

PPRP Exhibit__(HS-5)

BGE Responses to Selected Non-Confidential Data Requests

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 1
Request Received: 04/24/2019
Response Date: 05/08/2019

Item No.: PPRPDR01-01

The Applicant is declared to be Baltimore Gas and Electric Company (BGE) on page 2 of the Application:

- a) Please confirm that BGE is owned by Exelon Corporation.
- b) Will this project be conducted solely by BGE, as a distinct entity, or will other subsidiaries of or utilities owned by Exelon Corporation be responsible for elements of the project? If so, please list those elements and the responsible organization.

RESPONSE:

- a) BGE is a wholly-owned indirect subsidiary of Exelon Corporation.
- b) The Project will be conducted solely by BGE and its authorized contractors. However, in managing certain administrative functions, BGE will utilize Exelon Business Services Company (Exelon BSC). Exelon BSC is a shared services organization that provides enterprise-wide administrative function support across Exelon and its utilities for functions including finance, human resources, information technology, legal, and supply chain. Exelon BSC also assists with transmission planning functions.

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Item No.: PPRPDR01-02

The Application describes modifying an existing transmission line that was built in 1976.

- a) Was a CPCN issued for constructing the existing transmission line referenced by BGE? If so, please provide the PSC Order Number and copies of the Licensing Conditions, if any, associated with the CPCN.
- b) Did any previously granted CPCN for the Riverside to Brandon Shores 230 kV transmission line include, address, or condition the underground segment of the line between Hawkins Point and Sollers Point? If so, please describe those portions of the CPCN and indicate whether they are relevant to the proposed project.
- c) Footnote 1 on page 2 of the Application refers to "a modification of an existing **overhead** transmission line." [emphasis added] Please describe and illustrate with detailed maps all portions of the area in which the proposed new overhead transmission line structures and conductors will be constructed that overlap with existing overhead transmission line structures and conductors.

RESPONSE:

- a) The Sollers Point to Riverside portion of the existing 230 kV transmission line was included as part of the Commission Case No. 6353 CPCN proceeding. In issuing the associated Order No. 58087 and granting the CPCN, the Commission imposed no licensing conditions.

Additionally, please refer to Commission Case No. 9009 involving the granting of a CPCN to BGE to build an additional parallel 230 kV line from Brandon Shores to Riverside. In granting that CPCN (Order No. 79800), the Commission imposed nine (9) licensing conditions, all set forth in *PPRP01-02 Attachment 1*. BGE is referencing Case No. 9009 in this response because the current Project includes select modifications to the Sollers Point to Riverside section of the parallel 230 kV line that was the subject of Case No. 9009.

- b) The construction of the existing transmission line segment crossing under the Patapsco River between Hawkins Point and Sollers Point did not involve construction of an overhead transmission line segment and therefore was not subject to the CPCN statutory requirements found in Public Utilities Article § 7-207(b)(3). Accordingly, the underground segment of the line between Hawkins Point and Sollers Point was not

included, addressed, or conditioned, to BGE's knowledge or information, as part of any previously granted CPCN for the Riverside to Brandon Shores 230 kV transmission line.

- c) The statement in Footnote 1 on page 2 of the Application is referring to the fact that the proposed cross-Patapsco River overhead transmission line segment and the Sollers Point to Riverside transmission line segment work that are the subject of the Case No. 9600 proceeding are portions of an existing BGE 230 kV overhead transmission line that runs from the Brandon Shores generation station to the Riverside substation (with one underwater segment crossing under the Patapsco River). Accordingly, the proposed work is a modification to an existing overhead transmission line and is eligible for a discretionary CPCN waiver from the Commission pursuant to Public Utilities Article § 7-207(b)(3)(ii). As noted in the Application, BGE has elected not to seek such a waiver at this time, but reserves the right to do so at a later date. Please see *PPRPDR01-02 Attachment 2* for maps indicating the requested information regarding Project overlap with existing overhead transmission line structures and conductors.

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Item No.: PPRPDR01-03

The CPCN Application depicts in Figure 1, on page 7, a simplified schematic of the Baltimore 230 kV loop system. Please provide a detailed BGE Systems Map showing 115kV to 500kV transmission lines and associated substations.

RESPONSE:

Please see *CONFIDENTIAL CEII PPRPDR01-03 Attachment 1* for the requested information. Please note that the attached map contains confidential information and Critical Energy/Electric Infrastructure Information (CEII) and is being provided pursuant to the terms and conditions contained in the Protective Agreement and the CEII Addendum to Protective Agreement executed by PPRP and BGE in the Case No. 9600 proceeding.

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Item No.: PPRPDR01-04

Figure 3, on page 8 of the CPCN Application, shows the Baltimore 230 kV Loop System without the Harbor Crossing cable link.

- a) Did BGE evaluate an alternative that would add to, reinforce, or upgrade to 230 kV the existing 115 kV spokes from node BGE5 to the downtown loop and then back to node BGE4 to replace the Harbor Crossing link and re-establish the Loop System?
- b) If the answer to (a) is yes, please summarize that evaluation and explain why this option was not considered further.
- c) If the answer to (b) is no, please explain why this option was not included among the alternatives considered.

RESPONSE:

- a) Yes. During the conceptual planning stages of the Project, BGE evaluated high level alternatives to the preferred Harbor Crossing link. When developing these conceptual alternatives for consideration, BGE accounted for numerous factors to meet the requirements of meeting or exceeding the system performance that the circuits connecting the Brandon Shores and Riverside substations provide. Preliminary alternative analyses associated with reinforcing or upgrading to 230 kV the existing 115 kV spokes from node BGE5 to the downtown loop and then back to node BGE4 to replace the Harbor Crossing link and re-establish the Loop System included the following two high-level conceptual plans:

1) New 230kV underground circuits (No River Crossing) connecting Brandon Shores and Riverside substations

- Evaluated new underground circuits ranging between 19 and 23 miles.
- Expected to maintain a comparable level of system reliability and performance.
- Single cable per phase with reduced capacity planning level cost estimate 2 to 3 times more than the cost estimate for the proposed Harbor Crossing link.
- Two cables per phase to meet or exceed existing capacity planning level cost estimate 3 to 5 times more than the cost estimate for the proposed Harbor Crossing link.
- Indirect path between the substations creates a much longer circuit length.
- Route would traverse dense urban areas including a combination of industrial and residential areas and would include a series of Patapsco River tributary water crossings.

- Increased risks with regards to constructability resulting in significant uncertainty in scope, schedule, and cost for this alternative route.
 - Increased operations and maintenance costs over the lifetime of the circuit relative to overhead circuit.
 - Increased likelihood of sustained outages associated with the longer time to repair underground cables.
- 2) **New 500/230 kV transformation at Graceton Substation, new towerline connection Graceton Substation and Northeast Substation, upgrade/replace overloaded existing 115 kV supplies connecting to downtown Baltimore City and upgrade/replace downtown Baltimore City circuits, add bulk power capacitors/SVC**
- Scope of work would include replacing numerous downtown Baltimore City circuits, adding two new circuits between the Graceton and Northeast substations, and performing all associated substation upgrades.
 - Planning level cost estimate 2 to 3 times more than the cost estimate for the proposed Harbor Crossing link.
 - Breaks the double-circuit 230 kV ring around the Baltimore metropolitan area established with previous projects to address past planning criteria violations.
 - Exposes system to increased risks associated with single and common-mode outages for both thermal and voltage criteria violations.
 - Does not effectively use existing right-of-way between Brandon Shores and Riverside.
 - Reduction in ability to address market-driven generation retirement scenarios.
 - Provides limited support for system expansion and hampers ability to handle future load growth and higher-than-expected system loads.
 - Decreased flexibility to address additional aging infrastructure and associated outage requirements.
 - Negative impact to overall system stability with the potential to impact the stability of local generation.
 - Reduction in capacity emergency import capability.
 - Significant increase of dependence of the overall BGE electric network grid on the Baltimore downtown 115 kV circuits during both normal and emergency conditions.
 - Decrease of system resiliency during extreme events.
 - Possible transmission congestion impacts resulting in increased customer energy costs.
 - Reduction of operational flexibility during planned and unplanned outages.

Converting existing downtown 115 kV underground circuits to 230 kV voltages was evaluated not to be a feasible alternative to address the issues associated with removal of the Harbor Crossing cables. Outage requirements and substation upgrades and conversions to 230 kV would be extremely physically- and cost-prohibitive.

The preferred option to install overhead conductors across the Patapsco River addresses the Harbor Crossing cable failure risks without compromising the existing system reliability and performance. The alternatives considered to this preferred option were not expected to provide the same level of reliability and performance within comparable costs. Further detailed analysis of the scope of work required to implement the conceptual alternatives mentioned above and their estimated costs were not performed following the preliminary conceptual review.

- b) Please refer to BGE's response to (a) above.
- c) Please refer to BGE's response to (a) above.

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Item No.: PPRPDR01-05

The discussion on pages 4-5 of the Application indicates that tests have shown that the levels of combustible gases have been rising over time. Please provide a graph or table showing the test dates and the observed dissolved gas concentrations.

RESPONSE:

Please see below for graphs of the dissolved gas levels in each of the 5 pipe type cables. The values shown are normalized to make display and analysis easier. They are normalized based on the following values:

Ethylene 200 Acetylene 20 Hydrogen 1000 Oxygen 3000

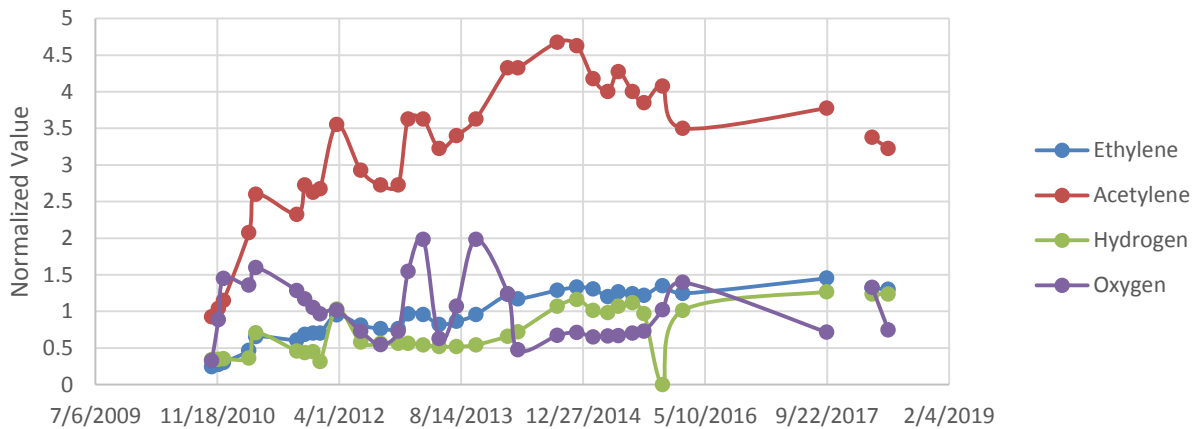
These normalized values need to be taken in the context of the normal / allowable values which are shown in the table below extracted from IEEE Std 1406-1998.

Based on this information, acetylene levels in excess of 50 ppm, or 2.5 on the normalized chart represent severe concern. The acetylene levels in these cables have been above that level since 2010. Similarly, hydrogen values over 0.6 represent severe concern and this has generally been the case since 2011.

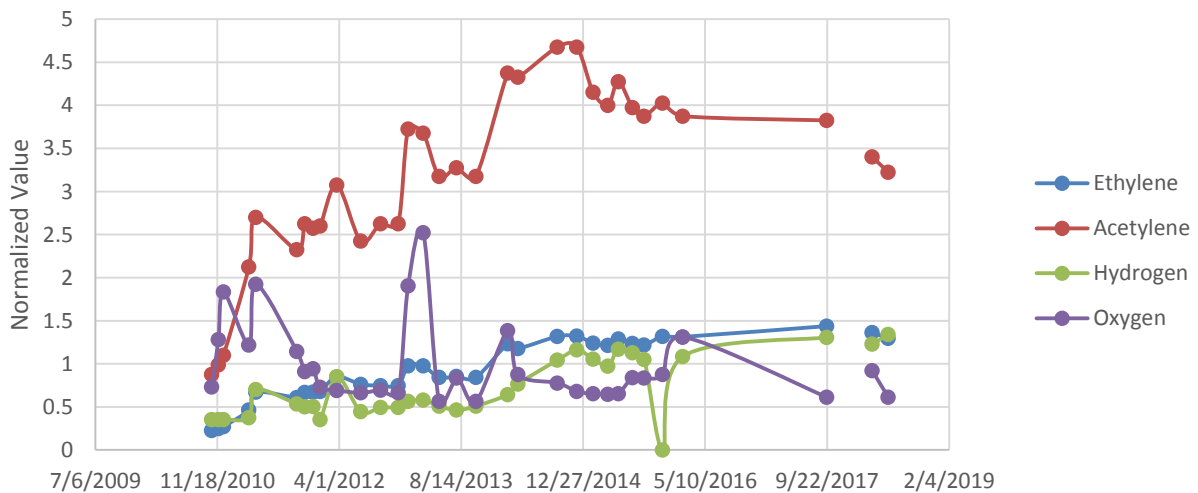
Table 9—Guidelines for levels of gases found by DGA in HPFF cable systems

Gas	Normal, age in years			Moderate concern	Severe concern
	<5	5–20	>20		
N ₂	<120,000			>120 000	>200 000
O ₂	500	1000	2000	>3000	>5000
CO ₂	300	500	800	>1000	>5000
CO	50	100	200	>500	>1000
H ₂	100	300	600	>1000	>5000
CH ₄	50	75	100	>500	>1000
C ₂ H ₆	200	300	500	>1000	>1500
C ₂ H ₄	25	50	75	>200	>1000
C ₂ H ₂	0	5	10	>20	>50
TCG	400	750	1200	>3000	>8000

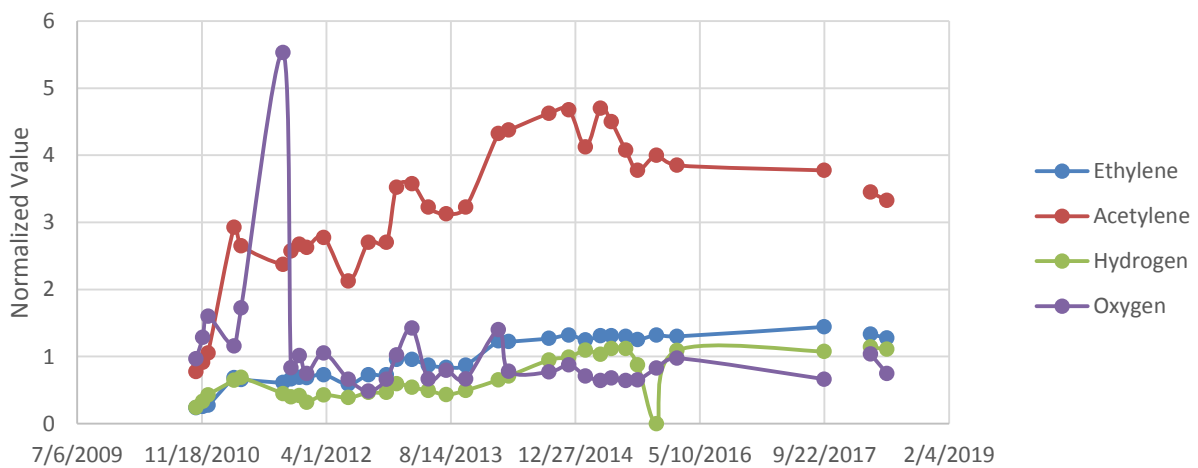
2345-1 Sollers



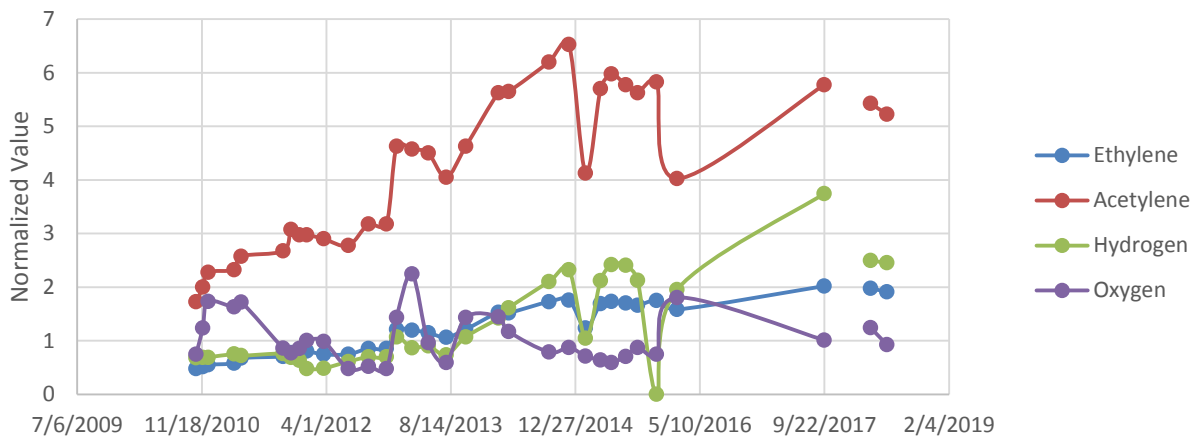
2345-2 Sollers



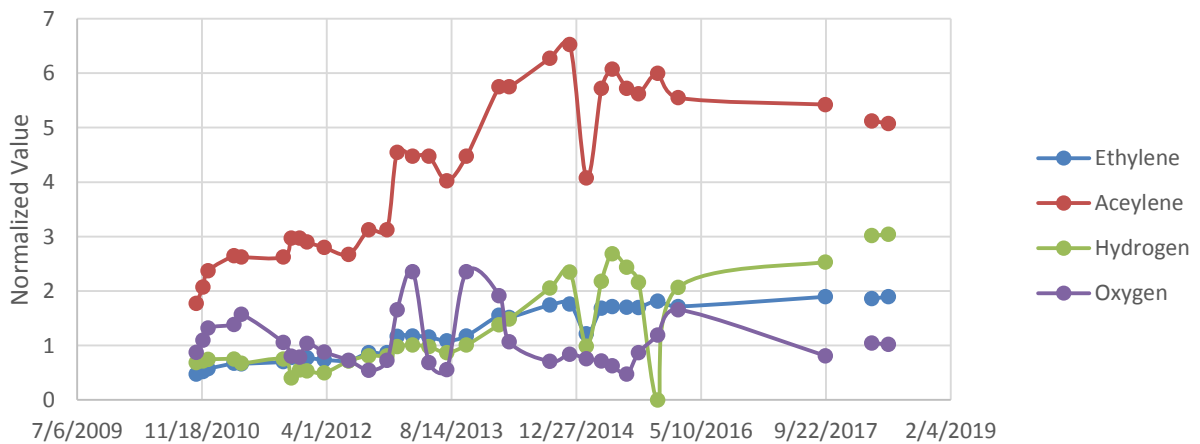
2345-3 Sollers



2344-1 Sollers



2344-2 Sollers



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Item No.: PPRPDR01-06

On pages 11-12 of the Application, BGE makes the following statements: "All five cables are believed to be exhibiting the same problems, and they have the same age and electrical exposure. It is possible that any single cable failure could be quickly followed by others without any specific causality. Specifically, since all the cables have the same operating hours, load cycles, and exposure to similar operating temperatures and thermos-mechanic bending forces, the failure mechanisms probably are not limited to a single cable or a single circuit."

- a) Although this passage suggests strong correlation between the cables, the time to failure of identical parts is usually considered to be statistically independent. Has BGE consulted any experts in reliability theory to arrive at its assessment? If the answer is yes, please provide a summary of the consultant(s) evaluation(s).
- b) Is BGE aware of any studies that estimate or use observations to determine the expected probability distribution of failure lifetimes for cables of this type? If so, please provide a reference or copy.
- c) Is BGE aware of any reported failures of submarine cables of this type? If so, please provide copies or references, or summarize these events, including any information on cable age, operating hours, load cycles, operating temperatures, or unusual circumstances contributing to the failure.

RESPONSE:

- a) BGE has not considered reliability theory to apply due to the poor condition assessment results of the existing cables, and therefore has not consulted any reliability theory experts. The elevated dissolved gas levels for acetylene and hydrogen were measured multiple times on all cables at or above the severe level of concern. Additionally, results of the Partial Discharge tests indicating multiple locations of discharges and the indications of cable movement within the pipes clearly indicate specific topics of concern. BGE believes that the consistency of the poor condition assessment results across all five cables negates any results that might come from the application of reliability theory.
- b) BGE is not aware of any studies of probability of cable failure based on elevated dissolved gas levels, active partial discharge, and signs of cable movement/displacement within the pipeline. Industry longevity studies have been based on overall performance without advanced knowledge of elevated gasses, partial discharges, and cable movement.

BGE is aware of a longevity study performed for BGE which was referenced in and attached as Confidential Attachment 1 to BGE's response to StaffDR02-16: USI Final Report: Longevity Study Baltimore Gas & Electric 230 kV Pipe Type Cable Circuits 2344/2345, Hawkins – Sollers Pt. Harbor Crossing, USI JO 11858, October 25, 2011.

- c) BGE is not aware of failures in submarine installed pipe type cables. Submarine transmission cables have been commonly installed using a different type of oil filled cable, the self-contained paper insulated oil filled cables. These self-contained cables have different construction compared to the existing pipe type cables, and failure mechanisms are different. In BGE's response to StaffDR02-16, reference was made to discussions with FPL. FPL has a significant number of pipe type cables installed in submarine environments. FPL recommended excavation of the splices and adjacent pipe type cable pipes. Based on previous PPRP guidance, that approach is not viable at BGE due to the fact that buried in-water splices would require excavating approximately 4,000 feet of existing river bottom to raise the splices to the surface.

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Item No.: PPRPDR01-07

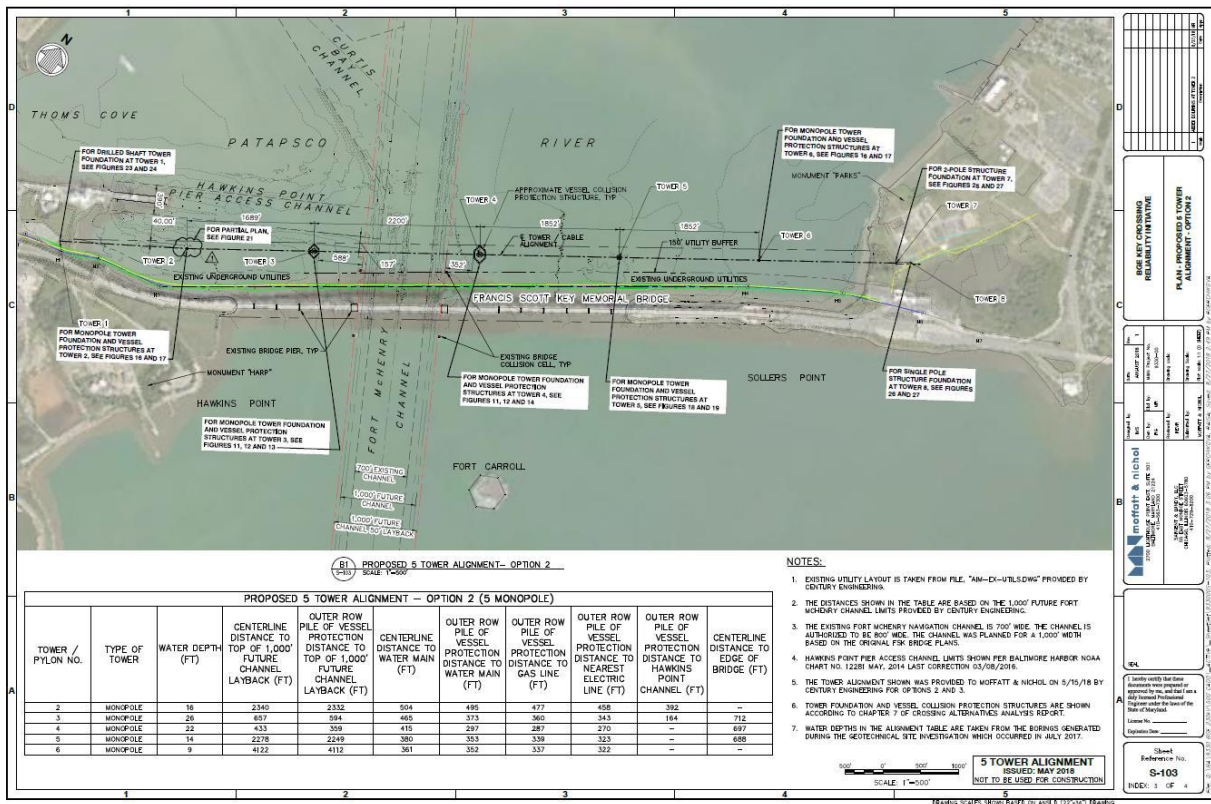
On page 14 of the CPCN Application, BGE states that the existing transmission line right-of-way (ROW) has a width varying between 70 and 180 feet. Sizes of the ring protection structures for the monopole configuration found in Environmental Review Document, Figures 3.2-21 and 3.2-22, are approximately 133 Ft x 201 Ft (Tower 4) and 154 Ft x 256 Ft (Tower 5), with the longer dimension oriented perpendicular to the ROW. Thus, the protection structures would appear to be wider than the maximum width of the ROW.

- a) Will the monopole foundations be located in the center of the ROW?
- b) Will the protection structures extend beyond the ROW boundary at any point?
- c) Will BGE need to expand the ROW to accommodate the protection structures?
- d) Please provide a diagram for each tower location showing the pole center point, the existing utility (cable) corridor, the extent of the pole foundation, and the outer extent of the associated protection structure, superimposed accurately on a map of the ROW boundaries at that location.

RESPONSE:

- a) The term right-of-way or "ROW" is used to refer to land-based real estate, specifically property either owned by BGE in fee or to which BGE has easement rights to use for transmission infrastructure. The land-based monopoles associated with the Key Crossing project will be within the BGE ROW but not necessarily in the middle of the ROW.
- b) For the monopoles to be located in the Patapsco River, BGE will secure the rights to construct, own and operate the transmission infrastructure through the permitting process. The size and location of these towers (foundations and vessel collision protection structures) will be recorded on marine navigation maps to aid commercial shipping and recreational boaters. Real property ownership or easement rights (e.g., ROW) are not applicable to these in-water structures.
- c) Please see the response to (b) above.
- d) BGE has chosen to proceed with Option 2, the monopole option. Please refer to the Joint Permit Application ("JPA") in Appendix E of the Environmental Review Document. Within the JPA documentation, Appendix D contains the 30% design drawings. Within the 30% design drawings, please refer to reference sheet S-103, which shows the

proposed alignment for the monopole design (a snapshot appears below). On the bottom is a table describing the distances between the new line facilities and various existing features. The third column from the right lists the distance between the nearest existing underground electric cable and the nearest driven pile for the new line. This table indicates that the distance ranges between 270 feet at Tower 4 to 458 feet at Tower 2. As mentioned in the response to (a) and (b) above, the land-based ROW boundaries are not applicable to these in-water towers.



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Item No.: PPRPDR01-08

Footnote 2 on page 14 of the Application indicates that "structure numbers, types, dimensions, and precise locations.... change from the information set forth in this application through actual construction of the Project." A change in the number or location of the transmission structures could modify the footprint of project significantly and require additional or revised assessments of the environmental impact of the project by PPRP.

- a) Will the Applicant be able to accommodate the delays that such re-evaluations will require within its proposed project schedule?
- b) Is the Applicant requesting that the environmental impact analyses include allowances for any specific potential changes in the numbers, types, dimensions, or locations of the proposed structures? If so, please provide a list or description of the alternate configurations that should be evaluated.

RESPONSE:

- a) The Applicant will not be able to accommodate any delays in its proposed project schedule that such additional or revised assessments would require. To avoid this scenario, BGE has further developed the project to the point that the possible changes referenced in Footnote 2 on page 14 of the Application are no longer expected with the final design. The Applicant is confident that the final design will be within the stated environmental impacts and that a reevaluation will not be necessary.
- b) The Applicant has adopted a conservative approach when stating the anticipated environmental impacts from the Key Crossing project. As the engineering and design of the project has progressed beyond the 30% design point that was included in the Application, the locations of the in-water towers have not changed. The sizes of the foundations and vessel collision protection structures have adjusted resulting in a slight net decrease in surface area, and the number of in-water piles has been reduced. At the time of this response the project is at a 65% design. The differences between the 30% design and the current 65% design are presented in more detail in the Project Summary, attached hereto as *PPRPDR01-08 Attachment 1*. As noted above in the response to (a), BGE does not expect these aspects of the Key Crossing project to change further as the final design details are addressed. Consequently, this has increased the Applicant's confidence that the final design will be within the stated environmental impacts and that a reevaluation will not be necessary.

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Item No.: PPRPDR01-09

COMAR 27.01.02.02.F.1.b generally prohibits development or redevelopment of utility transmission facilities in the Critical Area without a demonstration of a net water quality improvement.

- a) Please provide a breakdown by source of all water quality impacts and improvements that will result from the project, and to the extent possible provide quantitative estimates of the resulting impacts or improvements (e.g. amount of sediment eroded from construction areas, pounds of nutrients or particulate matter removed or sequestered per year, gallons of water filtered per year).
- b) Please summarize verbal discussions and provide copies of all correspondence to date with the Critical Area Commission with respect to construction in the Critical Area Buffer.
- c) Please summarize verbal discussions and provide copies of all correspondence to date with the Maryland Department of the Environment with respect to construction in the Critical Area itself.

RESPONSE:

The Key Crossing project is the replacement of an existing section of the BGE 230 kV transmission system which results in the decommissioning of two transition stations located in the Chesapeake Bay Critical Area ("CBCA"). The project consists of the construction of three transmission poles in the CBCA and the clearing of forest/shrubs associated with the revised overhead transmission easement. Through regulatory coordination meetings with Baltimore City, Baltimore County, and the CBCA Commission, the Baltimore City Planning Department abdicated jurisdiction and review to the CBCA Commission for impacts associated with work in Baltimore City. Additionally, the CBCA Commission has notified BGE that the project will require a full CBCA Commission review. BGE contractor Century Engineering, Inc. ("Century") is preparing existing conditions, impact, and mitigation plans for submission to the CBCA Commission and Baltimore County in May 2019 for review and approval.

- a) Below is a summary of clearing impacts and associated mitigation for the project based on the 65% design:

Jurisdiction	Vegetation Type	Location Type	Clearing Ratio	SF Impact	Mitigation Required (SF)
Baltimore County	Forested	Wetland/Buffer	3	32,111	95,871
Baltimore County	Forested	100' Buffer	2	15,580	35,116
	Totals			47,691	130,987
	Totals (AC)			1.09	3.01
	Totals (Trees, 200/ac)				601
	Individual Trees cleared		1	3 Trees	3 Trees
	Total Trees required			601+3	604

Jurisdiction	Vegetation Type	Location Type	Clearing Ratio	SF Impact	Mitigation Required (SF)
Baltimore City	Forested	Wetland/Buffer	3	8,078	24,234
Baltimore City	Forested	100' Buffer	2	1,619	3,238
Baltimore City	Forested	CBCA	1	23,670	23,670
	Totals			33,367	51,142
	Totals (AC)			0.77	1.17
	Totals (Trees, 200/AC)				235
	Individual Trees Cleared		1	0 Trees	0 Trees
	Total Trees Required				235

Approximately 3.92 acres of the required 4.18 acres of vegetative mitigation is anticipated to be satisfied on site at BGE's Riverside Property. Attached hereto as *PPRPDR01-09 Attachment 1* is a copy of the Riverside Master Plan graphic for proposed CBCA mitigation planting locations. Based on agency coordination the remainder of the mitigation will be satisfied at the Chestnut Hill Cove mitigation site, via fee-in-lieu payment, or the purchase of CBCA bank credits.

Based on draft CBCA 10% pollutant reduction calculations, there is no new net impervious area in the CBCA and therefore no pollutant reduction mitigation required for the project. Attached hereto as *PPRPDR01-09 Attachment 2* is a copy of the draft project calculations. Although the transition stations will be returned to a vegetated state (from yard stone to grass), no mitigation credit will be taken for this as the stone yard is semi-pervious and the ultimate development of these locations is unknown at this time.

b) BGE has had the following meetings with CBCA regulatory reviewers:

- Project Agency Summit Meeting – July 6th, 2016
- Section 7 and Section 106 Coordination Meeting at MDE – February 2017
- Baltimore City Planning Department – November 2018
- JE Meetings – May 2017, November 2017, and September 2018
- PPRP CPCN Field Meeting – March 19, 2019 (attached hereto as *PPRPDR01-09 Attachment 3* is a copy of the meeting sign-in sheet)
- Baltimore County JARG Meeting – March 21, 2019

- Key Crossing Reliability Initiative and Chestnut Hill Cove Site Visit – March 28, 2019 (attached hereto as *PPRPDR01-09 Attachment 4* is a copy of the meeting minutes email and the CBCA Commission email)

During the above agency coordination meetings, there were no objections to the proposed CBCA impacts associated with the project. Baltimore County will be reviewing the impacts on the Sollers Point side of the project and will coordinate with the CBCA Commission during the review for the Hawkins Point side of the project. As noted above, Baltimore City has deferred to the CBCA Commission for review and approval under the CBCA regulations.

- c) MDE was present at all of the meetings listed in the response to (b) above except for the meeting with the Baltimore City Planning Department. MDE has concurred with the CBCA Commission in its review and comments on the proposed project in the CBCA.

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Item No.: PPRPDR01-10

Please describe the techniques that will be used to string the cables across the Patapsco River, and indicate whether this operation will interfere with navigation or require bottom disturbance (e.g. barges anchored to river bottom areas).

RESPONSE:

A helicopter will be used to string the cables across the Patapsco River. For safety reasons, the shipping channel will be closed for short durations while this activity occurs. The stringing of the conductor wires across the Patapsco River is the only construction activity that will require temporary closure of the shipping channel. Please refer to Section 4.7.3.1 of the Environmental Review Document for additional information on harbor activity and safety. The wire pulling and tensioning equipment will be located on land. The Applicant does not anticipate using barges for these stringing operations.

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Item No.: PPRPDR01-11

Please provide an electronic copy or link to BGE's Avian Management Program Guidelines referenced on page 4-37 of the Environmental Review Document.

RESPONSE:

Please see *PPRPDR01-11 Attachment 1* for a copy of BGE's Avian Management Program Guidelines. Please also see *PPRPDR01-11 Attachment 2* for a copy of BGE's draft Key Cross Reliability Initiative Transmission Line Project Avian Protection Plan.

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Item No.: PPRPDR01-12

Page 22 of the Application notes that impacts to fish and aquatic fauna from installing the foundations for the new transmission towers will be mitigated to the extent possible by the construction techniques to be employed.

- a) Please provide the detailed information on the noise sensitivity of the aquatic species known to be present in the Patapsco River that was used by BGE in its assessment.
- b) Describe all noise mitigation approaches that were considered for protecting sensitive aquatic species during construction and explain why they were chosen or rejected for use in this project.
- c) Did BGE conduct any underwater acoustic environment measurements in or near the proposed project pathway? If so, please provide the data collected in spreadsheet or other form suitable for analysis.

RESPONSE:

- a) Subsection 4.4.3 of the Environmental Review Document (ERD) addresses the Project's potential impacts on aquatic resources. Underwater noise is addressed beginning on page 4-40. Noise sensitivities for three types of aquatic species with the possibility of exposure to Project construction are presented in Table 4.4-4 found on page 4-43. See also pages 4-47 and 4-53.
- b) The measures BGE has chosen to limit noise impacts are listed on page 4-37 of the ERD. On May 1, 2019 BGE met with several of the environmental agencies at the Department of Natural Resources in Annapolis, Maryland. PPRP was present at the meeting. The purpose of the meeting was to discuss the aspects of the Key Crossing project that may have an impact on avian or aquatic species. Attached hereto as *PPRPDR01-12 Attachment 1* and *PPRPDR01-12 Attachment 2* are copies of the Avian Fact Sheet and Fisheries Fact Sheet, respectively, presented at the meeting. The Fisheries Fact Sheet contains a list of the best management practices that BGE has been considering for potential deployment. The outcome of the meeting was that the Applicant will consider adopting an Adaptive Management Approach based upon sequencing construction activities and utilizing possible best management practices in a way that minimizes or mitigates the potential impact to avian and aquatic species of concern while minimizing the impact to construction productivity and the overall project schedule. This Adaptive Management Approach will be the subject of further discussions with the environmental agencies as the permitting process progresses.

- c) BGE has not conducted any measurements of the underwater acoustic environment, but is committed to conducting ambient noise monitoring, including during test pile installation.

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Item No.: PPRPDR01-13

Constructing the tower foundations and protection structures will deny access to currently fishable waters.

- a) Please estimate the total surface acreage that will no longer be accessible for fishing activities because of the project.
- b) Has BGE proposed any mitigation to compensate for this loss of fishable waters? If so, please describe.

RESPONSE:

- a) Access to fishing will be limited within the Limit of Work (“LOW”) – an area estimated to encompass 77.59 acres – but this will only be temporary during construction efforts, and construction sequencing will provide fishing access to multiple areas within the LOW during construction. Following construction, fishing will be reduced by approximately the surface area of the foundation pilings (or 2,048 ft² per the project summary fact sheet). Although the foundation and vessel collision protection (“VCP”) structure concrete platforms (25,503 ft² or 0.585 acres) are located within the Patapsco River, the foundation platforms, with the exception of the protective walers (944 ft²), do not occupy any of the water column. Additionally, the new foundations and VCP will provide structure within the water column that will act as habitat for many species by providing both a refuge for smaller fish species as well as conditions for ambushing by predatory fish species where previously none existed.
- b) Mitigation for tidal waterway fill is being required by MDE at a 1:1 ratio. This mitigation is being satisfied at the Chestnut Hill Cove mitigation site.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 1
Request Received: 04/24/2019
Response Date: 05/08/2019

Item No.: PPRPDR01-14

An internal Environmental Consulting and Technology, Inc. (ECT) company memorandum dated November 3, 2017 on the topic of “Biodegradation Applicability and Conceptual Plan for Key Crossing Oil Removal” from Mark A. Culbreth, P.G. and Greg B. Page, P.E. to Jeff Meling was included in Appendix C5 (titled “Key Crossing Oil Remediation Study Report”) of the Applicant’s Environmental Review Document (ERD). On page 3 of the internal memorandum, the following statement is provided:

“The original oil used in BGE’s system was Sun #4. When BGE replaced the terminations and degassed the system in 2009, approximately 3,000 gallons of a new oil, DF-100, was added, since Sun #4 was no longer available... BGE has tested the dielectric fluid/mineral oil for polychlorinated biphenyls (PCBs) and none have reportedly been detected.”

Please provide:

- a) The laboratory analyses for PCBs, and the associated sampling report, for the dielectric fluid/mineral oil.
- b) If the sample collection and laboratory analyses for PCBs was conducted after the approximately 3,000 gallons of DF-100 oil was added, please provide information regarding the sample methodology employed to ensure characterization of the original (i.e., Sun #4) dielectric fluid/mineral oil.

RESPONSE:

BGE routinely tests all transmission insulating oils for PCB to ensure contamination has not occurred. BGE collected the most recent oil samples for PCB testing on June 27, 2018 from the Hawkins Point and Sollers Point pump house tanks that supply oil to the existing underground transmission cables. Since the oil is constantly circulated taking oil from the tank is representative of the oil within the system. Both oil tanks were found to contain oil with less than 5 ppm PCB. These samples were tested in accordance with EPA SW-846 methods 8000, 8082, 9079 and 3541, and ASTM D4059. The report of all BGE samples taken at that time is shown below.



Exelon Industrial Services
1015 Brandon Shores Rd. Baltimore, MD 21226
Contact: (410) 470-0306, -9704
Emergency calls (outside business hours): (410) 470-0322

CERTIFICATE OF ANALYSIS

To: Dunham, Courtney

Account Number:

ORG/DEPT: BGE

Report Date: 7/10/2018

LAB NUMBER	MATRIX TYPE	COLLECT DATE	REFERENCE NUMBER	COMPANY NUMBER	PCB AMOUNT	UNITS	SAMPLING LOCATION	SAMPLE COMMENT
F0280705	OIL	06/27/2018	1	110553 A Phase	<5	ppm	Westport	None
F0280706	OIL	06/27/2018	2	110553 B Phase	<5	pm	Westport	None
F0280707	OIL	06/27/2018	3	110553 C Phase	<5	ppm	Westport	None
F0280708	OIL	06/27/2018	4	110554 A Phase	<5	ppm	Westport	None
F0280709	OIL	06/27/2018	5	110554 B Phase	<5	ppm	Westport	None
F0280710	OIL	06/27/2018	6	110554 C Phase	<5	ppm	Westport	None
F0280711	OIL	06/27/2018	7	P.House Tank 110552	<5	ppm	Westport	None
F0280712	OIL	06/27/2018	8	110602 Tanks	<5	ppm	Hillen	None
F0280713	OIL	06/27/2018	9	110604 Tanks	<5	ppm	Hillen	None
F0280714	OIL	06/27/2018	10	110604 3 Phase	<5	ppm	Haz. Sub MPFF	Common
F0280715	OIL	06/27/2018	11	110602 All Phase	<5	ppm	Haz. Sub Tanks	Common
F0280716	OIL	06/27/2018	12	P.House Tank	<5	ppm	East Towson	None
F0280717	OIL	06/27/2018	13	P.House Tank	<5	ppm	Caves Valley	None
F0280718	OIL	06/27/2018	14	P.House Tank 110517/518	<5	ppm	Dolfield	None
F0280719	OIL	06/27/2018	15	P.House Tank North	<5	ppm	Center	Spare
F0280720	OIL	06/27/2018	16	P.House Tank	<5	ppm	Meadows	None
F0280721	OIL	06/27/2018	17	P.House Tank	<5	ppm	Sollers Pt.	None
F0280722	OIL	06/27/2018	18	P.House Tank	<5	ppm	Hawkins Pt.	None
F0280723	OIL	06/27/2018	19	P.House Tank South	<5	ppm	Center	In Service
F0280724	OIL	06/27/2018	20	P.House Tank	<5	ppm	Erdman	None

REPORT NOTE:

Laboratory Procedures for analyses and sampling are based on: EPA SW-846 methods 8000, 8082, 9079, and 3541; and ASTM Method D4059.

If you have any questions about this report or require additional analytical work, please call 410-470-0306, -0322.

Samples will be held for five (5) working days from the date of this report unless you request otherwise.

Approved Data, Final Report

Sample Received Date Range Job Name REPORTED BY: Sarah Hoying 07/10/2018 2:10:12PM
06/27/2018 to 06/27/2018 PCB-00012157

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 2
Request Received: 05/02/2019
Response Date: 05/16/2019

Item No.: PPRPDR02-01

The document titled “Key Crossing Reliability Initiative, Alternatives Analysis” by Century Engineering and dated Nov 26, 2018 states that the Key Crossing project has a “critical function in the BGE 230 kV transmission” and that “BGE’s intent is to replace the circuits before the cables fail to preserve the integrity of the Bulk Energy System (BES)” (Executive Summary, p. I, 1st par.)¹

The document discusses the various alternatives for insuring reliability and grid integrity. One alternative covered in the document is the “No-build alternative,” which the document states “was rejected because of the effects that future cable failures would have on the capacity and reliability of the BES and the resultant interruptions of electrical service to BGE Customers.” (op.cit, p. ii).

- a) From the grid reliability perspective, please provide any technical studies, reports, or reviews that support this statement.
- b) Please identify the grid reliability criteria that BGE applied to determine that future cable failures would impact the reliability of the BES.
- c) Please provide any technical analysis or report that quantifies the impact on the reliability of the BES from a failure of the Key Crossing cable.
- d) Please quantify the term “resultant interruptions of electrical service to BGE Customers” in terms of number of customers affected, how often the interruptions will occur, and the duration of interruptions. Alternatively, this request may be addressed using industry measures such as SAIFI (System Average Interruption Frequency Index) and SAIDI (System Average Interruption Duration Index).
- e) Was there consideration given to reconfiguring the 115 kV and underlying distribution network to minimize the potential interruptions? If yes, please provide documentation on the reconfiguration options studied and the resultant changes to the impact on interruptions to customers. If no, provide an explanation of why such a consideration was not made.

RESPONSE:

- a) Please see *CONFIDENTIAL CEII PPRP02-01 Attachment 1* for load flow study results that describe the “No-build alternative” simulating future loading conditions without the

¹ This document is included as Appendix E of the Application for CPCN dated January 2019.

existing cables in service. The thermal loading on facilities above their emergency ratings are provided along with the list of contingencies that were simulated.

- b) The study referenced in the response to (a) above applied NERC, PJM, and BGE planning criteria to determine that future cable failures would impact the reliability of the BES.
- c) During real-time operations, PJM and BGE operate the transmission system consistent with PJM Manual 03 Transmission Operations, which is to an “N-1” contingency basis. At any time, the system is expected to be configured to withstand the loss of any single transmission facility and be within operating criteria. If a failure is to occur, PJM and BGE would subsequently look to the next “N-1” condition and determine if any operator actions are needed, including possibly taking emergency actions up to and including load shed. For planning studies, if a Key Crossing cable has failed and cannot be returned to service, the cable is removed from future modeling cases, and the planning criteria is applied to the new configuration. The load flow study results referenced in the response to (a) above also describe the scenario where all the cables are unavailable. The study results show that there are multiple criteria violations/potential facility overload conditions for many different contingencies.
- d) Please see the response provided in *CONFIDENTIAL PPRP02-01 Attachment 2*.
- e) BGE considered but did not pursue a reconfiguration of the 115 kV and underlying distribution network. Generally, reconfiguration of the 115 kV and underlying distribution network to minimize potential interruptions is a last resort method for operators to use during emergency conditions. It is not a preferred method used for long-term planning so that there remains some margin of operational flexibility during emergency conditions. In addition, abnormal conditions would increase reliability risk associated with other contingencies across the system.

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Baltimore Gas and Electric Co.
Response to PPRP Data Request 2
Request Received: 05/02/2019
Response Date: 05/16/2019

Item No.: PPRPDR02-02

A discussion of the situation if the Harbor Crossing cables were retired without replacement is given in page 15 of the document, which concludes that “(i) f there were no faults or failures in the system, power would still be delivered to all customers; however, if a fault occurred, especially on the east side of the 230 kV system, numerous customers could be affected.”²

- a. Please provide any technical studies, reports, or reviews that support the quoted statement.
- b. Please provide documentation on the specific faults evaluated, the assumed system conditions pre- and post-fault, and the software or method used to conduct the evaluation.
- c. Please identify the specific BGE transmission circuits that are referred to as “the east side of the 230 kV system.”
- d. Please quantify the statement regarding “numerous customers could be affected” in terms of estimated number of customers, how often such effects will occur, and the severity of the occurrences. Alternatively, this request may be addressed using industry measures such as SAIFI (System Average Interruption Frequency Index) and SAIDI (System Average Interruption Duration Index).

RESPONSE:

- a) Please see BGE’s response to PPRPDR02-01(a). The contingencies referenced in that response include facilities on the east side of the 230 kV system.
- b) All BES facilities were included as contingencies consistent with NERC, PJM, and BGE planning criteria. The study referenced in the response to PPRPDR02-01(a) was completed using PSS®E software by Siemens. The model in the study was consistent with the PJM Regional Transmission Expansion Plan models.
- c) Please see the response provided in *CONFIDENTIAL PPRP02-02 Attachment 1*.
- d) Please see the response provided in *CONFIDENTIAL PPRP02-02 Attachment 1*.

² This quoted statement is also included in the text of the Application for CPCN, p. 7, last paragraph.

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Response to PPRP Data Request 2
Request Received: 05/02/2019
Response Date: 05/16/2019

Item No.: PPRPDR02-03

On p. 16 of the document, it states that “In the absence of the Harbor Crossing cables, the 230 kV circuit loop would not be continuous, thereby increasing pressure on the 115 kV system to supply the east side of the BGE service territory and increasing the risk of sustained outages for customers downstream of the fault.”

- a. Please clarify whether there is a reliability criterion that forms the basis for the term “increasing pressure on the 115 kV system.” If there is such a criterion, provide a copy of the document that contains the criterion and indicate the specific section of the document that is being invoked.
- b. Please quantify the statement of “increasing risk” in terms of how much potential sustained outages increase in the absence of the Harbor Crossing cables.

RESPONSE:

Please see the response provided in *CONFIDENTIAL PPRP02-03 Attachment 1*.

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Response to PPRP Data Request 2
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Response Date: 05/16/2019

Item No.: PPRPDR02-04

Page ii of the document presents the various construction alternatives that were evaluated. However, industry practice for cases relating to reliability of service requires that prior to studying construction alternatives, an evaluation of transmission plan alternatives be conducted. A transmission plan exercise would involve evaluating the reliability impact of not constructing a replacement, i.e., the “no-build” plan, and if such is found to be unreliable, to consider transmission alternatives such as identifying an alternate transmission path (not necessarily the same as the existing path between Brandon Shores and Riverside substations), upgrading and/or strengthening the underlying 115 kV system, considering non-wires alternatives such as load management and embedded generation, and energy storage.

- a. Was a study of alternative transmission plans, as described here, conducted?
- b. If yes, please provide documentation of the study, including data, assumptions, alternatives considered, simulations, and findings. Provide a detailed description of each alternative studied and the rationale for studying each alternative. Provide details of specific analysis conducted such as power flow, contingency, transfer, voltage, and other analyses to evaluate each of the alternatives. If software was used to conduct the analysis, provide specific output from the software that supports the analysis and findings of the study.
- c. If no, please explain why such a study was not undertaken.

RESPONSE:

- a) Yes, please see BGE’s response to PPRPDR01-04.
- b) See the response to (a) above.
- c) See the response to (a) above.

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Baltimore Gas and Electric Co.
Response to PPRP Data Request 3
Request Received: 05/17/2019
Response Date: 06/03/2019

Item No.: PPRPDR03-01

On pages 11-12 of the Application, BGE states that "any single cable failure could be quickly followed by others without any specific causality."

- a. Is it BGE's contention that the five submarine cables comprising the Harbor Crossing are subject to a common mode of failure that will lead to loss of all five cables simultaneously?
- b. Alternatively, is BGE contending that after failure of one cable, that it is likely that all five cables will fail within a short period of time?
- c. Please explain BGE's responses to the previous two questions.

RESPONSE:

- a) It is not BGE's contention that all five submarine cables would fail simultaneously from internal causes. A simultaneous failure of all five cables, if it occurred, would likely be caused by external means, such as a large ship dragging an anchor and damaging all five submarine pipes, or an explosion or similar event in a terminal station damaging all equipment, etc. The referenced statement on pages 11-12 of the Application refers to the scenario whereby one cable fails from internal causes. If that were to occur, BGE would respond by disconnecting the failed cable from the system and restoring operation using the remaining 4 cables. This would result in the remaining cables operating at a slightly higher electrical loading than prior to the failure and creating higher amplitude cable heating and cooling cycles. From the observation of the cable moving within the pipeline toward the low spots under the shipping channel, it is believed the cable splices are wedged into the splice reducers. The increased amplitude of cable heating and cooling would increase the thermomechanical cable bending within the splice casings. Thermomechanical bending is a known cause of pipe type cable failures.
- b) BGE believes that once one cable fails, the increase in electrical loading on the remaining cables could increase the risk of failure of the remaining cables. It is believed this rate of failure would accelerate with each subsequent cable failure.
- c) Please see the responses to (a) and (b) above.

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Request Received: 05/17/2019
Response Date: 06/03/2019

Item No.: PPRPDR03-02

The five cables comprising the Harbor crossing are physically separated and connected to separate circuits of the Brandon Shores to Riverside 230 kV line.

- a. From a reliability and performance perspective, does BGE plan and operate its system on the assumption that the loss of both circuits of the Bayshores to Riverside 230 kV line is equally likely to the loss of one of the circuits?
- b. From a daily generation dispatching perspective, does BGE implement a security-constrained dispatch that assumes the loss of both circuits of the Bayshores to Riverside 230 kV line?
- c. Are there supplementary operating measures or guidelines in place to address the contingency loss of both circuits of the Bayshores to Riverside 230 kV line? If so, please provide documentation of such measures or guidelines.
- d. From the perspective of NERC standard TPL-004-1, under which of the contingency states does BGE classify the loss of one circuit from Bayshores to Riverside fall?
- e. From the perspective of NERC standard TPL-004-1, under which of the contingency states does BGE classify the loss of both circuits from Bayshores to Riverside fall?

RESPONSE:

- a) No. Regarding the Brandon Shores-Riverside circuits, BGE assumes that two simultaneous single circuit failures/contingencies is less likely than the loss of one of the circuits individually. However, after the single contingency loss of one circuit, the system must remain within prescribed operating limits. Furthermore, once a single contingency has occurred, the system operator must be able to readjust the system to prepare for any other subsequent single contingency. When planning the system, planners consider several types of credible contingencies including single and multiple element events with varying probability of occurrence and criticality. BGE plans to NERC, PJM, and BGE/Exelon criteria that prescribe the types of contingency events to be studied and the acceptable consequences when these events occur.
- b) BGE, as a transmission owner, does not perform generation dispatch. PJM, as the Transmission Operator, performs the generator dispatch function. During normal operation, PJM makes system adjustments, including generation re-dispatch, to control thermal and voltage constraints on a pre-contingency basis so that immediately following a single contingency, facility loadings and voltage profiles are within acceptable limits. After a single contingency occurs, the same process is followed to prepare for the next

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subsequent contingency. During unusual conditions, PJM may implement conservative operations and controls for the occurrence of more than one simultaneous contingency.

- c) BGE does not currently have supplementary operating measures or guidelines in place that would be used to address the real-time contingency loss of both circuits.
- d) NERC Standard TPL-004-1 (System Performance Following Extreme BES Events) is an inactive NERC standard that BGE does not use to identify planning criteria violations.
- e) Please see the response to (d) above.

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Item No.: PPRPDR03-03

BGE Response to PPRPDR01-04 (a) states that "BGE evaluated high level alternatives to the preferred Harbor Crossing link." Furthermore, BGE states that "The preferred option to install overhead conductors across the Patapsco River addresses the Harbor Crossing cable failure risks without compromising the existing system reliability and performance. The alternatives considered to this preferred option were not expected to provide the same level of reliability and performance within comparable costs."

- a. Please clarify the statement "existing system reliability and performance" with respect to the following:
 - i. Does this statement refer to existing reliability and performance criteria, standards or guideline? If so, please provide documentation of the criteria, standard or guideline.
 - ii. Was a quantitative measurement of the existing system reliability and performance performed? If so, please provide documentation of this measurement.
 - iii. Is BGE stating here that the baseline for upgrades to the BGE system is to maintain existing reliability and performance?
 - iv. Is this a statement that applies to how BGE has addressed reliability and performance in the past and how BGE will address the same in the future?
- b. Did BGE consider non-wires alternatives to the reliability and economic impacts of the Harbor Crossing link?
 - i. If so, what alternatives were considered, and what was the assessment that led to BGE preferring the Harbor Crossing Link?
 - ii. If not, please provide a basis for not taking such measures as load management, embedded generation and energy storage into account?

RESPONSE:

- a) (i) Yes. BGE plans in accordance with all relevant NERC, PJM, and BGE/Exelon Planning Criteria. The primary criteria, standard and guidelines are the following:
 - PJM Manual 14B: <https://www.pjm.com/-/media/documents/manuals/m14b.ashx>
 - NERC TPL-001-4: <https://www.nerc.com/ layouts/15/PrintStandard.aspx?standardnumber=TPL-001&title=Transmission%20System%20Planning%20Performance%20Requirements&jurisdiction=null>

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- BGE Planning Criteria: <https://pjm.com/-/media/planning/planning-criteria/exelon-planning-criteria.ashx?la=en>

(ii) Each year, BGE participates in PJM's RTEP process in which the existing system is modeled along with any approved baseline projects and planned supplemental projects. With respect to the Harbor Cables, they are modeled in service as part of the base condition. The models are then studied by applying prescribed contingency types which are evaluated to identify planning criteria violations.

As a baseline measurement of the existing system reliability with the Brandon Shores-Riverside circuits cables modeled as normally in service, no thermal or voltage planning criteria violations have been identified to exist today or within the next five years in association with these circuits. This study does not account for asset condition, the potential for a long-term outage, and future reliability of the system if the cables become unavailable for an extended period of time. Separately, BGE does consider asset condition and develops plans accordingly to maintain the long-term performance of the circuits so that they do remain available.

(iii) The replacement of the Harbor Cables was initiated based solely on asset condition. It was not driven by planning criteria violations that required increased reliability and performance through facility upgrades, transmission reinforcements or expansion. When planning these types of projects, opportunities to increase reliability and performance are reviewed, considered, and implemented based on good utility practice. BGE accounted for the potential for future system load increase and built into the project design increased capacity for the segment of the circuits being replaced. The proposed overhead water crossing portion of the circuits provides future opportunity to upgrade the remaining non-water crossing sections of the circuits to achieve approximately 40% additional capacity without requiring additional work on the overhead water crossing circuit sections.

(iv) Regarding transmission facility replacement projects driven by asset condition, the response to (iii) above aligns with BGE's practice of replacing its existing assets when needed to provide for a reliable transmission system at all times.

- b) (i) BGE plans according to PJM methodologies prescribed in Manual 14B which accounts for the availability of load management. Load management resources within the BGE area are forecasted annually for subsequent years and listed within PJM annual

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load forecasts. These forecasts are used to develop the planning models used for analysis.

Generation modeled in the powerflow cases BGE uses for analysis are modeled in accordance with PJM practices and existing tariffs. Proposing new generation to address reliability concerns is not a viable alternative for BGE to consider in its planning process.

BGE is currently analyzing the application of battery storage as a solution to potential transmission reliability concerns across the system. Because of the extent of the reliability issues identified regarding the Harbor Crossing project, however, BGE does not consider the use of battery storage as a viable alternative to the preferred solution.

(ii) See the response to b) (i) above.

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Response to PPRP Data Request 3
Request Received: 05/17/2019
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Item No.: PPRPDR03-04

Page 1-5, bullet 1, of BGE's ERD states that the "total river bottom disturbance [due to the proposed project] is only ~0.1 percent of what would result from construction of a replacement underground system". Please clarify whether this statement means that an underground system would disturb one thousand times more area or one thousand times more sediment than the proposed overhead crossing.

RESPONSE:

Please refer to page iii of the "Alternatives Analysis," Appendix E of the Environmental Review Document (ERD). As stated there, the overhead project that BGE has proposed was estimated to have impacts of 0.05 acres resulting from installation of foundation piles. The underground replacement alternative would have 49.6 acres of temporary impacts resulting from jet plowing. The former is approximately 0.1 percent of the latter.

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Response to PPRP Data Request 3
Request Received: 05/17/2019
Response Date: 06/03/2019

Item No.: PPRPDR03-05

The first paragraph on page 1-9 of BGE's ERD states that "After further study and comparing a host of factors, including engineering and construction feasibility, environmental impacts, and costs, BGE concluded that replacing existing underground cables with new overhead transmission lines was the best alternative."

- a. Please provide a side-by-side comparison table for these two approaches that lists separately each factor that was considered, the metric and decision criterion used for that factor, and the score or rank given to each method during BGE's evaluation.
- b. What weights were given to each factor to arrive at the final conclusion?

RESPONSE:

- a) A concise side-by-side summary comparison is provided on page iii of the "Alternatives Analysis" (ERD Appendix E). Full supporting analyses are provided in the main body of the Alternatives Analysis. See, especially, Chapter 5.0, "Route Evaluations and Construction Methods." Section 5.5, "Construction Methods Evaluation," begins on page 63. Conclusions are presented beginning on page 83.
- b) Factor weights were not applied.

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Item No.: PPRPDR03-06

Chesapeake Bay water quality criteria are specific to designated uses (dissolved oxygen), and salinity regions and seasons (dissolved oxygen, water clarity, Chlorophyll a). Likewise, thresholds for total nitrogen and total phosphorus are specific to salinity regions. For the period of record examined (May 2011 to February 2017), please explain how the designated uses, seasons, and salinity regime were taken into account in the analysis of water quality factors that starts on page 2-50 of the ERD.

RESPONSE:

Chapter 2.0 of the ERD describes the Project site and surrounding area in terms of the relevant environmental and other characteristics. In the case of water quality, the purpose of the information presented in Subsection 2.2.3.2 is to generally describe water quality across the Project area. Designated uses, seasons, and salinity regimes were not specifically considered, as the purpose of this subsection is more general in nature.

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Request Received: 05/17/2019
Response Date: 06/03/2019

Item No.: PPRPDR03-07

Page 2-51 of BGE's ERD considered TN and TP thresholds of 0.5 mg/l and .02 mg/l, respectively, citing the University of Maryland Center for Environmental Sciences' EcoCheck Program. However, the UMCES website <http://ian.umces.edu/ecocheck/>, which provides a snapshot of the health of the Chesapeake Bay, uses 0.6 mg/L as a threshold for TN and 0.04 mg/L as a threshold for TP. Please explain the difference between these thresholds and those used by BGE and provide any supporting research papers or other documentation that justifies using the lower thresholds.

RESPONSE:

The values provided in the ERD were correct as of the time the ERD was prepared. Project construction is not expected to have any appreciable effects on TN and TP levels within the Patapsco River.

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Item No.: PPRPDR03-08

Chesapeake Bay thresholds for dissolved oxygen are time duration and season specific, and different thresholds apply to open water, deep water, and deep channel. Appendix B of the Applicant's ERD includes monthly average profiles with criteria that do not consider the designated use. For example, the deep channel criterion for dissolved oxygen is 1.0 mg/L, which is much less than the 5 mg/L discussed in the ERD (page 2-51). Additionally, the ERD refers to waters with oxygen content less than 2 mg/L as anoxic (the absence of oxygen), when in fact they are hypoxic. Please provide revised text for the dissolved oxygen paragraph on page 2-51 that is based on the location of the proposed project and correct applicable thresholds.

RESPONSE:

Due to the varying location of the proposed tower structures within the Patapsco River (both in terms of depth and designated use), the more conservative criterion was used for reference. The summary presented in the ERD was not intended to establish a compliance standard that would apply to the Project but rather to provide a general overview of the Patapsco River water quality in the Project area. Hypoxic is the correct term for waters with oxygen content of less than 2 mg/L but above 0.5 mg/L.

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Request Received: 05/17/2019
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Item No.: PPRPDR03-09

Pages 2-53 to 2-60 of the Applicant's ERD provide a general characterization of the project site and vicinity that is a brief restatement of the MERLIN data and does not provide any detail on the resources at risk in the project area. Jeffrey Meling's direct testimony states that several field studies were carried out to supplement the information from MERLIN (pg. 11, line 11).

- a. Please provide the data from those field studies on wetlands, sensitive species, oyster sanctuaries, waterfowl, and amphibians and reptiles.
- b. Identify, based on these studies, the species and habitats that are significant to the ecology of the project area and vicinity.

RESPONSE:

- a) Copies of the studies that were completed by the BGE Project team are provided in Appendix C of the ERD.
- b) Species that are considered significant to the ecology of the Project area and vicinity are discussed in Chapter 4.0 of the ERD.

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Response to PPRP Data Request 3
Request Received: 05/17/2019
Response Date: 06/03/2019

Item No.: PPRPDR03-10

Page 2-80 of the Applicant's ERD states that 29 species of waterfowl were counted from the Cox Creek Survey point.

- a. Did BGE evaluate how the duck diversity of this area compares to other migratory duck overwintering habitats in the Chesapeake Bay? If so, please indicate whether Cox Creek is a high-diversity, average, or low-diversity overwintering habitat.
- b. Were populations of Ruddy Duck and Canvasback specifically studied in the vicinity of the project site? If so, please describe the procedures used.

RESPONSE:

- a) BGE did not evaluate how the duck diversity of the referenced area compares to other migratory duck overwintering habitats in the Chesapeake Bay.
- b) Please refer to the "Winter Waterfowl Survey" in ERD Appendix C. Ruddy Duck and Canvasback were identified during this survey.

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Baltimore Gas and Electric Co.
Response to PPRP Data Request 3
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Item No.: PPRPDR03-11

Page 2-107 of the Applicant's ERD states that "An oyster sanctuary that lies between Fort Carroll and the Key Bridge is currently undergoing restoration." Has BGE identified any project activities that will have an impact on this sanctuary? If so, please specify.

RESPONSE:

BGE has not identified any Project activities that will have an impact on the referenced oyster sanctuary. Please refer to Subsection 4.4.3.2 on page 4-47 of the ERD for more information.

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Item No.: PPRPDR03-12

Page 2-110 of the Applicant's ERD states that "within the waters immediately surrounding the Project site, bluefish (*Pomatomus saltatrix*), scup (*Stenotomus chrysops*), summer flounder (*Paralichthys dentatus*), and black sea bass (*Centropristus striata*) have designated EFH." Please describe the habitat requirements of these species and identify any project activities that would cause direct impacts to the fish or their habitat. If impacts are expected, what measures does BGE plan to take to mitigate these impacts?

RESPONSE:

Please refer to Subsection 4.4.3.6 on page 4-50 of the ERD. Table 4.4-5 describes the habitats for each of these species and how the Project activities may impact them. As stated therein:

Any effects on water quality within the EFH will be temporary and restricted to the area immediately near the towers. Thus, effects to EFH from water quality impacts from construction activities are not expected to be significant.

In addition, BGE is currently in discussions with the Maryland Department of Natural Resources (MDNR) and the National Marine Fisheries Service (NMFS) on how to ensure potential impacts to these species, their habitat, and food sources are minimized.

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Item No.: PPRPDR03-13

The final paragraph on p. 2-41 of the Applicant's ERD states that "None of the analytes were detected at concentrations greater than their probable effects concentrations." This is consistent with the data in Table 2.2-3 on the following page. However, on p. 2-125, the first full paragraph states "Exceedances for the probable effects level (PEL), the level above which adverse effects are frequently expected, for arsenic in the shallow composite samples at WB-9, WB-1, WB-5, and WB-6 were identified. Exceedances were also observed in the 20- to 50-ft composites at WB-9 and WB-6. The chromium PEL was exceed in the shallow composites at WB-9, WB-5 and WB-6. Chromium was also exceeded in the 20- to 50-ft composites at WB-10 and WB-6. WB-5 and WB-6 exceeded the lead PEL at WB-5 and WB-5 shallow composite samples. Threshold effect levels were never exceeded in any of the borings." It appears this paragraph has reversed the use of PEL and TEL; please confirm the correct statement regarding PEL and TEL in the two paragraphs cited above.

RESPONSE:

PEL and TEL were mistakenly switched in the paragraph on page 2-125 of the ERD. That paragraph should read:

Results were compared against federal sediment quality standards. Exceedances for the threshold effects level (TEL), the concentration below which adverse effects are expected to occur only rarely, for arsenic in the shallow composite samples at WB-9, WB-1, WB-5, and WB-6 were identified. Exceedances were also observed in the 20- to 50-ft composites at WB-9 and WB-6. The chromium TEL was exceeded in the shallow composites at WB-9, WB-5 and WB-6. Chromium was also exceeded in the 20- to 50-ft composites at WB-10 and WB-6. WB-5 and WB-6 exceeded the lead TEL at WB-5 and WB-5 shallow composite samples. Probable effect levels (PELs) were never exceeded in any of the borings.

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Item No.: PPRPDR03-14

On p. 2-46 of the Applicant's ERD, the second full paragraph discusses the Maryland 303(d) list issued October 16, 2015. This list was updated on April 9, 2019. Please provide an updated table 2.2-4 based on this latest list and revised text, where necessary, based on the latest information.

RESPONSE:

The 303(d) list summarized in Table 2.2-4 of the ERD was correct at the time the ERD was prepared. The updated list referred to in the data request above includes new listings as presented in the table attached as *PPRPDR03-14 Attachment 1*. These additions do not change the assessment of effects, suggested mitigation measures, or conclusions of the ERD.

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Response to PPRP Data Request 3
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Item No.: PPRPDR03-15

Table 2.2-14 of the Applicant's ERD lists fish and shellfish likelihood of occurrence near the project site. Two sources of data were cited for this table including Froese and Pauly, 2018 and ECT, 2018. The latter citation is not listed in the reference section; please indicate its full title and location in the application if present there or provide it if not. Other sources may be available indicating the presence of fish species within the Patapsco River estuary closer to the project site, such as EA, 2008*. Please locate and provide any other recent fish data (within the last 10-15 years) such as this and update table 2.2-14.

*(EA Engineering, Science, and Technology. 2008. Impingement and entrainment characterization report for H.A. Wagner generating station March 2006-March 2007. March 2008. Prepared for Constellation Energy. See Table 2-1.)

RESPONSE:

"ECT, 2018" was used to indicate that ECT has compiled and interpreted the data provided in the table or figure it is associated with. It is not a reference to a separate document and, as such, is not provided in the list of references.

ECT conducted a thorough search for existing data and information with which to characterize fisheries in the Project area. Refer to the list at the top of page 2-88 in the ERD. It is recognized that there may be other sources of information that have species lists that differ slightly from the list in Table 2.2-14 (as is the case with the report cited in the data request). Nonetheless, the table in the ERD adequately describes the fish communities that may be present within the Project area. Additionally, through consultation with the agencies responsible for fisheries in the Project area, all species of regulatory significance are included in Table 2.2-14 and are being addressed appropriately in the review of the Project.

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Response to PPRP Data Request 3
Request Received: 05/17/2019
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Item No.: PPRPDR03-16

Please provide information to describe the management or controls that will be used to minimize air emissions, e.g., release of suspended dust/sediment particulate, during construction activities. Supporting background information should include, but not be limited to: estimates of the quantity (in tons) of each pollutant emitted during the construction period; the quantity, type, fuel burned, and size (hp) of equipment used for construction; and operating schedule for construction activities (e.g., hour/day, day/week, week/year).

RESPONSE:

As discussed in Section 4.1 of the ERD, the Project's "potential impacts on air quality will be minimal and limited to small, temporary impacts during construction..." On-land construction will occur for short periods of time and on only several acres. Fugitive dust and equipment-related emissions generated during these on-land construction activities at Hawkins Point and Sollers Point will be minimal and any impacts limited to the immediate areas, which are industrial and institutional.

Emissions from combustion of fuels in engines used for on-water construction activities have been estimated using the best available information on what types of machines will be used and how they will be used. Please see *PPRPDR03-16 Attachment 1* for the requested information. Listed emissions from Project activities are conservatively high, as (a) emission factors for older, dirtier engines (on the order of 20 years old) were used and not factors for newer, cleaner engines, (b) the number of months of construction is likely to be much less than the 29 used for estimating purposes, and (c) construction is planned to be 8 hours/day, 5 days/week, whereas this analysis assumes construction ongoing continuously for 30 days/month. On an average, annualized basis, Project emissions are compared to the latest available estimates for Baltimore City (from EPA's National Emissions Inventory for 2014):

Pollutant	<u>Emissions (tons per year)</u>	
	Project	Baltimore City
Particulate matter (PM ₁₀)	6	4,333
Sulfur dioxide (SO ₂)	<1	900
Nitrogen oxides (NO _x)	109	9,712
Carbon monoxide (CO)	135	38,752
Volatile organic compounds (VOC)	16	9,783

This comparison shows that Project emissions, even using very conservative assumptions, will be small fractions of City-wide emissions. As a further comparison, emissions of NO_x and CO from the Brandon Shores power plant, located just south of the Key Crossing Project site in Anne Arundel County, in 2014 were 3,638 and 675 tons per year, respectively.

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Item No.: PPRPDR03-17

List and provide any technical report, document, study or analysis prepared within the last 12 months concerning this Project that has not been filed in the docket as of this date.

RESPONSE:

Please see *PPRPDR03-17 Attachment 1* through *PPRPDR03-17 Attachment 7*.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 4
Request Received: 06/28/2019
Response Date: 07/16/2019

Item No.: PPRPDR04-01

In BGE's response to PPRP DR01-04, BGE indicated that it evaluated "high level", "conceptual" and "preliminary" alternatives to the Key Crossing project.

- a. The first electric alternative presented by BGE is "new 230 kV underground circuits (No River Crossing) connecting Brandon Shores and Riverside substations. BGE further specifies that the circuits range from 19 to 23 miles.
 - i. Is there a detailed design that forms the basis of the estimated length? If yes, provide a route map for this alternative. If no, please explain.
 - ii. For this alternative, how many circuits are being proposed?
 - iii. What size cable will the circuit or circuits be comprised?
- b. For the same alternative, BGE states that "planning level cost estimate 2 to 3 times more than the cost estimate for the proposed Harbor Crossing Link" for "single cable per phase".
 - i. Given that the estimated capital cost of the Harbor Crossing project is \$243 million (per direct testimony of Mr. Casey), is BGE stating that the cost of this alternative will be in the range of \$490 to \$730 million?
 - ii. Please provide details or work papers that led BGE to make this cost estimate.
 - iii. Given the estimated length of the alternative, this translates into a range of about \$21 million to \$38 million per mile. Has BGE compared this per mile cost range to other similar projects in its own jurisdiction or in other locations? If so, what is the comparative cost per mile for a similar type transmission project?
- c. For the same alternative, BGE states that there would be "increased likelihood of sustained outages associated with the longer time to repair underground cables."
 - i. Is BGE comparing the increased likelihood of sustained outages to those of the submarine cables of the Key Crossing project? If so,

what is the basis for making this assertion? Please provide supporting documentation.

- d. For such a high capital and important project as the Key Crossing, did BGE consider making a more detailed study of the alternatives to ensure that the preliminary assessments are sound and appropriate?
- e. The second electric alternative presented by BGE is a “new 500/230 kV transformation at Graceton Substation, new towerline connection Graceton Substation and Northeast substation, upgrade/replace overloaded existing 115 kV supplies connecting to downtown Baltimore City and upgrade/replace downtown Baltimore City circuits, add bulk power capacitors/SVC.”
 - i. In support of this detailed description of the alternative, please provide diagrams, working papers and any associated study report or documentation in support of this alternative.
 - ii. Was there a detailed cost estimate prepared that supports the statement that the alternative has a “planning level cost for 2 to 3 times more than the cost estimate for the proposed Harbor Link.” If so, please provide documentation of the detailed cost estimate. If no, please explain how the estimate was made.
 - iii. Was there a stability study conducted to support the statement that the alternative will have “negative impact to overall system stability”? If so, please provide documentation of the stability study. If no stability study was performed, please explain why not.

RESPONSE:

- (a)(i) No, BGE did not produce a detailed design forming the basis of the estimated length of the No River Crossing alternative. Based on the initial conceptual review, further evaluation of this alternative was unwarranted. Please see BGE’s response to PPRP DR01-04. An alternative would not typically be advanced beyond the conceptual planning stage of project development once that alternative was determined to not be technically or economically competitive with other alternatives.

BGE’s general planning principles and approach to its initial evaluation of a potential transmission line project can be described as follows:

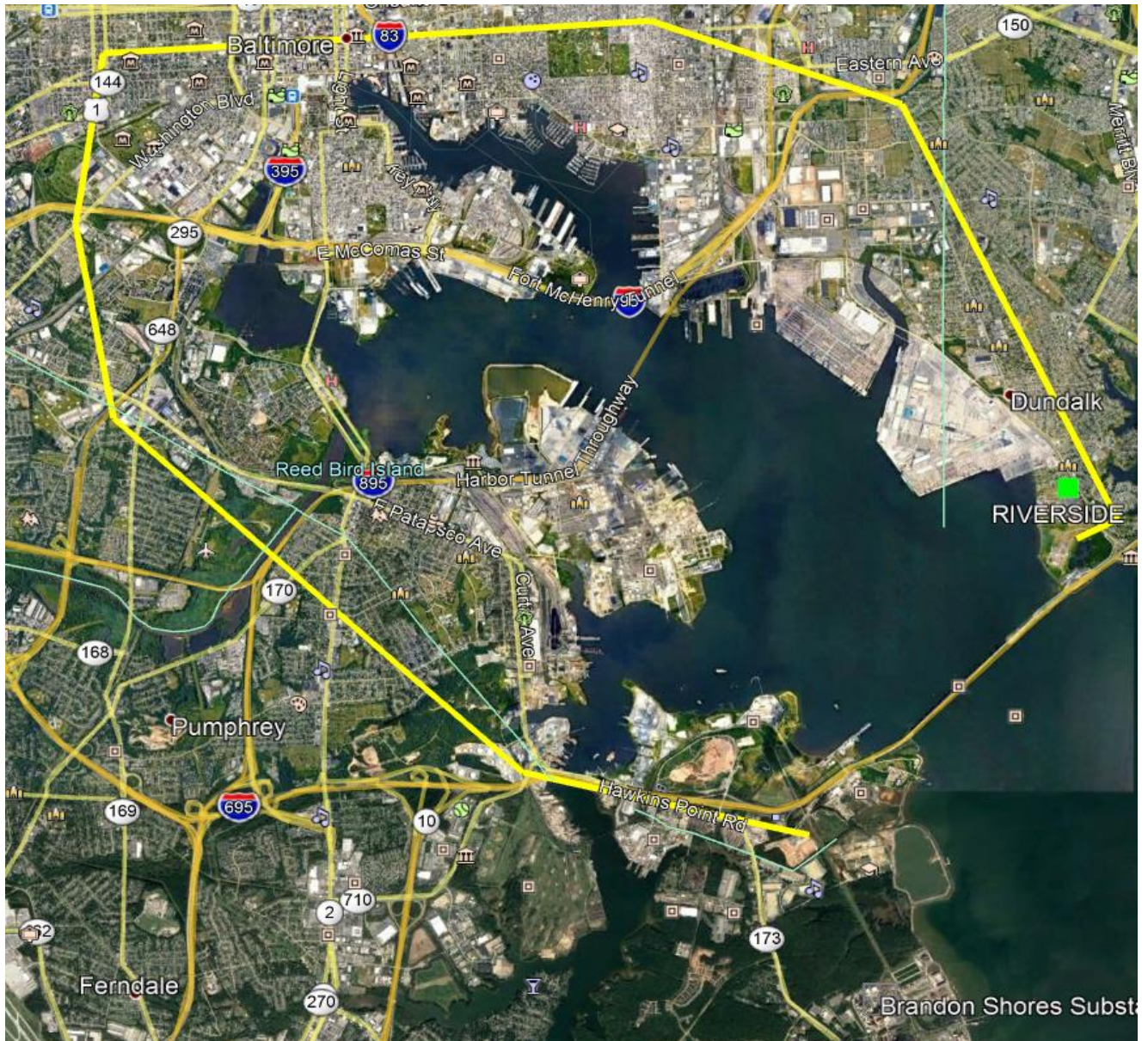
- When reviewing concept alternatives involving new transmission lines and developing conceptual routes, BGE transmission planners review the geographic area of focus for

existing corridors such as existing electric lines, highways, streets, and trails to develop concept routes that would have the least amount of impact to the environment and to individuals and businesses.

- These geographic characteristics would serve as the target areas to begin defining concept routes that would allow for the best possibility of successfully constructing a project in a reasonable amount of time.
- Routes that may have a significant environmental impact, that could cause considerable interruption to the community during construction, that could disproportionately affect certain individuals or groups, or that could have significant constructability issues, are generally avoided if possible.
- Considering these and other factors, a high-level conceptual route is determined.
- This route would then be reviewed, and a range of length would be assumed for the conceptual path, considering possible length adjustments to reflect unknown constructability issues that could be uncovered further along in the planning process.
- Typically, the conceptual path length would be multiplied by 10 to 20 percent to account for the expected need to follow streets through urban terrain.

For the No River Crossing alternative, BGE considered high level conceptual routes for a new underground 230 kV connection from the Brandon Shores substation to the Riverside substation that went up the western shore of the Patapsco River, through downtown Baltimore City, and back down the eastern shore of the Patapsco River to the Riverside substation. The conceptual cable route would begin west of Hawkins Point near the intersection of the existing 230 kV overhead lines and Ft. Armistead Road. An underground cable termination station or riser pole system would be installed to connect the new cables to the existing overhead lines toward Brandon Shores. This route would avoid any significant river crossings but would include directional drilled crossings under Curtis Creek and the Patapsco River.

Using the general planning principles and techniques previously described, the No River Crossing alternative route linking the Brandon Shores and Riverside 230 kV locations would produce an estimated length of 19-23 miles. The image on the following page reflects the conceptual route used to develop the estimate. The bright yellow line represents the conceptual route. The significant problems that would be encountered by pursuing an alternative based on this concept are readily apparent, and BGE concluded early on that this concept warranted no further evaluation.



- (a)(ii) In order to maintain a comparable level of system reliability and performance, the No River Crossing alternative is based on a double circuit 230 kV configuration.
- (a)(iii) No specific cable size was selected as part of BGE's conceptual review of the No River Crossing alternative. The largest size cable in use by BGE for 230 kV applications, however, is 2000 mm CU, which can carry approximately 2380 Amps or 948 MVA using two conductors per phase. To provide for comparable capacity of the existing Brandon Shores – Riverside circuits, two cables per phase would be required using 2000 mm CU conductors.

- (b)(i) Yes.
- (b)(ii) Planning level cost estimates are made based on previous projects along with any available recent cost data considering the voltage level being constructed, the number of circuits to install, the number of conductors being used, the diversity of terrain where the construction would take place, and the estimated length of the project, among other possible factors. As noted above, the No River Crossing alternative route assumed there would be two, 230 kV circuits using two conductors per phase. The route would extend for approximately 19-23 miles and would traverse dense urban areas including a combination of industrial and residential areas and a series of Patapsco River tributary water crossings. The route length would greatly exceed the longest underground 230 kV segment currently on the BGE system, which is between 2 and 3 miles long. Additionally, the No River Crossing route would likely have a significant negative socio-economic impact on the neighborhoods in which the route would be located, as well as causing extreme inconvenience to them during the construction process.
- Given this information, the cost for new 230 kV underground circuits connecting the Brandon Shores and Riverside 230 kV substations via the No River Crossing alternative route using only a *single* conductor per phase was expected to be at least two times that of the preferred Key Crossing Reliability Initiative Transmission Line project alternative. The addition of a *second* conductor per phase is estimated to increase the cost by approximately 100% over that of the single conductor variation, accounting for duct bank cable capacity limitations. The same technical challenges and constructability issues would likely lead to increased costs for two conductors per phase in proportion to using a single conductor per phase.
- (b)(iii) Yes. A similar BGE 230 kV underground transmission line project, when adjusted for two circuits and an urban environment, has an average cost per mile of \$38.1 million, using a single cable per phase.
- (c)(i) No. The comparison is to the Key Crossing Reliability Initiative Transmission Line project *overhead* transmission line preferred alternative. The increased likelihood of sustained outages of underground cables relative to an overhead option is inherent to the underground type of construction. The preferred overhead circuits could experience a transient outage from time to time, but they would most commonly be momentary, short duration outages. In contrast, underground cable failures are generally a result of dig-ins, thermo-

mechanical issues, defective materials, and wash-outs, among other possible causes. The duration of these outages could vary widely and may extend to as much as a year. Finding the location of the failure may take up to two weeks. Once the failure is located, developing a repair solution, obtaining the needed materials, and engaging the appropriate contract resources can take as long as 6-9 months in additional time prior to commencing any repairs. Executing the actual repairs may last as long as three months.

For the No River Crossing alternative, given the length of the circuits, the diverse types of terrain including Patapsco River tributary water crossings, and the different types of construction methods that BGE would expect to be employed, the length of time required to locate and repair potential failures should they occur, could be orders of magnitude longer in comparison to the momentary outages that could occur on the Key Crossing Reliability Initiative Transmission Line overhead circuit preferred alternative.

- (d) Please see BGE's responses to PPRPDR04-01(a) and (b) above.
- (e)(i) Similar to the No River Crossing alternative discussed in BGE's response to PPRPDR04-01(a) and (b) above, further detailed analysis of the scope of work required to implement the second alternative was not performed following the conceptual review. The second alternative was based on the preliminary study performed that reflected the potential thermal overloads and to address potential voltage issues that would be expected (see CONFIDENTIAL CEII PPRPDR02-01 *Attachment 1*).
- (e)(ii) Planning level cost estimates are made during the conceptual planning process based on previous project information along with any available recent cost data. BGE's project experience provides sufficient cost data to develop reasonable planning level cost estimates for use in comparing alternatives to most projects. When actual comparable costs for projects considered similar in nature and scope are not available, BGE uses estimates or information from other utilities within the region. In some cases adjustments would be made to account for differing scopes of work through discussions with the engineering organizations.

BGE has projects that are similar in nature to those described in the second alternative. The planning estimate for the second alternative is over \$500 million and would therefore fall in the range of 2-3 times the cost estimates of the preferred Key Crossing Reliability Initiative Transmission Line project alternative.

- (e)(iii) No stability study was completed as part of the second alternative conceptual review. The partial statement “negative impact to overall system stability” is describing the effect of removing from service the existing 230 kV connection between the Riverside and Brandon Shores substations as part of the second alternative to the Key Crossing Reliability Initiative Transmission Line project. These existing circuits serve as an outlet for the Brandon Shores generators. The removal of transmission circuits, especially those connected directly to generator busses, has the effect of increasing the impedance seen by that generator and has the general impact of reducing grid stability. The Key Crossing Reliability Initiative Transmission Line project, on the other hand, replaces the existing underwater circuit segments with overhead circuit segments and will generally allow for the same system parameters. This results in no negative impact to system stability. Given this result, no further system stability analysis was completed for the second alternative.

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Response to PPRP Data Request 4
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Response Date: 07/16/2019

Item No.: PPRPDR04-02

BGE has stated that the reason for proposing the Key Crossing project is not reliability but rather replacement for asset material condition (see response to StaffDR02-17).

- a. What is BGE's criteria for replacement of asset materials? Please provide documentation in support of this criteria.
- b. Please provide examples of projects that were implemented based on asset material condition. Please include the capital costs associated with each of these projects.
- c. Is it BGE's position that system reliability will improve or not improve with the implementation of the Key Crossing project? Please provide an explanation with the response.
- d. Has PJM been advised of the potential failure issue with the existing Harbor Crossing submarine cables as BGE has stated in this filing?
- e. Has BGE advised PJM that the loss of one cable may lead to loss of both circuits between Brandon Shores and Riverside as BGE has stated in this filing?

RESPONSE:

- (a) BGE did not state in the response to StaffDR02-17 that the reason for proposing the Key Crossing Reliability Initiative Transmission Line project is not reliability based. Rather, BGE stated that the existing submarine cables "were identified by BGE for replacement based on asset material condition." This condition is the elevated level of dissolved gasses within the cables. The condition of the cables prompted a series of discussions several years ago regarding the cables and the BGE electric network. Both the condition of the cables and the need to maintain electric system reliability were included in these discussions. Neither the Key Crossing Reliability Initiative Transmission Line project nor other transmission projects are developed by BGE based solely upon material condition. Electric system reliability is always a central aspect of these discussions.

Reliability has been and continues to be a primary driver for the proposed Key Crossing Reliability Initiative Transmission Line project. As noted in the November

2018 Alternatives Analysis (attached as Exhibit E to the ERD), if the cables are left in place to fail without a replacement (what BGE refers to as the “no-build” alternative), there are significant reliability concerns for the BGE electric system following cable failure. Specifically, please refer to pages 7, 13-17, and 63-64 of the Alternatives Analysis. Please also see BGE’s responses to PPRPDR02-02 and PPRPDR02-03 for additional information on system impact should the existing cables fail and no replacement be constructed.

Please also note that the Key Crossing Reliability Initiative Transmission Line project is a “supplemental project” for PJM classification purposes. These projects are based on *operational* reliability criteria, as opposed to *planning* reliability criteria that form the bases of PJM baseline projects. Accordingly, system reliability is a vital component of this project as poor asset conditions equate to poor system reliability.

(b) Other reliability projects implemented by BGE due to – at least in part – asset material condition, include the following:

- Conastone to MD Line (\$5.5M)
- Waugh Chapel (~\$30 M)
- Conastone to Mt. Airy (~\$8.3M)
- Transmission Breaker Replacement Program (~\$5M/Yr)
- Aging 500 kV Switch Replacement Program (~\$0.3M/Yr)
- Transmission Substation Relay Replacement Program (~\$0.7M/Yr)
- Northwest 230/115 kV Transformer Failure (\$2.9M – Installation of spare)
- Riverside 230/115 kV Transformer Replacement (\$8.6M – Two transformers replaced)
- Five Forks to MD Line (~\$8.7M) (planned)

(c) It is BGE’s position that the Key Crossing Reliability Initiative Transmission Line project will improve the reliability and availability of both the 230 kV circuits between the Brandon Shores and Riverside substations, as well as the larger BGE transmission system. The gassing problems of the existing submarine cables have resulted in more than 7 extended outages in the 230 kV network since 2010, and additional events with reduced electrical ampacity capability. The new 230 kV segment will not experience these types of long-term outage events. While overhead lines do experience some transient outages, these have been incorporated into the design resulting in an expectation of few if any transient outages. As a result, line reliability will be improved. As noted in the November 2018 Alternatives Analysis (attached as Exhibit E to the ERD), if the cables are left in place to fail without a replacement (what BGE refers to as the “no-build” alternative), there are significant reliability concerns for the BGE electric system following cable failure. Specifically, please refer to pages 13-17 and 63-64 of the Alternatives Analysis. Please also see BGE’s responses to PPRPDR02-02 and PPRPDR02-03 for additional information on system impact should the existing cables fail and no replacement be constructed.

(d) Yes.

(e) Yes.

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Item No.: PPRPDR04-03

Please describe the status of consultations that BGE has conducted with the National Marine Fisheries Service (NMFS) concerning time of year restrictions required to protect fishery resources from impacts caused by construction of the project.

- a. If consultations have not occurred, when are they expected to take place?
- b. If consultations have occurred, please indicate the times during the year that in-water construction will not be permitted.
- c. If time of year restrictions have not been agreed upon, please describe when a final set of restrictions is expected.
- d. Please describe the impacts of potential time of year restrictions on completion of the project.
- e. If negotiations with NMFS result in a reduction in the sturgeon and turtle time of year restriction periods how does that affect the need for other time of year waivers?

RESPONSE:

Coordination with NMFS as well as EPA, Maryland Department of Natural Resources (DNR) Environmental Impact Review and DNR Wildlife and Heritage Service began at the project summit meeting on July 6, 2016. Focused Section 7 agency coordination meetings were held on February 13, 2017 at Maryland Department of Environment and May 1, 2019 at USFWS. Additionally, the project was presented at JE in May 2017, November 2017, September 2018, and June 2019. Coordination with Kristy Beard, a marine habitat resource specialist at the National Oceanic and Atmospheric Administration (NOAA), regarding the Adaptive Management Approach for the project has been ongoing since the May 2019 meeting. Additionally, a conference call was held with Shane Guan of NOAA National Marine Fisheries Service on May 7, 2019 to discuss the dolphin presence and required protections for the proposed project. A copy of the proposed ambient noise study is currently under review with NMFS. The proposed study is scheduled for the week of July 29, 2019. NMFS JPA ESA/EFH consultation review comments were received from Maria Teresi with USACE on July 10, 2019. Consultations regarding time of year restrictions are ongoing.

- (a) Consultations with NMFS have occurred and are ongoing. See the response above.

- (b) Based on NMFS agency review comments from the JPA consultation, construction for Towers 3 and 4 will likely be restricted during the period of February 15 through June 15 unless an Adaptive Management Approach is reached.
- (c) A final set of restrictions is expected within the next few months, once discussions on this topic conclude. As mentioned by the environmental agencies at the June 26, 2019 JE Meeting, developing an Adaptive Management Approach in parallel to the processing of the permit application is an innovative initiative for this type of permit application. As this project is not a federally funded project, it does not require NEPA coordination. Therefore, this level/type of upfront agency coordination is unique in that the agencies agree that coordination of time of year restriction waivers, monitoring, and BMP plans upfront is needed for this type and scale of project. Waivers, monitoring, and BMPs as currently being negotiated with the regulatory agencies will be included as permit conditions included in the MDE and USACE authorizations. The environmental agencies have committed to work with BGE to find a solution that is feasible for the Key Crossing project construction yet addresses the agencies' primary concerns for the avian and aquatic species that visit the project work area. As discussed at the June 2019 JE meeting, the environmental compliance program will be coordinated following issuance of the authorizations and should additional waivers be necessary to complete project construction, BGE will seek authorization of additional waivers with the agencies at such time.
- (d) Time of year restrictions have the potential to affect the sequence of project construction, construction productivity, and the overall duration necessary for pile-driving activities. This potential impact to construction could lengthen the overall project duration and increase the cost of the Key Crossing project for BGE, and consequently, BGE's customers.
- (e) The time of year restrictions and associated waivers are all interrelated, as is the actual time within the year that all permits are received by BGE and construction of the Key Crossing project can begin.

Based on agency comments at the June 2019 JE meeting, Brian Hopper with NMFS does not see the sea turtle as an issue for the project and that time of year restriction will not be applied. Additionally, Mr. Hopper stated that the potential presence of sturgeon in the area would be transient fish looking for food and not resident fish. The sturgeon time of year restriction will likely be reduced to coincide with the anadromous fish closure period (February 15 through June 15).

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Item No.: PPRPDR04-04

BGE provided the Key Crossing Time of Year Restriction Tables at the Joint Evaluation meeting held on June 26, 2019. In reference to Tables 1 and 2, please provide the following:

- a. Specifically indicate the time of year restrictions requested for complete or partial waivers, by species groups, and for each of the water-based towers.
- b. Please justify the biological and project construction basis for each waiver request and include information on which time of year restriction waivers are necessary for project feasibility; that is, which waivers are required for project viability (construction cannot be completed within timeframe) versus waivers that are based on time and cost efficiency. Please justify not engaging a second installation crew to either speed-up pile installation at each tower or allow work on two tower locations to occur simultaneously in order to reduce the construction period and possibly the need to work in a restricted period.
- c. For partial waiver requests, indicate the closure periods that are considered acceptable versus timeframes necessary for the project viability.
- d. For waiver requests based on monitoring, please provide details of the type and schedule of the proposed monitoring. Please explain what actions would be taken based on the monitoring results.

RESPONSE:

The Time of Year Restriction Tables were offered as tools to assist with the discussions between the environmental agencies and BGE on the different potential time of year restrictions to construction for the different avian and aquatic species of concern. These tables are currently in draft form. It is BGE's desire to construct the Key Crossing Reliability Initiative Transmission Line project in a productive manner, optimizing construction efficiency in order to minimize the construction schedule duration and the associated cost of the project. At this time BGE and the environmental agencies are working collaboratively to determine an Adaptive Management Approach that will enable construction to be performed efficiently while also supporting BGE's commitment to protect the environment. The following principles are guiding those discussions: the discussion on the different species of concern; the periods of the year and area of the Patapsco River that is of primary concern; the flexibility that the environmental agencies have regarding closure periods, best management practices, types of monitoring and associated actions; the flexibility that a construction contractor would have on the sequence of construction;

the impact to construction efficiency caused by an interruption of pile-driving and related construction activities. BGE expects that as discussions with the environmental agencies on the Adaptive Management Approach conclude, additional responses to questions (a) through (d) will be available.

(a) As presented at the June 2019 JE meeting, the following waivers and considerations for modified closures were requested:

- Based on the project review, the bald eagle time of year restriction will not apply.
- A full waiver has been requested for the falcon time of year restriction due to the nesting pair located on the bridge being accustomed to the noise and vibration associated with their location.
- A waiver to the winter waterfowl concentration closure has been requested for Tower 5 due to the location of this tower on the edge of the historic mapped area, it's distance from shore, depth of water, and the additional remaining river area for the waterfowl to utilize.
- A waiver of the anadromous fish closure for all towers was requested with a proposed sequence of only one tower pile installation operations at one time. A specific request was made for Towers 2, 5, and 6 in consideration that these towers have no effect or limited effect based on a review of area of passage for fish.
- A waiver to the dolphin closure due to the infrequent presence of dolphins at the project location. This waiver was proposed with the condition of supplying a marine mammal spotter, tracking the Dolphin Watch App, and conducting noise monitoring in conjunction with the other proposed BMPs.

(b) See BGE's response to (a) above regarding waivers. BGE's baseline plan assumes installation of one pile at a time to limit vessel traffic and promote safety. BGE does not want to dictate contractor means and methods for pile driving activity. Considerations for a second pile driving crew could be made in the future by the construction contractor once schedule constraints associated with river closure periods are defined. BGE is endeavoring to provide as much flexibility as possible to the contractor that will be engaged to construct the Key Crossing Reliability Initiative Transmission Line project by agreeing with the environmental agencies on an Adaptive Management Approach as mentioned above.

(c) See BGE's response to (a) above.

(d) Monitoring plans and protocols are currently under development. Possible actions that could be taken based on results include adjusting BMPs such as replacing filter bags or adding a settlement tank to reduce turbidity while pumping if water quality standards are not being met, modifying the timing of impact hammering if dolphins are present, and adding additional sound dampening should noise limits not meet required standards.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 4
Request Received: 06/28/2019
Response Date: 07/16/2019

Item No.: PPRPDR04-05

To follow-up on BGE's response to PPRP DR03-17, please list and provide any technical report, plans, document, study or analysis prepared within the last 12 months concerning this Project that has not been filed in the docket as of this date. This may include reports, plans, and documents, studies that describe new components or features, and/or changes in the design or configuration of project components that need to be documented in the case files.

RESPONSE:

In addition to the materials provided in the response to PPRPDR03-17 on June 3, 2019, the documents listed below have been added to the Exelon ShareFile site for the Key Crossing Reliability Initiative Transmission Line project located at the following link:

<https://exeloncorp.sharefile.com/f/fob28421-50c3-4552-9fe7-6729923df982>

- Phase I Underwater Archaeological Investigation – Chestnut Hill Cove Mitigation, Nabbs Creek, Anne Arundel County, Maryland
- June 28, 2019 Memo on Key Crossing Reliability Initiative Project Hydro-Acoustic Ambient Monitoring
- June 2019 Ambient Noise Monitoring Plan Graphic
- BGE slide presentation from June 26, 2019 JE meeting

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-01

In response to PPRP DR03-02(c), BGE wrote, “BGE does not currently have supplementary operating measures or guidelines in place that would be used to address the real-time contingency loss of both circuits.”

- a. Please confirm if BGE has special protection schemes or remedial action schemes in place to address the real-time contingency loss of both circuits. If there are, please describe the scheme or schemes that are in place, including the operating time settings and the specific actions undertaken.
- b. Please describe PJM’s operating response to a real-time contingency loss of both circuits.

RESPONSE:

- a) BGE does not have special protection schemes or remedial action schemes in place to address the real-time contingency loss of both circuits.
- b) PJM directs the normal operation of the BGE system in accordance with PJM Manual 3. To the extent that a real-time contingency loss of both circuits would create an emergency condition, PJM Manual 13 would be the operating plan used by PJM and BGE to mitigate operational emergencies.

A specific response directed by PJM to maintain the reliability of the transmission system to mitigate the impacts of a long-term outage of both of the Brandon Shores-Riverside circuits would depend upon numerous factors, including but not limited to the system configuration at the time of failure, the system load levels, and the resulting potential thermal and voltage criteria violations. Actions PJM may direct could include system adjustments, generator re-dispatch, and possibly load reduction if required. Neither BGE nor PJM has a prescribed operating response to address only this specific scenario.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-02

In response to PPRP DR03-03(a)(ii), BGE wrote that “each year, BGE participates in PJM’s RTEP process in which the existing system is modeled along with any approved baseline projects and planned supplemental projects. With respect to the Harbor Cables, they are modeled in service as part of the base condition.” Further, in the same response, BGE wrote “As a baseline measurement of the existing system reliability with the Brandon Shores-Riverside circuits cables modeled as normally in service, no thermal or voltage planning criteria violations have been identified to exist today or within the next five years in association with these circuits. This study does not account for asset condition, the potential for a long-term outage, and future reliability of the system if the cables become unavailable for an extended period of time.”

- a. Please confirm if the potential for a long-term outage of both the Brandon Shores-Riverside circuits due a failure of the Harbor Cables exists today.
- b. If a long-term outage of both the Brandon Shores-Riverside circuits due a failure of the Harbor Cables occurs before BGE’s Key Crossing Initiative is undertaken, what actions will be taken by BGE to ensure reliability of the system? What actions will PJM take?
- c. As the transmission planner and being responsible for the reliability of the interconnected electric system, is PJM studying the impact of and needed transmission planning measures for a long-term outage of both the Brandon Shores-Riverside circuits? If not, are there any plans to do this study and when will such a study be conducted?

RESPONSE:

- a) Yes, BGE confirms that the potential for a long-term outage of both the Brandon Shores-Riverside circuits due to a failure of the Harbor Cables exists today. See BGE’s response to OPCDR02-01, subparts (e), (f), and (g), describing the BGE response to cable failures that are located under the river. There is no quick repair option. In these instances, the failed circuit would be restored to some lesser capability of service with a reduced rating. It would then need to be evaluated if a multi-year repair effort is needed, or if the cable should be retired. A repair would require large lengths of new cable and the uncertainty of the HPFF cable supply would come into play, as discussed in more detail in BGE’s response to OPCDR03-06(a).
- b) Please see BGE’s response to PPRPDR05-01(b).

- c) BGE is not aware of any such PJM study nor is it within PJM's normal purview to study the impact of a long-term outage of both the Brandon Shores-Riverside circuits based on the risk of failure identified by BGE as a result of its assets' material condition. BGE (not PJM) is responsible for its asset maintenance and equipment replacement decisions. BGE is not aware of any current plans for PJM to conduct additional studies of the impact of this scenario and needed measures.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-03

BGE considered several alternatives to the Key Crossing project including those mentioned in responses to PPRP DR01-04 and PPRP DR03-03(b)(i). In the planning approach that BGE describes in response to PPRP DR04-01(a)(i), was consideration given to other technologies such as phase angle regulators or system reconfiguration to control flow on the 115 kV system? If so, please describe the assessment conducted and the conclusion BGE reached from the assessment.

RESPONSE:

Phase angle regulators and system reconfiguration were not considered in detail as alternatives to the Key Crossing Project. The results from BGE's load flow study (provided as *CONFIDENTIAL CEII PPRPDR02-01 Attachment 1*) indicate many different combinations of load flow violations involving many different facilities across the 230 kV and 115 kV networks. Phase angle regulators and re-configuration of the system would not be feasible, as they would likely cause violations on other facilities due to the redirection of flows and reduced operability margins in other areas. Additionally, the types of re-configurations of the system that would have an impact would directly reduce the operability and reliability of different areas of the transmission system.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-04

In the direct testimony of Mr. Casey, an estimate of \$243 million is given for the Key crossing project.

- a. Has this cost estimate changed?
- b. How much of the \$243 million is for the overhead transmission line as opposed to decommissioning the existing lines and site?

RESPONSE:

- a) Yes, the capital cost estimate for the Key Crossing Project has reduced from \$243 million to \$232 million. This reduction in the estimated capital cost of the Project is primarily the result of the reduction in the number of steel pipe piles required for the foundation and vessel collision protection structures as the design has been refined. This estimate was developed using the same planning assumptions described in Mr. Casey's direct testimony (see Casey Direct Testimony at 6:15-24, explaining that the "estimated cost assumes that Patapsco River closure restrictions will be applied by the applicable environmental agencies through the permitting process and that these restrictions will prohibit any construction activity on the Project that impacts the Patapsco River bottom between February 15 and June 15 annually").
- b) The design, permitting, procurement and construction of the two new 230kV overhead circuits constitutes just over 95% of the total estimated capital cost for the Project.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-05

Please provide the basis for the estimate of \$38 million per mile estimate that BGE provided in its response to PPRPDR04-01(b)(iii). Specifically, please specify the location of the project being quoted in the response, the actual cost of the project, its length, number of circuits, size of conductors and voltage level.

RESPONSE:

BGE developed the \$38 million per mile estimate through adjustments made to actual costs associated with a prior project suite. Engineering judgements were made to adjust actual project costs to better align with the proposed scope of the Key Crossing Reliability Initiative Transmission Line project.

Project	Voltage	Length (Mi)	Circuits	Year Installed	Actual Project Cost	Adjusted Cost Per Double Circuit Mile *
Raphael Road to Joppatowne	115 kV	3.13	1	2017	\$55,300,000	\$32,614,031
Orchard to Constitution	115 kV	0.88	1	2016	\$20,200,000	\$40,007,467
Russet to Tipton	230 kV	2.3	3	2018	\$118,693,065	\$41,904,714
Average						\$38,175,404

- * The cost per mile in the above table adjusts for:
- Escalation to 2019 costs based on 3% per year from the installation date
 - Urban installation versus rural/suburban installation
 - Duct bank installation and excavation versus HDD installed segments
 - Double circuit adjustment when single or triple was installed
 - 230 kV cable & accessories when 115 kV was installed

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 5
Request Received: 07/29/2019
Response Date: 08/12/2019

Item No.: PPRPDR05-06

In its response to PSC Staff DR02-45, BGE stated that because Keys Crossing is a supplemental project, costs would be 100% allocated to customers in the BGE zone. How would costs be allocated if Key Crossing is evaluated as a PJM RTEP project? Please specify the advantages and disadvantages of having the Key Crossing project be considered as either a supplemental project or an RTEP project.

RESPONSE:

There is no option for BGE to choose whether the Key Crossing Reliability Initiative Transmission Line project is considered a supplemental project or a PJM baseline project. BGE (not PJM) is responsible for its asset maintenance and equipment replacement decisions as a result of material condition. The reliability criteria that is considered as part of PJM's RTEP baseline evaluation does not account for risks associated with the material condition of transmission assets and the potential for a long-term outage of both cables that make up a segment of the Brandon Shores to Riverside circuits. Accordingly, RTEP project cost allocation would not apply.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 7
Request Received: 09/16/2019
Response Date: 09/25/2019

Item No.: PPRPDR07-01

In BGE's response to StaffDR04-02, it stated that "The load flow model used to perform the analysis was developed by PJM using PJM's 2016 RTEP planning assumptions to study the year 2021 conditions. The generators were dispatched by PJM in the load flow model according to PJM's methods and procedures." For the present Data Request, we would refer to the model described in the preceding statement as "Load Flow 1". In BGE's response to PPRPDR02-01a, BGE provided the results of a load flow study that describe the "No-build alternative." In response to PPRPDR02-01a, BGE further states that "The load flow study results referenced in the response to (a) above also describe the scenario where all the cables are unavailable." For the present Data Request, we will refer to the load flow used to directly produce the results reported in PPRP02-01 Attachment 1 as "Load Flow 2."

- a. Please confirm if the description "removal from service of the current underwater 230 kV connections" as included in BGE's response to StaffDR04-02 means that the two Brandon Shores to Riverside 230 kV circuits are placed out of service in the load flow model.
- b. Does Load Flow 1, as originally provided by PJM, represent the removal from service of the current underwater 230 kV connections?
- c. Please specify the revisions that were made to Load Flow 1 from the version originally provided by PJM to when it was used for the analysis described in BGE's response to StaffDR04-02. For each revision, please specify the rationale for making the revision and the entity that implemented the revision.
- d. In any of the revisions specified in item (c), were generators dispatched by PJM according to PJM's methods and procedures? If yes, please provide details of the revised dispatch by comparing against the dispatch included in the original load flow model provided by PJM.
- e. Please specify what modeling differences, if any, there are between the original Load Flow 1 and Load Flow 2. For each difference, please specify the rationale for the difference and how this relates to the results provided in PPRP02-01 Attachment 1.
- f. Please specify the generation dispatch modeled for the Brandon Shores and Wagner generators in each of the original Load Flow 1 and Load Flow 2. If there is a difference in the dispatch of these generators between the two load flow models, please explain the reason for the difference.
- g. BGE's response to PPRPDR03-02b states that "PJM makes system adjustments, including generation re-dispatch, to control thermal and voltage constraints on a

pre-contingency basis so that immediately following a single contingency, facility loadings and voltage profiles are within acceptable limits.” Was this type of system adjustment applied to Load Flow 2 prior to the analysis conducted by BGE? If yes, please describe the system adjustments that were applied and whether these were specified by PJM or BGE. If no, please explain the reason why system adjustments were not applied.

RESPONSE:

- a) Yes, BGE confirms that the referenced statement means that the two Brandon Shores to Riverside 230 kV circuits are placed out of service in the load flow model.
- b) The single load flow model and the analysis evaluating the special scenario where both Brandon Shores to Riverside circuits are placed out of service as referenced in both BGE responses to StaffDR04-06(a) and PPRPDR02-01 was the same load flow model. Only one analysis was performed.

In its response to StaffDR04-02, BGE was describing the original load flow model developed by PJM and used by BGE as a starting point to evaluate the risks of not replacing the Harbor Cables. This model that PJM developed to perform its 2016 RTEP analysis was subsequently modified by BGE to perform its one special scenario analysis. This modification only included placing the Brandon Shores to Riverside 230 kV circuits out of service as a special scenario to be evaluated with no other changes being made. As further described in BGE’s response to StaffDR04-06(a), this study was performed by BGE because this special type of scenario is not evaluated as part of a normal baseline study of the transmission system during PJM’s annual RTEP analysis.

- c) Please see BGE’s response to PPRPDR07-01(b) above.
- d) Please see BGE’s response to PPRPDR07-01(b) above.
- e) Please see BGE’s response to PPRPDR07-01(b) above.
- f) As stated previously in BGE’s response to PPRPDR07-01(b), Load Flow 1 and Load Flow 2 are the same load flow models. The generation dispatch of the Brandon Shores and Wagner Generators within the PJM 2016 RTEP Load Flow model used as BGE’s starting point is the same dispatch PJM used in its 2016 RTEP analysis for study year 2021. This dispatch is reflected in BGE’s response to PPRPDR06-03 and *CONFIDENTIAL CEII PPRPDR06-03 Attachment 1*. This dispatch of PJM’s RTEP load flow model and the base power flow reflecting both Harbor Cables in service as studied by PJM as part of their 2016 RTEP analysis, is shown on the left side of the attachment labeled “Harbor Cables In Service”. Also provided in the attachment on the right side labeled “Harbor Cables Out of Service”, is the base power flow reflecting BGE’s modification to the model to study the two Brandon Shores – Riverside 230kV circuits

being out of service. As shown in the attachment, no changes were made to the dispatch of the Brandon Shores or Wagner Generators from the starting point PJM 2016 RTEP case to BGE's special scenario analysis. No changes were made to any generation within the load flow model.

- g) The statement from BGE's response to PPRPDR03-02(b) was in the context of the daily operation of the transmission system and generator dispatch in real-time and was not in the context of planning or in reference to the use of planning criteria and the methodologies used in planning studies. As stated previously in BGE's response to PPRPDR07-01(b), Load Flow 1 and Load Flow 2 are the same load flow model. The dispatch of generation in the planning models that BGE uses is developed by PJM using defined methods and is fixed. No adjustments are made prior to subsequent studies once the dispatch has been developed by PJM for that model.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 6
Request Received: 09/16/2019
Response Date: 09/25/2019

Item No.: PPRPDR07-02

In its response to PPRPDR01-01, BGE provides possible electric alternatives to the Key Crossing Project. Were any of these alternatives modeled and tested in a manner similar to the load flow tests shown in PPRP02-01 Attachment 1? If yes, please provide a table of results similar to those reported in PPRP02-01 Attachment 1. If no, please explain why such an analysis was not performed.

RESPONSE:

The alternatives referenced were not in the response to PPRPDR01-01, but rather were described in BGE's response to PPRPDR01-04, and were developed to only mitigate the adverse impacts/planning criteria violations presented in *CONFIDENTIAL CEII PPRPDR02-01 Attachment 1* for a scenario where both existing Harbor Cables were out of service permanently.

The existing system today with both Harbor Cables in service does not exhibit these planning criteria violations.

Each of the alternative projects including the selected alternative maintained the reliability of the existing system as it is today when both Harbor Cables are in service.

As a result of the other alternatives being a higher cost and providing no additional benefits, as well as other factors further described in BGE's responses to PPRPDR01-04 and PPRPDR04-01, no further detailed analysis was performed.

Case No. 9600
Baltimore Gas and Electric Co.
Response to PPRP Data Request 9
Request Received: 09/27/2019
Response Date: 10/10/2019

Item No.: PPRPDR09-01

BGE's response to PPRP 07-01(b), states that the load flow study "was performed by BGE because this special type of scenario is not evaluated as part of a normal baseline study of the transmission system during PJM's annual RTEP analysis."

- a. Has an update of this analysis been performed using any of the 2017, 2018 or provided in CONFIDENTIAL CEII PPRPDR02-01 Attachment 1. If not, please clarify which load flow study BGE is referring to.
- b. By "baseline study" is BGE referring to the Baseline Reliability Analysis described in PJM Region Transmission Planning Process (Manual 14B) Section 2.3.2? If not, please explain any difference in context and content to the study described in the aforementioned PJM Manual.
- c. Please describe the specific objectives of the load flow study.
- d. Please confirm if the methodology and modeling assumptions for the load flow study are consistent with the PJM Baseline Reliability Analysis. Please describe what the differences are, if any.

RESPONSE:

- a) BGE performed the initial evaluation in 2016 using the PJM 2016 RTEP load flow model with the results provided as *CONFIDENTIAL CEII PPRPDR02-01 Attachment 1*. The same scenario was re-evaluated in 2019 using PJM's 2019 RTEP load flow models with the results provided as *CONFIDENTIAL CEII PPRPDR08-01(a) Attachment 1*.
- b) Yes.
- c) The objective of the load flow studies was to identify the reliability impacts of a long-term failure of the existing underwater cables with no replacement in service.
- d) The methodology and modeling assumptions for the initial load flow studies performed in 2016 were consistent with PJM's 2016 Baseline Reliability Analysis except for the modeling assumptions for the existing underwater cables status. The 2016 Baseline Reliability Analysis modeling assumptions for the existing underwater cables assumed the cables to be in service as an initial condition. BGE's special scenario evaluated the potential risk of a long-term failure as a result of its material condition and the modeling assumption used for the cables was changed to reflect the cables being out of service as an initial condition.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-01

Would the construction, testing, or commissioning of the Project require electricity service interruptions or outages? If so, please indicate the extent (line length and number of customers affected) of impacts, when disruption would likely occur, and the duration of service impacts. Describe how the Company will manage the interruptions. If not, please indicate what the Company will do to avoid service interruption.

RESPONSE:

BGE does not anticipate any electricity service interruptions or outages for BGE customers as a result of the construction, testing, or commissioning of the Project. There will be certain temporary outages of the existing transmission line segments in order to facilitate construction of the overhead segment, but these outages will not result in any BGE customers experiencing a loss of electric power. *See* Environmental Review Document (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling) at pages 3-2, 3-51, and 3-63 for more information on the expected construction-related outages.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-02

Please identify any concerns expressed to date by residents, business representatives, local officials, and federal agencies regarding the Project and how the Company will respond or has responded. Describe any meetings the Company has had with residents, business representatives, or local/federal officials to address the concerns.

RESPONSE:

BGE has had and continues to undertake significant community and stakeholder outreach related to the Project. See the Prepared Direct Testimony of James A. Casey at Section 5, Page 11, Community and Stakeholder Outreach, which describes in detail the outreach prior to BGE's submittal of the Project application, as well as Section 1.4 of the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling), Project History and Prefiling Consultations.

As noted in Section 1.5 of the ERD, Public Outreach, BGE is always looking for additional opportunities to communicate effectively with customers, regulatory agencies, environmental organizations, state and local elected officials, community organizations, and property owners about the Project. BGE plans to conduct several open houses during 2019 in order to further this outreach effort. The first community open house was held at the Sollers Point Multi-Purpose Center in the Turner Station/Dundalk community of Baltimore County on March 21, 2019.

BGE's outreach strategy was and continues to be proactive outreach to key stakeholders early and often. BGE meets with stakeholders, listens to questions and concerns, and incorporates these comments as much as possible into Project plans. This ongoing outreach, which has taken place over the last several years, has proven very beneficial in gaining support for the Project from key stakeholders, including Fort McHenry, Maryland Historical Trust, the National Park Service, key environmental groups, and the Chestnut Hill and Turner Station Community Associations.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-03

Please provide a table to include a list of permits / approvals that would be required for the proposed Project and whether the Company has filed an application for each of the listed permits and approvals; the actual or projected application filing date; the current status of each permit/approval; and the projected issuance date for each.

RESPONSE:

Please refer to Table 1.3-1 in the Environmental Review Document (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling) on pages 1-7 and 1-8 for a summary of state, federal, and local permits and approvals potentially required for the Project.

BGE notes the following updated information since Table 1.3-1 was filed:

- The Rivers & Harbor Act (Section 408) permit application will be submitted by the end of May 2019.
- The Sediment and Erosion Control plans will be submitted by the end of May 2019.

All permits are expected to be received in 2020.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-04

Please describe parties that are intervening and/or participating in this case? Provide a copy of any comments by these parties regarding the proposed Project.

RESPONSE:

The Maryland Office of People's Counsel and the Commission's Office of Staff Counsel have entered their appearances in this case. To date, neither party has filed any comments. The deadline to file petitions to intervene in this proceeding was February 6, 2019 pursuant to the Public Utility Law Judge's Notice of Pre-Hearing Conference, issued January 7, 2019 (Maillog #223498). BGE is not aware of any other petitions to intervene being filed by any other parties in this case.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-05

Please provide drawings of the rights-of-way that BGE will utilize in order to complete this Project. Please indicate the widths of the ROWs, both the previous width, where applicable and new widths.

RESPONSE:

The Project site is shown on numerous figures in the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling). For example, see Figure 2.1-2 on page 2-4 of the ERD and multiple figures on pages 2-5 through 2-11 of the ERD. A more detailed outline of the site is depicted in Figure 2.2-22 of the ERD (4 maps, beginning on page 2-64 of the ERD). The Project makes use of existing BGE owned or controlled lands at Hawkins Point and Sollers Point, and most of the total Project length is for the crossing of the Patapsco River. As such, there is no true ROW width responsive to this data request. Please also see BGE's response to StaffDR02-08.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-06

Please describe the equipment that would be added to terminal substations proposed for the Project on both sides of the harbor. Please also provide a one line diagram that shows how the circuit would interconnect between two major 230 kV substations.

RESPONSE:

Please refer to section 3.2.6 of the Environmental Review Document (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling) on page 3-47. No equipment will be added to the existing terminal stations. The equipment within the existing terminal stations will be removed and the terminal stations will be decommissioned.

Please see *StaffDR02-06 CONFIDENTIAL Attachment 1* for the proposed one-line diagram.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-07

Has the Company selected a final construction method for building the foundation for the in water towers in the Patapsco River/Harbor? If so, please describe the method, if not, when does the Company plan to finalize its choice?

RESPONSE:

From the construction methods considered, BGE selected the Overhead Transmission Line as described in Section 5.5.8 of the Alternatives Analysis (included as part of Appendix E to the Environmental Review Document). For tower architecture, BGE has selected the Monopole Tower design as described in Section 7.5.2 of the Alternatives Analysis. From the route evaluation process, BGE has selected Route 1 as described in Section 5.4.1 of the Alternatives Analysis. These selections can be viewed on the Key Crossing Reliability Initiative community outreach video, available through the following hyperlink: <https://www.bge.com/SmartEnergy/InnovationTechnology/Pages/Key-Crossing-Initiative.aspx>. Further information on construction methods and techniques can be found in Section 3.3 of the Environmental Review Document (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling).

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-08

Please refer to page 13 of the Company's CPCN application to the PSC. The Company stated that it would need to secure a 0.5 acre easement across Maryland Port Authority-owned property on the Hawkins Point side of the Patapsco River. Please describe the Company's discussion with the Maryland Port Authority regarding obtaining easement for the Project. Does the Company need to secure any property rights for staging? If yes, please describe the location.

RESPONSE:

BGE is having ongoing discussions with the Maryland Port Administration (MPA) regarding property or property rights to site proposed Tower #1 on the Hawkins Point side of the Project. BGE has provided exhibits to MPA that address all questions received to date from MPA and has recently confirmed to MPA the Project's design considerations. These considerations account for MPA's future shipping channel width, depth, and vertical clearance requirements. BGE understands that MPA is currently evaluating the proposed plans and that MPA will contact BGE to schedule additional discussions.

The primary staging site for the Project will be within BGE's Riverside property, located in Dundalk, Maryland at 4000 Broening Highway. The Riverside staging area is included within the project site as indicated on Page 2-6, Figure 2.1-4 of the Environmental Review Document (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling).

BGE's construction contractor will be responsible for identifying any required water access facilities as well as any necessary supplemental staging areas.

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Item No.: StaffDR02-09

What are proposed Project construction hours and dates? Discuss how the Company is going to manage construction waste.

RESPONSE:

Construction activity is expected to take place during weekdays, for 8 to 10 hours/day.

Please refer to pages 34-35 of the Direct Testimony of Jeffrey L. Meling for information regarding the management of solid or hazardous waste from Project construction activities.

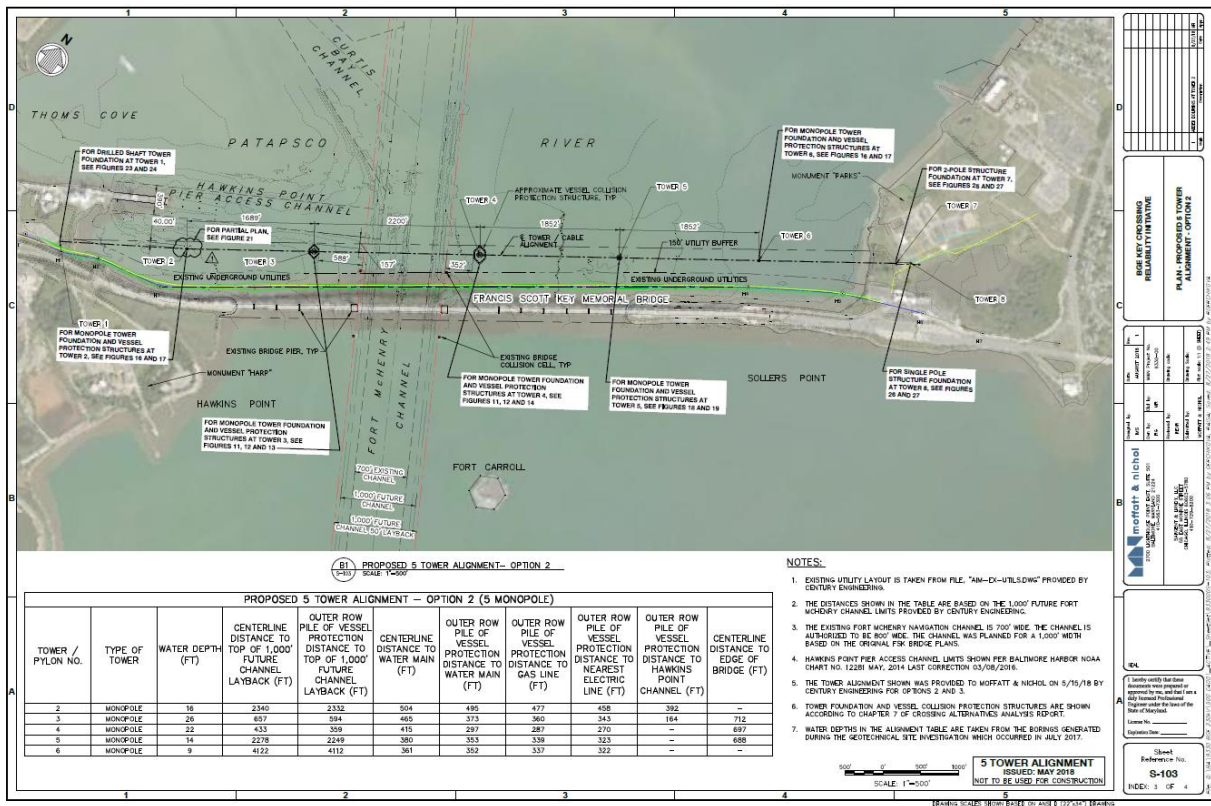
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Item No.: StaffDR02-10

Please refer to page 18 of the Application. The Company stated that the Project would be constructed adjacent to the existing underwater portion of the line. What would be the clearance between the existing underwater conduits and the proposed underwater foundation structure? Please discuss what the Company would do to protect the integrity of the existing underground infrastructure as well as impacts on the river during the construction of the Project.

RESPONSE:

Please refer to the Joint Permit Application (JPA) in Appendix E of the Environmental Review Document. Within the JPA documentation, Appendix D contains the 30% design drawings. Within the 30% design drawings, please refer to reference sheet S-103, which shows the proposed alignment for the monopole design (a snapshot appears on the following page). On the bottom is a table describing the distances between the new line facilities and various existing features. The third column from the right lists the distance between the nearest electric cable and the nearest driven pile for the new line. This table indicates the distance ranges between 270 feet at Tower 4 to 458 feet at Tower 2. The large physical distance described above is the primary mechanism to provide protection to the existing assets during the construction of the new line. Construction specifications will establish work areas to protect this buffer space between the lines.



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Item No.: StaffDR02-11

Please refer to the Application at page 18. The Company stated that the project sites where construction will take place are located within FEMA 100-year floodplains. Has the Company's design considered this to the plan? Please explain.

RESPONSE:

The areas of the Project site within the 100-year floodplain are depicted in the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling). See Maps 2 and 3 of Figure 2.2-22 on pages 2-65 and 2-66, respectively, of the ERD. These maps show the two landward ends of the Project site. Project construction on land will not occur within the depicted floodplain areas, which are limited to the immediate shorelines. Please also see page 9, Lines 17 and 18 of the Direct Testimony of Jeffrey L. Meling, which states that "[a]s shown in Figure 4.4-1 of the ERD, no fill or structures are proposed to be constructed within the floodplain." This statement refers to these landward portions of the site.

Project structures will also be constructed in the Patapsco River. The river itself is considered within the FEMA floodplain, as shown in Figure 2.2-16 on page 2-49 of the ERD.

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Item No.: StaffDR02-12

Please describe the entity that has jurisdiction over the shipping channel, and summarize the Company's discussion with this entity regarding the proposed Project including any concerns raised.

- a. Discuss how the Company intends to protect the safety of the proposed infrastructure from boats and other entities/persons that have access to the shipping channel.
- b. Would the Company require any easement in Patapsco River/shipping channel for the Project?

RESPONSE:

The U.S. Army Corp of Engineers (USACE), Maryland Port Administration (MPA), United States Coast Guard (USCG), and the Association of Maryland Pilots have jurisdiction over different aspects of the operation of the shipping channel. The Project has been presented to and discussed with each of these organizations. Please refer to Section 1.4 of the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling) and page 13 of the Prepared Direct Testimony of James A. Casey for additional information on the meetings with these organizations.

Construction work areas for the Project have been developed so as not to interfere with commercial and private boats using the shipping channel. Please refer to Figure 4.4-1 in the ERD for a depiction of the Limit of Work and the Limit of In-Water Work shown on the impact plates submitted with the Joint Permit Application.

The only construction activity that requires temporary closure of the shipping channel will be the stringing of the conductor wires across the river. A helicopter will be used for this activity and for safety reasons, the shipping channel will be closed for short durations while this activity occurs. Please refer to Section 4.7.3.1 of the ERD for additional information on harbor activity and safety.

- a. The electrical infrastructure will be protected by vessel collision protection structures. Tower locations 3, 4 and 5 have independent vessel collision protection structures. Vessel collision protection structures for tower locations 2 and 6 will be integrated into the tower foundations. Further information on these vessel collision protection structures can be found in Section 3.2.3 of the ERD, as well as Sections 7.4.3 and 7.6.4 of the Alternatives Analysis. The security of this infrastructure will be achieved by using removable, specialized transmission tower climbing ladders for boat access to the towers,

along with security fencing and locked gates on the tower foundations and vessel collision protection structures.

- b. BGE will not require any easements in the Patapsco River/shipping channel for the Project.

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Item No.: StaffDR02-13

Please discuss how the Company is going to decommission the existing underground 230 kV transmission line and any associated equipment? Will any components of the existing underground system be salvaged? Please explain.

RESPONSE:

The decommissioning of the underground cables is detailed in Section 3.2.5 of the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling). The removal of the existing terminal station equipment is described in Section 3.2.6 of the ERD. All the above ground terminal station equipment and most of the cable and piping within the terminal stations will be salvaged. The bulk of the oil within the complete pipeline cable system will be salvaged. The buried pipeline between the terminal stations will be abandoned in place and not removed.

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Item No.: StaffDR02-14

Please discuss potential electromagnetic field impacts of the Project including impacts on vehicles on FSK bridge.

RESPONSE:

The document described in BGE's response to StaffDR02-10 lists the distance between the proposed overhead line and the Francis Scott Key Bridge as no less than 688 feet. With these large distances, there are no anticipated electromagnetic field effects beyond background levels expected to impact vehicles traveling on the bridge.

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Item No.: StaffDR02-15

Please refer to William Munley's testimony at page 3. Mr. Munley stated that in 2009, BGE first began to identify elevated levels of dissolved gases within the oil encasing cables. Did the Company identify elevated dissolved gases as a result of a regular maintenance effort? Please explain.

RESPONSE:

BGE first identified the possibility of elevated dissolved gas levels when an employee was performing a routine inspection. Subsequent testing confirmed elevated levels of dissolved combustible gases, including acetylene.

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Item No.: StaffDR02-16

Please refer to Mr. Munley's testimony at pages 3 and 4. Discussing potential sources of dissolved gas, witness Munley stated that BGE contacted contractors and other utilities for guidance and all have suggested replacing the existing cables as the most viable mitigation solution. Please provide any reports or records of the guidance BGE received from its contractors and/or other utility companies.

RESPONSE:

BGE commissioned 5 studies to investigate the various aspects of the existing cable after the high levels of dissolved gasses were identified and found to be increasing over time. These 5 studies are noted below. BGE also consulted with other utilities that have extensive pipe type cable installations. These consultations included Florida Power & Light Company (FPL), which had significant submarine pipe type cable installations, and Commonwealth Edison Company (ComEd), which has one of the larger networks within the country. These reports and consultations are summarized below:

- 1) USI Final Report: Longevity Study Baltimore Gas & Electric 230 kV Pipe Type Cable Circuits 2344/2345, Hawkins – Sollers Pt. Harbor Crossing, USI JO 11858, October 25, 2011 (attached hereto as *StaffDR02-16 CONFIDENTIAL Attachment 1*).

Analysis: BGE agrees the dissolved gases were likely due to the instrumentation wiring, and thermomechanical bending within the pipeline system. To evaluate further, excavation of all cable splices would be required but the splice casings are buried under the river bottom. No further action possible without excavation of the pipeline splices and nearly 2000 feet of pipe for each.

- 2) Evaluating Causes of High Acetylene Levels in the Harbor Crossing Cables, March 2014, Power Delivery Consultants, Inc. (attached hereto as *StaffDR02-16 Attachment 2*).

Analysis: BGE agrees with the suspicions of thermomechanical issues and the instrumentation cables but these are not accessible without extensive in water excavation within the river. Changes to oil viscosity were subsequently found to not be viable concepts without reduction in cable rating.

- 3) On-Line Partial Discharge Testing of Five (5) Pipe Type 230 kV Cable Circuits – Baltimore, MD, Kinetrics North America Inc, Report No.: K-423336-001-RC-0001-R00, Dated August 4, 2015 (attached hereto as *StaffDR02-16 Attachment 3*).

Analysis: Four electrical partial discharges were identified, but this test was not very sensitive to issues remote from the terminal ends and as such provided little intelligence with respect to the submarine portions of the cable. The identified discharges could be attributed to thermomechanical or instrumentation cable issues within the terminal station portions of the cable system.

- 4) BG&E Harbor Cable Review of Gassing Data and Recommendations dated August 2016 (attached hereto as *StaffDR02-16 Attachment 4*).

Analysis: This report describes that the cables are aging as expected but that the acetylene levels and their general increasing trend are indicative of future failure. The replacement of the existing cables (or other solutions to tolerate their failure) are recommended. This report does not attempt to determine the source of the acetylene gas.

- 5) BG&E – Off-Line PD on Five 230 kV HPFF Submarine Cables Kinetrics Draft Technical Report – Off-Line PD Test on Circuits 2344 and 2345 between Hawkins Point and Sollers Point, Baltimore, MD, K-423749-DOC-0001 R00, dated November 25, 2017 (attached hereto as *StaffDR02-16 Attachment 5*).

Analysis: Most discharges were found close to the sensor locations, and two were found to be clearly in the submarine portion of the cable. The test's ability to reach far into the submarine portion of the cable is limited. The discharges identified in the submarine portion of the cable system are in locations where the instrumentation cables and damage to the outside 230 kV cable layers are likely the cause.

BGE's Project team met with the Power Plant Research Program (PPRP) in August 2015 to propose the original concept plan to install a new underground transmission cable system to replace the existing damaged cables. PPRP made it clear that excavating in the river bottom was not going to be an allowed alternative if any other option was available. PPRP's position, in conjunction with the results of BGE's commissioned studies, necessarily eliminated the option to excavate the existing cable and splices to repair or replace the cable within the pipes.

The Project team had telephone discussions with FPL in February 2017. FPL has experience with HPFF cables in similar submarine environments. The Project team was interested in learning about cable replacement/cable installation alternatives. The guidance from FPL indicated splice excavation and removal to support cable replacement as the recommended solution. Based on the PPRP guidance noted above, this was not a viable alternative.

The Project team had telephone discussions with ComEd in February 2017. Discussions with ComEd confirmed the FPL recommendation to replace the splices and cable. ComEd recounted an installation with similar temperature sensing wires to the BGE cables. These wires themselves had broken free from the cable shield at many locations and were creating spark

discharges under oil along with damage and burning to the outer cable shield. This was only identified upon cable removal. Cable removal was recommended by ComEd, this was not a viable alternative for BGE based on previous PPRP feedback regarding excavation within the riverbed.

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Item No.: StaffDR02-17

In its regional transmission expansion planning (RTEP) process, has PJM identified the existing 230 kV line as an infrastructure that requires an upgrade or replacement? If yes,

- a. Was the Project classified as a baseline upgrade, a network upgrade, or a supplemental upgrade? Please provide relevant pages of this RTEP report/study that the Project is identified in.
- b. Is the Company aware if PJM's studies factored in distributed energy resources?
- c. Please discuss whether the project is undergoing any review by PJM and the status of the review.

RESPONSE:

PJM has not identified the existing 230kV line as infrastructure that requires an upgrade or replacement as part of its RTEP process. These lines were identified by BGE for replacement based on asset material condition. This project is classified as a BGE supplemental project and will be included as part of the upcoming 2019 Series RTEP analysis that will study the year 2024 conditions.

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Item No.: StaffDR02-18

Did the Company identify the Project based on its assessment of system needs? If yes,

- a. Please discuss the Company's system reliability planning criteria.
- b. Discuss in detail the conditions under which the reliability performance of the transmission system was evaluated (e.g., planning horizon, load conditions, etc.).
- c. Does the Company employ metrics such as TSAIFI or TSAIDI? If yes, please explain quantitatively how they are applied to this Initiative.

RESPONSE:

BGE identified the Project as a supplemental project based on asset material condition.

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Item No.: StaffDR02-19

Please review page 11 of the Company's CPCN application to the PSC where the Company listed three cable failure scenarios that might occur if it does not replace the Key Bridge Harbor replacement Project (i.e., lowest impact, medium impact, and high impact). Please describe how the Company estimated maintenance duration in the three scenarios.

RESPONSE:

Please refer to Section 2.1.5 of the Alternatives Analysis (included in Appendix E to the Environmental Review Document) beginning on page 9. The estimates included therein are order of magnitude and based upon BGE's experience with pipe type cable repairs.

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Item No.: StaffDR02-20

Please refer to the Company's Alternatives Analysis at page 63 where the Company described the "no-build" option. Considering the existing 230-kV lines estimated useful life and current conditions, what is the Company's opinion of when any one cable might fail?

- a. Discuss the probability that a cable might fail within the next five years.
- b. Discuss when the next set of cables might fail after the first set of cables are damaged.

RESPONSE:

Please refer to Section 2.1.4 beginning on page 8 of the Alternatives Analysis (included in Appendix E to the Environmental Review Document). BGE is not able to estimate the probability of cable failure due to the inaccessibility of the cable and splices within the river. The cables and accessories within each of the 5 cable pipes are identical and have experienced similar historic temperature and loading conditions. It is expected that once a cable failure occurs the resultant electrical loading per cable would be increased causing increased cable temperature and associated thermo-mechanical movement. This is expected to increase the rate of failure of the remaining cables.

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Item No.: StaffDR02-21

Please review page 11 of the Company's CPCN application to the PSC. Discussing the lowest impact failure scenario, the Company stated that repairing a single cable pipe would have some cost impacts to the electrical network since generation would not be able to operate as economically as normal, and "off cost" premiums to dispatch other generation would occur.

- a. Describe "off cost" premium.
- b. Explain why generation would not be able to operate as economically as normal in the lowest impact scenario.
- c. Provide any congestion impacts if a cable is out for an extended period of time.

RESPONSE:

The term "off-cost" is defined by PJM as "out of merit dispatch operation that may necessitate the need for expensive resources to come online or economic resources to decrease their output to relieve a transmission constraint." The increase in the price of generation during this off-cost period can be considered a premium cost over costs incurred during a more optimal generation dispatch scenario.

During the lowest impact failure scenario, a temporary reduction in transmission line capacity of the affected circuit would be expected. The circuit may become a transmission constraint and have the potential to trigger "off-cost" operations preventing a more economical dispatch of generation.

If the cable or circuit would become unavailable for an extended period of time, real time congestion could occur depending on the condition and status of the remainder of the system.

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Item No.: StaffDR02-22

Please refer to page 9 of the Company's CPCN application to the PSC where the Company discussed the impact of a fault affecting both 230 kV circuits with the Harbor Crossing Cables out of service. Please quantify the impact of failed 230 kV circuits to the 115 kV lines feeding downtown Baltimore. Would there be thermal overloads on any of these lines, please supplement your response with a diagram identifying lines that would potentially be affected.

RESPONSE:

The impact that having the Harbor Cables out of service along with failed 230kV circuits supplied from the northeast would have on the downtown Baltimore 115kV lines is depicted on *StaffDR02-22 CONFIDENTIAL Attachment 1*. The circuits expected to potentially have loading beyond their Emergency Ratings are shown in Red. Additional overloads on these and other BGE circuits may occur depending on the modeled conditions. The overloaded circuits identified would be expected to occur during a summer peak load scenario in 2024 without any other type of mitigation.

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Item No.: StaffDR02-23

Please describe whether the impacts of increasing summer temperatures days due to climate change were factored into the design of the Project. If they were not factored in the design of the Project, please explain why.

RESPONSE:

The potential for increasingly higher summer temperatures due to climate change were factored into the design of the Project. One of the design conditions evaluated considers the operation of the new infrastructure in summer ambient temperatures up to 120°F.

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Item No.: StaffDR02-24

Please refer to William Munley's testimony on pages 3-4. Discussing the maintenance and troubleshooting challenges associated with the existing HPFF cable, Mr. Munley stated that BGE replaced the cable terminations on the system.

- a. On page 4, line 4, Mr. Munley stated that there was a lack of available spare parts for the original termination. What is the current availability of spare parts?
- b. On page 4, the witness describes ComED's experience and stated that temperature sensing instrument may be the source of the problem. Is it the Company's opinion that the temperature sensing instrument is the source of the dissolved gas release, or the cable terminations, or some other source?

RESPONSE:

- a. BGE currently maintains spare parts for the cable terminations currently in service. BGE maintains small amounts of the existing cable as a spare along with a reel of a comparable cable for use in repairs within the terminal station. BGE does not maintain any spare materials to address a failure within the river portion of the cable system.
- b. Please see BGE's response to StaffDR02-20. BGE believes there are likely two mechanisms at play (temperature sensing instrumentation wires, and thermomechanical bending issues at the splices), both of which are creating the source of the dissolved combustible gases.

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Item No.: StaffDR02-25

Please refer to the Alternatives Analysis at page 17. The Company listed the Key Crossing Reliability Initiative Transmission Line Project functional requirements. Discuss how the Company selected these functional requirements.

RESPONSE:

The functional requirements listed in Section 3.3 of the Alternatives Analysis were developed in consultation with BGE's Transmission Planning group and were based on maintaining the existing reliability and capacity of the circuits as a minimum requirement. There are no projected NERC, PJM, or BGE Planning Criteria at this time that require exceeding the existing reliability and capacity of these circuits. The current design considers the possibility for future capacity needs on these circuits and will accommodate future increases in the overall circuit capacity of approximately 43% through upgrades of the existing overhead sections without requiring upgrades to the design of the new overhead sections.

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Item No.: StaffDR02-26

Please refer to Jeffery Meling's testimony at page 9. Mr. Meling stated that Project construction would require clearing and management of woody vegetation to allow for transmission line clearance. Please describe the number and characteristics of trees that would be cleared for the construction of the Project.

RESPONSE:

Per local forest conservation and Chesapeake Bay Critical Area (CBCA) laws, forests, scrub-shrub areas, hedgerows, and specimen trees were assessed for species composition and health within limits of existing woody vegetation lines. Individual trees were located and identified beyond the limits of existing woody vegetation. Stand characterizations can be found in the Natural Resource Inventories for Sollers Point and Hawkins Point conducted by Century Engineering.

Approximately 1.14 acres of forest will be cleared on the Sollers Point side of the Project area to allow for transmission line clearance. Forest Stand 1 is dominated by willow oak (*Quercus phellos*) and red maple (*Acer rubrum*) in the 8 to 32-inch size class. Red maple and poison ivy (*Toxicodendron radicans*) are the dominant understory and shrub species. The herbaceous layer is dominated by Japanese honeysuckle (*Lonicera japonica*), common reed (*Phragmites australis*), and Japanese knotweed (*Fallopia japonica*). The forest stand is young deciduous forest in fair/poor condition. Also, please note that specimen trees 30" DBH or greater are not being removed as part of the Project. Additionally, three individual trees will be cleared outside of the limits of the forest stand. These three trees are black locusts (*Robinia pseudoacacia*) in good condition with diameters at breast height ranging from 7.2"-10.3" DBH.

Approximately 0.77 acres of scrub-shrub vegetation will be cleared on the Hawkins Point side of the project area to allow for transmission line clearance. Vegetation in this area consisted of red maple, smooth sumac (*Rhus glabra*), high-tide bush (*Baccharis halimifolia*), Virginia creeper (*Parthenocissus quinquefolia*), Bradford pear (*Pyrus calleryana*), common reed, Japanese knotweed, and Japanese honeysuckle ranging from three (3) to 15 feet tall. Red maple trees are in the 8" to 16" DBH size range in fair condition. Approximately 3.8 acres of onsite planting at BGE's Riverside property is being proposed to satisfy CBCA mitigation for the proposed clearing. Plans will be available by the end of April 2019 for submittal to CBCA Commission and Baltimore County officials for review.

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Item No.: StaffDR02-27

Please refer to Jeffery Meling's testimony at page 16. Mr. Meling stated that a limited amount of wildlife habitat will be permanently lost as a result of tree removal to provide the safety-and reliability-related clearances needed for the new circuits. Please discuss whether the Company is going to comply with NERC's regulations.

RESPONSE:

BGE will comply with all NERC requirements.

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Item No.: StaffDR02-28

Please refer to the “Alternatives Analysis” at page 51, the Company’s conclusion regarding the viability of Route 1. Discuss in further detail the technical issues associated with ferrous material in a soil.

RESPONSE:

BGE determined that Route 1 was viable for an overhead alternative, but not viable for an underground alternative. This route was unsuitable for underground alternatives due to the need to remediate the existing landfill at Hawkins Point and remove the shipwrecks and debris in the waters just off Hawkins Point. River-bottom surveys indicated that there were numerous shipwrecks in the area and a significant amount of ferrous material. The presence of ferrous material was of immediate concern because it could interfere with the installation of submarine cables or cables installed using Horizontal Directional Drilling (HDD) methods. The submarine cable installation method is to plow or trench into the river bottom, and the shipwrecks and ferrous material would block the plow or interfere with the trenching. HDD could be used to drill under the debris, but the ferrous material could affect the tracking and steering of the drill during installation. If submarine cables were going to be installed along Route 1, it would be necessary to remove the existing shipwrecks and the ferrous materials before installing the cables. The process would be expensive and time-consuming because the shipwrecks may have cultural and/or historical significance. The process would also disturb approximately 49.6 acres of river bottom. Another possible impact would be the disturbance of contaminated soils and the spread of contamination if sediment plumes could not be contained during the debris removal and installation processes.

For comparison purposes, the overhead solution completely avoids the shipwrecks and ferrous material by placing the tower foundations outside of the area where magnetic anomalies were detected.

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Item No.: StaffDR02-29

Please refer to the Alternatives Analysis's Executive Summary on page iv. Discussing the overhead tower designs, the Company stated that the alignment was refined from two independent parallel circuit lines to one dual-circuit line. Please discuss the difference between a parallel circuit line and a dual-circuit line including the benefits associated with each.

RESPONSE:

Please refer to Section 7.3 of the Alternatives Analysis beginning on page 96. The Alternatives Analysis is included in Appendix E of the Environmental Review Document. The two independent parallel line option was eliminated because it was impossible to construct without directly and negatively impacting the Alcoa Channel (a shipping channel) and the associated pier.

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Item No.: StaffDR02-30

Please refer to the Alternatives Analysis at page 41. Providing the Project history, the Company stated that it performed additional field work which included side-scan sonar and bathymetric testing and analysis. Please describe what a side-scan sonar and bathymetric testing and analysis is and how it is used in the development of the Project.

RESPONSE:

Side-scan sonar and bathymetric testing and analysis is a standard design practice to survey a waterway bottom prior to installing submarine cables to identify obstructions and understand the geology to prevent construction delays or damage to the submarine cables. In order to detect and identify underwater obstructions associated with the Project, three bathymetric surveying methods were employed: side-scan sonar, sub-bottom profiling, and magnetic anomaly detection. The three methods are described below. The results of the surveys are discussed in-depth and pictured in Section 4 of the Alternatives Analysis (pages 47-53) as well as in the geotechnical report and Phase I Underwater Archeology Study included in the appendices of the Alternatives Analysis. The Alternatives Analysis is included in Appendix E of the Environmental Review Document.

Side-scan sonar is a device that emits sound in the 100 to 500-kilohertz frequencies and records the reflections of the sound. The technology is very effective at identifying sunken objects, channel boundaries, and other features on or above the bottom of a waterway. In this case, side-scan sonar was used to map the river bottom to characterize the depth of the river and the shipping channel and locate underwater obstructions. Side-scan sonar cannot “see” below the waterway bottom, so sub-bottom profiling is used to detect objects or formations below the waterway bottom.

Sub-bottom profiling uses lower frequency sonar devices that can penetrate river bottom soils and provide information regarding the density of the sub-bottom materials. This information can be used to determine the suitability of the jet plowing installation method. Sub-bottom profiling can also be used to search for shipwrecks or other obstructions that have been covered with sediment.

Magnetic anomaly detection looks for anomalies in the earth’s magnetic fields. Localized anomalies are typically caused by concentrations of ferrous materials, pipelines, or buried electrical cables. For the Project, the survey was performed to confirm the location of the HPFF cables and search for sunken debris that could interfere with a jet plow or HDD alternative alignments/options.

The bathymetric surveying results were critical in the route and technology evaluations being performed by BGE. Although the presence of shipwrecks at Hawkins Point was known because several wrecks were visible at low tide, the extent of the debris at this location was more than anticipated. Additionally, this survey revealed that many more pilings were present at the Sollers Point pier location than were visible at low tide. The shipwrecks could have historic or cultural significance and all the pilings would have to be removed to install submarine cables. The environmental impact of removing the shipwrecks and pilings (river bottom disturbance, potential sediment contamination, etc.) was great enough that BGE began exploring alternate routes and performed another round of bathymetric surveys north of Route 1.

The second bathymetric survey indicated that Route 2 (on the northwest side of the Alcoa Pier) was essentially free of shipwrecks, ferrous material, or other features that would interfere with the installation of submarine cables, so BGE commenced designing for that route. At this point, Route 1 was abandoned as a non-viable route for submarine cable installation and the design focused on Route 2. A preliminary design for Route 2 was prepared and presented to the Maryland Port Administration (MPA) for their review and comments. MPA owns the Alcoa Pier and adjacent land and would have to grant BGE an easement in order to construct Route 2. After reviewing the Route 2 design, the MPA informed BGE that there were long-term plans to redevelop and expand the Alcoa Pier port facilities immediately north in Thoms Cove and that the installation of submarine cables in that vicinity would interfere with these port development plans. MPA was not amenable to granting BGE easements in this area. At this point, BGE canceled further investigation and design of Route 2 and alternative routes and installation methods were researched.

In order to meet conditions of the National Historic Preservation Act Section 106 coordination as part of the Joint Federal-State Permit Application for Wetlands and Waterways Impacts, magnetic anomaly survey and side-scan sonar were redone along Route 1 in the proposed project area, and were completed on March 26, 2019. Results are pending and will be published soon.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-31

Please refer to the Alternatives Analysis at page 57. Discussing Route 3, the Company stated that the route could interfere with MPA port facility development and future transportation projects such as potential bridge relocation in this area. Please describe the Company's discussion with MPA and whether there is a plan to develop the port facility. Has the Company discussed with MDTA about alternative route 3? If yes, please summarize any concerns raised.

RESPONSE:

After Route 2 was rejected because of the MPA's plans to develop a new port facility in Thoms Cove north of the Alcoa Pier, BGE began evaluating Route 3 (south of the Francis Scott Key Bridge). BGE discussed the development of a port facility south of the bridge with the MPA. In a meeting on April 1, 2015, the MPA informed BGE that there is a long-term interest in developing a new port facility on or adjacent to the Millennium Chemical site and asked BGE not to install any infrastructure that could interfere with future port development in that vicinity.

BGE also discussed with the MDTA at the Sollers Point MDTA Engineering Facility on September 8, 2016 the possible construction someday of a new, taller bridge to replace the Francis Scott Key Bridge. BGE was advised at a Harbor Safety Meeting that the Association of Marine Pilots and other Baltimore Port entities were advocating for either raising the bridge or replacing the bridge with a new taller bridge to allow the next generation of larger cargo ships to access the Baltimore Harbor. The MDTA advised BGE that they were aware of the issue but that there were currently no plans to raise the bridge or construct a new one. However, a letter was provided by MDTA to BGE on January 3, 2018 (attached hereto as *StaffDR02-31 Attachment 1*) stating that any proposed infrastructure shall meet minimum operational clearances of 1,500' horizontal, 215' vertical, and 60' depth where it crosses the main shipping channel.

After the meetings with the MDTA and the MPA, BGE determined that there is a significant possibility that, in the fifty-year plus life expectancy of the proposed transmission infrastructure, construction of a new bridge and/or development of a new port facility could require relocation or abandonment of any transmission system constructed in or adjacent to Route 3. BGE therefore determined that it would be imprudent to install transmission infrastructure in a corridor that could interfere with future development and could require relocation or abandonment of the infrastructure prior to the end of its useful life.

Please be advised that to BGE's knowledge there are no definitive plans to construct a new bridge to replace the Francis Scott Key Bridge, nor are there definitive plans to construct a new port facility at the Millennium Chemical Plant site, but there is a non-negligible probability that one or both actions could occur over the life of the proposed transmission assets.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-32

Please refer to the Company's Alternatives Analysis at pages 41-62. Please provide a quantitative scoring of the four routes the Company analyzed.

- a. Discuss whether each criterion (e.g., cost, technical issues, environmental impact including size of wetland resources, size of property rights required, etc.) would have the same weight.
- b. Discuss how reliability of the proposed line would compare along the four routes analyzed.
- c. Did the Company assume a linear relationship between cost and route length?
- d. Does the Company have a conceptual cost estimate of project cost along the different routes analyzed? If yes, please provide.

RESPONSE:

BGE did not perform a detailed quantitative assessment of the four routes. Quantitative data like total distance of each route (proxy for cost), and the magnitude of the temporary and permanent environmental disturbance was calculated and used in the evaluation. The quantitative data was used to determine the relative ranking of each route with respect to one another, but the fundamental evaluation methodology was qualitative in nature.

- a. Six evaluation categories were developed, and each category given equal weight in the evaluations. The six categories were distance, construction cost, environmental impacts, property rights, technical issues, and risk issues. In the initial evaluations, BGE employed a multi-parameter, multi-evaluator comparative assessment method to consider all evaluation characteristics individually but found that the process was excessively cumbersome and did not result in significant differences from the evaluation methodology described in this submittal.

BGE believes that this methodology is appropriate to the Project because it acknowledges that the value of each category is a subjective matter. For example, an environmental advocate may put greater emphasis on environmental impacts than an industrial or commercial ratepayer who is likely to be more concerned with cost and reliability. BGE's goal was to identify a solution that was characterized with the lowest cost, the lowest environmental impact, the least impact on property rights, the least number of technical issues, and the lowest risk. BGE believes the result of the evaluation came as close to that objective as is reasonably possible for projects of this nature.

- b. BGE performed a detailed risk assessment of the overall project and determined that from a reliability perspective, the greatest risk to an overhead transmission line in this location was damage from a collision with a marine vessel. Transmission towers crossing waterways have been struck in recent history (in the Houston Ship Channel in 2010¹ and in the Delaware River in 1987²). BGE commissioned a study to analyze the risks associated with vessel collisions. The study is included in Appendix 12 of the Alternatives Analysis (included in Appendix E of the Environmental Review Document).
- c. Although there is a linear relationship between the length of the route and the cost for that route, there are other cost factors that are non-linear. The largest non-linear cost factor is the cost of vessel collision protection. The need for vessel collision protection is a function of the vulnerability of the towers to vessel collisions, which is in turn a function of proximity to the channel and depth of the water around the tower foundation. Additionally, each route had unique property and environmental concerns.
- d. No. BGE did not quantify costs for each route and each technology evaluated.

¹ Johnson, Laurie. "Ship Channel Open and Operating." *Houston Public Media*, 6 Oct. 2010, www.houstonpublicmedia.org/articles/news/2010/10/06/23378/ship-channel-open-and-operating/.

² "A 615-Foot Cypriot Tanker Lost Its Compass Sunday and..." *UPI*, UPI, 1 Mar. 1987, www.upi.com/Archives/1987/03/01/A-615-foot-Cypriot-tanker-lost-its-compass-Sunday-and/9853541573200/.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-33

Please refer to the Company's Alternatives Analysis at pages 65 to 66 and Appendix 11 of the Analysis. Discussing the option to attach the ducts to the Francis Scott Key (FSK) Bridge, the Company indicated that the existing 5 pipe 15 cable circuit system will be replaced by a 12 to 18 cable system.

- a. Discuss how the Company would decide on the number, conductor size and type of cables that would be required.
- b. The Company stated that the "attaching ducts to the FSK Bridge" option would not be prudent because MDTA might require relocating the cables. Please describe the risks associated with relocating the cables.

RESPONSE:

- a. Each of the required two circuits will require a rating capacity of ~1,500 MVA. The limiting elements in the rating of the cables are primarily the diameter and operating temperature of the conductor. In general, the operating temperature of the conductor is mostly influenced by the electric current flow, distance between the cables, and other general and environmental parameters affecting heat transfer (such as air temperature, location of the installation, etc.), where larger conductor diameter, greater cable separation, cable configuration and thermal resistivity can result in increased power transfer capacity for the cable circuits. Cable diameter and distance between the cables are design parameters limited by manufacturer capabilities and engineering decisions. In the case of an installation on the FSK bridge, BGE would utilize XLPE cables and generally utilize what is commonly available from cable manufactures. The number of cables per phase and therefore the number of cables per circuit is governed by the parameters listed above.

For this application, BGE has not determined cable sizing nor has BGE discussed with cable manufacturers their available products that could meet the circuit capacity requirements. However, from BGE's experience, multiple cables per phase would be required to meet the circuit's rating capacity and ampacity.

The optimization of cable system design is addressed during the detailed design phase of the project, where BGE engages cable manufacturers and fine tunes the cable insulation design, and determines the influence of cable separation, installation environment and installation method/configuration upon the number of cables per phase required.

- b. BGE can only attach cables to the FSK bridge with the MDTA's approval, and the MDTA made it clear to BGE that permission would be contingent on MDTA's right to require BGE to remove or relocate the cables at the MDTA's request. Should MDTA ask BGE to relocate the cables, BGE would need to find an alternative location, rebuild the circuits and then switch over to the new circuit. This would be at considerable cost to ratepayers and would take a long time to resolve (which may be problematic for emergency bridge repairs).

Additionally, attaching the cables to the FSK bridge would restrict bridge maintenance activities and potential bridge modifications. Additional risks to BGE and the reliability/capacity of the Bulk Energy System could arise if MDTA were to request outages for these activities.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-34

Please refer to the Company's Alternatives Analysis at pages 66 to 68, the Company's evaluation of the option to install new cables into existing pipes. Table 5.7 indicates that this option is rated "fair" for prudence while in the text above the table, the Company stated that selecting this option would be imprudent. Please reconcile this difference in characterization. Also, on page 68, the Company stated that one of the significant risks associated with this option is USACE's potential for increasing the depth of the channel to 60 feet. Is that conclusion based on the Company's discussion with USACE about this specific option? Please elaborate.

RESPONSE:

Table 5.7 should indicate that the option is rated "poor." The Alternatives Analysis will be updated to reflect the change.

The possibility of the shipping channel being widened and deepened was discussed on several occasions with the USACE. In those discussions, the possibility of the channel depth being increased was mentioned as a possibility, but to BGE's knowledge, there are no plans to deepen the channel at this time. However, a letter was provided by MDTA to BGE on January 3, 2018 (see *StaffDR02-31 Attachment 1*) stating that any proposed infrastructure shall meet minimum operational clearances of 1,500' horizontal, 215' vertical, and 60' depth where it crosses the main shipping channel.

In subsequent evaluations, BGE concluded that there was a high probability that the channel would be widened over the service life of the cables, and a lower probability that the channel would be dredged to a greater depth over that period. From a historical perspective, the authorized depth of the main channel in the Baltimore Harbor has increased as follows:

Authorized Depth for the Main Channel in Baltimore Harbor³

Year of Authorization	Authorized Depth
1830	17'
1852	23.5'
1884	27'
1903	30'
1915	35'
1930	37'
1945	39'
1958	42'
1970	50'

The USACE has authorized deepening the channel at an average interval of 22 years over the past 190 years. History is not always an accurate predictor of the future, but in this case the project team decided that it could not ignore the possibility the USACE would authorize a deeper channel depth during the service life of the new cables.

³ “Dredged Material Management Plan (DMMP)-Historical Background.” *US Army Corps of Engineers - Baltimore District*, US Army Corps of Engineers - Baltimore District, www.nab.usace.army.mil/Missions/Civil-Works/Dredged-Material-Management-Plan-DMMP/Historical-Background/.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-35

Please refer to the Company's Alternatives Analysis pages 71, the Company's description of the option to install horizontal directional drilled duct with XLPE cable. The Company rated the option "very poor" with regard to environmental impact citing high probability of contamination from inadvertent drilling fluid releases. Please characterize the drilling fluid and its potential environmental impact.

RESPONSE:

The drilling fluid most commonly used in horizontal directional drilling is a mixture of raw or potable fresh water and bentonite. Bentonite is an aluminum phyllosilicate clay consisting mostly of montmorillonite and is generally considered non-toxic. According to the World Health Organization "Bentonite and kaolin have low toxicity to aquatic species, a large number of which have been tested."⁴

In the case of an inadvertent release, drilling fluid plumes would form in the waterway. Bentonite clay released in a low energy waterway settles out relatively quickly and, once settled, could remain in place for extended periods of time. If the drilling fluid was released at a period of higher energy, the sediment plume could travel farther, affecting a larger area. There is no way to determine or predict where an inadvertent release would occur along a horizontal directional drilling (HDD) route. As such, containment measures could not be deployed prior to construction. The plumes of drilling fluid that would form are hard to contain in a waterway like the Patapsco River due to the size and current. The release of drilling fluid will likely result in the bentonite settling on the river bottom and adversely affecting benthic life and negatively impacting fish health and spawning. There are no effective cleanup methods once a release has occurred.

The loosely consolidated soils of the Project location are highly susceptible to inadvertent releases during HDD installations and the Project would require up to 18 bores to be drilled across the river if HDD installations were selected. The combination of the high risk of inadvertent releases and the high number of bores could result in repeated plumes that may suffocate benthic life in the area.

⁴ Adamis, Z. and Williams, R. (2005). *Bentonite, kaolin and selected clay mineral*. Geneva: World Health Organization.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-36

Please describe the Company's discussion with the USACE about the different construction methods evaluated by the Company.

RESPONSE:

BGE met directly with the USACE on several occasions to brief them on the Project and solicit their comments and concerns. In addition to the meetings with the USACE, representatives of the USACE attended meetings with multiple agencies, including a summit meeting sponsored by BGE, and several Joint Evaluation (JE) Meetings attended by the Maryland Department of the Environment, the Department of Natural Resources, the USACE, and other agencies. The construction methods that were considered in the Alternatives Analysis were presented to the USACE, and their comments and concerns played a significant role in the selection of the preferred alternative. Issues raised by or discussed with the USACE included:

- Future shipping channel widening, dredging, or maintenance plans;
- Disrupting shipping channel traffic;
- Errant ships, collision risks, and the need for vessel collision protective structures;
- Locations of towers in the waterway;
- Aids to Navigation;
- Disposal of dredge spoils; and
- Environmental impacts of the construction method alternatives.

The biggest issues that affected the Alternatives Analysis were the need to consider future shipping channel widening, the need to minimize impacts to shipping traffic, and the location of future structures like tower foundations. Channel widening had the greatest impact on the submarine cable alternative. The USACE advised BGE that if submarine cables were installed across the channel, and the channel was subsequently widened, BGE would be responsible for relocating the cables to prevent interference with the channel dredging. BGE determined that relocating submarine cables was not feasible because they would be covered with 10 feet of fill and extensive outages on the transmission circuits would be required. The only viable option would be for BGE to pre-dredge the channel in the location of the cable crossing so that future dredging would not impact the cables. This pre-dredging activity would require the excavation and disposal of approximately 500,000 cubic yards of dredge spoils, adding significantly to the cost and environmental impact of the Project.

The locations of the towers for the overhead alternative were discussed with the USACE and the final locations were determined in large part by consideration of vessel traffic patterns and the shipping channel locations.

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Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-37

Please refer to the Company's Alternatives Analysis at page 59 table 5.3 where the Company concluded that Route 3 is non-viable for underground or overhead due to property rights issues. However, on page 84, table 5.15, the Company identified Route 3 as a viable Route and compared it with Route 1. Please reconcile the difference in description and discuss whether Route 3 is a viable option compared to Routes 2 and 4.

RESPONSE:

The statement in the heading of Table 5.3 that Route 3 is not viable for underground or overhead due to property rights issues is not accurate. The property rights issue is classified as very poor in the table, but property rights issues do not by themselves make Route 3 not viable. Property rights on Route 3 are complicated, but the other issues like possible construction of a new bridge in or adjacent to Route 3 are potentially "more serious." The Alternatives Analysis will be updated to reflect the change.

Property rights issues did contribute to a determination that Route 2 was not viable. In discussions with the Maryland Port Administration (MPA), BGE was informed that there were long-term plans to develop the north side of the Alcoa property (Thoms Cove), and the proposed route could interfere with the MPA's plans. BGE offered to coordinate the design for Route 2 with the MPA to minimize the interferences, but the MPA responded that the port development plans were not sufficiently developed to facilitate the coordination. In order to construct a transmission line along Route 2, the line would need to cross MPA-owned land in order to construct landside infrastructure. The MPA would be within their rights to deny an easement to BGE for infrastructure installed on MPA property should BGE interfere with their development plans. At this point, BGE determined that the Project would not be well served by seeking an eminent domain easement across MPA property. At that point, BGE ceased evaluation of Route 2.

Property rights for Route 4 are not as significant as they are with Routes 2 and 3 and are more comparable to Route 1. BGE requires an easement from the MPA to construct an overhead line across a short span of their property on Hawkins Point for Route 1. BGE would require an easement from the MDTA to cross over their property on the Sollers Point side of the river to construct Route 4. Obtaining an easement in this location is not considered problematic.

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Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-38

On pages 75 to 76 of the Company's Alternatives Analysis, BGE lists potential impacts to the Patapsco River associated with the Submarine jet plowing option and concludes that there are no permanent waterways impacts associated. Please list what the Company identifies as temporary and permanent impacts to waterways as it relates to this Project.

RESPONSE:

Permanent waterway impacts are defined as the location of permanent structures within the waterway or permanent alteration of the waterway boundaries. These impacts remain after construction is completed. Temporary impacts include temporary structures such as sediment and erosion controls (such as turbidity curtains, stabilized construction entrances, etc.) or impacts that do not change the location or boundaries of the waterway (such as backfilling a trench to the original grade).

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-39

Please refer to the Alternatives Analysis at page 81. The Company stated that National Park Service and the MHT raised concerns about the overhead towers effect on the view shed from Fort McHenry. Please discuss how the Company would balance scenic impacts and clearance requirements.

- a. Did the Company have additional discussions with the National Park Service and MHT after the CPCN filing with the PSC? If yes, please describe concerns raised by these entities.
- b. The Company stated that clearance would be met using towers of approximately 400 feet. Please provide a schematic that shows FSK Bridge vertical clearance, the height of the proposed tower, vertical height of the foundation, and estimated wire height during the greatest sag condition.

RESPONSE:

- a. BGE met with National Park Service (NPS) staff at Fort McHenry on several occasions prior to filing its CPCN application to apprise staff of the latest Project plans. See pages 1-10 and 1-11 of the Environmental Review Document (ERD) (attached as Exhibit JLM-2 to the Direct Testimony of Jeffrey L. Meling). The issue of main concern to the Fort McHenry staff was the Project's potential visual impact. The Superintendent of Fort McHenry National Monument and Historic Shrine sent a letter to BGE dated February 26, 2019 (attached as *StaffDR02-39 Attachment 1*) to BGE offering further background on the NPS's concerns. The letter also offered suggestions related to the Project.

Consistent with BGE's plans for outreach outlined in Section 1.5 of the ERD, BGE again met with the staff at Fort McHenry on Wednesday, March 27, 2019.

In general, both Fort McHenry and NPS were very complimentary and appreciative with respect to the way that the Project is being managed. Fort McHenry acknowledged that in the Superintendent's 30 years, she has never experienced a project that has engaged as early and as frequently, or that is as committed to addressing concerns. Both Fort McHenry and NPS acknowledged the proactive interaction BGE has had with external stakeholders. Additionally, NPS felt the ERD and Alternatives Analysis, along with the extensive outreach, confirms that an environmental impact statement is not needed for the Project.

The BGE team has been and remains in regular communication with MHT. In its role as State Historic Preservation Officer, MHT is a party to the Project's wetlands/dredge and fill permitting process being overseen by the U.S. Army Corps of Engineers and the Maryland Department of the Environment. MHT's main concerns have been the underwater archaeological resources present within the Project site and visual impacts on Fort McHenry and other historic properties. The placement of the Project's structures and the configuration of work areas have been designed, in part, to avoid any impacts to the underwater resources. Please see Figure 4.6-1 on page 4-62 of the ERD. MHT has attended several of the Joint Environmental meetings as well as meetings with Fort McHenry. Their visual concerns were satisfied once BGE renderings were created and shared with the agencies, including a nighttime view to represent necessary lighting requirements.

- b. Figure 3.2-5 on page 3-10 of the ERD provides a schematic responsive to this data request. Please also see Figures 4.6-2A and 4.6-2C on pages 4-65 and 4-67 of the ERD, respectively. BGE notes that the Project's conductors will not likely be visible at the distance of more than 4 miles separating Fort McHenry from the Project location.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-40

Please refer to page 12 of the Application. The Company stated that, compared to the underground option, the proposed overhead line significantly reduces environmental and “other impacts” that might otherwise result from constructing a new transmission corridor”. Please describe the “other impacts”.

RESPONSE:

The overhead option, if constructed, would not require the following activities that the underground options would require – activities that BGE considers “other impacts”:

- Pre-dredging the shipping channel and disposing of the dredge spoils (submarine cable option);
- Removing the shipwrecks and debris from the Hawkins Point side of the river (submarine cable option);
- Removing the abandoned pier pilings from the Sollers Point side of the river (submarine cable option);
- Remediating the existing landfill at Hawkins Point (submarine cable and HDD options);
- Construction of new terminal stations within the Chesapeake Bay Critical Area at Hawkins Point and Sollers Point (submarine cable and HDD options); or
- Construction of new permanent cofferdam islands in the river (HDD option).

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-41

Please refer to the Application at page 19. The Company stated that the installation of the jet plow option and installation of the jet plow submarine cables would result in more than 750 times more disturbance to the river bottom. Did the Company determine the disturbance in terms of area/depth that would be affected? Please explain.

RESPONSE:

The jet plow submarine option would require pre-dredging the shipping channel, which would disturb 9.2 acres of river bottom and require the disposal of 53,500 cubic yards of dredge spoils (assuming a 1,000-foot-wide shipping channel). The dredging would be required to a depth of 60 feet and would extend approximately 100 feet from both sides of the channel. The pre-dredged area would be approximately 500 feet long and would have to be benched back from the channel edges. Jet plowing would also require removal of the shipwrecks and debris from the Hawkins Point side and removal of the abandoned Sollers Point pier piling which would disturb 17.3 acres of river bottom. The actual plowing activity would disturb the river bottom as the jet plow is pulled through the river. Each pass of the jet plow would disturb a path approximately ten feet wide and more than 10,000 feet long for each of as many as 18 crossings of the river, for a total disturbance of 49.6 acres. During the plowing process, it is possible that the jet plow would cause legacy contaminated soils to be dispersed on the surface because the jet plow water injection point is approximately ten feet below the river bottom.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
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Item No.: StaffDR02-42

With regard to the electrical properties of the circuit (e.g., resistance, inductance, capacitance), will the overhead option provide better performance than the underground option? Please explain.

RESPONSE:

The electrical parameters of the proposed overhead transmission river crossing facility are different than those of the existing underground system. The river crossing portion of the existing 230 kV circuits is 45% of the overall circuit length between Brandon Shores and Riverside. The new circuit configuration composed of overhead transmission segments is expected to deliver similar performance to the existing hybrid overhead/underground configuration currently in service.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-43

Regarding BGE's response to Staff DR No. 1-01, please identify "another company".

RESPONSE:

"Another company" refers to the statutory language of Public Utilities Article § 7-209 cited by Staff in Data Request 1-1. As stated in its response, BGE examined the potential to use an existing transmission line of another company but determined that there are no such existing transmission lines convenient to the service area that could serve as an alternative to the construction of the proposed overhead segment.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-44

Please refer to the Alternatives Analysis, Executive Summary at page iii. The Company provided a capital and operating cost estimate for the overhead and the jet plow submarine cable options.

- a. Is this a conceptual grade cost estimate? If yes, please describe the target accuracy for this estimate (e.g., accuracy of -25% to +50%).
- b. Does the Company have a conceptual grade cost estimate for the other project construction methods it evaluated? If yes, please provide.
- c. Provide Project's final cost estimate including the target accuracy of the estimate. If not available, please indicate when the Company would make such an estimate available.
- d. Has the Company evaluated the reliability of the new line under the different construction techniques evaluated? If yes, please discuss and indicate which method is superior.

RESPONSE:

- a. Yes, this is a conceptual cost estimate. Exelon/BGE's guidelines for estimating state that a conceptual, order of magnitude cost estimate is expected to have an accuracy of +/- 50%.
- b. No, BGE does not have conceptual cost estimates for the other construction methods.
- c. BGE is about to embark on the final estimating effort, leading to the internal request for funding approval for the Project, which will cover construction of the new infrastructure and the decommissioning of the existing infrastructure at the Hawkins and Sollers Point Terminal Stations, and the decommissioning of the HPFF pipes beneath the Patapsco River. Exelon/BGE's guidelines for estimating state that this definitive cost estimate is expected to have an accuracy of +/- 10%. This final estimating effort is planned to be complete by the end of August 2019.
- d. BGE considers that either of the two viable alternatives could be designed and constructed to meet the reliability requirements of the 230kV system.

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Baltimore Gas and Electric Co.
Response to Staff Data Request 2
Request Received: 03/25/2019
Response Date: 04/08/2019

Item No.: StaffDR02-45

Does the Company anticipate that some or all of the cost of the proposed Project would be regionalized across all of PJM? If yes, please provide the allocation of cost to different PJM zones. For portions of the cost that the Company anticipates would not be regionalized, please describe customers who the company would propose be responsible.

RESPONSE:

The Project is currently a Supplemental Project (s1267) in PJM's queue. Costs associated with Supplemental Projects are the responsibility of the entity sponsoring the Supplemental Project, therefore 100% of the costs will be allocated to customers in the BGE zone. The Project will be included in the Network Integration Transmission Service (NITS) rate PJM will charge load serving entities purchasing NITS in the BGE load zone's wholesale market. To the extent BGE is allocated Project costs, those costs will be included in retail rates via Rider 1- Standard Offer Service of BGE's Maryland Public Service Commission-approved retail electric tariff. To the extent third party unregulated load serving entities are allocated Project costs, BGE would expect those costs to be included in the retail rates charged.

BGE CPCN Application Key Crossing

Case No. 9600

Dated: September 26, 2019

Staff Data Request No. 1 to PJM

**PJM Sponsor for Responses to Staff Data Request No. 1 to PJM (“Staff Data Request”),
Item 1: Aaron Berner, Manager, Transmission Planning**

- 1. Please describe PJM’s process used to evaluate BGE’s Key Bridge Project (s1267).**

RESPONSE

PJM Interconnection, L.L.C. (“PJM”) evaluated the BGE Key Bridge Project (“Supplemental Project s1267” or the “Project”) in accordance with the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. (“Operating Agreement”).

PJM’s evaluation was conducted prior to acceptance of the PJM Open Access Transmission Tariff (“Tariff”), Attachment M-3 process on September 26, 2018 by the Federal Energy Regulatory Commission (“FERC”) in Docket No. ER17-179 (the “Attachment M-3 Process”).

BGE’s assumptions were developed at the February 4, 2016 Mid-Atlantic Subregional RTEP Committee meeting. *See* Operating Agreement, Schedule 6, section 1.5.2.

PJM reviewed BGE’s proposed Supplemental Project s1267 with stakeholders in the context of the Transmission Expansion Advisory Committee (“TEAC”) and the Mid-Atlantic Subregional RTEP Committee. The TEAC and Subregional RTEP Committees are open to participation by: (i) all Transmission Customers and applicants for transmission service; (ii) any other entity proposing to provide Transmission Facilities to be integrated into the PJM Region; (iii) all Members; (iv) the electric utility regulatory agencies within the States in the PJM Region, the Independent State Agencies Committee, and the State Consumer Advocates; and (v) any other interested entities or persons.

Specifically, Supplemental Project s1267 was reviewed as part of the 12/1/2016, 1/5/2017 and 1/24/2017 Mid-Atlantic Subregional RTEP Committee meetings and the 1/12/2017 TEAC meeting.

Although the Operating Agreement in place prior to acceptance of the Attachment M-3 Process did not specifically require PJM or the PJM Transmission Owners to convene a separate assumptions, need and solution meeting before including a Supplemental Project

in the Local Plan, the Mid-Atlantic Subregional RTEP meetings that occurred served those functions.

Presentation materials for the Mid-Atlantic Subregional RTEP Committee meetings can be found at: <https://www.pjm.com/committees-and-groups/committees/srrtep-ma.aspx>.

Presentation materials for the 1/12/2017 TEAC meeting can be found at: <https://www.pjm.com/-/media/committees-groups/committees/teac/20170112/20170112-reliability-analysis-update.ashx>.

- a. Has PJM conducted the assumptions meeting? If yes, Please describe the underlying assumptions and criteria presented by BGE at this meeting. Please also provide a copy of documents that BGE submitted for the assumptions meeting.**

RESPONSE

See the response to Staff Data Request, Item 1, above.

- b. Has PJM conducted the need and solutions meetings in regards to the Project? If yes, was stakeholder comments incorporated? Please provide any report that may have been generated as a result of PJM's review of the Project's need and proposed solutions.**

RESPONSE

See the response to Staff Data Request, Item 1, above.

- c. If the assumption, need, or solutions meetings are not yet held, please provide a timeline as to when PJM anticipates meetings will be held.**

RESPONSE

See the response to Staff Data Request, Item 1, above.

- d. As part of a supplemental project planning process, how many meetings have taken place for the Project? please provide meeting minutes**

RESPONSE

See the response to Staff Data Request, Item 1, above.

- e. Has the proposed Project been posted in the Local Plan? Please describe what it means for the Project to be included in the Local Plan.**

RESPONSE

Yes. The Local Plan for the 2017 Regional Transmission Expansion Plan (“RTEP”) year is documented in the Mid-Atlantic Subregion section of the 2017 annual RTEP Report: <https://www.pjm.com/-/media/library/reports-notices/2017-rtep/2017-rtep-book-3.ashx?la=en>.

Including Supplemental Project s1267 as part of the Local Plan, and thus in the RTEP power flow case models, indicates that PJM reviewed the project (see generally the response to Staff Data Request, Item 1, above). PJM will continue to include the project in subsequent RTEP power flow case models and in subsequent studies.

- f. Is the Project included in the RTEP base case? If yes, please discuss what that means for the Project to be included in the RTEP base case.**

RESPONSE

See the response to Staff Data Request, Item 1(e).

BGE CPCN Application Key Crossing

Case No. 9600

Dated: September 26, 2019

Staff Data Request No. 1 to PJM

**PJM Sponsor for Responses to Staff Data Request No. 1 to PJM (“Staff Data Request”),
Item 2: Aaron Berner, Manager, Transmission Planning**

- 2. Has PJM and its stakeholders been formally informed of the new baseline drivers for S1267? If yes, please describe these drivers and how they may affect the need for BGE’s Project (s1267).**

RESPONSE

No baseline drivers have been identified for Supplemental Project s1267.

- a. If PJM and Stakeholders have not been formally informed, please describe PJM’s process to inform the stakeholders of the update?**

RESPONSE

See the response to Staff Data Request, Item 2, above.

- b. Please also characterize the stakeholders that will be reviewing supplemental projects such as the proposed Project?**

RESPONSE

See stakeholders listed in the response to Staff Data Request, Item 1, above.

BGE CPCN Application Key Crossing

Case No. 9600

Dated: September 26, 2019

Staff Data Request No. 1 to PJM

**PJM Sponsor for Responses to Staff Data Request No. 1 to PJM (“Staff Data Request”),
Item 3: Aaron Berner, Manager, Transmission Planning**

3. If Project S1267 is not built and is removed from the RTEP,

a. Does PJM identify a BES reliability violation and, if so, when is that violation projected to occur?

RESPONSE

Consistent with Schedule 6 of the Operating Agreement and PJM Manuals, PJM has not conducted an RTEP study without Supplemental Project s1267 in the RTEP power flow case models. Supplemental Project s1267 remains in the RTEP power flow case models.

b. Has PJM proposed any solutions to this violation? Has PJM independently verified and vetted the most efficient and/or least cost solutions that resolve the violation?

RESPONSE

See the response to Staff Data Request, Item 3(a).

BGE CPCN Application Key Crossing

Case No. 9600

Dated: September 26, 2019

Staff Data Request No. 1 to PJM

**PJM Sponsor for Responses to Staff Data Request No. 1 to PJM (“Staff Data Request”),
Item 4: Aaron Berner, Manager, Transmission Planning**

- 4. Will this Project be included in the Network Integration Transmission Service (NITS) rate?**

RESPONSE

Yes.

BGE CPCN Application Key Crossing

Case No. 9600

Dated: September 26, 2019

Staff Data Request No. 1 to PJM

**PJM Sponsor for Responses to Staff Data Request No. 1 to PJM (“Staff Data Request”),
Item 5: Aaron Berner, Manager, Transmission Planning**

5. Could a third party bid and build this Project?

RESPONSE

Supplemental Projects – including Supplemental Project s1267 – are projects not needed to address PJM criteria (system reliability, operational performance or economic); therefore, Supplemental Projects are not eligible to be included in PJM’s competitive proposal window process as set forth in Operating Agreement, Schedule 6, section 1.5.8 and PJM may not designate a Supplemental Project to a third party.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-01

Please refer to the Company's response to Confidential CEII PPRP 08-01(a), Attachment 1. Fully explain the Company's modeling assumptions in regards to generator outages, system loads, generator dispatch, and lines out of service.

- a. Discuss fully why the Company's modeling assumptions are appropriate for demonstrating the reliability need of the proposed Project. Please also discuss fully why all the contingencies modeled were similarly appropriate for demonstrating the reliability need for the Project.
- b. Describe how many cases the Company ran in both its power flow models that used PJM's RTEP 2016 and RTEP 2019 load flow models, and indicate what number and percentage of these cases resulted in reliability criteria violations.

RESPONSE:

- a) BGE used two of the three available PJM 2024 RTEP load flow models: one model representing a 2024 Summer Scenario and one model representing a 2024 Winter Scenario as the starting point of BGE's analysis of the system condition following a long-term/permanent failure of the existing underwater cables. The modeling assumptions used by BGE were PJM assumptions as presented by PJM at its Transmission Expansion Advisory Committee meeting on March 7, 2019 (see the following link: <https://www.pjm.com/-/media/committees-groups/committees/teac/20190307/20190307-rtep-assumptions-update-2019.ashx>). To best represent the expected system conditions, BGE reflected the delay of its supplemental project S1632. This project was originally modeled in the 2024 RTEP load flow model but was subsequently delayed. To complete the modeling of the initial load flow case used as its starting point, BGE then removed the two modeled circuits representing the two existing 230 kV Brandon Shores – Riverside (Harbor Cable) circuits. These assumptions were the basis of the scenario studied.
- b) The analysis consisted of 2024 Summer P1 (n-1), P3, P6 (n-1-1 with redispatch adjustments) and Generation Deliverability for single and common mode scenarios. An additional Winter Generation Deliverability analysis for both single and common mode outages was performed using the PJM 2024 Winter RTEP load flow Model. Each of the studies were performed using input files/settings provided by PJM. BGE performed the analysis using ALL of the same contingencies used by PJM in its 2024 RTEP analysis. This included 11,318 P1 contingencies; 9,955 P4-5 Stuck Breaker Contingencies; 2,377

P2 Bus Contingencies; and 1,576 P7 Tower Contingencies. Of these possible contingency scenarios/cases, 450 thermal and voltage criteria violations were observed resulting from 43 unique contingencies and (n-1-1) combinations of them. 26 Monitored Facilities (lines/transformers) were observed to have thermal overloads for one or more contingency scenarios/cases. 153 transmission busses were identified as having either a low voltage magnitude or voltage drop criteria violation for one or more contingency scenarios/cases.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-02

The Company stated in its Alternatives Analysis filing that the Harbor Circuits are critical to the reliability and stability of BGE's Bulk Electric System ("BES"). Please characterize stability impacts of losing the Harbor Cables on the Company's BES. If available, provide a quantitative description of the impacts, whether the impacts are considered significant or insignificant, any standard (similar to NERC standards) that may apply and whether they would be violated, and whether the proposed Project will address any stability impacts of losing the Harbor Cables.

RESPONSE:

BGE has recently performed an analysis of the impacts of the existing underwater cables failing and becoming permanently unavailable as a base condition. The output from the analysis is attached as *CONFIDENTIAL CEII StaffDR06-04 Attachment 2*. The stability analysis was performed consistent with PJM methods and procedures described in PJM's Manual 14B. No stability issues/criteria violations were observed. See also BGE's response to StaffDR06-04.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-03

Please refer to the Company's response to Staff DR 05-04 (b). Did PJM in its 'do-no harm' study conduct any stability simulations? If yes, please discuss the results of the simulations including whether PJM found the 7% increase in impedance associated with the Project insignificant. If PJM did not perform a stability simulation, explain why PJM not conduct such a study?

RESPONSE:

BGE would not expect PJM to perform a stability analysis as part of a "do-no harm" study on a supplemental project unless either the project appears to possibly affect the stability of a generator or known stability problems exist for the affected area. BGE would not consider the scope of the Key Crossing Reliability Initiative Transmission Line project to fall into either of these categories.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-04

PUA §7-207(e)(2)(ii) requires consideration of the stability and reliability of the electric system for granting a CPCN.

- a. In layman's terms please fully describe how BGE has satisfied the statutory requirement for stability required for granting the CPCN.
- b. In layman's terms please fully describe how BGE has satisfied the statutory requirement for reliability required for granting the CPCN

RESPONSE:

PUA §7-207(e)(2)(i) requires consideration of the effect of an overhead transmission line on the stability and reliability of the electric system. BGE evaluated the overall impact of the Key Crossing Reliability Initiative Transmission Line project on the electric system and gave due consideration to the impact of the stability and reliability of the electric system as required by PUA §7-207(e)(2)(i). BGE also conducted a stability impact study as explained below. After such evaluation and consideration, BGE determined that the proposed project, as a replacement for an existing transmission line segment, would not change the system configuration or parameters in any significant way that would cause a change to the existing stability or reliability of the system. However, the results did indicate adverse system reliability impacts that could be expected if the existing underwater cables were out of service and the Key Crossing Reliability Initiative Transmission Line project was not built as a replacement.

- a) In addition to the analysis referenced in BGE's response to StaffDR06-02, BGE has recently performed a transient stability analysis to support its original consideration of stability in that no stability impacts would be expected in relation to the new Key Crossing Reliability Initiative Transmission Line project. The complete analysis consisted of three system conditions:
 - Normal system conditions with the existing lines in-service. The output from this analysis is provided as *CONFIDENTIAL CEII StaffDR06-04 Attachment 1*.
 - Brandon Shores – Riverside (Harbor Cables Out of Service). The output from the analysis is provided as *CONFIDENTIAL CEII StaffDR06-04 Attachment 2*.
 - Normal system conditions with the proposed new overhead lines in-service. The output from the analysis is provided as *CONFIDENTIAL CEII StaffDR06-04 Attachment 3*.

The three cases utilized in the study were developed directly from the Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working

Group (MMWG) 2018 Series final dynamic cases for 2023 summer peak conditions. This is the most recent dynamic model reflecting a similar time frame to the expected in-service date currently available.

The studied contingencies, with clearing times modeled based on PJM's "2017 Revised Clearing times for each PJM company" spreadsheet revision 21 include:

- Three-phase faults with normal clearing time
- Single-phase faults with a stuck breaker
- Single-phase faults with delayed clearing

No stability issues/violations were observed for any of the three system conditions studied.

Please also refer to BGE's CPCN Application at pages 5-9 for a description of the effect of the Key Crossing Reliability Initiative Transmission Line project on system stability and reliability.

- b) BGE's supplemental project S1267 was modeled in PJM's 2019 Series (2024 RTEP) load flow model and studied in full as part of the 2019 RTEP process. As expected, the outcome of the PJM study demonstrated that the project maintains the existing reliability of the system by showing no violations within the BGE territory. Because the Key Crossing Reliability Initiative Transmission Line project is a replacement of the existing cables and does not expand or significantly alter the system, the project was not expected to provide increased reliability from a load flow model/contingency analysis perspective. However, the reliability of circuits themselves is expected to increase substantially through the replacement of the at-risk existing underwater cables and the removal of the risk of long-term or permanent failure and resulting severe reliability impacts that were described in BGE's response to PPRPDR08-01(a) and *Confidential CEII PPRPDR08-01 Attachment 1*. Please also refer to BGE's CPCN Application at pages 5-9 for a description of the effect of the Key Crossing Reliability Initiative Transmission Line project on system stability and reliability.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-05

Please provide the amount of power in MW that would be delivered by the harbor crossing cables (considering summer normal, summer peak, winter normal, winter peak loading conditions.):

- a. In the 2016 RTEP load flow model
- b. In the 2019 RTEP load flow model

RESPONSE:

The 2019 RTEP load flow model represents the best-known set of assumptions for the time period of interest. Using the assumptions modeled within the PJM 2024 RTEP load flow models, the base loading (n-0) conditions for each 230kV circuit connecting Brandon Shores – Riverside are as follows:

2024 Summer – (387 MVA Circuit 2344), (365 MVA Circuit 2345)
2024 Winter – (376 MVA Circuit 2344), (349 MVA Circuit 2345)
2024 Light Load – (537 MVA Circuit 2344), (499 MVA Circuit 2345)

These flows represent the normal (n-0) flows for the generation dispatch provided by PJM according to the methodologies and procedures described further in PJM's Manual 14B. These base flows would be expected to increase significantly under numerous modeled contingency conditions and possible real-time operating scenarios. BGE has proactively allowed for an approximate 43% capacity margin above the existing circuit ratings (as described in BGE's responses to StaffDR01-03, StaffDR02-25, and StaffDR05-07) in order to accommodate a large range of contingency conditions and future unknowns in order to prevent any need that would require future work on the transmission line segment crossing the Patapsco River.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-06

In what year's RTEP did PJM first consider the overhead Harbor Cables? Please indicate.

RESPONSE:

BGE Supplemental Project S1267 was first included in PJM RTEP load flow models in 2019 as part of PJM's 2019 Series (2024 RTEP).

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-07

Please refer to the Company's response to PPRP DR01-04, where alternative 2) was identified as "New 500/230 kV transformation at Graceton Substation, new towerline connection Graceton Substation and Northeast Substation, upgrade/replace overloaded existing 115 kV supplies connecting to downtown Baltimore City and upgrade/replace downtown Baltimore City circuits, add bulk power capacitors/SVC".

- a. Has BGE conducted load flow analysis with all or parts of the above alterations?
- b. If yes to the above, was the analysis conducted with or without the harbor crossing cables?
- c. Identify the contingency/ies that demonstrate NERC/PJM/BGE criteria violations

RESPONSE:

- a) No load flow analysis was conducted for the alternatives described in BGE's response to PPRPD01-04.
- b) Please see BGE's response to subpart (a) above.
- c) Please see BGE's response to subpart (a) above.

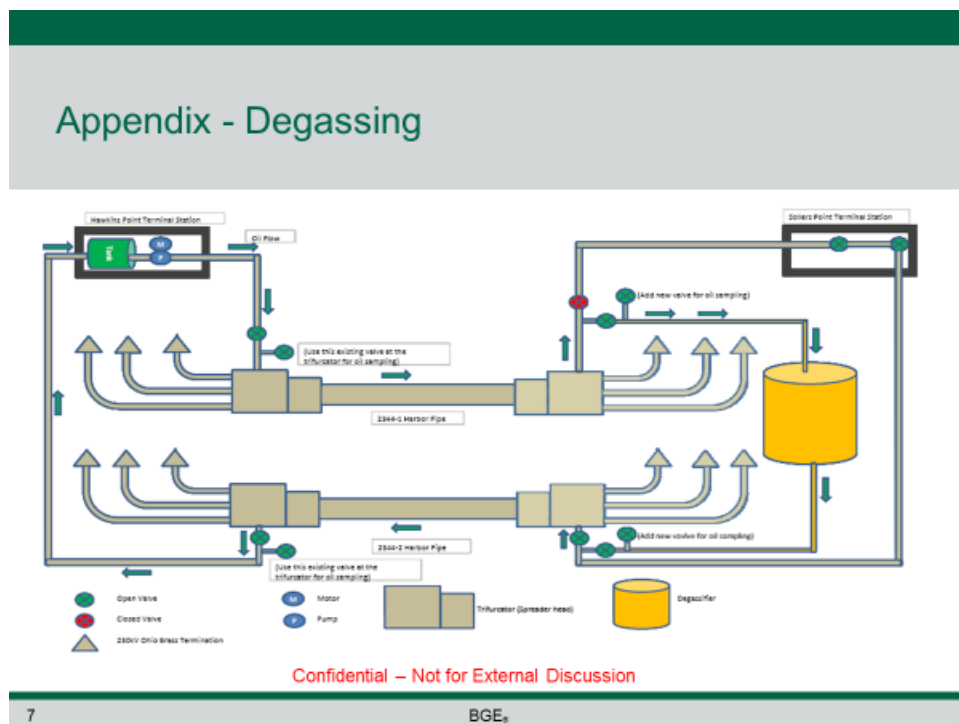
Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-08

Please refer to the Company's response to Staff DR 04-13. Please explain how harbor crossing cables were degassed. Please provide technical report(s) if available.

RESPONSE:

BGE hired a cable service contractor, W. A. Chester, to degas the underwater cables. To degas cable oil, the oil is first taken from the cable system and sprayed into a vacuum chamber. The gasses dissolved in the oil are liberated into the vacuum and the oil droplets fall to the bottom of the chamber where they are collected and pumped back into the cable system. On the existing underwater cables, due to the multiple pipes in parallel for each cable circuit and an oil circulation path, it was possible to create an oil circulation path that allowed oil-containing gas to be diverted from the pipeline to the degassifier, and then the clean oil returned to the circulation loop. The oil within the cable terminations and termination riser pipes was not included in this flow loop and was not degassed but represents about 2% of the oil volume within the pipe system. This degassing process treated 98% of the cable oil within the system. The image below was used to describe this to Staff's engineering team in 2010.



The degassing effort required multiple days to complete for each cable circuit due to the volume of oil within the systems, and the capacity of the vacuum chamber degassifier equipment. BGE performed three complete degassing cycles on each cable circuit to reduce the gas concentrations to near zero. For example, acetylene concentrations before the degassing effort were between 160 and 180 ppm, and after the degassing they were reduced to between 1 and 2 ppm.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-09

Please refer to the Company's response to PPRP DR04-02c, where "gassing problems of the existing submarine cables have resulted in more than 7 extended outages in the 230 kV network since 2010". Please discuss the length/duration of these outages and the mitigation measures the Company applied to restore power.

RESPONSE:

The 230 kV network was placed in an abnormal configuration for the degassing effort. Customer power was never lost. This is one of the benefits of the 230 kV ring network around the Baltimore metro area. Every substation has multiple sources/directions on supply which allows for operational flexibility for events such as equipment failures, or in this case oil degassing events. The redundancy of a 230 kV ring around the Baltimore metro area allows for abnormal configurations (such as degassing the existing underwater cables) to be tolerated with little or no customer impact.

The outages for the degassing and related activities were as follows:

- Degassing (2010): 2 outages (one on each circuit)
 - Each circuit was taken out of service for 3-4 days while the oil circulation continued. The oil was degassed and the cable was returned to service without circulation. Then the other circuit was taken out of service and degassed and returned to service without circulation.
 - The cables were returned to service without circulation and the cable rating was reduced to address the loss of oil circulation. The oil circulation was not resumed for three weeks in an effort to identify the location of gas generation within the pipeline. After the three weeks without oil circulation, the circulation was resumed, and the ratings were returned to normal.
- Cable Termination Replacement (2008 – 2011): 5 outages (one for each pipe)
 - The flexibility of the design of the Hawkins and Sollers Point terminal stations allows each of the five cable pipes to be disconnected from the electrical system. This allowed the cable terminations to be replaced, one pipe at each time. Each of the 5 outage events included the following steps:
 - A short 1/2-day outage on one circuit was required to disconnect one of the cable pipes from the circuit, then the circuit was re-energized. The cable pipe removed from service would have all six cable terminations

replaced. After the replacement a half day outage was needed to reconnect the pipe to the circuit. This process was repeated for the remaining cable pipes affecting both circuits. During the repair activity both circuits remained in service. However only 4 of the 5 cable pipes were in service at any time. This resulted in a reduction of the cable rating on circuit 2345 (normally containing 3 cable pipes) for this duration. The ratings on circuit 2345 are based on three pipes in service and retaining two pipes in service resulted in a reduction in rating.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-10

Please refer to Case No. 9482, where the Commission awarded C.P. Crane, LLC a CPCN to construct 150 MW of generating capacity. Does the 2019 RTEP that BGE adopted for load flow analysis include this capacity in its entirety or partially? If the capacity from C. P. Crane was not included in the 2019 RTEP, discuss why the Company believes it was not included.

RESPONSE:

The proposed new C.P. Crane generating station was not included in the PJM 2024 RTEP load flow models that BGE used to perform its analysis. This is consistent with the PJM modeling assumptions presented by PJM at its Transmission Expansion Advisory Committee meeting on March 7, 2019 and described within PJM's Manual 14B: <https://www.pjm.com/-/media/committees-groups/committees/teac/20190307/20190307-rtep-assumptions-update-2019.ashx>.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-11

Please refer to PJM's response to PPRP data request, 1-1C and 1-2, where PJM indicated "it would conduct a separate sensitivity study that uniquely looks at the impact of removing the line from service". Has BGE approached PJM to conduct such a study? Can BGE obtain a commitment from PJM for such a study?

RESPONSE:

BGE has not approached PJM to conduct a separate sensitivity study. However, BGE's analysis used the same load flow models, load flow analysis software, auxiliary input files, and program settings that PJM uses to perform its power flow analysis as part of its RTEP process. BGE would not expect any differences in its power flow results including the identified violations.

Case No. 9600
Baltimore Gas and Electric Co.
Response to Staff Data Request 6
Request Received: 10/30/2019
Response Date: 11/13/2019

Item No.: StaffDR06-12

Please refer to the Company's responses to PPRP DR 08-01(a) Attachment 1 (Confidential), PPRP DR 02-01 Attachment 1 (Confidential), and Staff DR 05-01.

- a. Please compare and characterize in lay terms the results of power flow models the Company performed in CEII Attachments to PPRP DR 02-01 and PPRP DR 08-01(a).
- b. In response to Staff DR 05-01(C), the Company stated that all of the scenarios provided in Confidential CEII PPRP DR 02-01, Attachment 1 represented violations. Do all tabs 2 through 8 in CEII PPRP DR 08-01(a) Attachment 1 (Confidential) represent violations and is the total number of violation the summation of all violations in these tabs? Please discuss.
- c. Explain in lay terms Confidential CEII PPRP DR 08-01(a), Attachment 1, tab 7, summer N-1-1 voltage magnitude (two overlapping single contingencies) and what "Wlow" means.
- d. Explain in lay terms Confidential CEII PPRP DR 08-01(a), Attachment 1, tab 8, summer N-1-1 voltage drop (two overlapping single contingencies) and what "Drop" and "WDrop" mean?

RESPONSE:

- a) The results of BGE's re-evaluation analysis presented in response to PPRPDR08-01(a) were based on the most recent RTEP model, the 2019 Series 2024 RTEP model with PJM 2019 modeling assumptions, as opposed to those results presented in response to PPRPDR02-01, which were based on the 2016 Series 2021 RTEP model using PJM 2016 Modeling assumptions. BGE considers the results presented in response to PPRPDR08-01(a) the most accurate portrayal of expected conditions given the most recent planning assumptions have been incorporated in the models studied.
- b) All the results presented in BGE's response to PPRPDR08-01(a) represent criteria violations. Please see BGE's response to StaffDR06-01 for further clarification. BGE provided a summary tab (Tab 2) in the attachment. The results provided in this summary tab of the worksheet represent all of the facilities (lines/transformers) that were identified as having one or more thermal criteria violations. The worst-case thermal loading condition for each of the identified facilities was filtered from all tests (Tabs 3-6) and presented on this summary tab. These facilities may have thermal violations for one or more contingency scenarios resulting from one or more types of studies. The full list of thermal criteria violations for each study are presented in the subsequent Tabs 3-6. Tabs 7 and 8 reflect voltage criteria violations not included in the summary (Tab 2).

- c) Tab 7 represent voltage magnitude criteria violations for n-1-1 conditions. The busses listed were identified as having voltages lower than 0.95 PU. “Wlow” is a program output intended to represent the worst low voltage condition for the identified bus when there are more than one low voltage conditions.
- d) The results shown in Tab 8 represent voltage drop criteria violations for n-1-1 conditions. These busses were identified as having a voltage drop greater than 10%. Like “Wlow” in the previous tab, “Wdrop” is a program output intended to represent the worst voltage drop condition at the identified bus where more than one voltage drop condition exists.



October 4, 2019

PJM Members Committee

Dear Members:

The PJM Board of Managers is pleased with the progress on Supplemental Projects that PJM and stakeholders have accomplished in the last few months. The PJM Manual 14B revisions that were approved with stakeholder support at the Aug. 22 Markets & Reliability Committee clarify the interaction of Supplemental Projects with the Regional Transmission Expansion Plan process. The result is more comprehensive and transparent documentation of this interaction.

The vote demonstrated how stakeholders and PJM can work together to build consensus through the stakeholder process, even when issues are complex and controversial. The Board appreciates stakeholders' attention to these issues and commends everyone involved for their commitment to identifying solutions.

Over the last few months, the PJM Board has undertaken a review of Supplemental Project issues. This review was informed by the letters from stakeholders, the discussions at stakeholder meetings, and a review of our governing documents, together with the relevant FERC orders and policy statements.

Through this review, the PJM Board has determined that PJM's role in the Supplemental Projects process can be expanded in some areas but also remains appropriately constrained in others, such as asset management decisions by Transmission Owners.

PJM will continue to focus its efforts on enhancing the transparency of the Supplemental Projects processes. PJM does not have the authority or expertise to assume responsibility for asset management decisions or to determine when a facility is at the end of its useful life or otherwise needs to be replaced. Those decisions are the sole responsibility of the Transmission Owner. PJM has the authority, expertise, and the obligation, to develop the RTEP. In some circumstances, PJM may be in the best position to determine the more cost-effective regional solution to replace a retired facility. PJM welcomes input from stakeholders to determine under what circumstances PJM might assert that authority.

The PJM Board is committed to continuing the progress that has been made toward clarifying PJM's role regarding Supplemental Projects and PJM's regional planning authority. The PJM Board recognizes that the concerns regarding Supplemental Projects may not be ameliorated and will continue to work with the PJM management to ensure that the appropriate actions are being taken by PJM.

Sincerely,

Dean Oskvig

Dean Oskvig, Chair-Board Reliability Committee
Board of Managers