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October 2, 2019

Rosemary Chiavetta, Secretary
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, 2nd Floor
Harrisburg, PA 17120

**Re: Letter of Notification of PECO Energy Company to Construct a 230 kV
Transmission Line Tap from the Existing 220-20 Transmission Line in
the City of Philadelphia, Pennsylvania
Docket No. A-2019-3012631**

Dear Secretary Chiavetta:

PECO's Answers to Staff Data Requests are attached. A **Verification Statement** and **Certificate of Service** are enclosed and precede PECO's answers.

Sincerely,



Ward L. Smith
Assistant General Counsel

Enclosures
WS/lo

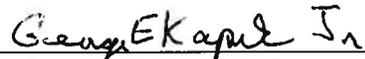
Cc (email only): Robert F. Young, Law Bureau
Darren Gill, Bureau of Technical Utility Services
Jordan Van Order, Bureau of Technical Utility Services

**BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

VERIFICATION

I, George E. Karpuk, Jr., hereby declare that I am Principal Engineer, Distribution Capacity Planning, for PECO Energy Company, that as such I am authorized to make this verification on behalf of PECO Energy Company; that the facts sets forth in the following Answers are true to the best of my knowledge, information and belief, and that I make this verification subject to the penalties of 18 Pa. C.S. § 4904 pertaining to false statements to authorities.

Date: October 2, 2019



George E. Karpuk, Jr.
Principal Engineer
Distribution Capacity Planning
PECO Energy Company

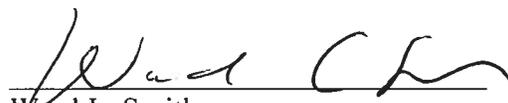
BEFORE THE
PENNSYLVANIA PUBLIC UTILITY COMMISSION

Letter of Notification of PECO :
Energy Company to Construct a 230 kV :
Transmission Line Tap from the : A-2019-3012631
Existing Line in the City of :
Philadelphia, Pennsylvania :

Certificate of Service

I, Ward Smith, hereby certify, pursuant to 52 Pa. Code Section 57.74, that I have this day served a copy of PECO Energy Company's *Answers to Staff Data Requests* on the individuals and entities named on the attached service list by first class mail.

Dated at Philadelphia, Pennsylvania, October 2, 2019.



Ward L. Smith
Counsel for PECO Energy Company
2301 Market Street, S23-1
Philadelphia, PA 19103

Service List

Philadelphia Mayor James Kenney
City Hall, Office 215
Philadelphia, PA 19107
(Chief Executive Officer, City of Philadelphia)

Philadelphia City Council President
Darrell C. Clarke
City Hall, Room 313
Philadelphia, PA 19107
(Governing Body, City of Philadelphia)

Department of Licenses and Inspections
City of Philadelphia
Municipal Services Bldg., 11th Floor
1401 John F. Kennedy Blvd.
Philadelphia, PA 19102
(Body Charged with the Duty of Planning
Land Use, City of Philadelphia)

Department of Environmental Protection
Rachel Carson State Office Building
400 Market Street
Harrisburg, PA 17101

Secretary, Dept. of Transportation
Keystone Building
400 North Street, Fifth Floor
Harrisburg, PA 17120

Chairman, Historical and Museum Commission
State Museum Building
300 North Street
Harrisburg, PA 17120

Jeffrey D. Kueppel
General Manager
SEPTA
1234 Market Street
Philadelphia, PA 19107

Richard Kanaskie
Bureau of Investigation & Enforcement
Pennsylvania Public Utility Commission
Commonwealth Keystone Building
400 North Street, Second Floor
Harrisburg, PA 17120

Erin K. Fure
Pennsylvania Office of Small Business
Advocate
300 North Second Street
Suite 202
Harrisburg, PA 17101

Tanya J. McCloskey
Office of Consumer Advocate
Forum Place, 5th Floor
555 Walnut Street
Harrisburg, PA 17101-1923

**PECO Energy Company's Answers to
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A-1 Reference the Letter of Notification, Section 4. Please provide the approximate year the Overbrook Substation was constructed.

PECO Answer to Staff Data Request A-1:

The Overbrook Substation was initially constructed in approximately 1941.

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A-2 Reference the Letter of Notification, Section 4. Fifth bullet point. Please provide the units for the rating, projected load, and available capacity.

PECO Answer to Staff Data Request A-2:

The data points are reported in amperes (amps). Please see PECO Attachment A-2, which is being provided in native Excel format to Staff via email, for a revised version of the data table that was initially provided in the Letter of Notification, with unit labelling included.

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A-3 Reference the Letter of Notification, Section 8. The description of project s1826 does not appear to be consistent with PJM's website. Please explain.

PECO Answer to Staff Data Request A-3:

PECO's Letter of Notification provided an incorrect PJM project number. The correct project number is S1849 (not S1826). A copy of the correct PJM website page is attached as PECO Attachment A-3.

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A-4 Reference the Letter of Notification, Section 21. Please state the approximate age and anticipated service life of the substation equipment to be decommissioned. Additionally, please provide a detailed description of the overall health of the equipment.

PECO Answer to Staff Data Request A-4:

Most of the equipment currently in service at Overbrook Substation was installed between its 1941 construction date and 1955. This equipment is therefore 64-78 years old. The 4kV air magnetic circuit breakers, 34kV oil circuit breakers, disconnect switches and transformers are all at or beyond their anticipated service lives. Replacement 4kV regulators were installed 21 years ago in 1998 as a quasi-life extension; those regulators are also nearing the end of their expected service lives.

The overall health of the equipment is as follows:

- The functionality of the equipment is limited compared to modern technologies. For example, due to the age of the protection and control equipment, the station does not have technology to allow PECO to monitor feeder load remotely; readings therefore need to be taken on-site during summer peaks. The majority of the 4 kV relays are electro-mechanical which provide limited fault information to investigate customer outages.
- 4 KV replacement parts are not available. Many of the original equipment manufacturers are no longer in business and inventory of replacement parts on the secondary market is very limited. Consequently, when 4 kV component parts fail, PECO generally cannot obtain new or refurbished replacement parts from third parties and has two options. First, it can rotate other "old" 4kV stock (that was previously decommissioned and placed into PECO's dead inventory) back into service. Second, certain individual parts can sometimes be custom-fabricated but often at a very high cost and with substantial delay.

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- The concrete 4kV reactors utilize outdated encasement technology which is generally not repairable – if damaged, the reactor must be replaced rather than repaired and, again, replacement parts are not available on the market.

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A-5 Reference the Letter of Notification, Section 22. For the previous five years, please provide information regarding any unplanned outages resulting from equipment to be retired at the Overbrook Substation.

PECO Answer to Staff Data Request A-5:

See PECO Attachment A-5, which is being provided in native Excel format to Staff via email. The Attachment provides a full outage history for all Overbrook circuits.

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A-6 Reference the Letter of Notification, Section 24. Please state the approximate number of customers served by the existing Overbrook Substation.

PECO Answer to Staff Data Request A-6:

Approximately 10,190 customers are served by Overbrook.

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A-7 Reference the Letter of Notification, Section 24. Please explain whether any of the loads to be served by the proposed Upland Substation are considered to be critical customers.

PECO Answer to Staff Data Request A-7:

Overbrook Substation supplies one of the four services to Lankenau Hospital.

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A-8 Reference the Letter of Notification, Section 25. Please quantify the anticipated increase in reliability from retiring the existing Overbrook Substation.

PECO Answer to Staff Data Request A-8:

Service outages from the Overbrook Substation have not materially increased, and replacement of Overbrook with Upland is thus not expected to cause an improvement in traditional reliability metrics such as SAIFI and CAIDI. The reliability issue for Overbrook is not a question of slow service degradation, but is potentially much more severe. Overbrook uses an outdated 4 kV technology that is beyond its service life and for which replacement parts are generally not available. The combination of the age of the equipment and the inability to source replacement parts exposes service from the Overbrook Substation to the risk that, if the 78-year old 4 kV technology suffers a major component failure, the result would be a catastrophic outage, affecting as many as 10,000 customers. Given the difficulty in sourcing replacement parts, it would be difficult or impossible for PECO to quickly restore service through the 4 kV components and, depending upon the scope of such a failure, it might not be possible to restore service to the 4 kV components at all. Consequently, in that event service to many of the 10,000 customers would be interrupted until PECO could source and install portable generation. Due to space limitations and the inability to connect all generators within the substation footprint, many of the portable generators would have to be located along area streets, which are mostly residential. The portable generation would need to be kept in place until at least a portion of the substation was returned to service, temporary substation facilities installed, or a modern replacement substation, such as the planned Upland Substation, was constructed. Even though reliability from the Overbrook Substation has not degraded, PECO does not consider the described risk of a catastrophic outage to be acceptable. It has therefore determined that it needs to replace the aged 4 kV technology at Overbrook.

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A-9 Reference the Letter of Notification, Section 27. Please provide a detailed description of the methodology used to determine that the Overbrook Substation has reached the end of its useful service life.

PECO Answer to Staff Data Request A-9:

- The facilities are 64-78 years old
- The original equipment manufacturer is no longer in business
- Replacement parts are generally not available from alternative manufacturers or on the secondary market
- PECO does not have robust inventory of replacement parts
- Fabrication of replacement parts, when it can be done, is expensive and cannot be done quickly
- If a major equipment failure occurred, there is a material risk that PECO therefore would not be able to procure replacement parts to repair the system, which could result in a major outage lasting until alternative systems could be constructed or portable generation could be installed
- The utility industry as a whole has not used 4 kV systems as a standard distribution system since the 1960s.

See also PECO Answer to Staff Data Requests A-4 and A-10 for further information as to why PECO has concluded that the Overbrook 4 kV system is beyond its useful service life and must be retired.

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A-10 Reference the Letter of Notification, Section 28. Please provide a cost benefit analysis for replacing the existing Overbrook Substation versus constructing the Upland Substation.

PECO Answer to Staff Data Request A-10:

Replacing the existing Overbrook Substation would not solve the engineering and loading issues that drive this project. *See* Letter of Notification, ¶ 4. The cost-benefit must be understood within that constraint.

When constructed, the Upland Substation will provide 70 MVA of 13 kV distribution capacity, which will be used in part to serve the existing load from the Overbrook Substation (approximately 30 MVA) and in part to relieve load from the Bala, Parrish, and Llanerch Substations, which currently serve load in the immediate vicinity of Overbrook/Upland and which are collectively loaded to 96% of their available capacity. *See* Letter of Notification, ¶ 4.

As discussed in the Letter of Notification (¶ 9), PECO estimates that the total cost of the Upland Substation, including the 220-20 transmission extension, will be approximately \$69 million. The 70 MVA of distribution capacity from the Upland Substation will thus cost approximately \$1 million per MVA.

The Overbrook Substation, if rebuilt in kind, would have 13 of MVA of 13 kV distribution capacity and 19 MVA of 4 kV distribution capacity. That capacity would be used to serve the load currently being served by Overbrook, with no additional capacity available to relieve the locally-driven overloading at the Bala, Parrish, and Llanerch Substations.

PECO estimates that it would cost approximately \$37 million to replace the Overbrook Substation in kind, comprised of \$26.8 million to rebuild the Substation and \$8.6 million to replace the aged 34 kV supply cables to the Substation. The 32 MVA of distribution capacity from a rebuilt Overbrook Substation thus would cost approximately \$1.15 million per MVA.

In the hypothetical rebuild scenario, in order to provide an apples-to-apples analysis, PECO would need to construct an additional 38 MVA of capacity. As stated in the Letter of Notification, ¶ 4, PECO evaluated whether it could build

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such additional capacity at Bala, Parrish, or Llanerch and determined that it was not feasible to do so. However, if such a site could be found, PECO would anticipate that the additional 38 MVA of capacity would cost at least \$1 million per MVA, or \$38 million, to construct. The total cost of the rebuild scenario, when coupled with additional spend to build capacity equivalent to the Upland Substation, would be \$37 for the rebuild plus \$38 million for the additional capacity, or a total of \$75 million. The total cost of the rebuild option, on an apples-to-apples to basis (\$75M), is thus higher than the cost for the Upland Substation option (\$69M).

In addition, the rebuild option would have the following disadvantages as compared to constructing Upland Substation:

- The rebuild option requires approximately 25 additional substation circuit breakers and one additional substation transformer as compared to the Upland option; each of those components will require period maintenance
- Continued use of 4 kV facilities will result in higher energy losses than will be experienced using 13 kV operation
- The 4 kV facilities create additional potential failure points
- The 4 KV system would have fewer reclosers with automatic transfer capability to minimize the number of customers affected by faults on the circuits
- The 4 kV system would not provide the same operational flexibility as converting to a 13 kV system and integrating it with the surrounding 13 kV system. 13 kV circuits have larger capacity and thus provide greater flexibility to quickly reconfigure the electric system when required by outages, storms, or localized growth.
- The 4 kV rebuild would have to be accompanied by a second construction project (potentially at the proposed Upland site) to construct the additional 38 kV of capacity
- A 4 kV rebuild would have to be done while on an energized Overbrook Substation while local residents continued to take service from Overbrook. Such a construction project could take up to 4 years, during which time the local distribution system would be out of configuration, and thus more vulnerable to outages, for the duration of the construction

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project. By the end of that construction project, the 4 kV facilities would be 82 years old.

Conclusion: Upland Substation is less expensive than a combination of rebuilding Overbrook and constructing the additional 13 kV capacity at another site. In addition, the 4 kV rebuild would have numerous operational constraints, described above, that are not present with the 13 kV system. The Upland Substation is superior to an Overbrook rebuild in both cost and subsequent operational flexibility.

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A-11 Reference the Letter of Notification. Please provide a five-year history of maintenance expenses for the Overbrook Substation.

PECO Answer to Staff Date Request A-11:

See PECO Attachment A-11, which is being provided in native Excel format to Staff via email.

PECO Attachment A-3

PJM Website Project Description for Project S1849

1849	6.1.2020	<p>Location:Upland Task:Build Equipment:Substation Desc:Build a new Upland 230/13 kV station Voltage:230/13 Expected Rating(N/E): Last Updated:08/27/2019</p>	PECO	<p>Study Year: Baseline Report: Driver: Customer Service Initial TEAC Date:02/22/2019 Last TEAC Date:</p>	PA	0	27.00
1849.1	6.1.2020	<p>Location:Upland Task:Build Equipment:Substation Desc:Purchase property to accommodate construction of Upland 230/13 kV substation Voltage:230/13 Expected Rating(N/E): Last Updated:09/09/2019</p>	PECO	<p>Study Year: Baseline Report: Driver: Customer Service Initial TEAC Date:02/22/2019 Last TEAC Date:</p>	PA	0	0.00
1849.2	6.1.2020	<p>Location:Bala, Parrish Task:Build Equipment:Transmission Line Desc:Construct tap from existing 230 kV Bala to Parrish line to feed new Upland substation Voltage:230 Expected Rating(N/E): Last Updated:09/09/2019</p>	PECO	<p>Study Year: Baseline Report: Driver: Customer Service Initial TEAC Date:02/22/2019 Last TEAC Date:</p>	PA	0	0.00
1849.3	6.1.2020	<p>Location:Upland Task:Instal. Equipment:Current Transformer Desc:Install 230 kV bus and two (2) 230/13 kV transformers in the Upland station Voltage:230/13 Expected Rating(N/E): Last Updated:09/09/2019</p>	PECO	<p>Study Year: Baseline Report: Driver: Customer Service Initial TEAC Date:02/22/2019 Last TEAC Date:</p>	PA	0	0.00