Exelon Generation.

RS-14-071

10 CFR 50.54(f)

March 31, 2014

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
11555 Rockville Pike,
Rockville, MD 20852

Peach Bottom Atomic Power Station, Units 2 and 3
Renewed Facility Operating License Nos. DPR-44 and DPR-56
NRC Docket Nos. 50-277 and 50-278

Subject: Exelon Generation Company, LLC, Seismic Hazard and Screening Report (Central and Eastern United States (CEUS) Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

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
2. NEI Letter, Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations, dated April 9, 2013
3. NRC Letter, Electric Power Research Institute Final Draft Report XXXXXX, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," as an Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations, dated May 7, 2013
4. Exelon Generation Company, LLC letter to the NRC, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident – 1.5 Year Response for CEUS Sites, dated September 12, 2013
5. EPRI Report 1025287, Seismic Evaluation Guidance, Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic
6. NRC Letter, Endorsement of Electric Power Research Institute Final Draft Report 1025287, "Seismic Evaluation Guidance," dated February 15, 2013
7. EPRI Technical Report 3002000704, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," dated May 2013

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 requested each addressee located in the Central and Eastern United States (CEUS) to submit a Seismic Hazard Evaluation and Screening Report within 1.5 years from the date of Reference 1.

In Reference 2, the Nuclear Energy Institute (NEI) requested NRC agreement to delay submittal of the final CEUS Seismic Hazard Evaluation and Screening Reports so that an update to the Electric Power Research Institute (EPRI) ground motion attenuation model could be completed and used to develop that information. NEI proposed that descriptions of subsurface materials and properties and base case velocity profiles be submitted to the NRC by September 12, 2013, with the remaining seismic hazard and screening information submitted by March 31, 2014. NRC agreed with that proposed path forward in Reference 3. In Reference 4, Exelon Generation Company, LLC (EGC) provided the description of subsurface materials and properties and base case velocity profiles for Peach Bottom Atomic Power Station, Units 2 and 3.

Reference 5 contains industry guidance and detailed information to be included in the Seismic Hazard Evaluation and Screening Report submittals. NRC endorsed this industry guidance in Reference 6.

The enclosed Seismic Hazard Evaluation and Screening Report for Peach Bottom Atomic Power Station, Units 2 and 3, provides the information described in Section 4 of Reference 5 in accordance with the schedule identified in Reference 2. As described in Enclosure 1, Peach Bottom Atomic Power Station, Units 2 and 3, do not meet the requirements of SPID Sections 3.2 and 7 (Reference 5) and therefore screen in and a Risk Evaluation and Spent Fuel Pool evaluation will be performed as determined by NRC prioritization following submittal of all nuclear power plant Seismic Hazard Re-evaluations per Reference 1. Additionally, Peach Bottom Atomic Power Station, Units 2 and 3, will prepare an Expedited Seismic Evaluation Process (ESEP) Report in accordance with Reference 7, by December 31, 2014.

A list of regulatory commitments contained in this letter is provided in Enclosure 2. If you have any questions regarding this report, please contact Ron Gaston at (630) 657-3359.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 31st day of March 2014.

Respectfully submitted,

James Barstow
Director - Licensing & Regulatory Affairs
Exelon Generation Company, LLC

Enclosures:

1. Peach Bottom Atomic Power Station, Units 2 and 3, Seismic Hazard and Screening Report
2. Summary of Regulatory Commitments

cc: Director, Office of Nuclear Reactor Regulation
Regional Administrator - NRC Region I
NRC Senior Resident Inspector – Peach Bottom Atomic Power Station
NRC Project Manager, NRR – Peach Bottom Atomic Power Station
Ms. Jessica A. Kratchman, NRR/JLD/PMB, NRC
Mr. Eric E. Bowman, NRR/DPR/PGCB, NRC or Ms. Eileen M. McKenna, NRO/DSRA/BPTS, NRC
Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Resources
S. T. Gray, State of Maryland
R. R. Janati, Chief, Division of Nuclear Safety, Pennsylvania Department of Environmental Protection, Bureau of Radiation Protection

Enclosure 1

Peach Bottom Atomic Power Station, Units 2 and 3

Seismic Hazard and Screening Report

(47 pages)

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 the

PEACH BOTTOM ATOMIC POWER STATION UNITS 2 & 3

1848 Lay Road, Delta, PA 17314

Facility Operating License No. DPR-44 & DPR-56

NRC Docket No. STN 50-277 & STN 50-278

Correspondence No.: RS-14-071

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Report Number: EXLNPB056-PR-001, Revision 1

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Approver:	Paul Hansen	[signature]	3/25/14
Lead Responsible Engineer:	Tracey Gallagher	[signature]	3/26/14
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Branch Manager:	Frank Giaco	signed per telecon TG	3/26/14
Senior Manager Design Engineering:	David Henry	[signature]	3/27/14
Corporate Acceptance:	Jeffrey Clark	[signature]	3/27/14

RECORD OF REVISIONS

Revision	Affected Pages	Description
0	All	Initial issue.
1	All	Revised text to align with final NEI Seismic Hazard and Screening Report example submittal for CEUS site.

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Executive Summary

Purpose

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) issued a 50.54(f) letter (Reference 1) requesting information in response to NRC Near-Term Task Force (NTTF) recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. The 50.54(f) letter (Reference 1) requests that licensees and holders of construction permits under Title 10 Code of Federal Regulations Part 50 (Reference 2) reevaluate the seismic hazards at their sites using updated seismic hazard information and present-day regulatory guidance and methodologies. This report provides the information requested in items (1) through (7) of the "Requested Information" in Enclosure 1 of the 50.54(f) letter (Reference 1), pertaining to NTTF Recommendation 2.1: Seismic for Peach Bottom Atomic Power Station (PBAPS), in accordance with the documented intention of Exelon Generation Company, LLC transmitted to the NRC via letter dated April 29, 2013 (Reference 20).

Scope

In response to the 50.54(f) letter (Reference 1) and following the Screening, Prioritization and Implementation Details (SPID) industry guidance document (Reference 3), a seismic hazard reevaluation for PBAPS was performed to develop a Ground Motion Response Spectrum (GMRS) for comparison with the plant-level seismic capacity. The new GMRS represents an alternative seismic demand determined using recently developed techniques. The new GMRS does not constitute a change in the plant design or licensing basis as described in the NRC letter dated February 20, 2014 (Reference 15). Section 1 provides an introduction. Section 2 provides a summary of the PBAPS regional and local geology and seismicity, other major inputs to the seismic hazard reevaluation, and detailed seismic hazard results including definition of the GMRS. Seismic hazard analysis for PBAPS, including site response evaluation and GMRS development (Sections 2.2, 2.3 and 2.4 of this report), was performed by the Electric Power Research Institute (Reference 17). A more in-depth discussion of the calculation methods used in the seismic hazard reevaluation can be found in References 3, 7, 8, 10, and 18. Section 3 describes the characteristics of the plant design basis ground motion for PBAPS. Section 4 provides a GMRS screening evaluation for PBAPS. Sections 5 and 6 discuss interim actions and conclusions, respectively, for PBAPS.

Conclusions

For PBAPS, the GMRS spectral acceleration exceeds that of the Safe Shutdown Earthquake (SSE) at spectral frequencies above approximately 3.7 Hz (as discussed in Section 4). As a result, PBAPS screens in for a risk evaluation and a spent fuel pool integrity evaluation in accordance with the SPID, Sections 3 and 7 (Reference 3). Since the GMRS spectral acceleration exceeds that of the SSE in the frequency range above

10 Hz, high-frequency exceedances can be addressed as part of the risk evaluation for PBAPS. As an interim action/assessment prior to completion of the risk evaluation, an Expedited Seismic Evaluation Process (ESEP) will be performed for PBAPS in conformance with the "Augmented Approach" guidance document (Reference 4). Actions to address NTTF 2.1: Seismic for central and eastern United States nuclear plants are outlined in the schedule provided in the April 9, 2013 letter from the industry to the NRC (Reference 6), as agreed to by the NRC in the May 7, 2013 letter to the industry (Reference 30).

1

Introduction

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). The NTTF was tasked with conducting a systematic review of NRC processes and regulations 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 requesting information to assure these recommendations would be addressed by all U.S. nuclear power plants (Reference 1). The 50.54(f) letter (Reference 1) requests that licensees and holders of construction permits under Title 10 Code of Federal Regulations Part 50 (10CFR50) (Reference 2) reevaluate the seismic hazards at their sites using updated seismic hazard information and present-day regulatory guidance and methodologies. Depending on the outcome of the comparison between the reevaluated seismic hazard and the current site-specific design basis, performance of a seismic risk assessment may be necessary. Risk assessment approaches acceptable to the NRC staff include a seismic probabilistic risk assessment (SPRA), or a seismic margin assessment (SMA). Based upon the risk assessment results, the NRC staff will determine whether additional regulatory actions are necessary to provide additional protection against the updated hazards.

This report provides the information requested in items (1) through (7) of the "Requested Information" in Enclosure 1 of the 50.54(f) letter (Reference 1), pertaining to NTTF Recommendation 2.1: Seismic for the Peach Bottom Atomic Power Station (PBAPS), located in York County, Pennsylvania in accordance with the documented intention of Exelon Generation Company, LLC (Exelon) transmitted to the NRC via letter dated April 29, 2013 (Reference 20). In providing this information, PBAPS followed the Screening, Prioritization, and Implementation Details (SPID) industry guidance document (Reference 3). The "Augmented Approach" guidance document (Reference 4), defines interim actions/evaluations for addressing a higher seismic hazard relative to the plant's current licensing/design basis prior to completion of the risk evaluations to demonstrate additional seismic margin. This short term aspect of the Augmented Approach is referred to as the Expedited Seismic Evaluation Process (ESEP). In response to NTTF Recommendation 2.3, seismic walkdowns for PBAPS have been performed as documented in Exelon Correspondence Numbers RS-12-173, RS-13-213 and RS-14-001(References 13, 14 and 29) to satisfy the 50.54(f) letter (Reference 1).

The original geologic and seismic siting investigations for PBAPS were performed in accordance with Appendix A of 10 CFR Part 100 (Reference 5) and meet General Design Criterion 2 in Appendix A of 10CFR50 (Reference 2). The Safe Shutdown Earthquake (SSE) ground motion was developed in accordance with Appendix A of 10CFR100 (Reference 5) and is used for the design of seismic Category I systems, structures and components (SSC). See Section 3 for further discussion on the development of the PBAPS SSE.

In response to the 50.54(f) letter (Reference 1) and following the guidance in the SPID (Reference 3), a seismic hazard reevaluation for PBAPS was performed. For screening purposes, a Ground Motion Response Spectrum (GMRS) was developed.

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Seismic Hazard Reevaluation

The Peach Bottom site is located partly in Peach Bottom Township, York County, partly in Drumore Township, Lancaster County, and partly in Fulton Township, Lancaster County, in southeastern Pennsylvania on the westerly shore of Conowingo Pond at the mouth of Rock Run Creek (Reference 11, Section 1.6.1.1.1). The site lies within the Piedmont Upland Section of the Piedmont Physiographic Province of the Appalachian Highlands (Reference 11, Section 2.5.2.2.1). Two major fault systems are prevalent in the region: faults of Paleozoic age or older, and faults of Triassic age. The Paleozoic faults are largely thrust faults and occurred during early Paleozoic regional metamorphism or during the late Paleozoic Appalachian Orogeny. The Triassic faults are normal or strike slip faults that occurred during late Triassic or early Jurassic times. Most of these faults are located near the Triassic lowlands, about 30 mi from the site, and are of limited significance (Reference 11, Section 2.5.2.2.3). No active fault is known or suspected in the vicinity of the site. Known faults in the area have been inactive for at least 140 million years. Bedrock at the site is the Peters Creek schist, a metamorphosed sedimentary rock of Precambrian or early Paleozoic age. Overburden is a residual sandy silt and gravel derived by weathering of the underlying schist. Zones of highly weathered rock separate the overburden and the fresh hard rock (Reference 11, Section 2.5.2.1.1). Class I structures are founded on competent Peters Creek schist (Reference 11, Section 2.5.3.1.1).

The Peach Bottom site lies in a region which has experienced a moderate amount of minor earthquake activity. The original investigation of historical seismic activity in the region indicated that a design intensity of VII (Modified Mercalli Scale) is adequately conservative for the site. PBAPS determined that Intensity VII corresponds to a maximum horizontal ground acceleration at foundation level of 0.12g, which is used for the SSE (Reference 11, Section 2.5.3.1.1).

2.1 Regional and Local Geology

The Peach Bottom site lies within the Piedmont Upland Section of the Piedmont Physiographic Province of the Appalachian Highlands. The northeast-southwest trending Piedmont Province is an eroded plateau of low relief and rolling topography. The surface of the plateau slopes to the southeast. This area is underlain by metamorphosed sedimentary and crystalline rocks of Paleozoic and Precambrian age. The rocks are relatively resistant to erosion and support an uneven hilly surface. The higher hills are capped by Cambrian quartzites and Precambrian crystalline rocks, while broad valleys characterize areas underlain by limestone and calcareous shales (Reference 11, Section 2.5.2.2.1). The dominant structural feature of the region is the Regional Appalachian Orogenic Belt (Reference 11, Section 2.5.2.2.3).

The Peach Bottom site is located adjacent to and west of the Conowingo Pond in Peach Bottom Township, York County, Pennsylvania, approximately 2.5 miles north of the Pennsylvania-Maryland state line (Reference 11, Section 2.5.1). The site is underlain at shallow depths by competent Peters Creek schist, a metamorphosed sedimentary rock of Precambrian or early Paleozoic age. The rock provides excellent foundation support for the facility. The site is located in the structurally complex Piedmont Province. The nearest fault to the site is associated with the Peach Bottom Syncline and passes about 1 mile south of the site. This fault and other regional faults have been inactive for 140 to 200 million years. Detailed analysis of the geology of the site and surrounding areas has revealed no geologic condition which would preclude construction and operation of a nuclear power station at this location (Reference 11, Section 2.5.2.3.6).

2.2 PROBABILISTIC SEISMIC HAZARD ANALYSIS

2.2.1 Probabilistic Seismic Hazard Analysis Results

In accordance with the 50.54(f) letter (Reference 1) and following the guidance in the SPID (Reference 3), a probabilistic seismic hazard analysis (PSHA) was completed using the recently developed Central and Eastern United States Seismic Source Characterization (CEUS-SSC) for Nuclear Facilities (Reference 7) together with the updated EPRI Ground-Motion Model (GMM) for the CEUS (Reference 8). For the PSHA, a lower-bound moment magnitude of 5.0 was used, as specified in the 50.54(f) letter (Reference 1).

For the PSHA, the CEUS-SSC background seismic sources out to a distance of 400 miles (640 km) around PBAPS were included. This distance exceeds the 200 mile (320 km) recommendation contained in NRC Reg. Guide 1.208 (Reference 18) and was chosen for completeness. Background sources included in this site analysis are the following:

1. Atlantic Highly Extended Crust (AHEX)
2. Extended Continental Crust—Atlantic Margin (ECC_AM)
3. Mesozoic and younger extended prior – narrow (MESE-N)
4. Mesozoic and younger extended prior – wide (MESE-W)
5. Midcontinent-Craton alternative A (MIDC_A)
6. Midcontinent-Craton alternative B (MIDC_B)
7. Midcontinent-Craton alternative C (MIDC_C)
8. Midcontinent-Craton alternative D (MIDC_D)
9. Northern Appalachians (NAP)
10. Non-Mesozoic and younger extended prior – narrow (NMESE-N)
11. Non-Mesozoic and younger extended prior – wide (NMESE-W)
12. Paleozoic Extended Crust narrow (PEZ_N)
13. Paleozoic Extended Crust wide (PEZ_W)
14. St. Lawrence Rift, including the Ottawa and Saguenay grabens (SLR)
15. Study region (STUDY_R)

For sources of large magnitude earthquakes, designated Repeated Large Magnitude Earthquake (RLME) sources in CEUS-SSC (Reference 7), the following sources lie within 1,000 km of the site and were included in the analysis:

1. Charleston
2. Charlevoix
3. Wabash Valley

For each of the above background and RLME sources, the mid-continent version of the updated CEUS EPRI GMM was used.

2.2.2 *Base Rock Seismic Hazard Curves*

Consistent with the SPID, Section 2.5.3 (Reference 3), base rock seismic hazard curves are not provided as the site amplification approach referred to as Method 3 has been used. Seismic hazard curves are shown below in Section 2.3.7 at the SSE control point elevation.

2.3 SITE RESPONSE EVALUATION

Following the guidance contained in Seismic Enclosure 1 of the 50.54(f) letter (Reference 1) and in the SPID, Section 2.4 (Reference 3) for nuclear power plant sites that are not founded on hard rock (considered as having a shear wave velocity of at least 9285 fps), a site response analysis was performed for PBAPS.

2.3.1 *Description of Subsurface Material*

PBAPS is located in the Piedmont Physiographic Province of southeastern Pennsylvania. The general site conditions consist of residual soils overlying partially weathered rock grading into hard metamorphic sedimentary rocks (Reference 19). Beneath the residual soils there is 20 ft. (6.1m) of firm rock (schist) over Paleozoic or Precambrian hard rock (schist).

PBAPS consists of two units (2 and 3) with both reactor buildings supported on sound rock. Table 2.3.1-1 shows the single suite of geotechnical properties appropriate for both units.

The following description of the general geology at the site is taken directly from the SGH Review of Existing Site Response Parameter Data (Reference 19):

> "The plant area is underlain by the competent Peters Creek schist, a greenish-gray to white chlorite schist, each gradation of which presents an increased degree of weathering. Boring logs indicate these (in order of increasing depth) from surficial soil to highly weathered to moderately weathered to relatively fresh rock. Compressional wave velocities in the Peters Creek formation range from under 7,000 fps in the highly weathered zone to over 16,000 fps in the relatively fresh rock.

"The site is mantled by residual soils derived by weathering of the underlying schist. These soils are compact and consist of sandy silt and silty sand with gravel. The residual soils range in thickness from 0 to about 40 ft.

"The upper zone of the bedrock formation has been greatly altered by weathering to essentially a friable material containing ribs of relatively unweathered rock. The interface between the overlying residual soil and the highly weathered rock is transitional. Although rock structure is generally evident in the highly weathered material, some of it has been destroyed by the weathering process. The zone of severe weathering ranges in thickness from less than 10 to more than 60 ft. However, this zone is generally limited to thicknesses of 25 ft. or less. The greatest thicknesses of highly weathered rock were encountered in the higher western portion of the site area. The weathered zones are relatively thin and generally parallel the schistosity of the rock.

"Below the highly weathered zone, the rock is harder and fresher. The relatively fresh rock surface was encountered at depths ranging from about 15 ft. below original grade, near the Susquehanna River, to greater than 80 ft. below grade in the higher western portion of the site area. The surface of the relatively fresh rock was encountered in the plant area at elevations ranging from about 101 to 201 ft. MSL."

Table 2.3.1-1 Summary of site geotechnical profile for PBAPS (Reference 19)

Elevations of Layer Boundaries Under Reactor Buildings (ft, MSL)	Range in Thickness Across Site (ft)	Soil/Rock Description and Age	Density (pcf)	Shear Wave Velocity (fps)[d]	Compressional Wave Velocity (fps)	Poisson's ratio
N/A[a]	0-40	Residual soil overburden derived from weathering underlying Peters Creek Schist, compact sandy silt and silty sand with gravel	110-150	N/A	2000	0.33
N/A[a]	10-50	Early Paleozoic or Precambrian Peters Creek Schist, highly weathered metamorphosed sedimentary rock	135-145	N/A	<7000	0.30
136[b] to 116	0-40	Early Paleozoic or Precambrian Peters Creek Schist, moderately weathered metamorphosed sedimentary rock	150-175	N/A	7000	0.30
116 and below[c]	N/A	Early Paleozoic or Precambrian Peters Creek Schist, unweathered metamorphosed sedimentary rock	160-170	N/A	>16000	0.28

[a] Residual soil overburden and highly weathered bedrock was excavated from the areas surrounding the main power block.
[b] Finish grade elevation is nominally 136 ft. MSL on the west side of the main power block, and 117 ft. MSL on the east. The control point elevation for the SSE and IPEEE HCLPF is at El. 136 ft. MSL.
[c] Bottom of the deepest foundation is at El. 88 ft. MSL, within the unweathered Peters Creek Schist.
[d] The documentation reviewed during this study does not contain shear wave velocity data.

2.3.2 *Development of Base Case Profiles and Nonlinear Material Properties*

Table 2.3.1-1 shows the recommended compressional-wave velocities, Poisson's ratios, and unit weights versus depth for the best estimate single rock profile representative of subsurface conditions for PBAPS Unit 2 and Unit 3. In Table 2.3.1-1 depths begin at elevation 136 ft. (41.5m) MSL. The SSE control point is at the same elevation which is at the top of the moderately weathered schist (see Section 3.2 for further control point discussion). The base-case profile was taken to consist of 20 ft. (6.1m) of firm rock overlying hard metamorphic sedimentary basement rock.

Shear-wave velocities were not given in Table 2.3.1-1 (Reference 19). Compressional-wave velocities and Poisson ratios are listed in the table and have been used to calculate a shear-wave velocity of 3,742 fps (1,140 m/sec) in the moderately weathered schist. The compression-wave velocities appear to have been derived from shock scope testing (Reference 19). Hard reference rock conditions are encountered at a depth of 20 ft. (6.1m) (Table 2.3.1-1).

Based on the lack of measured shear-wave velocities, a scale factor of 1.57 was adopted to reflect upper and lower range base-cases. The scale factor of 1.57 reflects a $\sigma_{\mu ln}$ of about 0.35 respectively, based on the SPID (Reference 3) 10^{th} and 90^{th} fractiles which implies a 1.28 scale factor on σ_{μ}.

Using the shear-wave velocities estimated from the parameters in Table 2.3.1-1, three base-profiles were developed using the scale factor of 1.57. The specified shear-wave velocities were taken as the mean or best estimate base-case profile (P1) with lower and upper range base-case profiles, P2 and P3 respectively. The three base-case profiles P1, P2, and P3, have a mean depth below the SSE control point at elevation 136 ft. (41.5m) (Table 2.3.2-2) of 20 ft. (6.1m) to hard reference rock, randomized ± 20 ft. (± 6.1m). The base-case profiles (P1, P2, and P3) are shown in Figure 2.3.2-1 and listed in Table 2.3.2-2. The depth randomization reflects ± 100% of the depth and was included to provide a realistic broadening of the fundamental resonance rather than reflect actual random variations to basement shear-wave velocities across a footprint.

Table 2.3.2-2 Layer thicknesses, depths, and shear-wave velocities (V_s) for three profiles, the Peach Bottom site

Profile 1			Profile 2			Profile 3		
Thickness (ft)	Depth (ft)	V_s (fps)	Thickness (ft)	Depth (ft)	V_s (fps)	Thickness (ft)	Depth (ft)	V_s (fps)
	0	3741		0	2383		0	5874
5.0	5.0	3741	5.0	5.0	2383	5.0	5.0	5874
5.0	10.0	3741	5.0	10.0	2383	5.0	10.0	5874
5.0	15.0	3741	5.0	15.0	2383	5.0	15.0	5874
5.0	20.0	3741	5.0	20.0	2383	5.0	20.0	5874
3280.8	3300.8	9285	3280.8	3300.8	9285	3280.8	3300.8	9285

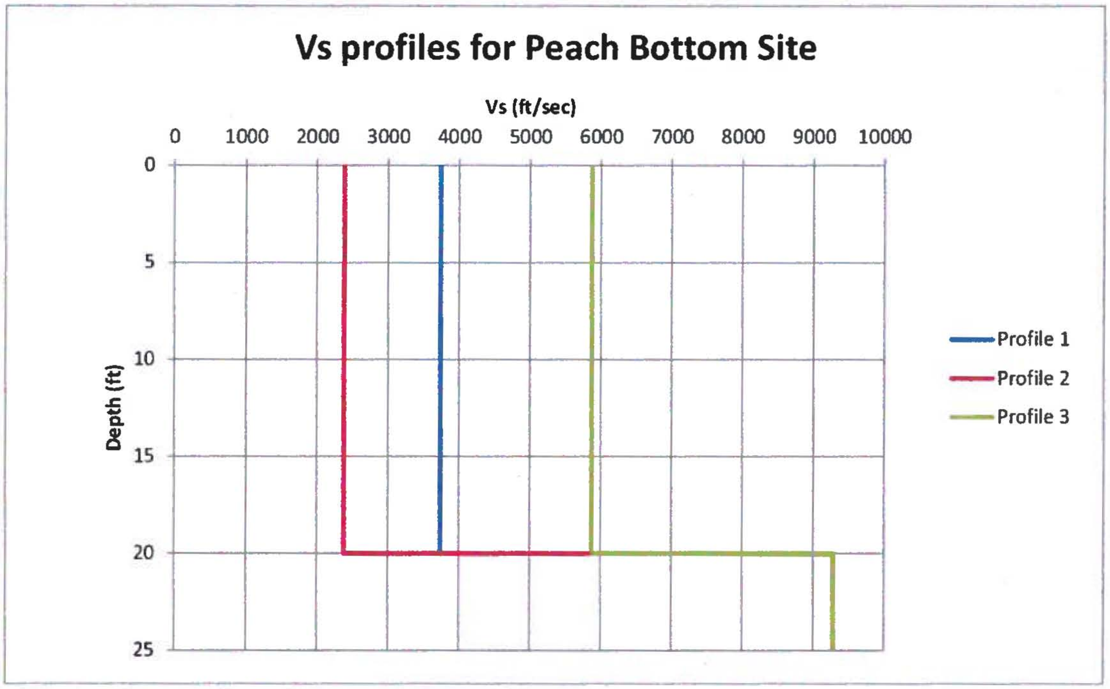


Figure 2.3.2-1 Shear wave velocity profiles for the Peach Bottom site

2.3.2.1 Shear Modulus and Damping Curves

No site-specific nonlinear dynamic material properties were determined for the firm rock materials in the initial siting of PBAPS. The rock material over the upper 20 ft. (6.1m) was assumed to have behavior that could be modeled as either linear or non-linear. To represent this potential for either case in the upper 20 ft. (6.1m) of firm rock at the Peach Bottom site, two sets of shear modulus reduction and hysteretic damping curves were used. Consistent with the SPID (Reference 3), the EPRI rock curves (model M1) were considered to be appropriate to represent the upper range nonlinearity likely in the materials at this site and linear analyses (model M2) was assumed to represent an equally plausible alternative rock response across loading level. For the linear analyses, the low strain damping from the EPRI rock curves were used as the constant damping values in the upper 20 ft. (6.1m).

2.3.2.2 Kappa

For the PBAPS profile of about 20 ft. (6.1m) of firm rock over hard reference rock, the kappa value of 0.006s for hard rock (Reference 3) dominates profile damping. The 20 ft. (6.1m) of firm rock, based on the low strain damping from the EPRI rock G/G_{max} and hysteretic damping curves, reflects a contribution of only about 0.0003s (Table 2.3.2-3). As a result the dominate epistemic uncertainty in low strain kappa was assumed to be incorporated in the reference rock hazard.

Table 2.3.2-3 Kappa values and weights used for site response analyses

Velocity Profile	Kappa (s)	Weights
P1	0.0063	0.4
P2	0.0066	0.3
P3	0.0062	0.3
G/G_{max} and Hysteretic Damping Curves		
M1		0.5
M2		0.5

2.3.3 Randomization of Base Case Profiles

To account for the aleatory variability in dynamic material properties that is expected to occur across a site at the scale of a typical nuclear facility, variability in the assumed shear-wave velocity profiles has been incorporated in the site response calculations (Reference 17). For the Peach Bottom site, random shear wave velocity profiles were developed from the base case profiles shown in Figure 2.3.2-1. Consistent with the discussion in Appendix B of the SPID (Reference 3), the velocity randomization procedure made use of random field models which describe the statistical correlation between layering and shear wave velocity. The default randomization parameters developed in Reference 10 for United States Geological Survey (USGS) "A" site conditions were used for this site. Thirty random velocity profiles were generated for each base case profile. These random velocity profiles were generated using a natural log standard deviation of 0.25 over the upper 50 ft. As specified in the SPID (Reference 3), correlation of shear wave velocity between layers was modeled using the footprint correlation model. In the correlation model, a limit of +/- 2 standard deviations about the median value in each layer was assumed for the limits on random velocity fluctuations.

2.3.4 Input Spectra

Consistent with the guidance in Appendix B of the SPID (Reference 3), input Fourier amplitude spectra were defined for a single representative earthquake magnitude (**M** 6.5) using two different assumptions regarding the shape of the seismic source spectrum (single-corner and double-corner). A range of 11 different input amplitudes (median peak ground accelerations (PGA) ranging from 0.01g to 1.5g) were used in the site response analyses. The characteristics of the seismic source and upper crustal attenuation properties assumed for the analysis of the Peach Bottom site were the same as those identified in Tables B-4, B-5, B-6 and B-7 of the SPID (Reference 3) as appropriate for typical CEUS sites.

2.3.5 Methodology

To perform the site response analyses for the Peach Bottom site, a random vibration theory (RVT) approach was employed. This process utilizes a simple, efficient approach for computing site-specific amplification functions and is consistent with existing NRC guidance and the SPID (Reference 3). The guidance contained in Appendix B of the SPID (Reference 3) on incorporating epistemic uncertainty in shear-wave velocities, kappa, non-linear dynamic properties and source spectra for plants with limited at-site information was followed for the Peach Bottom site.

2.3.6 *Amplification Functions*

The results of the site response analysis consist of amplification factors (5% of critical damping pseudo absolute response spectra) which describe the amplification (or de-amplification) of hard reference rock motion as a function of frequency and input reference rock amplitude. The amplification factors are represented in terms of a median amplification value and an associated standard deviation (sigma) for each spectral frequency and input rock amplitude. Consistent with the SPID (Reference 3), a minimum median amplification value of 0.5 was employed in the present analysis. Figure 2.3.6-1 illustrates the median and +/- 1 standard deviation in the predicted amplification factors developed for the eleven loading levels parameterized by the median reference (hard rock) peak acceleration (0.01g to 1.50g) for profile P1 and EPRI rock G/G_{max} and hysteretic damping curves. The variability in the amplification factors results from variability in shear-wave velocity, depth to hard rock, and modulus reduction and hysteretic damping curves. To illustrate the effects of nonlinearity at the PBAPS firm rock site, Figure 2.3.6-2 shows the corresponding amplification factors developed with linear site response analyses (model M2). Between the linear and nonlinear (equivalent-linear) analyses, Figure 2.3.6-1 and Figure 2.3.6-2 show only a minor difference across structural frequency as well as loading level. Tabulated values of the amplification factors are provided in Appendix A.

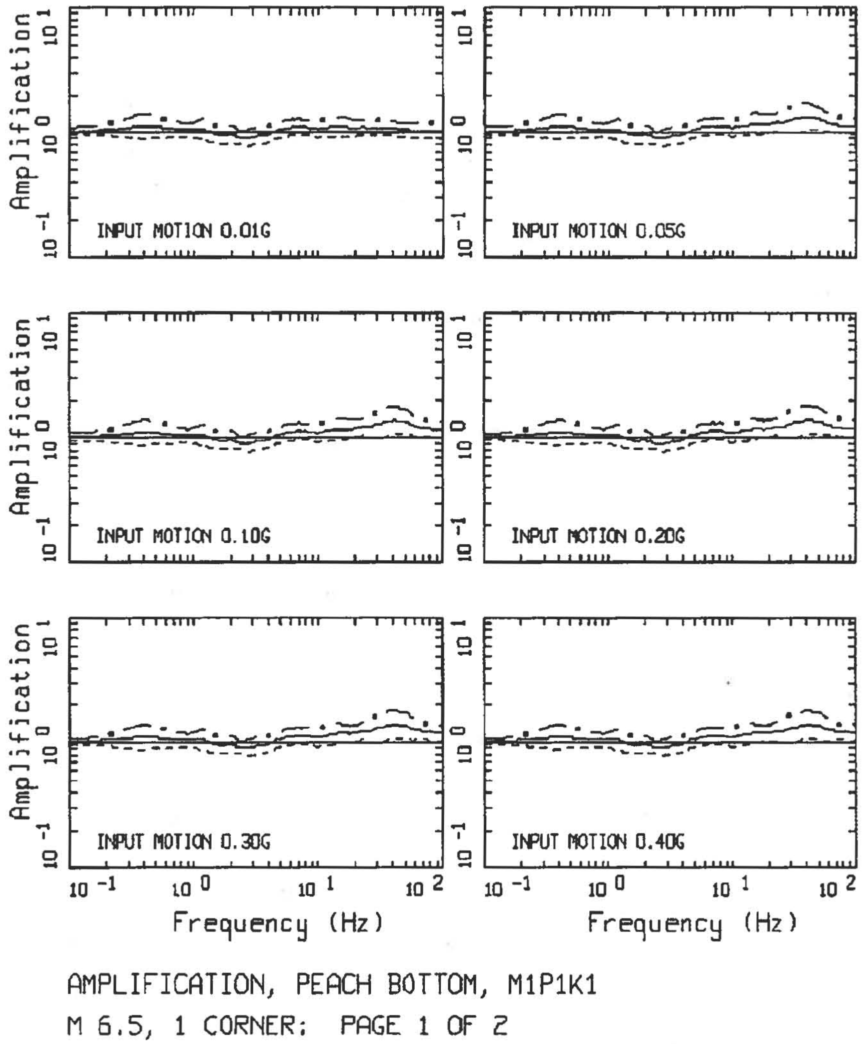
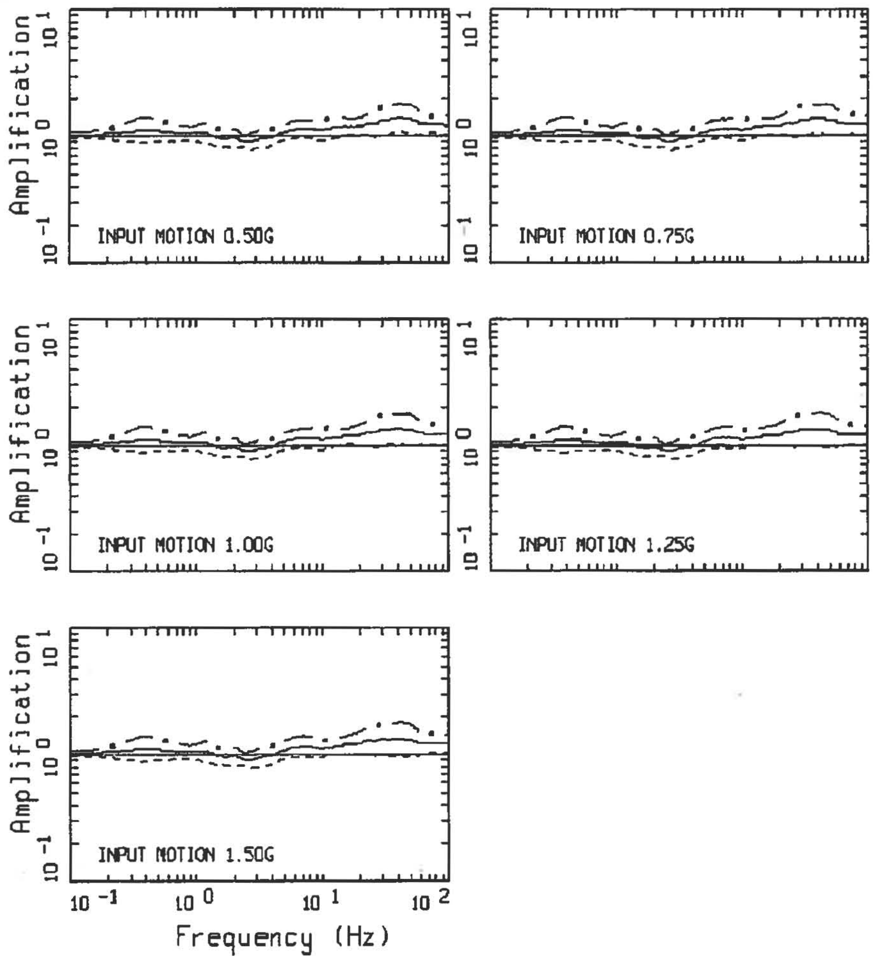


Figure 2.3.6-1 Example suite of amplification factors (5% of critical damping pseudo absolute acceleration spectra) developed for the mean base-case profile (P1), EPRI rock modulus reduction and hysteretic damping curves (model M1), and base-case kappa at eleven loading levels of hard rock median peak acceleration values from 0.01g to 1.50g. **M** 6.5 and single-corner source model (Reference 3)



AMPLIFICATION, PEACH BOTTOM, M1P1K1

M 6.5, 1 CORNER: PAGE 2 OF 2

Figure 2.3.6-1 continued

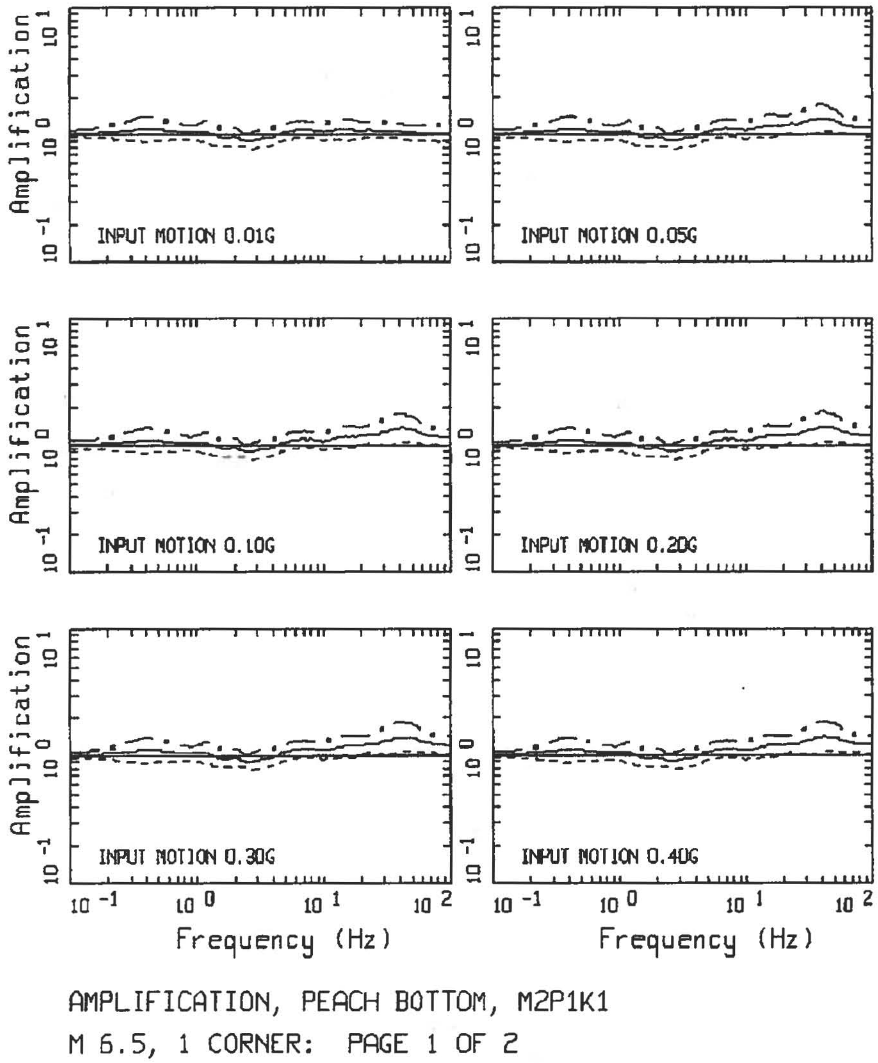
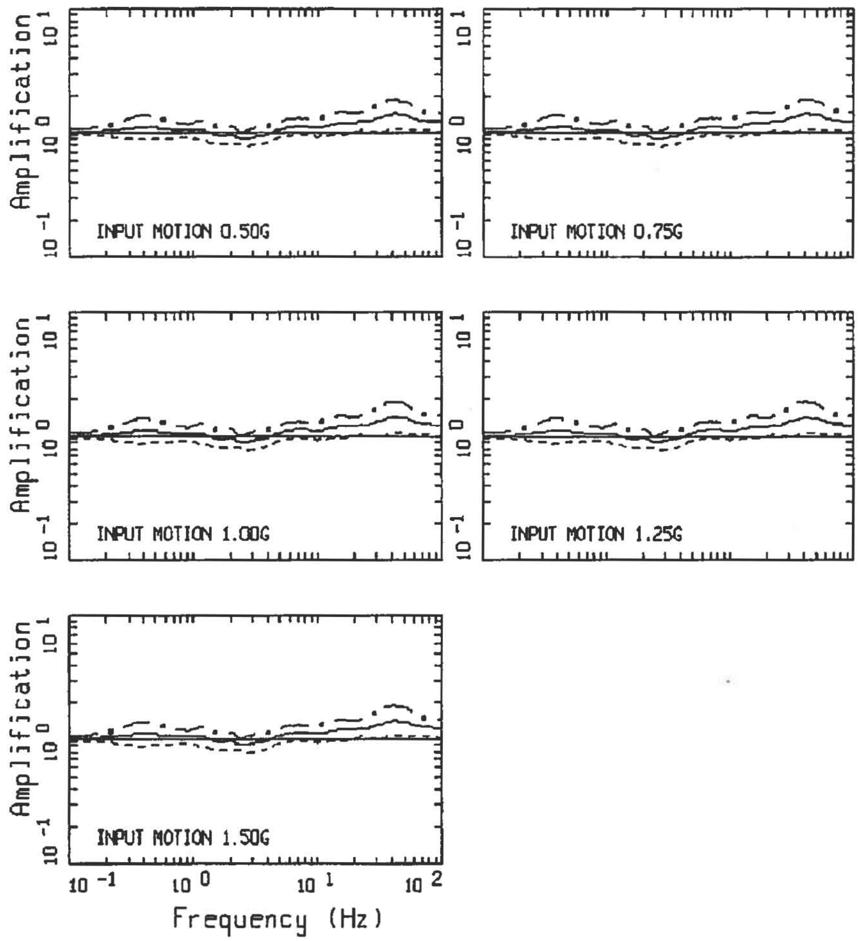


Figure 2.3.6-2 Example suite of amplification factors (5% of critical damping pseudo absolute acceleration spectra) developed for the mean base-case profile (P1), linear analyses (model M2), and base-case kappa at eleven loading levels of hard rock median peak acceleration values from 0.01g to 1.50g. **M** 6.5 and single-corner source model (Reference 3)



AMPLIFICATION, PEACH BOTTOM, M2P1K1

M 6.5, 1 CORNER: PAGE 2 OF 2

Figure 2.3.6-2 continued

2.3.7 Control Point Seismic Hazard Curves

The procedure to develop probabilistic site-specific control point hazard curves used in the present analysis follows the methodology described in Section B-6.0 of the SPID (Reference 3). This procedure (referred to as Method 3) computes a site-specific control point hazard curve for a broad range of spectral accelerations given the site-specific bedrock hazard curve and site-specific estimates of soil or soft-rock response and associated uncertainties. This process is repeated for each of the seven spectral frequencies for which ground motion equations are available. The dynamic response of the materials below the control point was represented by the frequency- and amplitude-dependent amplification functions (median values and standard deviations) developed and described in the previous section. The resulting control point mean hazard curves for PBAPS are shown in Figure 2.3.7-1 for the seven spectral frequencies for which ground motion equations are defined. Tabulated values of mean and fractile seismic hazard curves and site response amplification functions are provided in Appendix A.

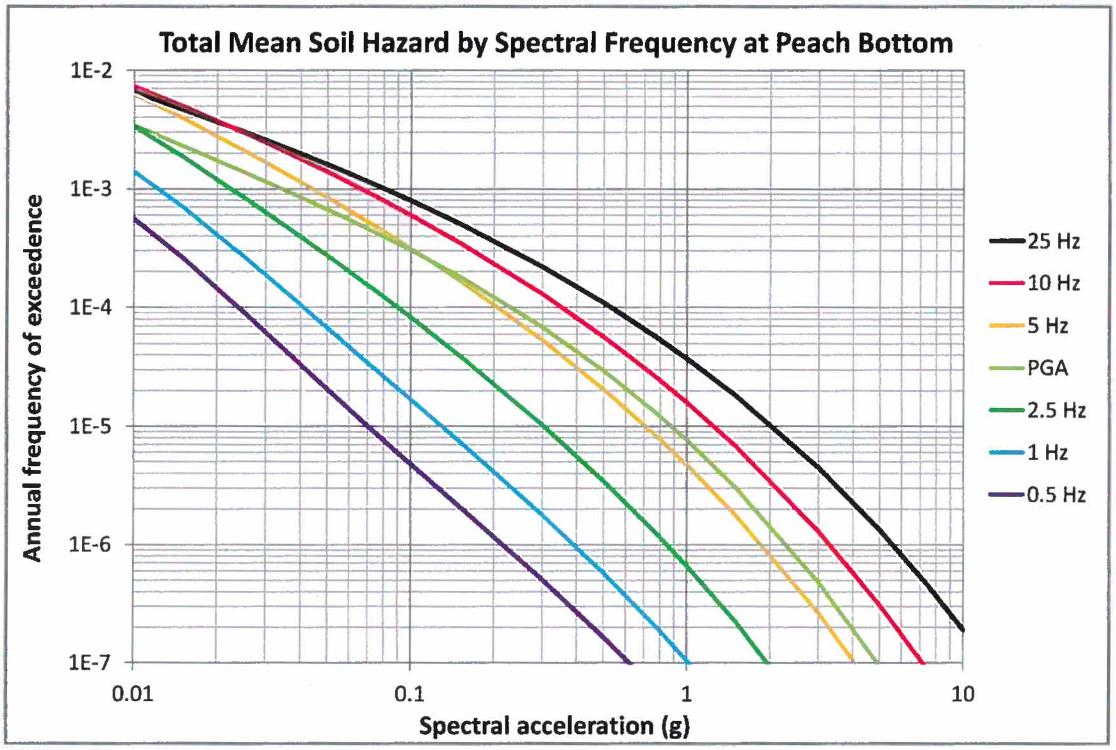


Figure 2.3.7-1 Control point mean hazard curves for spectral frequencies of 0.5, 1, 2.5, 5, 10, 25 and 100 Hz (PGA) at PBAPS (5% of critical damping)

2.4 Control Point Response Spectra (UHRS & GMRS)

The control point hazard curves described in Section 2.3.7 have been used to develop geometric mean horizontal uniform hazard response spectra (UHRS) and the GMRS. The UHRS were obtained through linear interpolation in log-log space to estimate the spectral acceleration at each spectral frequency for the 1E-4 and 1E-5 per year hazard levels. The 1E-4 and 1E-5 UHRS, along with a design factor (DF) are used to compute the GMRS at the control point using the criteria in NRC Reg. Guide 1.208 (Reference 18). The GMRS developed herein represents an alternative seismic demand for PBAPS determined using recently developed techniques. Table 2.4-1 shows the UHRS and GMRS accelerations for a range of spectral frequencies. Figure 2.4-1 shows the UHRS and GMRS at the control point.

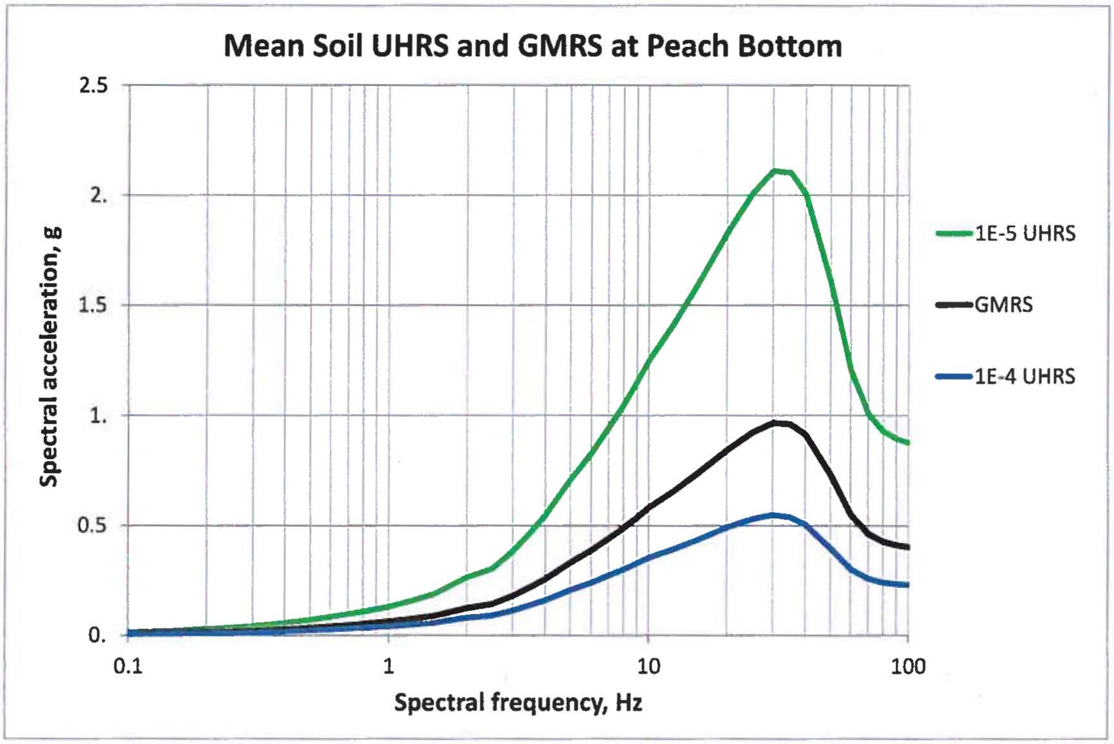


Figure 2.4-1 Plots of 1E-4 and 1E-5 UHRS and GMRS at control point for PBAPS (5% of critical damping response spectra)

Table 2.4-1 UHRS and GMRS at control point for PBAPS (5% of critical damping response spectra)

Freq (Hz)	1E-4 UHS (g)	1E-5 UHS (g)	GMRS (g)
100	2.29E-01	8.77E-01	4.02E-01
90	2.33E-01	8.94E-01	4.10E-01
80	2.41E-01	9.30E-01	4.26E-01
70	2.58E-01	1.01E+00	4.61E-01
60	3.02E-01	1.21E+00	5.49E-01
50	3.98E-01	1.61E+00	7.30E-01
40	5.05E-01	2.01E+00	9.14E-01
35	5.38E-01	2.10E+00	9.61E-01
30	5.48E-01	2.11E+00	9.67E-01
25	5.30E-01	2.01E+00	9.24E-01
20	4.91E-01	1.83E+00	8.44E-01
15	4.28E-01	1.57E+00	7.27E-01
12.5	3.93E-01	1.42E+00	6.59E-01
10	3.52E-01	1.25E+00	5.81E-01
9	3.27E-01	1.15E+00	5.36E-01
8	3.00E-01	1.05E+00	4.90E-01
7	2.71E-01	9.43E-01	4.41E-01
6	2.39E-01	8.27E-01	3.87E-01
5	2.06E-01	7.09E-01	3.32E-01
4	1.60E-01	5.46E-01	2.56E-01
3.5	1.37E-01	4.67E-01	2.19E-01
3	1.13E-01	3.82E-01	1.79E-01
2.5	8.99E-02	3.03E-01	1.43E-01
2	7.94E-02	2.64E-01	1.24E-01
1.5	5.79E-02	1.88E-01	8.93E-02
1.25	4.98E-02	1.60E-01	7.59E-02
1	4.11E-02	1.30E-01	6.19E-02
0.9	3.79E-02	1.19E-01	5.66E-02
0.8	3.50E-02	1.08E-01	5.17E-02
0.7	3.18E-02	9.70E-02	4.66E-02
0.6	2.82E-02	8.47E-02	4.08E-02
0.5	2.39E-02	7.02E-02	3.39E-02
0.4	1.91E-02	5.62E-02	2.72E-02
0.35	1.67E-02	4.92E-02	2.38E-02
0.3	1.43E-02	4.21E-02	2.04E-02
0.25	1.19E-02	3.51E-02	1.70E-02
0.2	9.54E-03	2.81E-02	1.36E-02
0.15	7.16E-03	2.11E-02	1.02E-02
0.125	5.96E-03	1.76E-02	8.49E-03
0.1	4.77E-03	1.40E-02	6.79E-03

3 Plant Design Basis Ground Motion

The design basis for PBAPS is identified in the Updated Final Safety Analysis Report (Reference 11). The current licensing basis Maximum Credible Earthquake (MCE, analogous to SSE) for PBAPS is based upon an evaluation of the maximum earthquake potential considering the regional and local geologic structure and seismic history. The response spectrum is based on the largest shock considered remotely possible in the region at the closest epicentral distance to the site consistent with geologic structure. The largest recorded earthquake in the region surrounding the site was the 1871 Wilmington, Delaware Intensity VII shock. Although this shock was likely related to readjustment along the Fall Zone, it may be related to a faulted area several miles north of Wilmington, which may be related to the series of faults inferred to pass through the vicinity of the site. (Reference 11, Section 2.5.3.5.1)

3.1 SSE Description of Spectral Shape

The SSE is defined in terms of a PGA and a design response spectrum. The effect of a shock as large as the 1871 Wilmington, Delaware (Magnitude 5 to 5 ½) earthquake occurring as close to the site as the Peach Bottom Fault was estimated to produce ground accelerations at the plant as high as 12% of gravity (0.12g) as the anchor point for the SSE (Reference 11, Section 2.5.3.5.1). The site response spectrum for the SSE has a Housner-type spectral shape (Reference 11, Figure C.3.2) and is normalized to a maximum horizontal ground acceleration of 0.12g.

The horizontal SSE (5% of critical damping) for PBAPS is shown below in Figure 3.1-1. Table 3.1-1 shows the spectral acceleration values as a function of frequency for the horizontal SSE (5% of critical damping). The SSE acceleration values are based on digitized data from Figure C.3.2 of the PBAPS UFSAR (Reference 11).

Table 3.1-1 Horizontal SSE for PBAPS (5% of critical damping response spectrum)

Frequency (Hz)	Spectral Acceleration (g)
0.1	0.00
0.125	0.01
0.15	0.01
0.2	0.01
0.25	0.02
0.3	0.02
0.35	0.03
0.4	0.04
0.5	0.05
0.6	0.06
0.7	0.07
0.8	0.08
0.9	0.09
1	0.11
1.25	0.13
1.5	0.16
2	0.19
2.5	0.21
3	0.22
3.5	0.22
4	0.22
5	0.21
6	0.21
7	0.20
8	0.20
9	0.19
10	0.19
12.5	0.18
15	0.18
20	0.17
25	0.16
30	0.15
35	0.15
40	0.15
50	0.14
60	0.14
70	0.13
80	0.12
90	0.12
100/PGA	0.12

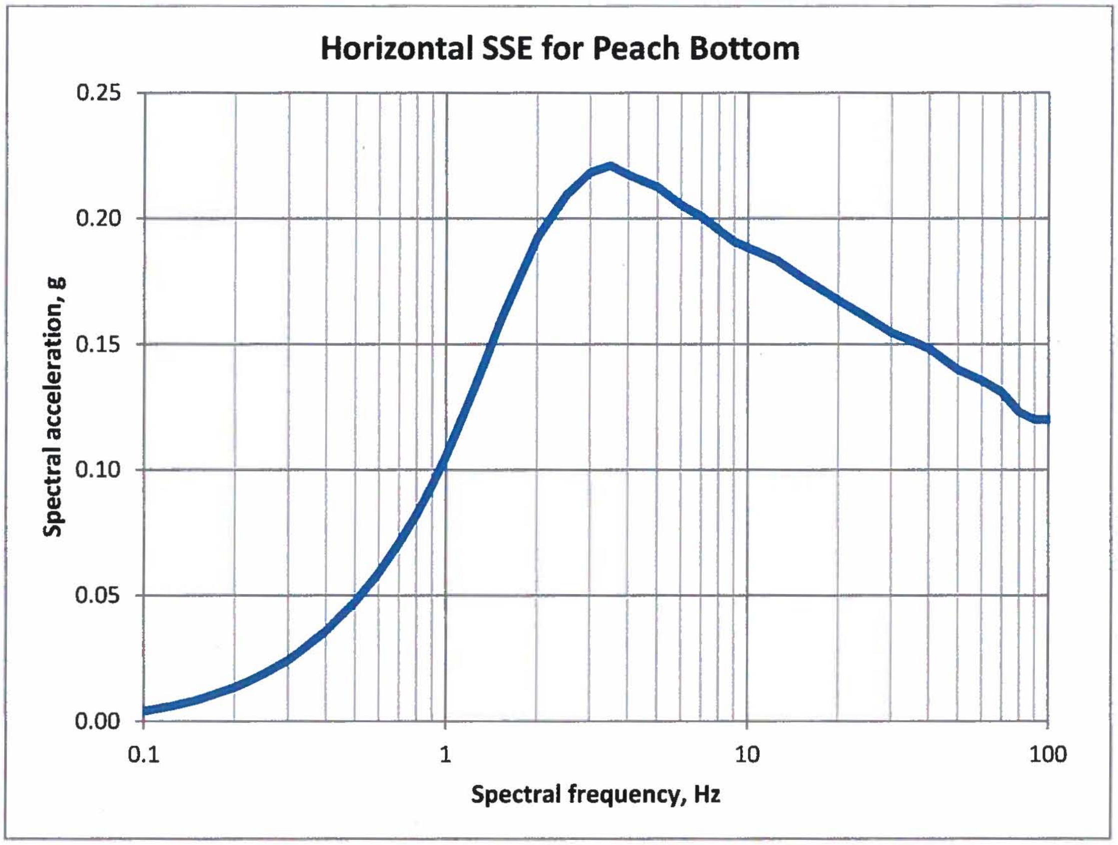


Figure 3.1-1 Horizontal SSE for PBAPS (5% of critical damping response spectrum)

3.2 Control Point Elevation

The Peach Bottom site is underlain with relatively fresh, competent schist-type bedrock at shallow depths below soil and highly weathered rock. These overburden layers were removed from the areas surrounding the main power block before founding the Peach Bottom safety-related structures on rock and/or lean concrete overlaying rock (Reference 11, Sections 2.7.6.3 and 2.8.1). The PBAPS UFSAR (Reference 11) does not define an SSE control point. Since PBAPS is a rock site and all major structures are founded on rock, the SSE control point elevation is taken to be at the top of the rock at Peach Bottom, which is nominally at elevation 136 ft. MSL adjacent to the main power block. This definition of the control point is consistent with the approach described in the SPID (Reference 3, Section 2.4.2).

4 Screening Evaluation

Following completion of the seismic hazard reevaluation, as requested in the 50.54(f) letter (Reference 1), a screening evaluation is performed in accordance with the SPID, Section 3 (Reference 3). The horizontal GMRS determined from the hazard reevaluation is used to characterize the amplitude of the alternative seismic hazard at each of the nuclear power plant sites. The screening evaluation is based upon a comparison of the GMRS with the established plant-level seismic capacity (either the SSE or IPEEE HCLPF Spectrum (IHS), where IPEEE is defined as Individual Plant Examination of External Events and HCLPF is defined as high-confidence-of-low-probability-of-failure), in accordance with the SPID (Reference 3). For PBAPS, the plant-level seismic capacity is based on the SSE.

4.1 Risk Evaluation Screening (1 to 10 Hz)

In the frequency range of 1 to 10 Hz, the GMRS spectral acceleration exceeds that of the SSE at spectral frequencies above approximately 3.7 Hz. As a result, PBAPS screens in for a risk evaluation in accordance with the SPID, Section 3.2 (Reference 3). Section 6.2 of the SPID (Reference 3) provides guidance as to whether an NRC SMA, as described in NRC Interim Staff Guidance JLD-ISG-2012-04 (Reference 9), or an SPRA is the appropriate approach for the risk evaluation. Since the GMRS exceeds 1.3 times the SSE and the Low Hazard Threshold (LHT) of 0.4g in the frequency range of 1 to 10 Hz, PBAPS screens in for an SPRA.

Further, in accordance with the screening requirements in Section 2.2 of the "Augmented Approach" guidance document (Reference 4), PBAPS will perform an ESEP as an interim action/assessment.

4.2 High Frequency Screening (> 10 Hz)

In the frequency range above 10 Hz, the GMRS spectral acceleration exceeds that of the SSE. The high-frequency exceedances can be addressed in the risk evaluation discussed in Section 4.1.

Section 3.4 of the SPID (Reference 3) discusses the impact of high-frequency ground motion on plant components and identifies the component groups that are sensitive to high-frequency vibration. As summarized in the SPID (Reference 3), EPRI Report NP-7498 (Reference 28) concludes that high-frequency vibration is not damaging, in general, to components with strain- or stress-based failure modes. However, components, such as relays, subject to electrical functionality failure modes have unknown acceleration sensitivity for frequencies above 16 Hz.

EPRI Report 1015108 (Reference 27) provides evidence that supports the conclusion that high-frequency motions are not damaging to the majority of nuclear plant

components, excluding relays and other electrical devices whose output signals may be affected by high-frequency vibration. EPRI Report 1015109 (Reference 26) provides guidance for identifying and evaluating potentially high-frequency sensitive components. Guidance from these documents is considered in the SPID (Reference 3) for identifying components that are sensitive to high-frequency vibration. Component types listed in Table 3-3 of the SPID (Reference 3) provide examples of components that are potentially sensitive to high-frequency vibrations. Those component types are:

- Electro-mechanical relays
- Circuit breakers
- Control switches
- Process switches and sensors
- Electro-mechanical contactors
- Auxiliary contacts
- Transfer switches
- Potentiometers

4.3 Spent Fuel Pool Evaluation Screening (1 to 10 Hz)

As the GMRS spectral acceleration exceeds that of the SSE in the frequency range of 1 to 10 Hz, a spent fuel pool integrity evaluation is needed for PBAPS in accordance with the SPID, Section 7 (Reference 3).

5

Interim Actions

Based on the screening results as described in Section 4 of this report, the GMRS spectral acceleration exceeds that of the SSE at all spectral frequencies above approximately 3.7 Hz at PBAPS. Therefore, PBAPS screens in for a risk evaluation in response to the 50.54(f) letter (Reference 1). Additionally, the "Augmented Approach" guidance document (Reference 4) prescribes expedited seismic evaluations of key components be performed.

5.1 Expedited Seismic Evaluation Process

Based on the screening results, the ESEP will be performed for PBAPS as proposed in the April 9, 2013 letter from the industry to the NRC (Reference 6) and agreed to by the NRC in a letter dated May 7, 2013 (Reference 30). Given the PBAPS screening results, efforts to complete the ESEP are currently being expedited in order to accelerate completion of the ESEP evaluations and subsequent modifications (if required) to gain earlier safety benefits.

Exelon has committed to follow the "Augmented Approach" guidance document (Reference 4), which introduces the ESEP as an interim action to augment the response to the NRC request for information. The ESEP addresses the part of the 50.54(f) letter (Reference 1) that requests "interim evaluation and actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the risk evaluation." Specifically, the ESEP focuses initial industry efforts on short term evaluations that will lead to prompt modifications to some of the most important components that could improve plant seismic safety.

5.2 Interim Evaluation of Seismic Hazard

Consistent with the NRC letter dated February 20, 2014 (Reference 15), the seismic hazard reevaluations presented herein are distinct from the current design and licensing bases of PBAPS. Therefore, the results do not call into question the operability or functionality of SSCs and are not reportable pursuant to 10CFR50.72, "Immediate notification requirements for operating nuclear power reactors" (Reference 2, Section 50.72) and 10CFR50.73, "Licensee event report system" (Reference 2, Section 50.73).

The NRC letter also requests that licensees provide an interim evaluation or actions to demonstrate that the plant can cope with the reevaluated hazard while the expedited approach and risk evaluations are conducted. In response to that request, the NEI letter dated March 12, 2014 (Reference 24) provides seismic core damage risk estimates using the updated seismic hazards for the operating nuclear plants in the CEUS. These risk estimates continue to support the following conclusions of the NRC GI-199 Safety/Risk Assessment (Reference 25):

"Overall seismic core damage risk estimates are consistent with the Commission's Safety Goal Policy Statement because they are within the subsidiary objective of 10^{-4}/year for core damage frequency. The GI-199 Safety/Risk Assessment, based in part on information from the U.S. Nuclear Regulatory Commission's (NRC's) Individual Plant Examination of External Events (IPEEE) program, indicates that no concern exists regarding adequate protection and that the current seismic design of operating reactors provides a safety margin to withstand potential earthquakes exceeding the original design basis."

PBAPS is included in the March 12, 2014 risk estimates (Reference 24). Using the methodology described in the NEI letter, the seismic core damage risk estimates for all plants were shown to be below 1E-4/year; thus, the above conclusions apply.

5.3 Seismic Walkdown Insights

In response to NTTF 2.3, the 50.54(f) letter (Reference 1) also requested licensees to perform seismic walkdowns in order to, in the context of seismic response: 1) verify that the current plant configuration is consistent with the licensing basis; 2) verify the adequacy of current strategies, monitoring, and maintenance programs; and 3) identify degraded, nonconforming, or unanalyzed conditions. Exelon committed to and performed seismic walkdowns in accordance with the seismic walkdown guidance (Reference 16) as initially documented and supplemented in Exelon Correspondence Numbers RS-12-173, RS-13-213 and RS-14-001 (References 13, 14 and 29).

Based on the successful completion of seismic walkdowns for all components to date in response to NTTF 2.3, all SSCs were determined to be acceptable, or deficiencies were entered into the corrective action program (CAP) and determined to be operable. Exelon has directly concluded that the PBAPS Units 2 and 3 current plant configurations are consistent with the respective plant licensing basis and can safely shut down the reactor and maintain containment integrity following the design basis SSE event. Additionally, the findings of the seismic walkdown program indirectly verify that the current PBAPS Units 2 and 3 monitoring and maintenance programs are adequate for ensuring seismic safety consistent with the licensing basis.

Plant vulnerabilities and commitments identified in the PBAPS IPEEE (Reference 12) were reviewed as part of the NTTF 2.3 seismic walkdowns (References 13, 14 and 29). The seismic walkdown reports confirmed that there are no outstanding IPEEE vulnerabilities or commitments, and all previously identified IPEEE vulnerabilities and commitments have been resolved (References 13, 14 and 29).

5.4 Beyond-Design-Basis Seismic Insights

An evaluation of beyond-design-basis ground motions was performed for PBAPS as part of the IPEEE program. The PBAPS IPEEE program demonstrated plant-level seismic capacity, which can be expressed in terms of a HCLPF. This plant-level seismic capacity is defined in Section 3.3.2 of the SPID (Reference 3) as the IHS. The PBAPS IPEEE seismic evaluation was initially submitted as a reduced scope SMA (Reference 12). Subsequent to the IPEEE submittal, PBAPS responded to a Request for Additional Information (RAI) and provided additional information that justified the PBAPS IPEEE SMA as achieving the intent of a modified focused-scope SMA with a HCLPF capacity of

0.2g PGA anchored to a NUREG/CR-0098 spectral shape (References 23 and 21). As a result of the PBAPS IPEEE seismic evaluations, plant modifications were made to enhance the reliability and safety of the plant. There are no outstanding IPEEE vulnerabilities or commitments and all previously identified IPEEE vulnerabilities and commitments have been resolved (References 13 and 14). The results of the PBAPS IPEEE showed there were no vulnerabilities to severe accident risk from external events, including seismic events (Reference 12). Based on the results of the IPEEE program for PBAPS, it may be qualitatively concluded that the plant has significant seismic margin beyond the design basis (Reference 22, Section 2.3.4) as evidenced by a comparison between the site SSE and the IHS in Figure 5.4-1.

The IHS for PBAPS is provided for context of demonstrating beyond-design-basis seismic margin capacity; however, the IHS is not used for the NTTF 2.1: Seismic screening evaluation. The horizontal IHS (5% of critical damping) is shown below in Table 5.4-1 and plotted in Figure 5.4-1.

Table 5.4-1 Horizontal IHS for PBAPS (5% of critical damping response spectrum)

Frequency (Hz)	Spectral Acceleration (g)
0.5	0.1
2.2	0.42
8	0.42
33	0.20
100/PGA	0.20

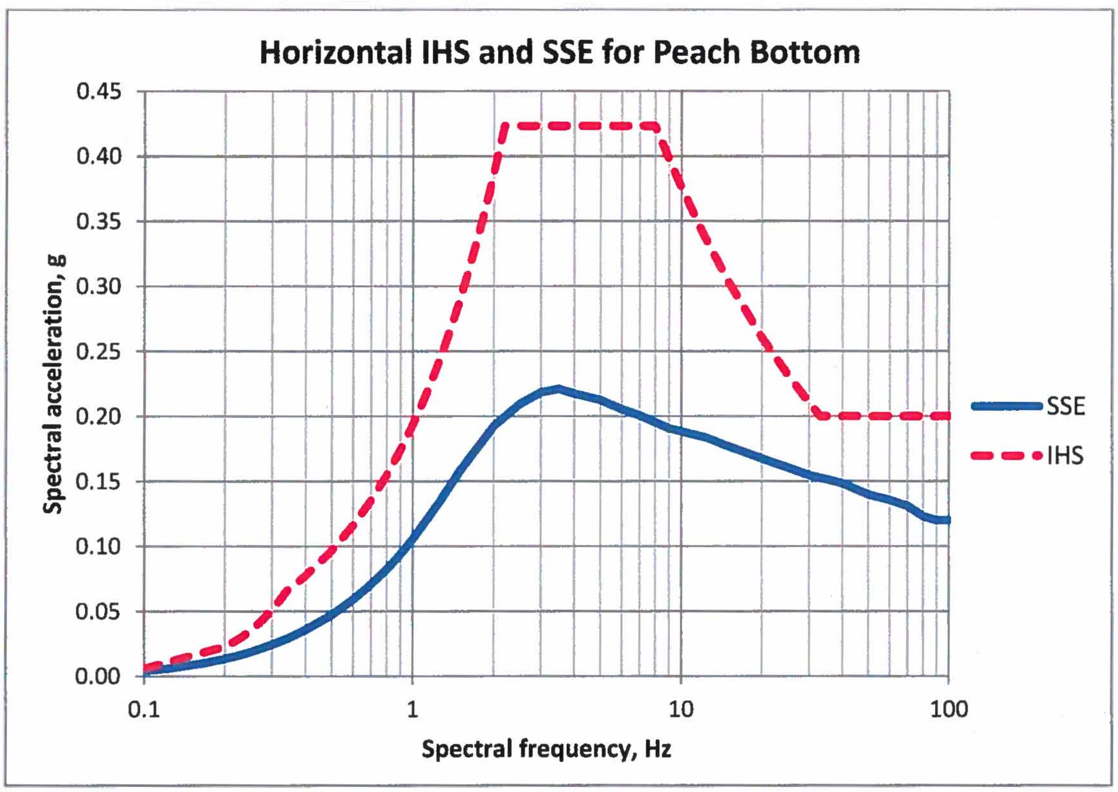


Figure 5.4-1 Horizontal IHS and SSE for PBAPS (5% of critical damping response spectra)

5.5 POTENTIAL GMRS REFINEMENT

During review of EPRI RSM-112013-026, *Peach Bottom Seismic Hazard and Screening Report*, dated November 27, 2013 (Reference 17), PBAPS identified probable conservatisms related to GMRS Control Point Elevation, distances to RLME sources, and distances to background sources. These issues were captured in the plant CAP. Exelon may refine the site-specific GMRS as further analyses are developed.

6

Conclusions

In accordance with the 50.54(f) letter (Reference 1), a seismic hazard and screening evaluation was performed for PBAPS. This evaluation followed the SPID guidance (Reference 3) in order to develop a site GMRS for the purpose of screening the plant in accordance with the SPID. The new GMRS does not constitute a change in the plant design or licensing basis as described in the NRC letter dated February 20, 2014 (Reference 15).

The screening evaluation comparison demonstrates that the GMRS spectral acceleration exceeds that of the SSE at spectral frequencies above approximately 3.7 Hz. Based on the screening evaluation, PBAPS screens in for a risk evaluation and a spent fuel pool integrity evaluation in accordance with the SPID, Sections 3 and 7 (Reference 3). Since the GMRS spectral acceleration exceeds that of the SSE in the frequency range above 10 Hz, high-frequency exceedances can be addressed as part of the risk evaluation for PBAPS. As an interim action/assessment, an ESEP will be performed for PBAPS in conformance with the "Augmented Approach" guidance document (Reference 4). This is an interim action to establish beyond-design-basis safety margin prior to completion of the risk evaluation. Actions to address NTTF 2.1: Seismic for CEUS nuclear plants are outlined in the schedule provided in the April 9, 2013 letter from the industry to the NRC (Reference 6), as agreed to by the NRC in the May 7, 2013 letter to the industry (Reference 30).

7 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,* dated March 12, 2012.

2. Title 10 Code of Federal Regulations Part 50, *Domestic Licensing of Production and Utilization Facilities.*

3. EPRI 1025287, *Seismic Evaluation Guidance: Screening, Prioritization and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, Palo Alto, CA, February 2013.

4. EPRI 3002000704, *Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, Palo Alto, CA, May 2013.

5. Title 10 Code of Federal Regulations Part 100, *Reactor Site Criteria.*

6. NEI Letter (A. R. Pietrangelo) to the NRC, *Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations,* dated April 9, 2013.

7. EPRI 1021097 (NUREG-2115), *Central and Eastern United States Seismic Source Characterization for Nuclear Facilities*, Palo Alto, CA, January 2012.

8. EPRI 3002000717, *EPRI (2004, 2006) Ground-Motion Model (GMM) Review Project*, Palo Alto, CA, June 2013.

9. NRC Japan Lessons-Learned Project Directorate Interim Staff Guidance JLD-ISG-2012-04, Revision 0, *Guidance on Performing a Seismic Margin Assessment in Response to the March 2012 Request for Information Letter*, November 2012.

10. Silva, W.J., N. Abrahamson, G. Toro and C. Costantino, "Description and validation of the stochastic ground motion model", Report Submitted to Brookhaven National Laboratory, Associated Universities, Inc. Upton, New York 11973, Contract No. 770573, 1997.

11. Exelon Generation Company, *Peach Bottom Atomic Power Station, Units 2 and 3, Updated Final Safety Analysis Report (UFSAR)*, Revision 24.

12. PECO Energy Company, Peach Bottom Atomic Power Station Units 2 and 3, *Individual Plant Examination for External Events*, May, 1996.

13. Exelon Generation Company letter to the NRC, *Exelon Generation Company, LLC's 180-day Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, RS-12-173, dated November 19, 2012.

14. Exelon Generation Company letter to the NRC, *Exelon Generation Company, LLC Proposed Resolution for Completion of the Seismic Walkdowns Associated with NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, RS-13-213, dated September 16, 2013.

15. NRC (E. Leeds) Letter to All Power Reactor Licensees et al., *Supplemental Information Related to Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Seismic Hazard Reevaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident,* dated February 20, 2014.

16. EPRI 1025286, *Seismic Walkdown Guidance for Resolution of Fukushima Near-Term Task Force Recommendation 2.3: Seismic*, Palo Alto, CA, June 2012.

17. EPRI RSM-112013-026, *Peach Bottom Seismic Hazard and Screening Report*, dated November 27, 2013.

18. NRC Regulatory Guide 1.208, *A performance-based approach to define the site-specific earthquake ground motion*, 2007.

19. SGH Report No. 128018-R-01, Revision 1, *Review of Existing Site Response Data for the Exelon Nuclear Fleet,* July 17, 2012.

20. Exelon Generation Company letter to the NRC, *Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding the Seismic Aspects of Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident*, RS-13-102, dated April 29, 2013.

21. NRC (B. Buckley) to PECO (J. Hutton), *Review of Peach Bottom Atomic Power Station, Units 2 and 3, Individual Plant Examination of External Events Submittal,* dated November 22, 1999.

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A

Additional Tables

Table A-1a Mean and fractile seismic hazard curves for PGA at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	3.39E-02	1.49E-02	2.64E-02	3.42E-02	4.19E-02	4.70E-02
0.001	2.39E-02	9.51E-03	1.77E-02	2.35E-02	3.14E-02	3.63E-02
0.005	6.63E-03	3.01E-03	4.31E-03	6.09E-03	8.35E-03	1.36E-02
0.01	3.42E-03	1.49E-03	2.07E-03	3.09E-03	4.37E-03	7.89E-03
0.015	2.30E-03	8.98E-04	1.27E-03	2.01E-03	3.05E-03	5.58E-03
0.03	1.15E-03	3.33E-04	4.98E-04	9.37E-04	1.69E-03	2.96E-03
0.05	6.70E-04	1.49E-04	2.39E-04	5.20E-04	1.07E-03	1.79E-03
0.075	4.27E-04	7.77E-05	1.32E-04	3.19E-04	7.03E-04	1.18E-03
0.1	3.04E-04	4.98E-05	8.85E-05	2.22E-04	5.05E-04	8.47E-04
0.15	1.83E-04	2.68E-05	4.98E-05	1.29E-04	3.05E-04	5.27E-04
0.3	6.82E-05	8.60E-06	1.72E-05	4.56E-05	1.15E-04	2.01E-04
0.5	2.93E-05	3.37E-06	6.93E-06	1.90E-05	4.98E-05	8.60E-05
0.75	1.38E-05	1.38E-06	3.01E-06	8.60E-06	2.35E-05	4.13E-05
1.	7.63E-06	6.73E-07	1.53E-06	4.63E-06	1.32E-05	2.35E-05
1.5	3.04E-06	2.07E-07	5.27E-07	1.74E-06	5.27E-06	9.93E-06
3.	4.81E-07	1.67E-08	5.35E-08	2.29E-07	8.12E-07	1.74E-06
5.	9.48E-08	1.67E-09	6.36E-09	3.57E-08	1.53E-07	3.84E-07
7.5	2.16E-08	2.60E-10	9.51E-10	6.54E-09	3.23E-08	9.65E-08
10.	6.80E-09	1.08E-10	2.49E-10	1.69E-09	9.51E-09	3.19E-08

Table A-1b Mean and fractile seismic hazard curves for 25 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	3.95E-02	2.19E-02	3.33E-02	4.01E-02	4.63E-02	5.12E-02
0.001	3.08E-02	1.53E-02	2.42E-02	3.05E-02	3.84E-02	4.37E-02
0.005	1.13E-02	5.35E-03	7.66E-03	1.05E-02	1.44E-02	2.13E-02
0.01	6.54E-03	3.14E-03	4.25E-03	6.00E-03	8.23E-03	1.32E-02
0.015	4.68E-03	2.19E-03	2.96E-03	4.25E-03	5.91E-03	9.65E-03
0.03	2.57E-03	1.07E-03	1.49E-03	2.32E-03	3.47E-03	5.35E-03
0.05	1.61E-03	5.66E-04	8.35E-04	1.42E-03	2.29E-03	3.37E-03
0.075	1.08E-03	3.23E-04	4.98E-04	9.24E-04	1.60E-03	2.35E-03
0.1	7.97E-04	2.10E-04	3.37E-04	6.73E-04	1.21E-03	1.79E-03
0.15	5.10E-04	1.11E-04	1.90E-04	4.13E-04	8.12E-04	1.23E-03
0.3	2.20E-04	3.95E-05	7.03E-05	1.69E-04	3.63E-04	5.75E-04
0.5	1.09E-04	1.77E-05	3.28E-05	8.23E-05	1.84E-04	2.92E-04
0.75	5.92E-05	8.72E-06	1.72E-05	4.37E-05	1.01E-04	1.62E-04
1.	3.71E-05	5.12E-06	1.04E-05	2.68E-05	6.45E-05	1.02E-04
1.5	1.81E-05	2.29E-06	4.70E-06	1.27E-05	3.19E-05	5.20E-05
3.	4.44E-06	4.25E-07	9.93E-07	2.92E-06	8.00E-06	1.34E-05
5.	1.32E-06	9.65E-08	2.49E-07	8.12E-07	2.39E-06	4.25E-06
7.5	4.45E-07	2.49E-08	7.03E-08	2.53E-07	8.00E-07	1.51E-06
10.	1.91E-07	8.47E-09	2.53E-08	1.01E-07	3.37E-07	6.73E-07

Table A-1c Mean and fractile seismic hazard curves for 10 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	4.32E-02	3.19E-02	3.73E-02	4.31E-02	4.90E-02	5.42E-02
0.001	3.53E-02	2.29E-02	2.92E-02	3.52E-02	4.19E-02	4.63E-02
0.005	1.33E-02	6.93E-03	9.51E-03	1.29E-02	1.69E-02	2.16E-02
0.01	7.31E-03	3.73E-03	4.98E-03	6.93E-03	9.24E-03	1.29E-02
0.015	4.99E-03	2.53E-03	3.37E-03	4.70E-03	6.36E-03	8.98E-03
0.03	2.46E-03	1.13E-03	1.55E-03	2.29E-03	3.28E-03	4.50E-03
0.05	1.39E-03	5.58E-04	7.89E-04	1.27E-03	1.95E-03	2.64E-03
0.075	8.61E-04	2.92E-04	4.31E-04	7.66E-04	1.27E-03	1.72E-03
0.1	6.01E-04	1.77E-04	2.72E-04	5.20E-04	9.24E-04	1.27E-03
0.15	3.52E-04	8.47E-05	1.40E-04	2.96E-04	5.66E-04	8.00E-04
0.3	1.30E-04	2.39E-05	4.31E-05	1.04E-04	2.19E-04	3.14E-04
0.5	5.68E-05	9.11E-06	1.74E-05	4.31E-05	9.93E-05	1.42E-04
0.75	2.76E-05	4.01E-06	8.00E-06	2.04E-05	4.83E-05	7.23E-05
1.	1.59E-05	2.16E-06	4.37E-06	1.15E-05	2.80E-05	4.25E-05
1.5	6.81E-06	8.23E-07	1.74E-06	4.70E-06	1.20E-05	1.95E-05
3.	1.30E-06	1.07E-07	2.60E-07	8.00E-07	2.29E-06	4.19E-06
5.	3.12E-07	1.72E-08	4.77E-08	1.69E-07	5.42E-07	1.10E-06
7.5	8.67E-08	3.14E-09	9.79E-09	4.19E-08	1.49E-07	3.28E-07
10.	3.21E-08	8.60E-10	2.84E-09	1.36E-08	5.35E-08	1.29E-07

Table A-1d Mean and fractile seismic hazard curves for 5 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	4.36E-02	3.23E-02	3.73E-02	4.37E-02	4.98E-02	5.50E-02
0.001	3.58E-02	2.25E-02	2.84E-02	3.57E-02	4.31E-02	4.83E-02
0.005	1.26E-02	6.00E-03	8.72E-03	1.21E-02	1.67E-02	1.98E-02
0.01	6.25E-03	3.01E-03	4.19E-03	6.00E-03	8.47E-03	1.02E-02
0.015	3.94E-03	1.95E-03	2.60E-03	3.79E-03	5.27E-03	6.54E-03
0.03	1.67E-03	7.45E-04	1.04E-03	1.57E-03	2.25E-03	2.92E-03
0.05	8.44E-04	3.19E-04	4.63E-04	7.77E-04	1.23E-03	1.57E-03
0.075	4.78E-04	1.53E-04	2.29E-04	4.25E-04	7.34E-04	9.51E-04
0.1	3.14E-04	8.72E-05	1.34E-04	2.72E-04	4.98E-04	6.64E-04
0.15	1.69E-04	3.79E-05	6.36E-05	1.42E-04	2.80E-04	3.73E-04
0.3	5.31E-05	9.11E-06	1.72E-05	4.19E-05	9.11E-05	1.31E-04
0.5	2.05E-05	3.09E-06	6.09E-06	1.51E-05	3.52E-05	5.50E-05
0.75	8.90E-06	1.20E-06	2.46E-06	6.26E-06	1.53E-05	2.57E-05
1.	4.71E-06	5.50E-07	1.18E-06	3.19E-06	8.12E-06	1.42E-05
1.5	1.78E-06	1.64E-07	3.73E-07	1.11E-06	3.09E-06	5.75E-06
3.	2.65E-07	1.29E-08	3.73E-08	1.40E-07	4.56E-07	9.65E-07
5.	5.19E-08	1.40E-09	4.77E-09	2.25E-08	8.72E-08	2.07E-07
7.5	1.21E-08	2.42E-10	7.66E-10	4.25E-09	1.95E-08	5.12E-08
10.	3.93E-09	1.08E-10	2.25E-10	1.18E-09	5.91E-09	1.72E-08

Table A-1e Mean and fractile seismic hazard curves for 2.5 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	3.95E-02	2.76E-02	3.23E-02	3.95E-02	4.70E-02	5.20E-02
0.001	3.00E-02	1.82E-02	2.25E-02	2.96E-02	3.79E-02	4.25E-02
0.005	8.12E-03	3.79E-03	5.35E-03	7.66E-03	1.10E-02	1.36E-02
0.01	3.36E-03	1.53E-03	2.10E-03	3.19E-03	4.63E-03	6.09E-03
0.015	1.87E-03	8.23E-04	1.13E-03	1.74E-03	2.57E-03	3.47E-03
0.03	6.32E-04	2.32E-04	3.42E-04	5.66E-04	9.11E-04	1.25E-03
0.05	2.73E-04	8.00E-05	1.25E-04	2.35E-04	4.13E-04	6.00E-04
0.075	1.37E-04	3.28E-05	5.50E-05	1.11E-04	2.13E-04	3.33E-04
0.1	8.29E-05	1.72E-05	3.01E-05	6.54E-05	1.31E-04	2.13E-04
0.15	3.96E-05	6.73E-06	1.25E-05	2.92E-05	6.36E-05	1.11E-04
0.3	1.02E-05	1.18E-06	2.53E-06	6.83E-06	1.72E-05	3.19E-05
0.5	3.43E-06	2.64E-07	6.54E-07	2.07E-06	6.00E-06	1.16E-05
0.75	1.34E-06	6.93E-08	2.01E-07	7.23E-07	2.35E-06	4.83E-06
1.	6.61E-07	2.39E-08	7.89E-08	3.23E-07	1.16E-06	2.49E-06
1.5	2.24E-07	4.77E-09	1.84E-08	9.51E-08	3.95E-07	8.98E-07
3.	2.72E-08	2.53E-10	1.05E-09	7.55E-09	4.37E-08	1.20E-07
5.	4.46E-09	9.11E-11	1.42E-10	8.60E-10	6.36E-09	2.04E-08
7.5	8.94E-10	5.42E-11	9.11E-11	1.72E-10	1.16E-09	4.07E-09
10.	2.60E-10	5.05E-11	6.09E-11	1.01E-10	3.37E-10	1.21E-09

Table A-1f Mean and fractile seismic hazard curves for 1 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	2.71E-02	1.38E-02	1.92E-02	2.72E-02	3.47E-02	3.95E-02
0.001	1.77E-02	8.00E-03	1.20E-02	1.74E-02	2.32E-02	2.80E-02
0.005	3.79E-03	1.23E-03	2.04E-03	3.47E-03	5.50E-03	7.55E-03
0.01	1.40E-03	3.84E-04	6.45E-04	1.21E-03	2.13E-03	3.23E-03
0.015	7.04E-04	1.74E-04	2.96E-04	5.83E-04	1.10E-03	1.72E-03
0.03	1.88E-04	3.79E-05	6.73E-05	1.42E-04	3.14E-04	4.77E-04
0.05	6.77E-05	1.07E-05	2.04E-05	4.77E-05	1.13E-04	1.90E-04
0.075	3.00E-05	3.73E-06	7.55E-06	1.98E-05	4.98E-05	9.11E-05
0.1	1.69E-05	1.67E-06	3.73E-06	1.04E-05	2.80E-05	5.42E-05
0.15	7.48E-06	5.42E-07	1.32E-06	4.13E-06	1.23E-05	2.57E-05
0.3	1.78E-06	6.26E-08	1.92E-07	7.89E-07	3.01E-06	6.93E-06
0.5	5.76E-07	9.65E-09	3.84E-08	2.04E-07	9.65E-07	2.49E-06
0.75	2.19E-07	1.90E-09	8.98E-09	6.17E-08	3.47E-07	1.02E-06
1.	1.05E-07	5.83E-10	2.92E-09	2.39E-08	1.60E-07	5.05E-07
1.5	3.47E-08	1.44E-10	5.58E-10	5.42E-09	4.63E-08	1.69E-07
3.	4.03E-09	6.09E-11	1.01E-10	3.42E-10	3.79E-09	1.79E-08
5.	6.55E-10	5.05E-11	6.09E-11	1.01E-10	4.90E-10	2.64E-09
7.5	1.33E-10	5.05E-11	5.42E-11	1.01E-10	1.34E-10	5.27E-10
10.	3.90E-11	5.05E-11	5.05E-11	9.11E-11	1.01E-10	1.95E-10

Table A-1g Mean and fractile seismic hazard curves for 0.5 Hz at PBAPS, 5% of critical damping

AMPS(g)	MEAN	0.05	0.16	0.50	0.84	0.95
0.0005	1.48E-02	7.66E-03	1.08E-02	1.44E-02	1.87E-02	2.25E-02
0.001	8.86E-03	3.95E-03	5.83E-03	8.47E-03	1.18E-02	1.51E-02
0.005	1.66E-03	3.63E-04	6.73E-04	1.40E-03	2.68E-03	3.95E-03
0.01	5.60E-04	8.85E-05	1.77E-04	4.13E-04	9.65E-04	1.55E-03
0.015	2.63E-04	3.52E-05	7.23E-05	1.77E-04	4.70E-04	7.77E-04
0.03	6.20E-05	6.09E-06	1.32E-05	3.57E-05	1.16E-04	1.98E-04
0.05	2.05E-05	1.44E-06	3.42E-06	1.04E-05	3.79E-05	7.34E-05
0.075	8.70E-06	4.43E-07	1.13E-06	3.90E-06	1.51E-05	3.42E-05
0.1	4.81E-06	1.77E-07	5.05E-07	1.92E-06	7.89E-06	2.04E-05
0.15	2.11E-06	4.56E-08	1.57E-07	6.93E-07	3.19E-06	9.79E-06
0.3	5.07E-07	3.47E-09	1.77E-08	1.11E-07	6.73E-07	2.64E-06
0.5	1.66E-07	4.50E-10	2.84E-09	2.42E-08	1.90E-07	9.11E-07
0.75	6.45E-08	1.29E-10	6.00E-10	6.17E-09	6.26E-08	3.47E-07
1.	3.16E-08	1.01E-10	2.19E-10	2.13E-09	2.64E-08	1.67E-07
1.5	1.08E-08	6.09E-11	1.01E-10	4.70E-10	6.73E-09	5.12E-08
3.	1.36E-09	5.05E-11	6.09E-11	1.01E-10	4.98E-10	5.20E-09
5.	2.38E-10	5.05E-11	5.05E-11	1.01E-10	1.18E-10	7.89E-10
7.5	5.15E-11	5.05E-11	5.05E-11	9.11E-11	1.01E-10	1.98E-10
10.	1.60E-11	5.05E-11	5.05E-11	9.11E-11	1.01E-10	1.11E-10

Table A-2 Amplification functions for PBAPS, 5% of critical damping

PGA	Median AF	Sigma ln(AF)	25 Hz	Median AF	Sigma ln(AF)	10 Hz	Median AF	Sigma ln(AF)	5 Hz	Median AF	Sigma ln(AF)
1.00E-02	1.06E+00	1.55E-01	1.30E-02	1.17E+00	2.12E-01	1.90E-02	1.10E+00	1.94E-01	2.09E-02	1.06E+00	1.57E-01
4.95E-02	1.18E+00	1.74E-01	1.02E-01	1.29E+00	2.89E-01	9.99E-02	1.12E+00	1.93E-01	8.24E-02	1.08E+00	1.57E-01
9.64E-02	1.21E+00	1.84E-01	2.13E-01	1.31E+00	2.95E-01	1.85E-01	1.12E+00	1.90E-01	1.44E-01	1.08E+00	1.57E-01
1.94E-01	1.23E+00	1.91E-01	4.43E-01	1.31E+00	2.96E-01	3.56E-01	1.13E+00	1.86E-01	2.65E-01	1.08E+00	1.58E-01
2.92E-01	1.24E+00	1.93E-01	6.76E-01	1.31E+00	2.98E-01	5.23E-01	1.13E+00	1.84E-01	3.84E-01	1.08E+00	1.60E-01
3.91E-01	1.24E+00	1.95E-01	9.09E-01	1.31E+00	3.02E-01	6.90E-01	1.13E+00	1.85E-01	5.02E-01	1.09E+00	1.62E-01
4.93E-01	1.24E+00	1.96E-01	1.15E+00	1.31E+00	3.08E-01	8.61E-01	1.13E+00	1.88E-01	6.22E-01	1.09E+00	1.65E-01
7.41E-01	1.24E+00	1.96E-01	1.73E+00	1.30E+00	3.18E-01	1.27E+00	1.14E+00	1.95E-01	9.13E-01	1.09E+00	1.66E-01
1.01E+00	1.24E+00	1.98E-01	2.36E+00	1.30E+00	3.26E-01	1.72E+00	1.14E+00	2.02E-01	1.22E+00	1.09E+00	1.57E-01
1.28E+00	1.24E+00	1.99E-01	3.01E+00	1.29E+00	3.28E-01	2.17E+00	1.14E+00	2.02E-01	1.54E+00	1.09E+00	1.58E-01
1.55E+00	1.24E+00	2.00E-01	3.63E+00	1.28E+00	3.25E-01	2.61E+00	1.15E+00	2.05E-01	1.85E+00	1.09E+00	1.61E-01

2.5 Hz	Median AF	Sigma ln(AF)	1 Hz	Median AF	Sigma ln(AF)	0.5 Hz	Median AF	Sigma ln(AF)
2.18E-02	9.07E-01	1.53E-01	1.27E-02	1.05E+00	1.64E-01	8.25E-03	1.10E+00	2.05E-01
7.05E-02	9.11E-01	1.53E-01	3.43E-02	1.05E+00	1.63E-01	1.96E-02	1.10E+00	2.03E-01
1.18E-01	9.12E-01	1.52E-01	5.51E-02	1.05E+00	1.63E-01	3.02E-02	1.10E+00	2.02E-01
2.12E-01	9.14E-01	1.52E-01	9.63E-02	1.05E+00	1.63E-01	5.11E-02	1.10E+00	2.01E-01
3.04E-01	9.15E-01	1.52E-01	1.36E-01	1.05E+00	1.62E-01	7.10E-02	1.10E+00	2.01E-01
3.94E-01	9.16E-01	1.52E-01	1.75E-01	1.05E+00	1.62E-01	9.06E-02	1.10E+00	2.01E-01
4.86E-01	9.17E-01	1.52E-01	2.14E-01	1.05E+00	1.62E-01	1.10E-01	1.10E+00	2.00E-01
7.09E-01	9.18E-01	1.54E-01	3.10E-01	1.05E+00	1.62E-01	1.58E-01	1.10E+00	2.00E-01
9.47E-01	9.20E-01	1.57E-01	4.12E-01	1.05E+00	1.62E-01	2.09E-01	1.10E+00	2.00E-01
1.19E+00	9.22E-01	1.62E-01	5.18E-01	1.05E+00	1.63E-01	2.62E-01	1.10E+00	2.00E-01
1.43E+00	9.22E-01	1.62E-01	6.19E-01	1.05E+00	1.63E-01	3.12E-01	1.10E+00	2.00E-01

Tables A2-b1 and A2-b2 are tabular versions of the typical amplification factors provided in Figures 2.3.6-1 and 2.3.6-2. Values are provided for two input motion levels at approximately 1E-4 and 1E-5 mean annual frequency of exceedance. These tables concentrate on the frequency range of 0.5 Hz to 25 Hz, with values up to 100 Hz included, and a single value at 0.1 Hz included for completeness. These factors are unverified and are provided for information only. The figures should be considered the governing information.

Table A2-b1 Median AFs and sigmas for Model 1, Profile 1, for 2 PGA levels

M1P1K1		Rock PGA=0.194		M1P1K1		PGA=0.741	
Freq (Hz)	Soil SA	Median AF	Sigma ln(AF)	Freq (Hz)	Soil SA	Median AF	Sigma ln(AF)
100.0	0.231	1.191	0.153	100.0	0.897	1.211	0.159
87.1	0.239	1.199	0.155	87.1	0.931	1.217	0.162
75.9	0.252	1.212	0.158	75.9	0.993	1.227	0.166
66.1	0.281	1.236	0.171	66.1	1.121	1.241	0.181
57.5	0.340	1.282	0.210	57.5	1.381	1.268	0.226
50.1	0.433	1.357	0.240	50.1	1.770	1.332	0.265
43.7	0.521	1.382	0.250	43.7	2.122	1.351	0.266
38.0	0.569	1.373	0.265	38.0	2.317	1.361	0.255
33.1	0.581	1.323	0.273	33.1	2.357	1.329	0.263
28.8	0.566	1.287	0.243	28.8	2.286	1.309	0.268
25.1	0.540	1.219	0.194	25.1	2.154	1.242	0.237
21.9	0.516	1.221	0.161	21.9	2.012	1.238	0.194
19.1	0.494	1.185	0.154	19.1	1.885	1.193	0.161
16.6	0.474	1.182	0.171	16.6	1.772	1.184	0.144
14.5	0.454	1.183	0.192	14.5	1.672	1.183	0.149
12.6	0.431	1.157	0.191	12.6	1.580	1.162	0.168
11.0	0.407	1.119	0.175	11.0	1.488	1.133	0.190
9.5	0.384	1.104	0.164	9.5	1.393	1.121	0.192
8.3	0.360	1.123	0.152	8.3	1.294	1.139	0.176
7.2	0.338	1.124	0.146	7.2	1.200	1.137	0.163
6.3	0.317	1.120	0.152	6.3	1.112	1.130	0.161
5.5	0.297	1.101	0.148	5.5	1.034	1.109	0.152
4.8	0.278	1.053	0.147	4.8	0.960	1.059	0.150
4.2	0.256	1.000	0.146	4.2	0.878	1.005	0.147
3.6	0.239	0.958	0.159	3.6	0.814	0.962	0.160
3.2	0.221	0.942	0.158	3.2	0.749	0.946	0.158
2.8	0.202	0.906	0.150	2.8	0.679	0.908	0.150
2.4	0.188	0.912	0.120	2.4	0.628	0.914	0.120
2.1	0.179	0.957	0.157	2.1	0.596	0.960	0.156
1.8	0.161	0.960	0.167	1.8	0.532	0.962	0.166
1.6	0.139	0.960	0.150	1.6	0.459	0.961	0.149
1.4	0.125	1.003	0.175	1.4	0.411	1.004	0.174
1.2	0.115	1.045	0.198	1.2	0.374	1.045	0.196
1.0	0.104	1.047	0.158	1.0	0.336	1.047	0.157
0.91	0.094	1.041	0.124	0.91	0.302	1.041	0.124
0.79	0.086	1.046	0.133	0.79	0.273	1.047	0.133
0.69	0.077	1.059	0.149	0.69	0.244	1.060	0.148
0.60	0.068	1.076	0.166	0.60	0.214	1.076	0.165
0.52	0.059	1.093	0.189	0.52	0.184	1.093	0.188
0.46	0.050	1.105	0.211	0.46	0.154	1.105	0.211
0.10	0.002	1.027	0.066	0.10	0.006	1.024	0.058

Table A2-b2 Median AFs and sigmas for Model 2, Profile 1, for 2 PGA levels

M2P1K1		PGA=0.194		M2P1K1		PGA=0.741	
Freq (Hz)	Soil SA	Median AF	Sigma ln(AF)	Freq (Hz)	Soil SA	Median AF	Sigma ln(AF)
100.0	0.232	1.194	0.158	100.0	0.906	1.224	0.169
87.1	0.239	1.203	0.160	87.1	0.943	1.233	0.172
75.9	0.253	1.216	0.163	75.9	1.010	1.247	0.175
66.1	0.282	1.243	0.175	66.1	1.151	1.274	0.190
57.5	0.343	1.292	0.211	57.5	1.438	1.321	0.230
50.1	0.438	1.373	0.242	50.1	1.862	1.401	0.256
43.7	0.525	1.393	0.258	43.7	2.217	1.412	0.268
38.0	0.573	1.382	0.274	38.0	2.380	1.398	0.282
33.1	0.582	1.326	0.271	33.1	2.374	1.339	0.277
28.8	0.566	1.287	0.233	28.8	2.264	1.296	0.237
25.1	0.541	1.221	0.187	25.1	2.128	1.227	0.190
21.9	0.518	1.226	0.165	21.9	2.002	1.232	0.166
19.1	0.497	1.191	0.173	19.1	1.892	1.198	0.173
16.6	0.476	1.188	0.196	16.6	1.787	1.194	0.195
14.5	0.454	1.184	0.200	14.5	1.681	1.189	0.200
12.6	0.430	1.153	0.183	12.6	1.573	1.157	0.183
11.0	0.406	1.114	0.165	11.0	1.468	1.118	0.165
9.5	0.383	1.100	0.157	9.5	1.370	1.103	0.157
8.3	0.359	1.120	0.148	8.3	1.275	1.122	0.147
7.2	0.337	1.122	0.143	7.2	1.186	1.124	0.143
6.3	0.316	1.118	0.150	6.3	1.102	1.121	0.150
5.5	0.297	1.099	0.147	5.5	1.027	1.101	0.147
4.8	0.278	1.052	0.146	4.8	0.955	1.053	0.145
4.2	0.256	0.999	0.146	4.2	0.875	1.001	0.146
3.6	0.239	0.958	0.159	3.6	0.811	0.959	0.159
3.2	0.221	0.942	0.158	3.2	0.747	0.943	0.158
2.8	0.202	0.905	0.150	2.8	0.678	0.907	0.150
2.4	0.188	0.912	0.120	2.4	0.627	0.913	0.120
2.1	0.179	0.957	0.157	2.1	0.596	0.958	0.156
1.8	0.161	0.960	0.167	1.8	0.532	0.961	0.166
1.6	0.139	0.960	0.150	1.6	0.458	0.960	0.150
1.4	0.125	1.003	0.175	1.4	0.410	1.003	0.174
1.2	0.115	1.044	0.198	1.2	0.374	1.044	0.197
1.0	0.104	1.047	0.158	1.0	0.336	1.047	0.157
0.91	0.094	1.041	0.124	0.91	0.302	1.041	0.124
0.79	0.086	1.046	0.133	0.79	0.273	1.046	0.133
0.69	0.077	1.059	0.149	0.69	0.244	1.059	0.148
0.60	0.068	1.076	0.166	0.60	0.214	1.075	0.165
0.52	0.059	1.093	0.189	0.52	0.184	1.092	0.188
0.46	0.050	1.105	0.211	0.46	0.154	1.105	0.212
0.10	0.002	1.026	0.066	0.10	0.006	1.024	0.058

Enclosure 2

SUMMARY OF REGULATORY COMMITMENTS

The following table identifies commitments made in this document. (Any other actions discussed in the submittal represent intended or planned actions. They are described to the NRC for the NRC's information and are not regulatory commitments.)

COMMITMENT	COMMITTED DATE OR "OUTAGE"	COMMITMENT TYPE	
		ONE-TIME ACTION (Yes/No)	PROGRAMMATIC (Yes/No)
1. Peach Bottom Atomic Power Station, Units 2 and 3, will perform a Risk Evaluation including a High Frequency Confirmation evaluation.	As determined by NRC prioritization following submittal of all nuclear power plant Seismic Hazard Re-evaluations, but no later than December 31, 2019.	Yes	No
2. Peach Bottom Atomic Power Station, Units 2 and 3, will perform a Spent Fuel Pool evaluation in accordance with EPRI Report 1025287, Section 7.	As determined by NRC prioritization following submittal of all nuclear power plant Seismic Hazard Re-evaluations, but no later than December 31, 2019.	Yes	No
3. Peach Bottom Atomic Power Station, Units 2 and 3, will prepare an Expedited Seismic Evaluation Process (ESEP) Report in accordance with EPRI Report 3002000704.	December 31, 2014	Yes	No