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July 22, 2020

**VIA eFILING**

Rosemary Chiavetta, Secretary  
Pennsylvania Public Utility Commission  
Commonwealth Keystone Building  
400 North Street  
Harrisburg, PA 17105-3265

**Re: Petition of PECO Energy Company for Approval of Its Electric Long Term  
Infrastructure Improvement Plan for the Period January 1, 2021 through  
December 31, 2025  
Docket No. P-2020-**

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Dear Secretary Chiavetta:

With this letter, we are filing a **Petition for Approval of PECO's Second Electric Long Term Infrastructure Improvement Plan** ("Petition"). PECO's second electric Long Term Infrastructure Improvement Plan ("LTIIIP II"), also known as PECO's Reliability and Resiliency plan, is attached as Exhibit No. 1 to the Petition.

As evidenced by the enclosed Certificate of Service, copies of the enclosed Petition, LTIIIP II, and PECO Exhibit No. 1 are being served upon the Bureaus of Investigation and Enforcement and Technical Utility Services, the Office of Consumer Advocate, the Office of Small Business Advocate and the parties to PECO's last electric base rate case.

**Rosemary Chiavetta, Secretary**  
**July 22, 2020**  
**Page 2**

If you have any questions regarding this filing, please contact me at 215.841.5777.

Sincerely,

A handwritten signature in black ink, appearing to read "R.W." followed by a long horizontal flourish.

Richard G. Webster, Jr.

Enclosures

- c: Dan Searfoorce - Bureau of Technical Utility Services (via e-mail and first class mail)
- Dave Washko - Bureau of Technical Utility Services (via e-mail and first class mail)
- John Van Sant - Bureau of Technical Utility Services (via e-mail and first class mail)

**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**PETITION OF PECO ENERGY :  
COMPANY FOR APPROVAL OF ITS :  
ELECTRIC LONG TERM : DOCKET NO. P-2020-  
INFRASTRUCTURE IMPROVEMENT :  
PLAN FOR THE PERIOD JANUARY 1, :  
2021 THROUGH DECEMBER 31, 2025 :**

**CERTIFICATE OF SERVICE**

I hereby certify and affirm that I have this day served a copy of the **Petition for Approval of PECO’s Electric Long Term Infrastructure Improvement Plan** on the following persons in the matter specified in accordance with the requirements of 52 Pa. Code § 1.54:

**VIA ELECTRONIC MAIL**

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Date: July 22, 2020

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**BEFORE THE  
PENNSYLVANIA PUBLIC UTILITY COMMISSION**

**PETITION OF PECO ENERGY** :  
**COMPANY FOR APPROVAL OF ITS** :  
**ELECTRIC LONG TERM** : **DOCKET NO. P-2020-**  
**INFRASTRUCTURE IMPROVEMENT** :  
**PLAN FOR THE PERIOD JANUARY 1,** :  
**2021 THROUGH DECEMBER 31, 2025** :

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**PETITION FOR APPROVAL OF PECO’S SECOND  
ELECTRIC LONG TERM INFRASTRUCTURE IMPROVEMENT PLAN**

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Pursuant to Section 1352(a) of the Pennsylvania Public Utility Code<sup>1</sup> and 52 Pa. Code § 121.5(c), PECO Energy Company (“PECO” or the “Company”) petitions the Pennsylvania Public Utility Commission (“PUC” or the “Commission”) to approve its second electric Long Term Infrastructure Improvement Plan (“LTIIIP II” or the “Plan”), also known as PECO’s Reliability and Resiliency plan, which accompanies this Petition as PECO Exhibit No. 1. If approved, PECO’s LTIIIP II will be effective for the period from January 1, 2021 through December 31, 2025, which immediately follows the expiration of PECO’s current LTIIIP (“LTIIIP I”) on December 31, 2020.

The Plan builds on LTIIIP I by continuing to focus on infrastructure improvements designed to enhance reliability by strengthening and modernizing PECO’s electric distribution system. In developing LTIIIP II, PECO employed the same form of risk analysis used to prioritize its investments in LTIIIP I. Consequently, LTIIIP II contains programs targeting infrastructure with a higher probability of failure and infrastructure that presents higher risk

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<sup>1</sup> 66 Pa.C.S. § 1352(a). Hereafter all reference to a “section” shall be to a section of the Pennsylvania Public Utility Code, 66 Pa.C.S. § 101 *et seq.*, unless specifically stated or the context indicates otherwise.

because of the severity of the impact a failure would produce. LTIIIP II will increase PECO's projected capital investment over the five years ending December 31, 2025 by \$1.36 billion for: (1) storm hardening and resiliency; (2) replacing underground cable with higher risk profiles; and (3) replacing older and degraded substation switchgear. LTIIIP II also includes \$75 million that PECO expects to invest over the Plan's term in plant and equipment related to facility relocations, which constitute "eligible property" as defined in Section 1351. Schedules showing PECO's projected expenditures and quantities of eligible plant to be replaced from 2021 to 2025 are provided in Appendix A to the Plan and are described in Section IV.C. of the Plan.

LTIIIP II contains all of the elements required by Section 1352(a)(1)-(6) and 52 Pa. Code §§ 121.1 *et seq.* (the "LTIIIP Regulations") and, therefore, satisfies all of the requirements for Commission approval set forth in Section 1352(a)(7) and the LTIIIP Regulations. Accordingly, PECO requests that the Commission approve PECO's proposed LTIIIP II as set forth in PECO Exhibit No. 1 without modification.

## **I. INTRODUCTION AND BACKGROUND**

1. PECO is a corporation organized and existing under the laws of the Commonwealth of Pennsylvania with its principal office in Philadelphia, Pennsylvania. PECO provides electric delivery service to approximately 1.66 million customers and natural gas delivery service to more than 511,000 customers in southeastern Pennsylvania. PECO furnishes electric service within its authorized service territory in Bucks, Chester, Delaware, Montgomery, and York Counties and the City of Philadelphia. PECO is a "public utility," as defined in 66 Pa.C.S. § 102, and, with respect to its provision of electric service, an "electric distribution company," as defined in 66 Pa.C.S. § 2803.

2. The names and addresses of PECO’s attorneys authorized to receive all notices and communications regarding this filing are as follows:

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3. On February 14, 2012, former Governor Corbett signed into law Act 11 of 2012 (“Act 11”). Act 11 amended the Public Utility Code by, *inter alia*, adding Subchapter B to Chapter 13, consisting of Sections 1350 – 1360. Subchapter B authorizes the Commission, upon petition by a qualifying utility,<sup>2</sup> to approve a Distribution Service Improvement Charge (“DSIC”) to recover the reasonable and prudent “fixed costs”<sup>3</sup> incurred to repair, improve, or replace “eligible property.”<sup>4</sup> Subchapter B also imposes various requirements that must be satisfied by a qualifying utility in order to establish a DSIC.

4. Section 1352(a) provides that a qualifying utility must submit an LTIP “in order to be eligible to recover costs under section 1353 (relating to distribution system improvement charge).” Additionally, Section 121.5(c) of the LTIP Regulations provides that a utility seeking

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<sup>2</sup> Section 1351’s definition of “utility” provides that utilities eligible to implement a DSIC shall include an electric distribution company (“EDC”), a natural gas distribution company, a water utility, or a wastewater utility.

<sup>3</sup> See Sections 1357(a)(3) and (b), designating the components of “fixed costs” for purposes of calculating the DSIC.

<sup>4</sup> See Section 1351, defining “eligible property”.

to continue to use a DSIC must file with the Commission a new LTIP at least 120 days before its then-effective LTIP expires. That section also provides that the new LTIP must contain the elements set forth in Section 121.3(a) of the LTIP Regulations, which in turn track, and add to, the required components of an LTIP set forth in Section 1352.

5. Section 1352 provides that an LTIP shall include the following information:

- (1) Identification of the types and age of eligible property owned or operated by the utility for which the utility would seek recovery under this subchapter.
- (2) An initial schedule for the planned repair and replacement of eligible property.
- (3) A general description of the location of the eligible property.
- (4) A reasonable estimate of the quantity of eligible property to be improved.
- (5) Projected annual expenditures to implement the plan and measures taken to ensure that the plan is cost effective.
- (6) The manner in which the replacement of aging infrastructure will be accelerated and how the repair, improvement or replacement will ensure and maintain adequate, efficient, safe, reliable and reasonable service.

6. On August 2, 2012, the Commission entered an Implementation Order,<sup>5</sup> most of which was devoted to explaining how the Commission intended to apply the provisions of Subchapter B, including the Commission's expectations regarding the contents of an LTIP. On May 23, 2014, the Commission entered its Final Rulemaking Order approving the LTIP

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<sup>5</sup> *Implementation of Act 11 of 2012*, Docket No. M-2012-2293611 (Final Implementation Order entered Aug. 2, 2012).

Regulations,<sup>6</sup> which establish the procedures and criteria for the filing, modification, and periodic review of LTIIPs. The LTIIIP Regulations include the six statutory components of an LTIIIP as well as additional requirements for submission of: (1) a workforce management and training program; and (2) a description of a utility's outreach and coordination activities with other utilities, the Department of Transportation, and local governments.<sup>7</sup>

7. On March 27, 2015, PECO filed a Petition at P-2015-2471423 seeking approval: (1) to implement LTIIIP I, which was designed to accelerate PECO's reliability-related investments by \$274.3 million over its five-year term; and (2) to establish a DSIC mechanism for its electric operations effective January 1, 2016. By its Opinion and Order entered October 22, 2015, the Commission found that PECO satisfied the requirements of Section 1352 and the LTIIIP Regulations and, therefore, approved LTIIIP I.<sup>8</sup> The Commission also approved PECO's proposed DSIC to become effective on January 1, 2016, subject to resolution of certain implementation issues that were referred to the Office of Administrative Law Judge ("OALJ").<sup>9</sup> On March 1, 2017 and annually March 1 thereafter, PECO filed its Annual Asset Optimization Plans ("AAOPs"), and those plans were subsequently approved by the Commission.

8. This Petition provides a summary of key elements of PECO's LTIIIP II. As explained below, PECO's LTIIIP II includes all the elements required by Section 1352(a) and the LTIIIP Regulations for Commission approval. PECO Exhibit No. 1 provides detailed information

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<sup>6</sup> *Review of Long-Term Infrastructure Improvement Plan*, Docket No. L-2012-2317274 (Order entered May 23, 2014). The LTIIIP Regulations became effective on December 20, 2014, following publication in the *Pennsylvania Bulletin*. 44 Pa.B. 7856.

<sup>7</sup> See 52 Pa. Code §§ 121.3(a)(7)-(8).

<sup>8</sup> *Petition of PECO Energy Co. For Approval of Its Elec. Long Term Infrastructure Improvement Plan and To Establish a Distribution Sys. Improvement Charge for Its Elec. Operations*, Docket No. P-2015-2471423 (Oct. 22, 2015), pp. 7-24.

<sup>9</sup> *Id.*, p. 38. The issues referred to the OALJ were resolved by a settlement approved by the Commission on September 21, 2017.

about the types of property being replaced or rehabilitated, explains how the proposed infrastructure improvements will enhance reliability and customer service, and shows that the Plan reflects PECO's acceleration of investment in DSIC-eligible property.

**II. PECO'S LTIIIP II SATISFIES THE REQUIREMENTS IMPOSED BY SECTION 1352(A) AND THE LTIIIP REGULATIONS; IS REASONABLE AND COST-EFFECTIVE; AND IS DESIGNED TO ENSURE AND MAINTAIN ADEQUATE, EFFICIENT, SAFE, RELIABLE, AND REASONABLE SERVICE**

9. As previously explained, Section 1352(a) and the Section 121.5(c) of the LTIIIP Regulations require that PECO submit a successor to its LTIIIP I at least 120 days before LTIIIP I expires on December 31, 2020 in order to continue to recover the fixed costs of eligible property through its DSIC. To that end, PECO has developed a new five-year plan of accelerated infrastructure improvements, as embodied in LTIIIP II, to continue to enhance the resiliency and reliability of its electric distribution system. The principal elements of LTIIIP II are discussed below and in more detail in the Plan.

**A. Types And Ages Of Eligible Property; How LTIIIP II Will Accelerate The Replacement Of Aging Infrastructure; And How The Repair, Improvement, Or Replacement Of Eligible Property Pursuant To LTIIIP II Will Ensure And Maintain Adequate, Efficient, Safe, Reliable, And Reasonable Service (Sections 1352(a)(1) and (a)(6); 52 Pa. Code §§ 121.3(a)(1) and (a)(6); LTIIIP II Sections IV.C. and IV.H.)**

10. The accelerated investment totaling \$1.4 billion (including facility relocations) encompassed by LTIIIP II consists entirely of "eligible property" as defined in Section 1351. As described in detail in LTIIIP II (Section IV.C. and Appendix A), the reliability-related property totaling \$1.36 billion included in the Plan covers a broad spectrum of distribution-related equipment and facilities, including overhead and underground conductors; underground cables; transformers and distribution substation equipment; and various fixtures and switching devices such as poles, lightning arresters, fuses, circuit breakers, reclosers and cross arms.

11. Upgrading PECO's distribution system with the property additions identified in LTIIIP II will enhance the Company's capacity to withstand and recover from major storms, to maintain or improve its overall system reliability, and, in general, continue to provide its customers adequate, efficient, safe, reliable, and reasonable service. The Company will continue replacing property with a higher probability of failure by further accelerating the Company's Customers Experiencing Multiple Interruptions ("CEMI") Programs and Cable Replacement Programs implemented in LTIIIP I. Additionally, the Company will target property with a higher probability of failure with new Aerial Infrastructure Resiliency Programs under LTIIIP II. Property at higher risk because of the severity of the impact from failure is addressed by the Company's Building Substation Program, Circuit Rebuild/Unit Substation Retirement Program, and Substation Switchgear Replacement Program. Each of these elements of LTIIIP II is discussed, in turn, below.

### **1. Storm Hardening and Resiliency Investments**

12. Over the last two decades, PECO's service area has experienced a number of significant weather events of increasing severity, which have included hurricanes and tropical storms, such as Irene (2011) and Sandy (2012), extreme winter weather, such as Winter Storms Nika (2014) and Quinn/Riley (2018), and derechos (2020). Because of Winter Storms Quinn and Riley, which occurred only five days apart in March 2018, approximately 795,000 PECO electric customers experienced service interruptions, and PECO had to replace or repair over 240 miles of conductors and nearly 1,796 cross arms. Significantly, the three largest storms in PECO's history, which affected nearly 2.2 million customers, occurred in the last decade. The frequency and severity of major storms has elevated the need for PECO and other Pennsylvania EDCs to reinforce and upgrade their electric distribution infrastructure to better withstand

extreme weather events. Accordingly, if approved, PECO's LTIIIP II will increase PECO's investment in plant and equipment to achieve storm hardening and resiliency.

13. Storm hardening and resiliency encompass physical changes that improve or retrofit facilities to make them less susceptible to the effects of extreme weather conditions, such as damage from falling trees and branches, high wind, flooding, or wind-driven debris and enhance a utility's ability to maintain or restore service to customers after its facilities have suffered damage from storms or other causes. LTIIIP II includes four major initiatives that increase PECO's investment above its current level for storm hardening and resiliency measures.

**a. PECO's CEMI Programs (LTIIIP II Section IV.C.1.a.)**

14. Under LTIIIP II, PECO will expand its LTIIIP I program to accelerate infrastructure improvements in areas of the distribution system (the CEMI Areas Program) and on specific circuits (the CEMI Targeted Circuits Program) that exhibit below-average reliability performance as measured by the CEMI index and the data underlying the index. Unlike system-wide averages, the CEMI index, which tracks the number of customers that have experienced more than four interruptions in a year, provides focused information on area-specific and circuit-specific customer outages. Based on that information, improvements can be specifically designed for, and targeted to, geographic areas and specific circuits where customers experience a number of sustained interruptions higher than the overall system average. These measures include replacing obsolete or degraded equipment (such as poles, cross arms and lightning arresters), installing new primary wires designed to reduce outages caused by falling trees and branches, investing in "smart" switching equipment (e.g., reclosers) to automatically restore power, and extending additional circuits closer to the pockets of increased CEMI to provide alternate circuits for service restoration when required. Because weather and vegetation are the

main drivers of the interruptions measured by the CEMI index, these measures were considered prime targets for accelerated investments. The success of PECO's CEMI initiatives will continue to be measured by the reduction in the frequency of interruptions in the improved areas and circuits with a long-term goal of a 25% reduction by 2026.<sup>10</sup>

**b. PECO's Aerial Infrastructure Resiliency Programs (LTIIIP II Section IV.C.1.b.)**

15. PECO's Aerial Infrastructure Resiliency Programs, like its CEMI Programs, have area and circuit-specific elements. As previously explained, PECO's CEMI Programs target areas and circuits that exhibit below-average reliability. The Aerial Infrastructure Programs, however, are designed to replace aerial infrastructure across PECO's entire electric service area on a systematic basis in order to proactively address those facilities that are vulnerable to failures caused by age-related degradation, normal environmental exposure, and ordinary wear and tear – factors that also increase the probability of storm-related damage. PECO will target for replacement aerial infrastructure installed before 1965, which, based on age-related risk factors, includes the vintages most susceptible to rising failure rates.

16. The Aerial Infrastructure Resiliency Programs in LTIIIP II are designed to replace aging and vulnerable facilities, including conductors, connectors, cross arms, poles, and cutouts, with new plant and equipment built to higher design standards, which will also strengthen the distribution system's ability to withstand higher winds and higher snow/ice loading. The success of these initiatives will be measured by the reduction in aerial equipment failures in the improved areas and circuits with a long-term goal of a 25% improvement by 2026.

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<sup>10</sup> PECO's projected LTIIIP II investments, in conjunction with the Company's projected "baseline" investments in distribution system infrastructure in the LTIIIP II project categories during 2021-2025, support the long-term goals outlined in the Plan.

**c. Building Substation Retirements (LTIIIP II Section IV.C.1.c.)**

17. PECO's electric distribution system presently contains 21 building substations without current or proposed retirement plans.<sup>11</sup> Building substations supply power to downstream facilities that serve a large number of customers. Nearly ninety percent of PECO's existing building substations were constructed over fifty years ago. Moreover, all of PECO's building substations contain obsolete equipment requiring customized replacement parts and have limited capabilities for remotely monitoring loading and equipment status. Given all these factors, building substations pose an increasing risk of sudden catastrophic failures that, should they occur, would interrupt service to thousands of customers. Additionally, if a building substation experiences a sudden catastrophic failure, it is difficult to restore. To address the potential reliability risk posed by building substations, the Company plans to complete the retirement of the two building substation projects it started under LTIIIP I during the LTIIIP II term to facilitate PECO's long-term goal of retiring all building substations in the next 20 to 25 years. Building substation retirement projects take multiple years to design and complete. Therefore, PECO will prioritize these retirements based on the existing substations' condition, the number of customers and load served, and the risk of failure.

**d. PECO's Circuit Rebuild/Unit Substation Retirement Program (LTIIIP II Section IV.C.1.d.)**

18. PECO's LTIIIP II will enhance storm hardening and resiliency by accelerating the Company's schedule under LTIIIP I for eliminating aging unit substations (i.e., those constructed 40 or more years ago) that are experiencing an increasing failure rate and upgrading all

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<sup>11</sup> PECO has a total of 27 building substations. Of that total, five have retirement plans in progress. In addition, PECO will begin to design another building substation retirement project in 2020 as part of LTIIIP I.

downstream low-voltage supply facilities to operate at higher voltages consistent with modern modes of operation.<sup>12</sup> Before it implemented LTIIIP I, PECO was retiring only a few unit substations per year. During the first four years of LTIIIP I, PECO forecasted and retired 17 unit substations and plans to retire six additional units in the final year of LTIIIP I, for a total of 23 units. Even at the rate of six units per year, it would require over 100 years to retire all unit substations. In LTIIIP II, PECO proposes to continue its Circuit Rebuild/Unit Substation Retirement Program and increase the retirement rate by an additional two to four unit substations per year to accelerate the timeline for retirement from 100 years to approximately 30 years. The specific unit substations selected for retirement will be prioritized on the basis of their susceptibility to storm damage (for example, if they are located in flood plains), the need to obtain spare equipment that is not readily available, capacity constraints, the number of customers served, and equipment obsolescence, among other considerations that may be location or unit-specific.

## **2. Investments to Address Conditions with the Potential to Degrade Reliability Performance**

19. In addition to storm hardening and resiliency, PECO is committed to continuously improving the reliability of its service and has implemented numerous programs to maintain, protect, and enhance its electric distribution system, including proactive inspection, electric infrastructure replacement, and general reliability construction programs. As a result of those infrastructure improvements, PECO has a track record of strong reliability performance in terms of the average number of times that a customer may be interrupted over the course of a year (System Average Interruption Frequency Index or “SAIFI”), the average power restoration time

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<sup>12</sup> The differences between building substations and unit substations are described in Sections IV.C.1.c. and IV.C.1.d. of the Plan.

for those interruptions (Customer Average Interruption Duration Index or “CAIDI”) and the average length of time customers are without service (System Average Interruption Duration Index or “SAIDI”). In addition, since 2012, PECO has performed better in each of those key metrics than the Commission’s benchmarks and minimum performance standards established in Docket No. M-00991220.<sup>13</sup>

20. In order to address property with high-risk profiles and bolster PECO’s ability to maintain and enhance reliability, PECO’s LTIIIP II proposes acceleration of LTIIIP I’s underground cable replacement initiatives, as well as new additional investment in the Company’s substation switchgear replacement program.

**a. Underground Cable Replacement – Main Stem Cable (LTIIIP II Section IV.C.2.a.) and Underground Residential Development (“URD”) Cable (LTIIIP II Section IV.C.2.b.)**

21. PECO owns and operates 16,710 miles of underground distribution cable throughout its service territory, consisting of main stem and URD cable. While underground distribution cable experiences fewer outages than aerial conductors, when outages occur, they can have a much longer duration because of the logistical difficulty with locating and repairing faults in underground facilities. As explained in more detail in the Plan, over the first three years of LTIIIP I, PECO realized significant reductions in failure rates due to the Company’s increased investment in underground cable replacement.

22. As part of its infrastructure improvement strategy, PECO carefully assesses trends in equipment failure rates, along with the age and state of repair of its distribution assets, to take appropriate action to prevent or reverse negative trends before reliability problems are

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<sup>13</sup> See, e.g., Pennsylvania Public Utility Commission, *Elec. Serv. Reliability in Pennsylvania 2018* (Oct. 2019), pp. 20-23.

experienced. Consistent with that prudent approach to maintaining reliability, PECO determined that it should substantially accelerate the thirty-year schedule for underground cable replacement under which the Company is working pursuant to LTIP I. To that end, PECO proposes to significantly increase investment in its existing Main Stem Cable Replacement Program and URD Cable Replacement Program in LTIP II to allow the Company to replace the targeted high-risk underground cable in ten to fifteen years. The main stem cable selected to be replaced will be prioritized to address the types of cable that have higher historical failure rates, including several vintages of paper-insulated lead cable and cross-linked polyethylene cable installed before 1985. The Company will also focus on replacing URD cable that was installed before 1985.

**b. Substation Switchgear Replacement (LTIP II Section IV.C.3.)**

23. PECO's electric distribution system currently contains 430 distribution busses<sup>14</sup> at 109 power substations. Of these, 110 are outdoor metal-enclosed switchgear busses that are experiencing failures due to ordinary environmental exposure and routine wear and tear. Like its building substations, the majority of PECO's outdoor metal-clad switchgear were constructed over fifty years ago and contain obsolete parts. These switchgear busses contain metal equipment that is degrading due to corrosion and other factors. Additionally, many outdoor metal-clad switchgear installations have electro-mechanical relay protection and associated control schemes that limit PECO's ability to upgrade those locations to digital protection systems (which is the current industry standard) and do not readily accommodate remote monitoring of loading and equipment status. Accordingly, PECO's outdoor metal-clad switchgear poses an increasing risk of failures and malfunctions that, should they occur, would interrupt service to

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<sup>14</sup> A "bus" is group of metal conductor bars that serve as a common connection for two or more circuits.

many customers. To address this potential reliability-related risk, the Company will begin proactively replacing additional targeted switchgear in 2021 pursuant to LTIIIP II. As explained in the Plan, candidates for replacement will be identified and prioritized based on age, existing operating condition, and number of customers served. The long-term goal of this program is to replace and upgrade all outdoor metal-clad switchgear in the next 30-40 years.

### **3. Facility Relocations (LTIIIP II Section IV.C.4.)**

24. “Unreimbursed costs related to highway relocation projects” are eligible for recovery under Sections 1351 and 1353. These costs arise when PECO moves facilities at the direction of the Commonwealth, a municipality, or another governmental entity. Such facility relocation costs are difficult to predict and estimate and, therefore, the \$15 million annual estimate for this category of eligible property that is set forth in Appendix A of PECO’s LTIIIP II is based on the five-year average (2015-2019) of PECO’s expenditures for facility relocations net of reimbursements. Additional information on facility relocation costs will be provided with PECO’s AAOPs filed after Commission approval of LTIIIP II.

25. In summary, PECO’s LTIIIP II provides a rigorous framework for analyzing, prioritizing, and accelerating infrastructure improvements that will reduce overall risks to its distribution system and improve resiliency, reliability, and customer service.

#### **B. Initial Schedule For The Planned Repair And Replacement Of Eligible Property And Reasonable Estimates Of The Quantity Of The Eligible Property To Be Improved (66 Pa.C.S. §§ 1352(a)(2) And (4); 52 Pa. Code §§ 121.3(a)(2) And (a)(4); LTIIIP II Sections IV.D. And IV.F.)**

26. Appendix A to the Plan provides detailed estimates of PECO’s planned annual expenditures for 2021 through 2025. The Company is proposing to increase its overall reliability-related capital expenditures by \$1.36 billion over the five-year LTIIIP II term (2021-

2025). The tables in Appendix A also show the number of storm hardening, resiliency, and building substation retirement projects, as well as the miles of conductors and number of switchgear busses to be replaced in PECO's service territory each year. These figures are estimates to account for any issues that may arise during the implementation period that could alter PECO's work plans, including potential supply chain disruptions as a result of the Commonwealth's response to the COVID-19 pandemic discussed in the Plan. The number of projects and replacements for any given level of investment may differ from PECO's estimates if actual site conditions are more or less favorable than those assumed for purposes of those estimates.

**C. Location Of Eligible Property (66 Pa.C.S. § 1352(3); 52 Pa. Code § 121.3(a)(3); LTIP II Section IV.E.)**

27. As explained in Section I, *supra*, PECO's authorized service territory is located in all or portions of Bucks, Chester, Delaware, Montgomery, and York Counties and the City of Philadelphia. The Company's investment under LTIP II will be targeted and prioritized based on the factors described in Section IV.E. of the Plan and Section II.A., *supra*.

**D. Projected Annual Expenditures To Implement The LTIP And Measures Taken To Ensure That The Plan Is Cost Effective (66 Pa.C.S. § 1352(a)(5); 52 Pa. Code § 121.3(a)(5); 52 Pa. Code §§ 121.4(d); LTIP Sections IV.C. and IV.G.)**

28. Appendix A (p. 1) of PECO's LTIP II shows PECO's plan to increase annual investment in storm hardening and resiliency and general reliability-related measures to a total of \$183.7 million in 2021, \$290.6 million in 2022, \$294.8 million in 2023, \$294.9 million in 2024 and \$295.0 million in 2025. Approximately, 54% (\$733 million) of the total reliability-related investment encompassed by PECO's LTIP II over its five-year term (\$1.36 billion) will be dedicated to storm hardening and resiliency. The overall cost-effectiveness of PECO's LTIP II

is established by data presented in Section IV.C. of the Plan. Those data show that PECO's proposed new and accelerated investments to increase the ability of the distribution system to withstand and recover from storm events and to proactively replace infrastructure with high-risk profiles to maintain and enhance reliability are the focus of PECO's LTIIIP II. Additionally, as explained in Section IV.G. of the Plan, PECO has successfully completed the units of work projected in the first four years of LTIIIP I within its budgeted investment levels for each program. PECO will analyze actual LTIIIP II expenditures to ensure that the costs it is incurring continue to be in line with projected investment levels both overall and on a unit cost basis.

**E. Workforce Management And Training Plan (66 Pa.C.S. § 1359(a); 52 Pa. Code § 121.3(a)(7); LTIIIP II Section IV.J.)**

29. Section IV.J.1 of the Plan describes PECO's extensive training regimen that prepares its employees to operate the Company's electric distribution system. All employees must undergo training before performing work independently on exposed, energized electrical equipment greater than 50 Volts, which may take up to five years to complete.

30. PECO anticipates that it will use outside general contractors to perform much of the work it is planning to undertake to implement LTIIIP II. To the extent PECO uses outside contractors, its contractor workforce will be fully qualified, in accordance with the standards set forth in Section 1359. In that regard, PECO administers a standard process for soliciting contractors. Part of that process includes evaluating the contractors' qualifications to perform work, including technical and financial capabilities and the level of its employees' qualifications. Most contractors employ personnel through the building trade unions, which have apprenticeship programs to ensure that employees are qualified to perform assigned work. Employee qualification programs for non-union contractors are stringently reviewed to assess the contractor's training program, such as on-the-job training and certification programs.

Contractors also must complete any necessary PECO-specific requirements for LTIIIP II tasks. Additionally, a contractor information website, maintained by PECO's Project and Contract Management Department, is available to contractors and provides Engineering Practices, Environmental Alerts, Field Bulletins, Technical Bulletins, Safety Messages, and Construction Specifications. Initial orientation training is provided to contractors by Project and Contract Management. Additional information about PECO's use of a qualified work force is provided in Section IV.J. of PECO's LTIIIP II.

**F. Outreach And Coordination Activities (52 Pa. Code § 121.3(a)(8); LTIIIP II Section IV.K.)**

31. As described in more detail in Section IV.K. of the Plan, PECO will continue to communicate with municipalities, the Department of Transportation, and other utilities in order to coordinate their respective work schedules and wherever possible to minimize the impact of activities on the public.

**III. SERVICE, COMMENTS AND COMMISSION REVIEW**

32. This Petition and the accompanying exhibits are being served upon the Commission's Bureaus of Investigation and Enforcement and Technical Utility Services, the Office of Consumer Advocate, the Office of Small Business Advocate, and the parties to PECO's last electric base rate case at Docket No. R-2018-3000164.

33. The LTIIIP Regulations (52 Pa. Code § 121.4(c)) provide a 30-day comment period for utility LTIIIPs. The LTIIIP Regulations further provide that an LTIIIP will not be assigned to the OALJ unless comments to LTIIIP II "raise material factual issues". PECO is not providing a proposed litigation schedule because it does not believe that LTIIIP II will raise any "material factual issues" or otherwise require evidentiary hearings.

#### **IV. CONCLUSION**

For the reasons set forth above, PECO's LTIIIP II satisfies the requirements set forth in Section 1352(a) and the LTIIIP Regulations. LTIIIP II identifies the age and type of eligible property included in the Plan; provides schedules depicting the levels of investment and quantity of property targeted for accelerated repair and replacement; provides the general location of eligible property covered by LTIIIP II; explains the measures being taken to ensure the Plan is cost-effective; explains the manner in which aging infrastructure will be accelerated to ensure and maintain adequate, efficient, safe, reliable and reasonable service; and provides an effective workforce management plan and discussion of coordination and outreach activities.

Based on the foregoing, including the attached exhibit, PECO respectfully requests that the Commission grant this Petition and enter an Order: (1) approving PECO's LTIIIP II; and

(2) finding that PECO's LTIP II is "adequate and sufficient to ensure and maintain adequate, efficient, safe, reliable and reasonable service" pursuant to Section 1352(a)(7).

Respectfully submitted,



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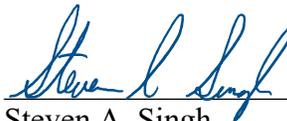
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Dated: July 22, 2020

*Counsel for PECO Energy Company*

## VERIFICATION

I, Steven A. Singh, hereby declare that I am the Vice President, Technical Services for PECO Energy Company; that, as such, I am authorized to make this verification on its behalf; that the facts set forth in the foregoing Petition of PECO Energy Company For Approval Of Its Electric Long Term Infrastructure Improvement Plan For The Period January 1, 2021 Through December 31, 2025 are true and correct 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.



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Steven A. Singh  
Vice President, Technical Services  
PECO Energy Company

Dated: July 22, 2020

# **PECO Exhibit No. 1**

**PECO Energy Company – Electric Division**

**Long Term Infrastructure Improvement Plan**

**For the Period 2021-2025**

**(Reliability and Resiliency Plan)**

**July 22, 2020**

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## I. INTRODUCTION

### A. Summary of PECO Energy Company's Electric Long Term Infrastructure Improvement Plan for the Period 2021-2025 ("Reliability and Resiliency")

PECO Energy Company ("PECO" or the "Company") is a Pennsylvania public utility that provides electric distribution service and natural gas distribution service subject to the jurisdiction of the Pennsylvania Public Utility Commission ("PUC" or the "Commission"). In its capacity as an electric distribution company ("EDC"), PECO's Electric Division furnishes electric distribution service to approximately 1.66 million customers across its authorized service territory in Philadelphia, Bucks, Montgomery, Delaware, Chester, and York Counties. To furnish that service, as of December 31, 2019, the Company owns and operates an electric distribution system comprising approximately 29,500 conductor miles of aerial distribution lines and approximately 16,700 conductor miles of underground distribution lines.<sup>1</sup> The Company also owns and operates approximately 1,100 miles of electric transmission lines that are under the operational control of the PJM Interconnection L.L.C. ("PJM") and are subject to the jurisdiction of the Federal Energy Regulatory Commission ("FERC").

Pursuant to Section 1352 of the Pennsylvania Public Utility Code, 66 Pa.C.S. § 1352,<sup>2</sup> PECO is submitting for Commission approval its second electric Long Term Infrastructure Improvement Plan ("LTIIIP II"), which the Company also refers to as the "Reliability and Resiliency" plan. If approved, PECO's LTIIIP II will be effective for the period from January 1, 2021 through December 31, 2025, which is the five-year period immediately following the expiration of PECO's currently approved LTIIIP ("LTIIIP I") on December 31, 2020.

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<sup>1</sup> PECO updates data regarding the composition of its distribution system annually using the Company's Geographic Information System.

<sup>2</sup> Hereafter, all references to a "section" shall be to a section of the Pennsylvania Public Utility Code, 66 Pa.C.S. §§ 101 *et seq.*, unless specifically stated, or the context indicates otherwise.

As explained in greater detail hereafter, under its LTIP II, PECO proposes to make additional capital investments totaling \$1.36 billion to construct reliability-related improvements over the period 2021 through 2025. Approximately \$733 million of PECO's accelerated investment will focus on storm hardening and resiliency measures. Approximately \$605 million will be invested in accelerated replacement of underground cable in order to address and forestall a rising trend in interruptions related to those facilities. Lastly, PECO proposes to invest \$21 million to replace aging switchgear that is at greater risk of failure. In addition to the \$1.36 billion PECO proposes to invest in the reliability-related improvements, outlined above, LTIP II includes \$75 million of investment for facility relocations, as permitted by Section 1351 (definition of "eligible property").

**B. Background, Legal Authority, and PUC Guidance**

On February 14, 2012, former Governor Corbett signed into law Act 11 of 2012 ("Act 11"). Act 11 amended the Public Utility Code by, *inter alia*, adding Subchapter B to Chapter 13, consisting of Sections 1350-1360 ("Subchapter B"). Subchapter B authorizes the Commission, upon petition by a qualifying utility,<sup>3</sup> to approve a Distribution Service Improvement Charge ("DSIC") to recover, between base rate cases, the reasonable and prudent "fixed costs" incurred to repair, improve or replace "eligible property." Subchapter B also imposes various requirements that must be satisfied by a qualifying utility in order to establish a DSIC.

On August 2, 2012, the Commission entered its Final Implementation Order in *Implementation of Act 11 of 2012*, Docket No. M-2012-2293611 ("Implementation Order") to explain how the Commission intended to implement the provisions of Subchapter B. In

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<sup>3</sup> Section 1351's definition of "utility" provides that utilities eligible to implement a DSIC shall include an EDC, a natural gas distribution company ("NGDC"), a water utility or a wastewater utility. Prior to the enactment of Act 11, the Public Utility Code expressly provided only for water utilities to establish a DSIC. *See* former Section 1307(g), which was repealed by Act 11.

particular, the Implementation Order set forth the Commission’s expectations with regard to the contents of an LTIIIP that must be filed in order to request authority to establish a DSIC (*see* 66 Pa.C.S. § 1352) and Annual Asset Optimization Plans (“AAOPs”) that must be filed each year by a utility that has an approved DSIC and LTIIIP (*see* 66 Pa.C.S. § 1356). The terms of the Implementation Order track, and build upon, the provisions of Subchapter B. On May 23, 2014, the Commission entered a Final Rulemaking Order at Docket No. L-2012-2317274 (“Final Rulemaking Order”) to formally codify the procedures and criteria for filing, modifying, and periodically reviewing LTIIIPs (the “LTIIIP Regulations”).<sup>4</sup>

On March 27, 2015, PECO filed a Petition at Docket No. P-2015-2471423 that requested approvals: (1) to implement its LTIIIP I, which was designed to accelerate PECO’s reliability-related investments by \$274.3 million over its five-year term; and (2) to establish a DSIC mechanism for its electric operations effective January 1, 2016. By its Opinion and Order entered October 22, 2015, the Commission found that PECO satisfied the requirements of Section 1352 and the LTIIIP Regulations and, therefore, approved LTIIIP I.<sup>5</sup> The Commission also approved PECO’s proposed DSIC to become effective on January 1, 2016, subject to resolution of certain implementation issues that were referred to the Office of Administrative Law Judge (“OALJ”).<sup>6</sup> On March 1 in 2017, 2018, 2019, and February 28, 2020, PECO filed its Annual Asset Optimization Plans (“AAOP”), and those plans were subsequently approved by the Commission.

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<sup>4</sup> The LTIIIP Regulations became effective on December 20, 2014, following publication in the *Pennsylvania Bulletin*, 44 Pa.B. 7856, and are set forth at 52 Pa. Code §§ 121.1–121.8.

<sup>5</sup> *Petition of PECO Energy Co. For Approval of Its Electric Long Term Infrastructure Improvement Plan and To Establish a Distribution System Improvement Charge for Its Electric Operations*, Docket No. P-2015-2471423 (Oct. 22, 2015), pp. 7-24.

<sup>6</sup> *Id.*, p. 38. The issues referred to the OALJ were resolved by a settlement approved by the Commission on September 21, 2017.

Section 1352(a) provides that a qualifying utility must submit an LTIP “in order to be eligible to recover costs under section 1353 (relating to distribution system improvement charge).” Additionally, Section 121.5(c) of the LTIP Regulations provides that a utility seeking to continue its eligibility to use a DSIC must file a new LTIP with the Commission at least 120 days before the utility’s then-effective LTIP expires. Section 121.5(c) also provides that the new LTIP must contain all the elements set forth in Section 121.3(a) of the LTIP Regulations. Because the five-year term of the Company’s LTIP I ends on December 31, 2020, PECO is filing LTIP II to facilitate its continued eligibility to charge a DSIC beyond that date.

For the reasons set forth herein and in PECO’s contemporaneously filed Petition, PECO requests that the Commission find and determine that its LTIP II: (1) includes all of the elements required by Section 1352(a) of the Pennsylvania Public Utility Code and Section 121.3 of the LTIP Regulations; (2) satisfies all of the criteria set forth in Section 121.4(e) of the LTIP Regulations; and (3) therefore, should be approved without modification because it is “adequate and sufficient to ensure and maintain adequate, efficient, safe, reliable and reasonable service.” *See* Section 1352(a)(7).

## **II. REQUIRED ELEMENTS OF AN LTIP**

Section 1352 provides that an LTIP should include the following:

- (1) Identification of the types and age of eligible property owned or operated by the utility for which the utility would seek recovery under this subchapter.
- (2) An initial schedule for the planned repair and replacement of eligible property.
- (3) A general description of the location of the eligible property.
- (4) A reasonable estimate of the quantity of eligible property to be improved.
- (5) Projected annual expenditures to implement the plan and measures taken to ensure that the plan is cost effective.
- (6) The manner in which the replacement of aging infrastructure will be accelerated and how the repair, improvement

or replacement will ensure and maintain adequate, efficient, safe, reliable and reasonable service.

In the Implementation Order, the Commission incorporated the six elements of an LTIIIP required by Section 1352(a) and provided further guidance on what an LTIIIP should contain and the standards by which such plans would be reviewed and approved. The LTIIIP Regulations, which build on the Implementation Order, include the six statutory LTIIIP components and three additional requirements: (1) a workforce management and training program; (2) a description of a utility's outreach and coordination activities with other utilities, the Department of Transportation, and local governments; and (3) for NGDCs, identification of certain critical valves. Areas of particular importance related to the content of an LTIIIP and the process for reviewing and approving an LTIIIP consist of the following:

**Time for Filing an Initial LTIIIP And New LTIIIP** (Final Rulemaking Order, p. 1; 52 Pa. Code § 121.5(c)). The Final Rulemaking Order provides that an LTIIIP must be filed and approved before a DSIC may be implemented. In addition, as previously explained, a utility seeking to continue its DSIC mechanism after the expiration of its LTIIIP must file a new LTIIIP at least 120 days prior to the expiration of its currently effective LTIIIP.

**Time Frame for LTIIIP** (Final Rulemaking Order, p. 29). The LTIIIP Regulations do not establish a standard term for an LTIIIP, and the Commission has left to the discretion of the utility whether to develop a five- or ten-year term for its individual LTIIIP. In the Implementation Order (pp. 18-19), the Commission determined that “a five to ten-year term for the LTIIIP is appropriate as this time period is forward-looking enough for utilities to make accurate predictions and also provides sufficient time for long-term planning of planned repairs and replacement of eligible property.”

**LTIIP Must Only Address Specific Property Eligible for DSIC Recovery**

(52 Pa. Code § 121.3(b)). The LTIIP filed by a utility need only identify the specific eligible distribution plant property, as defined in Section 1351, that the utility has determined it will repair, improve, or replace based upon the age, functionality, reliability, and performance of such property and for which it may seek DSIC recovery.

**Accelerates or Maintains an Accelerated Rate of Infrastructure Improvement** (52

Pa. Code § 121.4(e)(2)). The LTIIP Regulations provide that the Commission will review a filed LTIIP to determine whether the plan “specifies the manner in which it *accelerates or maintains an accelerated rate* of infrastructure repair, improvement or replacement.” (emphasis added). As explained in the Implementation Order, p. 19, this language reflects the Commission’s acknowledgment that “some utilities have already taken substantial steps recently to increase prudent capital investment to address their aging infrastructure.”

**Workforce Management and Training Plan** (52 Pa. Code § 121.3(a)(7)). As an

appropriate means of implementing the standards set forth in Section 1359 (i.e., that utilities must demonstrate that work done on eligible property is performed by “qualified employees of either the utility or an independent contractor”), the LTIIP Regulations require a workforce management and training plan that “is designed to ensure that the utility will have access to a qualified workforce to perform work in a cost-effective, safe and reliable manner.”

**Outreach and Coordination Activities** (52 Pa. Code § 121.3(a)(8)). The LTIIP

Regulations require a “description of a utility’s outreach and coordination activities with other utilities, Department of Transportation and local governments regarding their planned maintenance/construction projects and roadways that may be impacted by the LTIIP.” The Commission believes these activities are necessary to ensure that LTIIP projects are properly

planned, coordinated with other stakeholders, and executed in an efficient and cost-effective manner.

**Burden of Proof and Review Process** (52 Pa. Code § 121.4). The LTIP Regulations provide that a utility has the burden of proof to “demonstrate that its proposed LTIP and associated expenditures are reasonable, cost effective and are designed to ensure and maintain efficient, safe, adequate, reliable and reasonable service to consumers.” LTIP filings are subject to a 30-day comment period, and the LTIP will be referred to the Office of Administrative Law Judge only if comments are filed that raise “material factual issues.”

**Confidential Information** (52 Pa. Code § 121.4(b)). A utility may obtain a protective order for confidential or proprietary information contained in an LTIP.

**Making Modifications to An Existing LTIP** (52 Pa. Code § 121.5(b), (c)). A utility must file a separate petition for modification if it would like to incorporate a major modification to any of the LTIP elements in Section 121.3(a). “Major modification” is defined in the LTIP Regulations. A less formal process of review applies to minor modifications.

**Periodic Review of An LTIP** (52 Pa. Code § 121.7). The Commission will review a utility’s LTIP at least once every five years. The periodic review will include: (1) whether the utility has adhered to the parameters of its LTIP; and (2) whether changes to the LTIP are necessary to continue to maintain the efficiency, safety, adequacy, and reliability of the utility’s existing distribution infrastructure.

### III. OVERVIEW OF PECO'S ELECTRIC LTIIIP

Section IV and Appendix A of this LTIIIP II contain all the components of an LTIIIP specified by Section 1352, the Implementation Order, and the LTIIIP Regulations. The contents of Section IV and Appendix A are summarized below.

**Section IV.A.** provides an overview of LTIIIP I, which was filed for the years 2016-2020, and a detailed discussion of the results of LTIIIP I.

**Section IV.B.** provides a high-level overview of LTIIIP II, which is proposed for the years 2021-2025.

**Section IV.C.** identifies the types and ages of the eligible property that is the subject of PECO's LTIIIP II. In this section, PECO describes the analysis it used to identify the property that will be the focus of LTIIIP II. Additionally, PECO explains why LTIIIP II's proposed infrastructure improvements are being undertaken and how those improvements will enhance reliability and customer service. PECO also addresses the extent of the acceleration of PECO's investment in LTIIIP II and why that acceleration is prudent.

**Section IV.D.** identifies and discusses the initial schedule for PECO's planned repair and replacement of eligible property.

**Section IV.E.** describes, generally, the location of eligible property slated for modernization under PECO's LTIIIP II.

**Section IV.F.** discusses, generally, the estimated quantities of eligible property to be replaced or upgraded.

**Section IV.G.** summarizes PECO's actual and anticipated expenditures for LTIIIP I. It also summarizes the projected and actual expenditures, projects completed and unit costs under LTIIIP I through 2019 and uses the data to analyze the cost-effectiveness of the programs in

LTIIIP I. In addition, PECO explains why it will be cost effective to implement LTIIIP II over its five-year term (2021-2025).

**Section IV.H.** discusses how PECO has accelerated the repair, improvement, and replacement of eligible property and describes its plans to maintain that accelerated level of work for the term of LTIIIP II.

**Section IV.I.** identifies the charts and tables depicting estimated expenditures during the five-year term of LTIIIP II, as set forth in Appendix A, and explains how the estimates will be augmented with additional detail when PECO files future AAOPs.

**Section IV.J.** explains PECO's workforce management plan for utility and contractor employees.

**Section IV.K.** describes PECO's outreach and coordination activities with other utilities, the Pennsylvania Department of Transportation ("PennDOT"), and local governments regarding the planning and implementation of LTIIIP II projects.

#### **IV. PECO'S ELECTRIC LTIIIP II**

As explained hereafter, the modes of analysis and prioritization methods PECO has employed to develop LTIIIP II closely track those it used for LTIIIP I. In both instances, PECO has focused on infrastructure improvements designed to enhance reliability by strengthening and modernizing its electric distribution system. PECO proposes that the programs developed and implemented in LTIIIP I will be continued and augmented in LTIIIP II. Specifically, PECO's LTIIIP I consists of the following five programs:

- Customers Experiencing Multiple Interruptions ("CEMI");
- Circuit Rebuild/Unit Substation Retirement;

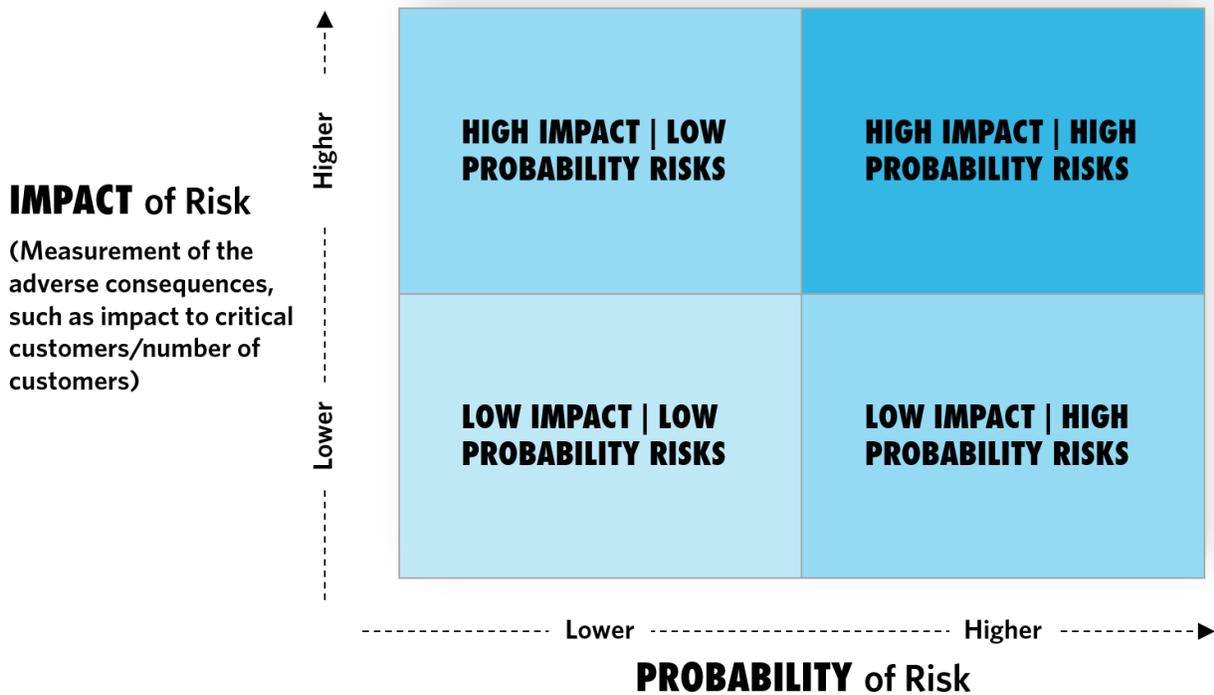
- Main Stem Cable<sup>7</sup> Replacement;
- Underground Residential Development<sup>8</sup> (“URD”) Replacement; and
- Building Substation Retirement.

In order to identify and develop the projects and programs included in LTIIP I, the Company used a risk-based approach. PECO’s risk analysis reflects the accepted definition of risk as the product of probability and impact, where “probability” is the likelihood that an event may occur, and “impact” is a measure of the adverse consequences such an occurrence would create. For example, the magnitude of adverse consequences can be measured by the number of customers affected or the criticality of the services provided by specific customers that would be interrupted, such as hospitals or first responders. Consequently, higher “risk” exists if there is a high probability that an event will occur or if there is a relatively lower probability of an event that, if it were to occur, would trigger significant harmful effects. This mode of analysis is often depicted as a risk “matrix” consisting of four quadrants that lie within the positive range of the x and y axes reflecting, respectively, probability and impact:

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<sup>7</sup> Main stem cable is installed in underground conduits and in ducts with manholes or aerially on poles. Main stem cable is typically used in congested areas near substations and in large industrial and densely populated areas.

<sup>8</sup> URD cable is installed by direct burial in underground trenches and is used primarily in residential developments.



A risk matrix, while helpful in providing a qualitative and directional depiction of risk factors, tends to overly simplify the underlying risk analysis. In practice, clear lines do not separate risk factors into probability and impact. Those factors overlap and, therefore, lie on a continuum from lower to higher risk. Thus, for individual items or groups of property encompassed by certain programs, higher risk could result from a higher probability of failure, from the greater impact that the failure of location-specific equipment could create, or from a combination of moderate risk factors in both categories that, in combination, increase total risk. Moreover, impact is measured by more than just the total number of customers affected. Main stem cable is an example that illustrates this effect. In some instances, main stem cable is at higher risk because it is the pathway that supplies thousands of customers on a circuit or supplies a major substation that, in turn, serves a large number of customers. However, the higher risk associated with main stem cable failures may exist in other areas because location-specific facilities supply a hospital, an airport or similar customers that furnish vital services.

Additionally, both factors could work together to raise the risk profile of main stem cable in specific geographic areas.

As discussed further in Sections IV.B and IV.C, the Company proposes to continue the programs implemented under LTIIIP I and to add other programs also designed to further improve reliability and resiliency for customers. Accordingly, the Company proposes the following nine programs in LTIIIP II<sup>9</sup>:

- CEMI Areas;
- CEMI Targeted Circuits;
- Aerial Infrastructure Resiliency Areas;
- Aerial Infrastructure Resiliency Targeted Assets;
- Building Substation Retirement;
- Circuit Rebuild/Unit Substation Retirement;
- Main Stem Cable Replacement;
- URD Cable Replacement; and
- Substation Switchgear Replacement.

#### **A. Overview of LTIIIP I**

In developing LTIIIP I, PECO employed the analysis described above to target electric infrastructure that exhibited two high-risk profiles: (1) equipment that, based on a number of factors, including a trend of increasing failure rates, exhibited a higher probability of failure; and (2) equipment that would affect a large number of customers (or customers that provide critical services) and has longer restoration times if the equipment were to fail and, therefore, warrants

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<sup>9</sup> The following programs are a continuation of LTIIIP I: CEMI Areas, Circuit Rebuild/Unit Substation Retirement, Building Substation Retirement, Main Stem Cable Replacement, and URD Cable Replacement.

preemptive and preventative measures to avoid failures. PECO's LTIP I included three programs to address equipment in the first category (higher probability of failure), which were identified as: (1) the CEMI/Spacer Cable<sup>10</sup> Program; (2) the Main Stem Cable Replacement Program; and (3) the URD Cable Replacement Program. The utility plant encompassed by these programs consists largely of components of linear infrastructure. For aerial facilities, this infrastructure includes conductors, poles, cross-arms, lightning arrestors, line hardware, and associated equipment. In some cases, the failure of any one component of these facilities would be unlikely to have a major impact measured by number of customers affected. However, the number of individual components involved (including linear feet of overhead conductors), their geographic dispersion across the Company's service area, and the probability that failures of individual components could occur (including concurrent or cascading failures) raise the risk profile of these facilities. LTIP I detailed the screening measures PECO used to identify the locations, vintages, and other relevant characteristics of the infrastructure that was the target of LTIP I investment in this category.

LTIP I also included two programs to address equipment in the second category (lower probability but higher impact). These programs were identified as the Circuit Rebuild/Unit Substation Retirement Program and Building Substation Retirement Program. Both programs were designed to retire substations operating at obsolete voltages, upgrade downstream facilities, and convert the downstream facilities to operate at higher voltage. Under all programs involving aerial infrastructure, PECO is also installing reclosers to reduce the number of customers affected by an event.

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<sup>10</sup> Spacer cable is a type and configuration of overhead cable that is more resistant to falling trees and branches.

Unit substations contain a single transformer operating in a range of 1 to 5 Megavolt Amperes (“MVA”), and building substations contain multiple transformers operating in a range from 5 to 15 MVA. However, a failure of either type of substation would cause an outage for a substantial number of customers served from those facilities. Consequently, their risk profile is high even though the probability of a failure occurring is lower than in the case of various units of mass property covered by the three higher probability/lower impact programs described previously. Because of the large-scale effects of a substation failure, prudent utility management practice dictates that proactive measures should be taken to prevent such failures.

Given the practical issues of initiating and implementing LTIIIP II, PECO’s LTIIIP I was designed to “ramp up” in 2016 and 2017 and to hit a steady state of ongoing LTIIIP I activity in years 2018 through 2020. By the end of 2019, PECO’s investment in accelerated infrastructure investment within the first four calendar years of LTIIIP I’s term closely aligned with the annual investment projections (by program and in total) set forth in LTIIIP I, as shown in Figure 1 below:

Figure 1

LTIIIP I Investment Summary (\$ in million, 2016 - 2019)												
	2016			2017			2018			2019		
	Filed	Actual	Variance	Filed	Actual	Variance	Filed	Actual	Variance	Filed	Actual	Variance
Customers Experiencing Multiple Interruptions (CEMI)	\$ 7.7	\$ 8.0	\$ 0.3	\$10.0	\$ 9.9	\$ (0.1)	\$15.0	\$14.3	\$ (0.7)	\$15.0	\$14.1	\$ (0.9)
Circuit Rebuild Enabling Unit Substation Retirement	\$ 1.7	\$ 1.7	\$ (0.0)	\$14.5	\$14.3	\$ (0.2)	\$15.0	\$14.7	\$ (0.3)	\$15.0	\$19.5	\$ 4.5
Main Stem Cable	\$ 8.2	\$ 8.4	\$ 0.2	\$18.0	\$18.8	\$ 0.8	\$18.0	\$16.4	\$ (1.6)	\$15.0	\$17.9	\$ 2.9
Underground Residential Development (URD)	\$ 4.2	\$ 4.5	\$ 0.3	\$10.0	\$ 9.3	\$ (0.7)	\$17.0	\$15.4	\$ (1.6)	\$17.0	\$17.1	\$ 0.1
Building Substation Retirement Program	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 1.0	\$ 0.4	\$ (0.6)
Total	\$ 21.8	\$22.5	\$ 0.7	\$52.5	\$52.4	\$ (0.1)	\$65.0	\$60.8	\$ (4.2)	\$63.0	\$69.0	\$ 6.0

In addition to meeting the investment targets set forth in LTIIIP I, PECO met (and exceeded) the targets for units of work it projected to be performed in each program, as shown in Figure 2 below:

Figure 2

LTIIIP I Project Summary (2016 - 2019)								
	2016		2017		2018		2019	
	Filed	Actual	Filed	Actual	Filed	Actual	Filed	Actual
Customers Experiencing Multiple Interruptions (CEMI) (projects)	5 - 8	10	6 - 9	10	8 - 13	11	8 - 13	14
Circuit Rebuild Enabling Unit Substation Retirement (number of unit subs to be retired)	0	0	5	5	6	6	6	6
Main Stem Cable (in miles)	8	10.8	17	18.1	17	19	14	14.1
Underground Residential Development (URD) (in miles)	8	9.6	19	22	32	32.9	32	32.6
Building Substation Retirement Program (number of substations)	0	0	0	0	0	0	0	0

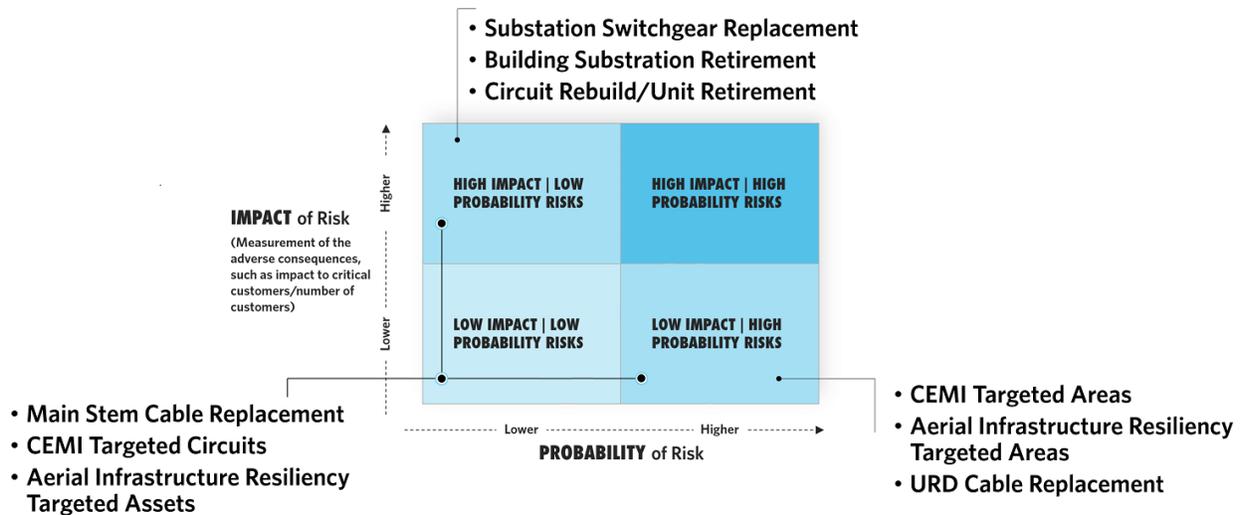
Since March 2020, the COVID-19 pandemic has resulted in “stay at home” orders, closure of schools and non-essential businesses across the Commonwealth, as well as other executive and administrative action to protect communities. Overall, PECO has been able to continue LTIIIP I work in order to provide reliable service to communities during these unprecedented times. While PECO encountered and overcame some scheduling issues to accommodate other essential businesses, the Company anticipates that it will be able to complete the LTIIIP I work planned for 2020 despite the challenges presented by the COVID-19 pandemic.

Over the relatively short timeframe of a single LTIIIP, it is difficult, and ultimately not informative, to try to use quantitative measures to assess the efficacy and positive impact of an LTIIIP on reliability performance. Equipment failures are not distributed evenly across the infrastructure comprising a utility’s distribution system. To the contrary, actual equipment failures exhibit a random distribution. This means that, while the utility is replacing infrastructure in specific areas – which its internal screening identified as a priority – failures can, and do, occur at higher than average frequency in other parts of the utility’s system. Eventually, the utility’s accelerated replacement programs will achieve critical mass and, in doing so, will have a substantial positive effect on the overall frequency and durations of outages.

The time required to complete individual projects is also a factor. For most projects that can be completed within one year, construction occurs throughout a calendar year, and replacement facilities are not placed in service until late in that year. The collective beneficial impacts of that work would not be realized until the following calendar year. For projects that require multiple years to complete, the potential beneficial effects occur even later in time. In short, many of the positive effects of an LTIIIP investment are likely to emerge well after that investment has been completed.

## **B. Overview of LTIIIP II**

In developing LTIIIP II, PECO employed the same form of risk analysis used to prioritize its investment in LTIIIP I. Consequently, LTIIIP II contains programs targeting infrastructure that is at higher risk because of its higher probability of failure and infrastructure that exhibits higher risk because of the severity of the impact a failure would produce. The chart below shows generally the risk profile of each program based on the impact to customers and the probability of occurrence. Equipment covered by the Main Stem Cable Replacement, CEMI Targeted Circuits, and Aerial Infrastructure Resiliency Targeted Assets Programs can be at higher risk of failure because of the number of customers or the criticality of the customers that would be affected by failures, conditions that indicate the property has a higher probability of failure, or a blending of those factors. Both factors vary based on the location of specific property.



As in LTIIIP I, property with a higher probability of failure is addressed generally by the Company’s CEMI Targeted Areas Program, Aerial Infrastructure Resiliency Targeted Areas Program, and URD Cable Replacement Program. Property at higher risk because of the severity of the impact from failure is addressed by the Company’s Circuit Rebuild/Unit Substation Retirement Program, Building Substation Program, and Substation Switchgear<sup>11</sup> Replacement Program. The CEMI Targeted Circuits Program, Main Stem Cable Replacement Program, and Aerial Infrastructure Resiliency Targeted Assets Program include property that, depending on the circuit or location, can have a variable amount of risk because of the variation in probability of failure in conjunction with range of impact if a failure were to occur. To reflect that fact, those programs are depicted by occupying three quadrants of the risk matrix. In LTIIIP II, PECO has also employed various filters to identify the types, locations and vintages of plant and equipment targeted for replacement in each program. Through lessons learned from implementing LTIIIP I, PECO has enlarged and enhanced the programs included in LTIIIP II.

<sup>11</sup> Switchgear is composed of electrical disconnect switches, fuses, or circuit breakers used to control, protect and isolate electrical equipment. A basic function of switchgear is to protect the distribution system by interrupting fault currents while maintaining service to unaffected circuits. Because switchgear is typically located at both the high-voltage and low-voltage side of transformers in electric substations, its failure, like the failure of a substation itself, is a “high impact” event, which raises the risk profile of aging and obsolete switchgear.

For its CEMI Programs, PECO identifies pockets where customers have experienced higher-than-average annual interruptions. Using a CEMI index to track the number of customers that have experienced more than four interruptions in a year, PECO can determine where outages are occurring with greater frequency and, therefore, where PECO should direct and accelerate increased investment.

LTIIIP II reflects the latest evolution of PECO's approach to addressing these CEMI "pockets." Historically, PECO – like other EDCs – focused its CEMI-reduction efforts on specific circuits. Although PECO still uses the circuit-based model to address specific targeted circuits, its geographic information system allows it to expand its approach to address CEMI across geographically defined areas that encompass multiple circuits. Combining the area approach and targeted-circuit approach provides a focused and efficient means of using available resources to address CEMI.

Like the CEMI Program in LTIIIP I, PECO's LTIIIP II CEMI Programs include replacing existing overhead conductors with "spacer" cable, replacing obsolete or degraded equipment (such as poles, cross-arms and lightning arresters), investment in "smart" switching equipment (e.g., reclosers) to automatically restore power, and extension of circuits closer to the pockets of increased CEMI to facilitate the construction of feeder lines from multiple substations to serve those areas.

While PECO's CEMI Programs target investment based on measures of actual substandard performance of specific areas and circuits, PECO's Aerial Infrastructure Resiliency Programs target investment using an age and condition-based assessment to replace equipment that has a higher probability of failure. The Aerial Infrastructure Programs are designed to

replace aerial infrastructure<sup>12</sup> across PECO's entire electric service area on a systematic basis in order to upgrade facilities that are the most vulnerable to failures caused by age-related degradation, normal environmental exposure, and ordinary wear and tear – factors that also increase the probability of storm-related damage. PECO will prioritize replacement of aerial infrastructure installed before 1965, which, based on the Company's analysis of age-related risk factors, represents the vintages most susceptible to rising failure rates. Like PECO's CEMI Programs, this aerial infrastructure resiliency initiative includes both an Aerial Infrastructure Resiliency Areas Program focused on specific geographic areas served by multiple circuits and an Aerial Infrastructure Resiliency Targeted Assets Program that identifies components or portions of circuits that meet the criteria for increased risk.

PECO's Circuit Rebuild/Unit Substation Retirement Program, Building Substation Retirement Program, and Substation Switchgear Replacement Program encompass property with high-risk profiles based on the impact a failure would have on PECO's distribution system. The higher impact is a function of the relatively large numbers of customers served from each substation that would experience an outage if a failure or malfunction were to occur. These programs are designed to address property that is aging, contains obsolete (and, therefore, hard to repair or replace) components, and is showing signs of degradation due to ordinary environmental exposure and routine wear and tear. Consequently, the risk profile warrants PECO taking a proactive approach to retire or replace these facilities before a high-impact failure occurs.

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<sup>12</sup> Aerial infrastructure consists of the same kinds of components replaced under PECO's CEMI Programs, such as conductors, cutouts, poles, cross-arms, and lightning arrestors.

Although PECO's LTIIIP II groups certain programs under the general description of storm hardening and resiliency, the property replacements and retirements encompassed by LTIIIP II contribute to reliability in multiple respects. Storm hardening of distribution infrastructure makes the new facilities more resistant to the effects of extreme weather. At the same time, storm-hardened replacements eliminate older components and substitute newer, stronger, and more modern plant and equipment, which will also increase reliability under "blue-sky" conditions. Similarly, replacing aging equipment that has deteriorated because of ordinary environmental exposure and routine wear and tear reduces the probability of failures under normal operating conditions while also increasing the new property's ability to withstand extreme weather. Additionally, all the work performed under PECO's LTIIIP II will include, as appropriate and necessary, the installation of reclosers and other measures to reduce outage and restoration time whether the events that precipitated the outage occur during storms or under blue-sky conditions.

As explained above, PECO's LTIIIP II includes, and expands upon, the reliability-enhancing and resiliency programs that were in LTIIIP I. Additionally, LTIIIP II reflects a further acceleration of PECO's investment over the replacement rate underlying LTIIIP I. LTIIIP I's investment levels were based on a general guideline of replacing property at a higher risk for failure over a period of approximately thirty years. PECO believes that the pace of replacement must now be accelerated further.

Since PECO filed LTIIIP I, the Company has had to address the increasing frequency and severity of extreme weather events, which PECO expects to increase considering the scientific community's consensus on the existence and significant adverse consequences of global climate change. These factors raise serious concerns about the negative effects for PECO's customers

and the economy of its service area if the replacement or retirement of at-risk property is pushed as far as thirty years into the future. The critical role of the electric system in the economy has been especially apparent during the wide-scale effort to “stay at home” during the COVID-19 pandemic.

PECO believes that the increased rate of replacement underlying its projected LTIIIP II investment is a prudent response to the known and unknown risks it faces and is essential to maintaining the level of reliability its customers expect and that is necessary for the economy of its service territory to remain healthy and continue to grow.

**C. Identification of the Types and Age of Eligible Property Included in PECO’s Electric LTIIIP II**

PECO’s LTIIIP II focuses on infrastructure improvements designed to enhance reliability by strengthening and modernizing PECO’s electric distribution system. If approved, PECO projects spending an additional \$1.36 billion on reliability improvements during the term of LTIIIP II. The projected year-by-year and total expenditures for each program in LTIIIP II are provided in the table in Appendix A. The accelerated investment totaling \$1.36 billion encompassed by LTIIIP II consists entirely of “eligible property,” as defined in Section 1351 and as described more fully below. As such, PECO’s investments made under LTIIIP II qualify for cost recovery under a DSIC.

Upgrading PECO’s distribution system with the property additions identified in LTIIIP II will enable the Company to enhance its capacity to withstand and recover from major storms, to maintain or improve its overall system reliability, and, in general, continue to provide its customers with adequate, efficient, safe, reliable, and reasonable service. To that end, PECO’s LTIIIP II will accelerate PECO’s investment in three areas of infrastructure improvement, consisting of: (1) storm hardening and resiliency; (2) replacing underground cable that is

exhibiting or is subject to a rising trend in failure rates; and (3) replacing older and degraded substation equipment, including switchgear. Additionally, investment related to government-required facility relocations is a fourth category in LTIP II, which is expressly designated as DSIC “eligible property” in Section 1351. Each of these areas of investment is discussed separately below.

### **1. Storm Hardening and Resiliency Measures**

PECO has demonstrated strong reliability performance, as measured by the indices used to assess reliability, specifically, the System Average Interruption Frequency Index (“SAIFI”), the System Average Interruption Duration Index (“SAIDI”), and the Customer Average Interruption Duration Index (“CAIDI”).<sup>13</sup> Pursuant to its electric service regulations at 52 Pa. Code §§ 57.191–57.198, the Commission has established performance standards for reliability consisting of a “Benchmark” and a “Standard,” with the Benchmark being the more rigorous of the two. As evidenced by its quarterly and annual reports to the Commission, PECO has achieved Benchmark performance in most of the years of the last decade and has achieved Standard performance on over 95% of reported reliability index values during the same period.<sup>14</sup>

Moreover, in the PUC’s most recent annual report on electric service reliability in Pennsylvania, the Commission found that “PECO has sustained CAIDI and SAIFI benchmark performance since 2006 and 2011, respectively, and is considered an excellent CAIDI and SAIFI

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<sup>13</sup> SAIFI measures the average frequency of interruptions per total number of customers. It is the number of “Interruptions” divided by “Total Number of Customers Served.” SAIDI is a measure of the average duration of service interruptions for the total number of a utility’s customers, which is the “Minutes Interrupted” divided by “Total Number of Customers Served.” As such, SAIDI is affected by the frequency as well as the duration of interruptions. CAIDI measures the average duration of service interruptions for affected customers.

<sup>14</sup> Several large storms in 2019 caused PECO’s duration-related indices of SAIDI and CAIDI to exceed the Commission’s Benchmarks and Standards.

benchmark performer.”<sup>15</sup> Specifically, in 2018 (the most recent year for which statewide data is available), PECO ranked second among large electric utilities for its twelve-month rolling CAIDI, SAIDI, and SAIFI. PECO was also the only large electric utility in Pennsylvania with reliability performance better than its baseline score prior to restructuring (i.e., 1994-1998 five-year average of annual system wide metrics) in every quarter in 2018.

The major performance indices assess a utility’s reliability over a broad range of day-to-day operating conditions. However, in accordance with the Commission’s electric service regulations, those indices exclude the effects of “major events,” as that term is defined in the Commission’s regulations.<sup>16</sup> In general, a major event affects at least ten percent of an EDC’s customers, which, in PECO’s case, puts the threshold for a major event at approximately 160,000 customers. The Commission has properly recognized that major storm events have significant impacts on electric distribution systems and, therefore, need to be considered separately from reliability performance over day-to-day operating conditions.

PECO has experienced several significant weather events in recent years. As shown in the table below, there have been twelve major events that affected PECO’s service area over the last eleven years (2010-2020):

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<sup>15</sup> Pennsylvania Public Utility Commission, *Electric Service Reliability in Pennsylvania 2018* (Oct. 2019) (“2018 Reliability Report”), p. 22, *available at*: [http://www.puc.state.pa.us/General/publications\\_reports/pdf/Electric\\_Service\\_Reliability2018.pdf](http://www.puc.state.pa.us/General/publications_reports/pdf/Electric_Service_Reliability2018.pdf).

<sup>16</sup> 52 Pa. Code § 57.192.

<b>Storm</b>	<b>Customers Affected</b>
2010 (February 10) Wind Snow Storm	186,720
2010 (June 24) Wind Lightning Storm	337,351
2011(August 27) Hurricane Irene	511,102
2011 (October 29) Snow/Rain Storm	275,710
2012 (October 29) Hurricane Sandy	845,709
2014 (February 5) Winter Storm Nika	723,681
2014 (July 3) Rain Lightning Storm	180,277
2014 (July 8) Rain Lightning Storm	236,177
2015 (June 23) Thunderstorm & High Winds	352,763
2018 (March 2) Winter Storm Riley	603,697
2018 (March 7) Winter Storm Quinn	191,272
2020 (June 3) Derecho	456,480

Significantly, the three largest storms in PECO’s history, which affected 2,173,087 customers in total, occurred in the last decade. In 2018, PECO’s service area experienced two major events, only five days apart, that affected more than 790,000 customers.<sup>17</sup> In the wake of back-to-back winter storms Quinn and Riley in 2018, PECO had to replace or repair over 240 miles of conductors and approximately 1,796 cross-arms.

PECO, along with the Commission and other utilities,<sup>18</sup> has recognized that the frequency and severity of major storm events have elevated the need for EDCs to reinforce and upgrade

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<sup>17</sup> In 2019, PECO experienced four significant storms, none of which individually met the Commission’s requirement for exclusion from the calculation of reliability performance indices (affecting 10% of customers). In the aggregate, these storms affected 394,126 customers (24% of customers), with pronounced negative impacts on PECO’s reported SAIDI and CAIDI.

<sup>18</sup> See 2018 Reliability Report (“[I]t should also be noted that Major Events had a significant negative impact on PECO customers that is not reflected in CAIDI and SAIFI performance metrics, and [in] 2018 are beginning to trend in a more negative direction.”).

their electric distribution infrastructure to better withstand extreme weather events and to improve the resiliency of their distribution system to recover from storm-related damage. That need was recognized in the design of PECO’s Commission-approved LTIIIP I. In March 2019, after Riley and Quinn, the Commission’s Bureau of Technical Services recommended that all EDCs consider storm hardening and climate adaptation as programs to be addressed in future LTIIIPs.<sup>19</sup> Accordingly, a significant portion of PECO’s LTIIIP II is dedicated to accelerating PECO’s investment in plant and equipment designed to achieve storm hardening and resiliency.

Storm hardening involves physical changes to improve or retrofit facilities to make them less susceptible to the impact of extreme weather conditions, such as damage from falling trees and branches, high wind, flooding, or wind-driven debris. Hardening can cover several measures, including installing new technology, upgrading equipment, constructing protective barriers, and increasing communications and monitoring capabilities. These measures typically require significant investments and may take years to implement on a scale that will materially improve reliability.

The United States Department of Energy has explained that resilience means “the ability to prepare for and adapt to changing conditions and withstand and recover rapidly from disruptions.”<sup>20</sup> As the 2019 Riley/Quinn Report explained, resiliency “is not just the ability for a utility to withstand impacts from storms and other significant events (e.g., physical and cyber-attacks), but also how the day-to-day operations and reliability will be impacted by the changing

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<sup>19</sup> Pennsylvania Public Utility Commission Bureau of Technical Services, *Summary Report on the Response of the Electric Distribution Companies Affected by Winter Storms Riley & Quinn* (March 2019), available at: [www.puc.pa.gov/Electric/pdf/Winter\\_Storm\\_Riley\\_Quinn\\_Report\\_2019.pdf](http://www.puc.pa.gov/Electric/pdf/Winter_Storm_Riley_Quinn_Report_2019.pdf) (“2019 Riley/Quinn Report”).

<sup>20</sup> United States Department of Energy. *North American Energy Resilience Model* (p. 7, n.9). Washington, DC (July 2019).

climate in Pennsylvania.”<sup>21</sup> When implemented, resiliency measures enhance the ability of electric facilities to continue operating despite incurring damage and promote a rapid return to normal operations if storm damage causes service interruptions to occur.

The storm hardening and resiliency components of PECO’s LTIP II consist of four initiatives for new or accelerated investment, namely, PECO’s CEMI Programs, Aerial Infrastructure Resiliency Programs, Building Substation Retirement Program, and Circuit Rebuild/Unit Substation Retirement Program. These programs are each described below.

**a. CEMI Programs**

The CEMI index tracks the number of customers that have experienced more than a specified number of interruptions in a given period. Unlike system-wide averages such as SAIFI and SAIDI, the CEMI index provides focused information on circuit-specific or location-specific customer outages. By focusing on areas where the CEMI index exceeds PECO’s CEMI benchmark criteria of four or more interruptions in a year, improvements can be specifically designed for, and targeted to, areas where customers experience a higher number of sustained interruptions relative to the overall system average.

In LTIP I, PECO identified areas for accelerated investment by grouping customers with multiple interruptions by their service transformers, assigning additional weight to those transformers with the higher frequency of interruptions, and selecting clusters of transformers for remediation. These clusters were labeled “pockets.” Additional information about the improvement in reliability experienced is provided in the table below. The data shows that PECO’s system-wide SAIFI score – a measure of the frequency of interruptions – improved by 16%. Customers that are served by specifically targeted transformers and are within CEMI

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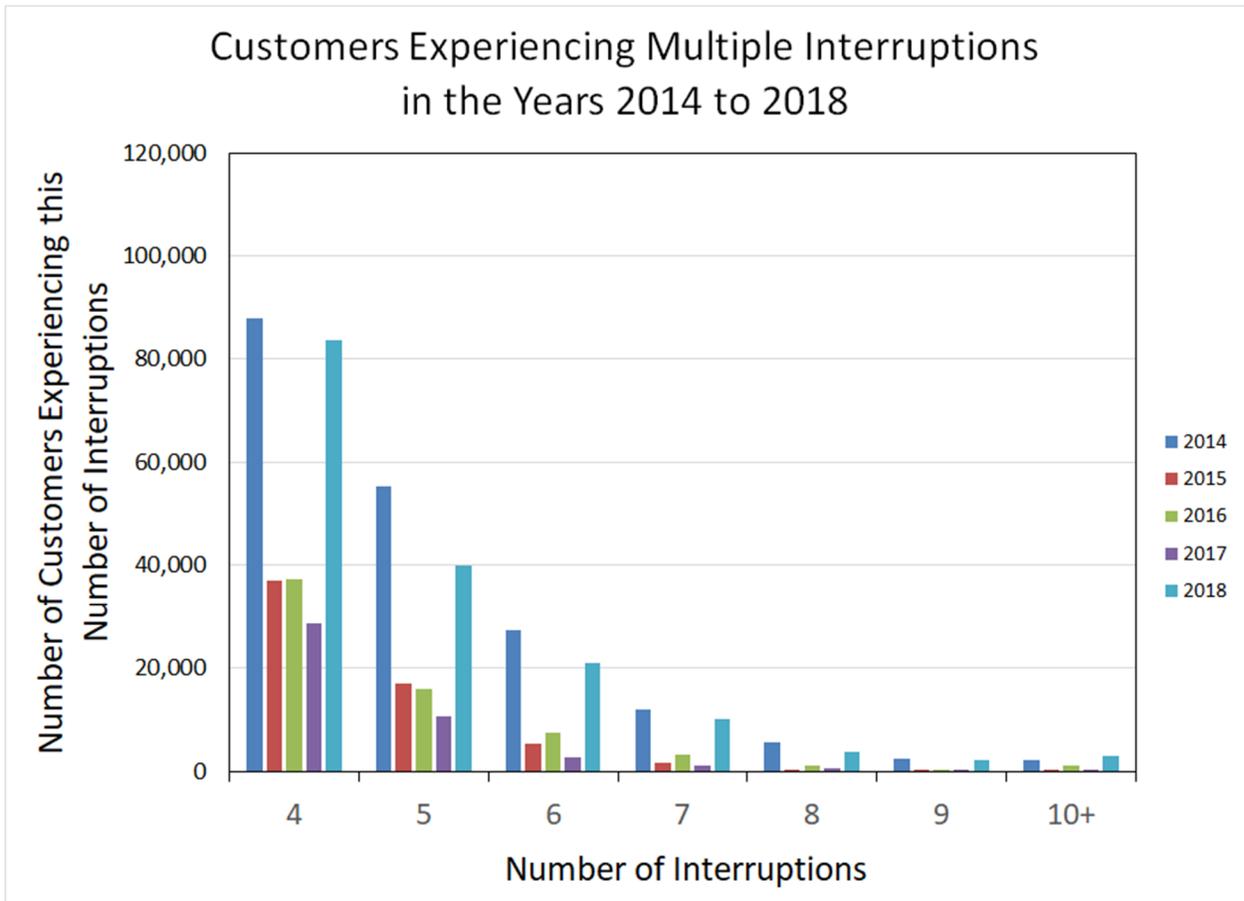
<sup>21</sup>. 2019 Riley/Quinn Report, p. 21.

pockets experienced a 41% improvement. Customers that are served by non-targeted transformers experienced an 11% improvement. Although the SAIFI score for the “targeted transformers” remains above the system average, those customers (many of whom are located in more heavily vegetated areas where trees or branches often fall onto power lines) have seen a significant improvement in interruption frequency.

<b>Group</b>	<b>Average annual All-in SAIFI (2010 – 2014)</b>	<b>Average annual All-in SAIFI (2016 – 2018)</b>	<b>SAIFI Improvement</b>	<b>Percent Improvement</b>
PECO System	1.27	1.07	0.20	16%
Transformers Not Targeted	1.10	0.97	0.12	11%
Targeted Transformers	4.43	2.62	1.81	41%

PECO’s success in delivering reliability improvements is shown in the above table, where the “All-in” designation indicates that all interruptions, including major storms, are included in the calculations. Figure 3 below shows, for 2014 through 2018, the total number of PECO customers who have experienced four or more interruptions per year and the number of customers in each interruption interval, by year. The high CEMI values in 2018, following generally improving performance from 2014 to 2017, are the result of major storm activity (e.g., Riley and Quinn), and are not indicative of the effects of the LTIP I CEMI program.

Figure 3



To put the foregoing data in perspective, for the period analyzed, only 3% of PECO’s customers have experienced four or more outages in twelve months (excluding the effects of major storms). Approximately 6% of PECO’s customers experienced four or more outages if major storms are included.

PECO’s LTIIP II builds on the progress made by LTIIP I by organizing future investment under two programs. As discussed in Section IV.C.1.a., PECO is able to move beyond the traditional utility CEMI focus on single circuits to address both single circuits and groups of circuits that serve single areas experiencing higher levels of interruption. In the *CEMI Areas Program*, PECO will focus on specific geographic areas served by multiple circuits, while the

*CEMI Targeted Circuits Program* will address single circuits that exceed PECO's benchmark criteria. Both the *CEMI Areas Program* and the *CEMI Targeted Circuits Program* will implement enhanced storm hardening and resiliency measures to combat weather and the impact of vegetation, which are the main drivers of the interruptions measured by the CEMI index.

As part of both programs, PECO will replace or upgrade poles, cross-arms, lightning arrestors, line hardware, and associated equipment that is obsolete or degraded or otherwise is not suited to withstanding more frequent and severe storms, high winds, and the impact of falling trees and limbs. In selected areas of high tree density, the Company will install new primary wires in a compact, high-strength configuration that has increased ability to withstand impacts from falling trees and limbs.

The Company will also increase its investment in "smart" switching equipment, particularly reclosers, which reduce the number of customers affected by an outage and automatically restore power to groups of customers, where possible, in less than five minutes. Installation of reclosers at appropriate intervals on a circuit makes the circuit more resilient when, for example, a tree-to-line contact occurs. Additionally, PECO will extend circuits to points closer to the pockets where reliability problems have been experienced. Doing so will facilitate the interconnection of multiple feeders to serve the targeted areas and, in that way, provide an alternative source of power to maintain service if the normal substation feed is damaged or otherwise removed from service.

Based on historical performance, the *CEMI Areas Program* and *CEMI Targeted Circuits Program* will focus on aerial facilities in Bucks, Chester, Delaware, Montgomery, and York Counties. Specific pockets targeted for remediation will be prioritized by considering the following factors: (1) historical outage patterns, outage locations, and outage causes;

- (2) continued adequacy of equipment in locations with elevated outage frequencies; and
- (3) opportunities to replace, repair, or improve existing circuits.

The Company proposes to complete 40 to 65 projects under the *CEMI Areas Program* and 15 – 20 projects through the *CEMI Targeted Circuits Program*. The effectiveness of the *CEMI Areas Program* will continue to be measured by the reduction in the frequency of interruptions for customers in the areas addressed. Interruptions will be measured for rolling 12-month periods after the project has been completed. For the *CEMI Targeted Circuits Program*, PECO will also assess the relative improvement in the frequency and duration of outages for the circuits on which LTIIIP II work is performed. PECO’s long-term goal for its CEMI programs is a 25% reduction in the frequency of interruptions for the improved areas and circuits by 2026.<sup>22</sup>

**b. Aerial Infrastructure Resiliency Programs**

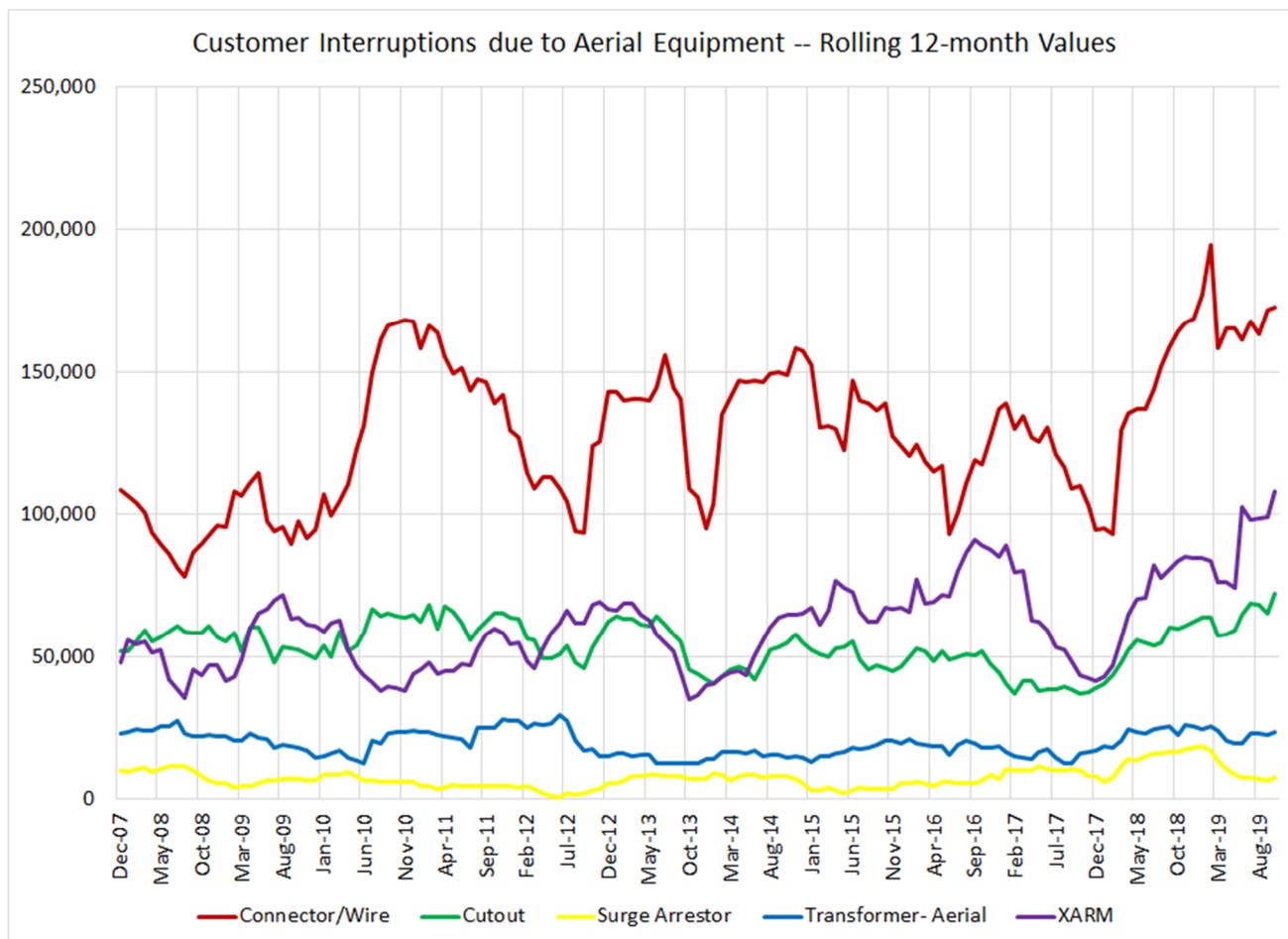
Aerial infrastructure consists of overhead conductors and the plant and equipment that support those conductors, including cross-arms, poles, insulators, connectors, and cutouts.<sup>23</sup> Aerial infrastructure is fully exposed to the elements and to vegetation that can fall on it or otherwise interfere with the operation of the distribution system. Failures of this type of equipment have been increasing over time, as shown by the data in Figure 4 below:

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<sup>22</sup> The proposed LTIIIP II spending is incremental to PECO’s projected “baseline” investment in distribution system infrastructure in the LTIIIP project categories during the 2021-2025 period. The projected LTIIIP II investments, in conjunction with baseline spending in 2021-2025, support the long-term goals outlined herein.

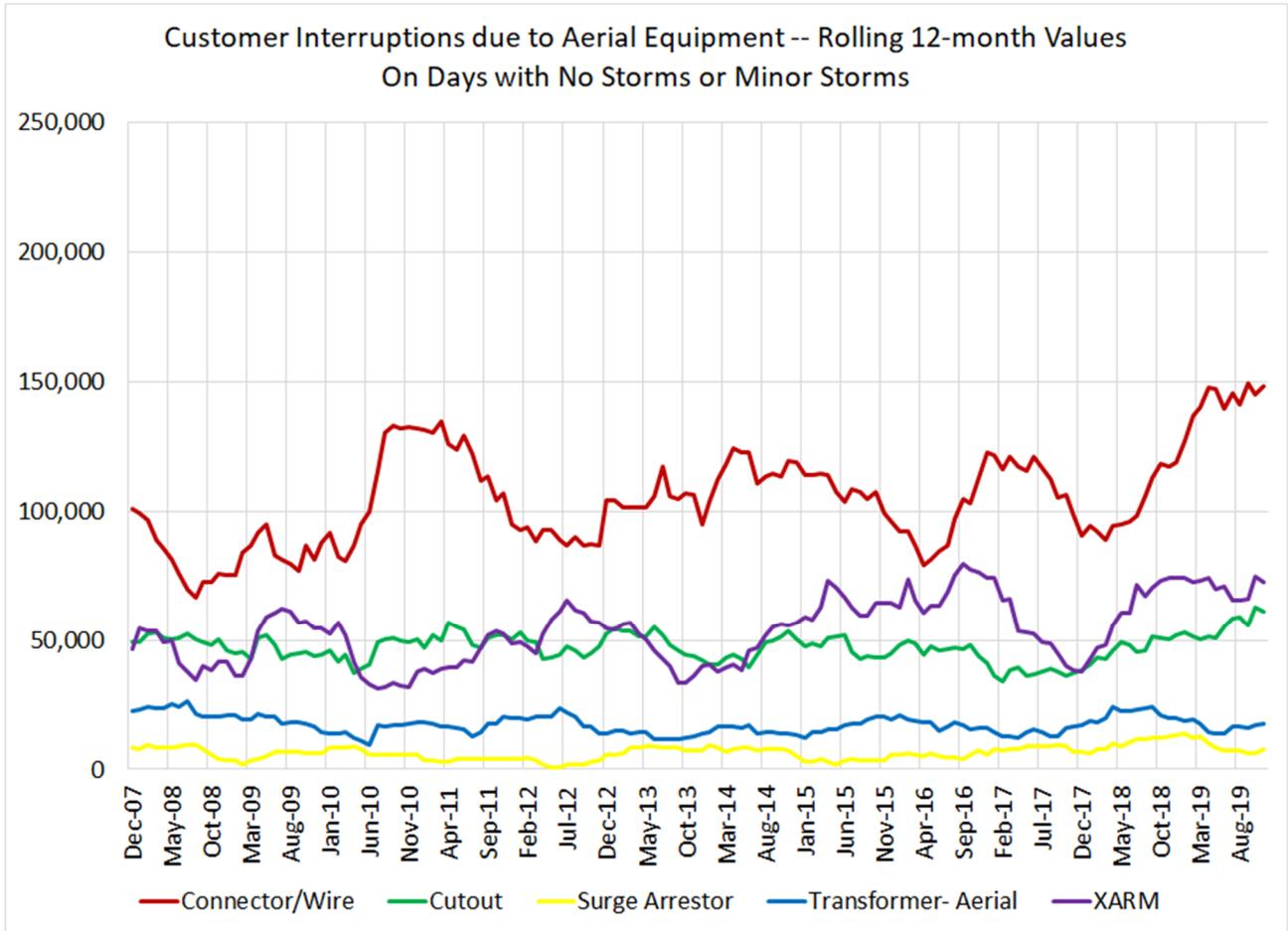
<sup>23</sup> A cutout is a combination of a fuse and switch used to protect overhead primary power feeder lines and taps from surges and overloads.

Figure 4



Notably, PECO has been experiencing a trend of increasing failure of aerial equipment even on days when the weather is not severe, as shown by the data in Figure 5:

Figure 5



In many cases, the ages of the individual pieces of equipment that contribute to customer interruptions are not known, but investigations have indicated that the equipment was likely installed 50 or more years ago when the poles that support the failed aerial infrastructure were installed. In order to address the trend of increasing failures, PECO proposes to accelerate the replacement of equipment at a higher risk of failure on a systematic basis. To that end, through its aerial infrastructure resiliency initiatives, PECO will conduct a condition-based assessment of the components installed before 1965 to prioritize replacements.

As with PECO’s CEMI programs, PECO’s aerial infrastructure resiliency initiative includes both an *Aerial Infrastructure Resiliency Areas Program* focused on specific geographic

areas served by one or more circuits and an *Aerial Infrastructure Resiliency Targeted Assets Program* that identifies individual assets or portions of circuits that meet the criteria for increased risk. Under these programs, PECO will replace aging infrastructure with equipment that is designed to withstand wind and ice loading consistent with the Grade B construction guidelines defined by the National Electric Safety Code. Equipment will be replaced with newer or more technically sophisticated models made of the most up-to-date materials. The strength of the new installations will improve reliability in normal weather conditions and provide enhanced resistance to storm-related damage.

The Company proposes to complete 10 to 25 projects under the *Aerial Infrastructure Resiliency Areas Program* and replace 28,800 to 33,800 assets through the *Aerial Infrastructure Resiliency Targeted Assets Program*. The effectiveness of the *Aerial Infrastructure Resiliency Areas Program* will be measured by the reduction in aerial equipment failures in the areas selected. The effectiveness of the *Aerial Infrastructure Resiliency Targeted Assets Program* will be measured by the reduction in aerial equipment failures on circuits where the equipment is addressed. The Company's long-term goal for these initiatives is an average of 25% improvement in aerial equipment failures for the improved areas and circuits by 2026.

**c. Building Substation Retirement Program**

This program entails the retirement and removal of building substations and the redesigning and upgrading of the distribution facilities they supply to operate at higher voltages. Building substations contain multiple transformers with typical ratings in the range of 5 to 15 MVA and supply power to down-stream facilities that serve between 5,000 and 10,000 customers. Building substations are supplied power from sub-transmission lines operating at 13kV or 34 kV. Each building substation transforms power to lower, distribution-level voltages and provides power to multiple feeders, which operate at 2.4 kV or 4 kV. The feeders are

generally overhead lines, but may be underground lines, that run along streets to supply power to distribution transformers which, in turn, further reduce the voltage to levels at which customers receive service.

All of PECO's existing building substations are aging and contain obsolete equipment. Therefore, operating and repairing building substations requires additional training since they contain equipment not used or different than the equipment used in newer substations. In addition, replacement parts are not available off-the-shelf, which requires PECO to have customized replacement parts specially fabricated in order to make permanent repairs. Obviously, that same problem makes it difficult to maintain an appropriate inventory of spare parts. Additionally, existing building substations have limited telemetry capabilities for remotely monitoring loading and equipment status, which can directly affect reliability.

Given these factors, building substations pose an increasing risk of sudden catastrophic failures that, should they occur, would interrupt service to thousands of customers. Most building substations have minimal connections to surrounding distribution facilities, which limits the Company's ability to respond if a major substation failure were to occur. A catastrophic failure of a building substation, in most cases, would require the Company to install large portable generators to restore service to the customers who normally would be supplied by the building substation. Since the areas served by these substations are mainly residential, the large generators would likely have to be installed in residential neighborhoods and remain in service for weeks until other more permanent methods of restoring service to these customers could be implemented.

In order to address the reliability risk posed by building substations, PECO will continue to incorporate into LTIIIP II a program for accelerating the retirement and removal of building

substations and redesigning and upgrading the portions of the distribution system they supply. Because building substations transform power from a higher to a lower voltage, they cannot be retired unless the down-stream portion of the distribution system they supply is upgraded to operate at a higher voltage. As a consequence of retiring the building substations and up-rating the down-stream facilities, an entire level of transformation provided by the building substations will be eliminated. This work will include replacing or up-rating the transformers down-stream from the building substations to transform the higher voltage supplied to those transformers to the same voltage currently supplied to customers. Moreover, the circuits supplying the up-rated transformers will be equipped with modern telemetry, which provides the Company with important information on system conditions that can improve its response if outages or power quality issues arise.

Additionally, the Company will use the opportunity provided by the system redesign and voltage up-rating to upgrade the distribution facilities supplied by the building substations to current construction standards where it is necessary to do so or where upgrading can be done cost-effectively as part of this project. These enhancements will be like those described in connection with the downstream facility improvements for the *Circuit Rebuild/Unit Substation Retirement Program*. Also, increasing the voltage of feeder lines that currently emanate from existing building substations will make it possible to integrate those feeders with other, nearby existing facilities of more current vintage that already operate at a higher (13 kV) voltage. That integration will help improve reliability by creating alternative paths to supply power to distribution transformers in the event an outage occurs on the lines that normally feed those transformers.

Under LTIIIP I, PECO accelerated the retirement of its building substations beginning in 2019 by initiating the design of upgraded facilities required to retire one additional building substation. The design work will continue through 2020, when PECO will start constructing the downstream facilities required to retire that substation. In 2020, PECO also plans to start designing a project to retire a second building substation. Based on the retirement rate under LTIIIP I, the Company would retire all building substations within 25 to 30 years. During LTIIIP II, the Company plans to complete the retirement of the two building substation projects it started during the term of LTIIIP I to facilitate PECO’s long-term goal of retiring all building substations in the next 20 to 25 years.

Building substation retirement projects are generally large, costly, complex, and take multiple years to design and complete. Therefore, the Company will prioritize these retirements based on appropriate consideration of the existing condition of the substations, the number of customers served, the load supplied, and the risk of failure.

**d. Circuit Rebuild/Unit Substation Retirement Program**

PECO forecasts that 743 unit substations will be in service at the end of 2020 at various locations throughout its six-county service territory, as shown, by county, in the table below:

<b>Location (by County)</b>	<b>Number of Unit Substations</b>
Bucks	174
Chester	162
Delaware	108
Montgomery	186
Philadelphia	103
York	10
Total	743

Each unit substation contains a single transformer operating within a range of 1 to 5 MVA and is supplied power from sub-transmission lines at voltages of either 13 kV or 34 kV. These substations transform power to lower, distribution-level voltages in order to supply power to a single “feeder” that operates at 2.4 kV, 4 kV, or 13 kV. Feeder lines are generally overhead lines, but may be underground lines, that run along streets to supply power to distribution transformers located on or near customers’ premises that further reduce voltage to levels at which secondary voltage customers receive service. Since each unit substation supplies a feeder that, in turn, supplies multiple customers, a unit substation failure can interrupt service to as many as 1,000 customers.

Many unit substations contain obsolete equipment that is difficult or costly to replace and are experiencing an increasing rate of failure with high customer impact. Since unit substations transform power from a higher to a lower voltage, a unit substation cannot be retired unless the portion of the distribution system down-stream from the substation is upgraded to operate at a higher voltage level.

Upgrading the distribution facilities supplied by the units to the operating voltage of the surrounding higher voltage feeders increases operating flexibility by providing additional load-transfer options. This improves the ability to respond to outages, particularly major storms, by providing alternate sources and paths that can be used to reroute power to customers who were interrupted for any reason or to perform routine maintenance. Additionally, voltage up-rating will also increase the ability of those feeders to handle the interconnection of additional customer-owned solar facilities. In short, portions of the overall distribution system can be

improved and made more reliable if unit substations are retired and necessary and appropriate upgrades are made to down-stream facilities.

In addition to enhancing distribution system capabilities and resiliency, retiring unit substations eliminates costs currently incurred to operate and maintain those substations. Without retirement, new units will have to be purchased and installed to replace aging units as those units fail, instead of using those funds to upgrade the down-stream facilities.

Before it implemented LTIIIP I, PECO was retiring only a few unit substations per year. During the first four years of LTIIIP I, PECO forecasted and retired 17 unit substations and plans to retire six additional units in the final year of LTIIIP I, for a total of 23 units. Even at the rate of six units per year, it would require over 100 years to retire all unit substations.

In LTIIIP II, PECO proposes to continue its *Circuit Rebuild/Unit Substation Retirement Program*. PECO will increase the retirement rate by an additional two to four unit substations each year for a total of 37 to 48 unit substations during LTIIIP II, which will accelerate the timeline for retirement of all unit substations from 100 years to approximately 30 years. As part of this program, PECO will upgrade the associated downstream facilities and convert those facilities to operate at higher voltages. The specific unit substations selected for retirement will be prioritized on the basis of their susceptibility to storm damage (for example, if they are located in a flood plain), the need to obtain spare equipment that is not readily available, capacity constraints, the number of customers served, and equipment obsolescence, or upon other considerations that may be location- or unit-specific.

Because unit substation retirements require an upgrade of down-stream facilities, this program will deploy similar measures described in PECO's CEMI, Aerial Infrastructure Resiliency, and URD Cable Replacement Programs to strengthen down-stream facilities to

current standards to withstand storms and to improve resiliency if any damage is incurred.

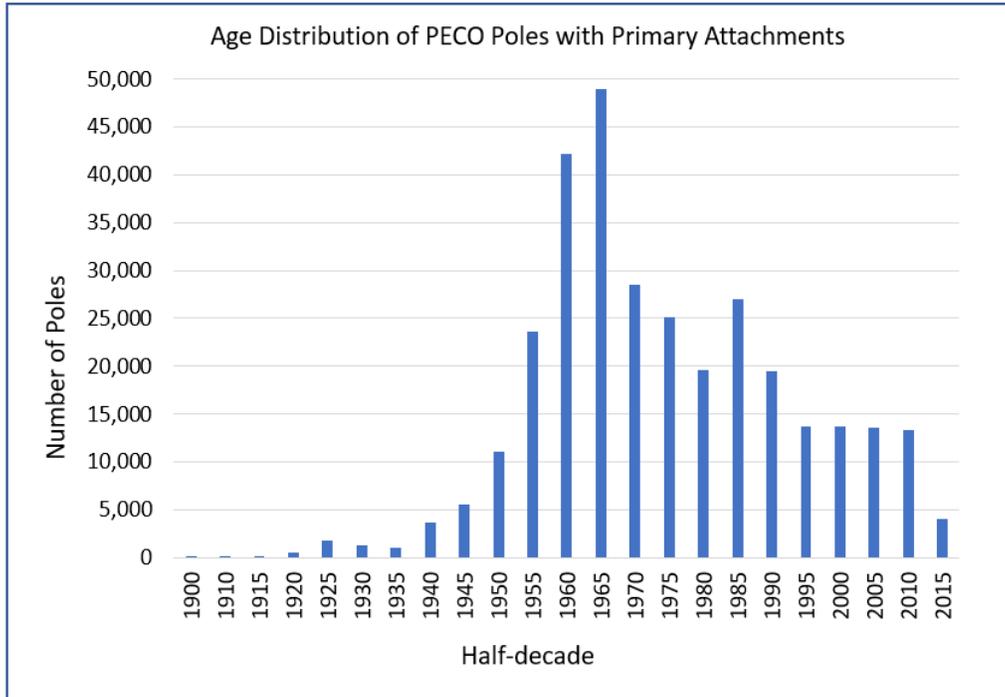
Completing all planned upgrades in an area as part of the same project is a more efficient and cost-effective way of performing these upgrades.

**e. Age and Type of Eligible Property for Storm Hardening and Resiliency**

**CEMI Areas and Targeted Circuits Program.** The plant and equipment in the areas that are the focus of this program consist of the full range of distribution property, including poles, cross-arms, conductors, switches, fuses, transformers, and a variety of associated equipment, in varying amounts and configurations. It is not possible to determine the ages of the specific equipment being replaced in these programs. Moreover, any replacement or upgrade of distribution plant and equipment in a particular location will be based on a determination that the equipment is obsolete, degraded, or not suitable to withstanding more frequent and more severe storms. In short, the determination of the plant to be replaced is not strictly, or primarily, a function of the age of that property but, instead, is dependent upon the various factors discussed in subsection a. above.

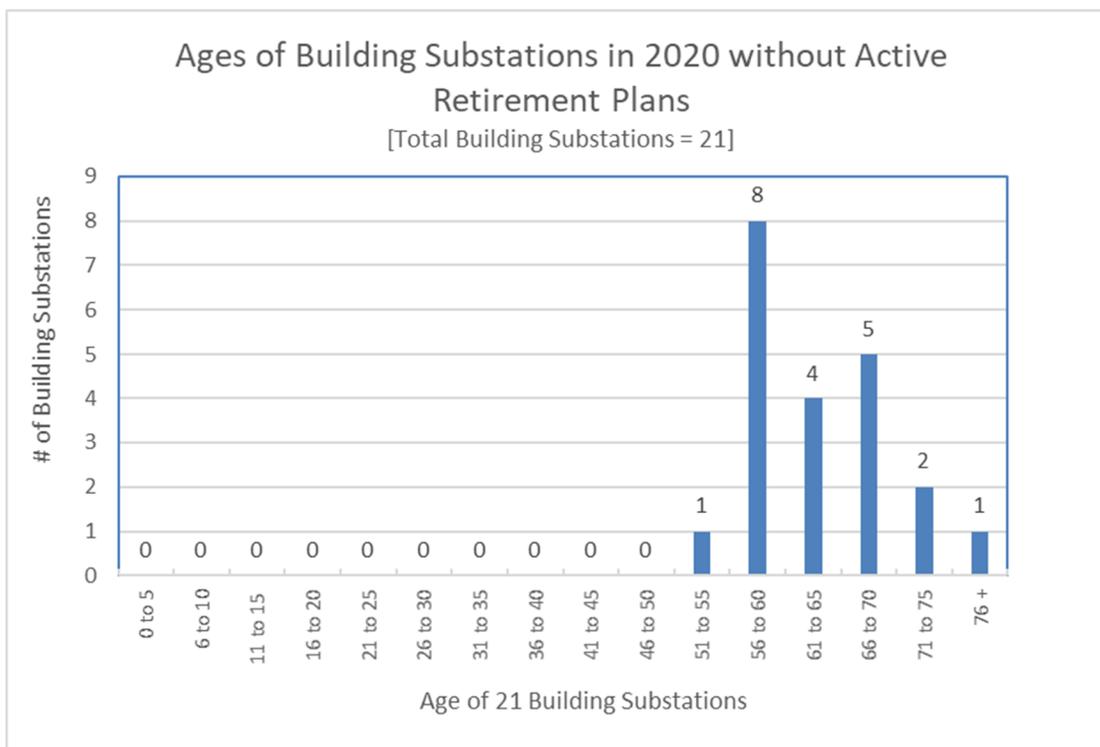
**Aerial Infrastructure Resiliency Areas and Targeted Assets Programs.** As illustrated in Figure 6 below, PECO has approximately 91,000 poles with primary wires attached that were installed more than 55 years ago (before 1965). PECO will concentrate its replacement of aerial components in geographical areas with high equipment failure rates causing service interruptions and on poles near this age category.

Figure 6



**Building Substation Retirement Program.** Of the 27 building substations presently in service, five have retirement plans in progress. Under LTIIP I, PECO accelerated the retirement of its building substations by initiating the design of upgraded facilities required to retire two additional building substations. Sixteen of the building substations without active or proposed retirement plans are located at various sites within the City of Philadelphia. The five remaining building substations are in Delaware (three) and Montgomery (two) Counties.

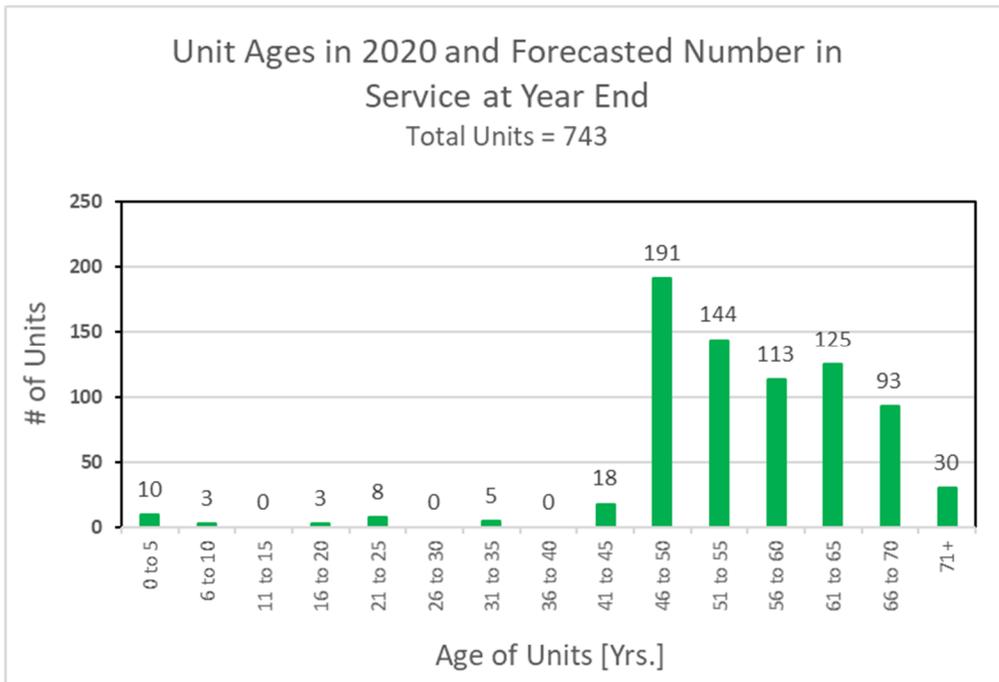
Figure 7



As shown in Figure 7 above, all 21 of the building substations without current or proposed retirement plans are more than 50 years old, and one is more than 75 years old.

**Circuit Rebuild/Unit Substation Retirement Program.** Of the Company's 743 unit substations, 696 are 45 years or older. The following graph shows the distribution of the ages of these unit substations.

Figure 8



As shown in Figure 8 above, most of these substations are presently over 45 years old.

## 2. Underground Cable Replacement

PECO owns and operates approximately 16,710 conductor miles of medium-voltage underground distribution cable throughout its service territory. Underground distribution cable is broadly divided between main stem cable<sup>24</sup> and URD cable. The characteristics of each category of underground distribution cable are discussed further in subsequent subsections.

Underground distribution cable is less susceptible to outages than aerial lines. While underground cable experiences fewer outages than aerial conductors, when outages occur, they can have a much longer duration because of the logistical difficulty in locating and repairing faults in underground facilities. Customers are often without service for a few to several hours

<sup>24</sup> In certain cases, main stem cable that is underground can continue aerially on poles.

after URD cable failures, especially those in developments constructed before the adoption of the current design standard of looped supplies.<sup>25</sup> While the Company may be able to restore service faster following a main stem cable failure on which switches to alternate supplies are typically installed compared to a URD cable failure, a larger number of customers or critical facilities (e.g., hospitals) are typically affected by interruptions to a main stem cable.

Over the first three years of LTIIIP I, PECO realized significant improvements in failure rates due to the Company's increased investment in underground cable replacement. Specifically, on the circuits where PECO replaced sections of URD cable, those investments reduced the annual URD cable failures per mile by 92%. And on the circuits where PECO replaced portions of main stem cable, annual cable failures were reduced by 63%, with no failures observed on the sections of main stem cable the Company replaced.

However, maintaining system reliability is not a "once and done" exercise. The factors that degrade plant and equipment and, in that way, adversely affect reliability are on-going. For that reason, it is important to carefully assess trends in equipment failure rates and take appropriate action to prevent or reverse negative trends before reliability problems are experienced. LTIIIP I's investment levels were based on a general guideline of replacing cable at a higher risk for failure over a period of approximately thirty years. Based on an increase in underground cable failures discussed below, PECO has determined that the pace of replacement should be accelerated further to 10-15 years to preserve overall reliability performance. The accelerated LTIIIP II investment in PECO's existing *Main Stem Cable Replacement Program* and

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<sup>25</sup> A URD looped supply to a development allows service to be restored to all customers quickly by arranging the cable supply to transformers in a continuous loop fed from two directions. In the event of a cable failure, the failed cable can be removed from service, and all transformers returned to supply using the other cables in the loop. In addition to reducing the average time to restore service, the looped supply eliminates the need to install a temporary cable to bypass a failed cable.

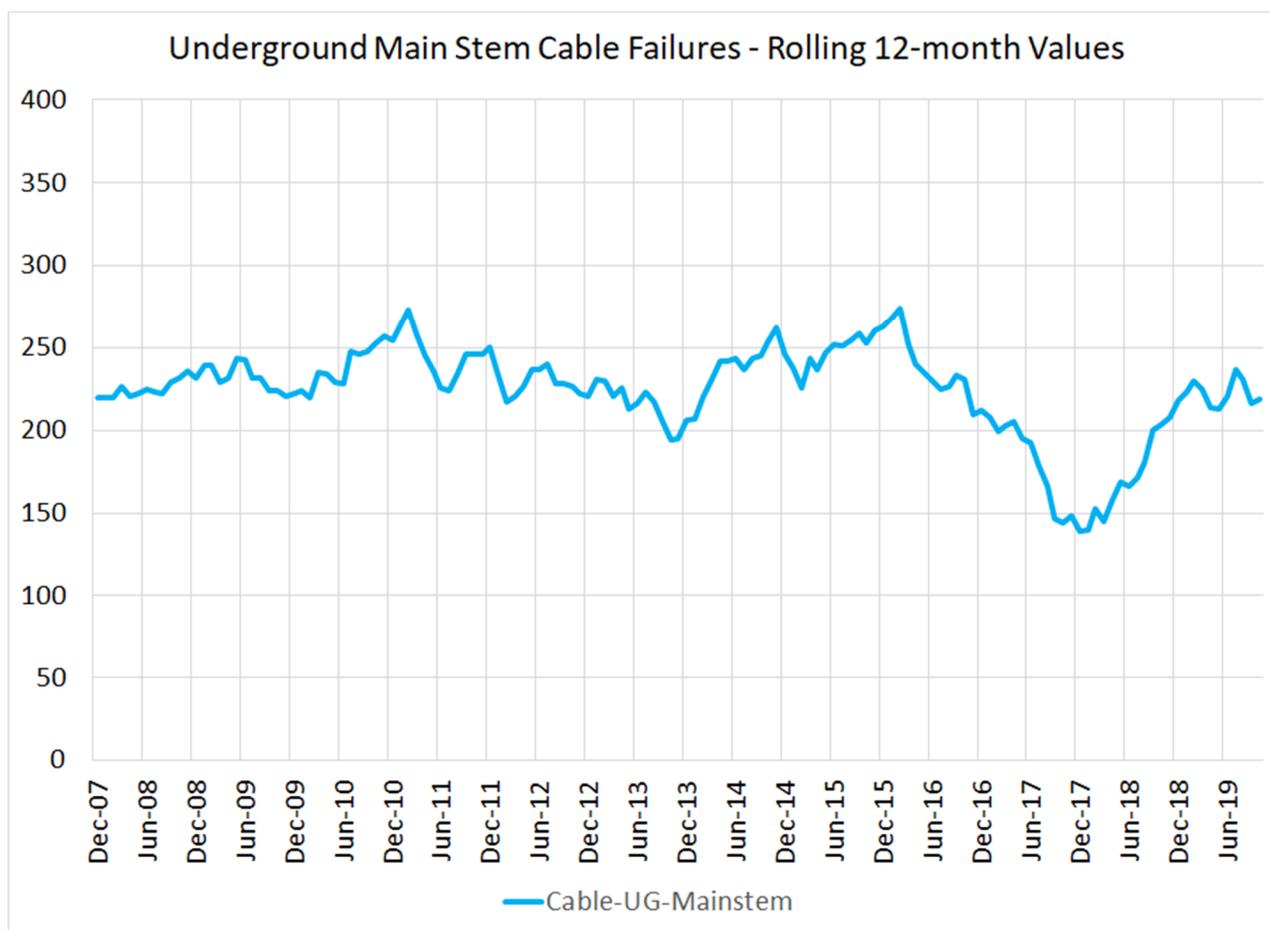
*URD Cable Replacement Program* also should reduce the cost of repairing underground distribution cables and allow PECO to more effectively manage its workflow considering the significant resources that must be re-prioritized to repair underground distribution cable when cable failures occur.

**a. Main Stem Cable Replacement Program**

Main stem cable is generally installed in industrial and densely populated areas (such as urban areas) and near substations. It operates at medium voltage and can be utilized underground in conduits and in ducts with manholes or aerially on poles. Main stem cable supplies power from substations to customers located in urban areas supplied by underground facilities and to most aerial circuits on the distribution system.

As shown in Figure 9 below, PECO experienced a growth in main stem cable faults between 2006 and 2014, leading to the Company's decision to implement its current underground cable replacement programs. While these programs successfully slowed negative trends in main stem cable failure rates in 2016 and 2017, failure rates began to rise again in 2018 and 2019, indicating that further acceleration of main stem cable replacement is needed to address aging infrastructure and ensure system reliability.

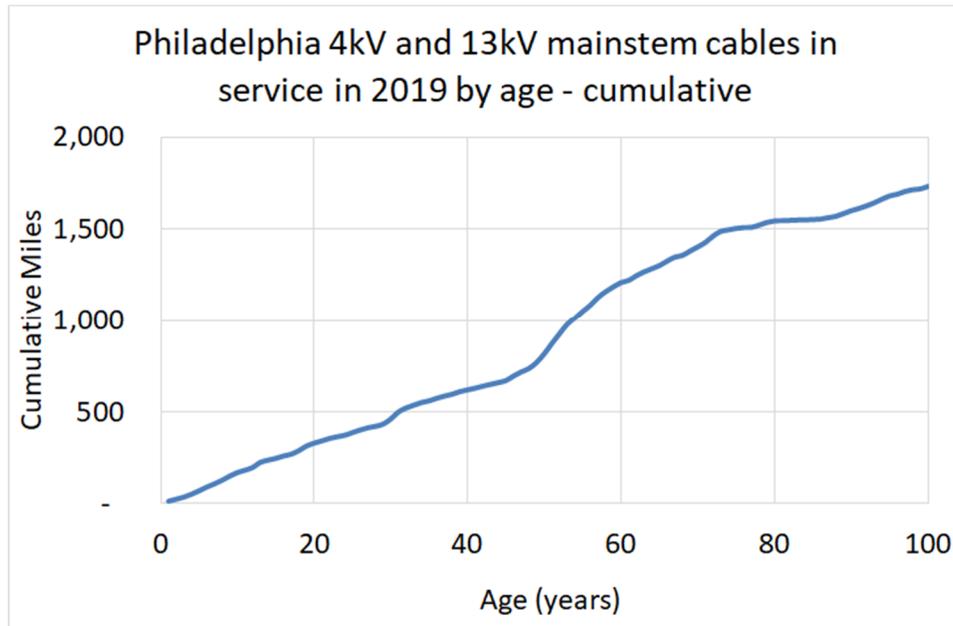
Figure 9



Although the types of main stem cable installed have varied over time, PECO currently has some cable in service that was installed in the early 1900s. The ages of PECO’s main stem cable within the City of Philadelphia, where most of main stem cable exists, are set forth in Figure 10 below. Of the 1,731 total miles shown in this figure, 1,073 miles, or 62% of the total, are 45 years of age or older. However, age alone is not an indicator of imminent failures. While main stem cable failures have not shown a large rise overall, PECO has observed elevated failure rates in two types of cable; specifically, several vintages of paper-insulated lead covered (“PILC”), along with its associated splices, and cross-linked polyethylene installed before 1985. This vintage of cross-linked polyethylene is known within the industry to have high failure rates

relative to other cable groups.<sup>26</sup> Accelerated replacement of cable of these types, and of other selected sections of cable with higher than average failure rates will protect against such failures and the associated emergency repair costs and reliability impacts.

Figure 10



The *Main Stem Cable Replacement Program* will address failures of those facilities that will impact a large number of customers and customers with critical or high-demand needs, such as hospitals, major transportation hubs, industrial customers, and high-rise buildings. The accelerated level of investment provided for in LTIIIP II will reduce the risk of such failures. Additionally, the replacement of main stem cable should improve overall system reliability by increasing the Company’s flexibility to switch the circuits serving load in a particular area so that service can be maintained even if one of the circuits serving that load were to fail.

At the accelerated rate of investment reflected in PECO’s LTIIIP II, the Company plans to replace an additional approximately 41 miles of main stem cable on average per year or within

<sup>26</sup> T. A. Short, *Electric Power Distribution Handbook* (New York, CRC Press, 2004), p. 118.

182-227 miles over the term of LTIIIP II. At this level of investment, PECO expects to replace the targeted main stem cable within ten to fifteen years instead of the thirty-year replacement timeframe underlying LTIIIP I. Cables that have experienced multiple failures or are of a type and vintage that are expected to have higher rates of failure will be replaced first, as in LTIIIP I. Replacements will be further prioritized based upon the presence of high-priority dual service customers (e.g. hospitals) and failure trends on similar types of cable. Given the nature of main stem cable and its typical applications, a large part of PECO's accelerated spending will occur in the City of Philadelphia.

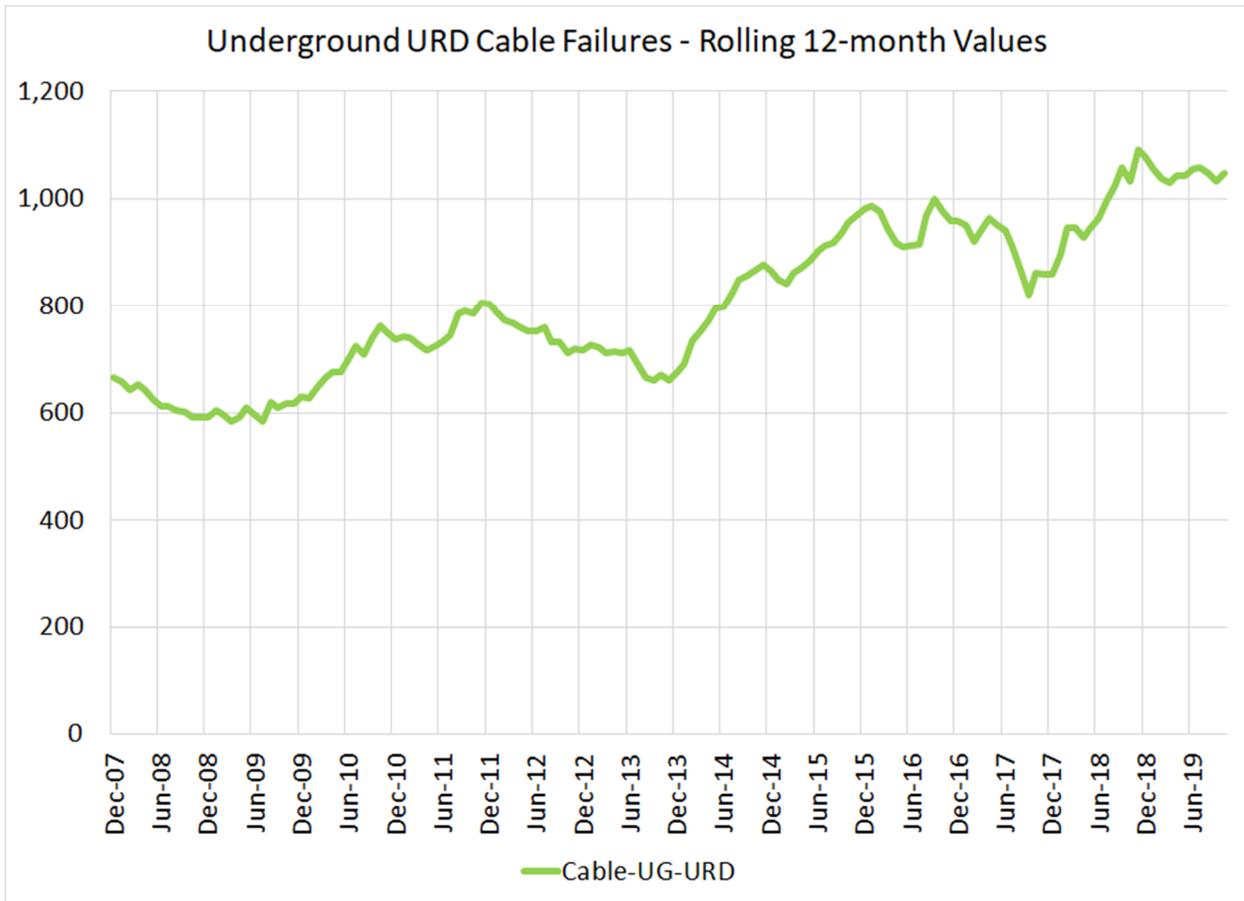
The success of this program will continue to be based on a reduction in annual main stem cable failures per mile of cable replaced on the circuits where the replacements occur. PECO's long-term goal is to replace and upgrade targeted main stem cable within 10 to 15 years.

**b. URD Cable Replacement Program**

URD cable is normally installed by direct burial in underground trenches without running the cable through ducts and manholes. Direct-buried cable is the primary construction method used in residential developments and to serve some small commercial and small industrial establishments. Developments served with URD cable may be fed either from a single source (radial) or from two separate sources (looped), with an open point in the middle that separates the supplies but allows for switching flexibility.

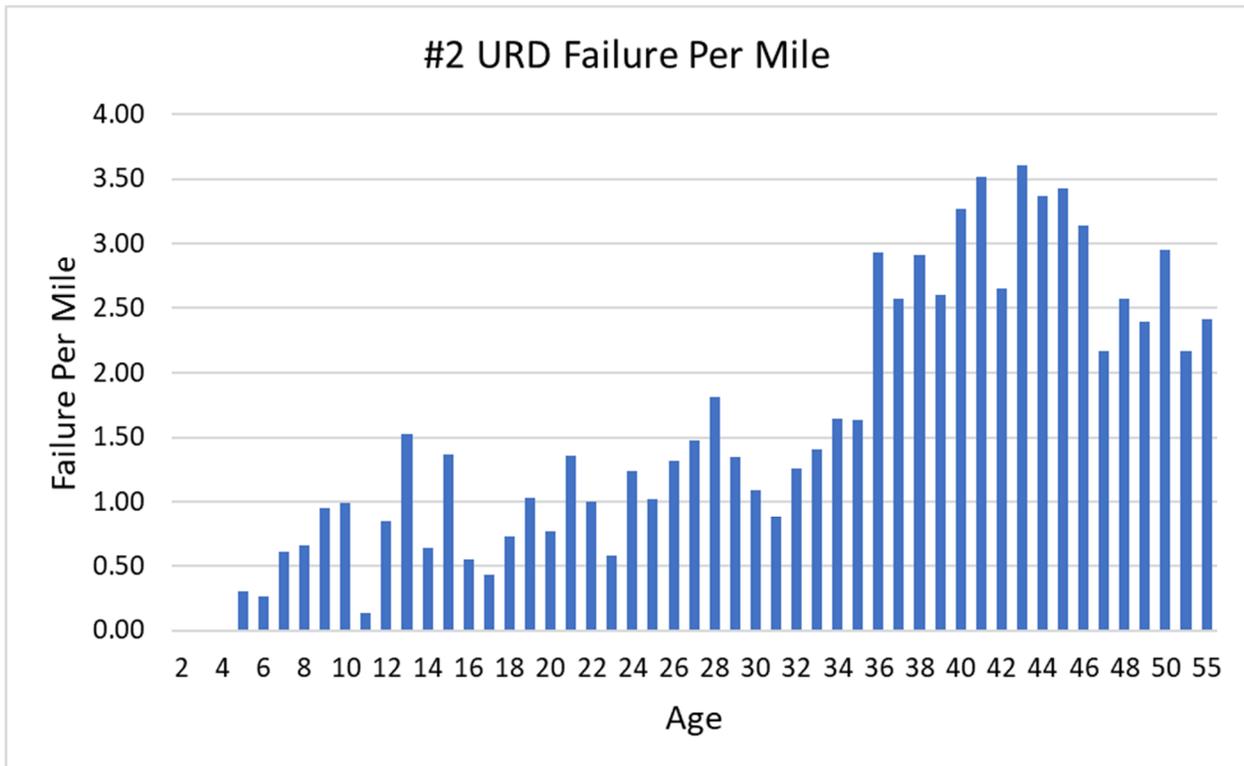
Since 2010, PECO has experienced a rising trend in URD failures, as shown in Figure 11 below, which graphs the actual fault data. While PECO's current level of investment in URD cable replacements has reduced failure rates on circuits where those replacements occurred, failures of older URD cable remaining on PECO's distribution system continue to rise.

Figure 11



URD cable installed prior to 1985 has a failure rate that is higher than other URD cable, as shown in Figure 12 below, which displays the failure rate per mile of URD cable grouped by vintage. A distinct increase in failure rates is apparent for URD cable manufactured more than 35 years ago, which corresponds to cable installed prior to 1985.

Figure 12



Interruptions caused by the failure of a radial URD cable installation are significant because it takes a considerable length of the time, after the failure occurs, to locate, excavate for, and repair the URD fault(s) that caused the interruption. Therefore, accelerated URD replacement will have an important positive impact on the duration of service interruptions experienced by customers served by radial URD cable installations. Because of the nature of URD cable and its application principally in residential developments, the accelerated investment will be made mostly in suburban areas where such developments are located. Accordingly, PECO estimates that its spending will be split evenly between Bucks/Montgomery and Delaware/Chester Counties.

PECO will focus on the replacement of URD cable that was installed prior to 1985, which PECO currently estimates is approximately 2,500 miles of URD cable. In 2018, the Company refined its estimate of pre-1985 vintage URD cable reflected in LTIP I (1,420 miles)

using advanced data analytics to associate publicly available information on ages of homes with updated data on cable locations derived from PECO's geographic information system. At the accelerated rate of investment reflected in PECO's LTIP II, the Company plans to replace approximately 154 miles of URD cable per year or a total of 725-820 additional miles over the five-year term, which will allow PECO to replace all its targeted URD cable within ten years. To reduce the duration of interruption to those customers fed from the radial URD installations, PECO will also focus on looping these installations to bring them into compliance with current design standards.

The effectiveness of this program will continue to be based on a reduction in annual URD cable failures per mile of cable replaced on the circuits where the replacements occur. The Company's long-term goal is to replace and upgrade targeted URD cable within 10 to 15 years.

**c. Age and Type of Eligible Property for Underground Cable Replacement**

**Main Stem Cable Replacement Program.** PECO began installing main stem cable in the early 1900s, mainly in Philadelphia, to electrically serve the city. Main stem cable is also utilized across the system as a means for power to exit a distribution substation. The target of the *Main Stem Cable Replacement Program* will be to replace cross-linked polyethylene cable ("CLPE"), manufactured prior to 1985, paper and lead cable, as well as other cable that has historically experienced a higher failure rate.

**URD Cable Replacement Program.** PECO began installing URD cable in the 1960s, principally to expand its distribution capacity in order to serve new residential developments. The focus of the *URD Cable Replacement Program* will be URD cable that was installed before 1985 and in developments with radial supplies.

### **3. Substation Switchgear Replacement**

PECO owns and operates many substations that transform power from transmission and sub-transmission voltages to distribution-level voltages (34 kV, 13 kV, 4 kV, or 2.4 kV). Many of these substations contain “switchgear,” which consists of the components necessary to separate the power supplied by substation transformers into individual “feeder” lines in order to provide power to PECO’s distribution system. The feeder lines generally leave the substation underground and once outside the fence that defines the perimeter of the substation property, they may continue underground but, generally, transition to overhead lines. In either case, the feeder lines run along streets to supply power to distribution transformers located on or near customers’ premises that further reduce voltage to levels at which secondary-voltage customers receive service. The feeder lines also supply customers who are served at distribution voltage levels and own their own transformers to reduce the voltage to secondary voltage levels.

Switchgear includes the equipment necessary to route the power supplied by a transformer through metal conductors, called a “bus,”<sup>27</sup> to which circuit breakers are attached. The circuit breakers supply individual feeder lines. The switchgear also includes the protective and monitoring equipment that is necessary to detect and isolate faults, via the circuit breakers, that may occur inside or outside of the substation. The protective equipment is designed to de-energize the least amount of equipment necessary to protect the integrity of the Company’s distribution facilities and, in that way, minimize the number of customers that may lose power when a failure occurs either inside or outside the substation. The main components of the switchgear are multiple metal conductors that, collectively, form a bus; protective relaying devices; current and voltage transformers, which provide power and vital information to the

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<sup>27.</sup> A “bus” is group of conductor bars that serve as a common connection for two or more circuits.

protective relaying devices; and circuit breakers, which are used as isolation points between transformers, busses, and feeder lines. The switchgear and its auxiliary components are located inside the substation fence.

Depending on the size and configuration of a substation, one or more transformers are used to feed one or more busses. Several busses can be linked together through circuit breakers so that if one transformer, bus, or breaker fails, most, if not all, customers may continue to be fed from the other busses and transformers. Breakers are also used to tap a bus in order to supply the separate feeder lines that distribute power from the substation to the distribution system. Each substation generally has two or three busses, and each bus typically has between two and eight feeder breakers, as well as other breakers that can disconnect or isolate the transformers from the bus or disconnect or isolate the busses from each other. Since busses supply multiple feeders, the failure of any switchgear component in a bus may interrupt service to more than 10,000 customers.

PECO's electric distribution system currently contains 430 distribution busses at 109 power substations. Of these, there is a subset of metal-enclosed switchgear busses of a specific design that are experiencing failures due to ordinary environmental exposure and routine wear and tear. This subset consists of "outdoor metal-clad" switchgear and there are 110 of this type of switchgear busses on the PECO system.

Over time, the outdoor metal-clad switchgear housing becomes compromised due to environmental conditions, such as moisture-induced corrosion of outer metal coverings, metal floors and support structures, or due to degradation caused by normal wear and tear (such as crumbling foundations, deformed metal, and wire insulation breakdown). As the metal housing deteriorates, the probability increases that the switchgear will fail or that the protective relaying

will not operate correctly. Such failures and malfunctions may cause more equipment to be de-energized than is necessary to properly protect the distribution system and, as a result, trigger outages that otherwise would not occur and increase the number of customers affected.

The majority of PECO's outdoor metal-clad switchgear was constructed 50 or more years ago and contains obsolete equipment. As a result, parts are not readily available, which makes repairs and replacements difficult. Some of PECO's outdoor metal-clad switchgear has begun to experience an increased failure rate. While switchgear-related failures do not currently have a major impact on PECO's overall reliability metrics, the high customer impact that such failures may create warrants proactively addressing the condition issues of deterioration and obsolete switchgear. Additionally, many outdoor metal-clad switchgear installations have electro-mechanical relay protection and associated control schemes that limit PECO's ability to upgrade those locations to digital protection systems (which is the current industry standard) and do not readily accommodate remote monitoring of loading and equipment status.

PECO currently replaces the outdoor metal-clad switchgear when failure trends show a marked increase. Given the factors outlined above, PECO's outdoor metal-clad switchgear poses an increasing risk of failures and malfunctions that, should they occur, would interrupt service to many customers. To address this potential reliability risk, the Company will begin proactively replacing additional targeted switchgear in 2021 pursuant to LTIP II. Switchgear locations will be prioritized for replacement based on PECO's assessment of their risk of failure, which will consider, among other factors, age, existing condition, number of customers served, and amount of the load served. Additionally, as part of its switchgear replacement program, the Company may replace other associated equipment, such as reactors and transformers, as necessary, and

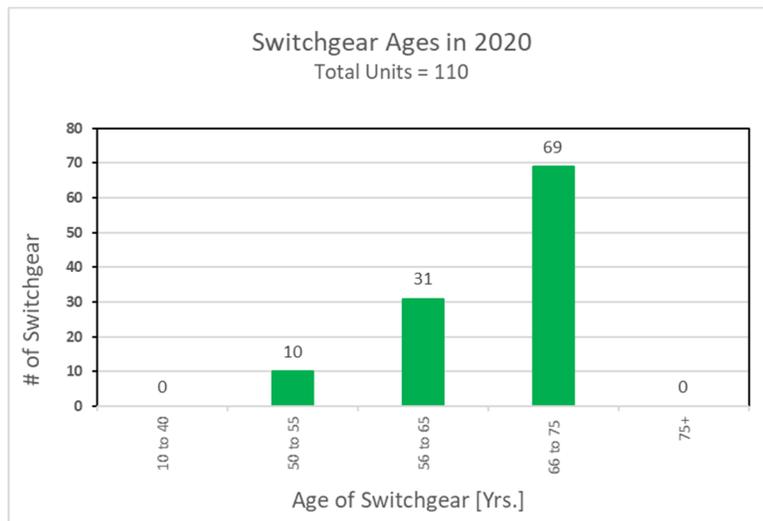
will construct the replacement facilities to meet current construction standards. During LTIIP II, the Company will replace 2 to 3 switchgear units.

The effectiveness of this program will be measured by a reduction in emergent repairs and preventing an increase in the number of distribution outages related to the failure or malfunctioning of targeted metal-clad switchgear components replaced (e.g., busses, current transformers, potential transformers, and breakers). The long-term goal of this program is to proactively replace and upgrade all outdoor metal-clad switchgear in the next 30 to 40 years.

**a. Age and Type of Eligible Property for Switchgear Replacement**

The target of the *Switchgear Cable Replacement Program* will be to replace outdoor metal-clad property, as well as other switchgear or associated property that has historically been a poor reliability performer. Of PECO’s existing 110 outdoor switchgear busses, 79 are located at various sites within the City of Philadelphia. The 31 remaining outdoor switchgear are located in Bucks (5), Delaware (20), and Montgomery (6) Counties. As shown in Figure 13 below, the age distribution of all 110 of PECO’s outdoor metal-clad switchgear is between 52 and 73 years, and 69 are more than 66 years old.

Figure 13



#### 4. Facility Relocations

The eligible property, type of work, and schedules comprising facility relocation projects are driven by the construction plans of PennDOT, the Pennsylvania Turnpike Commission, and local municipalities. Normally, these projects require PECO to move its facilities as part of road or bridge projects undertaken by a government entity. Parties requesting relocation do not pay for all of PECO's relocation work. Therefore, PECO has included an estimate of its unreimbursed costs for such work in LTIIIP II. In LTIIIP I, PECO projected unreimbursed facility relocations averaging \$10 million per year. During the five years ended December 31, 2019, PECO's actual expenditures for facility relocations averaged \$12.84 million per year net of reimbursements, as shown in the table below.

PECO Facility Relocation Spend (\$ in million)	2015	2016	2017	2018	2019	5 year average
Facility Relocate Expenditures	\$ 4.89	\$ 15.05	\$ 13.90	\$ 13.19	\$ 17.15	\$ 12.84

Major road and bridge projects initiated between 2016 and 2019 will continue during the term of LTIIIP II.<sup>28</sup> Therefore, PECO has increased its projected expenditures for facility relocations during the LTIIIP II term to \$15 million per year.

#### D. Initial Schedule for The Planned Repair and Replacement of Eligible Property

The schedule of expenditures for each LTIIIP II program is provided in the applicable table in Appendix A. This is a preliminary schedule, which is subject to revision based on near-term changes in any of the material conditions or assumptions underlying PECO's LTIIIP II work plans.

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<sup>28</sup> These projects include reconstruction of the Route 202 corridor, Interstate 95 and Route 1, in Bucks County, and the rebuilding of the Chestnut Street Bridge, in Philadelphia.

**E. Location of Eligible Property**

PECO provides electric service within its authorized service territory in Bucks, Chester, Delaware, York, and Montgomery Counties and the City of Philadelphia. All the facilities identified in PECO's LTIIIP II are located throughout its service territory and were selected for replacement based on criteria discussed in other sections of this document.

**F. Estimate of The Quantity of Eligible Property to Be Improved**

Estimates of the quantity of eligible property to be repaired or replaced have been provided in Appendix A and have been discussed in Section IV.C., above. Accordingly, those elements of PECO's LTIIIP II are incorporated by reference in this section and described more fully in the tables below.

If the COVID-19 pandemic shutdown continues for an extended period, the associated disruption of business operations of manufacturers of distribution equipment could compromise the manufacturing and delivery supply chain for materials needed to complete PECO's capital improvement projects. For example, PECO may experience delays or shortages in material supplies for switchgear equipment for a year or more due to the COVID-19 global supply chain impacts. Depending on the extent and the duration of the plant shutdowns and supply chain disruption in response to the COVID-19 pandemic, PECO's LTIIIP II work plans may be impacted.

PECO's expenditures to complete highway relocation projects are the net of total expenditures minus the project sponsor's reimbursements and are estimated to average approximately \$15 million per year. As noted previously, completion dates and amounts are subject to change based upon external requirements. The annual amounts of other components of the LTIIIP II are provided in the table in Appendix A.

**G. Projected Annual Expenditures to Implement the LTIIIP and Measures Taken to Ensure That the Plan Is Cost Effective**

The table set forth at page A-1 of Appendix A identifies PECO’s accelerated spending for DSIC-eligible investments in LTIIIP II. The specific programs reflected in this table were discussed in the preceding sections

The proposed LTIIIP II spending is incremental to PECO’s projected non-LTIIIP “baseline” investment in distribution system infrastructure in the LTIIIP II project categories during the 2021-2025 period. The chart on page A-2 of Appendix A graphically illustrates both the projected LTIIIP II and baseline spending in 2021-2025, and demonstrates how PECO’s planned investment represents a substantial increase over baseline and LTIIIP I spend in the 2016-2020 period. The increased baseline expenditures planned for 2020 are designed to both complete scheduled projects and undertake additional work to facilitate the expanded baseline and LTIIIP II investment planned for the 2021-2025 period.

Section 1352(a)(5) provides that an LTIIIP should describe the measures a utility is taking to ensure its projected expenditures are cost-effective. The projected annual expenditures in LTIIIP II, as set forth above, are cost effective because PECO has targeted accelerated investment to replace at-risk facilities that could adversely affect reliability. This investment in replacement equipment will have a direct positive impact on customer service and reliability in addition to reducing maintenance and outage costs.

The Company will also seek opportunities to streamline project administration and reduce costs. For example, as in LTIIIP I, PECO will continue to coordinate LTIIIP II projects by geographic area to realize reasonable economies of scale, as well as reduce the costs of emergency response time and avoid mobilization/demobilization costs. PECO will also leverage competitive bidding processes and relationships with existing suppliers and will pursue

longer-term contracts to maximize volume discounts and obtain the lowest unit cost for materials (e.g., cable and hardware). Additionally, the Company's Supply team will work with the Engineering department to ensure accurate quantities are procured. Lastly, PECO will promote cost effectiveness and efficiency by employing a qualified workforce and robust work management tools for all LTIIIP II projects.

The manner in which PECO prioritized the work to be performed under LTIIIP II and the reliability improvements expected for each program are detailed in Section IV.A. PECO will analyze actual LTIIIP II expenditures to ensure that the costs it is incurring continue to be in line with projected investment levels both overall and on a cost-per-unit basis. PECO performed such a cost analysis for programs in LTIIIP I, and the results of that analysis are summarized by program in the tables below.

As explained in Section IV.A and as shown by Figures 1 and 2, data available through the end of 2019 show that the Company has successfully completed the units of work projected in LTIIIP I within its budgeted investment levels for each program. The data in those tables also show that the overall variance between PECO's actual expenditures and the expenditures projected in LTIIIP I is approximately 1%. In several instances, the Company completed more projects than it projected in LTIIIP I.

In order to further validate the accuracy of the forecasting approach PECO used to develop LTIIIP II, the Company also performed a unit-cost analysis of its LTIIIP I performance relative to LTIIIP I projections. For the CEMI Program, the LTIIIP I projections and actual expenditures are as follows:

### 2016-2020 CEMI Program Costs

	2016	2017	2018	2019	2020
Filed Amount in LTIIIP I (\$M)	\$7.7	\$10.0	\$15.0	\$15.0	\$15.0
Actual Expenditures (\$M)	\$7.8	\$9.9	\$14.3	\$14.1	
Filed Number of Projects	5-8	6-9	8-13	8-13	8-13
Completed Number of Projects	10	10	11	14	
Filed Unit Cost Range (\$M)	\$0.96-\$1.54	\$1.11-\$1.67	\$1.15-\$1.88	\$1.15-\$1.88	\$1.15-\$1.88
Actual Unit Cost (\$M)	\$0.78	\$0.99	\$1.3	\$1.0	

The Company has experienced an increase in the unit cost of CEMI projects, which reflects increasing complexity and project size. Those increases are expected to continue into 2020 and beyond and, therefore, are reflected in the investment levels projected for LTIIIP II.

The unit cost for the one building substation retirement for which work was reflected in LTIIIP I cannot be analyzed at this time because construction has not yet started. The unit cost will be analyzed throughout the LTIIIP II period.

For the Circuit Rebuild/Unit Substation Retirement Program, the Company accurately forecasted unit costs for the LTIIIP I for 2016-2018, as shown by data in the table below. The Company started engineering work for the unit substation retirements in 2016 and began construction in 2017. As previously explained in Section IV.C, PECO plans to expand the scope of the Circuit Rebuild/Unit Substation Program following the completion of LTIIIP I, and the Company has incorporated the resulting increase in investment and number of projects in its assumptions for LTIIIP II.

**2016-2020 Circuit Rebuild/Unit Substation Retirement Program Costs**

	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Filed Amount in LTIIIP I (\$M)	\$1.7	\$14.5	\$15.0	\$15.0	\$15.0
Actual Expenditures (\$M)	\$1.8	\$14.3	\$14.7	\$19.5	
Filed Number of Units	0	5	6	6	6
Completed Number of Units	0	5	6	6	
Filed Unit Cost Range (\$M)	\$0	\$2.9	\$2.5	\$2.5	\$2.5
Actual Unit Cost (\$M)	\$0	\$2.86	\$2.45	\$3.25	

The Company has experienced an increase in the unit cost of Circuit Rebuild/Unit Substation Retirement program in 2019 in light of increasing complexity and project size. Those increases are expected to continue into 2020 and beyond and, therefore, are reflected in the investment levels projected for LTIIIP II.

For the Main Stem Cable Replacement Program in LTIIIP I, the Company has experienced year-to-year variations in unit costs, as shown by the data in the table below.

**2016-2020 Main Stem Replacement Program Costs**

	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Filed Amount in LTIIIP I (\$M)	8.2	18	18	15	13
Actual Expenditures (\$M)	8.4	18.8	16.4	17.9	
Filed Number of Miles	8	17	17	14	12
Completed Number of Miles	10.8	18.1	19	14.1	
Filed Unit Cost Range (\$M)	1.03	1.06	1.06	1.07	1.08
Actual Unit Cost (\$M)	0.78	1.04	0.86	1.27	

As discussed in Section IV.C, the Company will accelerate its investment in order to replace at-risk main stem cable over a duration materially shorter than 30-year replacement period used to develop the Main Stem Cable Replacement Program in LTIP I. Contracting costs are expected to increase because of increased demand for labor with the skill sets needed for cable replacement work. Those two factors, which drive increased costs, both overall and on a unit basis, are reflected in the cost assumptions underlying LTIP II.

The Company made reasonable forecasts of the unit cost for URD cable replacement in LTIP I. The table below shows the projected and actual investment both overall and in the unit cost (cost-per-mile). Consistent with its assumptions for main stem replacements, the Company expects a slight increase in unit costs for URD cable replacement during the 2021-2015 period, and those increases were reflected in developing LTIP II.

**2016-2020 URD Replacement Program Costs**

	<b>2016</b>	<b>2017</b>	<b>2018</b>	<b>2019</b>	<b>2020</b>
Filed Amount in LTIP I (\$M)	\$4.2	\$10.0	\$17.0	\$17.0	\$17.0
Actual Expenditures (\$M)	\$4.5	\$9.3	\$15.4	\$17.1	
Filed Number of Miles	8	19	32	32	32
Completed Number of Miles	9.6	22	32.9	32.6	
Filed Unit Cost Range (\$M)	\$0.53	\$0.53	\$0.53	\$0.53	\$0.53
Actual Unit Cost (\$M)	\$0.47	\$0.43	\$0.47	\$0.52	

**H. The Manner in Which the Replacement of Aging Infrastructure Will Be Accelerated Under the LTIIIP and How the Repair, Improvement or Replacement Will Ensure and Maintain Adequate, Efficient, Safe, Reliable and Reasonable Service**

The manner in which the replacement of aging and otherwise at-risk infrastructure will be accelerated under LTIIIP II and the explanation of how such replacements and enhancements will ensure and maintain adequate, efficient, safe and reliable service have been set forth in Sections IV.C, D, and F, which are incorporated in this section by reference.

**I. Detailed Expenditure Plans for the LTIIIP II Period**

The charts and tables in Appendix A provide the Company's estimated expenditures that will be made to implement LTIIIP II. Consistent with the requirements of the Implementation Order, additional details will be provided in the AAOPs that PECO will file after LTIIIP II is approved. The AAOPs will also provide information on how the Company performed in achieving the estimated scope of work for each prior year of the LTIIIP and what the Company's expectations are for the then-upcoming year.

**J. Use of a Qualified Work Force**

**1. Qualified Employees**

Section 1359 and the Commission's Implementation Order (pp. 17-18) require that all work performed under an LTIIIP shall be completed by a qualified work force. PECO has an extensive training regimen for employees of its Electric Division, which is implemented through various schools that provide the basic, advanced, and specialized skills required to operate the Company's electric distribution system. PECO's training programs prepare employees to design, build and install aerial, underground, and substation electrical systems. The schools provide hands-on training in a safe and controlled environment and do so in a manner tailored to both PECO's operating system and OSHA standards. The training protocols consist of a compilation of best practices created through input from field employees and other affiliated

utilities. Hazard recognition and safety are paramount to the program, and the training protocols are revised to reflect new technology and changes in customer service requirement and the electric industry generally.

Additionally, training is required before an employee may perform work independently on exposed, energized electrical equipment greater than 50 volts. This type of training is unique to the job classification and work being performed. The training is provided by experienced training professionals using a carefully developed curriculum, which may take up to five years to complete. Trainees receive regular assessments and are awarded incremental qualifications as they complete stages of training throughout the duration of the program. Retraining is conducted on a periodic basis as required by OSHA or more frequently when determined to be necessary.

## **2. Qualified Contractors**

PECO anticipates that it will use outside general contractors to perform much of the work it is planning to undertake to implement LTIIP II. To the extent PECO uses contractors, its contractor workforce will be fully qualified, in accordance with the standards set forth in Section 1359.

PECO administers a standard process for soliciting contractors to perform work on its distribution system. Part of that process includes evaluating the qualification of contractors to perform work for which they may be retained. To that end, PECO assesses contractors' technical and financial capabilities to meet their contractual commitments and may require references as it deems necessary or appropriate. Most contractors employ personnel through the building trades that have union apprenticeship programs to help ensure that employees are qualified to perform assigned work. Contractors must be familiar with, and must observe, established, industry-accepted labor practices, procedures, and agreements that apply to the work they perform. Contractors must maintain all professional qualifications, licenses, permits,

certifications, and skills and must successfully complete all training required by applicable laws or that are otherwise deemed necessary to perform their assigned work. Contractors must obtain, verify, and maintain evidence of the identity and employment eligibility under applicable federal and state laws of all contractor and subcontractor personnel performing work at the Company's job site, including compliance with the U.S. Citizenship and Immigration Service's I-9 process. Contractors also must complete any necessary PECO-specific requirements for the specific tasks they are called upon to perform, such as substation awareness and lock-out/tag-out.

Additionally, a contractor information website maintained by the Company's Project and Contract Management group provides contractors access to PECO's Engineering Practices, Environmental Alerts, Field Bulletins, Technical Bulletins, Safety Messages, and Construction Specifications. PECO's Project and Contract Management group also provides an initial orientation to contractors before they start work on Company sites.

**K. Outreach and Coordination with Other Utilities and Government Entities**

PECO practices proactive outreach for customers and townships utilizing multichannel, active communication. Townships and municipalities are engaged early in engineering and construction planning to ensure the community is well informed on the benefits of the work and prepared for the impacts to daily activities. Local residents are sent letters providing information on the project and identifying a dedicated PECO Customer Liaison contact so customers know they have a voice and their inquiries will be addressed in a timely and courteous manner. PECO also engages with businesses to ensure that any planned outages are scheduled in a manner that minimizes the effect on their day-to-day operations.

As part of the customer-focused approach to LTIP execution, PECO has developed two new Customer Liaison contracting positions to plan and manage outreach. Residential, municipal, and business customer experience is taken very seriously and considered essential to

the overall success of an LTIIIP project. As stated above, the PECO Customer Liaisons work quickly, efficiently, and respectfully to ensure all questions are answered, issues are addressed, and the appropriate information and needs are communicated between customers and project teams.

Lastly, PECO works directly with state and local permitting agencies and other outside utilities to ensure projects are completed safely, efficiently, and with the least possible impact to local communities. This includes proactive communication and planning with PennDOT, the Philadelphia Streets Department, municipal managers, telecommunications companies, and gas and water providers. Coordination with these organizations provides synergies in work (paving restoration, for example), and reduces delays in construction due to conflicting projects on overlapping timelines.

## **V. CONCLUSION**

In summary, PECO's LTIIIP II satisfies the requirements set forth in Section 1352(a), the Implementation Order, and the LTIIIP Regulations. LTIIIP II identifies the age and type of eligible property included in the plan; provides schedules depicting the levels of investment and quantity of property targeted for accelerated repair and replacement; provides the general location of eligible property covered by LTIIIP II; explains the measures being taken to ensure the plan is cost-effective; explains the manner in which aging infrastructure will be accelerated to ensure and maintain adequate, efficient, safe, reliable and reasonable service; and provides an effective workforce management plan.

PECO believes that the expenditures for these initiatives constitute a prudent and reasonable investment for managing its distribution assets and that each of the listed programs will successfully achieve one or more of the following benefits:

- Maintaining public and employee safety;

- Reducing customer interruptions;
- Reducing customer interruption duration;
- Improving storm performance; and
- Improving pocket reliability areas.

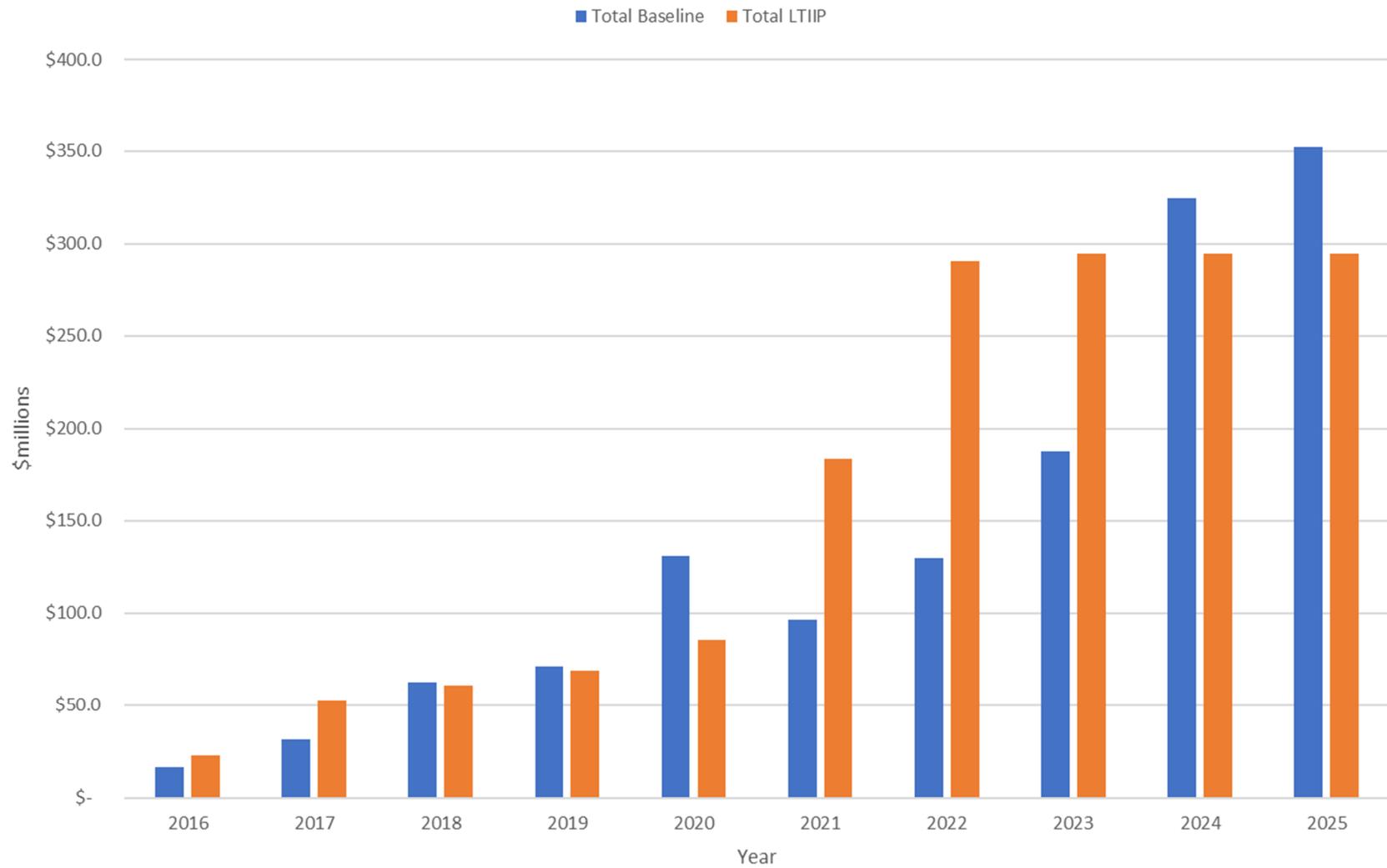
Consequently, the Commission should find and determine that PECO's LTIIIP II is "adequate and sufficient to ensure and maintain adequate, efficient, safe, reliable and reasonable service" and should, therefore, approve PECO's LTIIIP II without modification.

## **APPENDIX A**

## SUMMARY OF LTIP II EXPENDITURES

	PECO LTIP Spending Plan (\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
		Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units
Programs	<b>Storm Hardening and Resiliency Programs</b>												
	<i>CEMI Programs</i>												
	1 CEMI Areas	\$ 13.5	8 - 13 (P)	\$ 13.5	8 - 13 (P)	\$ 13.5	8 - 13 (P)	\$ 13.5	8 - 13 (P)	\$ 13.8	8 - 13 (P)	\$ 67.8	40 - 65 (P)
	2 CEMI Targeted Circuits	\$ 6.5	3 - 4 (P)	\$ 6.6	3 - 4 (P)	\$ 6.7	3 - 4 (P)	\$ 7.2	3 - 4 (P)	\$ 7.4	3 - 4 (P)	\$ 34.4	15 - 20 (P)
	<b>Aerial Infrastructure Resiliency Programs</b>												
	Aerial Infrastructure Resiliency Areas	\$ 4.9	2 - 5 (P)	\$ 5.0	2 - 5 (P)	\$ 5.1	2 - 5 (P)	\$ 5.2	2 - 5 (P)	\$ 5.3	2 - 5 (P)	\$ 25.5	10 - 25 (P)
	Aerial Infrastructure Resiliency Targeted Assets	\$ 30.3	2,500 - 3,500 (A)	\$ 70.0	6,500 - 7,500 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 313.3	28,800 - 33,800 (A)
	5 Building Substation Retirement Program	\$ 21.0	-	\$ 22.0	-	\$ 14.0	-	\$ 14.0	1 (U)	\$ 14.0	1 (U)	\$ 85.0	2 (U)
	6 Circuit Rebuild Enabling Unit Substation Retirement	\$ 25.0	6 - 8 (U)	\$ 44.0	7 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 207.0	37 - 48 (U)
	<b>Underground Cable Replacement Programs</b>												
7 Main Stem Cable	\$ 30.5	28 - 33 (M)	\$ 43.0	38 - 48 (M)	\$ 43.0	38 - 48 (M)	\$ 43.0	38 - 48 (M)	\$ 45.0	40 - 50 (M)	\$ 204.5	182 - 227 (M)	
8 Underground Residential Development (URD)	\$ 51.5	95 - 110 (M)	\$ 80.0	150 - 170 (M)	\$ 87.0	155 - 175 (M)	\$ 90.0	160 - 180 (M)	\$ 92.0	165 - 185 (M)	\$ 400.5	725 - 820 (M)	
9 <b>Switchgear Replacement Program</b>	\$ 0.5	-	\$ 6.5	-	\$ 8.5	-	\$ 5.0	2 - 3 (U)	\$ 0.5	-	\$ 21.0	2 - 3 (U)	
<b>Electric LTIP Eligible/Programs</b>	\$ 183.7	-	\$ 290.6	-	\$ 294.8	-	\$ 294.9	-	\$ 295.0	-	\$ 1,359.0	-	
<b>Facility Relocate Projection</b>	\$ 15.0	-	\$ 15.0	-	\$ 15.0	-	\$ 15.0	-	\$ 15.0	-	\$ 75.0	-	
10 <b>Total</b>	\$ 198.7	-	\$ 305.6	-	\$ 309.8	-	\$ 309.9	-	\$ 310.0	-	\$ 1,434.0	-	
	<b>KEY:</b>												
	<b>Project</b>		<b>P</b>										
	<b>Unit (either Unit Substation, Building Substation or Switchgear)</b>		<b>U</b>										
	<b>Asset</b>		<b>A</b>										
	<b>Miles</b>		<b>M</b>										

### Baseline & LTIP Expenditures



**NAME/TYPE OF ASSET: Customers Experiencing Multiple Interruptions (CEMI)**  
**Areas/Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on customers in pocket areas served by multiple circuits that have a higher interruption history when compared to PECO’s system-level reliability performance. The proposed plan will increase investments in inter-connecting circuits to improve operational flexibility, automated fault isolation and service restoration, and storm hardening and resiliency leading to permanent solutions to persistent higher-than-system-level outage frequency.

**Identification/Justification Process**

Common contributors to CEMI are dense vegetation, susceptibility to storms, and long 34 kV circuits near the borders of the service territory. Pocket areas are identified through a review of sustained customer interruptions in excess of four annually and evaluated for pocket size, outage causes, existing circuit design, and opportunities to strengthen lines and automate switching. Projects are ranked systematically based on long-term historical CEMI performance, year-to-date CEMI performance, cost per customer benefit, and expected reliability improvements. It should be noted that sizes of projects and related reliability-improvement costs vary significantly, which can result in a considerable variation in the number of planned projects per year.

**Success Metric**

Success of this initiative will be based on the reduction in the frequency of interruptions in the improved areas.

**Long-Term Goal**

The long-term goal of this initiative is to reduce the frequency of interruptions in the improved areas by 25% by 2026.

**Scope/Location/Planned Expenditures**

Locations are identified based upon reliability history and needs. This program is tracked by the number of projects (P) completed.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units								
PECO LTIP Spending Plan Storm Hardening and Resiliency Programs/CEMI Programs												
CEMI Areas	\$ 13.5	8 - 13 (P)	\$ 13.8	8 - 13 (P)	\$ 67.8	40 - 65 (P)						

**NAME/TYPE OF ASSET: Customers Experiencing Multiple Interruptions (CEMI) Targeted Circuits /Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIIIP II focuses on customers on single circuits that have a history of multiple interruptions when compared to PECO’s system-level reliability performance. The proposed plan will apply more significant investments in connecting circuits to improve operational flexibility, automated fault isolation and service restoration, and storm hardening and resiliency leading to permanent solutions to persistent higher-than-system-level outage frequency.

**Identification/Justification Process**

Common contributors to CEMI are dense vegetation, susceptibility to storms, and long 34 kV circuits near the borders of the service territory. Targeted circuits are identified through a review of sustained customer interruptions and various indices, such as CEMI, SAIFI and measures of interruption duration. Projects are ranked systematically based on long-term historical CEMI performance, year-to-date CEMI performance, cost-per-customer benefit, and expected reliability improvements. It should be noted that sizes of projects and related reliability-improvement costs vary significantly, which can result in a considerable variation in the number of planned projects per year.

**Success Metric**

Success of this initiative will be based on the reduction in the frequency of interruptions and duration of outages for the improved circuits.

**Long-Term Goal**

The long-term goal of this initiative is to reduce the frequency of interruptions for the improved circuits by 25% by 2026.

**Scope/Location/Planned Expenditures**

Locations are identified based upon reliability history and needs. This program is tracked by the number of projects (P) completed.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units								
PECO LTIIIP Spending Plan Storm Hardening and Resiliency Programs/ <i>CEMI Programs</i>												
CEMI Targeted Circuits	\$ 6.5	3 - 4 (P)	\$ 6.6	3 - 4 (P)	\$ 6.7	3 - 4 (P)	\$ 7.2	3 - 4 (P)	\$ 7.4	3 - 4 (P)	\$ 34.4	15 - 20 (P)

**NAME/TYPE OF ASSET: Aerial Infrastructure Resiliency Areas/Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on the replacement of aerial infrastructure, including poles, overhead conductors, cross-arms, insulators, connectors, and cutouts, in areas served by one or more circuits that have a higher probability of failure caused by age-related degradation, environmental exposure, and ordinary wear and tear.

**Identification/Justification Process**

Replacements will be prioritized based on a condition assessment of aerial components in geographical areas with high equipment failure rates, causing service interruptions, and, mainly installed, on poles with in-service dates before 1965.

**Success Metric**

Success of this initiative will be based on the reduction in aerial equipment failures in the improved areas.

**Long-Term Goal**

The long-term goal of this initiative is to reduce aerial equipment failures in the improved areas by 25% by 2026.

**Scope/Location/Planned Expenditures**

Areas are identified based upon age of infrastructure, failure history, and potential impacts of failures to customers. This program is tracked by the number of projects (P) completed.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units								
PECO LTIP Spending Plan Storm Hardening and Resiliency Programs/ <i>Aerial Infrastructure Resiliency Programs</i>												
Aerial Infrastructure Resiliency Areas	\$ 4.9	2 - 5 (P)	\$ 5.0	2 - 5 (P)	\$ 5.1	2 - 5 (P)	\$ 5.2	2 - 5 (P)	\$ 5.3	2 - 5 (P)	\$ 25.5	10 - 25 (P)

**NAME/TYPE OF ASSET: Aerial Infrastructure Resiliency Targeted Assets/Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on the replacement of aerial infrastructure assets, including poles, overhead conductors, cross-arms, insulators, connectors, and cutouts, that have a higher probability of failure caused by age-related degradation, environmental exposure and ordinary wear and tear.

**Identification/Justification Process**

Replacements will be prioritized based on a condition assessment of aerial components in geographical areas with high equipment failure rates, causing service interruptions, and mainly installed on poles with in-service dates before 1965.

**Success Metric**

Success of this initiative will be based on the reduction in aerial equipment failures on the improved circuits.

**Long-Term Goal**

The long-term goal of this initiative is to reduce aerial equipment failures on the improved circuits by 25% by 2026.

**Scope/Location/Planned Expenditures**

Circuits are identified based upon age of infrastructure, failure history, and potential impacts of failures to customers. This program is tracked by the number of assets (A) replaced.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units								
PECO LTIP Spending Plan Storm Hardening and Resiliency Programs/Aerial Infrastructure Resiliency Programs												
Aerial Infrastructure Resiliency Targeted Assets	\$ 30.3	2,500 - 3,500 (A)	\$ 70.0	6,500 - 7,500 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 71.0	6,600 - 7,600 (A)	\$ 313.3	28,800 - 33,800 (A)

**NAME/TYPE OF ASSET: Building Substation Retirement Program/Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIIIP II focuses on the retirement and replacement of Building Substations in order to maintain the current high level of reliability on the system.

**Identification/Justification Process**

Building Substations contain obsolete equipment, which requires specialized training and, in some cases, custom manufactured replacement equipment. Higher maintenance expenses, the increasing risk of failures with age, and the possibility of an extended outage if a failure occurs and the substation is significantly damaged are the reasons for pursuing this area. The proposed plan will prioritize the building substation retirements based on condition, customers served, load supplied, risk, etc.

The substations will be eliminated by converting the load they serve to a higher-level distribution voltage, which in most cases presently supplies the substation. This will eliminate the risk of failure and maintenance costs associated with the Building Substations. The reliability enhancements being applied to the Circuit Rebuild/Unit Retirement projects will be incorporated in the Building Substation Retirement Programs, as appropriate.

**Success Metric**

Success of this initiative will be based on the completion of two building substation retirement projects it started during the term of LTIIIP I.

**Long-Term Goal**

The long-term goal of this initiative is to retire all building substations in the next 20 to 25 years.

**Scope/Location/Planned Expenditures**

The timing of when the retirements will occur, and the funding required will depend on the substations selected based on a condition assessment of the substations. During LTIIIP II, PECO expects to complete the retirement of the two Building Substation retirement projects started during LTIIIP I.

The retirement projects will be designed to convert the facilities served by the Building Substation to a higher distribution voltage and integrate the upgraded facilities with existing facilities in the surrounding area to provide additional operating flexibility. This will require converting some adjacent facilities to achieve overall area integration. The converted facilities will be built to the present storm hardened and more resilient standards. This program is tracked by the number of building substations (U) retired.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
PECO LTIIIP Spending Plan	Capital	Units	Capital	Units								
Storm Hardening and Resiliency Programs												
Building Substation Retirement Program	\$ 21.0		\$ 22.0		\$ 14.0		\$ 14.0	1 (U)	\$ 14.0	1 (U)	\$ 85.0	2 (U)

**NAME/TYPE OF ASSET: Circuit Rebuilding Enabling Unit Substations Retirements/Storm Hardening and Resiliency**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on rebuilding circuits to current standards, strengthening the facilities against storms, and enabling the retirement of unit substations to maintain the current high level of system reliability.

**Identification/Justification Process**

At the beginning of LTIP II, 743 unit substations are expected to exist on the system with 696 of these units being over 45 years old (with an average of 4 to 5 unit failures per year). PECO’s assessment is that the annual failure rate for its unit substations will increase to 25 per year by 2035. The supply of spare units to replace failed ones has diminished to the point where new units will likely have to be purchased for replacements.

The facilities served by the units being retired will be converted to a higher distribution voltage and integrated with existing facilities in the surrounding areas to provide additional operating flexibility. This will introduce new equipment built to the current storm hardened and more resilient standards. The retirements will eliminate the routine and periodic maintenance costs associated with these units.

**Success Metric**

Success of this initiative will be based on the retirement of 37 to 48 unit substations during LTIP II.

**Long-Term Goal**

The long-term goal of this initiative is to retire all unit substations within approximately 30 years.

**Scope/Location/Planned Expenditures**

The planned expenditures are included in the table, below. Specific units will be prioritized based on the need to create spares, performance, operating flexibility, equipment obsolescence, geographic challenges (e.g., flood plains) and other factors. This program is tracked by the number of unit substations (U) retired.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units
PECO LTIP Spending Plan Storm Hardening and Resiliency Programs												
Circuit Rebuild Enabling Unit Substation Retirement	\$ 25.0	6 - 8 (U)	\$ 44.0	7 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 46.0	8 - 10 (U)	\$ 207.0	37 - 48 (U)

**NAME/TYPE OF ASSET: Main Stem/Underground Cable Replacement**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on replacement of main stem underground cable to maintain the current high level of reliability and to reduce the likelihood of future failures.

**Identification/Justification Process**

Replacements will be prioritized based on circuit sections with near-term fault increases, specific circuits with high cable failure rates, aerial cable with multiple repair splices per span, cables with high-priority, dual-service customers (e.g., hospitals), and the failure history of similar types of cable. Replacing main stem cables will reduce the future frequency and duration of service interruptions to a large number of customers, or to customers with critical or high-demand needs. Work may also include additional infrastructure upgrades, such as, but not limited to, upgrading oil switches to more modern equipment, installing additional switches to increase operating flexibility, installing or replacing ducts where necessary for cable installation, and installing or replacing underground secondary main cables serving general service and street lighting customers, among other categories of work.

**Success Metric**

Success of this initiative will be based on the reduction in annual main stem cable failures per mile of cable replaced on the circuits where the replacements occur.

**Long-Term Goal**

The long-term goal of this initiative is to replace and upgrade the targeted main stem cable in 10 to 15 years.

**Scope/Location/Planned Expenditures**

Locations are identified based upon cable type, age, failure history and potential impacts of failures to customers. The majority of this cable is located within Philadelphia and in more urban areas immediately outside the city. This program is tracked by the number of miles (M) replaced.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units								
PECO LTIP Spending Plan												
Underground Cable												
Replacement Programs												
Main Stem Cable	\$ 30.5	28 - 33 (M)	\$ 43.0	38 - 48 (M)	\$ 43.0	38 - 48 (M)	\$ 43.0	38 - 48 (M)	\$ 45.0	40 - 50 (M)	\$ 204.5	182 - 227 (M)

**NAME/TYPE OF ASSET: Underground Residential Development (URD) Cable Replacement/Underground Cable Replacement**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on the replacement of URD cable that is prone to failure. The LTIP will replace this cable and loop radial URD cable to maintain the current high level of reliability and reduce the likelihood of future failures.

**Identification/Justification Process**

Identification of URD cable replacements will be based on reliability histories of cable sections showing the highest rates of failure. Specific focus will be placed on replacing URD with XLPE insulation that was manufactured before 1985. This category of URD cable shows a trend in higher failure rates than newer cables, and the failure rates are increasing over time. Additional URD cable stretches or in developments with demonstrated high failure rates will also be replaced. Radial URD cable will also be looped as part of this program.

**Success Metric**

Success of this initiative will be based on the reduction in annual URD cable failures per mile of cable replaced on the circuits where the replacements occur.

**Long-Term Goal**

The long-term goal of this initiative is to replace and upgrade the targeted URD cable in 10 to 15 years.

**Scope/Location/Planned Expenditures**

There is an estimated 2,500 miles of targeted XLPE cable currently on-system. Planned expenditures per year are set forth in the following table. Specific projects will be prioritized according to reliability history and may include additional infrastructure improvements, including, but not limited to, looping of developments, voltage conversions, upgrading from submersible to pad-mounted transformers, and similar categories of work. While these locations may be anywhere in the service territory, the majority will be in the suburban areas outside the city of Philadelphia, where most URD cable is located. This program is tracked by the number of miles (M) replaced.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units
PECO LTIP Spending Plan												
Underground Cable Replacement Programs												
Underground Residential Development (URD)	\$ 51.5	95 - 110 (M)	\$ 80.0	150 - 170 (M)	\$ 87.0	155 - 175 (M)	\$ 90.0	160 - 180 (M)	\$ 92.0	165 - 185 (M)	\$ 400.5	725 - 820 (M)

**NAME/TYPE OF ASSET: Substation Switchgear Replacement Program**

**Program Description and Purpose**

This portion of the Company’s LTIP II focuses on the replacement of switchgear in order to maintain the current strong level of reliability on the system.

**Identification/Justification Process**

The switchgear being replaced contains equipment which is degrading. Higher maintenance expenses, the increasing risk of failures, and the risk of extended outages if the switchgear equipment fails are the reasons for pursuing this area. The proposed plan will prioritize the switchgear replacements based on material condition, customers served, load supplied, risk, etc.

**Success Metric**

Success of this initiative will be based on the reduction in emergent repairs and preventing an increase in the number of distribution outages related to the failure or malfunctioning of metal-clad switchgear components.

**Long-Term Goal**

The long-term goal of this initiative is to replace and upgrade the targeted switchgear in 30 to 40 years.

**Scope/Location/Planned Expenditures**

The switchgear to be replaced and the funding required will depend on the switchgear selected based on the condition assessment of the existing in-service switchgear. Each project may contain two to three switchgear busses. Considering the time required to design, plan and construct the replacement projects and the cost, PECO expects to replace two to three sections of switchgear during the LTIP period. This program is tracked by the number of switchgear busses (U) replaced.

(\$ in million)	2021		2022		2023		2024		2025		5 Year Total (2021-2025)	
	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units	Capital	Units
PECO LTIP Spending Plan Switchgear Replacement Program	\$ 0.5	-	\$ 6.5	-	\$ 8.5	-	\$ 5.0	2 - 3 (U)	\$ 0.5	-	\$ 21.0	2 - 3 (U)

**NAME/TYPE OF ASSET: Facility Relocations**

**Program Description and Purpose**

This portion of the Company's LTIP focuses on the relocation of distribution facilities necessitated by highway and other work by municipalities or other governmental entities for which PECO is not reimbursed.

**Identification/Justification Process**

This work is driven by the plans of PennDOT, the PA Turnpike Commission and local municipalities for road or bridge work. Pursuant to this work, PECO is required to relocate its facilities. To the extent that PECO is not reimbursed for this work, it will be included in the LTIP.

To accommodate highway relocations and other municipal projects, PECO undertakes approximately 50 to 95 projects and spends approximately \$12.84 million per year, net of reimbursements. PECO typically is notified to relocate its equipment 12 months or less prior to the start of the project.

**Scope/Location/Planned Expenditures**

Scope and locations are determined as requests are received.

**Planned Expenditures**

PECO's expenditures to complete highway relocation projects are the net of total expenditures minus the project sponsor's reimbursements and total approximately \$15 million per year.