Exelon Generation®

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November 2, 2016

U.S. Nuclear Regulatory Commission
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11555 Rockville Pike
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Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: High Frequency Supplement to Seismic Hazard Screening Report, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

References:

1. NRC Letter, Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated March 12, 2012 (ML12053A340)
2. NRC Letter, Electric Power Research Institute Report 3002000704, "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. NEI Letter, Final Draft of Industry Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic (EPRI 1025287), dated November 27, 2012 (ML12333A168 and ML12333A170)
4. NRC Letter, Endorsement of Electric Power Research Institute Final Draft Report 1025287, Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic, dated February 15, 2013 (ML12319A074)
5. Exelon Generation Company, LLC letter to NRC, Byron Station, Units 1 and 2 - Seismic Hazard and Screening Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10CFR50.54(f) Regarding Recommendation 2.1 of Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident, dated March 31, 2014 (RS-14-065) (ML14091A010)

6. NRC Letter, Screening and Prioritization Results Regarding Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Seismic Hazard Re-evaluations for Recommendation 2.1 of the Near Term Task Force Review of Insights from the Fukushima Dai-ichi Accident, dated May 9, 2014 (ML14111A147)
7. NRC Memorandum, Support Document for Screening and Prioritization Results Regarding Seismic Hazard Re-Evaluation for Operating Reactors in the Central and Eastern United States, dated May 21, 2014 (ML14136A126)
8. NEI Letter, Request for NRC Endorsement of High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation (EPRI 3002004396), dated July 30, 2015 (ML15223A100/ML15223A102)
9. NRC Letter to NEI: 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)
10. 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 Request for Information per 10 CFR 50.54(f) (Reference 1) to all power reactor licensees. The required response section of Enclosure 1 of Reference 1 indicated that licensees should provide a Seismic Hazard Evaluation and Screening Report within 1.5 years from the date of the letter for Central and Eastern United States (CEUS) nuclear power plants. By NRC letter dated May 7, 2013 (Reference 2), the date to submit the report was extended to March 31, 2014.

By letter dated May 9, 2014 (Reference 6), the NRC transmitted the results of the screening and prioritization review of the seismic hazards reevaluation report for Byron Station, Units 1 and 2 submitted on March 31, 2014 (Reference 5). In accordance with the screening, prioritization, and implementation details report (SPID) (References 3 and 4), and Augmented Approach guidance (Reference 2), the reevaluated seismic hazard is used to determine if additional seismic risk evaluations are warranted for a plant. Specifically, the reevaluated horizontal ground motion response spectrum (GMRS) at the control point elevation is compared to the existing safe shutdown earthquake (SSE) or Individual Plant Examination for External Events (IPEEE) High Confidence of Low Probability of Failure (HCLPF) Spectrum (IHS) to determine if a plant is required to perform a high frequency confirmation evaluation. As noted in the May 9, 2014 letter from the NRC (Reference 6) on page 4 of Enclosure 2, Byron Station, Units 1 and 2 is to conduct a limited scope High Frequency Evaluation (Confirmation).

Within the May 9, 2014 letter (Reference 6), the NRC acknowledged that these limited scope evaluations will require additional development of the assessment process. By Reference 8, the Nuclear Energy Institute (NEI) submitted an Electric Power Research Institute (EPRI) report entitled, High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation (EPRI 3002004396) for NRC review and endorsement. NRC endorsement was provided by Reference 9. Reference 10 provided the NRC final seismic hazard evaluation

screening determination results and the associated schedules for submittal of the remaining seismic hazard evaluation activities.

The High Frequency Evaluation Confirmation Report for Byron Station, Units 1 and 2, provided in the enclosure to this letter, shows that all high frequency susceptible equipment evaluated within the scoping requirements and using evaluation criteria of Reference 8 for seismic demands and capacities, are acceptable. Therefore, no additional modifications or evaluations are necessary.

This letter closes Commitment No. 1 in Reference 5.

This letter contains no new regulatory commitments.

If you have any questions regarding this report, please contact Ronald Gaston at 630-657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 2nd day of November 2016.

Respectfully submitted,

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Director - Licensing & Regulatory Affairs
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Enclosure: Byron Station, Units 1 and 2 - Seismic High Frequency Evaluation Confirmation Report

cc: NRC Regional Administrator - Region III
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Enclosure

Byron Station, Units 1 and 2

Seismic High Frequency Evaluation Confirmation Report

(75 pages)

HIGH FREQUENCY CONFIRMATION REPORT

IN RESPONSE TO NEAR TERM TASK FORCE (NTTF) 2.1 RECOMMENDATION

for the

Byron Generating Station, Units 1 and 2
4450 North German Church Road
Byron, Illinois 61010-9794
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455
Correspondence No.: RS-16-175

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

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S&A Stevenson & Associates	DOCUMENT APPROVAL SHEET Figure 2.8	PROJECT NO. 15C0346

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, 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 performed for Byron Nuclear Power Station, Units 1 and 2 (BYR). 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 BYR 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, BYR 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 BYR 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 BYR 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:

- BYR 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

BYR submitted reevaluated seismic hazard information including GMRS and seismic hazard information to the NRC on March 31, 2014 [4]. In a letter dated February 17, 2016, the NRC staff concluded that the submitted GMRS adequately characterizes the reevaluated seismic hazard for the BYR site for 2.1 Seismic [14].

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

1.5 Report Documentation

Section 2 describes the selection of devices. The identified devices are evaluated in Reference [190] for the seismic demand specified in Section 3 using the evaluation criteria discussed in Section 4. The overall conclusion is discussed in Section 5.

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

2 Selection of Components for High-Frequency Screening

The fundamental objective of the high frequency confirmation review is to determine whether the occurrence of a seismic event could cause credited FLEX/mitigating strategies equipment to fail to perform as necessary. An optimized evaluation process is applied that focuses on achieving a safe and stable plant state following a seismic event. As described in Reference [8], this state is achieved by confirming that key plant safety functions critical to immediate plant safety are preserved (reactor trip, reactor vessel inventory and pressure control, and core cooling) and that the plant operators have the necessary power available to achieve and maintain this state immediately following the seismic event (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 P&ID's attached to the Reactor Coolant System (RCS) and include all active isolation valves and any active second valve upstream or downstream that is assumed to be required to be closed during normal operation or close upon an initiating event (LOCA or Seismic). A table with the valves and associated P&ID is included in Table B-2 of this report.

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

Active Function: A function that requires mechanical motion or a change of state (e.g., the closing of a valve or relay or the change in state of a transistor)

Simple Check Valve: A valve which closes upon reverse fluid flow only.

The Letdown and Purification System on PWRs is a normally in service system with the flowpath 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. Letdown has auto isolation and abnormal operating procedure which isolate the flow. There are no auto open valves in this flowpath.

Table B-2 contains a list of valves analyzed and the resultant devices selected which are also identified in the section below. Based on the analysis detailed below, there are no moving contact control devices which could create a LOCA due to chatter-induced sustained valve misalignment, and thus no devices were selected for this category.

Reactor Coolant Loop Valves

Drain Line Valves 1RC8037A/B/C/D, 2RC8037A/B/C/D, Reactor Head Vent Valves 1RC014A/B/C/D, 2RC014A/B/C/D

Electrical control for the solenoid-operated pilot valves is via a rugged hand control switch. There are no chatter sensitive contact devices involved in the control of these valves [21, 22, 23, 24].

Pressurizer Power Operated Relief Valves 1RY455A, 1RY456, 2RY455A, 2RY456, Blocking Valves 1RY8000A/B, 2RY8000A/B

Electrical control for the solenoid-operated pilot valves is via relays which are energized from process control signals. There are no devices which could seal-in and cause a sustained undesirable opening of the Pressurizer Power Operated Relief Valves [25, 26, 27, 28, 29, 30]. For this reason, these valve controls can be credited in a high frequency event, and analysis of the Blocking Valve controls is unnecessary.

Residual Heat Removal Valves

Reactor Coolant Loop to Residual Heat Removal Pump Isolation Valves 1RH8701A-1/1B-2/2A-1/2B-2, 2RH8701A-1/1B-2/2A-1/2B-2

Both the P&ID and control schematic diagrams indicate 1RH8701B-2, 1RH8702A-1, 2RH8701B-2, and 2RH8702A-1 are closed and depowered during normal operation [31, 32, 33, 34, 35, 36]. Lacking electrical power, any SILO devices in the control for these valves would have no effect on valve position. Since these valves can be credited for remaining closed following a seismic event, analysis of the valve controls for 1RH8701A-1, 1RH8702B-2, 2RH8701A-1, and 2RH8702B-2 is unnecessary.

Process Sampling Valves

Hot Leg Loop 1&3 Sample Line Selector Valves 1PS9351A/B, 2PS9351A/B, Pressurizer Steam Sample Selector Valves 1PS9350A, 2PS9350A, Pressurizer Liquid Sample Selector Valves 1PS9350B, 2PS9350B, Cold Leg Loop 1/2/3/4 Sample Line Selector Valves 1PS9358A/B/C/D, 2PS9351A/B/C/D

Electrical control for the solenoid-operated pilot valves is via a rugged hand control switch and permissive relay. The P&ID indicates these valves are normally closed [37, 38, 39], and in this position the (rugged) hand control switch is normally open and blocks the effect of chatter in the series permissive relay. There are no other chatter sensitive contact devices involved in the control of these valves [40, 41, 42, 43].

Loop Sample Line Isolation Valves 1PS9356A, 2PS9356A, Pressurizer Steam Sample Isolation Valves 1PS9354A, 2PS9354A, Pressurizer Liquid Sample Isolation Valves 1PS9355A, 2PS9355A

Electrical control for the solenoid-operated pilot valves is via a rugged hand control switch and permissive relay. These valves are shown normally closed on the P&ID [37, 38, 39]. The only chatter sensitive device in the control circuit is the containment isolation permissive relay. When the valve is closed the valve position switch contacts are open and block the effect of chatter in the relay. There are no other chatter sensitive contact devices involved in the control of these valves [44, 45, 46, 47].

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

The core cooling systems were reviewed for contact control devices in seal-in and lockout circuits that would prevent at least a single train of non-AC power driven decay heat removal from functioning. For BYR, the credited decay heat removal system is the Diesel Driven Auxiliary Feedwater (DDAFW) Pump.

The selection of contact devices for the Diesel Driven Auxiliary Feedwater (DDAF) Pump was based on the premise that DDAF operation is desired, thus any SILO which would lead to DDAF operation is beneficial and thus does not meet the criteria for selection [17, 18]. Only contact devices which could render the DDAF system inoperable were considered.

Any chatter which could de-energize the normally-energized Engine Failure Lockout Relay K12 would prevent engine start [19, 20]. The lockout relay itself does not seal in, however the relays with contacts in K12's coil circuit do. The Overcrank Relay K7, High Water Temperature Relay K8, Overspeed Relay K9, and Low Lube Oil Pressure Relay K10 are normally energized and sealed-in. Chatter in the seal-in contacts of K7, K8, K9, K10, or in the contacts of the Overcrank Timer Relay K4 (input to K7), High Water Temperature Switch 1TSH-AF147 (input to K8), Speed Switch 1SS-AF8002 (input to K9), Low Oil Pressure Time Delay Relay K11 (input to K10), could trip the lockout relay and prevent engine start. The time delay associated with K4 and K11 prevents chatter in their coil circuits from affecting engine start. It is presumed that pump suction pressure is above the reset pressure setting of 1PSL-AF055 and therefore chatter in this pressure switch and the Low Suction Pressure Timer Relay K6 have only a temporary effect on engine start and thus do not meet 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,
- Battery Chargers and Inverters,

- EDG Ancillary Systems, and
- Switchgear, Load Centers, and 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 the BYR UFSAR [48]. BYR 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 [48, pp. 8.3-8]. The overall power distribution, both AC and DC, is shown on the Station One-Line Diagram [49].

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 in this narrative and apply to all divisions.

Emergency Diesel Generators

The analysis of the Emergency Diesel Generators, DG1A, DG1B, DG2A, DG2B, is divided into two sections, generator protective relaying and diesel engine control. General descriptions of these systems and controls appear in the UFSAR [48, pp. 8.3-8].

Generator Protective Relaying

The control circuits for the DG1A circuit breaker [50] include ESF Bus Lockout Relays 486-1412 (Normal Feed), 486-1413 (EDG Feed), and 486-1414X (Reserve Feed). If any of these lockout relays are tripped the EDG breaker will not close automatically during the LOOP. Bus Lockout Relay 486-1412 may be tripped by chatter in Phase Overcurrent Relays PR30A-451 and PR30C-451 and Ground Overcurrent Protective Relay PR31-451N [51]. Bus Lockout Relay 486-1413 is tripped by a solid-state differential relay (non-vulnerable) on the EDG breaker[50]. Bus Lockout

Relay 486-1414X may be tripped by chatter in Phase Overcurrent Relays PR27A-451 and PR27C-451 and Ground Overcurrent Protective Relay PR28-451N [52].

The control circuits for the other three EDG circuit breakers are identical in design and sensitive to chatter in their equivalent devices: DG1B: 486-1422, 486-1423, 486-1424X, PR33A-451, PR33C-451, PR34-451N, PR30A-451 PR30C-451 and PR31-451N [53, 54, 55]; DG2A: 486-2412, 486-2413, 486-2414, PR9A-451, PR9C-451, PR10-451N, PR13A-451 PR13C-451 and PR14-451N [56, 57, 58]; DG2B: 486-2422, 486-2423, 486-2424, PR7A-451, PR7C-451, PR8-451N, PR3A-451 PR3C-451 and PR4-451N [59, 60, 61].

Diesel Engine Control

Chatter analysis for the diesel engine control was performed on the start and shutdown circuits of each EDG [62, 63, 64, 65, 66, 67] (DG1A), [68, 69, 70, 71, 72, 73] (DG1B), [74, 75, 76, 77, 78, 79] (DG2A), [80, 81, 82, 83, 84, 85] (DG2B) using the description of operation [86, 87, 88, 89], legends [90, 91, 92, 93], and switch development documents [94, 95, 96, 97] as necessary. Two conditions were considered for EDG Start, Emergency Start in response to a true LOOP, and Manual Start as a defense-in-depth response to situations where a bus undervoltage trip has not occurred but offsite power may be considered unreliable after a seismic event (e.g. brownout). SILO devices that only affect Manual Start availability are being considered based on the discussion below.

It is conservatively assumed that manual start of the EDGs may be desired in the absence of a LOOP-induced emergency start. SILO devices which may block manual start have been identified herein.

The SILO devices which may block EDG Emergency Start in response to a LOOP are the Generator Differential Shutdown Repeater Relays 87G1X and 87G2X, and Engine Overspeed Relays 12X1 and 12X2. 87G1X and 87G2X are both controlled by 486-1413 (already covered). 12X1 and 12X2 are controlled by 1PS-DG251A, 1PS-DG252A, and 1PS-DG108A. Chatter in any of these devices could prevent EDG Emergency Start.

In addition to the devices which could prevent Emergency Start, Manual Start may be blocked by the normally-energized Unit Shutdown Relay 86S2[1]. Chatter of the seal-in contact of 86S2, or of the contacts of relays within the coil circuits of this relay, may prevent EDG manual start. Chatter in any other device in the start control circuit would only have a transient effect, delaying start by, at most, the period of strong shaking.

The Unit Shutdown Relay is normally energized and sealed-in. This relay is controlled by the Engine Shutdown Relay 86E, Generator Shutdown Relay 86G, Generator Differential Shutdown Repeater Relays 87G1X and 87G2X, Engine Overspeed Shutdown Relays 12X1 and 12X2, and Incomplete Starting Sequence Relay 48. Chatter in the contacts of these auxiliary relays may cause tripping of the engine shutdown relay. Once tripped this relay would need to be manually reset.

The Engine Shutdown Relay 86E is controlled by the Engine Lube Oil Low Pressure Shutdown Repeater Relay 63QELX, Turbo Low Lube Oil Pressure Shutdown Repeater Relay 63QTLX, Main and Connecting Rod High Bearing Temperature Shutdown Repeater Relay 26MBHTX, Turbo Thrust Bearing Failure Shutdown Repeater Relay 38TBFX, Jacket Water High Temperature Shutdown Repeater Relay 26JWSX, and Crankcase High Pressure Repeater Relay 63CX. Engine

[1] Note that the repeater (slave) relay 86S1 does not seal-in on its own; it merely mimics the state of 86S2.

trips (other than overspeed) are blocked when the diesel engine is not running by powering the associated auxiliary relay coil circuits via steering diodes. This design feature acts on the coils of these auxiliary relays, however the contacts of these relays are active in the engine fault circuits; and thus chatter in these auxiliary relays could prevent EDG manual start.

Generator Shutdown Relay 86G is controlled by Generator Overcurrent Relay 51X, Generator Neutral Ground Voltage Auxiliary Relay 59GX, Loss of Field Auxiliary Relay 40X, Reverse Power Auxiliary Relay 32X, and Under Frequency Auxiliary Relay 81UX. Generator faults are blocked when the EDG circuit breaker is open (the normal condition at the time of the seismic event) by depowering the coil circuits of these auxiliary relays. For this reason, chatter of the protection relays in these coil circuits would have no effect.

The Incomplete Starting Sequence Relay 48 is normally energized and sealed-in. Chatter in the Cranking Limit Time Delay Relay 62CL could break the seal-in and prevent EDG manual start. Other devices in the coil circuit of relay 48 are closed and arranged in parallel. This arrangement blocks the effect of chatter in any one of these other devices.

Note the device identifiers mentioned here are identical on all EDGs with the exception of the EDG Bus Lockout Relay: 486-1413 for DG1A; 486-1423 for DG1B; 486-2413 for DG2A; and 486-2423 for DG2B; and overspeed switches: 1PS-DG251A, 1PS-DG252A, and 1PS-DG108A for DG1A; 1PS-DG251B, 1PS-DG252B, and 1PS-DG108B for DG1B; 2PS-DG251A, 2PS-DG252A, and 2PS-DG108A for DG2A; and 2PS-DG251B, 2PS-DG252B, and 2PS-DG108B for DG2B.

Battery Chargers

Chatter analysis on the battery chargers was performed using information from the UFSAR [48] as well as plant schematic diagrams [98, 99, 100, 101, 102, 103]. Each battery charger has a high voltage shutdown circuit [48, pp. 8.3-46] which is intended to protect the batteries and DC loads from output overvoltage due to charger failure. The high voltage shutdown circuit has an output relay 1DC03E-DSH-K1 or 1DC04E-DSH-K1 (2DC03E-DSH-K1 or 2DC04E-DSH-K1), which shunt-trips the AC input circuit breaker, shutting the charger down. Chatter in the contacts of these output relays may disable the battery chargers, and for this reason meet the selection criteria.

The battery chargers for the Diesel Driven Auxiliary Feedwater Pump also have an overvoltage relay, 1AF01EA-1-DSH-K1 or 1AF01EB-1-DSH-K1 (2AF01EA-1-DSH-K1 or 2AF01EB-1-DSH-K1), that may shutdown these chargers [17, 19, 104, 18, 20, 105].

Inverters

Analysis of schematics for the Instrument Bus 111, 112, 113, and 114 (211, 212, 213, and 214) and Static Inverters as noted in the table below revealed no vulnerable contact devices in the control circuits and thus chatter analysis is unnecessary.

Static Inverters	
Bus	Reference
111	106
112	107, 108, 109, 110
113	111
114	112, 113, 114, 115
211	116
212	117
213	118
214	119

EDG Ancillary Systems

In order to start and operate the Emergency Diesel Generators require a number of components and systems. For the purpose of identifying electrical contact devices, only systems and components which are electrically controlled are analyzed. Information in the UFSAR [48] 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 [48, pp. 9.5-21], which are covered under the EDG engine control analysis above.

Combustion Air Intake and Exhaust

The combustion air intake and exhaust for the Diesel Generators are passive systems [48, pp. 9.5-29, 120, 121, 122, 123] which do not rely on electrical control.

Lube Oil

The Diesel Generators utilize engine-driven mechanical lubrication oil pumps [48, pp. 9.5-23] which do not rely on electrical control.

Fuel Oil

The Diesel Generators utilize engine-driven mechanical pumps to supply fuel oil to the engines from the day tanks [48, pp. 9.5-6]. The day tanks are re-supplied using AC-powered Diesel Oil Transfer Pumps [124, 125, 120, 121, 122, 123]. Chatter analysis of the control circuits for the electrically-powered transfer pumps [126, 127, 128, 129] concluded they do not include SILO devices. The mechanical pumps do not rely on electrical control.

Cooling Water

The Diesel Generator Cooling Water System is described in the UFSAR [48, pp. 9.5-15]. This system consists of two cooling loops, jacket water and Essential Service Water (ESW). Engine driven pumps are credited for jacket water when the engine is operating. These mechanical pumps do not rely on electrical control. The electric jacket water pump is only used during shutdown periods and is thus not included in this analysis.

Four ESW pumps, 1A, 1B, 2A, and 2B, provide cooling water to the heat exchangers associated with the four EDGs [130, 131, 132, 133, 134, 135]. In automatic mode these pumps are started via a sequencing signal following EDG start. Chatter analysis of the EDG start signal is included in the Emergency Diesel Generator section above. A chatter analysis of the ESW pump circuit breaker control circuits [136, 137, 138, 139] indicates the Low Suction Pressure Relays SX1AX or SX1BX; the Phase Overcurrent Relays PR3A-450/451, PR3C-450/451, PR4A-450/451, or PR4C-450/451 (U2: PR36A-450/451, PR36C-450/451, PR13A-450/451, or PR13C-450/451); and the Ground Fault Relays PR4-450N or PR5-450N (U2: PR37-450N or PR14-450N) all could prevent automatic (sequential) breaker closure following the seismic event.

ESW valves necessary for EDG cooling are either locked out, depowered, or, in the case of valves 1SX169A and 1SX169B (2SX169A and 2SX169B), do not contain SILO devices [140, 141].

Ventilation

The Diesel Generator Enclosure Ventilation System is described in Section 9.4.5.2 of the UFSAR [48, pp. 9.4-25]. Ventilation for each Diesel Generator Enclosure is provided via intake and exhaust fans [142, 143]. In automatic mode the intake fans are started via the EDG Start Signal or high room temperature. Chatter analysis of the EDG start signal is included in the Emergency Diesel Generator section above. Apart from SILO devices identified for the EDG start signal, chatter analysis of the control circuits for the intake fans [144, 145, 146, 147, 148, 149, 150, 151] concluded they do not include SILO devices. Contact chatter on pressure switch 1PDS-VD044 (2PDS-VD044) may set the latching relay VD01CAX and interrupt fan operation, however a timing circuit would automatically reset this relay after 58 seconds. Since this effect is transient only, it does not meet the selection criteria.

Contact chatter on pressure switches 1PDS-VD103 or 1PDS-VD105 (2PDS-VD103 or 2PDS-VD105) may set latching relays VD03CAX or VD03CBX, respectively, which would lock out the exhaust fans and require a manual reset [152, 153].

Switchgear, Load Centers, and MCCs

Power distribution from the EDGs to the necessary electrical loads (Battery Chargers, Inverters, Fuel Oil Pumps, and EDG Ventilation Fans) was traced to identify any SILO devices which could lead to a circuit breaker trip and interruption in power. This effort excluded control circuits for the EDG circuit breakers, which are covered in the Emergency Diesel Generator section above, and the ESW Pump breakers which are covered in the EDG Ancillary Systems section above, as well as component-specific contactors and their control devices, which are covered in the analysis of each component above. Those medium- and low-voltage circuit breakers in 4160V ESF Busses and 480V AC Load Centers [154, 155, 156, 157] supplying power to loads identified in this section (battery chargers, EDG ancillary systems, etc.) have been identified for evaluation: 52 @ 1AP05EF/ACB 1413, 52 @ 1AP05EU/ACB 1415X, 52 @ 1AP05EB, 52 @ 1AP10EF, 52 @ 1AP10EJ, 52 @ 1AP10EL, 52 @ 1AP10EQ, 52 @ 1AP06EF/ACB 1423, 52 @ 1AP06EP/ACB 1425X, 52 @ 1AP06EB, 52 @ 1AP12EC, 52 @ 1AP12EF, 52 @ 1AP12EG, 52 @ 1AP12EJ, and 52 @

1AP12EL (U2: 52 @ 2AP05ES/ACB 2413, 52 @ 2AP05ED/ACB 2415X, 52 @ 2AP05EW, 52 @ 2AP10EF, 52 @ 2AP10EJ, 52 @ 2AP10EL, 52 @ 2AP10EQ, 52 @ 2AP06ER/ACB 2423, 52 @ 2AP06EH/ACB 2425X, 52 @ 2AP06EJ, 52 @ 2AP12EC, 52 @ 2AP12EF, 52 @ 2AP12EG, 52 @ 2AP12EJ, and 52 @ 2AP12EL). Per the UFSAR [48, pp. 8.3-44], DC Distribution [170, 171, 172, 173, 174, 175, 176, 177] uses Molded-Case Circuit Breakers (MCCBs) which are seismically rugged [4, pp. 2-11]. MCCBs in the low voltage Motor Control Center Buckets [158, 159, 160, 161, 162, 163] (U1), [164, 165, 166, 167, 168, 169] (U2), as well as the 120VAC Vital Instrument Buses [178, 179, 180, 181, 182, 183, 184, 185] were considered rugged as well. The only circuit breakers affected by external contact devices not already mentioned were those that distribute power from the 4160V ESF Busses to the 4160/480V step-down transformers. A chatter analysis of the control circuits for these circuit breakers [186, 187, 188, 189] indicates the transformer primary phase overcurrent relays PR37A-450/451, PR37B-450/451, PR37C-450/451, PR28A-450/451, PR28B-450/451, or PR28C-450/451 (U2: PR3A-450/451, PR3B-450/451, PR3C-450/451, PR11A-450/451, PR11B-450/451, or PR11C-450/451); primary and secondary ground fault relays PR38-450N, PR29-450N, or PR1-351N (U2: PR4-450N, PR12-450N, or PR1-351N); and lockout relays 486-1415X or 486-1425X (U2: 486-2415X or 486-2425X) all could trip the transformer primary circuit breaker following the seismic event.

2.6 SUMMARY OF SELECTED COMPONENTS

The investigation of high-frequency contact devices as described above was performed in Ref. [191]. A list of the contact devices requiring a high frequency confirmation is provided in Appendix B, Table B-1. The identified devices are evaluated in Ref. [190] 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 BYR horizontal ground motion response spectrum (GMRS), which was generated as part of the BYR Seismic Hazard and Screening Report [4] submitted to the NRC on March 31, 2014, and accepted by the NRC on February 17, 2016 [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."

The applicable buildings at BYR are founded on rock; therefore, the Control Point GMRS is representative of the input at the building foundation.

The horizontal GMRS values are provided in Table 3-2.

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 below 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	10.0	3.048	10.0	3,197	0.0031	0.0031	3,145
2	20.0	6.096	10.0	3,197	0.0031	0.0063	
3	30.0	9.144	10.0	3,197	0.0031	0.0094	
4	40.0	12.192	10.0	3,197	0.0031	0.0125	
5	50.0	15.24	10.0	3,197	0.0031	0.0156	
6	60.0	18.288	10.0	3,197	0.0031	0.0188	
7	70.0	21.336	10.0	3,197	0.0031	0.0219	
8	80.1	24.41448	10.0	3,197	0.0031	0.0250	
9	90.1	27.46248	10.0	3,197	0.0031	0.0282	
10	97.0	29.5656	7.0	3,197	0.0022	0.0303	
11	101.0	30.7848	4.0	4,242	0.0009	0.0313	

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

- The time for a shear wave to travel through each soil layer is calculated by dividing the layer depth (d_i) by the shear wave velocity of the layer (Vs_i).
- The total time for a wave to travel from a depth of 30m to the surface is calculated by adding the travel time through each layer from depths of 0m to 30m ($\Sigma[d_i/Vs_i]$).
- The velocity of a shear wave traveling from a depth of 30m to the surface is therefore the total distance (30m) divided by the total time;
  i.e., $Vs30 = (30m)/\Sigma[d_i/Vs_i]$.
- Note: The shear wave velocity is calculated based on time it takes for the shear wave to travel 30.78m (101.0ft) instead of 30m (98.43ft). This small change in travel distance will have no impact on identifying soil class type.

The site's soil class is determined by using the site's shear wave velocity (Vs30) and the peak ground acceleration (PGA) of the GMRS and comparing them to the values within Reference [8], Table 3-1. Based on the PGA of 0.270g and the shear wave velocity of 3145ft/s, the site soil class is C-Hard.

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 20Hz.

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

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

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

Frequency (Hz)	HGMRS (g)	V/H Ratio	VGMRS (g)
100	0.270	0.81	0.219
90	0.272	0.84	0.228
80	0.275	0.88	0.242
70	0.284	0.93	0.264
60	0.307	0.94	0.289
50	0.365	0.92	0.336
45	0.400	0.91	0.364
40	0.435	0.87	0.378
35	0.467	0.82	0.383
30	0.497	0.77	0.383
25	0.508	0.71	0.361
20	0.514	0.7	0.360
15	0.488	0.7	0.342
12.5	0.508	0.7	0.356
10	0.568	0.7	0.398
9	0.581	0.7	0.407
8	0.583	0.7	0.408
7	0.551	0.7	0.386
6	0.477	0.7	0.334
5	0.385	0.7	0.270
4	0.269	0.7	0.188
3.5	0.218	0.7	0.153
3	0.172	0.7	0.120
2.5	0.129	0.7	0.090
2	0.113	0.7	0.079
1.5	0.090	0.7	0.063
1.25	0.081	0.7	0.057
1	0.070	0.7	0.049
0.9	0.066	0.7	0.046
0.8	0.062	0.7	0.043
0.7	0.058	0.7	0.040
0.6	0.054	0.7	0.038
0.5	0.051	0.7	0.035
0.4	0.040	0.7	0.028
0.35	0.035	0.7	0.025
0.3	0.030	0.7	0.021
0.25	0.025	0.7	0.018
0.2	0.020	0.7	0.014
0.15	0.015	0.7	0.011
0.125	0.013	0.7	0.009
0.1	0.010	0.7	0.007

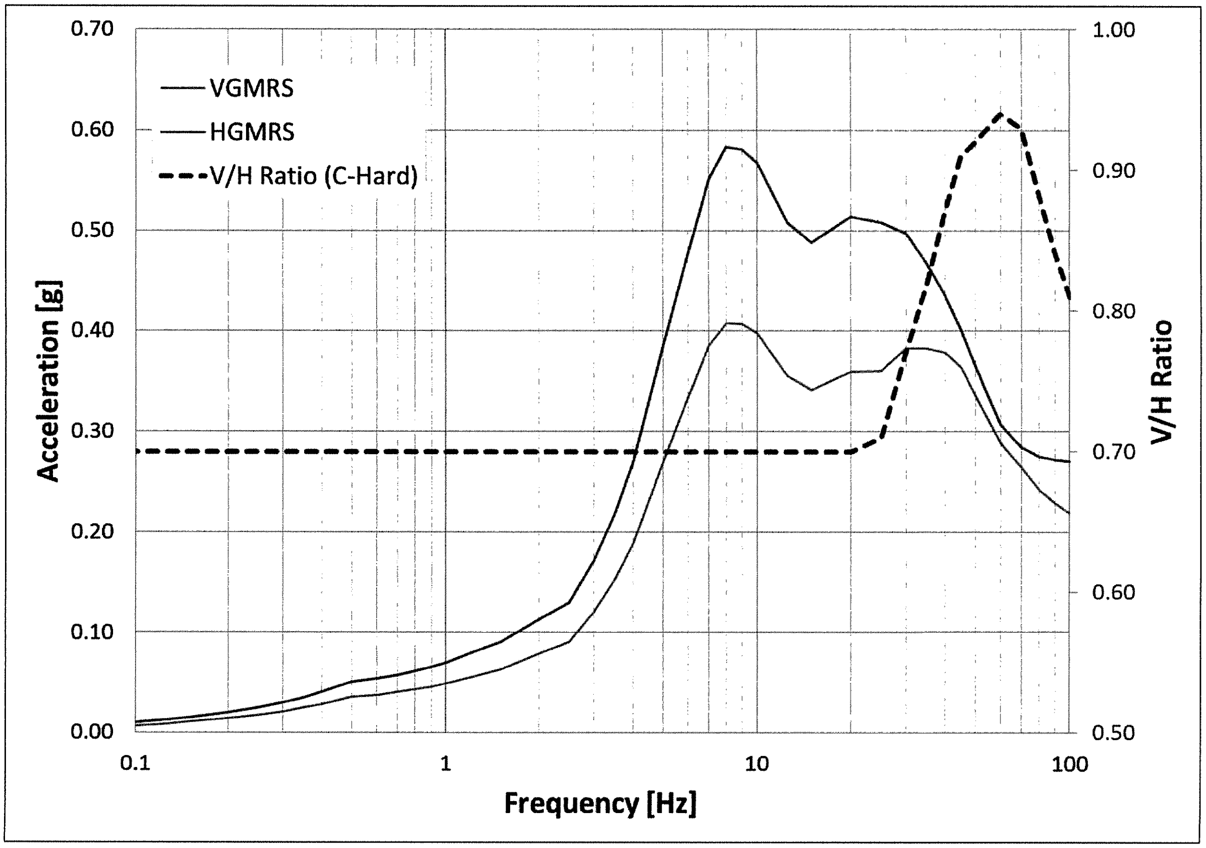

Figure 3-1 Plot of the Horizontal and Vertical Ground Motions Response Spectra and V/H Ratios

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 [13] assuming 5% in-cabinet response spectrum damping. EPRI NP-7148 [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:

- BYR 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.
- BYR 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.
- BYR 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.

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

BYR 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 226 components that required seismic high frequency evaluation. As summarized in Table B-1 in Appendix B, all of the devices have adequate seismic capacity for the reevaluated seismic hazard [4].

5.2 Identification of Follow-up Actions

No follow-up actions were identified.

6 References

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

2 NRC (W. Dean) Letter to the Power Reactor Licensees on the Enclosed List. “Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident.” October 27, 2015, ADAMS Accession Number ML15194A015

3 NRC (J. Davis) Letter to Nuclear Energy Institute (A. Mauer). “Endorsement of Electric Power Research Institute Final Draft Report 3002004396, ‘High Frequency Program: Application Guidance for Functional Confirmation and Fragility.’” September 17, 2015, ADAMS Accession Number ML15218A569

4 Seismic Hazard and Screening Report in Response to the 50.54(f) Information Request Regarding Fukushima Near-Term Task Force Recommendation 2.1: Seismic for BYR dated March 31, 2014, ADAMS Accession Number ML14091A010

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

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

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

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

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

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

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

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

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

14 NRC (F. Vega) Letter to Exelon Generation Company, LLC (B. Hanson). “Byron Station, 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 (CAC NOS. MF3884 and MF3885)." February 17, 2016, ADAMS Accession Number ML16027A045

15 Recommendations For Enhancing Reactor Safety in the 21st Century, "The Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident" July 12, 2011, ADAMS Accession Number ML111861807

16 NEI 12-06, Rev. 2. "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide"

17 Byron Drawing 6E-1-4030AF02 Rev. AE, Schematic Diagram Auxiliary Feedwater Pump 1B - Diesel Driven 1AF01PB

18 Byron Drawing 6E-2-4030AF02 Rev. Z, Schematic Diagram Auxiliary Feedwater Pump 2B Diesel Driven 2AF01PB

19 Byron Drawing 6E-1-4030AF12 Rev. AH, Schematic Diagram Auxiliary Feedwater Pump 1B (Diesel-Driven) Engine Startup Panel 1AF01J

20 Byron Drawing 6E-2-4030AF12 Rev. AH, Schematic Diagram Auxiliary Building Pump 2B (Diesel-Driven) Engine Startup Panel 2AF01J

21 Byron Drawing 6E-1-4030RC14 Rev. E, Schematic Diagram Loop 1A, 1B, 1C and 1D Drain Line Valves 1RC8037A, B, C and D (AOV)

22 Byron Drawing 6E-1-4030RC32 Rev. C, Schematic Diagram Reactor Head Vent Valves 1RC014A, B, C and D

23 Byron Drawing 6E-2-4030RC14 Rev. B, Schematic Diagram Loop 2A, 2B, 2C and 2D Drain Valves 2RC8037A, B, C and D (AOV)

24 Byron Drawing 6E-2-4030RC32 Rev. C, Schematic Diagram Reactor Head Vent Valves 2RC014A, B, C and D

25 Byron Drawing 6E-1-4030RY17 Rev. V, Schematic Diagram Nitrogen Supply Isolation Valves 1RY079A and B Pressurizer Power Relief Valves 1RY455A and 456, Pressurizer Relief Tank Primary Water Supply Isolation Valve 1RY8030

26 Byron Drawing 6E-1-4030RY13 Rev. G, Schematic Diagram Pressurizer Pressure and Level Control Non-Safety Related (Division 11).

27 Byron Drawing 6E-1-4030RY14 Rev. F, Schematic Diagram Pressurizer Pressure and Level Control Non-Safety Related (Division 12)

28 Byron Drawing 6E-2-4030RY17 Rev. L, Schematic Diagram Pressurizer Power Relief Valves 2RY455A and 2RY456, Pressurizer Relief Tank Primary Water Supply Isolation Valve 2RY8030

29 Byron Drawing 6E-2-4030RY13 Rev. E, Schematic Diagram Pressurizer Pressure and Level Control Non-Safety Related (Division 21)

30 Byron Drawing 6E-2-4030RY14 Rev. D, Schematic Diagram Pressurizer Pressure and Level Control Non-Safety Related (Division 22)

31 Byron Drawing M-62 Rev. BF, Diagram Of Residual Heat Removal Unit 1

32 Byron Drawing 6E-1-4030RH04 Rev. O, Schematic Diagram RC Loop 1A to RHR Pump Isolation Valves 1RH8701A and 1RH8701B

33 Byron Drawing 6E-1-4030RH05 Rev. O, Schematic Diagram RC Loop 1C to RHR Pump Isolation Valves 1RH8702A and 1RH8702B

34 Byron Drawing M-137 Rev. BH, Diagram Of Residual Heat Removal

35 Byron Drawing 6E-2-4030RH04 Rev. M, Schematic Diagram RC Loop 2A to RHR Pump Isolation Valves 2RH8701A and 2RH8701B

36 Byron Drawing 6E-2-4030RH05 Rev. P, Schematic Diagram Reactor Coolant Loop 2C to RHR Pump Isolation Valves - 2RH8702A 2RH8702B

37 Byron Drawing M-68 Sheet 1A Rev. D, Diagram of Process Sampling (Primary and Secondary) Unit 1

38 Byron Drawing M-68 Sheet 1B Rev. G, Diagram of Process Sampling Primary and Secondary

39 Byron Drawing M-140 Sheet 1 Rev. AQ, Diagram of Process Sampling Primary and Secondary

40 Byron Drawing 6E-1-4030PS03 Rev. J, Schematic Diagram Press Steam and Liquid Sample Isolation Valve 1PS9350A and 1PS9350B Hot Leg Loops 2 and 3 Sample Line Isolation Valves 1PS9351A and 1PS9351B

41 Byron Drawing 6E-1-4030PS06 Rev. K, Schematic Diagram Cold Legs Loop 1, 2, 3 and 4 Sample Line Isolation Valves 1PS9358A, B, C and D (AOV)

42 Byron Drawing 6E-2-4030PS03 Rev. F, Schematic Diagram Pressurizer Steam and Liquid Sample Isolation Valves 2PS9350A 2PS9350B; Hot Leg Loops 2 and 3 Sample Line Isolation Valves

43 Byron Drawing 6E-2-4030PS06 Rev. F, Schematic Diagram Cold Leg Loops 1, 2, 3 and 4 Sample Line Isolation Valves - 2PS9358A 2PS9358B 2PS9358C 2PS9358D

44 Byron Drawing 6E-1-4030PS01 Rev. E, Schematic Diagram Pressurizer Steam and Liquid Sample Isolation Valves 1PS9354A and B, 1PS9355A and B

45 Byron Drawing 6E-1-4030PS02 Rev. E, Schematic Diagram Loop Sample Line Isolation Valves - 1PS9356A and B Accumulator Sample Line Isolation Valves 1PS9357A and B

46 Byron Drawing 6E-2-4030PS01 Rev. C, Schematic Diagram Pressurizer Steam and Liquid Sample Isolation Valves 2PS9354A and B, 2PS9355A and B

47 Byron Drawing 6E-2-4030PS02 Rev. C, Schematic Diagram Loop Sample Line Isolation Valves 2PS9356A and B Accumulator Sample Line Isolation Valves 2PS9357A and B

48 Byron Report, "Updated Final Safety Analysis Report (UFSAR)," Revision 16, December 2015

49 Byron Drawing 6E-0-4001 Rev. N, Station One Line Diagram.

50 Byron Drawing 6E-1-4030DG01 Rev. AA, Schematic Diagram Diesel Generator 1A Feed to 4.16KV ESF Switchgear Bus 141 - ACB 1413

51 Byron Drawing 6E-1-4030AP23 Rev. X, Schematic Diagram System Auxiliary Transformer 142-1 Feed to 4.16KV ESF Switchgear Bus 141 - ACB 1412

52 Byron Drawing 6E-1-4030AP25 Rev. AF, Schematic Diagram Reserve Feed from 4.16KV ESF Switchgear Bus 241 to 4.16KV ESF Switchgear Bus 141 - ACB 1414

53 Byron Drawing 6E-1-4030DG02 Rev. X, Schematic Diagram Diesel Generator 1B Feed TO 4.16KV ESF Switchgear Bus 142 - ACB 1423

54 Byron Drawing 6E-1-4030AP32 Rev. W, Schematic Diagram System Auxiliary Transformer 142-2 Feed to 4.16KV ESF Switchgear Bus 142 - ACB 1422

55 Byron Drawing 6E-1-4030AP34 Rev. Z, Schematic Diagram Reserved Feed from 4.16KV ESF Switchgear Bus 242 to 4.16KV ESF Switchgear Bus 142 - ACB 1424

56 Byron Drawing 6E-2-4030DG01 Rev. T, Schematic Diagram Diesel Generator 2A Feed to 4.16KV ESF Switchgear Bus 241 - ACB 2413

57 Byron Drawing 6E-2-4030AP23 Rev. X, Schematic Diagram System Auxiliary Transformer 242-1 Feed to 4.16KV ESF Switchgear Bus 241 - ACB 2412

58 Byron Drawing 6E-2-4030AP25 Rev. X, Schematic Diagram Reserve Feed from 4.16KV ESF Switchgear Bus 141 to 4.16KV ESF Switchgear Bus 241 - ACB 2414

59 Byron Drawing 6E-2-4030DG02 Rev. T, Schematic Diagram Diesel Generator 2B Feed to 4.16KV ESF Switchgear Bus 242 - ACB 2423

60 Byron Drawing 6E-2-4030AP32 Rev. V, Schematic Diagram System Auxiliary Transformer 242-2 Feed to 4.16KV ESF Switchgear Bus 242 - ACB 2422

61 Byron Drawing 6E-2-4030AP34 Rev. V, Schematic Diagram Reserve Feed from 4.16KV Switchgear Bus 142 to 4.16KV ESF Switchgear Bus 242 - ACB 2424

62 Byron Drawing 6E-1-4030DG31 Rev. AO, Schematic Diagram Diesel Generator 1A Starting Sequence Control 1DG01KA Part 1

63 Byron Drawing 6E-1-4030DG32 Rev. AH, Schematic Diagram Diesel Generator 1A Starting Sequence Control 1DG01KA Part 2

64 Byron Drawing 6E-1-4030DG33 Rev. T, Schematic Diagram Diesel Generator 1A Starting Sequence Control 1DG01KA (Part 3)

65 Byron Drawing 6E-1-4030DG35 Rev. L, Schematic Diagram Diesel Generator 1A Generator Control 1DG01KA

66 Byron Drawing 6E-1-4030DG36 Rev. O, Schematic Diagram Diesel Generator 1A Generator and Engine Governor Control 1DG01KA

67 Byron Drawing 6E-1-4030DG40 Rev. U, Schematic Diagram Diesel Generator 1A Shutdown and Alarm System 1DG01KA

68 Byron Drawing 6E-1-4030DG51 Rev. AO, Schematic Diagram Diesel Generator 1B Starting Sequence Control 1DG01KB Part 1

69 Byron Drawing 6E-1-4030DG52 Rev. AG, Schematic Diagram Diesel Generator 1B Starting Sequence Control 1DG01KB Part 2

70 Byron Drawing 6E-1-4030DG53 Rev. X, Schematic Diagram Diesel Generator 1B Starting Sequence Control 1DG01KB (Part 3)

71 Byron Drawing 6E-1-4030DG55 Rev. L, Schematic Diagram Diesel Generator 1B Generator Control 1DG01KB

72 Byron Drawing 6E-1-4030DG56 Rev. Q, Schematic Diagram Diesel Generator 1B Generator and Engine Governor Control 1DG01KB

73 Byron Drawing 6E-1-4030DG60 Rev. S, Schematic Diagram Diesel Generator 1B Shutdown and Alarm System 1DG01KB

74 Byron Drawing 6E-2-4030DG31 Rev. AO, Schematic Diagram Diesel Generator 2A Starting Sequence Control 2DG01KA Part 1

75 Byron Drawing 6E-2-4030DG32 Rev. AG, Schematic Diagram Diesel Generator 2A Starting Sequence Control 2DG01KA Part 2

76 Byron Drawing 6E-2-4030DG33 Rev. T, Schematic Diagram Diesel Generator 2A Starting Sequence Control 2DG01KA (Part 3)

77 Byron Drawing 6E-2-4030DG35 Rev. J, Schematic Diagram Diesel Generator 2A Generator Control 2DG01KA Unit 2

78 Byron Drawing 6E-2-4030DG36 Rev. L, Schematic Diagram Diesel Generator 2A Generator and Engine Governor Control 2DG01KA Unit 2

79 Byron Drawing 6E-2-4030DG40 Rev. P, Schematic Diagram Diesel Generator 2A Shutdown and Alarm System 2DG01KA

80 Byron Drawing 6E-2-4030DG51 Rev. AJ, Schematic Diagram Diesel Generator 2B Starting Sequence Control 2DG01KB Part 1

81 Byron Drawing 6E-2-4030DG52 Rev. AG, Schematic Diagram Diesel Generator 2B Starting Sequence Control 2DG01KB Part 2

82 Byron Drawing 6E-2-4030DG53 Rev. S, Schematic Diagram Diesel Generator 2B Starting Sequence Control 2DG01KB (Part 3)

83 Byron Drawing 6E-2-4030DG55 Rev. L, Schematic Diagram Diesel Generator 2B Generator Control 2DG01KB

84 Byron Drawing 6E-2-4030DG56 Rev. N, Schematic Diagram Diesel Generator 2B Generator and Engine Governor Control 2DG01KB Unit 2

85 Byron Drawing 6E-2-4030DG60 Rev. N, Schematic Diagram Diesel Generator 2B Shutdown and Alarm System 2DG01KB (Part 2)

86 Byron Drawing 6E-1-4030DG34 Rev. F, Schematic Diagram Diesel Generator 1A Starting Sequence Control (Description of Operation) 1DG01KA Part 4 Unit 1

87 Byron Drawing 6E-1-4030DG54 Rev. F, Schematic Diagram Diesel Generator 1B Starting Sequence Control (Description of Operation) 1DG01KB Part 4 Unit 1

88 Byron Drawing 6E-2-4030DG34 Rev. D, Schematic Diagram-Diesel Generator 2A Starting Sequence Control (Description of Operation) 2DG01KA Part 4 Unit 2

89 Byron Drawing 6E-2-4030DG54 Rev. D, Schematic Diagram Diesel Generator 2B Start Sequence Control (Description Of Operation) 2DG01KB Part 4 Unit 2

90 Byron Drawing 6E-1-4030DG41 Rev. L, Schematic Diagram Diesel Generator 1A Legends 1DG01KA

91 Byron Drawing 6E-1-4030DG61 Rev. M, Schematic Diagram Diesel Generator 1B Legends 1DG01KB

92 Byron Drawing 6E-2-4030DG41 Rev. J, Schematic Diagram Diesel Generator 2A Legends 2DG01KA Unit 2

93 Byron Drawing 6E-2-4030DG61 Rev. H, Schematic Diagram Diesel Generator 2B Legends 2DG01KB Unit 2

94 Byron Drawing 6E-1-4030DG44 Rev. V, Schematic Diagram Diesel Generator 1A Control Cabinet Switches Development 1DG01KA

95 Byron Drawing 6E-1-4030DG64 Rev. U, Schematic Diagram Diesel Generator 1B Control Cabinet Switches Development 1DG01KB

96 Byron Drawing 6E-2-4030DG44 Rev. N, Schematic Diagram Diesel Generator 2A Control Cab Switches Development 2DG01KA Unit 2

97 Byron Drawing 6E-2-4030DG64 Rev. N, Schematic Diagram Diesel Generator 2B Control Cab Switches Development 2DG01KB Unit 2

98 Byron Drawing 6E-1-4030DC01 Rev. N, Schematic Diagram 125V DC Battery Charger 111 1DC03E

99 Byron Drawing 6E-1-4030DC02 Rev. N, Schematic Diagram 125V DC Battery Charger 112 1DC04E

100 Byron Drawing 6E-1-4030DC04 Rev. B, Schematic Diagram Firing Amplifier and Miscellaneous Alarm Modules 125V DC and 250V DC Battery Chargers

101 Byron Drawing 6E-2-4030DC01 Rev. K, Schematic Diagram 125V DC Battery Charger 211 2DC03E

102 Byron Drawing 6E-2-4030DC02 Rev. M, Schematic Diagram 125V DC Battery Charger 212 2DC04E

103 Byron Drawing 6E-2-4030DC04 Rev. B, Schematic Diagram Firing Amplifier and Miscellaneous Alarm Modules 125V DC and 250V DC Battery Chargers

104 Byron Drawing 6E-1-4030AF19 Rev. C, Schematic Diagram 32V DC Battery Charger 1AF01EA-1 and 1AF01EB-1

105 Byron Drawing 6E-2-4030AF19 Rev. E, Schematic Diagram 32V DC Battery Charger 2AF01EA-1 and 2AF01EB-1

106 Byron Drawing 6E-1-4030IP01 Rev. Q, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 111 - 1IP05E

107 Byron Drawing 6E-1-4030IP02 Sheet 1 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 112 1IP06E Part 1

108 Byron Drawing 6E-1-4030IP02 Sheet 2 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 112 1IP06E Part 2

109 Byron Drawing 6E-1-4030IP02 Sheet 3 Rev. A, Schematic Diagram 10 KVA Inverter Static Switch for Instrument Bus 112 1IP06E Part 3

110 Byron Drawing 6E-1-4030IP02 Sheet 4 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 112 1IP06E Part 4

111 Byron Drawing 6E-1-4030IP03 Rev. S, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 113 IP07E

112 Byron Drawing 6E-1-4030IP04 Sheet 1 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 114 - 1IP08E Part 1

113 Byron Drawing 6E-1-4030IP04 Sheet 2 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 114 - 1IP08E Part 2

114 Byron Drawing 6E-1-4030IP04 Sheet 3 Rev. A, Schematic Diagram 10 KVA Inverter Static Switch for Instrument Bus 114 - 1IP08E Part 3

115 Byron Drawing 6E-1-4030IP04 Sheet 4 Rev. A, Schematic Diagram 10 KVA Inverter for Instrument Bus 114 - 1IP08E Part 4

116 Byron Drawing 6E-2-4030IP01 Rev. K, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 211 - 2IP05E

117 Byron Drawing 6E-2-4030IP02 Rev. K, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 212 - 2IP06E

118 Byron Drawing 6E-2-4030IP03 Rev. L, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 213 - 2IP07E

119 Byron Drawing 6E-2-4030IP04 Rev. L, Schematic Diagram 7.5KVA Fixed Frequency Inverter for Instrument Bus 214 - 2IP08E

120 Byron Drawing M-50 Sheet 1C Rev. AN, Diagram of Diesel Fuel Oil Unit 1

121 Byron Drawing M-50 Sheet 1D Rev. AP, Diagram of Diesel Fuel Oil Unit 1

122 Byron Drawing M-130 Sheet 1A Rev. BH, Diagram of Diesel Oil and Fuel Oil Supply

123 Byron Drawing M-130 Sheet 1B Rev. BE, Diagram of Diesel Oil and Fuel Oil Supply

124 Byron Drawing M-50 Sheet 1A Rev. AS, Diagram of Diesel Fuel Oil Unit 1

125 Byron Drawing M-50 Sheet 1B Rev. AP, Diagram of Diesel Fuel Oil

126 Byron Drawing 6E-1-4030DO02 Rev. H, Schematic Diagram Diesel Generator 1A Fuel Oil Transfer Pumps 1DO01PA and 1DO01PC

127 Byron Drawing 6E-1-4030DO03 Rev. J, Schematic Diagram Diesel Gen 1B Fuel Oil Transfer Pumps 1DO01PB and 1DO01PD Unit 1

128 Byron Drawing 6E-2-4030DO02 Rev. G, Schematic Diagram Diesel Gen 2A Fuel Oil Transfer Pumps 2DO01PA and 2DO01PC

129 Byron Drawing 6E-2-4030DO03 Rev. G, Schematic Diagram Diesel Gen 2B Fuel Oil Transfer Pumps 2DO01PB and 2DO01PD Unit 2

130 Byron Drawing M-42 Sheet 1A Rev. AQ, Diagram of Essential Service Water Critical Control Room Drawing

131 Byron Drawing M-42 Sheet 2A Rev. BC, Diagram of Essential Service Water Units 1 and 2

132 Byron Drawing M-42 Sheet 2B Rev. BC, Diagram of Essential Service Water Units 1 and 2

133 Byron Drawing M-42 Sheet 3 Rev. BD, Diagram of Essential Service Water Unit 1 Critical Control Room Drawing

134 Byron Drawing M-42 Sheet 6 Rev. BC, Diagram of Essential Service Water Critical Control Room Drawing

135 Byron Drawing M-126 Sheet 1 Rev. BG, Diagram Of Essential Service Water Unit 2

136 Byron Drawing 6E-1-4030SX01 Rev. W, Schematic Diagram Essential Service Water Pump 1A 1SX01PA

137 Byron Drawing 6E-1-4030SX02 Rev. X, Schematic Diagram Essential Service Water Pump 1B 1SX01PB

138 Byron Drawing 6E-2-4030SX01 Rev. T, Schematic Diagram Essential Service Water Pump 2A 2SX01PA

139 Byron Drawing 6E-2-4030SX02 Rev. Q, Schematic Diagram Essential Service Water Pump 2B 2SX01PB

140 Byron Drawing 6E-1-4030SX17 Rev. M, Schematic Diagram Diesel Gen 1A and 1B ESS Service Water Valves 1SX169A and 1SX169B

141 Byron Drawing 6E-2-4030SX17 Rev. M, Schematic Diagram Diesel Generator 2A and 2B ESS Service Water Valves 2SX169A and 2SX169B

142 Byron Drawing M-97 Rev. S, Diagram Of Diesel Generator Room 1A And 1B Ventilation System

143 Byron Drawing M-98 Rev. P, Diagram Of Diesel Generator Room 2A And 2B Ventilation System

144 Byron Drawing 6E-1-4030VD01 Rev. L, Schematic Diagram Diesel Generator Room 1A HVAC System Ventilation Fan 1A 1VD01CA

145 Byron Drawing 6E-1-4030VD02 Rev. K, Schematic Diagram Diesel Generator Room 1B HVAC System Ventilation Fan 1B 1VD01CB

146 Byron Drawing 6E-1-4030VD03 Rev. S, Schematic Diagram Diesel Generator Room 1A HVAC System Ventilation and Exhaust Fans Auxiliary Relays Switches and Alarm - Part I

147 Byron Drawing 6E-1-4030VD04 Rev. N, Schematic Diagram Diesel Generator Room 1A HVAC System Ventilation and Exhaust Fans Auxiliary Relays Switches and Alarms Part II

148 Byron Drawing 6E-2-4030VD01 Rev. M, Schematic Diagram Diesel Generator Room 2A HVAC System Ventilation Fan 2A 2VD01CA

149 Byron Drawing 6E-2-4030VD02 Rev. M, Schematic Diagram Diesel Generator Room 2B HVAC System Ventilation Fan 2B 2VD01CB

150 Byron Drawing 6E-2-4030VD03 Rev. S, Schematic Diagram Diesel Generator Room 2A HVAC System Ventilation and Exhaust Fans Auxiliary Relays, Switches and Alarms Part I

151 Byron Drawing 6E-2-4030VD04 Rev. M, Schematic Diagram Diesel Generator Room 2A HVAC System Ventilation and Exhaust Fans Auxiliary Relays, Switches and Alarms Part II

152 Byron Drawing 6E-1-4030VD07 Rev. L, Schematic Diagram Diesel Generator Room 1A and 1B HVAC System Exhaust Fans 1A and 1B - 1VD03CA and 1VD03CB

153 Byron Drawing 6E-2-4030VD07 Rev. L, Schematic Diagram Diesel Generator Room 2A and 2B HVAC System Exhaust Fans 2A and 2B 2VD03CA and 2VD03CB

154 Byron Drawing 6E-1-4007A Rev. M, Key Diagram 480V ESF Substation Bus 131X (1AP10E)

155 Byron Drawing 6E-1-4007D Rev. O, Key Diagram 480V ESF Substation Bus 132X (1AP12E)

156 Byron Drawing 6E-2-4007A Rev. J, Key Diagram 480V ESF Substation Bus 231X (2AP10E) Critical Control Room Drawing

157 Byron Drawing 6E-2-4007D Rev. L, Key Diagram 480V ESF Substation Bus 232X (2AP12E) Critical Control Room Drawing

158 Byron Drawing 6E-1-4008A Rev. AE, Key Diagram 480V Auxiliary Building ESF MCC 131X1 - 1AP21E - Part 1

159 Byron Drawing 6E-1-4008B Rev. Z, Key Diagram 480V Auxiliary Building ESF MCC 131X1 and 131X1A - 1AP21E and 1AP21EA - Part 2

160 Byron Drawing 6E-1-4008J Rev. AJ, Key Diagram 480V Auxiliary Building ESF MCC 132X1 (1AP23E)

161 Byron Drawing 6E-1-4008L Rev. AQ, Key Diagram 480V Auxiliary Building ESF MCC 132X2 and A (1AP27E and 1AP27A)

162 Byron Drawing 6E-1-4008Q Rev. S, Key Diagram 480V Auxiliary Building ESF MCC 131X3 (1AP22E)

163 Byron Drawing 6E-1-4008Y Rev. AG, Key Diagram 480V Auxiliary Building ESF MCC 132X3 1AP24E

164 Byron Drawing 6E-2-4008A Rev. N, Key Diagram 480V Auxiliary Building ESF MCC 231X1 2AP21E Part 1

165 Byron Drawing 6E-2-4008B Rev. O, Key Diagram 480V Auxiliary Building ESF MCC 231X1-A 2AP21E-A Part 2

166 Byron Drawing 6E-2-4008J Rev. Y, Key Diagram 480V Auxiliary Building ESF MCC 232X1 (2AP23E)

167 Byron Drawing 6E-2-4008L Rev. AE, Key Diagram 480V Auxiliary Building ESF MCC 232X2 and A (2AP27E and 2AP27A)

168 Byron Drawing 6E-2-4008Q Rev. R, Key Diagram 480V Auxiliary Building ESF MCC 231X3 2AP22E

169 Byron Drawing 6E-2-4008Y Rev. U, Key Diagram 480V Auxiliary Building ESF MCC 232X3 2AP24E

170 Byron Drawing 6E-1-4010A Rev. M, Key Diagram 125V DC ESF Distribution Center Bus 111 (1DC05E) Part 1

171 Byron Drawing 6E-1-4010B Rev. G, Key Diagram 125V DC ESF Distribution Center Bus 111 (1DC05E) Part 2

172 Byron Drawing 6E-1-4010D Rev. N, Key Diagram 125V DC ESF Distribution Center Bus 112 (1DC06E) Part 1

173 Byron Drawing 6E-1-4010E Rev. G, Key Diagram 125V DC ESF Distribution Center Bus 112 (1DC06E) Part 2

174 Byron Drawing 6E-2-4010A Rev. L, Key Diagram 125V DC ESF Distribution Center Bus 211 (2DC05E) Part 1

175 Byron Drawing 6E-2-4010B Rev. F, Key Diagram 125V DC ESF Distribution Center Bus 211 (2DC05E) Part 2

176 Byron Drawing 6E-2-4010D Rev. L, Key Diagram 125V DC ESF Distribution Center Bus 212 (2DC06E) Part 1

177 Byron Drawing 6E-2-4010E Rev. E, Key Diagram 125V DC ESF Distribution Center Bus 212 (2DC06E) Part 2

178 Byron Drawing 6E-1-4012A Rev. W, Key Diagram 120V AC Instrument Bus 111 - 1IP01J ESF Division 11 Channel I

179 Byron Drawing 6E-1-4012B Rev. T, Key Diagram 120V AC Instrument Bus 112 - 1IP02J ESF Division 12 Channel II

180 Byron Drawing 6E-1-4012C Rev. V, Key Diagram 120V AC Instrument Bus 113 - 1IP03J ESF Division 11 Channel III

181 Byron Drawing 6E-1-4012D Rev. Z, Key Diagram 120V AC Instrument Bus 114 - 1IP04J ESF Division 12 Channel IV

182 Byron Drawing 6E-2-4012A Rev. K, Key Diagram 120V AC Instrument Bus 211 - 2IP01J ESF Division 21 Channel I

183 Byron Drawing 6E-2-4012B Rev. J, Key Diagram 120V AC Instrument Bus 212 - 2IP02J ESF Division 22 Channel II

184 Byron Drawing 6E-2-4012C Rev. K, Key Diagram 120V AC Instrument Bus 213 - 2IP03J ESF Division 21 Channel III

185 Byron Drawing 6E-2-4012D Rev. M, Key Diagram 120V AC Instrument Bus 214 - 2IP04J ESF Division 22 Channel IV

186 Byron Drawing 6E-1-4030AP27 Rev. J, Schematic Diagram 4.16KV ESF Switchgear Bus 141 Feed to 480V Auxiliary Transformer 131X - ACB 1415X

187 Byron Drawing 6E-1-4030AP36 Rev. H, Schematic Diagram 4.16KV ESF Switchgear Bus 142 Feed to 480V Auxiliary Transformer 132X - ACB 1425X

188 Byron Drawing 6E-2-4030AP27 Rev. J, Schematic Diagram 4.16KV ESF Switchgear Bus 241 Feed to 480V Auxiliary Transformer 231X - ACB 2415X

189 Byron Drawing 6E-2-4030AP36 Rev. G, Schematic Diagram 4.16KV ESF Switchgear Bus 242 Feed to 480V Auxiliary

190 15C0346-CAL-001, Rev. 1, High Frequency Functional Confirmation and Fragility Evaluation of Relays

191 15C0346-RPT-001, Rev. 1, Selection of Relays and Switches for High Frequency Seismic Evaluation

A Representative Sample Component Evaluations

The following sample calculation is extracted from Reference [190].

Notes:

1. Reference citations within the sample calculation are per Ref. [190] reference section shown on the following page.
2. This sample calculation contains evaluations of sample high-frequency sensitive components per the methodologies of both the EPRI high-frequency guidance [8] and the flexible coping strategies guidance document NEI 12-06 [16].

6 REFERENCES

1. Codes, Guidance, and Standards
   1.1. EPRI 3002004396, "High Frequency Program: Application Guidance for Functional Confirmation and Fragility Evaluation." July 2015.
   1.2. EPRI 3002002997, "High Frequency Program: High Frequency Testing Summary." September 2014.
   1.3. EPRI NP-7147-SL, "Seismic Ruggedness of Relays", August 1991.
   1.4. NEI 12-06, Appendix H, Rev. 2, "Diverse and Flexible Coping Strategies (FLEX) Implementation Guide."
   1.5. EPRI NP-5223-SL, Rev. 1, "Generic Seismic Ruggedness of Power Plant Equipment."

2. Nuclear Regulatory Commission Documents
   2.1. Byron Seismic Hazard and Screening Report, Rev. 0, NRC Docket No. STN 50-454 and STN 50-455, Correspondence No. RS-14-065.

3. Station Documents
   3.1. BYRON-UFSAR, Rev. 14
   3.2. Calculation BYR08-091, Rev. 0, "Review of Engine Systems, Inc. (ESI) Seismic Qualification Report No. ES-SR-08-106, Revision 0, For a Replacement Speed Circuit for the Auxiliary Feedwater Diesel Driven Pump at Byron Station."
   3.3. DC-ST-04-BB, Rev. 2, "Development of Seismic Subsystem (or Equipment) Design Criteria (Horizontal and Vertical) and Response Spectra."
   3.4. Calculation SM-AF143, Rev. C, "Calcs. For Aux Feed Pump (2)1B Diesel Engine Oil Pressure Switch."
   3.5. Calculation CQD-200156, Rev. 0, "Seismic Qualification of Westinghouse 7300 Series Process Control and Protection System, Spec. No. F/L-2812."
   3.6. Calculation EMD-020714, Rev. 0, "Review of Seismic Qualification Report for the Aux. Feedwater Diesel Drive and Control Panel (Safety-Related)."
   3.7. Calculation BRW-05-0094-E, Rev. 1, "Seismic Qualification of ABB Protective Relays for the 480V, 4.16 kV and 6.9 kV Switchgear at Byron and Braidwood Stations. (WCAP-16451-P, Revision 01)."
   3.8. Calculation 018815(EMD) (Wyle Report 44369-2), Rev. 0, "Review of Seismic Qualification for Engine/Generator Panel of Cooper Energy Services."
   3.9. Calculation 012617 (CQD), Rev. 0, "Review of Seismic Test Reports for various Control Components."
   3.10. Calculation CQD-012527, Rev. 0, "Seismic Simulation Test Program on a 130-VDC Battery Charger."
   3.11. Calculation CQD-200164 (Wyle Report 47993-1), "Seismic Qualification Test Report for Battery Chargers, 0SX02EA-1 thru 0SX02ED-1, 1,2AF01EA-1, 1,2AF01EB-1 (Model #32-50)."
   3.12. Calculation CQD-007041, Rev. 0 & 1, "Seismic Qualification Review for HVAC Control Instrumentation."
   3.13. Not Used
   3.14. Calculation CQD-007999, Rev. 1, "Seismic Qualification of Westinghouse 480 Volt Switchgear (1&2AP10E, 1&2AP12E, 1&2AP98E, 1&2AP99E)."

4. Station Drawing
   4.1. Drawing 6E-1-4031AF14, Rev. D, "Loop Schematic Diagram Aux. Feedwater Pump Suction Pressure Cab. 1PA34J."
   4.2. Drawing 6E-2-4031AF14, Rev. E, "Loop Schematic Diagram Aux. Feedwater Pump Suction Pressure Cab. 2PA34J."
   4.3. Drawing 6E-1-4468, Rev. Y, "Elevation Auxiliary Feedwater Pump 1B Startup Panel 1AF01J."
   4.4. Drawing 6E-2-4468, Rev. W, "Elevation Auxiliary Feedwater Pump 2B Startup Panel 2AF01J."
   4.5. Drawing 6E-1-4234B, Rev. H, "Bill of Material & Nameplate 125V DC Battery Chargers 111 & 112 (1DC03E, 1DC04E)."
   4.6. Drawing 6E-2-4234B, Rev. H, "Bill of Material & Nameplate 125V DC Battery Chargers 211 & 212 (2DC03E, 2DC04E)."
   4.7. Drawing 6E-1-4030VD07, Rev. L, "Schematic Diagram Diesel Generator Room 1A & 1B HVAC System Exhaust Fans 1A & 1B – 1VD03CA & B."
   4.8. Drawing 6E-2-4030VD07, Rev. L, "Schematic Diagram Diesel Generator Room 2A & 2B HVAC System Exhaust Fans 2A & 2B – 2VD03CA & B."
   4.9. Drawing 6E-1-4468, Rev. Y, "Elevation Auxiliary Feedwater Pump 1B Startup Panel 1AF01J."
   4.10. Drawing 6E-2-4468, Rev. W, "Elevation Auxiliary Feedwater Pump 2B Startup Panel 2AF01J."

5. S&A Documents
   5.1. 15C0346-RPT-001, Rev. 1, "Selection of Relays and Switches for High Frequency Seismic Evaluation."

6. Miscellaneous Documents
   6.1. Test Report ES-1000, "Nuclear Environmental Qualification Test Report On Agastat E7000 Series Timing Relays." (See Attachment E)
   6.2. Report 60967, Rev. 0, "Nuclear Environmental Qualification Report for a Microswitch, P/N BZLN-LH." (See Attachment H)
   6.3. Solon Manufacturing Company Catalog, "Model Series 7PS Pressure Switch Diaphragm Sensing Element." (See Attachment J)
   6.4. Ashcroft Data Sheet, "B Series Switches – Pressure, Differential Pressure & Hydraulics." (See Attachment K)
   6.5. Report S9025.0, Rev. 2, "Seismic Test Report for Parker Regulator & Gauge, Durabla Check Valve and Square D Pressure Switch." (See Attachment M)

7 INPUTS

Inputs are provided as necessary within Section 8 of this calculation.

8 ANALYSIS

8.1 Equipment Scope

The list of essential relays at BYR is per Ref. 5.1 and can be found in Section 1, Table 1.1 of this calculation.

8 ANALYSIS (cont'd)

8.2 High-Frequency Seismic Demand

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

Sample calculation for the high-frequency seismic demand of relay components 1AF01J-K4 and 1AF01J-K10 is presented below. A table that calculates the high-frequency seismic demand for all of the subject relays listed in Section 1, Table 1.1 of this calculation is provided in Attachment A of this calculation.

8.2.1 Horizontal Seismic Demand

The horizontal site-specific GMRS for Byron Nuclear Generating Station (BYR) is per Ref. 2.1. GMRS data can be found in Attachment B of this calculation. A plot of GMRS can be found in Attachment C 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): $SA_{GMRS} := 0.514g$ (at 20 Hz)

Calculate the horizontal in-structure amplification factor based on the distance between the plant foundation elevation and the subject floor elevation.

Grade Elevation (Ref. 3.1): $EL_{grade} := 400ft$

Per Ref. 3.1, Table 3.7-3, the embedment depth of the foundation varies between 0' to 70'. Conservatively use 70' as the Auxiliary Building embedment depth.

Auxiliary Building Embedment Depth (Ref. 3.1, Table 3.7-3): $embed_{ab} := 70ft$

Foundation Elevation (Auxiliary Building): $El_{found.ab} := EL_{grade} - embed_{ab} = 330.00 \cdot ft$

Relay floor elevation (Table 1.1): $EL_{relay} := 383ft$

Relay components 1AF01J-K4 and 1AF01J-K10 are both located in the Auxiliary Building at elevation 383'-0".

Distance between relay floor and foundation: $h_{relay} := EL_{relay} - El_{found.ab} = 53.00 \cdot ft$

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 relay floor and foundation with Ref. 1.1, Fig. 4-3 to calculate the horizontal in-structure amplification factor.

Slope of amplification factor line, $0ft < h_{relay} < 40ft$ $\quad m_h := \frac{2.1 - 1.2}{40ft - 0ft} = 0.0225 \cdot \frac{1}{ft}$

Intercept of amplification factor line: $\quad b_h := 1.2$

Horizontal in-structure amplification factor:

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

$$AF_{SH}(h_{relay}) = 2.10$$

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

Type of cabinet (per Table 1.1) (enter "MCC", "Switchgear", "Control Cabinet", or "Rigid"): $\quad cab :=$ "Control Cabinet"

Horizontal in-cabinet amplification factor (Ref. 1.1, p. 4-13):

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

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

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

Horizontal in-cabinet response spectrum (Ref. 1.1, p. 4-12, Eq. 4-1a and p. 4-15, Eq. 4-4):

$$ICRS_{c.h} := AF_{SH}(h_{relay}) \cdot AF_{c.h}(cab) \cdot SA_{GMRS} = 4.857 \cdot g$$

Note that the horizontal seismic demand is same for both relay components 1AF01J-K4 and 1AF01J-K10.

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)

$SA_{GMRS} = 0.514 \cdot g$ (at 20 Hz)

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

$$PGA_{GMRS} := 0.270g$$

Calculate the shear wave velocity traveling from a depth of 30m to the surface of the site (V_{s30}) from Ref. 1.1, p. 3-5 and Attachment D.

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 D, the sum of thickness of the layer over shear wave velocity of the layer is 0.0313 sec.

Shear Wave Velocity:

$$V_{s30} := \frac{30m}{0.0313sec} = 3145 \cdot \frac{ft}{sec}$$

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 0.270g and shear wave velocity of 3145ft/sec at BYR, the site soil class is conservatively taken as C-Hard.

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

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

Determine the peak acceleration of the vertical GMRS (SA_{VGMRS}) between frequencies of 15Hz and 40Hz. (By inspection of Attachment B, the peak SA_{VGMRS} occurs at 35Hz.)

V/H ratio at 35Hz (See Attachment B of this calculation): $VH := 0.82$

Horizontal GMRS at frequency of peak vertical GMRS (at 35Hz) (See Attachment B of this calculation): $HGMRS := 0.467g$

Peak acceleration of vertical GMRS between 15 Hz and 40 Hz: $SA_{VGMRS} := VH \cdot HGMRS = 0.383 \cdot g$ (at 35 Hz)

A plot of horizontal and vertical GMRS is provided in Attachment C 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 plant foundation elevation and the subject floor elevation.

Distance between relay floor and foundation (see Sect. 8.2.1 of this calculation): $h_{relay} = 53.00 \cdot ft$

Work the distance between the relay floor and foundation 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: $AF_{SV} := m_V \cdot h_{relay} + b_V = 1.901$

The sample relay components 1AF01J-K4 and 1AF01J-K10 are mounted within host 1AF01J. Therefore, the vertical in-cabinet amplification for sample relay components is 4.7 per Ref. 1.1, Eq. 4-3.

Vertical in-cabinet amplification factor: $AF_{c.V} := 4.7$

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

Vertical in-cabinet response spectrum (Ref. 1.1, p. 4-12, Eq. 4-1b and p. 4-15, Eq. 4-4):

$$ICRS_{c.V} := AF_{SV} \cdot AF_{c.V} \cdot SA_{VGMRS} = 3.421 \cdot g$$

Note that the vertical seismic demand is same for both relay components 1AF01J-K4 and 1AF01J-K10.

8 ANALYSIS (cont'd)

8.3 High-Frequency Seismic Capacity for Ref. 1.1 Relays

A sample calculation for the high-frequency seismic capacity of 1AF01J-K4 and 1AF01J-K10 relay components are presented here. A table that calculates the high-frequency seismic capacities for all of the Ref. 1.1 subject relays listed in Section 1, Table 1.1 of this calculation is provided in Attachment A of this calculation.

8.3.1 Seismic Test Capacity

The high frequency seismic capacity of a relay can be determined from the Ref. 1.2 high-frequency testing program or other broad banded low frequency capacity data such as the Generic Equipment Ruggedness Spectra (GERS). Per Ref. 1.1, Sect. 4.5.2, a conservative estimate of the high-frequency (i.e., 20Hz to 40Hz) capacity can be made by extending the low frequency GERS capacity into the high frequency range to a roll off frequency of about 40Hz. Therefore, if the high frequency capacity was not available for a component, a SA_T value equal to the GERS spectral acceleration from 4 to 16 Hz could be used.

For the relay component 1AF01J-K4 (Model #: E7012OEL) and 1AF01J-K10 (Model #: KHS17D11), the GERS spectral acceleration from Ref. 1.3 is used as the seismic test capacity.

Seismic test capacity (SA*):

$$SA' := \begin{pmatrix} 12.5 \\ 10 \end{pmatrix} g \qquad \begin{pmatrix} \text{1AF01J-K4 (Ref. 1.3, Page B-8)} \\ \text{1AF01J-K10 (Ref. 1.3, Page B-29)} \end{pmatrix}$$

8.3.2 Effective Spectral Test Capacity

GERS spectral acceleration for the relay components 1AF01J-K4 and 1AF01J-K10 is used as the seismic test capacity. Therefore for the relay components 1AF01J-K4 and 1AF01J-K10 there is no spectral acceleration increase.

Effective spectral test capacity (Ref. 1.1, p. 4-16):

$$SA_T := \begin{pmatrix} SA'_1 \\ SA'_2 \end{pmatrix} = \begin{pmatrix} 12.50 \\ 10.00 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

8 ANALYSIS (cont'd)

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

8.3.3 Seismic Capacity Knockdown Factor

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

The knockdown factor for relay components 1AF01J-K4 and 1AF01J-K10 is obtained per Ref. 1.1, Table 4-2.

Seismic capacity knockdown factor: $F_k := \begin{pmatrix} 1.50 \\ 1.50 \end{pmatrix}$ $\begin{pmatrix} \text{1AF01J-K4 (Ref. 1.1, Table 4-2)} \\ \text{1AF01J-K10 (Ref. 1.1, Table 4-2)} \end{pmatrix}$

8.3.4 Seismic Testing Single-Axis Correction Factor

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

Per Ref. 1.1, pp. 4-17 to 4-18, relays mounted within cabinets that are braced, bolted together in a row, mounted to both floor and wall, etc. will have a correction factor of 1.00. Relays mounted within cabinets that are bolted only to the floor or otherwise not well-braced will have a correction factor of 1.2.

The sample relay components 1AF01J-K4 and 1AF01J-K10 are mounted within host 1AF01J. Per Ref. 1.1, pp. 4-18, conservatively take the F_{MS} value as 1.0.

Single-axis correction factor (Ref. 1.1, pp. 4-17 to 4-18): $F_{MS} := 1.0$

8 ANALYSIS (cont'd)

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

8.3.5 Effective Wide-Band Component Capacity Acceleration

Calculate the effective wide-band component capacity acceleration of relay components 1AF01J-K4 and 1AF01J-K10 per Ref. 1.1, Eq. 4-5.

Effective wide-band component capacity acceleration (Ref. 1.1, Eq. 4-5)

$$TRS := \left(\frac{SA_T}{F_k}\right) \cdot F_{MS} = \begin{pmatrix} 8.333 \\ 6.667 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

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

8.4.1 Effective Wide-Band Component Capacity Acceleration

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

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

$C_{10\%}$ vs. $C_{1\%}$ ratio $\qquad C_{10} := 1.36$

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

$$TRS_{1.4} := TRS \cdot C_{10} = \begin{pmatrix} 11.333 \\ 9.067 \end{pmatrix} \cdot g \qquad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

8 ANALYSIS (cont'd)

8.5 Relay (Ref. 1.1) High-Frequency Margin

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

A sample calculation for the high-frequency seismic demand of relay components 1AF01J-K4 and 1AF01J-K10 is presented here. A table that calculates the high-frequency seismic margin for all of the subject relays listed in Section 1, Table 1.1 of this calculation is provided in Attachment A of this calculation.

Horizontal seismic margin (Ref. 1.1, Eq. 4-6):

$$\frac{TRS}{ICRS_{c.h}} = \begin{pmatrix} 1.716 \\ 1.373 \end{pmatrix} \quad \begin{matrix} \mathbf{> 1.0,\ O.K.} \\ \mathbf{> 1.0,\ O.K.} \end{matrix} \quad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

Vertical seismic margin (Ref. 1.1, Eq. 4-6):

$$\frac{TRS}{ICRS_{c.v}} = \begin{pmatrix} 2.436 \\ 1.948 \end{pmatrix} \quad \begin{matrix} \mathbf{> 1.0,\ O.K.} \\ \mathbf{> 1.0,\ O.K.} \end{matrix} \quad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

Both the horizontal and vertical seismic margins for the relay components 1AF01J-K4 and 1AF01J-K10 are greater than 1.00. The sample relays are adequate for high-frequency seismic spectral ground motion. The sample relays are adequate for high-frequency seismic spectral ground motion for their Ref. 1.1 functions.

8.6 Relay (Ref. 1.4) High-Frequency Margin

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

A sample calculation for the high-frequency seismic demand of relay components 1AF01J-K4 and 1AF01J-K10 is presented here. A table that calculates the high-frequency seismic margin for all of the subject relays listed in Section 1, Table 1.1 of this calculation is provided in Attachment A of this calculation.

Horizontal seismic margin (Ref. 1.1, Eq. 4-6):

$$\frac{TRS_{1.4}}{ICRS_{c.h}} = \begin{pmatrix} 2.333 \\ 1.867 \end{pmatrix} \quad \begin{matrix} \mathbf{> 1.0,\ O.K.} \\ \mathbf{> 1.0,\ O.K.} \end{matrix} \quad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

Vertical seismic margin (Ref. 1.1, Eq. 4-6):

$$\frac{TRS_{1.4}}{ICRS_{c.v}} = \begin{pmatrix} 3.312 \\ 2.650 \end{pmatrix} \quad \begin{matrix} \mathbf{> 1.0,\ O.K.} \\ \mathbf{> 1.0,\ O.K.} \end{matrix} \quad \begin{pmatrix} \text{1AF01J-K4} \\ \text{1AF01J-K10} \end{pmatrix}$$

Both the horizontal and vertical seismic margins for the relay components 1AF01J-K4 and 1AF01J-K10 are greater than 1.00. The sample relays are adequate for high-frequency seismic spectral ground motion for their Ref. 1.4 functions.

B Components Identified for High Frequency Confirmation

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
1	1	1AF01J-K10	Control Relay	Core Cooling	Low Lube Oil Pressure Relay	Potter Brumfield	KHS-17D11	1AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
2	1	1AF01J-K11	Control Relay	Core Cooling	Low Oil Pressure Time Delay Relay	Agastat	7022OC	1AF01J	Control Cabinet	Auxiliary Building	383	EPRI HF Test	Cap > Dem
3	1	1AF01J-K4	Control Relay	Core Cooling	Overcrank Timer Relay	Agastat	E7012OEL004	1AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
4	1	1AF01J-K7	Control Relay	Core Cooling	Overcrank relay	Potter Brumfield	KHS-17D11-24VDC	1AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
5	1	1AF01J-K8	Control Relay	Core Cooling	High water temperature relay	Potter Brumfield	KHS-17D11-24VDC	1AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
6	1	1AF01J-K9	Control Relay	Core Cooling	Overspeed relay	Potter Brumfield	KHS-17D11-24VDC	1AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
7	1	1SS-AF8002 "S1"	Process Switch	Core Cooling	Speed switch	Dynalco	SST-2400A	1AF01J	Control Cabinet	Auxiliary Building	383	BYR Report	Cap > Dem
8	1	1TSH-AF147 "S10"	Process Switch	Core Cooling	High water temperature switch	United Electric	F400-6BS-20S-20S	1AF01PB	Control Cabinet	Auxiliary Building	383	BYR Report	Cap > Dem
						Square D	9025-BCW-32						Cap > Dem
9	1	486-1413 @ 1AP05EF	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 656A830G01	1AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
10	1	486-1412 @ 1AP05ER	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	1AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
11	1	PR30A-451 @ 1AP05ER	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
12	1	PR30C-451 @ 1AP05ER	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
13	1	PR31-451N @ 1AP05ER	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6B 1456C05A16	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
14	1	486-1414X @ 1AP05EP	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	1AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
15	1	PR27A-451 @ 1AP05EP	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
16	1	PR27C-451 @ 1AP05EP	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
17	1	PR28-451N @ 1AP05EP	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456C05A16	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
18	1	62CL @ 1PL07J	Control Relay	AC/DC Power Support System	Cranking Limit Time Delay Relay	Tyco	E7012PDL004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
19	1	48 @ 1PL07J	Control Relay	AC/DC Power Support System	Incomplete Starting Sequence Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
20	1	86E @ 1PL07J	Control Relay	AC/DC Power Support System	Engine Shutdown Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
21	1	63QELX @ 1PL07J	Control Relay	AC/DC Power Support System	Engine Lube Oil Low Pressure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
22	1	63QTLX @ 1PL07J	Control Relay	AC/DC Power Support System	Turbo Low Lube Oil Pressure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
23	1	26MBHTX @ 1PL07J	Control Relay	AC/DC Power Support System	Main and Connecting Rod High Bearing Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
24	1	38TBFX @ 1PL07J	Control Relay	AC/DC Power Support System	Turbo Thrust Bearing Failure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
25	1	26JWSX @ 1PL07J	Control Relay	AC/DC Power Support System	Jacket Water High Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
26	1	63CX @ 1PL07J	Control Relay	AC/DC Power Support System	Crankcase High Pressure Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
27	1	86G @ 1PL07J	Control Relay	AC/DC Power Support System	Generator Shutdown Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
28	1	51X @ 1PL07J	Protective Relay	AC/DC Power Support System	Generator Overcurrent Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
29	1	59GX @ 1PL07J	Control Relay	AC/DC Power Support System	Generator Neutral Ground Voltage Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
30	1	40X @ 1PL07J	Control Relay	AC/DC Power Support System	Loss of Field Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
					Loss of Field Auxiliary Relay	Agastat	GPDR-C740						Cap > Dem
31	1	32X @ 1PL07J	Control Relay	AC/DC Power Support System	Reverse Power Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
32	1	81UX @ 1PL07J	Control Relay	AC/DC Power Support System	Under Frequency Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
33	1	87G1X @ 1PL07J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
34	1	87G2X @ 1PL07J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
35	1	12X1 @ 1PL07J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
36	1	12X2 @ 1PL07J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
37	1	86S2 @ 1PL07J	Control Relay	AC/DC Power Support System	Unit Shutdown Relay	Agastat	EGPDR-C2017-004	1PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
38	1	1PS-DG108A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Square D	9012-GAW-24	1DG01KA	Diesel Generator	Auxiliary Building	401	BYR Report	Cap > Dem
39	1	1PS-DG251A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	1PL07J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
40	1	1PS-DG252A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	1PL07J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
41	1	52 @ 1AP05EF	Medium Circuit Breaker	AC/DC Power Support System	DG1A Circuit Breaker (ACB 1413)	Westinghouse	50 DHP 350	1AP05E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
42	1	52 @ 1AP05EU	Medium Circuit Breaker	AC/DC Power Support System	Transformer 131X Primary Circuit Breaker (ACB 1415X)	Westinghouse	50 DHP 350	1AP05E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
43	1	52 @ 1AP05EB	Medium Circuit Breaker	AC/DC Power Support System	ESW Pump 1A Circuit Breaker	Westinghouse	50 DHP 350	1AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
44	1	52 @ 1AP10EF	Low Circuit Breaker	AC/DC Power Support System	MCC 131X1 Feeder Circuit Breaker	Westinghouse	DS 206	1AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
45	1	52 @ 1AP10EJ	Low Circuit Breaker	AC/DC Power Support System	DG Room Vent Fan 1A Circuit Breaker	Westinghouse	DS 206	1AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
46	1	52 @ 1AP10EL	Low Circuit Breaker	AC/DC Power Support System	Battery Charger 111 Circuit Breaker	Westinghouse	DS 206	1AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
47	1	52 @ 1AP10EQ	Low Circuit Breaker	AC/DC Power Support System	MCC 131X3 Feeder Circuit Breaker	Westinghouse	DS 206	1AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
48	1	486-1415X @ 1AP05EU	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 503A804G01	1AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
49	1	PR37A-450/451 @ 1AP05EU	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse Westinghouse	CO-9A 1456C05A05	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
50	1	PR37B-450/451 @ 1AP05EU	Protective Relay	AC/DC Power Support System	Phase B Overcurrent Relay	Westinghouse Westinghouse	CO-9A 1456C05A05	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
51	1	PR37C-450/451 @ 1AP05EU	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse Westinghouse	CO-9A 1456C05A05	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
52	1	PR38-450N @ 1AP05EU	Protective Relay	AC/DC Power Support System	Neutral Overcurrent Relay	Westinghouse Westinghouse	SSC-T 1321D79A03	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
53	1	PR1-351N @ 1AP10EA	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse Westinghouse	CO-6 1456C05A08	1AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
54	1	PR3A-450/451 @ 1AP05EB	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse Westinghouse	CO-5A 1456C05A04	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
55	1	PR3C-450/451 @ 1AP05EB	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse Westinghouse	CO-5A 1456C05A04	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
56	1	PR4-450N @ 1AP05EB	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse Westinghouse	SSC-T 1321D79A03	1AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
57	1	SX1AX @ 1AP05EB	Protective Relay	AC/DC Power Support System	Low Suction Pressure Time Delay Relay	Tyco	E7012PD004	1AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
58	1	1PDS-VD103	Process Switch	AC/DC Power Support System	High DG 1A Exhaust Fan 1A Delta Pressure	Solon	7PS/7P2A	1VD03CA	Diesel Generator Vent Fan	Auxiliary Building	401	GERS	Cap > Dem
59	1	1DC03E-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	1DC03E	Battery Charger	Auxiliary Building	451	BYR Report	Cap > Dem
60	1	486-1423 @ 1AP06EF	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 656A830G01	1AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
61	1	486-1422 @ 1AP06ES	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	1AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
62	1	PR33A-451 @ 1AP06ES	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
63	1	PR33C-451 @ 1AP06ES	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
64	1	PR34-451N @ 1AP06ES	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	SSC-T 1321D79A02	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
65	1	486-1424X @ 1AP06EQ	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	1AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
66	1	PR30A-451 @ 1AP06EQ	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
67	1	PR30C-451 @ 1AP06EQ	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
68	1	PR31-451N @ 1AP06EQ	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456C05A08	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
69	1	62CL @ 1PL08J	Control Relay	AC/DC Power Support System	Cranking Limit Time Delay Relay	Tyco	E7012PDL004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
70	1	48 @ 1PL08J	Control Relay	AC/DC Power Support System	Incomplete Starting Sequence Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
71	1	86E @ 1PL08J	Control Relay	AC/DC Power Support System	Engine Shutdown Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
72	1	63QELX @ 1PL08J	Control Relay	AC/DC Power Support System	Engine Lube Oil Low Pressure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
73	1	63QTLX @ 1PL08J	Control Relay	AC/DC Power Support System	Turbo Low Lube Oil Pressure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
74	1	26MBHTX @ 1PL08J	Control Relay	AC/DC Power Support System	Main and Connecting Rod High Bearing Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
75	1	38TBFX @ 1PL08J	Control Relay	AC/DC Power Support System	Turbo Thrust Bearing Failure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
76	1	26JWSX @ 1PL08J	Control Relay	AC/DC Power Support System	Jacket Water High Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component ID	Component Type	Component System	Component Function	Manufacturer	Model No.	Enclosure ID	Enclosure Type	Building	Floor Elev. (ft)	Basis for Capacity	Evaluation Result
77	1	63CX @ 1PL08J	Control Relay	AC/DC Power Support System	Crankcase High Pressure Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
78	1	86G @ 1PL08J	Control Relay	AC/DC Power Support System	Generator Shutdown Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
79	1	51X @ 1PL08J	Protective Relay	AC/DC Power Support System	Generator Overcurrent Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
80	1	59GX @ 1PL08J	Control Relay	AC/DC Power Support System	Generator Neutral Ground Voltage Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
81	1	40X @ 1PL08J	Control Relay	AC/DC Power Support System	Loss of Field Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
82	1	32X @ 1PL08J	Control Relay	AC/DC Power Support System	Reverse Power Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
83	1	81UX @ 1PL08J	Control Relay	AC/DC Power Support System	Under Frequency Auxiliary Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
84	1	87G1X @ 1PL08J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
85	1	87G2X @ 1PL08J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
86	1	12X1 @ 1PL08J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
87	1	12X2 @ 1PL08J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
88	1	86S2 @ 1PL08J	Control Relay	AC/DC Power Support System	Unit Shutdown Relay	Agastat	EGPDR-C2017-004	1PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
89	1	1PS-DG108B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Square D	9012-GAW-24	1DG01KB	Diesel Generator	Auxiliary Building	401	BYR Report	Cap > Dem
90	1	1PS-DG251B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	1PL08J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
91	1	1PS-DG252B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	1PL08J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
92	1	52 @ 1AP06EF	Medium Voltage Circuit Breaker	AC/DC Power Support System	DG 1B Circuit Breaker (ACB 1423)	Westinghouse	50 DHP 350	1AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
93	1	52 @ 1AP06EP	Medium Voltage Circuit Breaker	AC/DC Power Support System	Transformer 132X Primary Circuit Breaker (ACB 1425X)	Westinghouse	50 DHP 350	1AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
94	1	52 @ 1AP06EB	Medium Voltage Circuit Breaker	AC/DC Power Support System	ESW Pump 1B Circuit Breaker	Westinghouse	50 DHP 350	1AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
95	1	52 @ 1AP12EC	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 132X3 Feeder Circuit Breaker	Westinghouse	DS 206	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
96	1	52 @ 1AP12EF	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 132X1 Feeder Circuit Breaker	Westinghouse	DS 206	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
97	1	52 @ 1AP12EG	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 132X2 Feeder Circuit Breaker	Westinghouse	DS 206	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
98	1	52 @ 1AP12EJ	Low Voltage Circuit Breaker	AC/DC Power Support System	DG Room Vent Fan 1B Circuit Breaker	Westinghouse	DS 206	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
99	1	52 @ 1AP12EL	Low Voltage Circuit Breaker	AC/DC Power Support System	Battery Charger 112 Circuit Breaker	Westinghouse	DS 206	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
100	1	486-1425X @ 1AP06EP	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 503A804G01	1AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
101	1	PR28A-450/451 @ 1AP06EP	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-9	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
102	1	PR28B-450/451 @ 1AP06EP	Protective Relay	AC/DC Power Support System	Phase B Overcurrent Relay	Westinghouse	CO-9	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
103	1	PR28C-450/451 @ 1AP06EP	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-9	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
104	1	PR29-450N @ 1AP06EP	Protective Relay	AC/DC Power Support System	Neutral Overcurrent Relay	Westinghouse	SSC-T	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1321D79A03						Cap > Dem
105	1	PR1-351N @ 1AP12EA	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6	1AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A08						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
106	1	PR4A-450/451 @ 1AP06EB	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-5A	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A04						Cap > Dem
107	1	PR4C-450/451 @ 1AP06EB	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-5A	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A04						Cap > Dem
108	1	PR5-450/451 @ 1AP06EB	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	SSC-T	1AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1321D79A03						Cap > Dem
109	1	SX1BX @ 1AP06EB	Control Relay	AC/DC Power Support System	Low Suction Pressure Time Delay Relay	Tyco	E7012PD004	1AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
110	1	1PDS-VD105	Process Switch	AC/DC Power Support System	High DG 1B Exhaust Fan 1B Delta Pressure	Solon	7PS/7P2A	1VD03CB	Diesel Generator Vent Fan	Auxiliary Building	401	GERS	Cap > Dem
111	1	1DC04E-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	1DC04E	Battery Charger	Auxiliary Building	451	BYR Report	Cap > Dem
112	1	1AF01EA-1-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	1AF01EA-1	Battery Charger	Auxiliary Building	386.17	BYR Report	Cap > Dem
113	1	1AF01EB-1-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	1AF01EB-1	Battery Charger	Auxiliary Building	389.42	BYR Report	Cap > Dem
114	2	2AF01J-K10	Control Relay	Core Cooling	Low Lube Oil Pressure Relay	Potter Brumfield	KHS-17D11	2AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
115	2	2AF01J-K11	Control Relay	Core Cooling	Low Oil Pressure Time Delay Relay	Agastat	7022OC	2AF01J	Control Cabinet	Auxiliary Building	383	EPRI HF Test	Cap > Dem
116	2	2AF01J-K4	Control Relay	Core Cooling	Overcrank Timer Relay	Agastat	7012OEL	2AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
117	2	2AF01J-K7	Control Relay	Core Cooling	Overcrank relay	Potter Brumfield	KHS-17D11	2AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
118	2	2AF01J-K8	Control Relay	Core Cooling	High water temperature relay	Potter Brumfield	KHS-17D11	2AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
119	2	2AF01J-K9	Control Relay	Core Cooling	Overspeed relay	Potter Brumfield	KHS-17D11	2AF01J	Control Cabinet	Auxiliary Building	383	GERS	Cap > Dem
120	2	2SS-AF8002 "S1"	Process Switch	Core Cooling	Speed switch	Dynalco	SST-2400A	2AF01J	Control Cabinet	Auxiliary Building	383	BYR Report	Cap > Dem
121	2	2TSH-AF147 "S10"	Process Switch	Core Cooling	High water temperature switch	Square D	9025-BCW-32	2AF01PB	Control Cabinet	Auxiliary Building	383	BYR Report	Cap > Dem
						United Electric	F400-6BS-20S-20S						Cap > Dem
122	2	486-2413 @ 2AP05ES	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 656A830G01	2AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
123	2	486-2412 @ 2AP05EG	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	2AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
124	2	PR9A-451 @ 2AP05EG	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
125	2	PR9C-451 @ 2AP05EG	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
126	2	PR10-451N @ 2AP05EG	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456CO5A16	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
127	2	486-2414 @ 2AP05EJ	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 501A817G01	2AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
						Electroswitch	793A389G01F						Cap > Dem
128	2	PR13A-451 @ 2AP05EJ	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
129	2	PR13C-451 @ 2AP05EJ	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
130	2	PR14-451N @ 2AP05EJ	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456C05A08	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
131	2	62CL @ 2PL07J	Control Relay	AC/DC Power Support System	Cranking Limit Time Delay Relay	Westinghouse	E7012PDL004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
132	2	48 @ 2PL07J	Control Relay	AC/DC Power Support System	Incomplete Starting Sequence Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
133	2	86E @ 2PL07J	Control Relay	AC/DC Power Support System	Engine Shutdown Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
134	2	63QELX @ 2PL07J	Control Relay	AC/DC Power Support System	Engine Lube Oil Low Pressure Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
135	2	63QTLX @ 2PL07J	Control Relay	AC/DC Power Support System	Turbo Low Lube Oil Pressure Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
136	2	26MBHTX @ 2PL07J	Control Relay	AC/DC Power Support System	Main and Connecting Rod High Bearing Temperature Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
137	2	38TBFX @ 2PL07J	Control Relay	AC/DC Power Support System	Turbo Thrust Bearing Failure Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
138	2	26JWSX @ 2PL07J	Control Relay	AC/DC Power Support System	Jacket Water High Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
139	2	63CX @ 2PL07J	Control Relay	AC/DC Power Support System	Crankcase High Pressure Repeater Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
140	2	86G @ 2PL07J	Control Relay	AC/DC Power Support System	Generator Shutdown Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
141	2	51X @ 2PL07J	Protective Relay	AC/DC Power Support System	Generator Overcurrent Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
142	2	59GX @ 2PL07J	Control Relay	AC/DC Power Support System	Generator Neutral Ground Voltage Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
143	2	40X @ 2PL07J	Control Relay	AC/DC Power Support System	Loss of Field Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
144	2	32X @ 2PL07J	Control Relay	AC/DC Power Support System	Reverse Power Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
145	2	81UX @ 2PL07J	Control Relay	AC/DC Power Support System	Under Frequency Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
146	2	87G1X @ 2PL07J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
147	2	87G2X @ 2PL07J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
148	2	12X1 @ 2PL07J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
149	2	12X2 @ 2PL07J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
150	2	86S2 @ 2PL07J	Control Relay	AC/DC Power Support System	Unit Shutdown Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL07J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
151	2	2PS-DG108A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Square D	9012-GAW-24	2DG01KA	Diesel Generator	Auxiliary Building	401	BYR Report	Cap > Dem
152	2	2PS-DG251A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	2PL07J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
153	2	2PS-DG252A	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	2PL07J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
154	2	52 @ 2AP05ES	Medium Voltage Circuit Breaker	AC/DC Power Support System	DG2A Circuit Breaker (ACB 2413)	Westinghouse	50 DHP 350	2AP05E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
155	2	52 @ 2AP05ED	Medium Voltage Circuit Breaker	AC/DC Power Support System	Transformer 231X Primary Circuit Breaker (ACB 2415X)	Westinghouse	50 DHP 350	2AP05E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
156	2	52 @ 2AP05EW	Medium Voltage Circuit Breaker	AC/DC Power Support System	ESW Pump 2A Circuit Breaker	Westinghouse	50 DHP 350	2AP05E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
157	2	52 @ 2AP10EF	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 231X1 Feeder Circuit Breaker	Westinghouse	DS 206	2AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
158	2	52 @ 2AP10EJ	Low Voltage Circuit Breaker	AC/DC Power Support System	DG Room Vent Fan 2A Circuit Breaker	Westinghouse	DS 206	2AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
159	2	52 @ 2AP10EL	Low Voltage Circuit Breaker	AC/DC Power Support System	Battery Charger 211 Circuit Breaker	Westinghouse	DS 206	2AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
160	2	52 @ 2AP10EQ	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 231X3 Feeder Circuit Breaker	Westinghouse	DS 206	2AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
161	2	486-2415X @ 2AP05ED	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 503A804G01	2AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
162	2	PR3A-450/451 @ 2AP05ED	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-9A	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
163	2	PR3B-450/451 @ 2AP05ED	Protective Relay	AC/DC Power Support System	Phase B Overcurrent Relay	Westinghouse	CO-9A	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
164	2	PR3C-450/451 @ 2AP05ED	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-9A	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
165	2	PR4-450N @ 2AP05ED	Protective Relay	AC/DC Power Support System	Neutral Overcurrent Relay	Westinghouse	SSC-T	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1321D79A03						Cap > Dem
166	2	PR1-351N @ 2AP10EA	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6	2AP10E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A08						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
167	2	PR36A-450/451 @ 2AP05EW	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse Westinghouse	CO-5A 1456C05A04	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
168	2	PR36C-450/451 @ 2AP05EW	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse Westinghouse	CO-5A 1456C05A04	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
169	2	PR37-450N @ 2AP05EW	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse Westinghouse	SSC-T 1321D79A03	2AP05E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem Cap > Dem
170	2	SX1AX @ 2AP05EW	Control Relay	AC/DC Power Support System	Low Suction Pressure Time Delay Relay	Tyco	E7012PD004	2AP05E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
171	2	2PDS-VD103	Process Switch	AC/DC Power Support System	High DG 2A Exhaust Fan 2A Delta Pressure	Solon	7PS/7P2A	2VD03CA	Diesel Generator Vent Fan	Auxiliary Building	401	GERS	Cap > Dem
172	2	2DC03E-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	2DC03E	Battery Charger	Auxiliary Building	451	BYR Report	Cap > Dem
173	2	486-2423 @ 2AP06ER	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 656A830G01	2AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
174	2	486-2422 @ 2AP06EF	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse Electroswitch	Type WL 501A817G01 793A389G01F	2AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem Cap > Dem
175	2	PR7A-451 @ 2AP06EF	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
176	2	PR7C-451 @ 2AP06EF	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
177	2	PR8-451N @ 2AP06EF	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456CO5A08	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
178	2	486-2424 @ 2AP06ED	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse Electroswitch	Type WL 501A817G01 793A389G01F	2AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem Cap > Dem
179	2	PR3A-451 @ 2AP06ED	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
180	2	PR3C-451 @ 2AP06ED	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-7 1456C05A09	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
181	2	PR4-451N @ 2AP06ED	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6 1456CO5A08	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
182	2	62CL @ 2PL08J	Control Relay	AC/DC Power Support System	Cranking Limit Time Delay Relay	Westinghouse	E7012PDL004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
183	2	48 @ 2PL08J	Control Relay	AC/DC Power Support System	Incomplete Starting Sequence Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
184	2	86E @ 2PL08J	Control Relay	AC/DC Power Support System	Engine Shutdown Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
185	2	63QELX @ 2PL08J	Control Relay	AC/DC Power Support System	Engine Lube Oil Low Pressure Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem
186	2	63QTLX @ 2PL08J	Control Relay	AC/DC Power Support System	Turbo Low Lube Oil Pressure Shutdown Repeater Relay	Agastat Agastat	EGPDR-C2017-004 GPDR-C740	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
187	2	26MBHTX @ 2PL08J	Control Relay	AC/DC Power Support System	Main and Connecting Rod High Bearing Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
188	2	38TBFX @ 2PL08J	Control Relay	AC/DC Power Support System	Turbo Thrust Bearing Failure Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
189	2	26JWSX @ 2PL08J	Control Relay	AC/DC Power Support System	Jacket Water High Temperature Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
190	2	63CX @ 2PL08J	Control Relay	AC/DC Power Support System	Crankcase High Pressure Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
191	2	86G @ 2PL08J	Control Relay	AC/DC Power Support System	Generator Shutdown Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
192	2	51X @ 2PL08J	Protective Relay	AC/DC Power Support System	Generator Overcurrent Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
193	2	59GX @ 2PL08J	Control Relay	AC/DC Power Support System	Generator Neutral Ground Voltage Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
194	2	40X @ 2PL08J	Control Relay	AC/DC Power Support System	Loss of Field Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
195	2	32X @ 2PL08J	Control Relay	AC/DC Power Support System	Reverse Power Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
196	2	81UX @ 2PL08J	Control Relay	AC/DC Power Support System	Under Frequency Auxiliary Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
197	2	87G1X @ 2PL08J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
198	2	87G2X @ 2PL08J	Control Relay	AC/DC Power Support System	Generator Differential Shutdown Repeater Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
199	2	12X1 @ 2PL08J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
200	2	12X2 @ 2PL08J	Control Relay	AC/DC Power Support System	Engine Overspeed Shutdown Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
201	2	86S2 @ 2PL08J	Control Relay	AC/DC Power Support System	Unit Shutdown Relay	Agastat	EGPDR-C2017-004	2PL08J	Control Cabinet	Auxiliary Building	401	BYR Report	Cap > Dem
						Agastat	GPDR-C740						Cap > Dem
202	2	2PS-DG108B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Square D	9012-GAW-24	2DG01KB	Diesel Generator	Auxiliary Building	401	BYR Report	Cap > Dem
203	2	2PS-DG251B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	2PL08J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
204	2	2PS-DG252B	Process Switch	AC/DC Power Support System	Engine Overspeed Switch	Honeywell	BZLN-LH	2PL08J	Control Cabinet	Auxiliary Building	401	SQURTS Report	Cap > Dem
205	2	52 @ 2AP06ER	Medium Voltage Circuit Breaker	AC/DC Power Support System	DG 2B Circuit Breaker (ACB 2423)	Westinghouse	50 DHP 350	2AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
206	2	52 @ 2AP06EH	Medium Voltage Circuit Breaker	AC/DC Power Support System	Transformer 232X Primary Circuit Breaker (ACB 2425X)	Westinghouse	50 DHP 350	2AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
207	2	52 @ 2AP06EJ	Medium Voltage Circuit Breaker	AC/DC Power Support System	ESW Pump 2B Circuit Breaker	Westinghouse	50 DHP 350	2AP06E	Switchgear	Auxiliary Building	426	EPRI HF Test	Cap > Dem
208	2	52 @ 2AP12EC	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 232X3 Feeder Circuit Breaker	Westinghouse	DS 206	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
209	2	52 @ 2AP12EF	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 232X1 Feeder Circuit Breaker	Westinghouse	DS 206	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
210	2	52 @ 2AP12EG	Low Voltage Circuit Breaker	AC/DC Power Support System	MCC 232X2 Feeder Circuit Breaker	Westinghouse	DS 206	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
211	2	52 @ 2AP12EJ	Low Voltage Circuit Breaker	AC/DC Power Support System	DG Room Vent Fan 2B Circuit Breaker	Westinghouse	DS 206	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
212	2	52 @ 2AP12EL	Low Voltage Circuit Breaker	AC/DC Power Support System	Battery Charger 212 Circuit Breaker	Westinghouse	DS 206	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
213	2	486-2425X @ 2AP06EH	Control Relay	AC/DC Power Support System	Circuit Breaker Lockout Relay	Westinghouse	Type WL 503A804G01	2AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
214	2	PR11A-450/451 @ 2AP06EH	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-9A	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
215	2	PR11B-450/451 @ 2AP06EH	Protective Relay	AC/DC Power Support System	Phase B Overcurrent Relay	Westinghouse	CO-9A	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
216	2	PR11C-450/451 @ 2AP06EH	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-9A	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A05						Cap > Dem
217	2	PR12-450N @ 2AP06EH	Protective Relay	AC/DC Power Support System	Neutral Overcurrent Relay	Westinghouse	SSC-T	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1321D79A03						Cap > Dem
218	2	PR1-351N @ 2AP12EA	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	CO-6	2AP12E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A08						Cap > Dem
219	2	PR13A-450/451 @ 2AP06EJ	Protective Relay	AC/DC Power Support System	Phase A Overcurrent Relay	Westinghouse	CO-5A	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A04						Cap > Dem
220	2	PR13C-450/451 @ 2AP06EJ	Protective Relay	AC/DC Power Support System	Phase C Overcurrent Relay	Westinghouse	CO-5A	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1456C05A04						Cap > Dem
221	2	PR14-450N @ 2AP06EJ	Protective Relay	AC/DC Power Support System	Ground Fault Relay	Westinghouse	SSC-T	2AP06E	Switchgear	Auxiliary Building	426	BYR Report	Cap > Dem
						Westinghouse	1321D79A03						Cap > Dem
222	2	SX1BX @ 2AP06EJ	Control Relay	AC/DC Power Support System	Low Suction Pressure Time Delay Relay	Tyco	E7012PD004	2AP06E	Switchgear	Auxiliary Building	426	GERS	Cap > Dem
223	2	2PDS-VD105	Control Switch	AC/DC Power Support System	High DG 1B Exhaust Fan 1B Delta Pressure	Solon	7PS/7P2A	2VD03CB	Diesel Generator Vent Fan	Auxiliary Building	401	GERS	Cap > Dem
224	2	2DC04E-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	2DC04E	Battery Charger	Auxiliary Building	451	BYR Report	Cap > Dem
225	2	2AF01EA-1-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	2AF01EA-1	Battery Charger	Auxiliary Building	389.25	BYR Report	Cap > Dem

Table B-1: Components Identified for High Frequency Confirmation

No.	Unit	Component						Enclosure		Building	Floor Elev. (ft)	Component Evaluation	
		ID	Type	System	Function	Manufacturer	Model No.	ID	Type			Basis for Capacity	Evaluation Result
226	2	2AF01EB-1-DSH-K1	Protective Relay	AC/DC Power Support System	Overvoltage Relay	N/A	N/A	2AF01EB-1	Battery Charger	Auxiliary Building	385.92	BYR Report	Cap > Dem

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

VALVE	P&ID	SHEET	UNIT	NOTE
1RC8037A	M-60	1A	1	
1RC8037B	M-60	2	1	
1RC8037C	M-60	3	1	
1RC8037D	M-60	4	1	
1RC014A	M-60	1B	1	
1RC014B	M-60	1B	1	
1RC014C	M-60	1B	1	
1RC014D	M-60	1B	1	
1RY8000A	M-60	5	1	May be excluded provided 1RY455A is closed
1RY455A	M-60	5	1	
1RY8000B	M-60	5	1	May be excluded provided 1RY456 is closed
1RY456	M-60	5	1	
1SI8900A	M-61	2	1	Simple Check Valve (no need to be included)
1SI8900B	M-61	2	1	Simple Check Valve (no need to be included)
1SI8900C	M-61	2	1	Simple Check Valve (no need to be included)
1SI8900D	M-61	2	1	Simple Check Valve (no need to be included)
1SI8949A	M-61	3	1	Simple Check Valve (no need to be included)
1SI8949B	M-61	3	1	Simple Check Valve (no need to be included)
1SI8949C	M-61	3	1	Simple Check Valve (no need to be included)
1SI8949D	M-61	3	1	Simple Check Valve (no need to be included)
1SI8819A	M-61	3	1	Simple Check Valve (no need to be included)
1SI8819B	M-61	3	1	Simple Check Valve (no need to be included)
1SI8819C	M-61	3	1	Simple Check Valve (no need to be included)
1SI8819D	M-61	3	1	Simple Check Valve (no need to be included)
1SI8948A	M-61	5	1	Simple Check Valve (no need to be included)
1SI8948B	M-61	5	1	Simple Check Valve (no need to be included)
1SI8948C	M-61	6	1	Simple Check Valve (no need to be included)

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

VALVE	P&ID	SHEET	UNIT	NOTE
1SI8948D	M-61	6	1	Simple Check Valve (no need to be included)
1RH8701A-1	M-62	1	1	May be excluded provided 1RH8701B-2 is closed
1RH8701B-2	M-62	1	1	EC 384171 to isolate flowpath
1RH8702A-1	M-62	1	1	EC 384171 to isolate flowpath
1RH8702B-2	M-62	1	1	May be excluded provided 1RH8702A-1 is closed
1CV8377	M-64	5	1	Simple Check Valve (no need to be included)
1CV8378A	M-64	5	1	Simple Check Valve (no need to be included)
1CV8379A	M-64	5	1	Simple Check Valve (no need to be included)
1PS9351A	M-68	1A	1	
1PS9351B	M-68	1A	1	
1PS9358A	M-68	1A	1	
1PS9358B	M-68	1A	1	
1PS9358C	M-68	1A	1	
1PS9358D	M-68	1A	1	
1PS9356A	M-68	1A	1	
1PS9350A	M-68	1B	1	
1PS9350B	M-68	1B	1	
1PS9354A	M-68	1B	1	May be excluded provided 1PS9350A is closed
1PS9355A	M-68	1B	1	May be excluded provided 1PS9350B is closed
Unit 2 Byron RCS leakage valves				
2RC8037A	M-135	1A	2	
2RC8037B	M-135	2	2	
2RC8037C	M-135	3	2	
2RC8037D	M-135	4	2	
2RC014A	M-135	1B	2	
2RC014B	M-135	1B	2	
2RC014C	M-135	1B	2	
2RC014D	M-135	1B	2	

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

VALVE	P&ID	SHEET	UNIT	NOTE
2RY8000A	M-135	5	2	May be excluded provided 2RY455A is closed
2RY455A	M-135	5	2	
2RY8000B	M-135	5	2	May be excluded provided 2RY456 has is closed
2RY456	M-135	5	2	
2SI8900A	M-136	2	2	Simple Check Valve (no need to be included)
2SI8900B	M-136	2	2	Simple Check Valve (no need to be included)
2SI8900C	M-136	2	2	Simple Check Valve (no need to be included)
2SI8900D	M-136	2	2	Simple Check Valve (no need to be included)
2SI8949A	M-136	3	2	Simple Check Valve (no need to be included)
2SI8949B	M-136	3	2	Simple Check Valve (no need to be included)
2SI8949C	M-136	3	2	Simple Check Valve (no need to be included)
2SI8949D	M-136	3	2	Simple Check Valve (no need to be included)
2SI8819A	M-136	3	2	Simple Check Valve (no need to be included)
2SI8819B	M-136	3	2	Simple Check Valve (no need to be included)
2SI8819C	M-136	3	2	Simple Check Valve (no need to be included)
2SI8819D	M-136	3	2	Simple Check Valve (no need to be included)
2SI8948A	M-136	5	2	Simple Check Valve (no need to be included)
2SI8948B	M-136	5	2	Simple Check Valve (no need to be included)
2SI8948C	M-136	6	2	Simple Check Valve (no need to be included)
2SI8948D	M-136	6	2	Simple Check Valve (no need to be included)
2RH8701A-1	M-137	1	2	May be excluded provided 2RH8701B-2 is closed
2RH8701B-2	M-137	1	2	EC 385243 to isolate flowpath
2RH8702A-1	M-137	1	2	EC 385243 to isolate flowpath
2RH8702B-2	M-137	1	2	May be excluded provided 2RH8702A-1 is closed
2CV8377	M-138	5C	2	Simple Check Valve (no need to be included)
2CV8378A	M-138	5C	2	Simple Check Valve (no need to be included)
2CV8379A	M-138	5C	2	Simple Check Valve (no need to be included)
2PS9351A	M-140	1A	2	

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

VALVE	P&ID	SHEET	UNIT	NOTE
2PS9351B	M-140	1A	2	
2PS9358A	M-140	1A	2	
2PS9358B	M-140	1A	2	
2PS9358C	M-140	1A	2	
2PS9358D	M-140	1A	2	
2PS9356A	M-140	1A	2	
2PS9350A	M-140	1B	2	
2PS9350B	M-140	1B	2	
2PS9354A	M-140	1B	2	May be excluded provided 2PS9350A is closed
2PS9355A	M-140	1B	2	May be excluded provided 2PS9350B is closed