.33. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003216, "2B-03 (Rev. 7)"

3.3.34. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003360, "2B-03 (Rev. 8)"

3.3.35. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000027, "1B-04 (Rev. 0)"

3.3.36. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001475, "1B-04 (Rev. 1)"

3.3.37. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001545, "1B-04 (Rev. 2)"

3.3.38. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001535, "1B-04 (Rev. 3)"

3.3.39. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002136, "1B-04 (Rev. 4)"

3.3.40. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002408, "1B-04 (Rev. 5)"

3.3.41. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002536, "1B-04 (Rev. 6)"

3.3.42. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002219, "2B-04 (Rev. 4)"

3.3.43. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002896, "1B-04 (Rev. 8)"

3.3.44. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002989, "1B-04 (Rev. 9)"

3.3.45. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003324, "1B-04 (Rev. 10)"

3.3.46. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-000029, "2B-04 (Rev. 0)"

3.3.47. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001589, "2B-04 (Rev. 1)"

3.3.48. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-001536, "2B-04 (Rev. 2)"

3.3.49. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002111, "2B-04 (Rev. 3)"

3.3.50. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002797, "2B-04 (Rev. 4)"

3.3.51. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-003361, "2B-04 (Rev. 5)"

3.3.52. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002290, "C-82 (Rev. 3)"

3.3.53. Point Beach Nuclear Plant Screening Evaluation Work Sheet (SEWS) SQ-002378 "C-81 (Rev. 3)"

3.3.54. Point Beach EC Number 0000257402, Rev. 1, "G-03/G-04 EDG Coolant Discharge Temperature Switch (TS-03342A /B), EDG Jacket Water High Alarm Temperature Switch (TS-03312A/B) AND G-03/G-04 Coolant Discharge Temperature Switch (TS-03343A /B)."

3.4. Station Information

3.4.1. Design Information Transmittal DIT-PBNP-EXT-20170123, Rev. 0, "High Frequency Seismic Evaluation."

3.4.2. 99C0118-C-001, Rev. 0, "EDG Relay Outlier Resolution."

3.4.3. 16Q0390-RPT-001, Rev. 1, "Selection of Relays and Switches for NTTF R2.1 High Frequency Seismic Evaluation."

4. S&A Documents

4.1. Not Used

5. Other Documents

5.1. Electroswitch Series 24 Lock-Out Relay (LOR) Information Sheet. (See Attachment D for select pages)

5.2. Struthers-Dunn Catalog, Edition 301, "Power Relays and Contactors Catalog." (See Attachment E for select pages)

5.3. ABB Letter to NextEra Energy Point Beach, "10 C.F.R. Part 21 Notification of Deviation – GKT Relay", April 13, 2017. (see Attachment F)

5.4. ABB Descriptive Bulletin 41-117S, July 1991, "Type SSC-T Current Relay." (see Attachment G for select pages)

5.5. Square D Class 8501 Catalog, "Industrial Control Relays Type X." (see Attachment H for select pages)

5.6. ABB Descriptive Bulletin 41-181S, January 1991, "Type GKC, GKT Ground Fault Relay Systems." (see Attachment L for select pages)

8 ANALYSIS

A detailed example analysis of two components is provided within this section. This example is intended to illustrate each step of the high frequency analysis methodology given in Section 2. A complete analysis of all subject components is shown in tabular form in Attachment A.

8.1 Equipment Scope

The list of essential components at PBNP are per Ref. 3.4.3 and can be found in Attachment A, Table A-1 of this calculation.

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 1-62-4044 and 1-86/A52-60 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 PBNP 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): $SA_{GMRS} := 0.267g$ (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 elevation of the highest foundation of key, safety-related structures, which is EL. 8'-0".

Control Point Elevation (Ref. 2.1, Section 3.2) $EL_{cp} := 8 \cdot ft$

Component Floor Elevation (Ref. 3.4.1): $EL_{comp} := 8 \cdot ft$

Components 1-62-4044 and 1-86/A52-60 are both located in the Control Building at elevation 8'-0".

Distance Between Component Floor and Control Point: $h_{comp} := EL_{comp} - EL_{cp} = 0.00 \cdot ft$

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:

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

$$AF_{SH}(h_{comp}) = 1.20$$

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 and 1.3) (enter "MCC", "Switchgear", "Control Cabinet", or "Rigid"):

$$cab := \begin{pmatrix} \text{"Control Cabinet"} \\ \text{"Switchgear"} \end{pmatrix} \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

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

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

$$\overrightarrow{AF_{c.h}(cab)} = \begin{pmatrix} 4.50 \\ 7.20 \end{pmatrix} \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

Note: See Group 1 and Group 2 in Attachment A for further explanation regarding Control Cabinet configuration selection for components 1-62-4044 and 1-86/A52-60.

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):

$$ICRS_{c.h} := \overrightarrow{AF_{SH}(h_{comp}) \cdot AF_{c.h}(cab) \cdot SA_{GMRS}} = \begin{pmatrix} 1.442 \\ 2.307 \end{pmatrix} \cdot g$$

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)

$$SA_{GMRS} = 0.267 \cdot g \quad \text{(at 15 Hz)}$$

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

Peak Ground Acceleration (GMRS):

$$PGA_{GMRS} := 0.140g$$

Calculate the shear wave velocity traveling from a depth of 30m to the surface of the site (V_{s30}) from Ref. 1.1, Eq. 3-1, 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 (98.43ft) to the surface of the site is 0.10149 sec.

Shear Wave Velocity:

$$V_{s30} := \frac{98.43ft}{0.10149sec} = 970 \cdot \frac{ft}{sec}$$

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 0.140g and shear wave velocity of 970ft/sec at Point Beach, the site soil class is A-Soft.

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). For high-frequency evaluation, the range of interest frequency is 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 40Hz.)

V/H Ratio at 40Hz
(See Attachment B of this calculation): $V/H := 1.10$

Horizontal GMRS at Frequency of Peak Vertical GMRS (at 40Hz)
(See Attachment B of this calculation): $SA_{HGMRS} := 0.186g$

Peak Acceleration of Vertical GMRS Between 15 Hz and 40 Hz: $SA_{VGMRS} := V/H \cdot SA_{HGMRS} = 0.205 \cdot g$ (at 40 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): $h_{comp} = 0.00 \cdot ft$

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: $AF_{SV} := m_v \cdot h_{comp} + b_v = 1.00$

Per Ref. 1.1, Eq. 4-3, 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): $ICRS_{c.v} := AF_{SV} \cdot AF_{c.v} \cdot SA_{VGMRS} = 0.96 \cdot g$

Note that the vertical seismic demand is the same for both components 1-62-4044 and 1-86/A52-60.

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity

A sample calculation for the high-frequency seismic capacity of components 1-62-4044 and 1-86/A52-60 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.

1-62-4044 Capacity

The model for component 1-62-4044 is an Agastat ETR14D3D004 relay mounted on control panel 1C-197 in the Control Building (CB), EL. 8'-0". As explained in Attachment A (Group 1), an effective horizontal amplification factor of 4.5 and vertical amplification factor of 4.7 is used for components mounted on panel 1C-197.

The relay model for component 1-62-4044 was not tested as part of the Ref. 1.2, high-frequency testing program. GERS spectral accelerations from Ref. 1.7 are used as the seismic test capacity. Per Ref. 1.7, page B-29, the minimum (non-operate, normally-open or normally-closed) GERS capacity of Agastat ETR relay is 3.8g. Per Ref. 1.7, Fig 2-1 (p. 2-3) and p. 2-21, all groups of GERS relays are specified by the IEEE test standard C37.98 (Ref. 1.10). The seismic test capacity of each relay is based on 5% damping.

1-86/A52-60 Capacity

The model for component 1-86/A52-60 is a Westinghouse MG-6 relay mounted on switchgear 1A-05 in the Control Building (CB), EL. 8'-0". As explained in Group 2, an effective horizontal amplification factor of 7.2 and vertical amplification factor of 4.7 is used for components mounted on switchgear 1A-05.

Per Ref. 3.1.1, Appendix C, pg. 102, the capacity of component 86/1A52-60 mounted on switchgear 1A-05 is taken as 10g (GERS Capacity). The testing is specified by the IEEE test standard (ANSI/IEEE C37.98, formerly IEEE501) (Ref. 1.10). The seismic test capacity is based on 5% damping.

Seismic Test Capacity (SA*):

$$SA' := \begin{pmatrix} 3.8 \\ 10.0 \end{pmatrix} g \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity (cont'd)

8.3.2 Effective Spectral Test Capacity

GERS spectral acceleration for the components 1-62-4044 and 1-86/A52-60 is used as the seismic test 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):

$$SA_T := \begin{pmatrix} SA'_1 \\ SA'_2 \end{pmatrix} = \begin{pmatrix} 3.80 \\ 10.00 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

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:

$$F_k := \begin{pmatrix} 1.50 \\ 1.50 \end{pmatrix} \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

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. 4-17 to 4-18, conservatively take the F_{MS} value of 1.0.

Single-Axis Correction Factor:

$$F_{MS} := 1.0$$

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):

$$TRS := \left(\frac{SA_T}{F_k}\right) \cdot F_{MS} = \begin{pmatrix} 2.533 \\ 6.667 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

8.4 Component 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 1-62-4044 and 1-86/A52-60 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): $$\frac{TRS}{ICRS_{c.h}} = \begin{pmatrix} 1.757 \\ 2.890 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

Vertical seismic margin (Ref. 1.1, Eq. 4-6): $$\frac{TRS}{ICRS_{c.v}} = \begin{pmatrix} 2.634 \\ 6.933 \end{pmatrix} \begin{matrix} > \mathbf{1.0,\ O.K.} \\ > \mathbf{1.0,\ O.K.} \end{matrix} \begin{pmatrix} \text{1-62-4044} \\ \text{1-86/A52-60} \end{pmatrix}$$

Both the horizontal and vertical seismic margins for 1-62-4044 and 1-86/A52-60 are greater than 1.00; indicating that these components are adequate for high frequency seismic spectral ground motion.

The preceding sample calculation is summarized in Table A-1 below:

Table A-1: Summary of Sample Evaluation

Description		
Model Number	ETR14D3D004	MG-6
Manufacturer	Agastat	Westinghouse
Equipment ID	1-62-4044	1-86/A52-60
Enclosure ID	1C-197	1A-05
Enclosure Type	Control Cabinet	Switchgear
Building	Control Building	Control Building
Floor EL. (ft)	8.00	8.00
Found. EL. (ft)	8.00	8.00
Capacity		
Test Source	GERS	GERS
Test Result	Lowest level without chatter	Lowest level without chatter
Multi-axis motion?	Yes	Yes
Seismic Test Capacity (SA*) (g)	3.800	10.000
Effective Spectral Test Capacity ($SA_{T)}$ (g)	3.800	10.000
Seismic Capacity Knockdown Factor (F_k)	1.500	1.500
Seismic Testing Single-Axis Correction Factor (F_{MS})	1.000	1.000
Effective Wide-Band Component Capacity Acceleration (TRS) (g)	2.533	6.667
Horizontal High Frequency Demand		
Peak Horizontal Acceleration of GMRS (SA_{GMRS})(g)	0.267	0.267
In-structure Amplification (AF_{SH})	1.200	1.200
In-cabinet Amplification (AF_{CH})	4.500	7.200
Mounting Point Demand ($ICRS_{CH}$) (g)	1.442	2.307
Vertical High Frequency Demand		
Horizontal GMRS at Frequency of Peak Vertical GMRS (at 40Hz) $(SA_{GMRS})_i$ (g)	0.186	0.186
$(V/H)_i$ Ratio	1.100	1.100
Peak Vertical Acceleration of GMRS SA_{VGMRS} (g)	0.205	0.205
In-cabinet Amplification (AF_{SV})	1.000	1.000
In-cabinet Amplification (AF_{CV})	4.700	4.700
Mounting Point Demand ($ICRS_{CV}$) (g)	0.962	0.962
Capacity / Demand		
TRS / $ICRS_{CH}$	1.757	2.890
TRS / $ICRS_{CV}$	2.634	6.933

B Components Identified for High Frequency Confirmation

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
1	1-62-4044	Relay	Core Cooling	1MS-2082 Trip Time Delay Relay	Agastat	ETR14D3D004	1C197	Control Panel	CB	8	GERS	Cap > Dem
2	2-62-4044	Relay	Core Cooling	2MS-2082 Trip Time Delay Relay	Agastat	ETR14D3D004	2C197	Control Panel	CB	8	GERS	Cap > Dem
3	1-86/A52-60	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	Westinghouse	MG-6	1A-05	Switchgear	CB	8	GERS	Cap > Dem
4	1-86/A52-58	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	Westinghouse	MG-6	1A-05	Switchgear	CB	8	GERS	Cap > Dem
5	ESTX	Relay	AC/DC Power Support Systems	Engine Stop Auxiliary Relay	Westinghouse	MG-6	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
6	2-86/A52-67	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	Westinghouse	MG-6	2A-05	Switchgear	CB	8	GERS	Cap > Dem
7	2-86/A52-75	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	Westinghouse	MG-6	2A-05	Switchgear	CB	8	GERS	Cap > Dem
8	ESTX	Relay	AC/DC Power Support Systems	Engine Stop Auxiliary Relay	Westinghouse	MG-6	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
9	42(o)	Contactor	RCS/Reactor Vessel Inventory Control	1CV-1299 Opening Contactor	Cutler Hammer	A201K1C	1B32 Compt. 7J	Motor Control Center (MCC)	PAB	8	GERS	Cap > Dem
10	42(o)	Contactor	RCS/Reactor Vessel Inventory Control	2CV-1299 Opening Contactor	Cutler Hammer	A201K1C	2B32 Compt. 7J	Motor Control Center (MCC)	PAB	8	GERS	Cap > Dem
11	42(c)	Contactor	Core Cooling	1MS-2082 Closing Contactor	Westinghouse	NBFD65NR	1SMS-02082	Switchgear	CB	8	GERS	Cap > Dem
12	42(c)	Contactor	Core Cooling	2MS-2082 Closing Contactor	Westinghouse	NBFD65NR	2SMS-02082	Switchgear	CB	8	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
13	ESTR	Relay	AC/DC Power Support Systems	Engine Stop Delay Auxiliary Relay	Westinghouse	NBFD66S	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
14	ESTR	Relay	AC/DC Power Support Systems	Engine Stop Delay Auxiliary Relay	Cutler Hammer	NBFD66S	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
15	BTR	Relay	AC/DC Power Support Systems	Breaker Trip Relay	Westinghouse	NBFD65NR	C-81	Control Panel	DGB	28	GERS	Cap > Dem
16	BTR	Relay	AC/DC Power Support Systems	Breaker Trip Relay	Westinghouse	NBFD65NR	C-82	Control Panel	DGB	28	GERS	Cap > Dem
17	SDRX2	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Westinghouse	NBFD65NR	C-81	Control Panel	DGB	28	GERS	Cap > Dem
18	SDRX2	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Westinghouse	NBFD65NR	C-82	Control Panel	DGB	28	GERS	Cap > Dem
19	1-51/50A/A 52-60	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	1A-05	Switchgear	CB	8	GERS	Cap > Dem
20	1-51/50B/A 52-60	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	1A-05	Switchgear	CB	8	GERS	Cap > Dem
21	1-51/50C/A 52-60	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	1A-05	Switchgear	CB	8	GERS	Cap > Dem
22	51A	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
23	51B	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
24	51C	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
25	2-51/50A/A 52-67	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	2A-05	Switchgear	CB	8	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
26	2-51/50B/A 52-67	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	2A-05	Switchgear	CB	8	GERS	Cap > Dem
27	2-51/50C/A 52-67	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	2A-05	Switchgear	CB	8	GERS	Cap > Dem
28	51A	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
29	51B	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
30	51C	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-5 HILO	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
31	1-51/50A/A 52-58	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	1A-05	Switchgear	CB	8	GERS	Cap > Dem
32	1-51/50B/A 52-58	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	1A-05	Switchgear	CB	8	GERS	Cap > Dem
33	1-51/50C/A 52-58	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	1A-05	Switchgear	CB	8	GERS	Cap > Dem
34	2-51/50A/A 52-75	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	2A-05	Switchgear	CB	8	GERS	Cap > Dem
34	2-51/50B/A 52-75	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	2A-05	Switchgear	CB	8	GERS	Cap > Dem
36	2-51/50C/A 52-75	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	CO-8	2A-05	Switchgear	CB	8	GERS	Cap > Dem
37	1-86/A-05	Relay	AC/DC Power Support Systems	Bus Lockout Relay	ELECTRO SWITCH	SERIES 24	1A-05	Switchgear	CB	8	GERS	Cap > Dem
38	1-86/A-06	Relay	AC/DC Power Support Systems	Bus Lockout Relay	ELECTRO SWITCH	SERIES 24	1A-06	Switchgear	DGB	28	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
39	2-86/A-05	Relay	AC/DC Power Support Systems	Bus Lockout Relay	ELECTRO SWITCH	SERIES 24	2A-05	Switchgear	CB	8	GERS	Cap > Dem
40	2-86/A-06	Relay	AC/DC Power Support Systems	Bus Lockout Relay	ELECTRO SWITCH	SERIES 24	2A-06	Switchgear	DGB	28	GERS	Cap > Dem
41	NEWX	Relay	AC/DC Power Support Systems	Fault Latching Relay	STRUTHERS-DUNN	B255XBAP	C-34	EDG Alarm and Electrical Panel	CB	8	EPRI HF Test	Cap > Dem
42	NEWX	Relay	AC/DC Power Support Systems	Fault Latching Relay	STRUTHERS-DUNN	B255XBAP	C-35	EDG Alarm and Electrical Panel	CB	8	EPRI HF Test	Cap > Dem
43	32X	Relay	AC/DC Power Support Systems	Reverse Power Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
44	32X	Relay	AC/DC Power Support Systems	Reverse Power Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
45	40X	Relay	AC/DC Power Support Systems	Loss of Field Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
46	40X	Relay	AC/DC Power Support Systems	Loss of Field Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
47	51X	Relay	AC/DC Power Support Systems	Overcurrent Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
48	51X	Relay	AC/DC Power Support Systems	Overcurrent Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
49	87X	Relay	AC/DC Power Support Systems	Differential Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
50	87X	Relay	AC/DC Power Support Systems	Differential Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
51	OTR	Relay	AC/DC Power Support Systems	Overspeed Trip Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
52	OTR	Relay	AC/DC Power Support Systems	Overspeed Trip Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
53	R2	Relay	AC/DC Power Support Systems	Fail-to-Start Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
54	R2	Relay	AC/DC Power Support Systems	Fail-to-Start Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
55	R7	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
56	R7	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
57	R7X	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
58	R7X	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
59	R7X1	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
60	R7X1	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
61	R9	Relay	AC/DC Power Support Systems	Idle Start Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
62	R9	Relay	AC/DC Power Support Systems	Idle Start Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
63	R9X1	Relay	AC/DC Power Support Systems	Idle Start Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
64	R9X1	Relay	AC/DC Power Support Systems	Idle Start Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
65	SDR	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
66	SDR	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
67	SDRX	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
68	SDRX	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
69	SDRX1	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
70	SDRX1	Relay	AC/DC Power Support Systems	Emergency Safety Shutdown Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
71	TD4X	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
72	TD4X	Relay	AC/DC Power Support Systems	Normal Stop Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
73	TD5X	Relay	AC/DC Power Support Systems	Shutdown Isolation Auxiliary Relay	Square D	8501	C-81	Control Panel	DGB	28	GERS	Cap > Dem
74	TD5X	Relay	AC/DC Power Support Systems	Shutdown Isolation Auxiliary Relay	Square D	8501	C-82	Control Panel	DGB	28	GERS	Cap > Dem
75	FFTD	Relay	AC/DC Power Support Systems	Field Flash Time Delay Relay	Agastat	E7012PC004	C-81	Control Panel	DGB	28	GERS	Cap > Dem
76	FFTD	Relay	AC/DC Power Support Systems	Field Flash Time Delay Relay	Agastat	E7012PC004	C-82	Control Panel	DGB	28	GERS	Cap > Dem
77	TD1	Relay	AC/DC Power Support Systems	Air Start Time Delay Relay	Agastat	E7012PC004	C-81	Control Panel	DGB	28	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
78	TD1	Relay	AC/DC Power Support Systems	Air Start Time Delay Relay	Agastat	E7012PC004	C-82	Control Panel	DGB	28	GERS	Cap > Dem
79	ITD	Relay	AC/DC Power Support Systems	Idle Time Delay Relay	Agastat	E7012PD004	C-81	Control Panel	DGB	28	GERS	Cap > Dem
80	ITD	Relay	AC/DC Power Support Systems	Idle Time Delay Relay	Agastat	E7012PD004	C-82	Control Panel	DGB	28	GERS	Cap > Dem
81	TD4	Relay	AC/DC Power Support Systems	Normal Stop Time Delay Relay	Agastat	E7012PH004	C-81	Control Panel	DGB	28	GERS	Cap > Dem
82	TD4	Relay	AC/DC Power Support Systems	Normal Stop Time Delay Relay	Agastat	E7012PH004	C-82	Control Panel	DGB	28	GERS	Cap > Dem
83	TD5	Relay	AC/DC Power Support Systems	Shutdown Isolation Time Delay Relay	Agastat	E7014PE004	C-81	Control Panel	DGB	28	GERS	Cap > Dem
84	TD5	Relay	AC/DC Power Support Systems	Shutdown Isolation Time Delay Relay	Agastat	E7014PE004	C-82	Control Panel	DGB	28	GERS	Cap > Dem
85	TD8	Relay	AC/DC Power Support Systems	Normal Stop Time Delay Relay	Agastat	E7022PC004	C-81	Control Panel	DGB	28	EPRI HF Test	Cap > Dem
86	TD8	Relay	AC/DC Power Support Systems	Normal Stop Time Delay Relay	Agastat	E7022PC004	C-82	Control Panel	DGB	28	EPRI HF Test	Cap > Dem
87	87	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	SA-1	C-81	Control Panel	DGB	28	GERS	Cap > Dem
88	87	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	SA-1	C-82	Control Panel	DGB	28	GERS	Cap > Dem
89	1A52-58	Circuit Breaker	AC/DC Power Support Systems	1X-13 Circuit Breaker	Westinghouse	50DH350	1A-05	Switchgear	CB	8	EPRI HF Test	Cap > Dem
90	1A52-60	Circuit Breaker	AC/DC Power Support Systems	G-01 Circuit Breaker	Westinghouse	50DH350	1A-05	Switchgear	CB	8	EPRI HF Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
91	2A52-67	Circuit Breaker	AC/DC Power Support Systems	G-02 Circuit Breaker	Westinghouse	50DH350	2A-05	Switchgear	CB	8	EPRI HF Test	Cap > Dem
92	2A52-75	Circuit Breaker	AC/DC Power Support Systems	2X-13 Circuit Breaker	Westinghouse	50DH350	2A-05	Switchgear	CB	8	EPRI HF Test	Cap > Dem
93	1A52-80	Circuit Breaker	AC/DC Power Support Systems	G-03 Circuit Breaker	ABB	5HK350	1A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
94	1A52-81	Circuit Breaker	AC/DC Power Support Systems	1X-06 Circuit Breaker	ABB	5HK350	1A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
95	1A52-84	Circuit Breaker	AC/DC Power Support Systems	1X-14 Circuit Breaker	ABB	5HK350	1A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
96	2A52-89	Circuit Breaker	AC/DC Power Support Systems	2X-14 Circuit Breaker	ABB	5HK350	2A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
97	2A52-92	Circuit Breaker	AC/DC Power Support Systems	2X-06 Circuit Breaker	ABB	5HK350	2A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
98	2A52-93	Circuit Breaker	AC/DC Power Support Systems	G-04 Circuit Breaker	ABB	5HK350	2A-06	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
99	1B52-10C	Circuit Breaker	AC/DC Power Support Systems	P-032A Circuit Breaker	Westinghouse	DB-50	1B-03	Switchgear	CB	26	GERS	Cap > Dem
100	1B52-11C	Circuit Breaker	AC/DC Power Support Systems	P-032B Circuit Breaker	Westinghouse	DB-50	1B-03	Switchgear	CB	26	GERS	Cap > Dem
101	1B52-13C	Circuit Breaker	AC/DC Power Support Systems	1B-39 Feeder Circuit Breaker	Westinghouse	DB-50	1B-03	Switchgear	CB	26	GERS	Cap > Dem
102	1B52-14B	Circuit Breaker	AC/DC Power Support Systems	1B-32 Feeder Circuit Breaker	Westinghouse	DB-50	1B-03	Switchgear	CB	26	GERS	Cap > Dem
103	1B52-20C	Circuit Breaker	AC/DC Power Support Systems	P-032C Circuit Breaker	Westinghouse	DB-50	1B-04	Switchgear	CB	26	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
104	1B52-24C	Circuit Breaker	AC/DC Power Support Systems	1B-49 Feeder Circuit Breaker	Westinghouse	DB-50	1B-04	Switchgear	CB	26	GERS	Cap > Dem
105	2B52-27B	Circuit Breaker	AC/DC Power Support Systems	P-032D Circuit Breaker	Westinghouse	DB-50	2B-04	Switchgear	CB	26	GERS	Cap > Dem
106	2B52-27C	Circuit Breaker	AC/DC Power Support Systems	P-032E Circuit Breaker	Westinghouse	DB-50	2B-04	Switchgear	CB	26	GERS	Cap > Dem
107	2B52-31A	Circuit Breaker	AC/DC Power Support Systems	2B-49 Feeder Circuit Breaker	Westinghouse	DB-50	2B-04	Switchgear	CB	26	GERS	Cap > Dem
108	2B52-34B	Circuit Breaker	AC/DC Power Support Systems	P-032F Circuit Breaker	Westinghouse	DB-50	2B-03	Switchgear	CB	26	GERS	Cap > Dem
109	2B52-36C	Circuit Breaker	AC/DC Power Support Systems	2B-39 Feeder Circuit Breaker	Westinghouse	DB-50	2B-03	Switchgear	CB	26	GERS	Cap > Dem
110	2B52-38B	Circuit Breaker	AC/DC Power Support Systems	2B-32 Feeder Circuit Breaker	Westinghouse	DB-50	2B-03	Switchgear	CB	26	GERS	Cap > Dem
111	1B52-16B	Circuit Breaker	AC/DC Power Support Systems	1B-03 Feeder Circuit Breaker	Westinghouse	DB-75	1B-03	Switchgear	CB	26	GERS	Cap > Dem
112	1B52-17B	Circuit Breaker	AC/DC Power Support Systems	1B-04 Feeder Circuit Breaker	Westinghouse	DB-75	1B-04	Switchgear	CB	26	GERS	Cap > Dem
113	2B52-25B	Circuit Breaker	AC/DC Power Support Systems	2B-04 Feeder Circuit Breaker	Westinghouse	DB-75	2B-04	Switchgear	CB	26	GERS	Cap > Dem
114	2B52-40B	Circuit Breaker	AC/DC Power Support Systems	2B-03 Feeder Circuit Breaker	Westinghouse	DB-75	2B-03	Switchgear	CB	26	GERS	Cap > Dem
115	1-50D/A52-81	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	50D	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
116	1-50D/A52-84	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	50D	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
117	2-50D/A52-89	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	50D	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
118	2-50D/A52-92	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	50D	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
119	1-51/A52-80	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
120	1-51/A52-81	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
121	1-51/A52-84	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
122	2-51/A52-89	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
123	2-51/A52-92	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
124	2-51/A52-93	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
125	1-87-1/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
126	1-87-2/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
127	1-87-3/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
128	2-87-1/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
129	2-87-2/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
130	2-87-3/A-06	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	87B	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
131	1-50G/A52-81[3]	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	GKC	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
132	1-50G/A52-84[3]	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	GKC	1A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
133	2-50G/A52-89[3]	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	GKC	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
134	2-50G/A52-92[3]	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	GKC	2A-06	Switchgear	DGB	28	Qualification Test	Cap > Dem
135	1-50G/A52-58	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	SSC-T	1A-05	Switchgear	CB	8	Rugged[2]	Cap > Dem
136	2-50G/A52-75	Relay	AC/DC Power Support Systems	Ground Fault Protective Relay	ABB	SSC-T	2A-05	Switchgear	CB	8	Rugged[2]	Cap > Dem
137	LS-OTLS	Switch	AC/DC Power Support Systems	Overspeed Switch	Square D	Class 9007, Type T	G-01 Skid	Diesel Generator	CB	8	Rugged[2]	Cap > Dem
138	LS-OTLS	Switch	AC/DC Power Support Systems	Overspeed Switch	Square D	Class 9007, Type T	G-02 Skid	Diesel Generator	CB	8	Rugged[2]	Cap > Dem
139	OTS	Switch	AC/DC Power Support Systems	Overspeed Switch	Square D	Class 9007, Type T	G-03 Skid	Diesel Generator	DGB	28	Rugged[2]	Cap > Dem
140	OTS	Switch	AC/DC Power Support Systems	Overspeed Switch	Square D	Class 9007, Type T	G-04 Skid	Diesel Generator	DGB	28	Rugged[2]	Cap > Dem
141	LR	Switch	AC/DC Power Support Systems	Voltage Shutdown Latching Relay	Square D	Class 8501 (XUDO)	C-81	Switchgear	DGB	28	EPRI HF Test	Cap > Dem
142	LR	Switch	AC/DC Power Support Systems	Voltage Shutdown Latching Relay	Square D	Class 8501 (XUDO)	C-82	Switchgear	DGB	28	EPRI HF Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
143	1-86/A52-80	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	1A-06	Switchgear	DGB	28	GERS	Cap > Dem
144	1-86/A52-81	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	1A-06	Switchgear	DGB	28	GERS	Cap > Dem
145	1-86/A52-84	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	1A-06	Switchgear	DGB	28	GERS	Cap > Dem
146	2-86/A52-89	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	2A-06	Switchgear	DGB	28	GERS	Cap > Dem
147	2-86/A52-92	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	2A-06	Switchgear	DGB	28	GERS	Cap > Dem
148	2-86/A52-93	Relay	AC/DC Power Support Systems	Circuit Breaker Lockout Relay	ABB	RXM1	2A-06	Switchgear	DGB	28	GERS	Cap > Dem
149	TS4	Switch	AC/DC Power Support Systems	Temperature Switch	Neo-Dyn	100T3FZ3P	G-03 Skid	Diesel Generator	DGB	28	GERS	Cap > Dem
150	TS4	Switch	AC/DC Power Support Systems	Temperature Switch	Neo-Dyn	100T3FZ3P	G-04 Skid	Diesel Generator	DGB	28	GERS	Cap > Dem
151	1-87A/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	1A-05	Switchgear	CB	8	Qualification Test	Cap > Dem
152	1-87B/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	1A-05	Switchgear	CB	8	Qualification Test	Cap > Dem
153	1-87C/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	1A-05	Switchgear	CB	8	Qualification Test	Cap > Dem
154	2-87A/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	2A-05	Switchgear	CB	8	Qualification Test	Cap > Dem
155	2-87B/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	2A-05	Switchgear	CB	8	Qualification Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation (See Section 2)

No.	Component						Enclosure		Bldg.[1]	Floor Elev. (ft)	Component Evaluation	
	ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
156	2-87C/A-05	Relay	AC/DC Power Support Systems	Differential Protective Relay	ABB	CA-16	2A-05	Switchgear	CB	8	Qualification Test	Cap > Dem
157	67RP	Relay	AC/DC Power Support Systems	Reverse Power Protective Relay	ABB	CW	C-34	EDG Alarm and Electrical Panel	CB	8	Qualification Test	Cap > Dem
158	67RP	Relay	AC/DC Power Support Systems	Reverse Power Protective Relay	ABB	CW	C-35	EDG Alarm and Electrical Panel	CB	8	Qualification Test	Cap > Dem
159	40T	Relay	AC/DC Power Support Systems	Field Voltage Time Delay Relay	Square D	Series A, Type EQ	C-34	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
160	40T	Relay	AC/DC Power Support Systems	Field Voltage Time Delay Relay	Square D	Series A, Type EQ	C-35	EDG Alarm and Electrical Panel	CB	8	GERS	Cap > Dem
161	32	Relay	AC/DC Power Support Systems	Reverse Power Protective Relay	Basler	BE1-032R	C-81	Control Panel	DGB	28	Qualification Test	Cap > Dem
162	32	Relay	AC/DC Power Support Systems	Reverse Power Protective Relay	Basler	BE1-032R	C-82	Control Panel	DGB	28	Qualification Test	Cap > Dem
163	40	Relay	AC/DC Power Support Systems	Loss of Field Protective Relay	General Electric	CEH51	C-81	Control Panel	DGB	28	Qualification Test	Cap > Dem
164	40	Relay	AC/DC Power Support Systems	Loss of Field Protective Relay	General Electric	CEH51	C-82	Control Panel	DGB	28	Qualification Test	Cap > Dem
165	51	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	C-81	Control Panel	DGB	28	Qualification Test	Cap > Dem
166	51	Relay	AC/DC Power Support Systems	Overcurrent Protective Relay	ABB	51E	C-82	Control Panel	DGB	28	Qualification Test	Cap > Dem

[1] Building Key: CB = Control Building, DGB = Diesel Generator Building, PAB = Primary Auxiliary Building

[2] Seismic capacities for these components are not available. Per Ref. [7], Section 6.2, these types of relays and switches were shown to be rugged in the high-frequency range. Therefore, these components are screened out.

[3] The manufacturer and model for components 1-50G/A52-81, 1-50G/A52-84, 2-50G/A52-89, and 2-50G/A52-92 as shown in Table B-1 are the manufacturer and model of proposed replacement relays (ABB GKC relays). The adequacy of these components are only valid following the replacement of the existing relays with the ABB GKC relays shown in Table B-1.

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation (See Section 2.2)

Valve ID	P&ID	Comment	Included in Analysis?
1CV-296	541F091 sh. 3 [18]	Upstream of 1CV-297	No
1CV-297	541F091 sh. 3 [18]	Simple Check Valve (no need to be included)	No
1RC-430	541F091 sh. 3 [18]	Normally would only be a potential Leak Path if 1RC-516 fails to be closed	Yes*
1RC-431C	541F091 sh. 3 [18]	Normally would only be a potential Leak Path if 1RC-515 fails to be closed	Yes*
1RC-515	541F091 sh. 3 [18]	Motor Operated Valve	Yes*
1RC-516	541F091 sh. 3 [18]	Motor Operated Valve	Yes*
1CV-314	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1RC-434	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1RC-435	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1RC-535	541F091 sh. 2 [19]	Manual Valve Normally Open	No
1RC-580A	541F091 sh. 2 [19]	Normally Closed SOV. If Open will create a leak	Yes*
1RC-580B	541F091 sh. 2 [19]	Normally Closed SOV. If Open will create a leak	Yes*
1RH-861B	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1SI-861A	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1SI-887	541F091 sh. 2 [19]	Potential Leak Path	Yes*
1CV-295	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1CV-383	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1RC-297	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1RC-431A	541F091 sh. 1 [20]	Failed Closed 1RC-431A directly connected to the RCS. No leakage	No
1RC-431B	541F091 sh. 1 [20]	Failed Closed 1RC-431B directly connected to the RCS. No leakage	No

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation (See Section 2.2)

Valve ID	P&ID	Comment	Included in Analysis?
1SI-853C	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1SI-853D	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1SI-867A	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1SI-867B	541F091 sh. 1 [20]	Simple Check Valve (no need to be included)	No
1SC-950	541F092 sh. 1 [21]	Manual Valve	No
1SC-951	541F092 sh. 1 [21]	Seismic failure of AOV 1SC-951 will result in failure of RCS integrity.	Yes*
1SC-952	541F092 sh. 1 [21]	Manual Valve	No
1SC-953	541F092 sh. 1 [21]	Seismic failure of AOV 1SC-953 will result in failure of RCS integrity.	Yes*
1SC-954	541F092 sh. 1 [21]	Manual Valve	No
1SC-966A	541F092 sh. 1 [21]	Normally would only be a potential Leak Path if 1SC-951 fails to be closed	Yes*
1SC-966B	541F092 sh. 1 [21]	Normally would only be a potential Leak Path if 1SC-952 fails to be closed	Yes*
1SC-966C	541F092 sh. 1 [21]	Normally would only be a potential Leak Path if 1SC-955 fails to be closed	Yes*
1SC-955	541F092 sh. 1 [21]	Seismic failure of AOV 1SC-955 will result in failure of RCS integrity.	Yes*
1CV-1299	684J741 sh. 3 [153]	Motor Operated Valve	Yes* [4]
1CV-200A	684J741 sh. 3 [153]	Valve fails closed on loss of instrument air.	Yes*
1CV-200B	684J741 sh. 3 [153]	Valve fails closed on loss of instrument air.	Yes*
1CV-200C	684J741 sh. 3 [153]	Valve fails closed on loss of instrument air.	Yes*
1CV-203	684J741 sh. 3 [153]		Yes*

[4] Per Section 2.2, contactor 42(o) was included in the High Frequency evaluation as a result of the evaluation of this valve. See component No. 9 of Table B-1.

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation (See Section 2.2)

Valve ID	P&ID	Comment	Included in Analysis?
1CV-285	684J741 sh. 3 [153]	Normally would only be a potential Leak Path if 1CV-1299 fails to be closed	Yes*
1CV-386	684J741 sh. 3 [153]	1CV-386 is an AOV in the 3/4" RCP seal water bypass line. RCP seal injection via the CVCS. Failure of 1CV-386 is assumed to fail RCS integrity	Yes*
1CV-304A	684J741 sh. 3 [153]	Simple Check Valve (no need to be included)	No
1CV-304B	684J741 sh. 3 [153]	Simple Check Valve (no need to be included)	No
1CV-304C	684J741 sh. 3 [153]	Simple Check Valve (no need to be included)	No
1CV-304D	684J741 sh. 3 [153]	Simple Check Valve (no need to be included)	No
1F-39A	684J741 sh. 2 [154]	F-39A is a filter in the RCP seal injection flow path. RCP seal injection upstream of 1CV-304C & 1CV-304D.	No
1F-39B	684J741 sh. 2 [154]	F-39B is a filter in the RCP seal injection flow path. RCP seal injection upstream of 1CV-304C & 1CV-304D.	No
2CV-296	541F445 sh. 3 [155]	Upstream of 2CV-297	No
2CV-297	541F445 sh. 3 [155]	Simple Check Valve (no need to be included)	No
2RC-430	541F445 sh. 3 [155]	Normally would only be a potential Leak Path if 2RC-516 fails to be closed	Yes*
2RC-431C	541F445 sh. 3 [155]	Normally would only be a potential Leak Path if 2RC-515 fails to be closed	Yes*
2RC-515	541F445 sh. 3 [155]	Motor Operated Valve	Yes*
2RC-516	541F445 sh. 3 [155]	Motor Operated Valve	Yes*
2CV-314	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2RC-434	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2RC-435	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2RC-535	541F445 sh. 2 [156]	Manual Valve Normally Open	No
2RC-580A	541F445 sh. 2 [156]	Normally Closed SOV. If Open will create a leak	Yes*

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation (See Section 2.2)

Valve ID	P&ID	Comment	Included in Analysis?
2RC-580B	541F445 sh. 2 [156]	Normally Closed SOV. If Open will create a leak	Yes*
2RH-861B	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2SI-861A	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2SI-887	541F445 sh. 2 [156]	Potential Leak Path	Yes*
2CV-295	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2CV-383	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2RC-297	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2RC-431A	541F445 sh. 1 [157]	Failed Closed 2RC-431A directly connected to the RCS. No leakage	No
2RC-431B	541F445 sh. 1 [157]	Failed Closed 2RC-431B directly connected to the RCS. No leakage	No
2SI-853C	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2SI-853D	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2SI-867A	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2SI-867B	541F445 sh. 1 [157]	Simple Check Valve (no need to be included)	No
2SC-950	541F445 sh. 1 [157]	Manual Valve	No
2SC-951	541F448 sh. 1 [158]	Seismic failure of AOV 2SC-951 will result in failure of RCS integrity.	Yes*
2SC-952	541F448 sh. 1 [158]	Manual Valve	No
2SC-953	541F448 sh. 1 [158]	Seismic failure of AOV 2SC-953 will result in failure of RCS integrity.	Yes*
2SC-954	541F448 sh. 1 [158]	Manual Valve	No
2SC-966A	541F448 sh. 1 [158]	Normally would only be a potential Leak Path if 2SC-951 fails to be closed	Yes*
2SC-966B	541F448 sh. 1 [158]	Normally would only be a potential Leak Path if 2SC-952 fails to be closed	Yes*

Table B-2: Reactor Coolant Leak Path Valve Identified for High Frequency Confirmation (See Section 2.2)

Valve ID	P&ID	Comment	Included in Analysis?
2SC-966C	541F448 sh. 1 [158]	Normally would only be a potential Leak Path if 2SC-955 fails to be closed	Yes*
2SC-955	541F448 sh. 1 [158]	Seismic failure of AOV 2SC-955 will result in failure of RCS integrity.	Yes*
2CV-1299	685J175 sh. 3 [159]	Motor Operated Valve	Yes* [5]
2CV-200A	685J175 sh. 3 [159]	Valve fails closed on loss of instrument air.	Yes*
2CV-200B	685J175 sh. 3 [159]	Valve fails closed on loss of instrument air.	Yes*
2CV-200C	685J175 sh. 3 [159]	Valve fails closed on loss of instrument air.	Yes*
2CV-203	685J175 sh. 3 [159]		Yes*
2CV-285	685J175 sh. 3 [159]	Normally would only be a potential Leak Path if 2CV-1299 fails to be closed	Yes*
2CV-386	685J175 sh. 3 [159]	2CV-386 is an AOV in the 3/4" RCP seal water bypass line. RCP seal injection via the CVCS. Failure of 2CV-386 is assumed to fail RCS integrity	Yes*
2CV-304A	685J175 sh. 3 [159]	Simple Check Valve (no need to be included)	No
2CV-304B	685J175 sh. 3 [159]	Simple Check Valve (no need to be included)	No
2CV-304C	685J175 sh. 3 [159]	Simple Check Valve (no need to be included)	No
2CV-304D	685J175 sh. 3 [159]	Simple Check Valve (no need to be included)	No
2F-39A	685J175 sh. 2 [160]	F-39A is a filter in the RCP seal injection flow path. RCP seal injection upstream of 2CV-304C & 2CV-304D.	No
2F-39B	685J175 sh. 2 [160]	F-39B is a filter in the RCP seal injection flow path. RCP seal injection upstream of 2CV-304C & 2CV-304D.	No

* Note: The evaluation of this valve is discussed in Section 2.2 of this report as well as in report 16Q0390-RPT-001 [17].

[5] Per Section 2.2, contactor 42(o) was included in the High Frequency evaluation as a result of the evaluation of this valve. See component No. 10 of Table B-1.