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April 1, 2020

Ms. Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
1325 G Street N.W., Suite 800
Washington, DC 20005

Re: PEPACR-2020-01 and Formal Case No. 1119

Dear Ms. Westbrook-Sedgwick:

Attached please find Potomac Electric Power Company's 2020 Annual Consolidated Report. In addition, per Order No. 20203, Pepco has included Attachment F, which provides required information related to the Downtown Resupply Project.

Please note that, as discussed on page 236 of the attached report, information required regarding cable splicing is not included and will be provided when that information becomes available.

Please feel free to contact me if you have any questions regarding this matter.

Sincerely,

/s/ Dennis P. Jamouneau

Dennis P. Jamouneau

Enclosures

cc: All Parties of Record

2020 CONSOLIDATED REPORT

- **Comprehensive Plan**
 - **Productivity Improvement Plan**
 - **Manhole Event Report**
-
-

Filed By

POTOMAC ELECTRIC POWER COMPANY

In accordance with

D.C. Formal Case No. 991, Order No. 12735 (Comprehensive Plan)

D.C. Formal Case No. 766, Order No. 7668 (Productivity Improvement Plan)

D.C. Formal Case No. 991, Order No. 13812 (Manhole Event Report)

D.C. Formal Case No. 766, Order No. 16975 (Consolidated Report)

D.C. Formal Case No. 991, Order No. 17074 (Consolidated Report)

D.C. Formal Case No. RM5-2014-01-E, Order No. 17684 (Consolidated Report)

D.C. Formal Case No. PEPACR-2014-01, Order No. 17816 (Consolidated Report)

D.C. Formal Case No. 1119, Order No. 18148 (Merger Order)

and

D.C. Formal Case No. PEPACR-2015-01, Order No. 19119 (Consolidated Report)



An Exelon Company

April 1, 2020

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INTRODUCTION

Potomac Electric Power Company (Pepco) herein presents its 2020 Consolidated Report combining three reporting requirements directed by the District of Columbia Public Service Commission (Commission) in Formal Case Nos. 766 and 991. The three reports comprising the Consolidated Report are identified respectively as the Comprehensive Plan for the Planning, Design, and Operation of the Distribution System within the District of Columbia (Comprehensive Plan), the Productivity Improvement Plan (PIP), and the annual Manhole Event Report. Additionally, a section of References has been included at the end of the report.

Additionally, Attachment D includes information related to Paragraph 60 of Attachment B to Order No. 18148 and discusses Pepco's 2019 safety performance and initiatives as well as a report by Exelon on existing safety and cybersecurity policies. References to previous Commission directives are included in footnotes or the body of the report, as noted throughout. Attachment E is included as Pepco's Vegetation Management attestation, in accordance with Paragraphs 98-99 of Order No. 19119. Attachment F provides the information required in the Commission's Order No. 20203 regarding the Downtown Resupply Project."

Summary

The following is a brief description of the four parts of this Report:

¹ Order No. 18148, *In The Matter of the Joint Application of Exelon Corporation, Pepco Holdings, Inc., Potomac Electric Power Company, Exelon Energy Delivery Company, LLC and New Special Purpose Entity, LLC for Authorization and Approval of Proposed Merger Transaction*, Formal Case No. 1119, at P 1 (March 23, 2016) ("Merger Order"). The Commission subsequently issued Order No. 18160 (April 4, 2016) correcting certain errors in the Merger Order and in Attachment B to the Merger Order (the "Merger Commitments"). References herein to the Merger Order and the Merger Commitments are to Order No. 18148 and Attachment B to Order No. 18148, respectively, as corrected by Order No. 18160.

Part 1: Comprehensive Plan

During Commission hearings on November 5-7, 2001, addressing Formal Case No. 991, the Commission issued directives, followed by Order No. 12293, requiring the Company to produce and submit its first Comprehensive Plan on February 8, 2002. Pepco's filed report presented a compilation of major elements of its underground distribution construction and plans as well as supporting technologies and conversion programs to improve system reliability. Over the years, the Comprehensive Plan has evolved with Commission orders to address current issues. In 2020, the Comprehensive Plan covers similar material to the 2019 Comprehensive Plan.

Part 2: PIP

On November 1, 1982, in Order No. 7668, the Commission adopted final rules regarding the submission of an annual PIP in Formal Case No. 766. These rules are codified in Title 15 of the District of Columbia Municipal Regulations, Chapter 5, Rules 502.1 and 502.2. Because of the divestiture or transfer to an affiliate of all of Pepco's generating stations, most of these rules are no longer applicable to Pepco's operations. Instead, this PIP was compiled pursuant to the latest requirements for Pepco to report on its transmission and distribution system operating performance and measures to improve service reliability.

Part 3: Manhole Event Report

Part 3 of the Consolidated Report is the 2019 Manhole Event Report. On June 6, 2000, the Commission issued Order No. 11716 in Case No. 991 requiring Pepco file an annual Manhole Event Report on the previous year's manhole incidents. Part 3 of the Consolidated Report includes descriptive statistics regarding reportable events, a trend analysis for slotted manhole covers, and a listing of splice data. Appendix 3A contains a listing of 2019 Manhole Events. Appendix 3B includes a discussion of the 2019 Manhole Inspection Program including annual program results. Appendix 3C contains Pepco's update on implementation of its Network Accuracy Procedure.

Part 4: References

Part 4 of the filing contains a compilation of abbreviations, acronyms, and technical terms and diagrams; and a section providing Commission Order references delineating the history of the Consolidated Report requirements.

Attachments A – F

- A. Vegetation Management Communications
- B. Work Plan
- C. Priority Feeder Maps
- D. Cyber and Safety Statement
- E. Vegetation Management Attestation
- F. Downtown Resupply Description

PART 1: 2020 COMPREHENSIVE PLAN

SECTION 1.2 – SYSTEM PLANNING²

The mission of System Planning is to develop a rational and orderly plan for Pepco's existing and future electric system needs that will provide reliable electric service to customers and support load growth in a cost effective manner. In order to accomplish this mission, the North American Electric Reliability Corporation (NERC) / Reliability First Corporation (RFC) Standards and Pepco's Planning Criteria for the transmission, subtransmission, and distribution systems govern the design of the electric system.

Pepco continuously analyzes the adequacy of its electric system to meet demand for energy on its system and to plan for future growth. The Company maintains engineering and operating criteria to be used in the design of new and modified portions of the system. To provide for rational and orderly changes to the electric system, Pepco has developed engineering and operating criteria which it applies to the design of new and modified systems. The three major components of system planning criteria are (1) voltage and reactive support, (2) ratings of facilities, and (3) reliability. For example, voltage on a nominal 120 volt system must be maintained between 114 and 126 volts under normal conditions and between 105 and 126 volts under contingency conditions. Ratings of facilities include normal, emergency, and short-term emergency ratings on all facilities including feeders, power

² The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001. The Commission requested that the Company provide a Comprehensive Plan detailing proposed changes to the electric system for the purposes of meeting load growth or maintaining system reliability. On pages 143-144 of the hearing transcript, Pepco's Witness Gausman explained the nature of the Company's existing plans for the distribution and transmission systems:

We have plans for each of our substations in D.C., and in each of those plans we address the needs for that location, what the growth forecast is, what type of construction is going to be needed for expansion in the distribution system in each of those locations... Now when you go up to the transmission level or the substation supply level, there you have a plan that is addressing a larger area of the town because you're looking at the whole capacity of the system.

The Company expanded its responses to the Commission's requests in the first filed Comprehensive Plan. Since that date, the Company's Comprehensive Plans have been expanded based on several Commission directives. The report that follows either expands upon the discussion in the initial hearings requesting the Consolidated Report or responds to subsequent Commission directives as cited below.

The following section of the report addresses system plans based on forecasted load growth.

In Order No. 12804 paragraph 53 B, the Commission stated the following:

53. The 2003 PIP is hereby APPROVED, provided that PEPCO:

(b) Submit quarterly reports to the PIWG as well as a report in the 2004 and subsequent PIPs on its plans for implementing the recommendations for alleviating the anticipated transmission constraints identified in the RTEP report.

transformers, circuit breakers, for both summer and winter periods. In terms of reliability, the data that are reviewed and tracked include historical and forecasted load compared to capacity of the feeders, feeder groups, and substations.

1.2.1 LOAD FORECASTING³

Planning for future load growth starts with the development of load growth projections. A forward-looking 10-year peak load forecast is developed and maintained for each distribution system component such as feeders, substation transformers, and substations in order to plan for longer duration projects. In addition, a short-term forecast is developed in order to address the more frequent changes from new building construction and customer load growth that is occurring across the distribution system. Short-term, summer-peak forecasts are developed for three years in order to address the more frequent changes from new building construction and customer load growth that occurs across the distribution system. Long range forecasting (four to ten years) is used to develop advance plans for longer duration projects or construction projects that require more than two or three years to complete, and to identify future capital projects in the Construction Budget Forecast process.

Forecasting begins with the examination of the summer historical loads for each feeder and substation on a two-year cycle. Further, actual new customer loads from submitted class of service forms and other available development reports, planned changes in feeder configuration and emergency transfers, and reductions due to distributed energy resources (DER) are also analyzed. The individual feeder and feeder group loads for each year are calculated and adjusted to produce the substation load predictions for each year of the plan.

1.2.2 Peak Load Forecasting Process

As described in Figure 1.2-A, the development of the peak load forecast is the first step in Pepco's distribution system planning process. The development of the forecast is a critical step, because it has

³ In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, the following topics were discussed, as cited on pages 141-144 of the hearing transcript:

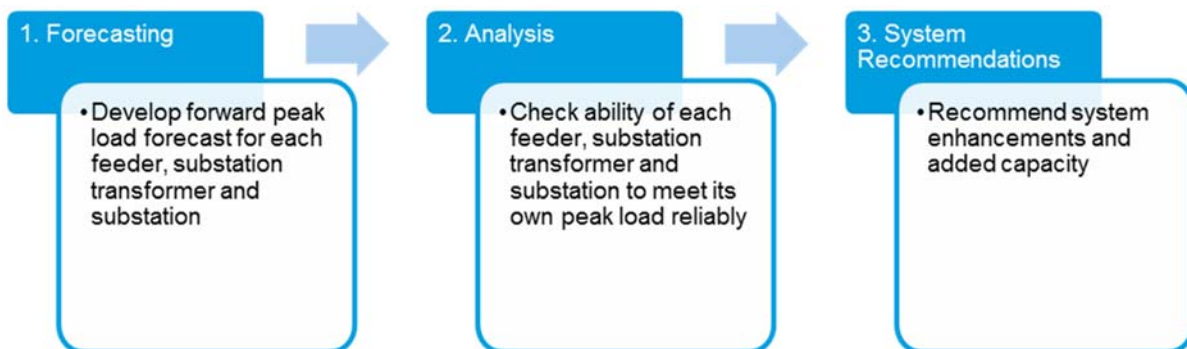
- *Comprehensive long-term planning on the underground system*
- *Pepco's 10-year construction plans*
- *Distribution load growth forecasts by substation*
- *Transmission/substation supply load growth forecasts*

an impact on the outcomes of each subsequent step in the process and, ultimately, the timing and magnitude of the investments in the distribution system made by Pepco.⁴ This section provides additional details on the analytical processes Pepco employs to develop its peak load forecast and the way in which DERs are incorporated into these processes.

It is important to note that Pepco must create more than just one peak load forecast. In fact, it creates many – one for each distribution feeder, individual substation transformer, and substation on its system. The creation of peak load forecasts for each distribution system component is needed to ensure that both individual system components are sized appropriately, and that the system as a whole will perform as it should.

This peak load planning process is depicted in the following figure:

Figure 1.2-A: General Planning Process for Distribution Feeders, Substation Transformers, and Substations



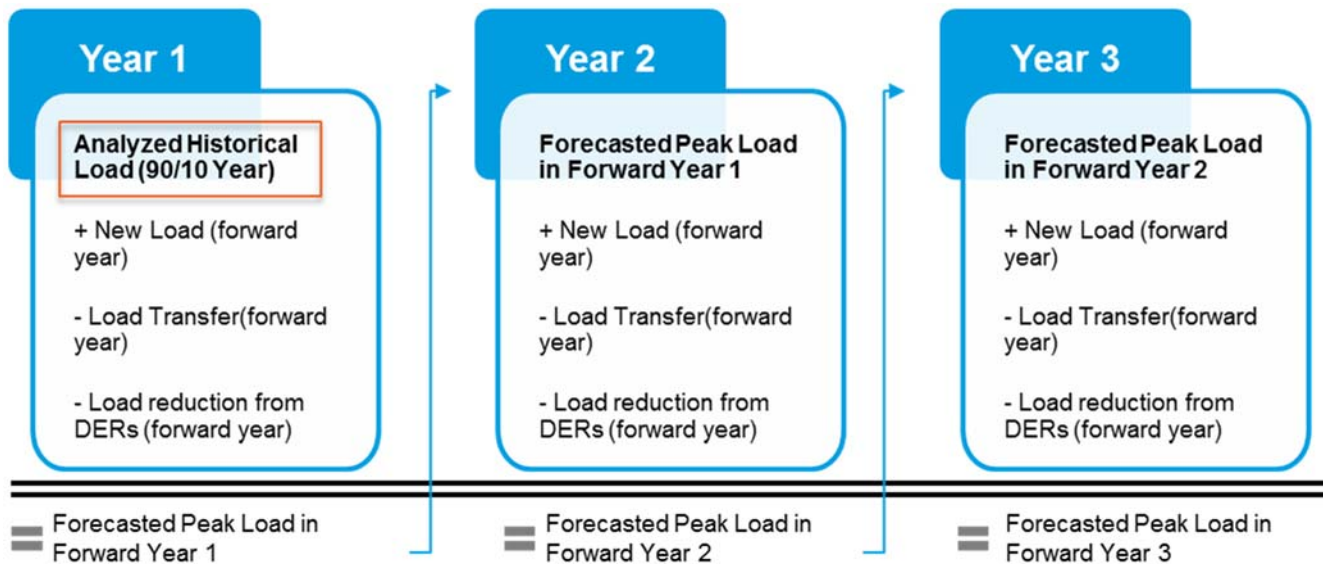
1.2.3 Short-Range and Long-Range Peak Load Forecasts

The peak load forecast is comprised of a short-range forecast for future years 1-3 and a long-range forecast for future years 4-10. This short-term forecast also serves as the basis for the development of the longer term 10-year plan. The former is a detailed, “bottom-up” analysis of historical peak load data, projected new load growth and energy reduction initiatives. The latter is a higher-level and “top-down” trending effort based on the PJM (the regional transmission operator or “RTO” responsible for maintaining the stability of the transmission system) system peak load forecast. The short-range forecast is generally formulated in accordance with the calculation detailed in Figure 1.2-B.⁵

⁴ Consistent with PHI’s regulatory obligations to provide safe, reliable electric service to its customers.

⁵ Specific circumstances may merit variations in this calculation process.

Figure 1.2-B: General Process for Creating Distribution Feeder, Substation Transformer, and Substation Short-Range Forecasts



For the purposes of this report, terms are defined as follows:

- Analyzed Historical Peak Load** – This value serves as the base value from which future projections are calculated. This value is most often derived for each distribution system component by taking its actual historical peak load⁶ in the hottest year within the last ten years,⁷ and adding to it the incremental load changes (i.e., new loads, load transfers and load reductions from DERs) that have occurred between that hottest year and the year prior to the current year.⁸
- New Load** – This represents additional new load that is anticipated to come online as a result of new building or development activities. At times and in some areas of Pepco’s service territories,

⁶ As recorded within the SCADA and AMI systems.

⁷ Pepco plans to the hottest year in the last 10-years to develop its peak loads for each distribution system component in the short-term load forecast. Pepco uses the 90/10 forecast produced by PJM as the basis of its long-range growth forecast in order to ensure that each utility has adequate system capacity to meet area load needs during seasons with extremely hot weather. The 90/10 forecast is produced by PJM to depict peak loading that has a 10 percent probability of occurring in any given year. For capturing peak historical loadings, Pepco’s methodology uses actual load readings for each component during years of extreme (one in ten year) weather. For years when less than extreme weather occurs, Pepco uses the load of the latest extreme summer, making adjustments to the load to account for prospective new businesses (PNBs), load transfers, DERs and other factors. By employing this historical loading methodology, Pepco can seamlessly transition from the historical loads used to develop its short-term plan to the long-term forecast using the PJM 90/10 loads as the basis for the trend in growth. This process also assures that no peak load used for future planning is more than 10 years old.

⁸ On occasion, this method will result in a value that is less than the peak load encountered in the year prior to the current. This may occur because actual load growth on a feeder is greater than what Pepco would arrive at through its calculation (i.e., the addition of new load only from new build). In such cases, Pepco will use the actual peak load (i.e., via SCADA and AMI readings) from prior years as the Analyzed Historical Peak Load, to ensure that it is planning the distribution system to meet its maximum load requirement.

this value may be negative such as when an existing customer facility closes. New loads are added at the anticipated level of load that Pepco expects a building of the same size and energy use would add to the distribution system.

- **Load Transfers** – These are projects that Pepco conducts to utilize available capacity in one portion of its distribution system to help meet a projected capacity shortfall in another part of the system. Such projects may include rerouting feeders from one substation or another or transferring a portion of one feeder to another feeder. These types of projects occur seasonally on the distribution system and are a way of managing load without undertaking more expensive upgrades or construction. Such projects are planned ahead of time and have an impact on the forecast in future years, and are thus accounted for in the process. It is important to note that these are permanent redistributions of load that must not cause a total projected load to exceed the normal rating of the component, as opposed to the contingency load transfers which occur during outages to help sectionalize and restore customers' service and can result in a component operating up to its emergency rating.
- **Load Reductions from DERs** – Distributed energy resources may, depending on their operation, reduce peak load. Whether or not these resources reduce peak load depends on the coincidence of the resource with the time of peak load on a particular distribution system component. The degree to which a DER contributes to a reduction in peak load depends on its output (which may be variable) and its contribution to total load at the time of peak load.
- In addition, energy efficiency measures that are known are reflected in the historical loads that are being measured for each facility.

1.2.4 Long-Range Forecast

Upon completion of the short-range forecast, Pepco then completes the long-range forecast for years 4-10. Pepco's process for completing the long-range forecast generally occurs via the following steps:

- 1) Pepco first conducts a trending of the short-range forecast beyond its duration (within years 1-3) and into the window of the long-range forecast (years 4-10).
- 2) Pepco then adjusts this trending of peak load for each feeder, substation transformer, and substation for larger-scale system changes and factors that are known to be planned within the long-range forecast window. These changes may include considerations such as major long-term redevelopment initiatives within a geographical area.

- 3) Finally, Pepco adjusts the projected year-by-year long-range peak load growth on each distribution system component such that the growth rate of the system-level peak load of Pepco's long-range forecast is reconciled with the rate of growth within the corresponding PJM long-range load forecast. The following paragraphs provide further elaboration on this point.

Pepco reconciles the growth rate of its long-range forecast with PJM's 90/10 long-range forecast to ensure consistency across the planning process of the entirety of the power delivery system, inclusive of the distribution system under Pepco's purview and the transmission and generation systems under PJM's purview.

Pepco must plan for the reliable operation of each feeder, substation transformer, and substation at its individual peak load (MVA). These individual equipment peak loads generally do not coincide with one another, and are thus generally referred to as being "non-coincident" peaks. Moreover, the sum of individual non-coincident equipment peaks generally exceeds the peak load demanded of the collective whole at any given time. In other words, Pepco must plan for its "non-coincident" peaks for each component of the distribution system while PJM must plan for the coincident peak that the transmission system is required to serve.

1.2.5 Feeder, Substation Transformer, and Substation Analysis Process

Once the peak load forecast is completed, Pepco analyzes the capabilities of each distribution system component to ensure that it can reliably meet its forecasted peak loads. Planners use the PNB and DER information gathered in the load forecasting process along with historical AMI customer load data, SCADA and electrical configuration information from Pepco's geographic information system (GIS) to model each feeder in its power flow analysis software. From this analysis, predicted system violations such as low voltage and thermal overloads are identified and resolved through the system recommendations process.

1.2.6 System Recommendations Process

Upon completing its analysis process, Pepco considers the specific predicted system violations to develop recommended actions, which may consist of:

- 1) **Operational measures** – Resetting relay limits, conducting phase balancing, or other measures;

- 2) **Load transfers** – Conducting field switching to transfer load from a higher loaded feeder to a lower loaded feeder;
- 3) **Short-range construction projects** – Feeder extensions, installation of capacitors or voltage regulators, reconductoring, NWA solutions; and
- 4) **Long-range construction projects** – New feeder extensions, new substation transformers or entirely new substations.

Once the recommended actions are identified, an area plan containing construction recommendations is issued.

1.2.7 Factors Guiding the Consideration of DERs in Pepco’s Peak Load Forecast

DERs are considered in the peak load forecast and are therefore reflected in the entirety of the distribution planning process which follows. How or whether a DER is counted as providing a peak load reduction depends on the availability of that resource during the peak load time for the component of the distribution system being assessed. The magnitude of impact of a DER to be counted toward reducing load depends on the level to which that resource can be relied upon to provide a load reduction at that specific point in time when the peak load will occur on the component being assessed.

1.2.7.1 Availability of a DER at the time of Peak Load

A DER may or may not be available or in operation at the time of distribution feeder, substation transformer, or substation peak load. This is an important factor that has an impact on how the resource is considered in the peak load forecast, and ultimately the entirety of the planning process. The examples below illustrate some of the potential scenarios to be contemplated when incorporating DERs in the planning process:

- A customer completes an energy efficiency upgrade consisting of the installation of a new energy efficient air conditioning unit in place of an old unit – this would result in a permanent load reduction, and thus this DER (the EE upgrade)—if known to Pepco—would be fully available at the time of peak load on the distribution feeder, substation transformer, and substation from which this customer is provided service, and would thus be considered a resource that reduces peak load on these components.
- An industrial customer installs a large diesel generator, which is run on occasion to supplement the customer’s energy usage at the time of the customer’s maximum energy demand, which occurs seasonally in mid-spring, and not in the summer when the local distribution system

experiences a peak load. Therefore, the diesel generator would not be a resource toward reducing peak load on the distribution feeder, transformer, and substation from which this customer is provided service.

- Several customers install small scale residential solar systems on their roofs. In a given area, these DERs would be considered available at the time of peak load on the distribution feeder, substation transformer, and substation from which these customers are provided service. The total percentage of nameplate capacity considered to be available can be determined using a backcasting analysis which relates the hourly capacity factor⁹ of the DERs, the hour of the peak load on the component, and the total nameplate capacity on the component.
- A commercial developer installs a utility-scale battery system on a distribution feeder that is discharged during peak load periods on the transmission system. Therefore, most likely this would not be a resource counted toward reducing peak load on the distribution feeder, substation transformer, and substation from which this customer is provided service, because distribution system peaks do not necessarily coincide with the peak load on the transmission system.

In order to be considered as a planning resource, a DER must be “firm.” In other words, it must be available at the time of peak load. Pepco’s system planning criteria dictate that a DER is considered firm and is thus a dependable resource for peak planning purposes, if it is available (or coincides) 95% of the time with the peak on whichever component of the distribution system is being evaluated (feeder, substation transformer, or substation).

Planners, however, must also consider the consequences to the system when the DER is not available such as after restoration from a momentary or sustained power outage. For example, current industry standards and local electric codes mandate that all inverter-based systems (e.g., solar PV) automatically disconnect from the utility feeder upon loss of power.¹⁰ When the feeder is reenergized, loading observed on that feeder is now the full load without the reduction from the solar generation until the inverters reconnect the customer PV back to the distribution system, which generally occurs after a minimum of five minutes. For planning purposes, the reduction from solar PV is added back into the loads of each distribution system component and those loads are compared to the emergency capacity ratings of the feeders and substation transformers and to the firm capacity rating of the substation. This

⁹ Capacity Factor is defined as the average power generated for a specified period of time divided by the rated nameplate power of the generating asset.

¹⁰ IEEE 1547.

ensures that Pepco maintains adequate capacity during times when customer generation is unavailable, consistent with its regulatory obligation to provide safe, reliable electric service. Actions to be taken by the planners as a result of this analysis will depend on which component is overloaded and what actions that can be taken to mitigate the overload until the solar PV systems begin to generate and reduce customer net loads. For example, if the only overload that exists is at the substation level, then restoration can be performed in stages to mitigate the risk of an overload and no further system enhancements would be needed.

Planners also consider the effects of distributed generation being offline during an outage event when automatic sectionalizing and restoration (ASR) schemes are operated through automated inline and tie switching devices. These ASR schemes are designed to automatically operate in order to isolate a fault during a feeder outage event and restore as many customers as possible. During the outage event, it is anticipated that all distributed generation on the affected feeder will have tripped off due to loss of utility power. Planners must analyze the potential transfers¹¹ to examine if the receiving feeder/substation transformer/substation can handle the extra load being transferred to it through automated switching. Planners design ASR schemes to maximize the amount of time during the year that there is adequate capacity to back-up an adjacent feeder.

1.2.7.2 Magnitude of Impact (kW) of a DER at the time of Peak Load

While some resources which meet the firm criteria are considered permanent load reductions (e.g., CVR, EMTs and other programmatic energy efficiency) additional analysis is required for other types of DERs to calculate the magnitude of the impact of the resource. This is particularly evident for variable generation sources such as solar PV. Over the course of a 24-hour period, hourly production of solar PV can range from 0% to 100% of nameplate capacity. Therefore, calculating the magnitude of the impacts requires considering several pieces of related information:

- 1) Actual or simulated production of the resource (in the case of distributed generation without dedicated metering and telemetry, a backcasting process is used to simulate production based upon conditions in a representative area);

¹¹ The total load to be transferred would be equal to the load that existed just prior to the outage plus the total available PV generation on the circuit. Once all load is transferred and customers are restored to service, the solar PV systems will be restored and load will be reduced to pre-outage levels.

- 2) The amount of nameplate capacity of the DER interconnected to a distribution system component; and,
- 3) The hour and magnitude (MVA) of the peak for the distribution system component being evaluated.

1.2.8 Customer Growth Projections and Historical Comparisons¹²

Pepco's System Planning group forecasts electric load growth in order to plan for future additions to the electric system. Changes in the number of customers do not necessarily correspond to a similar change in load since neighborhoods containing specific types of customers may be redeveloped into ones containing different types of customers with different load characteristics. For example, former industrial zoned districts can be re-zoned to permit mixed use development. In addition, existing customers may increase their load, which has no effect on the customer count. Both new customer additions and increases in existing customer load are factors used in forecasting load growth. The increase or decrease in the number of customers can have an impact on system load. However, the more critical information is the amount of load that a customer uses. Thus, Pepco focuses on forecasting system load growth with future development and associated customer counts as an input.

District of Columbia customer counts for six years (2014-2019) are provided on a substation basis in Table 1.2-A. Substations have been assigned to District of Columbia wards based on their location rather than the area that they serve.

1.2.9 Load Growth Projections and Historical Comparisons

Table 1.2-B provides six years of historical loads, and Table 1.2-C provides Pepco's projections for electric load growth in the District of Columbia for 2020 to 2029. The 33 substations listed in Table 1.2-B represent all the 13 kV distribution substations as well as the 4 kV substations not supplied by

¹² In Order No. 12735 issued on May 16, 2003, the Commission directed (paragraph 139) the following:
139. PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:

- (a) Customer growth projections by District of Columbia wards (including historical comparisons);*
 - (b) Load growth projections encompassing commercial and residential development by District of Columbia wards (including historical comparisons);*
- The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.*

In Order No. 12804 (paragraph 53) the Commission directed the following:

53. *The 2003 PIP is hereby APPROVED, provided that PEPCO:*

- (a) Provide the projected zonal and projected default (i.e., SOS) load data for the District of Columbia to the PIWG on a quarterly basis as well as in the 2004 and subsequent PIPs;...*

a listed 13 kV substation within the District of Columbia. Pepco tracks and projects load by substation. Substations have been assigned to one of the eight District wards based on the substations' locations rather than the area where they serve. Because feeders may cross ward boundaries, all feeders emanating from a substation will be assumed to supply load in the ward to which that substation is assigned.

The District has experienced uneven overall load growth from 2014 to 2019, as there are certain neighborhoods that have been growing relatively rapidly and other neighborhoods that have actually reduced load. Pepco attributes the reduction in loads to a marked increase in the number of customer owned photo voltaic (PV) solar generation connections and energy efficiency measures. Pepco's planning process examines historical load data on its substations and feeders, then examines PNB report data and internal and external reports regarding the load reductions due to DERs to develop a short-term forecast for each feeder and substation. Pepco uses trends developed in the short-term forecasting process combined with information about long-term neighborhood development projects and DERs to determine the long-term forecast for each feeder and substation. The trend analysis also takes into consideration energy efficiency activities that customers have supported during the past years and further uses AMI data from recently constructed buildings to refine expected loadings for new buildings. Developing energy usage trends will reflect these reductions in aggregate and are included in the decision-making process to determine when and where increased capacity is needed.

1.2.10 Mt. Vernon Square Substation

The load predictions for the Mt. Vernon Square substation project have been relatively consistent since the project was introduced in the 2013 Consolidated Report.

Facility: Northeast Sub. 212 Southwest LVAC Group

Summer Summer Rating = 50.0 MVA

	2015 Anticipated	2016 Anticipated	2017 Anticipated	2018 Anticipated	2019 Anticipated	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated
2019 ACR					41.6	43.4	47.5	49.2	53.4
2018 ACR				37.4	41.6	43.4	47.5	49.2	53.4
2017 ACR			34.4	39.7	40.1	44.9	48.5	51.6	52.8
2016 ACR		40.3	43.3	45.9	47.8	49.9	51.1	52.8	53.4
2015 ACR	38.7	40.3	43.5	46.6	49.2	52.0	54.5	56.6	60.0
2014 ACR	41.0	42.1	43.6	46.8	48.6	51.2	53.2	55.1	56.9
2013 ACR	41.6	44.3	46.5	48.8	50.9	53.1	55.2	57.5	-

Current and Previously Forecasted Loads for Northeast Sub. 212 SW LVAC Group

The amount of development currently occurring in the Mt. Vernon Triangle area, including Capitol Crossing, is evidence that the existing load forecast is in line with actual and developing load. As previously stated, the ten-year forecast is conducted each year and a reduction in the forecast could lead to a deferral of the Mt. Vernon substation if warranted. Pepco is tracking active and planned development projects in the NoMa, Mt. Vernon Triangle and Capitol Crossing areas. This currently includes over 15,000 apartment type residential units, 1,300 hotel rooms, 2.5 million square feet of retail space and 6.5 million square feet of office space. The load forecast, which includes contributions of historical and forecasted DERs conducted this past year, shows a slightly reduced forecast for the Northeast Sub. 212 Southwest LVAC Group to the point where it is no longer predicted to exceed group firm capacity until 2023. Therefore, the substation projected in-service date has been deferred to June 1, 2023.

1.2.11 Incorporation of Field Information into the Planning Process¹³

Pepco's planning process incorporates equipment condition assessments (ECA) and other field information into its short-term and long-range plans, when applicable. The planning group creates long-range plans to upgrade or replace utility infrastructure evaluated to be approaching end-of-life.

The planning group is an active participant in ECA meetings and is the sponsor of substation transformer and switchgear replacement projects. The planning group participates in decision making regarding actions to take when equipment is evaluated to be near end-of-life, including whether to replace the equipment in kind or through a new capital project. The decision depends upon how close to failure a piece of equipment is evaluated to be, what other load-driven or reliability-driven capital projects are in the area, and the age and condition of other equipment in the substation.

¹³ Order No. 16975 states the following at paragraphs 89 and 116:

89. Decision: The Commission believes that OPC's recommendation has merit. However, we understand that equipment condition assessments may be included within the distribution system planning process, as shown in the description of the Pepco Planning Process provided by OPC at "Existing System Analysis." We direct Pepco to explain in the 2013 Consolidated Report the extent to which field information is considered within "Existing System Analysis."

116. Pepco is DIRECTED to provide field information consistent with paragraph 89 herein;

TABLE 1.2-A: D.C. Historical Customer Counts per Substation

Ward	Substation Number	KVLEV	2014			2015			2016			2017			2018			2019			2014 - 2019 Avg. Trend			
			Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	
Ward 1	10	19784	1556	21319	20856	1487	22343	21189	1548	22705	20380	1441	21827	21026	1441	22487	21337	1461	22738					
	13 (4kV)	433	2968	3248	2805	3452	2789	254	3063	750	74	824	870	76	746	654	69	723						
	13 (13kV)	13	7616	694	8280	7976	671	8647	7889	658	8527	8498	638	9197	8848	712	9300	8734	723	9457				
	25	9924	1154	11078	10256	1098	11565	10494	1114	11608	12308	1213	13719	12911	1210	14121	13101	1221	14322					
	Subtotal - Ward 1	40262	3663	43925	41893	3504	45397	42351	3572	45923	42141	3426	45587	43255	3459	46714	43826	3474	47300			1.71%	-1.05%	1.48%
Ward 2	2	9155	1804	10959	8616	11637	9658	1908	11844	10256	1895	12151	10488	1915	12401	10558	1912	12470						
	12	6288	1429	7637	6516	7718	6337	1467	7804	6340	1454	7784	6315	1466	7781	6668	1474	8162						
	18	3384	566	3959	3274	494	3768	3270	577	3947	3318	554	3892	3351	540	3891	3484	550	4044					
	21	22	205	44	222	206	44	222	206	43	238	281	57	248	305	56	238	294						
	52	138	7109	1326	8435	9059	1432	10491	8097	1500	10197	9399	1336	10735	9417	1350	10767	9528	1358	10886				
Subtotal - Ward 2	29156	7050	36206	32040	7002	39042	31834	7463	39297	32978	7223	40201	33552	7317	40869	34098	7309	41407			3.18%	0.72%	2.72%	
Ward 3	38 (13kV)	5538	383	5921	5385	363	5743	4891	288	5149	3420	268	3683	3410	270	3630	3425	253	3678					
	38-5 (4kV)	148	3	151	0	0	0	0	0	0	0	0	0	0	0	0	0	0						
	77	6175	587	6762	6217	595	6812	6242	619	6991	6048	616	6984	6031	617	6938	6079	616	6955					
	93	433	728	15	743	704	17	721	711	728	715	15	730	716	14	730	711	15	728					
	Subtotal - Ward 3	30674	2396	33070	31350	2304	33654	31388	2369	33757	30765	2348	33113	30883	2332	33215	30729	2317	33046			0.04%	-0.67%	-0.01%
Ward 4	27	8781	683	9464	8115	621	8736	8128	633	8781	7565	564	8129	7161	513	7674	7192	522	7714					
	190	20050	1542	21572	21226	1496	22822	22013	1568	23671	23088	1621	24719	23497	1612	25109	23436	1584	25019					
	28811	2225	31036	29241	2117	31358	30141	2191	32332	30683	2185	32848	30658	2125	32783	30627	2106	32733			1.23%	-1.09%	1.07%	
	Subtotal - Ward 4	190	20050	1542	21572	21226	1496	22822	22013	1568	23671	23088	1621	24719	23497	1612	25109	23436	1584	25019				
	Subtotal - Ward 5	25214	2226	27440	25380	2173	27553	26243	2215	28458	28450	2474	30924	30033	2586	32619	30749	2597	33346			4.05%	3.13%	3.98%
Ward 6	133	16534	1819	18353	16507	1804	18311	16768	1781	18529	17385	1756	19141	17807	1797	19004	18124	1785	19609					
	212	8680	407	9087	8873	369	9242	9475	454	9929	11095	718	11783	12226	789	13015	12625	812	13437					
	Subtotal - Ward 6	17066	2373	19439	18375	2331	20706	19776	2510	22286	21924	2404	24328	23560	2431	25991	25545	2435	27990			8.40%	0.52%	7.56%
	Subtotal - Ward 7	86	433	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
	Subtotal - Ward 7	39540	3493	43133	40455	3108	43363	42594	3444	46038	43314	3438	46753	43022	3403	46425	43645	3398	47043			1.94%	-0.55%	1.75%
Ward 8	8 (4kV)	433	329	94	423	353	95	448	368	97	455	371	464	9	464	12	464	188	4256					
	8 (13kV)	138	7068	846	7984	7455	741	8196	7503	733	8226	528	467	5735	5315	495	5800	5362	484	5836				
	138	14641	1322	15963	15300	1290	16250	15324	1248	16572	17618	1518	19134	1518	19462	17607	1496	19073						
	168	5226	632	5858	5496	6059	5466	6014	576	6041	5500	578	6076	5473	570	6043	5507	577	6034					
	Subtotal - Ward 8	27294	2864	30158	28574	2688	31263	28651	2653	31304	28757	2651	31408	28731	2628	31359	28478	2578	31056			0.89%	-2.08%	0.59%
DC TOTAL	238117	26290	264407	247308	25228	272536	262978	26417	279395	268992	26150	285142	263894	26281	288975	267697	26214	293811			2.37%	-0.06%	2.14%	

Table 1.2-A

Historical District of Columbia Loads									
Loads in Mega-Volt-Amperes (MVA)									
Ward 1	Sub. Number		2014	2015	2016	2017	2018	2019	
	10		135.4	135.7	143.0	125.6	127.1	127.5	
	13 (4.33kV)		10.0	9.4	9.9	3.1	2.5	2.2	
	13		32.5	31.7	33.0	31.9	34.3	33.6	
	25		40.1	39.1	44.0	50.2	51.0	56.0	
	Subtotal - Ward 1		218.0	215.9	229.9	210.8	214.9	219.3	Avg. Trend = 0.12%
Ward 2	Sub. Number		2014	2015	2016	2017	2018	2019	
	2		159.1	151.7	154.1	147.6	146.9	143.1	
	12		104.8	105.9	106.6	104.2	102.5	100.8	
	18		129.7	126.9	134.3	128.3	126.0	127.7	
	21		36.5	36.4	36.3	37.1	39.9	33.7	
	52		177.4	175.9	175.8	157.0	154.7	159.7	
	74		48.1	43.8	43.3	41.0	41.8	42.3	
	124		103.2	99.7	101.5	98.5	96.2	93.4	
	197		120.5	116.5	117.5	112.4	107.2	104.1	
	Subtotal - Ward 2		879.3	856.8	869.4	826.1	815.2	804.8	Avg. Trend = -1.76%
Ward 3	Sub. Number		2014	2015	2016	2017	2018	2019	
	38		46.1	46.3	47.3	37.5	36.7	38.7	
	38 (4.33kV)		3.9	0.0	0.0	0.0	0.0	0.0	
	77		67.0	70.0	68.7	64.3	64.9	66.9	
	93 (4.33kV)		4.0	3.2	5.4	3.0	3.4	4.4	
	129		150.2	151.5	162.1	159.3	162.7	153.5	
	145 (4.33kV)		2.8	2.5	3.1	2.4	2.6	2.5	
	146 (4.33kV)		4.0	3.6	5.8	5.4	4.8	5.4	
	Subtotal - Ward 3		278.0	277.1	292.4	271.9	275.1	271.4	Avg. Trend = -0.48%
Ward 4	Sub. Number		2014	2015	2016	2017	2018	2019	
	27		36.6	31.4	34.1	34.1	36.4	35.6	
	190		80.7	84.0	88.9	89.0	87.3	90.5	
	Subtotal - Ward 4		117.3	115.4	123.0	123.1	123.7	126.1	Avg. Trend = 1.46%

Table 1.2-B

Historical District of Columbia Loads									
Loads in Mega-Volt-Amperes (MVA)									
Ward 5	Sub. Number		2014	2015	2016	2017	2018	2019	
	133		99.1	97.0	108.2	101.8	106.2	103.4	
	212		79.9	79.5	83.9	106.9	116.2	122.1	
	Subtotal - Ward 5		179.0	176.5	192.1	208.7	222.4	225.5	Avg. Trend = 4.73%
Ward 6	Sub. Number		2014	2015	2016	2017	2018	2019	
	Sta. 'B'		118.7	110.7	119.3	123.1	56.5	55.7	
	33		16.3	16.5	17.1	16.4	16.1	15.8	
	117		108.5	104.1	112.7	104.5	101.4	105.7	
	161		109.5	114.7	112.3	108.5	107.1	103.1	
	223		0.0	0.0	0.0	0.0	78.0	77.5	
	Subtotal - Ward 6		353.0	346.0	361.4	352.5	359.1	357.8	Avg. Trend = 0.27%
Ward 7	Sub. Number		2014	2015	2016	2017	2018	2019	
	7		160.7	160.2	158.5	159.7	162.3	159.1	
	Subtotal - Ward 7		160.7	160.2	158.5	159.7	162.3	159.1	Avg. Trend = -0.20%
Ward 8	Sub. Number		2014	2015	2016	2017	2018	2019	
	8 (4.33kV)		1.5	1.5	1.6	1.2	0.9	0.8	
	8		25.8	25.9	27.6	17.5	22.5	24.4	
	136		80.6	80.3	89.5	91.2	93.4	93.9	
	168		21.6	19.3	20.7	20.6	20.5	22.7	
	Subtotal - Ward 8		129.5	127.0	139.4	130.5	137.3	141.8	Avg. Trend = 1.83%
	DC TOTAL		2314.8	2274.9	2366.1	2283.3	2310.0	2305.8	Avg. Trend = -0.08%
Notes: All substations supply 13.8kV of primary power unless otherwise noted.									
Loads shown are actual readings taken during peak summer conditions.									
Totals shown are the sum of undiversified peak loads and are not meant to be used as official									
Pepco system peak loads.									
Trends shown are based on the straight line regression of the loads and include transfers amongst									
the substations.									

Table 1.2-B (con't)

Forecasted District of Columbia Loads											
Loads in Mega-Volt-Amperes (MVA)											
Ward 1	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	10	165.2	163.0	163.2	163.6	163.9	164.1	164.5	164.7	165.1	165.5
	13 (4.33kV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	13	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	25	57.6	56.9	56.9	56.9	56.9	56.8	56.8	56.8	56.7	56.6
	Subtotal - Ward 1	222.8	219.9	220.1	220.5	220.8	220.9	221.3	221.5	221.8	222.1
										Avg. Trend =	-0.03%
Ward 2	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	2	178.9	178.4	178.5	178.6	178.6	178.7	178.8	178.9	178.9	178.9
	12	120.9	120.6	120.7	120.8	120.8	120.9	121.0	121.1	121.1	121.1
	18	156.1	156.5	157.1	157.7	158.3	158.9	159.5	160.1	160.7	161.3
	21	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2
	52	194.7	194.7	195.2	195.6	196.1	196.5	197.0	197.4	197.9	198.4
	74	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7
	124	113.1	113.0	113.1	113.2	113.3	113.4	113.5	113.6	113.7	113.8
	197	127.8	127.9	128.1	128.3	128.5	128.7	128.9	129.1	129.3	129.5
	Subtotal - Ward 2	981.4	981.0	982.6	984.1	985.5	987.0	988.6	990.1	991.5	992.9
										Avg. Trend =	0.13%
Ward 3	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	38	48.9	48.2	48.2	48.2	48.2	48.3	48.3	48.3	48.3	48.3
	38 (4.33kV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	77	75.8	74.0	74.1	74.2	74.3	74.4	74.5	74.5	74.6	74.7
	93 (4.33kV)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	129	180.4	178.5	178.5	178.6	178.6	178.7	178.7	178.7	178.8	178.9
	145 (4.33kV)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
	146 (4.33kV)	5.6	5.6	5.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	Subtotal - Ward 3	317.2	312.8	312.9	313.0	313.1	313.4	313.5	313.5	313.7	313.9
										Avg. Trend =	-0.12%
Ward 4	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
	27	31.4	31.2	31.1	31.1	31.0	31.0	30.9	30.9	30.8	30.7
	190	124.8	123.4	123.3	123.2	123.1	123.0	123.0	122.9	122.8	122.7
	Subtotal - Ward 4	156.2	154.6	154.4	154.3	154.1	154.0	153.9	153.8	153.6	153.4
										Avg. Trend =	-0.20%

Table 1.2-C

Forecasted District of Columbia Loads												
Loads in Mega-Volt-Amperes (MVA)												
Ward 5	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
	133	122.8	119.6	109.8	109.4	108.9	108.4	108.0	107.6	107.3	107.0	
	212	157.4	175.0	190.0	199.7	208.4	213.0	218.3	224.3	228.3	232.3	
	Subtotal - Ward 5	280.2	294.6	299.8	309.1	317.3	321.4	326.3	331.9	335.6	339.3	
												Avg. Trend = 2.15%
Ward 6	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
	Sta. 'B'	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	31.0	
	33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	117	119.5	119.4	119.5	119.6	119.7	119.7	119.8	119.9	120.0	120.1	
	161	116.1	116.7	117.3	118.2	118.8	120.8	121.7	122.6	123.1	123.6	
	223	163.5	166.4	169.8	173.2	176.6	180.1	183.5	186.9	190.4	193.9	
	Subtotal - Ward 6	430.1	433.5	437.6	442.0	446.1	451.6	456.0	460.4	464.5	468.6	
												Avg. Trend = 0.96%
Ward 7	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
	7	178.0	176.1	175.8	175.4	175.0	174.7	174.3	174.0	173.7	173.4	
	Subtotal - Ward 7	178.0	176.1	175.8	175.4	175.0	174.7	174.3	174.0	173.7	173.4	
												Avg. Trend = -0.29%
Ward 8	Sub. Number	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
	8 (4.33 kV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	8 (13.8 kV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	136	144.2	143.6	145.1	146.7	148.3	149.9	151.5	153.1	154.7	156.3	
	168	23.1	22.2	22.1	21.9	21.7	21.5	21.3	21.1	21.0	20.9	
	Subtotal - Ward 8	167.3	165.8	167.2	168.6	170.0	171.4	172.8	174.2	175.7	177.2	
												Avg. Trend = 0.64%
	DC TOTAL	2733.2	2738.3	2750.4	2767.0	2781.9	2794.4	2806.7	2819.4	2830.1	2840.8	
												Avg. Trend = 0.43%
Notes: All substations supply 13.8kV of primary power unless otherwise noted.												
Totals shown are the sum of undiversified peak loads and are not meant to be used as official Pepco system peak loads.												
Totals shown for first two years include planned transfers, the last eight years do not show planned transfers.												

Table 1.2-C (con't)

On a system basis, Pepco’s control area loads over the ten-year period between 2009 and 2019 are provided below in Figure 1.2-C.

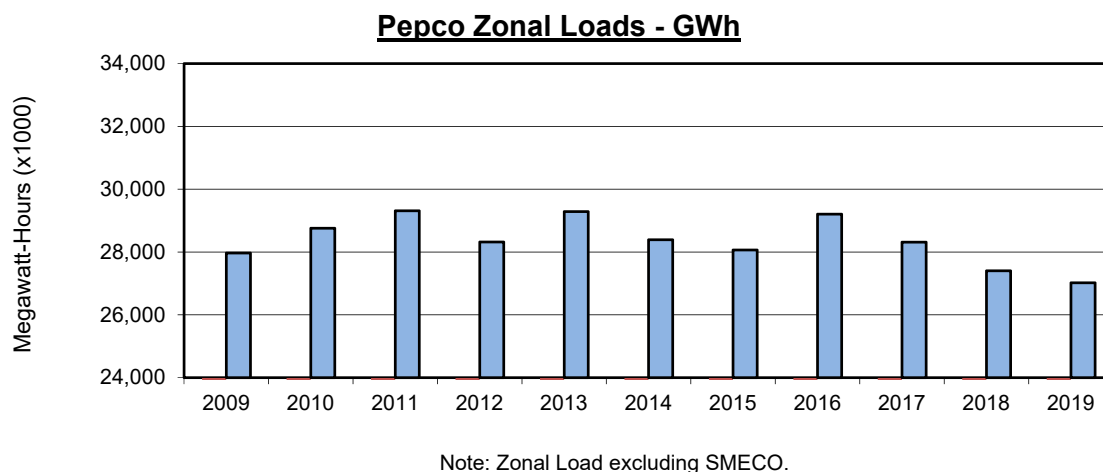


Figure 1.2-C

Pepco’s projected monthly and annual zonal loads for 2020 are provided in Table 1.2-D. Pepco’s zonal loads are for the Pepco distribution system (Maryland and District of Columbia), excluding the Southern Maryland Electric Cooperative (SMECO) and include demands for Pepco distribution customers.

<u>2020 Forecast -- Pepco Zonal Load*</u>													
(x 1,000)													
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
MWh	2,261	1,972	2,003	1,765	1,870	2,139	2,497	2,412	1,986	1,851	1,848	2,074	24,677
*Excludes SMECO load													

Table 1.2-D Pepco Zonal Load

1.2.12 POWER FACTORS AND ENERGY LOSSES¹⁴

Power Factors

The power factor provides one measure of how efficiently Pepco's electric system is being used. Substation load has two components: real power (kilowatts) and reactive power (kilovars). Real power is the power which serves the customers' end-use electrical devices. Reactive power does not serve customer requirements but decreases the substation's ability to deliver real power and increases system losses. This reduced ability to deliver real power is based on a substation's power delivery limitations. The power delivered is a combination of reactive and real power, so the greater the reactive power, the lower the real power that can be delivered. As the system power factor approaches unity, real power delivered is greater and system losses due to reactive power are reduced. By making appropriate use of capacitors, the reactive power flow on the electric system can be reduced such that it approaches zero. (When the reactive power flow is zero, the power factor is unity (*i.e.*, 1.0).) A unity power factor would be ideal and would result in the maximum usable power being delivered to the customers. However, a unity power factor is not technically or economically practical to maintain because of changing loads and system conditions.

Pepco plans for a 98% (.98) power factor or higher on its 4 kV and 13 kV distribution substations at the summer peak. Table 1.2-E below provides the percent of all Pepco's 4 kV and 13 kV distribution substations that had power factors $\geq 98\%$ at the summer peak hour for the years 2010 - 2018. In 2018, 92% of the 4 kV and 13 kV substations had a power factor of ≥ 0.98 at the summer peak hour.

¹⁴ In Order No. 10133, the Commission directed Pepco to include performance factors relating to the transmission and distribution (T&D) system in future PIPs.

"PEPCO...was directed to...provide in future PIP reports forecasts of plant performance factors which are based on analyses of both the projected performance and the prior year's actual performance"(page 10, Section B).

"...the Commission finds it entirely appropriate to include performance measures for PEPCO's transmission and distribution in the mix of issues examined by the PIWG and reported in the PIP"(page 12, third paragraph).

By way of compliance with the above requirements, in the September 1993 PIWG Meeting, Pepco proposed reporting performance data on its 13 kV distribution substation power factors.

% of Pepco Substations with Power Factors
Greater than 98% on Peak Summer Days
(System-wide)

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
% of 4 kV and 13 kV Substations with Power Factor \geq 0.98	96%	95%	96%	97%	97%	97%	97%	96%	92%	89%
Total Number of 4 kV and 13 kV Distribution Substations (Pepco system-wide)	116	116	116	115	115	113	112	112	113	113

Table 1.2-E: Power Factor

Annual System Energy Losses¹⁵

Table 1.2-F shows a ten-year comparison of annual system energy losses for PJM and adjacent utilities. 2009 through 2018 were obtained from the Federal Energy Regulatory Commission (FERC) web site. All data are from FERC Form 1. A comparison of annual system energy losses over the past ten years is provided for PJM utilities and utilities adjacent to the Pepco service territory. Pepco's system energy losses for 2018 are 3.79% or approximately 26% lower than the group average of 5.14%.

% Annual System Energy Losses:

$$\% \text{ Annual System Energy Losses} = \left(\frac{\text{Total Energy Losses (FERC Form 1, Line 27, page 401a)}}{\text{Total Energy (FERC Form 1, Line 28, page 401a)}} \right) \times 100$$

UTILITY	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Atlantic City Electric Company	4.94%	4.63%	5.61%	5.52%	5.15%	5.74%	5.78%	5.06%	6.27%	4.46%
Baltimore Gas & Electric Co. #	6.27%	5.77%	6.41%	6.17%	6.51%	6.24%	7.54%	6.36%	6.48%	6.67%
Delmarva Power & Light Co.	5.16%	5.25%	5.54%	4.52%	7.26%	5.39%	5.72%	7.92%	4.90%	4.77%
Jersey Central Power & Light Co.	5.07%	5.59%	6.35%	5.71%	8.39%	8.32%	8.60%	7.97%	7.99%	7.24%
Metropolitan Edison Company	5.37%	4.87%	4.71%	6.21%	5.30%	5.35%	7.41%	9.93%	7.95%	8.43%
Pennsylvania Electric Company	4.54%	5.45%	5.90%	6.08%	7.12%	8.23%	7.57%	6.35%	3.92%	6.67%
PPL Electric Utilities Corp.	6.04%	6.93%	6.55%	6.58%	6.66%	6.41%	6.07%	6.12%	6.12%	5.72%
PECO Energy Company	4.98%	5.25%	4.23%	5.67%	5.81%	5.69%	5.63%	5.69%	5.17%	5.13%
Potomac Edison Company #	3.81%	4.28%	2.07%	4.79%	5.12%	0.96%	1.96%	2.54%	3.09%	2.96%
Potomac Electric Power Co.	4.51%	4.38%	4.14%	4.12%	3.59%	4.01%	3.19%	2.90%	3.46%	3.79%
Public Service Electric & Gas	4.60%	4.13%	4.86%	3.99%	5.32%	4.25%	4.62%	4.58%	4.34%	3.78%
Virginia Electric & Power Co. #	2.63%	3.97%	3.12%	1.65%	2.07%	-0.79%	0.89%	-0.35%	1.20%	2.11%
ANNUAL AVG.	4.83%	5.04%	4.96%	5.09%	5.69%	4.98%	5.42%	5.42%	5.07%	5.14%

ADJACENT UTILITY

Table 1.2-F Annual System Energy Losses¹⁵ Industry comparison of annual system energy losses is presented in Table 1.2-F.

1.2.13 SUBSTATION ADDITIONS AND ENHANCEMENTS^{16 17}

The discussion below updates the information provided in the 2019 Consolidated Report. All planning data is based on current information, and may be revised as the Company completes final designs, fully evaluates site conditions, receives permitting and zoning requirements and receives final contract and equipment bids. This information could impact both the costs and timing of a project. Costs presented reflect forecasts based on approved budgets, and include related transmission, distribution, real estate, and permitting costs. Plans associated with the L Street Substation have been removed from this list as they are being rolled into the long-term Downtown Resupply plan described below.

Table 1.2-G reflects Pepco's planned substation additions and enhancements for the District of Columbia with their anticipated in-service dates based on current data and analysis, as well as approved budgets. In-service dates are therefore tentative and are adjusted as in-service dates become nearer.

¹⁶ In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, Commissioner Meyers stated the following (page 266 of the hearing transcript):

But what we were talking about here yesterday was that the comprehensive plan would include... any rebuilt substations you might have; any new substations you might have...

¹⁷ Order No. 16975 states the following at paragraphs 50 and 101:

50. Decision: ...Consequently, we require Pepco to include a report on substation additions and enhancements in future Consolidated Reports. In addition to the information provided in the 2012 Consolidated Report, the Commission requires that Pepco provide details concerning the justification for these projects, including, as applicable, load growth projections and equipment age and condition in future Consolidated Reports.

101. Pepco is DIRECTED to provide a report on substation additions and enhancements consistent with paragraph 50 herein;

#	<u>Project Cost</u>	<u>Project Description</u>	<u>Projected In-Service Date</u>	<u>Areas Served</u>
1	\$192.0 million	Harrison Sub. (Formerly Northwest Sub.) – Upgrade substation to replace aging infrastructure.	Dec. 2019 ¹	Friendship Heights, Chevy Chase
2	\$154.4 million	Mt. Vernon Square Sub. – Build new substation to relieve predicted network overloads.	June 2023	NoMa, Mt. Vernon Triangle, Shaw
3	\$192.4 million	Harvard Sub. – Upgrade Harvard as a new 230/13 kV substation to retire existing Harvard and Champlain substations.	June 2024	Columbia Heights, Adams Morgan
4	\$155.9 million	Champlain Sub. – Upgrade Champlain as a new 230/69/34 kV substation to resupply downtown distribution substations.	June 2026	Downtown

Table 1.2-G: Substation Additions and Enhancements

¹ This project went into service in December 2019.

Justification of Substation Additions and Enhancements

The new Harrison Substation upgrade replaces aging infrastructure and in order to meet area load growth. The new substation at Mt. Vernon Square is needed to provide capacity to the redeveloping Mt. Vernon Triangle and Shaw areas. The capacity improvements at the Harvard Substation are needed to replace aging infrastructure at the Harvard and Champlain Substations, and to create capacity to serve the growing Columbia Heights area. The new upgraded substation at Champlain will be used to re-supply existing L Street, F Street, and Georgetown substations with new solid dielectric feeders. Pepco has also projected capacity constraints and, thus, a potential need for a load-driven substation in the 2026-2028 timeframe in the St. Elizabeth’s and Columbian Quarter area of Ward 8. Future ACRs will discuss this project in more detail and as its load continues to develop.

1. Upgrade Harrison Sub. 38 (2019 Aging Infrastructure Project)

The upgraded Harrison Sub. 38 will be a 138 kV / 13 kV substation with an ultimate capacity of 150 MVA. All 13 kV load currently supplied from Harrison Sub. 38 has been temporarily supplied from equipment assembled on the site next to Harrison Sub. 38. This allowed for the existing substation to be de-energized so that the station could be upgraded on the site of the existing substation. Once construction is finished, all circuits will be transferred from the temporary equipment and the temporary equipment will be removed from the property. The re-built substation was energized in December 2019 and the transfer of all circuits to the permanent substation is scheduled to be completed in 2020.

Load Growth Projections:

Facility: Harrison Sub. 38

Summer Summer Rating = 144.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	40.0	48.9	48.2	48.2	48.2	48.2	48.3	48.3	48.3	48.3	48.3
Cumulative DER Impacts since 2011	1.5	1.6	1.8	2.5	2.6	2.6	2.7	2.7	2.7	2.8	2.9

Note: Loads shown include the net effects of converting and transferring the 4 kV load off of Harrison Sub. 38 to other area substations. Also 2019 historical loads shown include the temporary transfers to neighboring substations to prevent the temporary substation from exceeding its firm

Magnitude of Load: Approximately 49 MVA of load will initially be served from the upgraded Harrison Sub. 38. Approximately 70% of the load is in the District of Columbia. Additional load will be transferred from neighboring substations in the following years in order to provide capacity for future growth in those areas.

Identified Need: Project is needed to improve reliability by meeting load growth and replacing aging infrastructure.

Justification: The main building at Harrison Sub. 38 was constructed in 1940 and has had various additions over time. Harrison Sub. 38 – 13 kV substation is anticipated to exceed its firm capacity in the summer of 2025. The transformers are 47 to 60 years old. Transformer 1 has been assessed as impaired and will need eventual replacement. The switchgear is a double bus configuration and in need of replacement based on its assessed condition. Some of the switches are 52 years old with only a 500 MVA rating. This substation is already "landlocked", meaning that there is only access from the front or from a 12-foot driveway. Given that there is no additional space for new equipment, there is no realistic way that the existing equipment inside Harrison Sub. 38 can be upgraded without first removing it.

The existing 4 kV substations at Harrison Sub. 38 also needed replacement. Transformer 6 has been assessed as impaired and needs eventual replacement. Pepco completed work to convert and re-route existing 4 kV feeders in order to retire the 34/4 kV and 13/4 kV substations at Harrison Sub. 38 to eliminate the need to build a new 4 kV substation on the Harrison substation property.

Total Planned Capital Investment (Includes A & G): \$192.0 million. The estimate for Harrison substation has been increased to reflect construction bids received, and the construction of a temporary substation.

In-service Date: December 2019

Current Status: The new substation was energized in December 2019. The temporary substation was completed in the first quarter of 2017 and upgrades on the existing substation began in the first quarter of 2017. The transferring of all circuits to the permanent substation are scheduled to be completed in 2020.

Alternative: An alternative to upgrading the Harrison Sub. 38 would be to extend 17 feeders from Little Falls Sub. 77 and transfer all load from Harrison Sub. 38 to that substation.

The total cost of completing this alternative is also estimated to be approximately \$107 million and would leave Little Falls Sub. 77 without any spare substation bus feeder positions for future use. Also, it is predicted that Little Falls Sub. 77 will exceed its firm capacity in 2021 if this alternative work is completed, requiring the construction of a new substation at that time.

2. Construct New Mt. Vernon Square Area Substation (2023 Load Relief Project)

Overview: This project consists of constructing a new 230/13 kV substation with an ultimate capacity of 210 MVA near Mt. Vernon Square. It is currently planned to initially have three 230/13 kV transformers for a firm capacity of 140 MVA. This substation will provide distribution capacity to the rapidly redeveloping area in and around the Mt. Vernon Triangle. Initially, approximately 58.0 MVA of load would be transferred from the Northeast Sub. 212 Southwest LVAC Network Group and Tenth Street Sub. 52 radial distribution in 2023.

Load Projections:

Facility: Northeast Sub. 212 Southwest LVAC Group

Summer Summer Rating = 50.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	41.6	43.4	47.5	49.2	53.4	56.3	57.5	59.0	61.5	63.0	64.5
Cumulative DER Impacts since 2011	0.5	0.6	0.6	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4

Facility: Northeast Sub. 212

Summer Summer Rating = 214.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	134.9	157.4	175	190.0	199.7	208.4	213	218.3	224.3	228.3	232.3
Cumulative DER Impacts since 2011	1.6	1.8	2.0	3.2	3.3	3.3	3.4	3.5	3.6	3.7	3.8

Magnitude of Load: Initially, approximately 58.0 MVA of load would be transferred from the

Northeast Sub. 212 Southwest LVAC Network Group and Tenth Street Sub. 52 radial distribution in 2023.

Justification: The new Mt. Vernon Square Area Substation will provide relief to the Northeast Sub. 212 Southwest LVAC Network Group, which is expected to exceed its firm capacity in 2023 by approximately 7%, due to space limitations in the streets around the Northeast substation, no new feeder groups can be extended to relieve these overloads.

Over approximately 140 MVA of long-term growth is expected to come into service in the Mt. Vernon Triangle, NoMa, and Capitol Crossing areas over the next 8 years. This currently includes over 15,000 apartment type residential units, 1,300 hotel rooms, 2.5 million square feet of retail space and 6.5 million square feet of office space.

Total Planned Capital Investment (Includes A & G): \$154.4 million

Current Status: In design stages.

In-service Date: June 2023.

Alternative: An alternative to constructing Mount Vernon Substation in 2023 is to delay the construction of the facility until 2024. To facilitate this, a series of cascading load transfers are required to relieve Northeast Sub. 212 using Florida Avenue Sub. 10. This alternative is not practical due to load proximity. The feeders being extended from Florida Avenue Sub. 10 will be less reliable due to length and would reduce area operating flexibility as Florida Avenue Sub. 10 and the other area substations will all be loaded near their full capacity.

Multiple sites were evaluated for locating the proposed Mt. Vernon Square Sub. An alternative substation location was investigated along New York Avenue in Northeast DC. It was determined that the primary amount of development and load center of the new substation was in the Mt. Vernon Triangle area. Several sites were investigated in the Mt. Vernon Triangle area, but alternatives were rejected as too expensive or not offering required access to the nearby streets.

3. Upgrade Harvard Sub. 13 (2024 Aging Infrastructure Project)

Overview: This project consists of removing the current 34kV/13kV substation at Harvard Sub. 13 and upgrading to a new 230/13kV substation with an ultimate Firm Capacity of 210 MVA. It will initially have three 230/13kV transformers resulting in a Firm Capacity of 140 MVA. The upgraded Harvard Sub. 13 will serve all 13kV load supplied from the existing Harvard Sub. 13 and will provide capacity to enable the transfer of load from Florida Avenue Sub. 10 and partial load from Champlain Sub. 25. The remaining load of Champlain Sub. 25 will be transferred to Florida Avenue Sub. 10, allowing for the retirement of that facility as a distribution substation. The upgraded Harvard Sub. 13 will also provide capacity for future load growth in the Columbia Heights and Adams Morgan areas.

NOTE: Changes to the original plan for transferring all load of Champlain Sub. 25 to new Harvard Sub. 13 are due to feeder routing limitations discovered during field investigations.

Load Growth Projections:

Facility: Harvard Sub. 13

Summer Summer Rating = 39.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cumulative DER Impacts since 2011	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Magnitude of Load: Approximately 35 MVA of load is predicted to be supplied from the existing Harvard Sub. 13 in 2020 when construction of the new substation is scheduled to begin. During construction of the new Harvard substation, all load currently supplied by the existing Harvard Sub. 13 will be transferred temporarily to nearby substations. After the upgraded Harvard Sub. 13 is put into service, partial load from Florida Avenue Sub. 10 and Champlain Sub. 25 will be transferred to it. The remaining load supplied from Champlain Sub. 25 will be transferred to Florida Avenue Sub. 10, allowing for the retirement of the Champlain distribution substation.

Identified Need: This project is needed to retire aging infrastructure including Harvard Sub. 13 13 kV substation originally constructed in 1907, the 34 kV supplies to Harvard Sub. 13 from Buzzard Point Sta. “B”, constructed around 1960, and Champlain Sub. 25 13 kV substation, constructed around 1954. This upgraded substation will also supply capacity to the growing Columbia Heights and Adams Morgan areas.

Justification: Harvard Substation 13 was initially built in 1907 with the substation having undergone several refurbishments with the latest taking place in the mid-1960s. The 34kV supplies to Harvard Substation 13 were constructed in the 1940s. The last incarnation of Champlain Substation 25 was put into service in the mid-1950s although some portions of the site are likely older. Neither substation meets Pepco’s current standard for fault current withstand and are configured in a non-standard way

which could lead to longer restoration times for failures experienced inside the substation. In addition, completion of this project along with the project to resupply L Street Sub. 21 (Downtown 34-69kV Resupply) and the retirements of Anacostia Sub. 8 and Navy Yard Sub. 33 will enable the retirement of Buzzard Point Sta. B 13/34 kV substation. The upgraded Harvard substation will provide capacity to accommodate projected load growth in the Columbia Heights area.

Total Planned Capital Investment (Includes A & G): \$192.4 million (overall estimated cost of project increased due to inclusion of historic landmark nomination, demolition and civil engineering costs).

Current Status: In design stage

In-service Date: June 2024

Alternative: An alternative would be to maintain the Harvard and Champlain substations, replacing the switchgear in each substation. This was not considered a viable option as the switchgear would have to be demolished rather than removed because it is concrete encased. In addition, if this station is maintained, the 34 kV transformers at Harvard and Buzzard Point as well as the 34 kV supply feeders would have to be replaced. Even with these replacements, there would be little increase in capacity for future load growth.

4.Upgrade Champlain Sub. 25 to 230/69/34 kV substation (2026 Aging Infrastructure Project)

Overview: This project consists of removing the current 69 kV/13 kV substation at Champlain Sub. 25 and upgrading to a new 230 kV / 69 kV / 34 kV substation with an ultimate capacity of around 570 MVA. It will have three 230 kV / 69 kV transformers and four 69 kV / 34 kV transformers. From the upgraded Champlain Sub. 25, four new 69 kV supplies will be extended to serve F Street Sub. 74 and Georgetown Sub. 12 and four new 34 kV supplies will be extended to serve L Street Sub. 21. The supply feeder replacements for F Street Sub. 74 and Georgetown Sub. 12 are recommended so the existing, aged, fluid self-contained 69 kV supplies from Potomac River Sta. C can be retired. These feeders have had increasing maintenance issues over the past several years. The new 34 kV supply feeders to L Street Sub. 21 from Champlain are recommended to retire the existing 34 kV feeders from Buzzard Point which restrict the firm capacity available at L Street Sub. 21.

Load Growth Projections:

Facility: F St. Sub. 74

Summer Summer Rating = 82.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	45.9	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7
Cumulative DER Impacts since 2011	0.0	0.0	0.0	1.5	1.7	2.0	2.2	2.4	2.6	2.8	3.0

Facility: Georgetown Sub. 12

Summer Summer Rating = 132.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	121.3	120.9	120.6	120.7	120.8	120.8	120.9	121.0	121.1	121.1	121.1
Cumulative DER Impacts since 2011	2.3	2.6	2.9	3.1	3.1	3.1	3.1	3.2	3.2	3.2	3.2

Facility: L St. Sub. 21

Summer Summer Rating = 62.0 MVA

	2019 History	2020 Anticipated	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated
Net Load Forecast (MVA)	39.7	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2	43.2
Cumulative DER Impacts since 2011	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4

Magnitude of Load: Approximately 211 MVA of load will be served from the upgraded Champlain Sub. 25 as the existing F Street Sub. 74, Georgetown Sub. 12 and L Street Sub. 21 will all be supplied from new 69 kV and 34 kV feeders extended from Champlain.

Identified Need: This project is needed to retire aging 69 kV supply feeders to Georgetown Sub. 12 and F Street Sub. 74 and the aging 34 kV supply feeders to L Street Sub. 21.

Justification: These feeders are all over thirty years old. The 69 kV supply feeders are “self-contained” type cables, meaning that there is fluid contained inside the cable jacket for cooling purposes. There have been an increasing number of maintenance problems with this cable which require extended time and resources to resolve due to limited material availability and few contractors with expertise repairing this type of cable system. This increases customer outage risk as the feeder needs to be taken out of service for extended periods of time while repairs are made.

The new 34 kV supplies to L Street Sub. 21 will replace the solid dielectric and gas filled cables that are at least 30 years old. In addition, resupplying L Street will allow for the retirement of Buzzard Point 13 kV and 34 kV substations, the former of which was originally built in the 1930’s as a generating station. Another benefit of replacing the feeders is that the firm capacity at L Street will significantly increase.

Total Planned Capital Investment (Includes A & G): \$155.9 million. The increase in cost is due to the inclusion of costs associated with Takoma Sub. 500MVA phase shifters.

Current Status: In the early design stages.

In-service Date: June 2026

Alternative: The alternative would be to replace the 69 kV and 34 kV cables in kind with new solid dielectric from Potomac River and Buzzard Point. These extensions are far longer than they would be from the proposed new Champlain substation. Also, in the case of the 34 kV feeders from L Street Sub. 21, the Buzzard 34 kV and 13 kV substations would have to be rebuilt which is not cost efficient as L Street would be the only load to be supplied by Buzzard Point 13 kV and 34 kV once all other proposed work to transfer load from Buzzard Point 13 kV and 34 kV is completed.

1.2.14 DISTRIBUTION PROJECTS^{18 19}

Overhead and Underground Distribution Projects²⁰

Pepco's overhead and underground distribution project budgets over the past six years are provided in Table 1.2-H.

Pepco DC 2014 - 2019 Capital Budgets						
(Dollars in Millions)						
Distribution Construction	2014	2015	2016	2017	2018	2019
Customer Driven	\$53.0	\$55.4	\$67.2	\$68.7	\$71.3	\$85.4
Reliability	133.7	127.5	121.2	114.8	157.6	176.0
Load	36.4	51.8	45.0	20.4	71.9	62.9
TOTAL	\$223.1	\$234.7	\$233.4	\$203.9	\$300.8	\$324.3

Table 1.2-H: Historical Routine Overhead and Underground Distribution Projects

¹⁸ In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, Commissioner Meyers stated the following (pages 266-267 of the hearing transcript):
But what we were talking about here yesterday was that the comprehensive plan would include... anything that you might envision to account for distribution load growth...

¹⁹ Order No. 16975 states the following at paragraphs 51, 52 and 102:
 51. *Staff Recommendation #7: Continue to provide annual updates of on-going and planned OH and UG distribution projects driven by customer, reliability, and load considerations in future Consolidated Reports. Include budget as well as actual spending for each of the three categories and explanation of significant differences in actual versus budgeted amounts...*
 85. *Decision: The Commission adopts recommendation #7, noting that Section 1.2.4 of the Consolidated Report does not contain a comparison of actual vs. budgeted spending, nor does it include an explanation of any variances. Pepco is therefore directed to include this information in future Consolidated Reports.*
 102. *Pepco is DIRECTED to continue providing updates of on-going and planned overhead and underground distribution projects consistent with paragraph 52 herein;*

²⁰ In Order No. 12735 issued on May 16, 2003, the Commission stated the following at paragraphs 74 and 135:
 74. *During the November 2001 hearings the Commission requested that PEPCO submit a comprehensive plan to include a current assessment of, and future plans for, its underground distribution and network facilities.179 The Commission requested the plan as a tool to evaluate PEPCO's planning methodology and to assess PEPCO's ability to anticipate and respond to changing conditions in its underground distribution system...*

135. PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:

(c) *Listing of underground distribution projects, such as the Adams-Morgan neighborhood project (including budgets, time schedules, and expected benefits) by secondary vs. primary system by District of Columbia wards affected, but not specific locations;*
The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

Pepco's overhead and underground distribution project budgets for the next five years are provided in Table 1.2-J. In developing forecasts, system planners review each component of the existing electric system, along with requirements for new service hook-ups, to develop the costs and schedules for changes to the electric system. Results are then proposed as candidates for inclusion in the construction budget process, which takes place during the second half of each year. The construction budget process culminates with the approval of the following year's budget and the selection of projects to be included in the budget and four-year forecast of electric system additions. Projects may be added or deleted from the budget and four-year forecast from year to year as required. The summary budget and four-year forecast for overhead and underground distribution projects, which identifies types of projects and their respective budgets and forecasts for the years 2020 through 2024, is provided as Table 1.2-J.

Pepco DC 2020 - 2024 Capital Budget (Dollars in Millions)					
Distribution Construction	2020	2021	2022	2023	2024
Customer Driven	\$88.4	\$82.6	\$83.4	\$85.8	\$85.0
Reliability	176.5	260.0	278.6	208.6	244.9
Load	52.2	57.9	77.1	28.6	25.0
TOTAL	\$317.1	\$400.5	\$439.1	\$323.0	\$354.9

Note: Pepco only prepares a four-year forecast. Potential emergency restoration work is included in the Reliability budget and forecast. Prospective work for the DC PLUG initiative has been included in this plan.

Table 1.2-J: Planned Overhead and Underground Distribution Projects

Section 1.2.4

Pepco's overhead and underground distribution project variances for 2019 are provided here in Table 1.2-I, in accordance with Order No. 18644.

Pepco DC 2019 Capital Budget Variances (Dollars in Millions)			
	2019 Budget	2019 Actual	Variance
Distribution Construction			
Customer Driven	\$85.4	\$73.6	(\$11.8)
Reliability	176.0	164.5	(11.5)
Load	62.9	62.4	(0.5)
TOTAL	\$324.3	\$300.5	(\$23.8)

Table 1.2-I: 2017 Routine Overhead and Underground Distribution Project Variances

Pepco's 2019 actual spending on Load was within less than 1% of its original budget. While actual spend was within 7% on Reliability and 16% on Customer Driven of what was originally budgeted.

SECTION 1.3 – MAINTAINING SYSTEM RELIABILITY

Pepco is committed to maintaining a safe and reliable electric distribution system and has programs in place that advance the operation of the electric distribution system by increasing the capabilities to monitor and analyze the performance of its system and enhance the ability to determine where to make modifications and additions to replace poorly performing equipment. Pepco monitors the performance of its distribution feeders system-wide. This process is performed annually and enables Pepco to analyze and determine the relative ranking of each feeder’s performance from the least to the most reliable.

This section of the Consolidated Report addresses:

- Technology: Monitoring, Automation, and Information Systems;
- Equipment Standards and Inspections;
- Vegetation Management (VM) Program Detail;
- Industry Comparisons;
- Best Practices; and
- Storm Readiness.

1.3.1 TECHNOLOGY: MONITORING, AUTOMATION, AND INFORMATION SYSTEMS

Systems and Technology²¹

The discussion below addresses the Company's technology initiatives that contribute to improved reliability performance.

SCADA²²

The System Control and Data Acquisition (SCADA) System is the primary tool used by the System Operators to monitor and operate the electric system. This system provides the System Operator at the Control Center the ability to remotely monitor and operate all major equipment at all substations and selected equipment outside of the substations. It is through this system that the System Operator learns what is happening across the electric system and has the ability to take appropriate actions to maintain a safe and reliable system and restore service during outages.

The Remote Terminal Unit (RTU) at each substation gathers data from all substation monitored equipment and provides an interface to pass the data to the central computer system, Energy Management System (EMS), and to the System Operator, who can then remotely control devices at each substation. Major equipment status (open or closed) and equipment metering (watt, var, voltage and ampere) is monitored by the Operator. Additionally, there are specific equipment alarms that indicate abnormal conditions like high temperature, low oil pressure or overloads on a particular device or feeder.

Pepco maintains its own extensive communication system that allows for direct communication between the RTUs at the substations and the computer system at the Control Center.

The computer system at the Control Center gathers the data from all the RTUs, analyzes the data, displays results to the System Operators, and provides the interface for the System Operator to

²¹ In Order No. 12804 paragraph 53 E, the Commission ordered the following:

53. *The 2003 PIP is hereby APPROVED, provided that PEPCO:*

(e) *Provide to the PIWG, quarterly status reports on the new Technology Initiatives being undertaken by Pepco. An annual status report should be included in the 2004 and future PIPs. The status reports should include current accomplishments, plans for the future, and anticipated completion dates.*

²² The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001, at page 313.

remotely operate the system to protect equipment. Any change of electric system status at the substation is displayed to the System Operator within approximately 4 seconds. The system also provides various analyses. For example, it provides an indication if any substation equipment exceeds its capability limits. It does this by comparing the design limit of the equipment with the present loading. Through the SCADA system automatic switching activities can be performed or the System Operator can take action manually to protect remote system equipment and relieve the condition that caused the equipment to be operating outside of its limits.

All raw data from the SCADA system (meter values and status changes) are retained and made available to those areas (System Planning, Distribution and Engineering, etc.) that need the data for analysis. The available data consists of meter values (watts, vars, volts and amps) and status (open and closed) of various facilities, equipment and feeders.

Substation Automation²³

Although all 13 kV substations have full SCADA control, some 4 kV substations have only limited monitoring capability and do not have the full RTU capability that provides remote control and operation. At these substations all equipment status indications are grouped together on a substation basis and when there is a change of status, a single alarm point provides a single substation alarm indication. Personnel are dispatched to the substation to determine the specific problem. A project is underway to install full RTU capability in the Company's 4 kV substations that are not scheduled for conversion and retirement by installing smart relays on all critical equipment. This will provide for improved restoration capability and hourly data for analyses.

The following is the schedule for substation automation as currently planned:

- Macarthur Boulevard Sub. 152 (October/2020)
- Texas Ave Sub. 195 (December 2020)
- Fort Dupont Sub. 58 (Spring 2021)
- Fort Davis Sub. 100 (Fall 2021)
- Seat Pleasant Sub. 30 (Spring 2022)

²³ Substation Automation and the following section, Distribution Automation, are also addressed in Sections 2.3.2.1 and 2.3.2.3, respectively, as PIP Projects.

In addition, conventional electro-mechanical relays are being replaced with new generation Smart Relays. Additional information provided by these relays is allowing for more effective and efficient operation. In certain applications, the smart relays can provide information with respect to the distance from the substation to the fault on the feeder. This will allow for faster troubleshooting of system problems, improved restoration capability and increased data for system analyses.

Distribution Automation (DA)

As part of the DA projects, sixteen 13 kV substations have been equipped with upgraded Smart Relays and enhanced RTUs for improved visibility and control at these locations. Additional information provided by these relays will allow for more effective and efficient operation and will support the operation of the Automatic Sectionalizing and Restoration (ASR) system being installed at each location. The following sixteen 13kV substations, which supply load within the District of Columbia, have been equipped with enhanced RTUs and upgraded Smart Relays:

- 12th & Irving Substation
- Alabama Ave Substation
- Benning Substation
- Fort Slocum Substation
- Harrison Substation
- Little Falls Substation
- NRL Substation
- Van Ness Substation
- Beech Rd Substation (located in MD but serves some DC customers)
- Bladensburg Substation (located in MD but serves some DC customers)
- Grant Ave Substation (located in MD but serves some DC customers)
- Green Meadows Substation (located in MD but serves some DC customers)
- St. Barnabas Substation (located in MD but serves some DC customers)
- Takoma Substation (located in MD but serves some DC customers)
- Tuxedo Substation (located in MD but serves some DC customers)
- Walker Mill Substation (located in MD but serves some DC customers)

In 2019, Pepco brought the total number of feeders with ASR to 30, benefitting approximately 41,800 customers in the District of Columbia. Refer to section 2.3 for additional discussion on the 2019 DA scope due to ASR architecture centralization efforts.

Projects are underway to install additional 13 kV and 69 kV remotely operated switches on feeders in addition to the feeders associated with the ASR systems. The additional switches will allow more capability to isolate the faulted portion of the feeder and return more customers to service sooner. The remote control capability of these switches allows the System Operator to perform switching without the need for field crews, thus reducing customer outage time.

Pepco has completed the installation, testing and integration of the network transformer remote monitoring system (RMS) on 53 network transformers in the Buzzard Point Network (in Southeast District of Columbia), 59 transformers in the Substation 212 Southeast group, 72 transformers in the Sub 18 Central group, 80 transformers in the Sub 212 South group, 69 transformers in Sub 7 North group, 86 transformers in the Sub 161 South, 56 transformers in the Sub 25 Central group, 79 transformers in the Sub 52 West Network group, and 59 transformers in the Sub 52 South Network group. In 2020, Pepco will complete the installation, testing and integration of RMS on 3 transformers in the Sub 212 Southeast group and 3 transformers in the Sub 223 Southwest group.

These monitors will provide increased visibility and control capability for system operators to remotely open or close the network transformer protectors through two-way communications. Load, voltage, protector status, and equipment condition data are recorded for study and operating purposes, and for increased ability to schedule maintenance of this equipment. RMS will provide operational data to evaluate the performance of the transformer and protector, allowing Pepco to perform maintenance when needed and not just on an interval-based inspection schedule, and allow remote operation of the protector to disconnect network load from the transformer without the need to wait for a crew to manually operate the protector. This will provide great benefits during emergencies when there is a need to very quickly isolate a transformer from the network. The development of the RMS system and the initial installation at Buzzard Point were part of the Department of Energy Smart Grid Investment Grant (SGIG)

that the Company received. The installations of RMS on these networks are part of the Company's long term plan to install RMS in all of its 49 networks, which contain approximately 4,000 transformers.

Outage Management System (OMS)²⁴

The OMS is the primary tool used to receive customer trouble reports, analyze reports and provide summary reports for crew dispatching. Typically, the process starts with the customer reporting an outage by calling the Pepco Call Center or from an Advanced Metering Infrastructure (AMI) meter reporting the loss of power. Information from that call or meter report is entered into the OMS system. The OMS database has the customer information, including customer phone number, address, and connected transformer. Additionally, the database contains the electrical network configuration of each feeder connecting each transformer to a feeder and the location of switches, fuses and taps. The system then analyzes all reported trouble by sorting the reports, prioritizing and grouping multiple problems to a common source. The analyzed data are then displayed to the System Operator for dispatch of crews to investigate and resolve the problem.

The SCADA system also provides input to the OMS. When a feeder breaker at a substation opens and the entire feeder is out, all customers connected to that feeder are known to be out of service. Information obtained from customers (pole struck, line down, tree limb on wire, etc.) in the OMS is then used to determine the source of the problem and to dispatch crews. For trouble involving these pieces of equipment, the customer trouble calls provide the data necessary to determine the problem. The OMS analyzes all the customer calls as well as AMI meter statuses and then determines the common source of the problem. Information is also passed back through the OMS to the Call Center to provide that information to the customer when they call in or review their account online. This information includes knowledge of current trouble and estimated restoration time under non-major storm outage conditions. No significant changes or additions were made to Pepco's OMS system in 2019.

²⁴ In Order No. 13422 on the 2004 Consolidated Report, paragraph 66, the Commission ordered the following:
66. *The 2004 Consolidated Report: Productivity Improvement Plan and Comprehensive Plan is hereby APPROVED, provided that PEPCO:*
(a) *Report in the 2005 Consolidated Report, due February 15, 2005, on the corrective actions taken to fix the OMS;*

Information Systems

Asset Suite 8

AS8 is the system used for construction, engineering, scheduled preventative maintenance and corrective work management at Pepco. Asset data is also maintained in the system. It is closely integrated with the Graphical Work Design (GWD) system and two new scheduling systems, Primavera P6 and Syntempo. AS8 replaced Pepco legacy systems WMIS and SAP in early 2019. They are still available in read-only mode for reference.

Primavera P6

Primavera P6 is the primary tool for T-Week scheduling for construction, engineering, and plant maintenance (preventative and corrective) work at Pepco and is closely integrated with the Asset Suite 8 and Syntempo systems.

Syntempo

Syntempo is the primary tool for underground New Business work at Pepco and is closely integrated with the Asset Suite 8 and Primavera P6 systems.

GIS/GWD System

Pepco continues to deploy new functions offered by the GIS vendor for greater use of GIS data throughout the company, primarily in the area of data visualization and easier access to GIS data across the organization. The GIS/GWD system continues to be Pepco's official database of field assets. The Exelon utilities are discussing and evaluating the roadmap for GIS technologies among each company in the coming years.

Power Delivery Information System Projects²⁵

²⁵ In Order No. 12735, paragraph 139, the Commission ordered the following:

Pepco's Power Delivery Information System Projects are provided in Table 1.3-A. Included in Table 1.3-A are historical information system projects for the years 2015 - 2019. All costs are for those allocated to the District of Columbia.

The engineering for Fort Dupont Sub 58, Fort Davis Sub 100, and Seat Pleasant Sub 30 is in progress.

Rollup-1	Estimated DC Portion 2015	Estimated DC Portion 2016	Estimated DC Portion 2017	Estimated DC Portion 2018	Estimated DC Portion 2019
ROLLUP (\$000s)					
Customer Systems	446	782	2,295	10,634	4,544
CIS Replacement	133	0	0	0	0
Smart Grid Systems	867	514	585	1,594	1,792
Network Operating Center (NOC)	90	6	80	1	0
Energy Supply Systems	86	35	0	0	0
Operations Systems	190	102	1,176	1,147	143
Energy Management System (EMS)	249	1,298	742	2,023	2,301
Engineering Systems	242	260	33	38	422
Field technologies	85	0	133	0	0
Work Management	292	315	1,763	7,233	2,951
Planning and Performance	5	0	80	255	548
Subtotal IT Capital (DC Portion)	2,684	3,312	6,886	22,925	12,701

Table 1.3-A: Historical Information System Projects

PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:...

(d) Listing of power delivery information system projects with implementation schedules, annual costs, and milestones;

(e) Listing of new technology investigations with decisions, annual costs, and implementation schedules;

...The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

1.3.2 EQUIPMENT STANDARDS & INSPECTIONS Equipment Standards

Pepco establishes and maintains material specifications, engineering and construction standards and practices, and operating guidelines to support the efficient, safe, and reliable operation of the Pepco distribution system. Further, Pepco established and maintains guidelines for the design and operation of its four-wire 13 kV distribution system and guidelines for the design and operation of its low voltage AC network system located in the downtown business district. These guidelines ensure that the electric distribution system is constructed and expanded in a consistent fashion according to the Company's established standards, practices, and requirements, to support the safe and reliable operation of Pepco's distribution system and downtown network system.

In addition, Pepco evaluates new products and equipment upgrades to improve system reliability and evaluates the technical capabilities of potential equipment suppliers to validate that their products or services meet or exceed established Company specifications and requirements. Manufacturer inspections and equipment reviews are performed to verify that these established requirements are met.

Pepco has been actively involved in the standardization of major equipment across the Exelon utilities, for such items as capacitors, regulators, switches, reclosers and transformers. The consistent construction standards are intended to support the consistent proper installation of equipment throughout the PHI regions for safe, reliable, and cost-effective operation.

Equipment Inspections²⁶

A proactive inspection and monitoring program reduces the possibility of unexpected failures and secondary damage to surrounding units, and increases the opportunities that Pepco can plan for the replacement of impending problem equipment. The frequency of inspections and monitoring is based on Pepco's experience, manufacturers' recommendations, and/or industry practices. Inspections may lead to repair or replacement of transmission and distribution system components to maintain safety and reliability of the system.

Inspection and modeling activities identify equipment to be replaced due to loading or condition. Distribution line equipment such as transformers, cable, and other components are not subject to detailed electrical testing and are replaced only when physical inspection indicates a need for replacement. Other than those inspections, equipment is replaced when it is upgraded, relocated or fails.

As new technologies are installed, actual operational data will be available to better analyze the loading and performance of equipment. For example, load data from the AMI system can potentially identify overloaded transformers prior to failure.

Table 1.3-B below provides a range of inspection or maintenance cycles for different classes of equipment. These were developed by weighing factors such as criticality, duty cycle, varying manufacturer's recommendations, and technological differences.

The equipment types and asset groups listed on Table 1.3-B have been designated as either a "preventive" or a "predictive" maintenance. It should be noted that Pepco views its overall

²⁶ In Order No. 16091, paragraphs 63 and 46, the Commission ordered the following:

63. *Pepco IS DIRECTED to provide a description of its maintenance policies and methodologies, consistent with paragraph 46 of this Order;*

46. *Decision. ... we shall require that Pepco provide a list of the types of equipment for which a "run to failure" method applies and those for which a preventive method applies. (Footnote: If other maintenance methods are used, Pepco shall describe them as well.) The Commission requires that Pepco provide an explanation of why different maintenance methods apply to different types of equipment. We also require a description of the "test procedures" that Pepco uses to assess the performance and remaining life of the equipment. (Footnote: See Pepco comments at 7.) Further, Pepco shall provide an estimate of the current book value of equipment maintained under each method used by Pepco. The 2011 Consolidated Report shall include this description of maintenance policies and methods.*

maintenance methodology to be defined by “reliability-centered” practices, with predictive and preventive methodologies to be subsets of this reliability-centered focus.²⁷

Table 1.3-B: Equipment Inspections

<u>Equipment</u>	<u>Inspection</u>	<u>Periodicity</u>	<u>Maintenance Methodology</u>
Substation	General Inspection	Every 2 months	Preventive
Substation Power Transformers	Predictive Maintenance Routine	Annually	Predictive
	Oil Collection and Analysis of Transformer Main Tank and Load Tap Changer (LTC)	Once a year or more frequently if triggered by the Equipment Condition Assessment (ECA) Process, or criticality of transformer	Predictive
	Routine Inspection and Test	Every 4, 8, or 16 years based on criticality, or more frequently as recommended by Equipment Condition Assessment Process.	Preventive
	External Inspection and Test	Annually	Preventive
	LTC Filter Change	Where applicable and condition-based maintenance on high filter differential pressure	Preventive
	Routine Cooler Inspection	Annually	Preventive
Substation Capacitor Banks - Metal Enclosed	Routine Inspection	Annually or more frequently as recommended by Equipment Condition Assessment Process	Preventive
Substation Capacitor Banks - Open Rack	Routine Inspection	Annually or more frequently as recommended by Equipment Condition Assessment Process.	Preventive
Substation Capacitor Banks - Open Rack with Circuit Switcher	Routine Inspection	Annually or more frequently as recommended by Equipment Condition Assessment Process.	Preventive
Substation Circuit Breakers – Air Magnetic	Predictive Maintenance (PDM) Tasks	Annually	Predictive
	Routine Test	6 Years or more frequently as recommended by Equipment Condition Assessment Process.	Preventive

²⁷ Table 1.3-B has been modified in response to the Commission’s directive to “describe Pepco’s maintenance methodology (reactive, preventive, predictive, and/or reliability-centered) for each equipment type or asset group listed,” *In The Matter of the Annual Consolidated Report of the Potomac Electric Power Company*, Formal Case No. PEPACR-2014-01, Order No. 17816 at P 354 (February 27, 2015).

<u>Equipment</u>	<u>Inspection</u>	<u>Periodicity</u>	<u>Maintenance Methodology</u>
Substation Circuit Breakers – Oil	Oil Collection and Analysis Of OCB	Every 1, 2 or 3 years based on criticality, or more frequently as recommended by Equipment Condition Assessment Process	Predictive
	Predictive Maintenance (PDM) Inspections	Annually	Predictive
	Internal Inspection and Test	5 – 8 Years, or more frequently as recommended by Equipment Condition Assessment Process	Preventive
	Diagnostic Testing	4 Years	Preventive
	Compressor Inspection/Pre-Charge Inspection (as applicable)	2 Years	Preventive
Substation Circuit Breakers – SF6	Predictive Maintenance (PDM) Inspections – Non-intrusive	Annually	Predictive
	Routine Inspection – Intrusive	Single Pressure: 8 Years, Dual Pressure: 4 Years, or more frequently as recommended by Equipment Condition Assessment Process	Preventive
	Diagnostic Testing	Single Pressure: 8 Years, Dual Pressure: 4 Years, or more frequently as recommended by Equipment Condition Assessment Process	Preventive
Substation Circuit Breakers – Vacuum	Predictive Maintenance (PDM)	Annually	Predictive
	Routine Inspection	6 Years or more frequently as recommended by Equipment Condition Assessment Process	Preventive
Substation – 69 to 230kV High-Pressure Pipe-Type Potheads	Periodic Inspections where sample ports are available.	Every 4 to 6 years (230kV),	Preventive
		Every 6 to 8 years (115kV),	Preventive
		Every 8 to 10 years (69kV)	Preventive
Substation – Battery & Charger Systems	Visual & On-line Test/Inspection	Annually or more frequent as recommended based on an ECA.	Preventive
Substation – Building Heating, Ventilation and Air Conditioning (HVAC) System	Annual Inspection	Annually	Preventive
Substation – Emergency Generators	Start and Run Test	Up to 4 times per year: Routine Inspections; Annually: Standby Generator Inspection and Maintenance and Black Start Generator Test Inspections as recommended based on equipment condition.	Preventive

<u>Equipment</u>	<u>Inspection</u>	<u>Periodicity</u>	<u>Maintenance Methodology</u>
Substation – Fire Protection Pump	Routine Inspection	Annually	Preventive
Right-of-Way Integrated VM (Transmission)	Routine Inspection	Interval based on Right-of-Way inspections and height of vegetation.	Preventive
Scheduled Tree Trimming - Overhead Distribution Feeders Not In Transmission Rights-of-Way	Routine and Condition-based Tree Inspection	4 Year trim cycle	Preventive
Protective Relays and Automatic Reclosing Relays	Preventive Maintenance	4 to 8 years based on system voltage class	Preventive
Under-Frequency Relays	Preventive Maintenance	8 years	Preventive
RTUs - SCADA	Predictive Maintenance	Failure to operate properly based on condition monitoring – self diagnostics, EMS trouble logs, real	Predictive
SCADA (Supervisory Control and Data Acquisition) Metering	Preventive Maintenance	Condition based maintenance	Preventive
Digital Fault Recorder	Preventive Maintenance	200kV and Above: 8 Years, Below 200kV: Failure to operate properly based on condition monitoring-self diagnostics, fault records, real time data analysis and remote communications.	Preventive
Power Line Carrier (PLC)	Preventive Maintenance	Every 24 Months	Preventive
Microwave Equipment	Preventive Maintenance	Every 24 Months	Preventive
Fiber Optic Equipment	Preventive Maintenance	Condition Based Maintenance	Preventive
Leased Line	Preventive Maintenance	Every 24 Months	Preventive
Pole-Type Recloser	Routine Inspection	Visual: 2 years Operational Test: Every 3 to 6 yrs.	Preventive
Pole-Type Regulators	Routine Inspection/Test	Every 24 months	Preventive
Critical (Hospital/Nursing Home) Network Transformers/Protectors	Routine Inspection	Every 3 years	Preventive
Distribution Manholes	Routine Inspection	Every 6 years	Preventive

<u>Equipment</u>	<u>Inspection</u>	<u>Periodicity</u>	<u>Maintenance Methodology</u>
Underground Network Transformers/Protectors	Routine Long Inspection	Every 5 years de-energized (Staggered w/Short Inspection so visits are 2.5 years apart). Inspection cycle for some locations may differ and be between 2 - 10 years based on: 1) criticality - hospital locations are inspected more frequently; 2) location type - sidewalk/roadway location or roof top/basement; and 3) installation type - junction	Preventive
Capacitor Banks – Pole Mounted	Routine Inspection	2 Years for Non-Distribution VAR Dispatch (DVD), DVD capacitors monitored near real-time.	Preventive
Distribution Pad mounted Transformers / Switchgear	Routine Inspection	5 Years	Preventive
Pipe-Type Cable Joint Sleeves in Manholes	Periodic Inspection	Every 5 to 10 years	Preventive
Wood Poles	Wood Pole Inspection, Remedial Treatment and Restoration	Every 10 years (starting in 2015)	Preventive
Power Line Over Navigable Waterway – Overhead Clearance	Routine Inspection	5 years	Preventive
High Voltage Transmission Structure Aviation Warning Lighting	Periodic Inspection	Annually	Preventive
High Voltage Transmission Structure Grounding	Periodic Inspection	Inspect Grounding System on a 5 – 10 year interval	Preventive
Microwave Tower and Aviation Warning Lighting	Periodic Inspection	Annual or as per Federal Aviation Administration(FAA)	Preventive
High Voltage Transmission Line Comprehensive Inspection	Aerial Inspection	6 Years	Preventive
Cathodic Protection	Substation Inspection and Manhole Survey	Condition based – Various intervals (based upon type of work involved)	Preventive
Cable Oil and Gas Alarms	Annual Inspection	Annually	Preventive
Fluid Pressurizing Plants for High- Pressure Pipe-Type Cables	Operational Test and Inspection	Every 1 to 2 weeks (chart replacement), Every 1 to 2 years (operational test)	Preventive

Table 1.3-C includes the book value of equipment as of December 31, 2019. Book values have been categorized by direct and allocable plant. The use of FERC Mass Asset Accounting does not allow

any specific asset to be identified and linked to its accumulated depreciation and remaining useful life or to link it to the maintenance method applied to the equipment as assets are depreciated by account.

Potomac Electric Power Company			
DC Distribution Plant, Reserve, Net Book Value - 2019			
DC DISTRIBUTION PLANT	Book Cost	Reserve	Net Book Value
E-3601-Land	89,358,025	-	89,358,025
E-3602-Land Rights	572,532	119,177	453,355
E-3610-Structures and Improvements	72,733,771	30,375,228	42,358,543
E-3620-Station Equipment	566,668,969	168,368,605	398,300,364
E-3640-Poles, Towers, and Fixtures	142,514,718	25,739,368	116,775,350
E-3650-O/H Conductors and Devices	156,059,308	44,378,712	111,680,596
E-3660-U/G Conduit	906,444,187	322,444,024	584,000,163
E-3670-U/G Conductors and Devices	896,763,399	245,586,996	651,176,403
E-3680-Line Transformers	587,365,498	167,886,438	419,479,060
E-3691-O/H Services	18,286,644	(563,482)	18,850,126
E-3692-U/G Services	120,445,028	70,914,664	49,530,364
E-3693-U/G Cable Services	174,622,662	64,983,714	109,638,948
E-3700-Meters	6,872,571	2,958,353	3,914,218
E-3701- AMI Meters	62,818,636	23,445,313	39,373,323
E-3711-Install on Customer Premises	1,367,203	1,250,994	116,209
E-3731-Overhead Street Lighting	176,663	(158,361)	335,024
E-3732-Underground Street Lighting	9,651,062	6,575,674	3,075,388
E-3734-Dusk to Dawn Street Lighting	50,315	31,585	18,730
Total DC Distribution Plant, Reserve, NBV	3,812,771,191	1,174,337,002	2,638,434,189

Table 1.3-C: Distribution Equipment Net Book Value

Overhead Feeder Inspection Program²⁸

Pepco's Overhead Feeder Inspection Program was initiated in 2012 to improve overall system reliability and remediate potential safety issues. In the years since the initial inception, the Overhead Feeder Inspection Program has been refined to facilitate more aggressive inspection timelines and prioritization for remediation activities that addresses the criticality of infrastructure issues and is consistent with typical feeder improvement work.

Overhead Feeder Inspection Cycle

Pepco's Overhead Feeder Inspection Program ensures that all feeders with overhead exposure are inspected within a two-year period. Pepco currently has 203 District of Columbia feeders with overhead exposure.

Overhead Feeder Inspection Components

The overhead feeder inspection consists of a mobile scan of all main line poles on a feeder, from ground line to the top of the pole, including the conductors from pole to pole, utilizing Ultrasonic and Infrared Non-Destructive Testing (NDT) methodology.

Visual inspection is performed on all feeder mainlines to determine feeder/equipment condition and identify immediate threats to reliability created on the following equipment:

- Cross-arms and braces
- Insulators
- Grounds
- Lightning arrestors
- Conductors
- Transformers
- Reclosers
- Capacitors
- Regulators
- Ancillary equipment
- Vegetation

Ultrasonic and infrared scans are also conducted on equipment and all connections for each pole and pertinent ancillaries. Scan results are obtained and analyzed to determine feeder condition.

²⁸ Order No. 16975 states the following at paragraphs 64 and 107:

64. Decision: Pepco is directed to report on the Overhead Feeder Inspection Program in future Consolidated Reports as recommended by OPC and the Staff, including results of the inspections, actual and incipient failures detected and remediation actions taken to correct the nonconformance items recorded. In particular, as requested by OPC, Pepco is directed to report on replacement of lightning arresters.

107. Pepco is DIRECTED to report on the Overhead Feeder Inspection Program consistent with paragraph 64 herein;

Overhead Feeder Inspection Results

Overhead feeder inspection results, required remediation work and completion status are tracked. Prioritization of remedial work is based on both safety and reliability attributes. Immediate or near-term response is assigned to those conditions that must be addressed to mitigate imminent safety or reliability issues. Less emergent conditions are required to be remediated within the typical design and build cycle for distribution projects. Conditions that do not pose a reliability or safety threat in neither the near-term nor long-term, are identified for possible upgrade in conjunction with other planned work.

Repairs or upgrades to correct or eliminate conditions observed during inspections are scheduled under the following guidelines.²⁹

- Priority 10: A condition where upon inspection, a Pepco facility is deemed to present an imminent safety hazard to utility personnel and/or the public. In this case, steps shall be taken to immediately eliminate the hazard. Inspectors are required to immediately notify Pepco and to stand by until relieved by Pepco personnel.
- Priority 20: A condition where upon inspection, a component of an overhead feeder is observed and confirmed to pose a threat to service reliability but does not pose a direct public safety threat. Conditions under this category should be remediated within 90 days.
- Priority 30: A condition where damage or degradation exists on a component of an overhead feeder line, does not pose a direct public safety threat, and if left uncorrected, has the potential to affect service reliability under adverse system conditions. Conditions under this category should be remediated within 18 months.
- Priority 40: A condition that poses no threat to safety or reliability but does not conform to current Pepco standards. Conditions under this category should be corrected when other work presents the opportunity to bring the condition to current standards.

²⁹ See APPENDIX 3B - MANHOLE INSPECTION PROGRAM (MIP) for a details of Exelon Utilities Corrective Maintenance Prioritization system.

Overhead Feeder Inspection Cycle

Pepco inspects approximately half of its overhead feeders every other year resulting in a full inspection cycle being completed every two years.

Overhead Feeders Inspected 2019

In 2019, 103 District of Columbia feeders were inspected as part of the Overhead Feeder Inspection Program. One-hundred and three (103) conditions were identified.

Feeder	Condition
14005	Visual/Thermal scan identified-Split Cross Arm - Minor
14005	Visual/Thermal scan identified-Missing Pole Tag
14015	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
205	Visual/Thermal scan identified-Split Cross Arm - Minor
205	Visual/Thermal scan identified-Broken Cross Arm Brace
205	Visual/Thermal scan identified-Cross Arm - Leaning/Bent
205	Visual/Thermal scan identified-Broken Cross Arm Brace
205	Visual/Thermal scan identified-Missing Pole Tag
327	Visual/Thermal scan identified-Thermal Anomaly – Metal Riser (Primary Feed) – Found with an elevated temperature of 207.5°C – P10
328	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
328	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
328	Visual/Thermal scan identified-Split Cross Arm - Major
328	Visual/Thermal scan identified-Blown Arrestor
372	Visual/Thermal scan identified-Broken Cross Arm Brace
380	Visual/Thermal scan identified-Floating Neutral Wire
380	Visual/Thermal scan identified-Floating Neutral Wire
383	Visual/Thermal scan identified-Split Cross Arm - Major
383	Visual/Thermal scan identified-Broken Cross Arm Brace
383	Visual/Thermal scan identified-Missing Pole Tag
387	Visual/Thermal scan identified-Broken Cross Arm Brace
387	Visual/Thermal scan identified-Missing Pole Tag
387	Visual/Thermal scan identified-Blown Arrestor
387	Visual/Thermal scan identified-Broken Cross Arm Brace
494	Visual/Thermal scan identified-Wooden Dead End Insulator
494	Visual/Thermal scan identified-Blown Arrestor
496	Visual/Thermal scan identified-Broken Cross Arm Brace
228	Visual/Thermal scan identified-Blown Arrestor (x3)
323	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
323	Visual/Thermal scan identified-Cross Arm - Leaning/Bent
14709	Visual/Thermal scan identified-Broken Cross Arm Brace
14709	Visual/Thermal scan identified-Wooden Dead End Insulator
14709	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
14709	Visual/Thermal scan identified-Cracked Cross Arm
14709	Visual/Thermal scan identified-Blown Arrestor

14808	Visual/Thermal scan identified-Broken Cross Arm Brace
52	Visual/Thermal scan identified-Broken Cross Arm Brace
65	Visual/Thermal scan identified-Split Cross Arm - Major
65	Visual/Thermal scan identified-Leaning Insulator
65	Visual/Thermal scan identified-Blown Arrestor
65	Visual/Thermal scan identified-Below 8 Ft. Step - NESC Violation
101	Visual/Thermal scan identified-Broken Cross Arm Braces (x4)
101	Visual/Thermal scan identified-Decayed Cross Arm (x2)
102	Visual/Thermal scan identified-Decayed Cross Arm
102	Visual/Thermal scan identified-Broken Cross Arm Brace
102	Visual/Thermal scan identified-Decayed Cross Arm
102	Visual/Thermal scan identified-Leaning Insulator
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Below 8 Ft. Step - NESC Violation
14768	Visual/Thermal scan identified-Wooden Dead End Insulator (x2)
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Below 8 Ft. Step - NESC Violation
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Cross Arm - Split Minor
14768	Visual/Thermal scan identified-Missing Pole Tag
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Street Light - Dayburner
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Blown Arrestor
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Wooden Dead End Insulator

14768	Visual/Thermal scan identified-Wooden Dead End Insulator
14768	Visual/Thermal scan identified-Overhead Transformer - Fresh Leak
14769	Visual/Thermal scan identified-Broken Cross Arm Brace
14769	Visual/Thermal scan identified-Blown Arrestor
14769	Visual/Thermal scan identified-Below 8 Ft. Step - NESC Violation
14769	Visual/Thermal scan identified-Broken Cross Arm Braces (x2)
467	Visual/Thermal scan identified-Cross Arm - Leaning/Bent
14022	Visual/Thermal scan identified-Broken Cross Arm Brace
14023	Visual/Thermal scan identified-Broken Cross Arm Brace
15707	Visual/Thermal scan identified-Ground Wire - Broken Below 8 Ft.
15707	Visual/Thermal scan identified-Missing Pole Tag
15707	Visual/Thermal scan identified-Below 8 Ft Step - NESC Violation
15016	Visual/Thermal scan identified-Wooden Dead End Insulator
15016	Visual/Thermal scan identified-Missing Pole Tag
15016	Visual/Thermal scan identified-Wooden Dead End Insulator
15016	Visual/Thermal scan identified-Split Cross Arm - Minor
15016	Visual/Thermal scan identified-Missing Pole Tag
15016	Visual/Thermal scan identified-Decayed Cross Arm
15016	Visual/Thermal scan identified-Broken Cross Arm Brace
15016	Visual/Thermal scan identified-Wooden Dead End Insulator
15016	Visual/Thermal scan identified-Wooden Dead End Insulator
15944	Visual/Thermal scan identified-Blown Arrestor
15707	Visual/Thermal scan identified-Thermal Anomaly – Transformer Bushing – Found with an elevated temperature of 215.4°C – P10

All conditions summarized in the table above were referred to the appropriate engineering area for further evaluation and remediation and have been remediated.

Overhead Feeder Inspection Schedule

The following Overhead Feeder Inspection Schedule is projected for the District of Columbia to ensure that all feeders will be inspected over the next two years.

2020

56	309	479	14136	14752	15012	15199
97	324	481	14139	14753	15013	15457
99	333	482	14140	14755	15014	15458
119	345	485	14145	14756	15130	15459
120	347	489	14146	14758	15165	15632
128	366	495	14150	14811	15169	15701
132	367	14006	14158	14812	15170	15705
167	368	14035	14159	14900	15171	15755
177	369	14054	14200	15001	15172	15756
178	385	14055	14713	15006	15173	15801
181	386	14058	14715	15007	15174	
183	388	14132	14716	15008	15175	
227	394	14133	14717	15009	15177	
229	413	14134	14718	15010	15197	
308	476	14135	14719	15011	15198	Total=100

2021

43	118	372	14007	14261	14987	15709
52	133	380	14008	14701	15003	15710
60	144	383	14009	14702	15015	15711
63	164	387	14010	14707	15016	15867
64	165	414	14014	14709	15018	15943
65	205	451	14015	14711	15021	15944
66	228	467	14016	14765	15094	15945
75	244	488	14017	14766	15166	15946
82	292	490	14019	14767	15167	15947
87	323	491	14020	14806	15168	15949
96	327	494	14021	14808	15176	15950
101	328	496	14022	14809	15631	15997
102	329	499	14023	14813	15702	14144R
104	348	14002	14031	14890	15706	
117	349	14005	14093	14891	15707	Total=103

1.3.3 VEGETATION MANAGEMENT PROGRAM DETAIL

Each year, Pepco's system reliability is impacted by trees and tree branches that have contacted, fallen on, or otherwise interfered with poles and wires, causing disruption of service. Due to the density of tree coverage in Pepco's District of Columbia service territory and public concerns relative to tree pruning, challenges exist when balancing the value of trees to customers and communities and the need for reliable electric service. The main objectives that the Vegetation Management (VM) program attempts to balance are safety, reliability, regulatory compliance, environmental stewardship, and customer satisfaction. Pepco's VM program includes tree pruning, tree removal, maintaining access and tree planting.

Pepco's VM priorities are:

- Achieving and maintaining a high degree of reliability across the entire electric system;
- Targeting areas of the electric system found to be most susceptible to outages and damage from trees;
- Performing cyclical pruning to maintain the stability of the system;
- Working with local stakeholders and property owners in the removal of hazard trees in close proximity to Pepco's electric lines;
- Communicating with customers through various media;
- Performing emergency tree and limb removal from electric lines; and
- Assuring that the VM work is performed consistently with good environmental stewardship.

Pepco's VM program in the District of Columbia includes:

- Scheduled two-year cyclical maintenance or routine scheduled pruning and removals;
- Planting of trees to mitigate the impact of VM work;
- Unscheduled (non-cycle) maintenance operations; and
- Selective application of herbicide.

Pepco's VM process can be summarized in the following steps:

- Establish an annual VM plan strategy in accordance with regulatory requirements,

International Society of Arboriculture (ISA) Best Management Practices and Pepco VM goals;

- Plan Work – Inspect the feeder to develop a VM work plan that defines the work to be performed;
- Prune/Remove/Clear Trees – VM personnel engage qualified contractors and perform project management and contract administration to complete feeder maintenance as planned;
- Validate completion of work plan – Certified Arborist inspects to validate that work performed is completed in accordance with plan and American National Standards Institute (ANSI) standards; and
- Document and report progress.

Scheduled Pruning

Pepco’s scheduled cycle tree maintenance program in the District of Columbia includes a comprehensive inspection by an ISA Certified Arborist to develop a work plan for each feeder on a two-year cycle in accordance with guidelines established in conjunction with the District of Columbia’s Urban Forestry Administration (UFA) and American National Standards Institute (ANSI) standards, and International Society of Arboriculture (ISA) Best Management Practices (BMPs).

Coordination with

DC Urban Forestry Administration (UFA) and others

The UFA is responsible for the management of the majority of public space trees that grow in proximity to Pepco overhead facilities. UFA also administers the tree protection laws and is responsible for issuing permits for tree removal on private property. Arborists from Pepco and UFA work to identify and eliminate hazardous tree conditions during cycle and unscheduled maintenance operations. Pepco also coordinates with natural resource managers from the National Park Service, the District of Columbia Department of Parks and Recreation, and private property owners.

Despite the good working relationship between Pepco and UFA, challenges remain, especially with respect to VM work associated with “legacy” trees. District of Columbia statutes and

regulations from decades ago resulted in “legacy trees” that impact operations today and have historically limited the degree and technique of vegetation cutback from Pepco power lines. This has resulted in large trees growing through and in close proximity to conductors. Examples of the policies include the following:

1. Section 13 of “An Act for the Preservation of the Public Peace and the Protection of Property within the District of Columbia,” approved July 29, 1892. (27 Stat. 324; District of Columbia Official Code § 22-3310) (Emphasis added.)

1892: “An act for the preservation of the public peace and the protection of property within the District of Columbia” ...*unlawful for any person willfully **top**, cut down, remove, girdle, break, wound, destroy, or in any manner injure*any tree not owned by that person...”

2. Policy produced by District of Columbia, June 9, 1960, "Trees in Public Space: Washington, DC," at pg. 17.

1960: “Utility lines must be cleared by the use of directional clearance methods only.....the removal of internal branches to permit passage of utility lines through the trees where necessary”

Many of the older trees are in conflict with the Pepco distribution system such that the issues with the various trees cannot be resolved without cutting entire “legacy” trees down. No standardized practice or agreement currently exists to resolve these conflicts. Pepco continues to work with UFA to resolve these issues on a case-by-case basis and in accordance with the Vegetation Management Plan for Utility Tree Pruning – District of Columbia (2005 Plan).³⁰

In 2016, the Urban and Forestry Protection Act of 2002 was amended.” The 2016 changes heightened the requirements to obtain permits to remove private trees. A “Special Tree Permit” is required to remove private trees as small as 13.9” diameter and the fee increased by 63%.

Mitigation and Tree Planting Programs

Pepco’s tree planting funding mitigates removals and promotes “Right Tree Right Place” best management practices around utility space. In 2019 Pepco planted 544 trees in the District of Columbia and contributed \$35,610 to the DC Tree Fund (in the form of special tree removal

³⁰ The 2005 Plan was produced as a result of a tree-trimming working group including members from the District Department of Transportation’s Urban Forestry Administration and Pepco’s Vegetation Management team. Pepco filed the 2005 Plan on March 17, 2005 in Formal Case No. 982.

permits).

Selective Application of Herbicide and Tree Growth Regulators

Pepco's VM program includes the use of herbicide and tree growth regulators. An herbicide plan is developed each year to control brush and sprout growth where trees have been previously cleared. Herbicide applications are used selectively on rights-of-way, easements and, when granted permission, on private property, throughout the Pepco system in the District of Columbia. The use of herbicides follows a systematic approach with the aim of reducing woody stems from growing in the utility space. Herbicides and growth regulators used on Pepco's ROW are extremely low in toxicity and are biodegradable. Most herbicides affect treated plants by inhibiting the production of chemicals which plants need to produce chlorophyll, or by inhibiting the formation of leaf-buds. Without chlorophyll production, or functional leaves, the treated plant exhausts its stored food supply and dies.

Tree growth regulators reduce the cell elongation of trees, which can help to extend the cycle time that we need to return to prune a tree again. Only herbicides and growth regulators registered by the U.S. Environmental Protection Agency (EPA) and D.C. Department of Environment are applied in strict accordance with the label and under the regulation of United States Department of Agriculture (USDA). Pepco contract applicators are supervised by certified commercial pesticide applicators.

Customer Communication Materials

- Provide consistent notification to customers regarding Pepco's VM activities on their property and in their community;
- Provide information to customers explaining the VM program along with a schedule of trim and contact information;
- Make available Pepco forestry representatives to respond to inquiries as work is being done and scheduled;
- Encourage customers to access the Pepco website for more detailed educational material including links to ANSI A330 standards, Utility Arborist Association, and the "Right Tree, Right Place" program under the Arbor Day Foundation;
- Enable the planners to meet with customers and local officials, or correspond through mail,

e-mail, and phone as needed;

- Enable work permits to be obtained in advance of scheduled work to allow work to continue in a coordinated and planned manner;
- Participate in community meetings; and
- Coordinate public awareness of Pepco's VM activities and programs through the use of door hangers that are placed on customer's door prior to start of VM work.

Customer Communications: VM

See Attachment A for an example of the Company's 2019 customer communications, which is an example of pertinent information that is relayed to customers as bill inserts and other means of communication.

1.3.4 INDUSTRY COMPARISONS³¹

The Industry Comparisons section contains industry comparisons of transmission and distribution operations and performance. The comparisons of reliability indices are provided in Figures 1.3-A through 1.3-C in response to Commission directives in Formal Cases No. 766 and 982.

Institute of Electrical and Electronics Engineers (IEEE) Benchmarking Survey Results

Each year, Pepco participates in the annual Transmission and Distribution System Benchmarking Study conducted by IEEE. Although Pepco's District of Columbia service territory did not participate separately in the study, the Company has calculated separate values for Pepco's District of Columbia territory in both 2018 and 2019, using equivalent Major Event Day exclusions, and has indicated both of these reliability results on the following charts. Note that Pepco's 2019 reliability results that are reported in the following graphs are not directly comparable to the data used in the 2018 study. See Figure 1.3-A through Figure 1.3-C.

³¹ In Order No. 15568 paragraph 57, the Commission ordered the following:
57. Pepco IS DIRECTED to provide a report on the Electric Utilities Best Practices, consistent with Paragraph 50 of this Order. This report shall be included in that 2010 Consolidated Report; and shall include the best practices of the electric utility industry on improving reliability and outage restoration (from the Benchmarking Studies). Pepco shall submit a continuous improvement plan, including resourcing, specific performance targets, and milestone dates to achieve the reliability and outage restoration performance of the best (quartile) performing (comparable) utilities in the Benchmarking Studies.

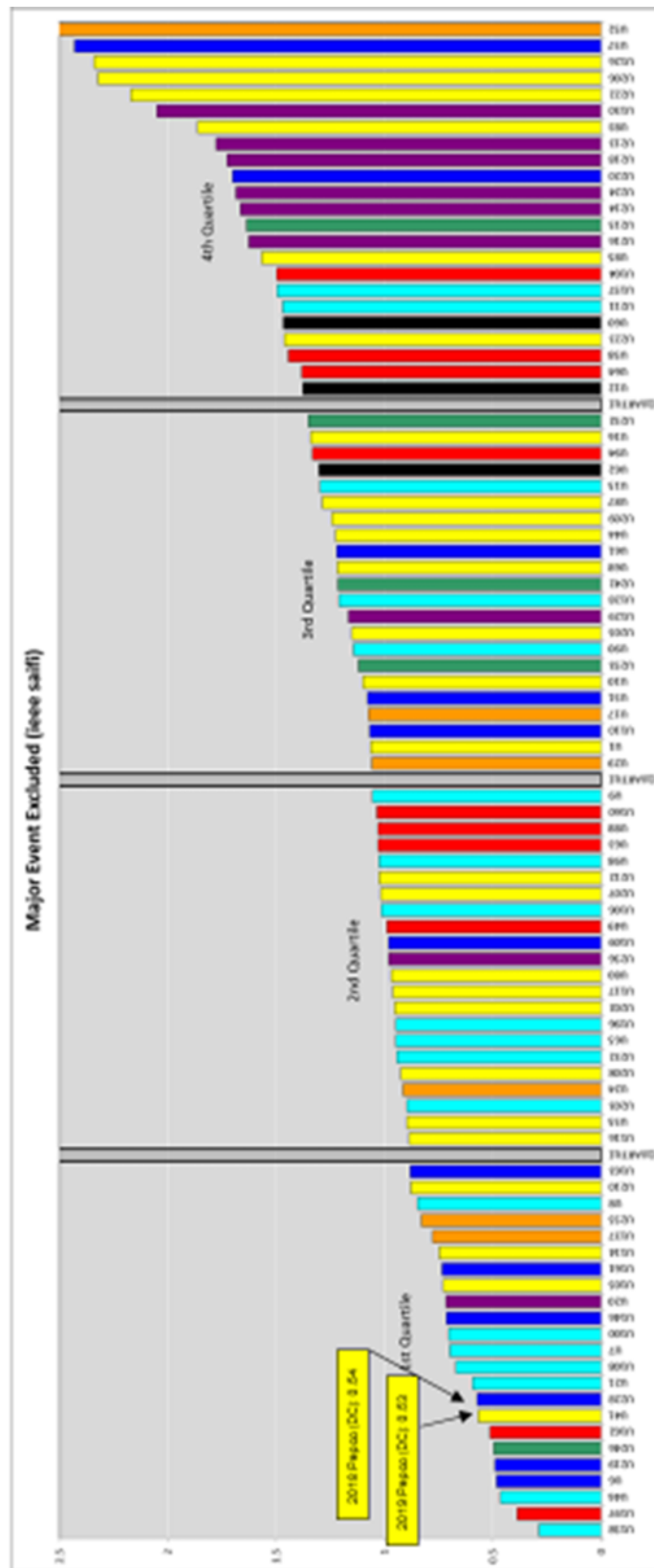


Figure 1.3-A

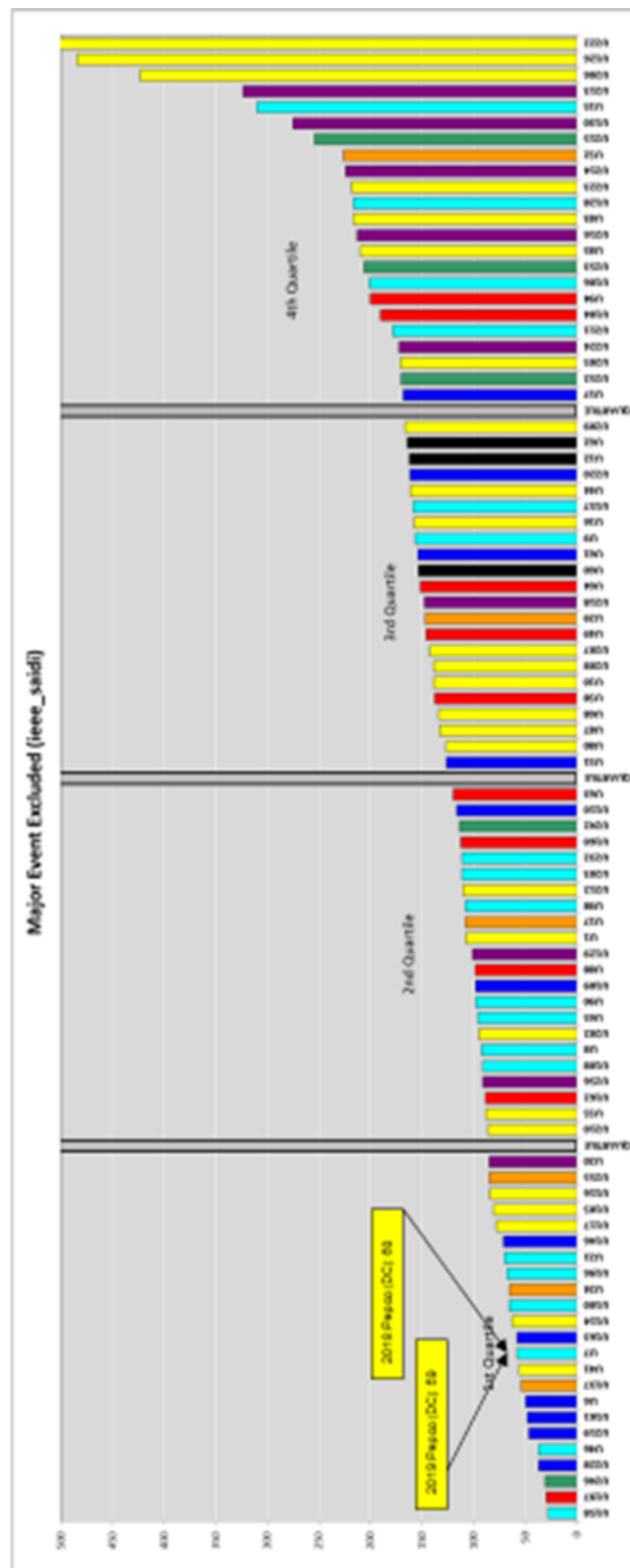


Figure 1.3-B

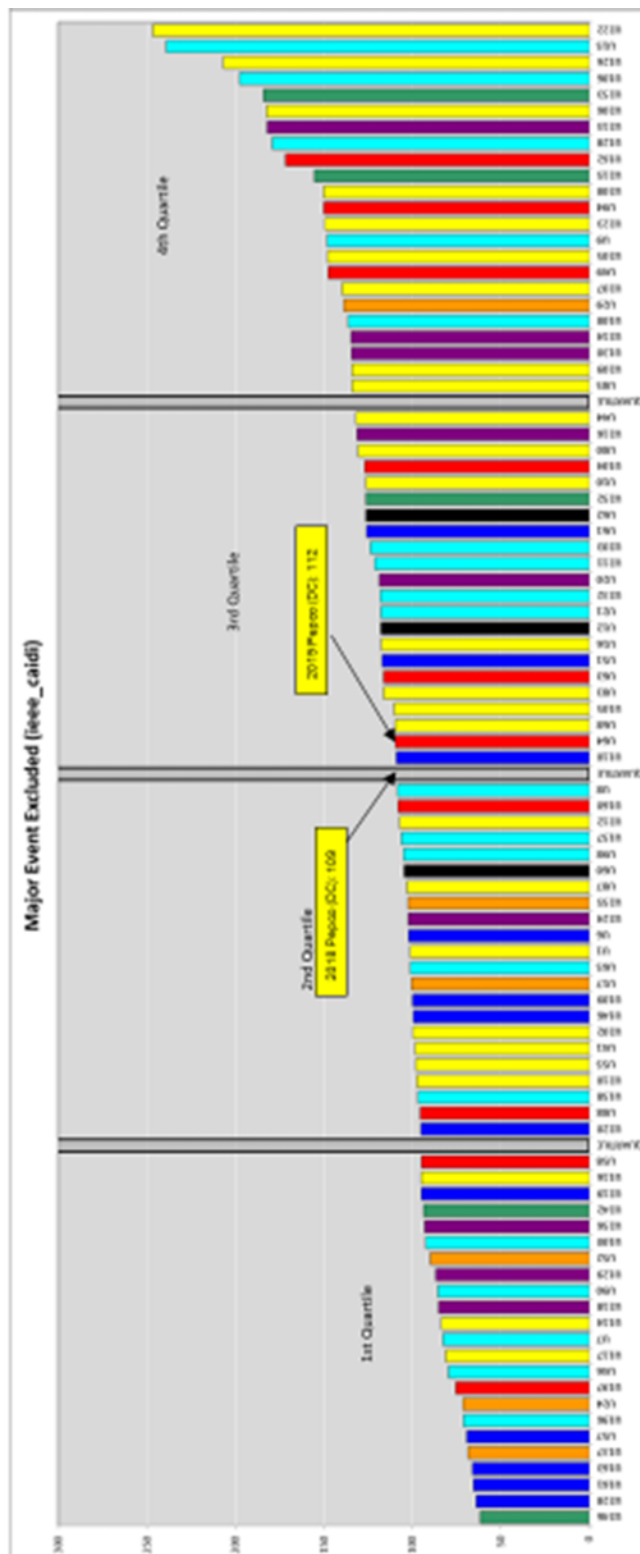


Figure 1.3-C

1.3.5 BEST PRACTICES

Implementation of Twenty Best Practices^{32,33,34,35}

³² In Order No. 16091 paragraph 61, the Commission stated the following:

61. *Pepco IS DIRECTED to include a “2011 Best Practices Report” in its 2011 Consolidated Report describing its on-going implementation of no fewer than twenty of the best practices identified in the 2009 Polaris Program, consistent with Paragraph 22 of this Order;*
22. *Decision. First, we conclude that Pepco has complied with the requirements of Paragraphs 32 and 52 of Order No. 15568. Second, as to the Staff’s Recommendation that Pepco file a “Best Practices Report” from the PA Consulting’s 2009 Polaris Transmission and Distribution Benchmarking Program, we agree that a report may be helpful in assuring that best practices continue to be implemented. Therefore, the Commission shall require that Pepco include in its 2011 Consolidated Report a section entitled “2011 Best Practices Report” in which Pepco shall describe its on-going implementation of no fewer than twenty of the best practices identified in the 2009 Polaris Program included in the 2010 Consolidated Report as Appendix 2D. The twenty best practices selected by Pepco should be those judged to have the most impact on reliability and outage restoration performance. Pepco shall report on all its activities during 2010 to implement these best practices, including data on staffing levels, expenses and results. This requirement is separate from the requirement to produce a “Continuous Improvement Plan,” as is described more fully in Section IV.A.1.f.*

³³ In Order No. 15632 issued in these proceedings, the Commission states at paragraph 5 the following:

5. *Pepco shall file with the Company’s annual Consolidated Reports to the Commission data on the Company’s measures to continue to address each of the recommendations made by PA Consulting and the effectiveness of the Company’s approaches to improve CAIDI and SAIDI to at least the average of PA Consulting benchmarks. This obligation shall begin with the 2010 Consolidated Report.*

³⁴ Order No. 16623 states the following at paragraphs 29 and 52:

29. *Decision: The Commission agrees with the Staff that the information provided in the 2011 Consolidated Report does not allow a complete assessment of Pepco’s progress in implementing the twenty “best practices.” Therefore, we direct Pepco to provide further information for each “best practice,” including staffing levels, expenses and schedules and percentage of completion. In those cases where no incremental expenses or staffing occurred, we require Pepco to identify the other activities with which these best practices were combined “for efficiency” and provide expenses and staffing levels associated with those activities. In order to provide a comparative analysis, we require Pepco to provide budget vs. actual expenses and staffing levels for the period 2007 to 2011. We also require Pepco to provide an assessment of the progress it has made in fully implementing each best practice. In addition we require Pepco to identify whether and how each best practice has been incorporated within its Comprehensive Reliability Plan.⁹⁶ This information shall be included in the 2012 Consolidated Report.*
52. *Pepco is DIRECTED to prepare a report on best practices consistent with paragraph 29 herein;*

³⁵ Order No. 16975 states the following at paragraphs 85 and 114:

85. *Decision: The Commission finds that Pepco has failed to comply completely and explicitly with the requirement that it identify “whether and how each best practice has been incorporated within its Comprehensive Reliability Plan.” While Pepco includes some of its best practices as part of the REP, it does not discuss each best practice, as required by Order No. 16623. The Commission agrees with OPC that “including these practices within the REP would be an effective means for improving reliability.” Pepco is required to fully address the role that each best practice has in the REP in its 2013 Consolidated Report and in future Consolidated Reports. If a best practice is not part of the REP, then Pepco shall explicitly state that fact.*
114. *Pepco is DIRECTED to address the role each best practice has in the Reliability Enhancement Plan consistent with paragraph 85 herein;*

Pepco continues to follow the best practices discussed in the 2019 Consolidated Report. The status, maturity/implementation levels, and staffing impacts remain unchanged.

Approximate Costs Attributable to the District of Columbia

Regarding the costs of implementing best practices, Pepco must provide the following explanations:

1. **Cost allocation across companies and jurisdictions:** Many of the activities associated with the best practices described herein are performed by centralized teams supporting all PHI companies or teams supporting Pepco system-wide. Budgets and expenditures of departments that serve all of PHI are not directly attributable to one jurisdiction or another.
2. **Redirection of resources:** The implementation of some best practices by these teams did not necessarily require additional resources, but rather either required the allocation of additional duties or a shift in duties from previous practices to the newly-identified best practices. Further, activities supporting the best practices are only a subset of all work done by these departments, and the activities of many of the primary personnel involved in executing and advancing these best practices are allocated to general overhead accounts.
3. **Reported best practices costs:** The Company has attempted to allocate estimated resource hours and associated activity-based costs in these centralized functions to the District of Columbia where possible. (See Table 1.3-D.) Where defined expenditures for process and reliability improvement exist, Pepco cites these expenditures in the attached table.

Best Practice #	Activity Supporting Best Practices	Average Hourly ATP*	Approximate Costs Attributable to District of Columbia									
			2015		2016		2017		2018		2019	
			Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost
1-4	Reliability Centered Maintenance (RCM) Planning	\$ 96.00	2500	\$ 240,000.00	2500	\$ 240,000.00	2500	\$ 240,000.00	2500	\$ 240,000.00	2500	\$ 240,000.00
	Equipment Condition Assessment (ECA)	\$ 96.00	2040	\$ 195,840.00	2040	\$ 195,840.00	2040	\$ 195,840.00	2040	\$ 195,840.00	2040	\$ 195,840.00
	Dissolved Gas Analysis (DGA)	\$ 96.00	500	\$ 48,000.00	500	\$ 48,000.00	500	\$ 48,000.00	500	\$ 48,000.00	500	\$ 48,000.00
5	Priority Feeder Analysis	\$ 96.00	200	\$ 19,200.00	200	\$ 19,200.00	200	\$ 19,200.00	200	\$ 19,200.00	200	\$ 19,200.00
6	QA for VM work	\$ 85.00	2000	\$ 170,000.00	2000	\$ 170,000.00	2000	\$ 170,000.00	2000	\$ 170,000.00	2000	\$ 170,000.00
7	Responsible Engineer Assignments	\$ 96.00	5500	\$ 528,000.00	5500	\$ 528,000.00	5500	\$ 528,000.00	5500	\$ 528,000.00	5500	\$ 528,000.00
7	Large Project Management	\$ 125.00	2000	\$ 250,000.00	2000	\$ 250,000.00	2000	\$ 250,000.00	2000	\$ 250,000.00	2000	\$ 250,000.00
8	WMIS/SAP PM Integration	\$ 96.00	1200	\$ 115,200.00	1200	\$ 115,200.00	1200	\$ 115,200.00	1200	\$ 115,200.00	1200	\$ 115,200.00
9	Critical Customer Analysis	\$ 85.00	122	\$ 10,370.00	122	\$ 10,370.00	122	\$ 10,370.00	122	\$ 10,370.00	122	\$ 10,370.00
10	ETR Process Improvement	\$ 96.00	1500	\$ 144,000.00	1500	\$ 144,000.00	1500	\$ 144,000.00	1500	\$ 144,000.00	1500	\$ 144,000.00
11	Shift coverage adequacy	Please see narrative for explanation of impacts										
12	Ongoing revision of Stepped restoration processes (Control Center allocation)	\$ 85.00	200	\$ 17,000.00	200	\$ 17,000.00	200	\$ 17,000.00	200	\$ 17,000.00	200	\$ 17,000.00
13	SCADA upkeep O&M increment	\$ 90.00	2000	\$ 180,000.00	2000	\$ 180,000.00	2000	\$ 180,000.00	2000	\$ 180,000.00	2000	\$ 180,000.00
14-17	VM Program Management including hazard tree removal, monitoring preventative vs corrective efforts, maintaining specifications, and utilization of cycle based trimming	\$ 85.00	1000	\$ 85,000.00	1000	\$ 85,000.00	1000	\$ 85,000.00	1000	\$ 85,000.00	1000	\$ 85,000.00
18	Maintaining Metrics for VM	\$ 85.00	125	\$ 10,625.00	125	\$ 10,625.00	125	\$ 10,625.00	125	\$ 10,625.00	125	\$ 10,625.00
20	Feeder Trimming Prioritization	\$ 96.00	80	\$ 7,680.00	80	\$ 7,680.00	80	\$ 7,680.00	80	\$ 7,680.00	80	\$ 7,680.00

* The average fully loaded activity based cost for resources performing or the activity for 2014-2018

Table 1.3-D: Approximate Costs Attributable to the District of Columbia

ECA Team³⁶³⁷³⁸

A discussion of costs and benefits, as required by Order No. 16975, is provided below.

ECA driven projects generally consist of planned projects to replace large, high cost, long lead time primary components within substations. Targets for these projects are usually selected by condition based criteria such as dissolved gas in oil analysis. However, due to certain external drivers (such as load, location, environment and system criticality), these replacements may also be triggered by historic performance of a component. These projects are primarily driven by Pepco's need to manage contingency risk and do not result from cost / benefit analyses. Replacements are usually in-kind or upgrades and depend on component availability at the time. System emergencies can alter the prioritization of these projects.

The utility's obligation to serve requires substation design criteria which provides redundancy and risk management. Although substation component failures are rare in comparison to feeder components, the loss of a critical substation asset could result in long term outages affecting thousands of customers. The provision of redundant components, backup sources, and minimization of single points of failure in substation designs reduces this risk and generally allows Pepco to perform routine maintenance and upgrades without the need for planned outages. This redundancy also allows Pepco to manage contingencies and continue service despite the loss of a major substation component. As such, substation reliability is maintained by keeping

³⁶ Order No. 16975 states the following at paragraphs 39 and 98:

39. *Decision: ...Specifically, the Commission directs Pepco to report on the recommendations and actions taken by the ECA team, including membership lists, meeting dates and minutes, analyses of impact of the ECA team on maintenance or replacement policies and asset management strategy and tactics. We also require Pepco, to the extent not already included, to report on costs for recommended equipment replacements and the projected benefits of those replacements, as OPC suggests. Further, the Commission directs Pepco to provide an explanation of how the work of the ECA team relates to other Pepco reliability initiatives and include a discussion of the equipment failure analysis as part of future years' Consolidated Reports.*

98. *Pepco is DIRECTED to include a report on the results of its Equipment Condition Assessment work consistent with paragraph 39 herein;*

³⁷ The ECA minutes have been modified in response to the Commission's directive "to include a brief description of the project status (i.e., whether it is deferred, completed or ongoing)," *In The Matter of the Annual Consolidated Report of the Potomac Electric Power Company*, Formal Case No. PEPACR-2014-01, Order No. 17816 at P 231 (February 27, 2015).

³⁸ ³⁸ Order No. 19119 also addressed the ECA minutes and directed Pepco and OPC to file comments on potential elimination and/or changes to the content of the ECA information presented in the ACR. The Commission has not yet issued a final order on this matter.

both the primary and redundant assets in good working condition. Therefore, condition and criticality of assets predominantly drives substation reliability programs and many projects in the substation reliability category do not directly translate to improvements in outage frequency and duration. This concept is known as Reliability Centered Maintenance (RCM), the principles of which dictate that predictive maintenance activities serve to identify failing assets prior to catastrophic failure.

Substation assets are inspected under various inspection programs, including visual, infrared, and oil sampling where applicable. Based on observed condition and potential system risk, assets are cleared for normal duty, scheduled for closer monitoring, scheduled for maintenance, selected for immediate replacement, or added to prioritized programmatic replacement programs, as appropriate. Pepco's ECA process is the vehicle used to identify substation assets for condition-driven replacement in order to maintain the reliability of the substation. The ECA process cooperatively analyzes major equipment condition, makes major repair / replace decisions utilizing various subject matter experts and through consensus, prioritizes candidates for replacement on a quarterly basis.

Substation assets such as transformers, breakers, and larger components typically have long lead times and must be ordered well in advance (months to years) of anticipated need. For this reason, a number of replacement projects are kept in the project pipeline at any given time. This allows Pepco to substitute one project for another in situations where long lead times would subject the system and customers to significant reliability risk. Projects are engineered and built using standard designs and approved equipment.

Generally, substation reliability projects cannot be translated into measurable or forecasted SAIDI or SAIFI benefits. The presence of redundant systems within substations reduces or eliminates the direct threat to customer reliability from the loss of a single asset. However, the failure of such assets reduces the security of supply to feeders and elevates the risk of large scale customer outages. Given the potential for customer impacts along with the long replacement cycle of major substation assets, Pepco replaces these assets proactively based on condition assessment and the desire to manage such contingency risk.

A summary of the four quarters of ECA meeting dates and minutes (which include the analyses) for 2019 are included below. The format has been changed to summarize the data while retaining requests for greater clarity regarding timing, costs and completion of projects.

Pepco-DC Region Equipment Condition Assessment

Meeting Minutes – 1st through 4th Qt. 2019

Transformers:

2019 Capital Work:

Location	Position	WBS	2019 Spend	Status
83 Blue Plains	R-23107	UTSPRD8AD3	\$4,400,984	In Progress
168 Naval Research	1T	DSPRD8AD11	\$2,209,815	In Progress
168 Naval Research	2T	DSPRD8AD11	\$ 368,843	Completed
150 Twining City	2T	UDSPRD8TC1	\$ 621,788	In Progress

Breakers:

2019 Capital Work Completed:

Location	Position	WBS	2019 Spend	Status
120 Burtonsville	1A	UTSPRD8Q1M	\$1,736,196	Completed
158 Norbeck	69077B (16F)	UDSPRD8CM	\$ 405,748	Completed
158 Norbeck	1TS1B (18F)	UDSPRD8CM	\$ 405,748	Completed
2 O Street	2B -13816	UTSPRD8CD1	\$ 94,121	Completed
121 Bells Mill	11TS1B (3F)	UDSPRD8Q1	\$1,131,151	Completed

Batteries:

2019 Capital Work

Location	Position	WBS	2019 Spend	Status
154 Wood Acres	Z-150-1	UDSPRD8EM	\$18,536	Completed
149 Lanham	Z-149-1	UDSPRD8EM	\$24,680	Completed
58 Ft Dupont	Z-58-1	UTSPRD8ED	\$13,820	Completed
173 Toaping	Z-173-1	UTSPRD8ED	\$40,275	Completed
42 Buzzard Point	Z-42-1	UTSPRD8ED	\$77,778	Completed
122 Oak Grove	Z-122-1	UTSPRD8ED	\$57,662	Completed
149 Lanham	Z-149-1	UTSPRD8ED	\$62,139	Completed
123 Ritchie	Z-123-1	UTSPRD8ED	\$61,879	Completed
162 Bowie	Z-162-1	UTSPRD8ED	\$43,493	Completed
195 Ryceville	Z-195-1	UTSPRD8ED	\$56,111	Completed
Chalk Pt -230kV		UTSPRD8EM	\$98,997	Completed
Chalk Pt -500kV		UTSPRD8EM	\$81,019	Completed
Chalk Pt -500		UTSPRD8EM	\$88,242	Completed
121 Bells Mill	Z-121-2	UTSPRD8EM	\$86,847	Completed
66 Brighton	Z-66-2	UTSPRD8EM	\$82,925	Completed

Meeting Attendees:*1st through 4th Qt. 2019*

Title	Department
Manager Transmission & Substation Engineering	PSC Equipment Standards
Principle Engineer	PSC Equipment Standards
Senior Engineer Standards	PSC Equipment Standards
Senior Engineer Standards	PSC Equipment Standards
Senior Engineer Standards	PSC Equipment Standards
General Engineer	PSC Equipment Standards
Engineer	PSC Equipment Standards
Associate Engineer	PSC Equipment Standards
Manager Transmission & Substation Engineering	PEPCO Substation Engineering
Supervisor of Engineering	PEPCO Substation Engineering
Senior Engineer	PEPCO Substation Engineering
Senior Engineer	PEPCO Substation Engineering
Senior Engineer	PEPCO Substation Engineering
Senior Engineer	PEPCO Substation Engineering
Manager Regional Capacity Planning	PEPCO Distribution Planning
Principle Engineer	PEPCO Distribution Planning
Senior Engineer	PEPCO Distribution Planning
Sr. Engineering Tech Specialist	PEPCO Distribution Planning
Manager Regional Electrical Operations	PEPCO Sub Construction & Maintenance
Sr. Engineer	PEPCO Sub Construction & Maintenance
Engineering Tech Specialist	PEPCO Sub Construction & Maintenance
Principle Project Outage Coordinator	PEPCO System Operations

1.3.6 STORM READINESS

Pepco's mandate is to provide safe and reliable electric service. This is the basis for all Company contingency operations, including storm restoration, and is the foundation for the storm restoration objective of safely restoring electric service to the greatest number of customers in a minimum amount of time. The Pepco District of Columbia Major Service Outage Restoration Plan (MSO Plan) uses these principles to assess damage across the entire Pepco service area and to establish restoration guidelines for preparedness, pre-storm planning, storm response, communications, and post-storm evaluations.

The PHI Crisis Management Plan and the MSO Plan necessarily modify the normal corporate organization, in accordance with the National Incident Management System's (NIMS) Incident

Command System structure and manages this amended structure to accomplish storm restoration and emergency response. The Pepco Regional Incident Management Team (IMT) assigns personnel to this temporary structure to efficiently restore customer service. The overall governing principle of the Pepco IMT is to match resources to restoration requirements. The Pepco IMT is flexible in order to adjust resources to the various types of restoration efforts that may be required and to enable restoration activities to be prioritized to restore the largest number of customers first across Pepco's service territory. All Company resources, including Operations, Logistics, Planning & Analysis, and Finance and Administration are dedicated to customer service and the storm restoration effort.

Each branch of the Pepco IMT has the ability to expand or contract staffing for the response effort as necessary. Storm positions are activated based on the support or response functions required for efficient restoration. Pre-established storm duties are maintained for each storm position. The Staging Area branch of the IMT is activated under unique circumstances. The increased number of customer calls during storms requires additional staffing at the Customer Operations Call Center to answer customer inquiries and to supplement the automated entry of customer outage information. In the event of a major storm, Pepco's High-Volume Call

Answering (HVCA) System can be activated to take the high volume of outage calls Pepco expects in the immediate aftermath of a major storm. This HVCA system is capable of answering more than 100,000 calls per hour to reduce the incidence of busy signals and hold times and is most efficient in the early stage of the restoration process. Once the initial outage reports are in, the Company disables the automated call system and staffs the Pepco call center with additional employees who are trained to assist call center representatives in handling the increased volume of calls. All areas in the Customer Care Group, in performing their second roles are required to provide support to the Call Center. Additional personnel across the Company provide assistance through their incident response role assignments and help to relay accurate information between customers and operations.

Communication requirements for internal as well as external groups are identified in advance, planned for, and monitored for effectiveness during storm response. Accurate, timely and coordinated communications provide a vital link in the restoration response. Approximately 48 hours in advance of a significant major storm with predicted multi-day outages, Pepco notifies customers who are enrolled in Pepco's Emergency Medical Equipment Notification Program so they can prepare to implement their contingency plans in the event of power outages. Pepco also notifies regulatory and government officials and emergency management agencies of its storm preparations and to discuss any special concerns. Operational communications coordinate field restoration activities. Communication roles in the PHI Crisis Management Plan and the MSO Plan provide for a proactive and flexible communication strategy.

The Storm Restoration Objectives are to safely restore electric service to the largest number of customers in a minimum amount of time. This requires advance planning and pre-storm preparation. Advance planning during non-storm conditions enables operational readiness for restoration activities. In addition to drills and exercises designed to lead employees through a variety of emergency scenarios, Pepco also works with local emergency management agencies and a cross-section of community, government and business leaders in a collaborative effort to review restoration plans and practices to develop more effective ways to improve Pepco's response.

In addition, Pepco actively pursues a public education and awareness campaign that includes initiatives such as the “Weathering the Storm” brochure. These publications and additional brochures contain information about the Company’s Emergency Medical Equipment Notification Program, tree trimming, and portable generator safety, all of which are available upon request as well as on Pepco’s web site. These materials and information provided in Pepco’s monthly newsletter that is mailed to customers with their bill provide information that help families and individuals prepare in advance for any emergency situation and are a significant component of Pepco’s advance planning efforts. Additional preparedness information, as well as neighborhood outage maps, with information regarding each outage event, including the ETR, is also available on the Pepco web site.

Pre-storm preparation is the process of preparing for mobilization before a storm occurs. When a significant major storm threatens, Pepco begins preparations, when possible, by reviewing Pepco’s inventory of storm repair materials and notifying vendors of the potential need for material procurement. To plan for sufficient staffing, Pepco informs employees of the pending storm and the potential for activation of their incident response second role assignments. The Company also alerts Pepco contractors and discuss plans for possible aid from the utilities within Pepco’s participating mutual assistance groups. Both advance planning and pre-storm preparation activities enable a state of preparedness to transition smoothly to IMT operations and to minimize restoration time.

After a storm affects the electric system, assessment and restoration begins. Damage Assessment requires an on-going evaluation of the substations shut down, distribution feeders locked out, and feeders with damaged segments, as well as the areas and the number of customers affected. This continual process enables efficient and appropriate allocation of restoration resources. The IMT is activated to provide customer communications and to coordinate the mobilization of crews for system repairs. Since damage assessment is on-going and storm levels may change in intensity, the restoration strategy may be modified throughout the effort, and the level of mobilization may be adjusted to meet restoration requirements.

Adequate supplies of materials, tools, and equipment are necessary for restoration to proceed safely and efficiently. Logistics include procuring, maintaining, and transporting restoration

resources, personnel and materials. Departments are responsible for determining logistics requirements on an on-going basis and maintaining procedures.

When major reconstruction work or significant outside resources are required for system restoration, a staging area may be established. Staging Areas are defined as sites where crews and materials are temporarily stationed in severely damaged areas of the service territory. Staging areas are set up to respond to specific restoration efforts with assigned crews and on-site materials. Sites are selected for their accessibility, parking, and space to store materials needed for reconstruction and restoration of customer service, and ability to house and feed crews.

During major outage events of extended duration Pepco can use resources from other PHI companies, if available, or request mutual assistance from one of several regional and national mutual assistance groups in which it participates. These groups meet periodically to review policies, procedures and work practices to ensure continued ability to provide mutual assistance between electric utility companies. Post-event evaluations following major service outages contribute to continuous improvements to the Pepco District of Columbia MSO Plan. Response activities are most likely to improve when recommendations are linked and incorporated into the plan and departmental support procedures. These links serve as the vehicle to enhance response plan capability. Trained personnel are essential for successful execution of storm response duties. Additional training requirements may be highlighted as a result of debriefings or drills.

Further, during major outage events, Pepco uses its Advanced Metering Infrastructure (AMI) to enhance storm restoration efforts. For example, during those major outage events, Pepco's AMI capability to "ping" meters help to determine whether a customer has electric service. This application of Pepco's AMI network contributes to reducing restoration times, and avoiding costs, without necessitating phone calls to customers thus minimizing unnecessary costs. It also materially reduces the number of truck rolls needed to verify customer restoration, helping ensure that crews are dispatched efficiently.

Drills and Functional Exercises

In 2019, Pepco held Service Center Drills at the Rockville Service Center on September 6th and at the Forestville Service Center on September 13th. In addition, the Pepco IMT participated in GridEx V on November 13th & 14th which satisfied their regional exercise requirements.

In conjunction with the MSO Plan, Pepco may also activate PHI's Crisis Management Plan. PHI's Crisis Management Plan defines the management structure and outlines response activities for extensive emergencies, including unplanned events that can cause significant injuries to employees, customers or the public; cause physical, environmental or technological damage; or can shut down the business or disrupt operations. This plan also provides general guidelines allowing PHI and Pepco sufficient flexibility to respond to any emergency condition promptly and effectively.

PART 2: 2019 PIP

SECTION 2.1 – REQUIREMENTS

On November 1, 1982, in Order No. 7668, the Commission adopted final rules regarding the submission of an annual PIP in Formal Case No. 766. These rules are codified in Title 15 of the District of Columbia Municipal Regulations, Chapter 5, Rules 502.1 and 502.2. In 1982, the Commission also directed the Company to establish the PIWG, consisting of representatives from the Commission Staff, the Office of the People's Counsel (OPC), and Pepco to provide a setting for communication among all parties and Commission Staff during the developmental stage of the first annual PIP. With the divestiture or transfer to an affiliate of all of Pepco's generating stations, the primary focus of the PIP and PIWG has shifted instead to transmission and distribution operations, performance, and reliability.³⁹ Later, Order No. 16623 emphasized a focus on reliability for the Consolidated Report.

SECTION 2.2 – PIWG

As discussed above, the PIWG has evolved over the years since its establishment but continues to serve as a standing committee for collaboration among the Commission Staff, the OPC, and Pepco. The PIWG meetings address issues of interest to the Commission or PIWG members. Agendas and meeting frequency are determined according to issues of immediate concern to PIWG members and according to directives of the Commission. The PIWG generally meets no more frequently than monthly, but at least once per quarter. A discussion of the items on the next meeting's agenda usually occurs at the end of each PIWG

³⁹ In Order No. 15152 on the 2008 Consolidated Report paragraphs 68 the Commission stated the following:

68. *The Productivity Improvement Working Group, which includes OPC, provided a reasonable definition of a productivity improvement project in 2006. Specifically, the PIWG states:*

T&D productivity improvement projects were considered those projects that will increase T&D system efficiency by reducing losses and improve[ing] system reliability, and which may defer more costly additions to the electric system. (Footnote: F.C. No. 766, Decision on Consideration of OPC's T&D Productivity Improvement Working Group in Response to Commission Order No. 13754, filed July 6, 2006 ("2006 PIWG Report"), at 2.)

The power serving the District's Standard Offer Service customers is now procured through a wholesale procurement process by PEPCO and, as such, productivity improvement is applicable only to transmission and distribution issues. We find the PIWG's definition of a productivity improvement project workable and adopt it here.

meeting. The agenda for the next meeting is also included in meeting minutes, which are circulated to PIWG members for comment before filing with the Commission.

2019 PIWG Activities

The PIWG met five times in 2019. The 2019 PIWG meeting dates and meeting minutes filing dates are as follows:

2019 PIWG Meeting Dates and Meeting Minutes Filing Dates

Meeting Date	Filing Date of the Meeting Minutes (See Formal Case No. 766)
Feb. 7	Feb. 19
May 8	May 16
July 26	Aug. 6
Sept. 26	Oct. 17
Dec. 5	Dec. 20

Table 2.2-A

SECTION 2.3 – PIP

In Order No. 16623 on the 2011 Consolidated Report, the Commission stated the following in paragraph 8: “As a preliminary matter, we note our continuing concern with the reliability of the Pepco electrical distribution system... It is through the prism of these [reliability] efforts that we consider the Pepco Consolidated Report.” In accordance with the Commission’s focus in Order No. 16623 and the guidance of the PIWG, the Company presented its 2019 PIP projects, with a strong emphasis on reliability.

The 2019 PIP projects were as follows:

- 4 kV Distribution Substation Automation Projects
- 4 kV to 13 kV Conversion Projects
- DA Projects
- Priority Feeder Projects

2.3.1 PIP PROJECT STATUS

The year-end 2019 status of the 2019 PIP Projects is included in Table 2.3-A.

2019 PIP Projects						
(Thousands of Dollars)						
Item	Description	PIP Project Year	2019 Project Amounts ¹ (x1000)		Cost Variance Actual from Budget	Project Status
			Budget	Actual		
1	4 kV Distribution Substation Automation Projects	2019	\$784	\$501	(\$283)	See Section 2.3.2.1 below.
2	4 kV to 13 kV Conversion Projects	2019	\$17,801	\$3,458	(\$14,343)	See Section 2.3.2.2 below.
3	Distribution Automation Projects	2019	\$10,200	\$4,200	(\$6,000)	See section 1.3.1 for RMS projects and section 2.3.2.3 for ASR projects.
4	Priority Feeder Projects	2019	\$1,456	\$994	(\$462)	See section 2.3.2.4 below.

Table 2.3-A

2.3.2 PIP PROJECT DETAIL

Detail addressing each of the 2019 PIP projects – including work completed in 2019, work forthcoming in 2020, and longer-term plans – is provided below.

2.3.2.1 4 kV Distribution Substation Automation Projects

The substation automation work continues at Macarthur Boulevard Sub 152 and is expected to be completed in the fall of 2020. The construction at Texas Avenue Sub 195 is expected to be completed in the winter of 2020.

2.3.2.2 4 kV to 13 kV Conversion Projects^{40 41}

These projects are included in the Load Growth program.

Background: The 4 kV distribution system supplies load throughout various neighborhoods in the District of Columbia. The 4 kV system has provided an effective and reliable supply to Pepco customers for many years. However, the 13 kV system is capable of supplying a greater density of load and generally produces less electrical losses. Therefore, as load density increases locally, or the system requires more maintenance and replacement becomes the best economic alternative, the 4 kV system is gradually being replaced with a 13 kV distribution system.

Magnitude of the Conversion: There are presently 114 megawatts of 4 kV load on the Pepco system, mostly in the District of Columbia. Over the next ten years, approximately 30 megawatts (including growth) will be converted to 13 kV service. Allowing for load growth, approximately 100 megawatts are projected to remain on the 4 kV distribution system by 2029. This 4 kV load will be located primarily in Wards 3, 7 and 8 where the load is served by substations that have either multiple transformers or are networked together through the feeder primaries. These remaining 4 kV areas are considered reliable due to the shortness

⁴⁰ In Order No. 16091 at paragraphs 50, 53, and 64, the Commission stated the following:

- 50. *Decision. We agree with the Staff recommendation and require Pepco to provide justification for any deviations from the plan schedules and annual budgets for 4 kV to 13 kV conversion projects in its Consolidated Reports, excluding minor deviations of less than 5%. This information may be provided in the discussion of "Reliability Projects."*
- 53. *Decision. ...we have not adopted the Staff's "replace or rebuild" recommendation. However, we agree that future Consolidated Reports should contain detailed schedules and budgets for Reliability Projects, as well as justification for deviations from those schedules and budgets. We shall require Pepco to submit such schedules in future Consolidated Reports.*
- 64. *Pepco IS DIRECTED to provide detailed schedules and budgets for conversion projects, as well as justification for any non-minor deviations from these , consistent with Paragraphs 50 and 53 of this Order;*

⁴¹ Commission Order No. 16623 states the following:

- 32. *Staff Recommendation: Require Pepco to provide and submit a report as to whether the budgets and schedules for each of the four 4 kV to 13 kV conversion projects have undergone non-minor deviations from previous plans. Include the justification for such deviations.*
- 33. *We accept the Staff's recommendation and direct Pepco to include a complete update in the 2012 Consolidated Report, including changes in budgets and schedules and justification for each non-minor deviation.*
- 54. *Pepco is DIRECTED to provide a report of conversion projects consistent with paragraph 33;*

of the feeders and the availability of ready backup. Areas that are going to be maintained and not converted will involve upgrading of substantial transformer equipment and other supporting equipment.

Areas Scheduled for Conversion: Areas supplied by the following substations are scheduled to have conversion work performed in the next ten years:

- Georgetown Sub. 12 NW Underground conversion.
- Harvard Sub. 13 NW Underground conversion.
- North Capitol Sub. 40 NE Overhead conversion
- Twelfth Street Sub. 126 SW Underground conversion
- Anacostia Sub. 8 SE Overhead conversion
- G Street Sub. 28 NE Underground conversion

All of the projects described below are multi-year projects with multiple phases. Five of the six projects were initiated prior to 2015. G Street was accelerated to begin work in 2016 to build infrastructure to extend new 13 kV feeders. This was done because significant new loads are expected to materialize in the G Street area and the existing 4 kV infrastructure is inadequate to meet this expected new load. Dollars spent on these projects may fluctuate over the years to account for project phasing. The Anacostia, Harvard and North Capitol conversion work is scheduled to be completed during 2020. The overall budget for the 4 kV conversion projects is still in line with the Company's long-term conversion plan.

Status: In 2019 Pepco spent \$3,457,922 on its 4 to 13 kV conversion projects, \$14,343,481 less than the budget of \$17,801,403.00. The deviation between the 2019 budget and actual expenditures is due to a combination of work being delayed by permitting and work time. Multiple phases of redesign projects resulted in projects being held thus zero dollars were spent.

Convert a part of the load at Georgetown Sub. 12 from 4 kV to 13 kV and retire 4 kV Substation

A modernization of this area infrastructure started in 2001. It includes the 4 kV to 13 kV conversions that will ultimately retire the 4 kV radial distribution system supplied from Georgetown Sub. 12. The 4 kV to 13 kV conversion has been completed for the area between M Street to the south, P Street to the north, Wisconsin Avenue to the west and 27th Street, NW to the east, by extending two 13 kV distribution feeders from Georgetown Sub.

12. In addition, conversions along M Street, Prospect Street, and N Street west of Wisconsin Avenue were completed in 2010 and 2011. Conversions along O and P Streets west of Wisconsin Avenue concluded in 2012. In 2017, conduit was built between 34th and Water St., NW and 29th and K St., NW.

Existing Configuration: The 4 kV underground radial distribution system serves mostly residential and some small commercial loads. Moderate load growth is anticipated for this isolated area but there are basically no external ties to deliver this power. The existing underground infrastructure, conduit and cable are in need of remediation with a history of extended outages due to limited transfer capability and circuit configuration and conduit construction that limits the size of cable that can be installed and provides limited physical protection to the cables.

The Georgetown 4 kV substation was rebuilt in the 1980s however the 4 kV underground infrastructure is the original construction and is nearing its full capacity.

Proposed Enhancement: Convert all 4 kV load to 13 kV with the exception of Francis Scott key bridge which feeds Roosevelt island where step-down transformers are being considered due to access limitations and the retirement of all 4 kV substation equipment.

Status: With the exception of a few remaining transformers, conversions of the area north of M Street were completed in 2016. The section south of M Street NW identified as Phase 6, which has long and lightly loaded feeders, is currently finishing design with conduit and cable work which continued into 2017 with the rest of the system keeping the 4kV feeders

by using step-down transformers in the 2018-2019 timeframe. The conduit work under the Francis Scott Key Bridge took roughly 1 year to complete. The 2019 budget was \$5,479,087 and approximate spend for 2019 was \$23,262. Due to the unanticipated non-constructability of the previous plans, we are now revising the conversion work and releasing a new plan this year. All construction is currently on hold.

Georgetown Sub. Conversion:

2020 – 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$0	\$500	\$0	\$0	\$0	\$500

**The revised plan will be a new project under the project initiation process to be funded. Currently there is no budget for the project

Convert load at Harvard Sub. 13 from 4 kV to 13 kV and retire 4 kV Substation

This project will initiate infrastructure upgrades to the existing 4 kV system in the Upper Shaw and Harvard/Columbia Heights areas. Two 13 kV Feeders were extended from Florida Avenue Sub. 10 in 2011 to provide capacity for the conversion and to allow load to be transferred to Sub. 10 from Sub. 13. Existing 13 kV Feeders from Sub. 13 and new 13 kV Feeders from Sub. 25 were used to convert the final portion of 4 kV load starting in 2015.

Approximately 75% of the Harvard 4 kV load has been converted as the area south of Harvard Street is largely completed. Recently completed phases of the conversion extended two new feeders from Champlain Sub 25 along Champlain Street, Columbia Road and 16th Street to Newton Street in order to convert 4 kV load in the area bounded by Harvard Street NW to the south, 16th Street NW to the west, Otis Street NW to the north and 10th Street NW to the east.

Existing Configuration: The existing 4 kV underground distribution system serves residential and small commercial loads. Modest load growth is anticipated for this area which is isolated from the rest of the system and has no external ties. The existing

underground system experiences feeder overloads, voltage deficiencies and a greater than average number of underground cable outages due to the age and condition of the cable and

limited transfer and switching capabilities.

Proposed Configuration: Convert 4 kV load to 13 kV distribution feeders and retire Harvard Sub. 13 which currently operates at 4 kV.

Status:

The building of conduit and extension of main trunk of the two 13 kV feeders out of Florida Avenue has been completed and most of the load south of Harvard Street has been converted. Work was completed to extend two new feeders from Champlain Sub. 25 and conversions in the area north of Harvard Street and east of 16th Street began in late 2016 and was completed in 2017. The 2019 budget was \$1,471,070 and approximately \$2,559,167 was spent in 2019. Currently 75% of the load has been converted to 13kV with approximately 3.0 MVA remaining. This remaining load is in the vicinity of Georgia Avenue and Sherman Avenue, NW between Quincy Street and Florida Avenue, NW and will be converted to existing 13kV feeders from Harvard Sub. 13 and Florida Avenue Sub. 10. The 4 to 13 kV conversions in this area are scheduled to be completed in 2020.

Harvard Sub. Conversion:

2020 – 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$800	\$0	0	\$0	\$0	\$0

Convert load at North Capitol Sub. 40 from 4 kV to 13 kV and retire 4 kV Substation

This project relates to an extension of existing and new 13 kV feeders to convert all 4 kV load served by North Capitol Street Sub. 40 to 13 kV. The North Capitol Street 4kV system serves mostly residential and small commercial customers in the Manor Park, Fort Totten, and Petworth neighborhoods. The first phase of this project to convert load from portions of North Capitol Sub. 40 Feeders 482 and 485 along 4th Street, NW between Buchanan and Hamilton Streets, NW to Fort Slocum Sub. 190 - 13kV Feeders 15006, 15012 and 15015 was completed in 2013. 2014 saw the completion of conversions along Hamilton Street, NW, Hawaii Avenue, NE and Fort Totten Drive, NE. In 2015, conversions were completed along North Capitol Street and Rock Creek Church Road.

Existing Configuration: The North Capitol Sub. 40 4 kV system is an isolated area on the Pepco distribution system that is not connected to any other 4kV substations or systems. Recent substation inspections have revealed deteriorating circuit breakers. The Allis Chalmers switchgear necessitates the salvage of spare parts from like equipment because the original equipment manufacturer is no longer in business and other manufacturers no longer supply parts for this equipment.

Proposed Configuration: Convert all 4 kV loads to 13 kV distribution feeders and retire North Capitol Sub. 40 - 4 kV.

Status: The project is underway. As of the end of 2019, several 13 kV trunk extensions have been completed and approximately 7 MVA of the 4 kV load has been converted to 13 kV. In 2017, two new 13 kV feeders were extended from Fort Slocum Sub. 190 to facilitate conversions in the area bounded by Kansas Avenue, NW, New Hampshire Avenue, NW, 4th Street, NW, and Missouri Avenue, NW. The budget for 2019 was 1,471,070. Approximately \$2,559,167 was spent in 2019. Currently, nearly 65% of the load has been converted to 13kV with approximately 4.0 MVA remaining. This remaining load is in the vicinity of North Capitol Street and 3rd Street, NW between Kennedy Street and Buchanan Street, NW and will be converted to existing 13kV feeders from Fort Slocum Sub. 190. The 4 to 13 kV conversions in this area are scheduled to be completed by December 2020.

North Capitol Sub. Conversion

2020 – 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$2,057	\$0	\$0	\$0	\$0	\$2,057

Convert load at 12th Street Sub. 126 from 4 kV to 13 kV and retire 4 kV Substation

This project will extend two 13 kV feeders in order to convert and/or transfer all 4 kV load supplied by 12th Street Sub. 126.

The 12th Street 4 kV system serves residential and small commercial customers in Southwest area and National Park Service buildings, street lights and traffic signals in the National Mall area. The conversion and retirement of the 12th Street Sub. 126 will be done in two phases. Phase 1 will construct an 8-way conduit bank from 2nd and C street SW to the vicinity of 7th and Maryland Avenue SW. It will involve the construction of approximately 1 mile of 8-way conduit bank. Phase 2 will involve extending Feeders 15294 and 15295 to two new three-way switches. Loops will then be extended from the switches to supply load around the National Mall and Southwest Waterfront. The last phase will require extending Feeders 15294 and 15295 to two new 3-way switches and extending laterals to the area of Hanes Point, the Tidal Basin and the 14th Street Bridge.

Existing Configuration: The 12th Street Sub. 126 contains oil circuit breakers that will be removed based on the review of condition and reliability. Both the 13 kV/4 kV transformers are identified as in need of eventual replacement. These oil circuit breakers are no longer manufactured, and the manufacturer no longer provides spare parts. As part of the conversion process, this substation will be retired.

Proposed Configuration: Convert all 4 kV loads to 13 kV distribution feeders and retire Twelfth Street Sub. 126 – 4 kV including the transformers and oil circuit breakers.

Status: The remaining major scope of work includes installing approximately 20,000 feet of #2 EPJ cable, ten (10) tap holes, 4 stepdown transformers and two (2) – 50kVA B phase transformers to complete the conversion for feeders 232 and 233. The completion of this work is contingent upon the approval of the National Park permit to complete the conduit

work at locations along East Basin Dr. SW adjacent to the George Mason Memorial and portions of Ohio Drive on the east side of East Potomac Park. All conduit designs have been prepared and are in the process of coordinating with NPS and DDOT (extra coordination needed due to construction being necessary into the 395 abutments on Arland Williams Bridge). Field work has also been difficult to obtain due to road grade being close to the water table and NPS coordination needed for occupancy. The project is nearly ready to move forward with conduit construction. Based on designs being mostly complete, project on track to complete the conversion by end of year 2020. The budget for 2019 was \$1,524,830. Approximately \$376,903 was spent in 2019.

12th Street Sub. Conversion:

2020 – 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$6,864	\$3	\$0	\$0	\$0	\$6,864

Convert Load at Anacostia Sub. 8 from 4 kV to 13 kV and Retire 4 kV Substation

The project relates to the extension of 13 kV feeders from Alabama Avenue Sub. 136 in order to convert all 4 kV load from Anacostia Sub. 8 4 kV and retire the Anacostia Sub. 8 – 4 kV substation.

The Anacostia Sub. 8 4 kV system supplies residential and small commercial load in the Anacostia area of Southeast Washington, D.C. New and existing 13 kV overhead feeders from Alabama Avenue Sub. 136 will be extended in order to convert all 4 kV load.

Existing Configuration: Anacostia Sub. 8 is supplied by two 34 kV feeders from Buzzard Point Station B. Converting 4 kV load from Anacostia Sub. 8 will also relieve load from Buzzard Point Station B 13 kV substation, which is approaching its firm capacity. Review of the equipment at Anacostia Substation and the 34 kV supplies indicated the need to replace all this equipment for long term reliability. Instead of rebuilding this station, conversion of the 4 kV load and transfer of the 13 kV load to Alabama Avenue Substation will allow the retirement of both the substation and supplies and improve the overall reliability of the distribution system in this area.

Proposed Configuration: Convert all 4 kV loads to 13 kV distribution feeders and retire Anacostia Sub. 8 – 4 kV.

Status: Much of the Anacostia Sub. 8 4 kV load has been converted over the past several years as part of the 23rd Street and Anacostia 4 kV conversion projects. Construction for the Anacostia 4 kV conversion project began in 2012 and about 2.4 MVA load has been converted to 13 kV. The 2019 budget for this project was \$0 and \$1,886 was spent in 2019. The work to convert the remaining 0.9 MVA to Feeders 15173 and 15177 is scheduled to be completed in 2020. Anacostia substation will be retired after all Alabama Avenue substation and distribution work has been completed. New feeders were recommended to transfer/covert all load currently supplied from the Anacostia substation to Alabama Avenue Sub. 136. All work is scheduled to be completed by the end of 2020.

Anacostia Sub. Conversion:

2020 – 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$241	\$0	\$0	\$0	\$0	\$241

Convert load at “G” Street Sub. 28 from 4 kV to 13 kV and retire 4 kV Substation

This project relates to an extension of existing and new 13 kV feeders to convert all 4 kV load served by “G” Street Sub. 28 to 13 kV.

The “G” Street 4kV system serves mostly residential and small commercial customers in the Capitol Hill, Barney’s Circle and Navy Yard neighborhoods. The first phase of this project to convert load from portions of “G” Street Sub. 26 feeders 212, 223, 227 & 228 Street, supplying load east of 11th Street SE and south of Pennsylvania Avenue SE to new Southwest Sub. 18 – 13kV Feeders 15876 and 15877, which has been designed and released to construction and will be extended to make the first phase conversions. The next phases will consist of extending a third 13 kV feeder from Southwest Sub. 18 along with the initial two feeders to convert portion of “G” Street 4kV load north of Pennsylvania Avenue SE and South of Massachusetts Avenue SE. The remaining 4 kV load north of Massachusetts Avenue SE will be converted to Benning Sub. 7 feeders 14708 and 14152.

Existing Configuration: G Street Sub. 28, was built in 1965 and is an isolated 4kV system not connected to any other 4kV substation. The area is experiencing moderate load growth and the existing 4kV system cannot accommodate any large new business load. Furthermore, some of the 4kV Feeders have had voltage problems, and the existing conduit and cables are very old. Therefore, an upgrade of this system is underway to eliminate potential reliability concerns proactively.

Status: Project scope and estimate was reassessed in early 2019. The project was handed over to Project Management for execution. It is currently in design. A significant portion of the design for the conversion south of Pennsylvania Ave. has been completed. The section north of Pennsylvania Ave. design is anticipated to be completed by June 30th, 2020. Construction to begin early 2021. The 2019 budget for this project was \$8,526,399.00 and \$351,840.00 was spent in 2019.

“G” Street Sub. Conversion:

2020– 2024 Budget (Figures in Thousands of Dollars)

<u>2020</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>	<u>2024</u>	<u>Total</u>
\$1,346	\$10,164	\$12,973	\$10,467	\$10,467	\$11,471

2.3.2.3 DA PROJECTS

DA is the conversion of a manually-operated distribution system with limited available status information and limited control to a system that not only is fully automated but also performs operations totally independent of any human intervention. Advancements in technologies have made these automation activities practical for the lower voltage systems and will significantly change the way the Company responds to outages and operates and restores the electric system.

Status: Refer to section 1.3.1 (Technology: Monitoring, Automation and Information System) above for the status of the completed DA Projects. There are 11 more feeders identified for ASR activation in 2020. To identify candidate feeders, Pepco evaluated the performance history of individual substation main and feeder breakers, and automatic reclosers downstream on circuits. Specifically, Pepco targets feeders with some of the highest SPC values which consider the customer interruptions and duration of these interruptions over the last three years. The table below lists the 11 candidate feeders for ASR feeder scheme deployment in 2020 timeframe. This set of feeders will primarily benefit customers in Ward 8.

ASR Feeders Planned for 2020 with their Historical Lockout Statistics

Substation	Feeder Number	Reliability Performance (SPC Value)
Alabama Ave	15166	0.001220816
Alabama Ave	15172	0.009402057
Alabama Ave	15173	0.014119247
Alabama Ave	15174	0.013754641
Alabama Ave	15175	0.001771977
Alabama Ave	15176	0.011980111
Alabama Ave	15177	0.018171942
NRL	14752	0.002606653
NRL	14753	0.002007367
NRL	14755	0.003456576
NRL	14758	0.016827682

A full discussion of current and planned DA work is provided in Section 1.3.1 of this report.

2.3.2.4 PRIORITY FEEDER PROJECTS

These projects are included in the Feeder Improvement program.

Status: In response to the Commission's focus on preventing repeat Priority Feeders, Pepco has adjusted its feeder remediation strategy to a more comprehensive approach. Instead of focusing on locations where previous failures have occurred, the entire feeder is reviewed to address potential locations for future failures. The actual expenditure of the 2019 Priority Feeder Projects was \$994,000. A more detailed description of the work, as well as a discussion of the 2019 Priority Feeder projects, can be found in Section 2.4.1.

SECTION 2.4 – PERFORMANCE

2.4.1 PRIORITY FEEDERS & AGGRESSIVE INITIATIVES

2.4.1.1 FEEDER PERFORMANCE AND AGGRESSIVE INITIATIVES⁴²

⁴² Order No. 16975 states the following at paragraphs 58 and 59, 60, and 105:

58. *Decision: ...We therefore require Pepco to provide in the 2013 Consolidated Report, the information recommended by the Staff including an explanation of any discrepancies between work planned and work completed.... In Order No. 15941, the Commission required Pepco to provide specific information regarding any 4 kV feeder that has appeared on the Priority Feeder List three times or any 13 kV feeder that has appeared on the Priority Feeder List four times. On June 13, 2012, Pepco filed a report pursuant to that Order, providing information on two 13 kV feeders, 14717 and 14768. The Commission believes it is necessary to expand the scope of Pepco's reporting on feeder improvement to include any feeder that has appeared on the priority feeder list more than twice. Therefore, we require Pepco to provide the information required in paragraph 13 of Order No. 15941 in the future Consolidated Reports for any feeder appearing more than twice on the Priority Feeder List....*
59. *In future Consolidated Reports, Pepco shall include the following information about each feeder on the Priority Feeder List:*
- (1) a detailed description of outages, including causes and corrective actions taken;*
 - (2) the SAIDI, SAIFI, number of interruptions, and number of hours of customer interruptions for that feeder for each year beginning with the year the feeder first appeared on the Priority Feeder list;*
 - (3) a map showing the feeder service area, including affected neighborhoods;*
 - (4) an analysis of why past corrective actions failed;*
 - (5) Pepco's proposed solution to the feeder's reliability problem, including an explanation of options considered with the cost/benefit analysis of each and justification for the option recommended;*
 - (6) a cost/benefit analysis of the solution, including budget and cash flows by year, as well as any impact on the revenue requirement; and*
 - (7) a detailed justification for its aggressive feeder remediation measure of replacing open wire secondary with triplex secondary conductor.*
60. *The Commission notes that in recent PIWG meetings, Pepco has indicated its intention to change the methodology which it uses to determine Priority Feeders. A change in methodology would diminish the value of the Priority Feeder List in determining historically poorly performing feeders and would lessen our ability to track and compare the historical data. Therefore, we require Pepco to provide two Priority Feeder Lists, using both the historical (CPI) and any new methodologies in the 2013, 2014 and 2015 Consolidated Reports. In addition, the Commission requires Pepco to provide the information required by paragraph 13 of Order No. 15941 for any feeder appearing more than twice on the Priority Feeder List using either the historical or any new method.*
105. *Pepco is DIRECTED to provide information on Priority Feeders consistent with paragraphs 58-60 herein;*

Feeder Performance⁴³

Each year Pepco analyzes the performance of its feeders to determine the relative ranking of each feeder from the best to the least reliable. From this ranking, Pepco selects the least reliable two percent (2%) of its feeders (excluding the selected feeders from the prior year study) to analyze and identify actions which likely will improve the reliability of the feeders, and therefore the system.

Beginning in 2013, the Company began using the SPC (System Performance Contribution), a method that provides greater system performance improvement potential. The SPC value for each feeder is calculated using the following equation:

$$\text{SPC} = 75\% \times (\text{Feeder CI} / \text{System CI}) + 25\% \times (\text{Feeder CMI} / \text{System CMI}),$$

where

Feeder CI = Customer Interruptions of the feeder
 System CI = Customer Interruptions of the total system
 Feeder CMI = Customer Minutes of Interruption of the feeder
 System CMI = Customer Minutes of Interruption of the total system.

In addition, when selecting the annual priority feeders, the selections are made based on the combination of the following criteria:

- (1) Feeders blended performance ranking by SPC values (i.e., individual feeder contribution to system SAIFI and SAIDI);
- (2) Feeders that are not repeated from the year prior;
- (3) Feeders with a minimum SAIFI value of 2.00; and
- (4) Feeders experienced at least 10 outage occurrences in the evaluation period.

Additional analysis at the feeder level is conducted to ensure the proper feeders are selected and corrective actions are reasonable (e.g., excluding feeders with abnormal configuration

⁴³ The Electricity Quality of Service Standard D.C.M.R. 3603.6 states the following:
 3603.6 *The utility shall continue the current reporting of the worst performing (lowest two (2) percent) feeders (utility methodology) and corresponding corrective action plans, with the action taken in year 1 and the subsequent performance in year 2 in the annual Consolidated Report.*

at the time of the outage occurrence, when outage causes were remediated during initial outage restoration work, etc.).

Excluded from this annual study are the Priority Feeders from the prior year, which typically would not show the full results of corrective actions until a full year following the completion of the corrective actions.

As of December 2019, there are 777 feeders (4 kV and 13 kV) in the District of Columbia. Sixteen feeders represent 2% of the 777 feeder total. The sixteen 2019 Priority Feeders, along with customers served, are provided in Section 2.4.1.2., and each includes a narrative outlining the initial measures necessary to improve performance. Additional corrective actions may result from continuing analysis of the outage data and detailed engineering. These feeders originate from seven different substations.

Attachment C contains maps of the 2019 Priority Feeders. The priority feeder program will be an enhanced initiative including both reliability work routinely performed on the selection of priority feeders supplemented with more aggressive initiatives.

Cost/Benefit Discussion

Order No. 16975 requires that Pepco provide the following in this and future Consolidated Reports (paragraph 59, item 6):

(6) a cost/benefit analysis of the solution, including budget and cash flows by year⁴⁴, as well as any impact on the revenue requirement;

As described in previous ACRs, the measurement of benefits associated with feeder reliability projects generally depends on the outage history of the feeder and the likelihood that a portfolio of remediation activities will reduce or totally eliminate similar outages for the same or similar cause. Simply allocating a portion of the previous customer interruptions or customer minutes of interruption prior to the remediation activity is a way of qualifying the relative cost / benefit of individual remedial efforts. This is, however, not a dependable

⁴⁴ The budget and cash flow discussion is provided in Section 2.4.1.2 below on a feeder by feeder basis.

method of forecasting future feeder or aggregate system reliability because no remediation tactic is all inclusive of every possible outage cause. Likewise, this approach assumes all other inputs to system reliability are held constant (same weather, same animal events, same tree faults, etc.), which is unlikely.

Similarly, the measure and inclusion of cost/benefit per feeder or per individual initiative would potentially serve to reduce the field of options available to apply in feeder performance improvement. Some activities are not as efficient or economical as others based on a simple mathematical evaluation. However, the potential exclusion of these activities based on their relative inefficiency at the feeder or activity level would mean that the best overall portfolio of remedies could not be utilized in system level improvement. Further, with the advances in sectionalization technology, standard cost benefit analyses could drive a utility to employ only mitigation efforts rather than more appropriate but potentially more costly fault elimination tactics. Pepco evaluates each of these options and implements mitigation as well as elimination techniques when evaluating work to improve reliability of a feeder.

Aggressive Initiatives⁴⁵

The Priority Feeder program is an enhanced initiative including both reliability work routinely performed on the selection of priority feeders supplemented with more aggressive initiatives.

Aggressive initiatives may include the following:

- Installation of tree wire in close configuration construction to replace bare wire through heavily treed areas where aggressive tree trim and standard cross-arm construction would have limited success or is restricted by ordinance or property owners.
- Installation of PAC for use as the main trunk of the feeder with the existing mainline reconfigured as fused laterals.
- Installation of automatic circuit reclosers (ACR) in loop scheme configuration to automatically sectionalize faulted sections of the feeder and provide automatic backup to unfaulted sections.
- Installation of remote operated load break switches into the loop scheme configuration with the automatic circuit reclosers.

Pepco's proposed aggressive initiatives to its underground distribution feeders are:

4 kV System

In addition to performing Very Low Frequency (VLF) testing and manhole inspections, the process of correcting identified issues also includes the following:

- Installation of tap-holes (switch points) at key locations to improve the ability to isolate

⁴⁵ In Order No. 15152 paragraph 73, the Commission ordered the following:

73. Pepco is DIRECTED to investigate the viability of the "aggressive" initiatives for all least performing feeders, to file a progress report regarding the implementation of these initiatives where viable as part of the 2009 Consolidated Report, and to file quarterly progress reports thereafter, consistent with paragraph 62 of this Order;

In Order No. 15809 paragraph 11, the Commission ordered the following:

11. Pepco IS DIRECTED to include in its 2011 Consolidated Report a plan for development and application of "aggressive initiatives" to its underground distribution feeders;

problems as well as improving the ability to restore customers following each event.

- Perform a review of the failure history of the area for each failure and comparison of failure locations to replacement history. Perform proactive cable replacement of stretches that were not previously replaced in the area.

Regarding Commission's recommendation (per Order No. 16975) to add switch points to 4kV feeders, over time these 4kV feeders will be converted to 13kV, in which the loop alternate feed design is inherent. In the interim, all of the 4kV systems have backup supply for trunk outages. And for lateral outages, Pepco is replacing cable, installing tap holes, and ultimately converting all current underground 4kV feeders to 13kV feeders.

13 kV System

In addition to performing VLF testing and manhole inspection, correcting identified issues include the following:

- Perform a review of the failure history of the area for each failure and compare failure locations to replacement history. Perform proactive cable replacement of stretches that were not previously replaced in the area.
- Replace all of the problem sections of cable.

For various reasons, not all of the "Aggressive Initiatives" are applied to each of the Priority Feeders. For example, if a particular feeder is completely underground, installing tree wire, PAC, ACR and remote operated load-break switches would not be applicable as these types of equipment are not used on underground feeders. Similarly, if a feeder is already equipped with remote switching capabilities and the switches are functioning properly, then simply increasing the number of remotely operated switches will generally not yield improvement. Further, if the predominant outage cause for a feeder is not tree-related, installing tree wire along the previous outage locations, will not yield performance improvement.

Order No. 16975 states the following at paragraph 58:

58. ...In addition to the information required by paragraph 13 of Order No. 15941, the Commission also requires that Pepco provide detailed justification for its aggressive feeder remediation measure of replacing open wire secondary with triplex secondary conductor, as recommended by the OPC response.

The following is Pepco's explanation for replacing open wire secondary conductors with triplex conductors:

Triplex conductors are less susceptible to mechanical damage such as trees, winds, etc. They increase the distance between the primary and neutral conductors, which reduces the opportunity for primary related tree outages. Other miscellaneous upgrades will also be performed such as pole, hardwire, and equipment replacements due to deterioration. Upgrading will significantly reduce future equipment failures. Should damage occur, restoration is faster with the triplex conductors. Therefore, customers will experience lower number of outages as well as a shorter duration of outages. The cost to replace open wire secondary conductors with triplex conductors is approximately \$40,000 per mile.

2.4.1.2 2019 PRIORITY FEEDER PROGRAM

Order No. 16975 requires that Pepco provide the following in this and future Consolidated Reports (paragraph 59, item 1):

(1) a detailed description of outages, including causes and corrective actions taken;

2019 Priority Feeder Program - District of Columbia - Corrective Actions Proposed vs. Completed				
Rank	Feeder	Proposed Corrective Actions, as filed in the 2019 Consolidated Report	Detailed Corrective Actions - Completed	Explanation of Variances/ Comments
	14023	<ul style="list-style-type: none"> • Install/Replace 574' of Primary Wire • Install/Replace 574' of Secondary Service • Install 1 Pole • Replace 1 Gang Switch • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	<ul style="list-style-type: none"> • Install/Replace 480' of Primary Wire • Install/Replace 488' of Secondary Service • Install 1 Pole • Replaced 1 Gang Switch • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	This Work was completed in the 2nd quarter of 2019
	14132	<ul style="list-style-type: none"> • Install/Replace 1 Pole • Remove 1 Gang Switch • Miscellaneous upgrades such as fuse cutouts, crossarms, etc. 	<ul style="list-style-type: none"> • Replaced 1 Pole • Removed 1 Gang Switch • Miscellaneous upgrades such as fuse cutouts, crossarms, etc. 	This Work was completed in the 2nd quarter of 2019
	15013	<ul style="list-style-type: none"> • Replace 531' of Primary Wire • Replace 170' of Secondary Service Wire • Replace 3 poles • Replace 1 Gang Switch • Replace 1 T Transformer • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	<ul style="list-style-type: none"> • Replaced 531' of Primary Wire • Replaced 500' of Secondary Service Wire • Replaced 2 poles • Replaced 1 Gang Switch • Replaced 1 T Transformer • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	No significant variance
	15172	<ul style="list-style-type: none"> • Install (6) Fused Cutouts & Associated Equipment 	<ul style="list-style-type: none"> • Installed (6) Fused Cutouts & Associated Equipment 	This Work was completed in the 2nd quarter of 2019
	15176	<ul style="list-style-type: none"> • Replace 2,822' of Primary Wire • Replace 2,039' of Secondary Wire • Replace 4 poles • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, regulator drops, missing grounds, uninsulated down guys, etc. 	<ul style="list-style-type: none"> • Replaced 2,822' of Primary Wire • Replaced 2,822' of Secondary Wire • Replaced 4 poles • Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, regulator drops, missing grounds, uninsulated down guys, etc. 	No significant variance
	15177	<ul style="list-style-type: none"> • Replace 370' of Primary Wire • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	<ul style="list-style-type: none"> • Replaced 442' of Primary Wire • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc. 	This Work was completed in the 2nd quarter of 2019
	15197	<ul style="list-style-type: none"> • Miscellaneous upgrades such as animal guards, lightning arrestors, Jumper Wires, Gang switch Drops, etc. 	<ul style="list-style-type: none"> • Miscellaneous upgrades such as animal guards, lightning arrestors, Jumper Wires, Gang switch Drops, etc. 	This Work was completed in the 2nd quarter of 2019
	14014	<ul style="list-style-type: none"> • Due to ongoing work taking place under the 12th and Irving Area Reliability Improvement Plan, no work is planned on this feeder under the 2019 Priority Feeder Program. 	<ul style="list-style-type: none"> • No Work 	No variance
	14093	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	14717	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	14786	<ul style="list-style-type: none"> • Work on Feeder 14786 will be occurring under the proposed New Jersey Area Reliability Improvement Plan which is still in the planning stages. As such, no work will be occurring under the Priority Feeder Program. 	<ul style="list-style-type: none"> • No Work 	No variance
	14900	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	15003	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	15764	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	16000	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance
	16001	<ul style="list-style-type: none"> • No mainline work proposed under the 2019 Priority Feeder Program 	<ul style="list-style-type: none"> • No Work 	No variance

Proposed Corrective Actions for 2020 Priority Feeders⁴⁶

The following information provides an overview of the outages and proposed corrective actions for the 2020 Priority Feeders and detailed information regarding the equipment related events and/or outages. Please see Attachment D for maps of the 2020 Priority Feeders reflecting overhead and underground portions, and the 2020 Priority Feeders by District of Columbia Ward.

Pepco's OMS assigns event numbers based on length of time between interruptions. Therefore, during the trouble locating and restoration process, more than one event number may be generated and counted. For the sections that explain equipment failures, for mainline feeders, line fuses and transformers, the events were grouped by incidents.

⁴⁶ Actual equipment failures may be more or less than the number shown because a single event may give rise to more than one equipment failure and due to OMS limitations that do not allow a single unique case to be identified in each line.

2020 Priority Feeders

The following 16 feeders have been identified as priority feeders. Please note that some feeders, as stated below, will not have work performed in 2020 under the Priority Feeder program; rather, as specified below, some feeders had corrective work performed coincident with the outage(s) that caused the feeder to be a priority feeder or whose work is subsumed in another reliability program.

1.) Circuit: 00211

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	G Street (28)	584	12	3.62	484	271	0%	100%	1.90	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) There were 0 mainline events. There were 0 fused lateral events. One hundred percent (100%) of customer outages were due to three localized transformer events; all three events were caused by equipment failure.

2018: (Oct 17-Sep 18) There were 0 mainline events. There were 0 fused lateral events. One hundred percent

(100%) of customer outages were due to three localized transformer events; two events were caused by equipment failure; one event was caused by vandalism.

2019: (Oct 18-Sep 19) Eighty-five percent (85%) of customer outages were due to seven mainline events; all seven events were caused by equipment failure. Fourteen percent (14%) of customer outages were due to two fused lateral events that were all due to equipment failures. One percent (1%) of customer outages were due to 5 localized transformer events; 3 events were caused by equipment failure; one event was caused by tree contact and one event was due to an unknown cause.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	3.620	99%
Tree	0.002	<1%
Unknown	0.002	<1%

Field Observations:

- This feeder is currently under design for 4kV conversion and field observations will be performed during the field evaluation portion of the design.

Previous Actions Taken (Past 3 years):

- No work performed within the last 3 years.

Planned Remediation (Current Year):

- Cable, transformers, switches and other equipment will be replaced under the G Street conversion program.

Milestones/Schedule:

No work will be performed to this feeder under Priority Feeder Program.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
N/A	N/A	N/A	N/A

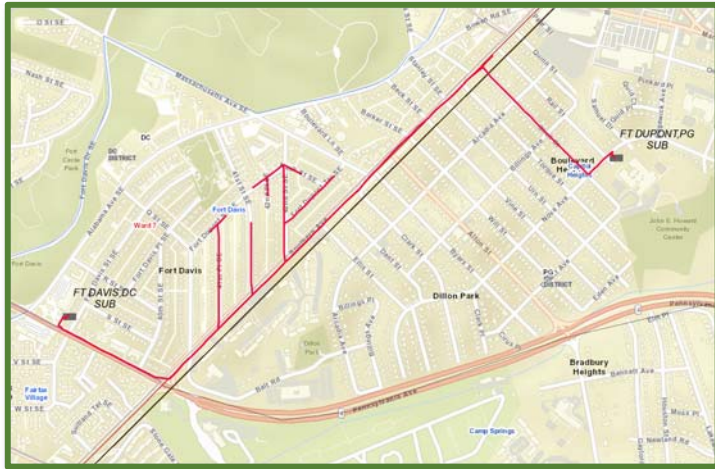
Anticipated Benefits:

The conversion of this feeder from 4kv to 13kv with new equipment will improve performance by mitigating equipment and cable failures.

2.) Circuit: 00328

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices			Feeder Miles			Repeated Last 2 Years?
				(In Hours)			OH	UG	Total	
				SAIFI	SAIDI	CAIDI				
DC	Ft. Dupont (58)	404	15	4.06	614	811	97%	3%	2.32	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) There were 0 mainline events. There were 0 fused lateral events. One hundred percent (100%) of customer outages were due to three localized transformer events; two events were caused by equipment failure and one event was due to foreign contact.

2018: (Oct 17-Sep 18) There were 0 mainline events. There were 0 fused lateral events. One hundred percent (100%) of customer outages were due to six localized transformer events; two events were caused by equipment failure and two events were caused by inclement weather/lightning and 2 events were due to tree contact.

2019: (Oct 18-Sep 19) Seventy-three percent (73%) of customer outages were due to 3 mainline events. All three events were caused by tree related issues. Twenty-four percent (24%) of customer outages were due to 2 lateral fuse events. The events were caused by a motor vehicle. Three percent (3%) of customer outages were due to ten localized transformer events; seven events were caused by tree contact, one event was caused by equipment failure, one event was caused by windy conditions and one event was due to an unknown cause.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Tree	3.146	75%
Equipment Hit	0.970	23%
Equipment Failure	0.059	1%
Weather	0.015	<1%
Unknown	0.002	<1%

* Other Category Includes: Contractor, Employee

Field Observations:

Feeder 00328 serves approximately 404 customers in the Fort Davis area of Washington D.C., as well as the Coral Hills and Capitol Heights areas of Maryland. The feeder primarily consists of residential customers. The mainline of this feeder exits the Fort Dupont substation in Maryland, runs for a short span northwest along Shell St, and then heads southwest on Southern Ave. Several single-phase laterals break off to the north, providing load to residents. Two out of these three laterals are currently fused, with the third lateral utilizing solid blade cutouts. The mainline construction consists of an even split of 4/0 ACSR Bare and 1/0 CU Bare conductors. The overall condition of the feeder is fair with few crossarms needing replacement due to condition within the residential areas. There are opportunities to improve animal protection at all large equipment poles. In addition, there are several sections of tight vegetation overhang along Southern Ave and Pennsylvania Ave SE. The feeder ends as it ties to the Fort Davis substation in D.C.

Previous Actions Taken (Past 3 years):

- No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes replacements and/or installation of crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	3/15/2019	5/15/2019
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
N/A	N/A	N/A	N/A

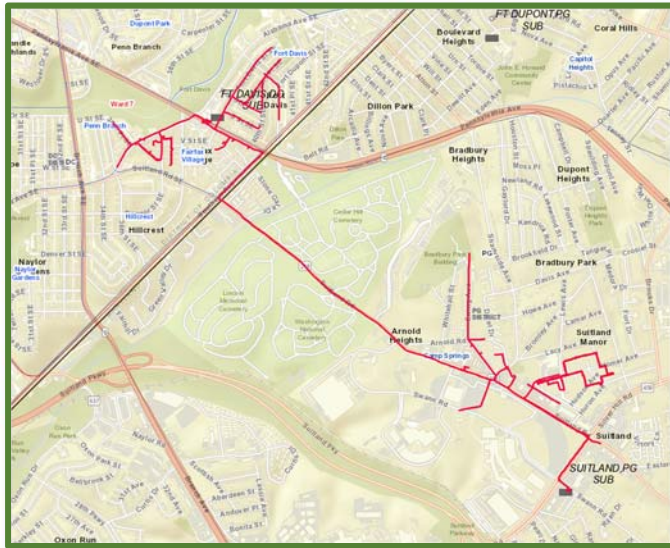
Anticipated Benefits:

The work planned will improve animal protection on the feeder and address aging infrastructure thereby improving the feeder performance.

3.) Circuit: 14035

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Suitland (134)	1,098	10	1.64	117	794	80%	20%	6.86	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) There were 0 mainline events. Ninety-seven percent (97%) of customer outages were due to six lateral fused events; two outages were caused by equipment failures, three events were caused by equipment failure, two events were caused by animals, and one event was due to load related issues. Three percent (3%) of customer outages were due to nine localized transformer events; three events were caused by equipment failure, one event was caused by a motor vehicle, one event was caused by vandalism, two events were due to windy conditions and two events were due to unknown causes.

2018: (Oct 17-Sep 18) There were 0 mainline events. There were 0 fused lateral events. One hundred percent (100%) of customer outages were due to three localized transformer events; two events were caused by equipment failure and one event was caused by vandalism.

2019: (Oct 18-Sep 19) Ninety-nine percent (99%) of customer outages were due to three mainline

events; all three events were caused by motor vehicles. There were 0 fused lateral events. One percent (1%) of customer outages were due to eight localized transformer events; four were caused by equipment failure, one was caused by a motor vehicle, one was caused by vandalism, one was due to an unknown cause and one was due to animal contact.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Hit	1.630	99%
Equipment Failure	0.007	<1%
Animal	0.001	<1%
Other*	0.001	<1%
Unknown	0.001	<1%
Overload	0.014	<1%

* Other Category Includes: Contractor, Employee

Field Observations:

Feeder 14035 serves approximately 1,098 customers in the Fairfax Village area of Washington D.C as well as the Suitland area of Maryland. The feeder covers a mixture of both residential and commercial customers. The mainline of this circuit ties to another feeder in Washington D.C. The feeder getaway cable goes overhead near the intersection of Suitland Rd and Silver Hill Rd. The majority of the mainline in the breaker zone consists of 4/0 ACSR Bare wire. The mainline then moves into Pre-Assembled Aerial Cable (PAC), traveling northwest until Southern Ave. The conductor turns northeast to an ACR, and then continues northwest. The remainder of mainline is a mix of 4/0 ACSR Bare, 477 ACSR Bare, and 1/0 CU Bare conductors. The third zone of this feeder has a heavy mix of concentrated vegetation. In the Breaker Zone the condition of poles and equipment is generally fair. The exception is a portion along Suitland Rd, where crossarms needing replacement due to condition. The pole line in this section will be relocated and upgraded in the coming months for a customer project.

Previous Actions Taken (Past 3 years):

- No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

- Reconductor ~600’ 1/0 CU Bare and undersized conductor heading southeast of the getaway pole to the ACR Tie Point with circuit 14793
- Reconductor ~450’ of /0 CU Bare wire along Shadyside Ave to the ACR Tie Point with circuit 14033
- Pole line is being relocated for a customer project along Suitland Rd where weathered crossarms exist.
- Additional work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	3/11/2020	4/11/2020	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A**Budget/Actuals**

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$74,975	N/A	N/A	N/A

Anticipated Benefits:

The reconductoring work will allow Feeder 14035 to reliably tie into and back feed from other feeders while also increasing resiliency against weather and any vegetation issues. The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

4.) Circuit: 14136

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Van Ness (129)	1,336	18	1.65	149	769	24%	76%	8.14	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Ninety-nine percent (99%) of customer outages were due to one mainline event and the event were caused by an employee. There were 0 fused lateral events. One percent (1%) of customer outages were due to two localized transformer events, one event was caused by foreign contact, and one event was caused by an employee.

2018: (Oct 17-Sep 18) Eighty-five percent (85%) of customer outages were due to two mainline events; both events were caused by trees down. Fifteen percent (15%) of customer outages were due to three fused lateral events and all events were caused by equipment failure. Less than one percent (<1%) of customer outages were due to two localized transformer events; one was caused by foreign contact, and one was caused by vandalism.

2019: (Oct 18-Sep 19) Ninety-four percent (94%) of customer outages were due to three mainline events; two were caused by equipment failure, one was caused by trees down. Four percent (4%) of customer outages were caused by one fused lateral event; the event was due to unknown cause. Two percent (2%) of customer outages were due to fifteen localized transformer events. Twelve events

were caused by equipment failure, one was caused by windy conditions, one was caused by animal contact, and one was caused by an employee.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	1.058	64%
Tree	0.518	31%
Unknown	0.068	4%
Weather	0.001	<1%
Animal	0.001	<1%
Other*	0.001	<1%

* Other Category Includes: Contractor, Employee

Field Observations:

Feeder 14136 serves approximately 1,336 customers in the Mclean Gardens and Westchester areas of Northwest Washington D.C. The feeder covers a mixture of both residential and commercial customers, and the majority is underground (76%). The feeder runs underground from the Van Ness substation and along Upton St NW for a short span, before heading south on Wisconsin Ave NW. The feeder getaway cable goes overhead near the intersection of 39th St NW and Cathedral Ave NW. There is a short run of 477 ACSR Tree wire, followed by a run of Spacer Cable. Spacer Cable is installed due to heavy overhanging vegetation. The remainder of the mainline consists of 4/0 ACSR Bare in fair condition. The Breaker Zone consists of fair and newer construction. The Second Zone has aged infrastructure with few crossarms that would need replacement. The older construction areas have animal, BIL, and lightning protection issues with grounded metal terminal brackets that are being addressed as part of this project.

Previous Actions Taken (Past 3 years):

- 2017 – Transformer, fused cut-outs and miscellaneous upgrades such as animal guard installation.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.
- Approximately 14,000 ft cable replacement work for this feeder as part of Underground Residential Distribution (URD) replacement program.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	3/15/2019	5/15/2019
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
15,000	N/A	N/A	N/A

Anticipated Benefits:

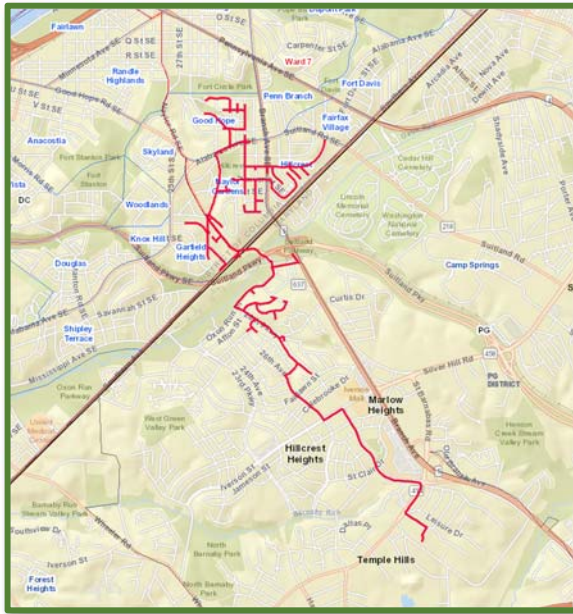
The feeder is currently being evaluated for underground switch and cable replacement. The outages on this feeder were mainly related to the underground section of this feeder and the work planned will ensure that these performance issues are mitigated thereby improving service to the customers.

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

5.) Circuit: 14261

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices			Feeder Miles			Repeated Last 2 Years?
				(In Hours)			OH	UG	Total	
				SAIFI	SAIDI	CAIDI				
DC	Beech Road (159)	1,333	25	3.54	78	798	92%	8%	9.76	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Two percent (2%) of customer outages were due to two mainline events; one event was caused by equipment failure; one event was caused by tree contact. Sixty-six percent (66%) of customer outages were due to three fused lateral events; two events were caused by trees; one event was caused by animal contact. Thirty-two percent (32%) of customer outages were due to fourteen localized transformer events; five events were caused by trees, four events were caused by equipment failure, one event was caused by a motor vehicle, two events were due to an unknown cause, and two events were caused by employees.

2018: (Oct 17-Sep 18) Eighty-eight percent (88%) of customer outages were due to two mainline events; both events were caused by equipment failures. Nine percent (9%) of customer outages were due to two fused lateral events; one event was caused by animal contact and one event was caused by a motor vehicle. Three percent (3%) of customer outages were due to thirteen localized transformer events; six were caused by equipment failures, two were due to tree contact, one was caused by an animal, one was caused by foreign contact, one was caused by a motor vehicle, one was due to vandalism and one was caused by windy conditions.

2019: (Oct 18-Sep 19) Ninety-seven percent (97%) of customer outages were due to seven mainline events; six were caused by equipment failure and one was due to an unknown cause. Less than one percent (<1%) of customer outages were due to two fused lateral events; one event was caused by a motor vehicle and one event was caused by tree contact. Three percent (3%) of customer outages were

due to nineteen localized transformer events; even were caused by tree contact, four were caused by equipment failure, two events were caused by animals, one event was caused by a motor vehicle, two were due to unknown, one was caused by vandalism, and two were caused by windy conditions.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	3.043	86%
Unknown	0.426	12%
Tree	0.035	1%
Animal	0.014	<1%
Equipment Hit	0.008	<1%
Weather	0.008	<1%
Other*	0.001	<1%

*Other Category Includes: Contractor, Employee

Field Observations:

Feeder 14261 serves approximately 1,336 customers in the Naylor Gardens area of Southeast Washington D.C. The circuit serves a mix of residential and commercial customers. The feeder goes overhead near the intersection of Saint Barnabas Rd and Holly Tree Rd. From here the circuit is an express feed of Pre-Assembled Aerial Cable (PAC) c. The entire Breaker Zone is overhead PAC except for a short span of 4/0 ACSR Bare. This run of PAC is aged with multiple splices over a various span.

The PAC opens at a gang switch near the intersection of Easton St and 27th Ave. The 2nd zone consists of 1/0 CU Bare wire with sections of heavy vegetation containing 477 ACSR Tree wire. This circuit ties with Feeder 15173 near the intersection of Gainesville St and Naylor Rd. The 3rd Zone primarily consists of 1/0 CU Tree wire and provides load to a residential neighborhood.

Previous Actions Taken (Past 3 years):

- 2019 - Vegetation work
- 2017 - Replacements of poles, crossarms and animal guard installation.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

No work to occur on this Feeder under the Priority Feeder Program

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
3,764	N/A	N/A	N/A

Anticipated Benefits:

The PAC will be replaced as part of resiliency improvement on this feeder. The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

6.) Circuit: 14711

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices			Feeder Miles			Repeated Last 2 Years?
				(In Hours)			OH	UG	Total	
				SAIFI	SAIDI	CAIDI				
DC	Benning (7)	1,798	12	0.73	36	276	7%	93%	7.48	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Feeder was not in service. No data available.

2018: (Oct 17-Sep 18) Ninety-four percent (94%) of customer outages were due to two mainline events that were both due to equipment failure. Six percent (6%) of customer outages were due to nine localized transformer events; four events were caused by equipment failure, four events were caused by lightning and one event was caused by vandalism.

2019: (Oct 18-Sep 19) Ninety-nine percent (99%) of customer outages were due to nine mainline events; six events were caused by equipment failure, two events were caused by employees, one event was caused by animal contact. One percent (1%) of customer outages were due to eight localized transformer events; five were caused by equipment failure, two were due to an unknown cause and one was caused by vandalism.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Other*	0.419	57%
Equipment Failure	0.305	42%
Animal	0.006	<1%
Unknown	0.001	<1%

*Other Category Includes: Contractor, Employee

Field Observations:

Feeder 14711 serves approximately 1,798 customers in the Kingman Park area of Northeast Washington D.C. The feeder is 7% overhead, and 93% underground. The circuit originates out of the Benning substation. The short overhead section runs along Benning Rd, with a few single-phase laterals branching off to provide overhead service to customers. The construction consists of 4/0 ACSR Tree-wire on armless same-side crossarms, and the overall condition is fair.

Previous Actions Taken (Past 3 years):

- No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

No work to occur on this Feeder under the Priority Feeder Program

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
2.028	N/A	N/A	N/A

Anticipated Benefits:

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

7.) Circuit: 15015

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices			Feeder Miles			Repeated Last 2 Years?
				(In Hours)			OH	UG	Total	
				SAIFI	SAIDI	CAIDI				
DC	Ft. Slocum (190)	2,401	21	2.35	134	417	59%	41%	10.08	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Thirty percent (30%) of customer outages were due to one mainline event that was caused by equipment failure. Eight percent (8%) of customer outages were due to two fused lateral events; both events were caused by animal contact. Sixty-two percent (62%) of customer outages were due to sixteen localized transformer events; eight events were caused by equipment failure, three events were caused by animal contact, two events were caused by tree contact, one event was caused by unknown, one event was caused by vandalism, one event was caused by lightning.

2018: (Oct 17-Sep 18) There were 0 mainline events. Forty-seven percent (47%) of customer outages were due to five fused lateral events; three events were caused by animals; two events were due to tree contact. Fifty-three percent (53%) of customer outages were due to 18 localized transformer events; twelve were caused by equipment failure, one event was due to animal contact, one was due to an employee, one was caused by tree contact, two were due to an unknown cause, one was due to lightning contact.

2019: (Oct 18-Sep 19) Ninety-eight percent (98%) of customer outages were due to four mainline events caused by equipment failure. Two percent (2%) of customer outages were due to two fused lateral events; both events were caused by equipment failure. Less than one percent (<1%) of customer outages were due to thirteen localized transformer events; eight were caused by equipment failure, one was caused by animal contact, two were due to foreign contact, one was caused by a load issue and one was due to an unknown cause.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	2.347	99%
Animal	0.002	<1%
Other*	0.001	<1%
Overload	0.000	0%
Unknown	0.000	0%

* Other Category Includes: Contractor, Employee

Field Observations:

Feeder 15015 originates from the Fort Slocum substation in Washington D.C. and serves approximately 2,401 customers in the Brightwood Park and Petworth residential areas. The mainline runs underground along Kansas Ave NW until it reaches the riser pole, located at the intersection of Farragut St NW and 5th St NW. Most of the load is distributed through overhead service. The conductor sizes vary, frequently changing between 1/0, 4/0, and 477 sizes, both insulated and bare. The mainline of this circuit ties to several other feeders. The overall condition of the feeder, including poles and equipment, is fair.

Previous Actions Taken (Past 3 years):

- 2017- Transformer replacement, recloser, pole, crossarm and animal guard installation.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.
- Install phase spacers at the midspan of the single span tap off pole 789404-630460

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed. The milestones established during this period are as follows:

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	3/15/2020	5/15/2020
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

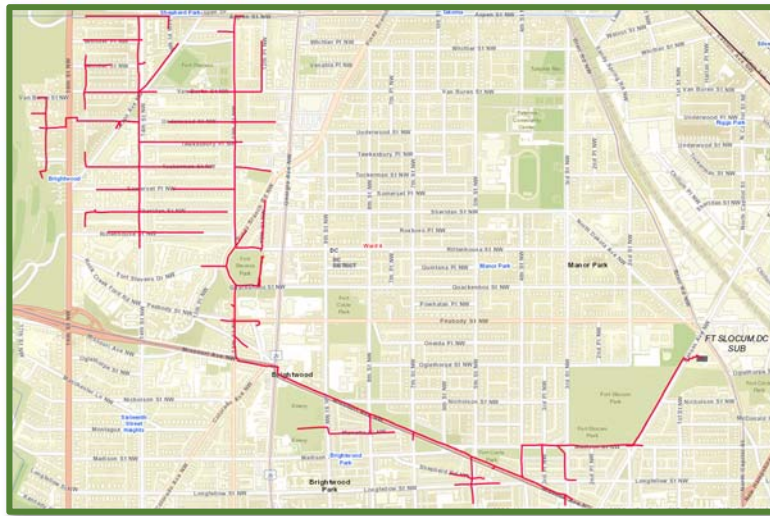
Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
8,095	N/A	N/A	N/A

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder. Phase spacer install along the single span tap will prevent any future phase slapping between the bare conductors.

8.) Circuit: 15021

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Ft. Slocum (190)	2,227	19	2.32	59	499	93%	7%	7.47	Y

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Ninety five percent (95%) of customer outages were due to eight mainline events; three events were caused by equipment failure, three events were caused by animal contact, and two were caused by tree contact. Three percent (3%) of customer outages were due to four fused lateral events; three events were caused by animal contact; one event was due to an unknown cause. Two percent (2%) of customer outages were due to eight localized transformer events; five events were caused by equipment failure, two events were caused by animal contact, one event was caused by tree contact.

2018: (Oct 17-Sep 18) Ninety seven percent (97%) of customer outages were due to eight mainline events; three events were caused by equipment failure and five events were caused by tree contact. Three percent (3%) of customer outages were due to four fused lateral events; two events were caused by equipment failure; two events were due to animal contact. Less than one (<1%) of customer outages were due to six localized transformer events; three events were caused by equipment failure, one event was caused by tree contact, one event was caused by vandalism and one event was due to an unknown cause.

2019: (Oct 18-Sep 19) Ninety-seven percent (97%) of customer outages were due to four mainline events; three events were caused by tree contact and one was due equipment failure. Three percent (3%) of customer outages were due to four fused lateral events; two events were caused by lightning and one event was due to animal contact. one event was due to an unknown cause Less than one percent (<1%) of customer outages were due to twelve localized transformer events, eight events were caused by equipment failure, two events were caused by animal contact and two events were caused by tree contact.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Tree	1.426	62%
Equipment Failure	0.826	36%
Animal	0.031	1%
Weather	0.029	1%
Unknown	0.004	<1%

Field Observations:

Originating from the Fort Slocum substation in Northwest Washington D.C., Feeder 15021 serves approximately 2,227 customers. Most of the feeder is overhead construction and provides power to both commercial and residential customers. The neighborhoods served consists of Brightwood and sections of Brightwood Park. The getaway pole is located near the intersection of Kansas Ave NW and Madison St NW. The mainline runs west and then south for a short span, before turning northwest along Missouri Ave NW. The feeder goes into underground construction to travel through Georgia Ave NW. Once it returns to overhead, this circuit continues through the Brightwood area providing service to residents. The mainline of this circuit ties to several other feeders. The mainline primarily consists of 4/0 ACSR Treewire and 1/0 CU Treewire. There are several areas with moderate vegetation issues and a few areas with heavy vegetation. In the Breaker Zone, there is heavy vegetation with 1/0 CU Bare conductor. In the 4th and 5th Zones, there are areas with heavy vegetation that have 1/0 CU Treewire. The conductor is in poor shape and has excessive splicing as a result of multiple tree outages. Poles and equipment condition vary from new to old, depending on the location. The overall condition of this circuit is fair.

Previous Actions Taken (Past 3 years):

- 2018 - Treewire installation, pole replacement, fault indicator, crossarm, animal guard, fused cutout and transformer installation.

Planned Remediation (Current Year):

Mainline:

- Reconductor ~1,400’ of Copper wire in the breaker zone, while also addressing any animal/BIL issues at large equipment poles
- Reconductor ~700’ of heavily spliced conductor along 13th St NW
- Reconductor ~2,100’ of conductor that runs through the heavily treed area along 14th St

NW

- Additional work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	3/4/2020	4/8/2020	5/11/2020	5/15/2020
Actual	3/4/2020	4/8/2020	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$217,200	N/A	N/A	N/A

Anticipated Benefits:

The reconductoring throughout areas of this circuit will greatly increase the reliability of a circuit that has shown to be quite vulnerable to vegetation related outage events. Reconductoring of the copper wire in the breaker zone will eliminate dated/brittle conductor and will help to ensure that the feeder will be able to handle increased current flow given the event that this circuit is used to back feed another circuit or needs to tie into another circuit during a breaker event. Reconductoring the heavily spliced area along 13th St NW, combined with a large tree no longer being present should fully remediate any issues in this area. Reconductoring the conductor in the heavily treed area will allow the circuit to withstand more tree limb events along 14th St NW.

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

9.) Circuit: 15094

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Bladensburg (175)	2,510	23	3.20	429	922	39%	61%	21.68	Y

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Eighty-five percent (85%) of customer outages were due to six mainline events; two events were caused animal contact, one event was caused by an employee, one event was caused by equipment failure, two events were due to an unknown cause. Fifteen percent (15%) of customer outages were due to nine fused lateral event; three events were caused by equipment failure, one event was caused by windy conditions, three events were caused by tree contact, one event was due to a load issue, one event was caused by a cut cable. Less than one percent (<1%) of customer outages were due to Twenty-one localized transformer events; thirteen events were caused by equipment failure, two events were caused by animal contact, one event was caused by a cut cable, one event was caused by fire, one event was caused by a motor vehicle, two events were caused by tree contact and one event was caused by windy conditions.

2018: (Oct 17-Sep 18) Fifty-nine percent (59%) of customer outages were due to one mainline event, which was caused by equipment failure. Thirty-six percent (36%) of customer outages were due to six fused lateral events; four events were caused by equipment failure, one event was due to an unknown cause, and one event was caused by lightning. Five percent (5%) of customer outages were due to nineteen localized transformer events; eleven events were caused by equipment failures, one event was caused by a load issue, two events were caused by tree contact, one event was due to an unknown cause, one event was caused by vandalism, and three events were caused by lightning.

2019: (Oct 18-Sep 19) Eighty-six percent (86%) of customer outages were due to twenty-five mainline events; fifteen events were due to equipment failure, one event was caused by a cable cut, three events

were caused by foreign contact, two events were caused by motor vehicles and four events were due to scheduled outages. Thirteen percent (13%) of customer outages were due to six fused lateral events, one event was caused by equipment failure, two events were caused by foreign contact, two events were due to scheduled outages, and one event was caused by tree contact. One percent (1%) of customer outages were due to sixteen localized transformer events; three events were due to animal contact, one event was caused by a cable cut, four events were caused by equipment failure, one was caused by foreign contact, six events were due to scheduled outages, and one event was caused by tree contact.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	1.679	53%
Other *	1.296	41%
Equipment Hit	0.135	4%
Tree	0.069	2%
Animal	0.018	<1%

*Other Category Includes: Employee, Vandalism

Field Observations:

Originating from the Bladensburg Substation, feeder 15094 provides power grid connection to approximately 2,510 customers. Majority of the mainline spans along Bladensburg Rd, Rhode Island Ave, and Eastern Ave. For the most part, the feeder covers residential areas of Woodridge and Fort Lincoln. Most of this circuit is underground (61% underground and 39% overhead).

Previous Actions Taken (Past 3 years):

- 2018 – Treewire Installation.

Planned Remediation (Current Year):

Mainline:

- As part of the Ft. Lincoln Reliability improvement initiative a new feeder will be extended to provide adequate segmentation and sectionalizing. Additionally, 1,582ft of cable and switches will be replaced to improve performance and restoration capabilities along feeder 15100.
- The reliability team has issued a list of work requests that address animal/BIL issues at pole locations, and rotted poles and crossarms throughout the circuit. The work requests will further increase the reliability of this feeder.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	3/16/2019	5/30/2019
Actual	N/A	N/A	TBD	TBD
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$123,000	N/A	N/A	N/A

Anticipated Benefits:

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder. Moreover, further analysis of 15094 and the rest of Ft. Lincoln location will be commencing next year under the area plan initiative.

10.) Circuit: 15130

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Walker Mill (15)	2,027	22	2.79	293	625	68%	32%	11.02	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Eighty-three percent (83%) of customer outages were due to three mainline events; all events were caused by foreign contact. Fifteen percent (15%) of customer outages were

due to six fused lateral events; four events were caused by equipment failure, one event was caused by animal contact, one event was caused by tree contact. Two percent (2%) of customer outages were due to twelve localized transformer events; seven events were caused by equipment failure, two events were caused by animal contact, one event was caused by a cut cable, one event was caused by a motor vehicle and one event was caused by tree contact.

2018: (Oct 17-Sep 18) Eighty-five percent (85%) of customer outages were due to one mainline event which was caused by tree contact. Fifteen percent (15%) of customer outages were due to ten localized transformer events; four events were caused by equipment failure, one event was caused by an employee, one event was caused by a motor vehicle, two events were caused by vandalism, one event was caused by lightning and one event was caused by windy conditions.

2019: (Oct 18-Sep 19) Ninety-eight percent (98%) of customer outages were due to ten mainline events; four events were caused by equipment failure, one was caused by foreign contact, four were due to unknown causes, one was caused by windy conditions. One percent (1%) of customer outages were due to two fused lateral events; both events were caused by equipment failure. One percent (1%) of customer outages were due to thirteen localized transformer events; twelve events were caused by equipment failure and one event was caused by tree contact.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Unknown	1.065	38%
Equipment Failure	0.859	31%
Other*	0.793	28%
Weather	0.069	2%
Tree	0.000	<1%

*Other Category Includes: Employee, Vandalism

Field Observations:

Feeder 15130 originates from the Walker Mill Rd substation in Coral Hills, MD, and serves approximately 2,027 customers. The feeder is 68% overhead and 32% underground and provides power to both residential and commercial customers. The mainline emerges from the substation along Marlboro Ave in PG county, where it branches off to the northwest. Eventually the mainline splits, with service continuing along Bowen Rd and Heath St. There is a large number of single-phase laterals off the mainline providing service to local residents. The feeder continues along Benning Rd. The mainline of this circuit ties to several other feeders in various locations.

In the Breaker Zone, the mainline conductor has limited exposure to tree events. Periodic splicing is evident, with higher concentrations in some areas. Due to “unknown events” occurring over the past couple years as well as splicing and tree concerns, localized areas within the Breaker Zone require hardening attention. Lateral fusing is adequate in this zone. In the 2nd Zone, 1/0 CU Bare conductor on provides potential choke points for downstream loading, and/or load swapping capabilities between nearby feeders. Isolated tree coverage on the northern branch of this zone is also a concern for mainline limb events. The southern branch provides commercial service primarily and has splicing concerns for 1/0 CU and 4/0 ACSR conductors. Lateral fusing along the trunk is lacking in several locations. In the 3rd Zone, 1/0 CU Bare conductor is subject to some

adjacent tree line and limited overhang and creating potential for mainline limb events.

Previous Actions Taken (Past 3 years):

- No work performed within last 3 years.

Planned Remediation (Current Year):

Mainline:

- Reconductor ~1,700' of primary conductor in the breaker zone to address areas of excessive splicing and area that has a history of outages due to balloons getting tangled in the bare conductor
- Additional work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	3/11/2020	4/11/2020	3/15/2019	5/15/2019
Actual	TBD	TBD	TBD	TBD
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$113,900	N/A	N/A	N/A

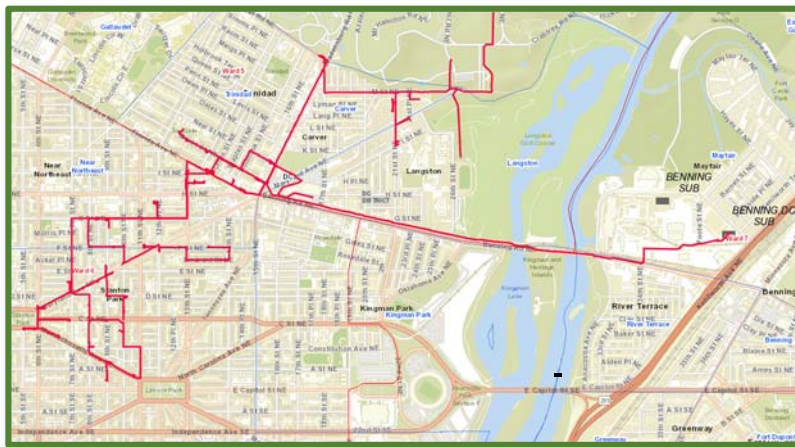
Anticipated Benefits:

Reconductoring in the breaker zone will help to harden areas that have shown vulnerability in the past and will help prevent as many future breaker events. The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

11.) Circuit: 15702

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Benning (7)	2,636	15	1.44	163	934	5%	95%	12.07	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) There were 0 mainline events. Twenty-eight percent (28%) of customer outages were due to one fused lateral event which was caused by equipment failure. Seventy-eight percent (78%) of customer outages were due to nine localized transformer events; eight events were caused by equipment failure and one event was caused by an employee.

2018: (Oct 17-Sep 18) Ninety-nine percent (99%) of customer outages were due to ten mainline events; eight events were caused by equipment failure, one was caused by a cut cable, one was due to an unknown cause. One percent (1%) of customer outages were due to six localized transformer events; two events were caused by equipment failure, one event was due to load, one event was due to an unknown cause, two events were caused by cable cuts.

2019: (Oct 18-Sep 19) Seventy-six percent (76%) of customer outages were due to four mainline events; all were caused by equipment failure. Three percent (3%) of customer outages were due to one fused lateral event which was caused by equipment failure. Twenty-one percent (21%) of customer outages were due to seventeen localized transformer events; fourteen events were caused by equipment failure, one event was due to an employee, one events was caused by vandalism and one event was due to an unknown cause.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	1.404	98%
Other*	0.025	2%
Unknown	0.007	<1%
Overload	0.000	0%

*Other Category Includes: Employee, Vandalism

Field Observations:

Feeder 15702 serves approximately 2,636 customers in Northeast Washington D.C. Originating from the Benning Substation; this circuit is 5% overhead and 95% underground. The mainline provides both residential and commercial service in the H Street Corridor and Carver/Langston areas. In the small sections with overhead there is 1/0 ACSR Bare conductor on a mix of crossarm and armless construction, with older poles and equipment present.

Previous Actions Taken (Past 3 years):

- No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

- Pole 807390-190440 (2081 M St NE,)
 - Replace aged leaning pole
 - Address animal/BIL issues

Additional work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	2/26/2020	3/21/2020	3/15/2019	5/15/2019
Actual	2/26/2020	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$19,800	N/A	N/A	N/A

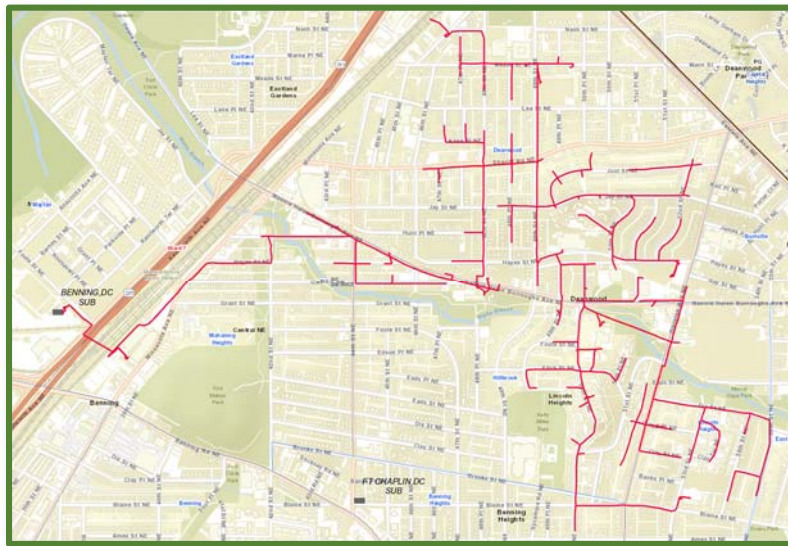
Anticipated Benefits:

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

12.) Circuit: 15707

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Benning (7)	3,167	27	2.56	162	568	91%	9%	9.52	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Sixty-five percent (65%) of customer outages were due to one mainline event; the event was caused by equipment failure. Nineteen percent (19%) of customer outages were due to three fused lateral events; one event was caused by foreign contact, one event was caused by a motor vehicle, one event was caused by an employee. Sixteen percent (16%) of customer outages were due to seventeen localized transformer events; five events were caused by animals, four were caused by equipment failure, one was caused by foreign contact, one was caused by load, three were caused by tree contact, one was due to an unknown cause, two were caused by vandalism.

2018: (Oct 17-Sep 18) Sixty-one percent (61%) of customer outages were due to one mainline event; which was caused by an employee. Nine percent (9%) of customer outages were due to one fused lateral event, which was caused by a motor vehicle. Thirty percent (30%) of customer outages were due to eighteen localized transformer events; six events were caused by equipment failure, two events were caused by animal contact, two events were caused by employees, one event was caused by load, one event was caused by a motor vehicle, one event was due to an unknown cause, three events were caused by vandalism, two events

were caused by lightning.

2019: (Oct 18-Sep 19) Seventy-seven percent (77%) of customer outages were due to four mainline events; one event was caused by a motor vehicle, two events were due to unknown causes, one event was due to animal contact. Twenty percent (20%) of customer outages were due to three fused lateral events, two were due foreign contact, and one was due to equipment failure. Three percent (3%) of customer outages were due to twenty-one localized transformer events; thirteen events were caused by equipment failure, four events were caused by animal contact, one event was caused by a fire, one event was caused by foreign contact, one event was due to an unknown cause, one event was due to windy conditions.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Hit	0.994	39%
Unknown	0.967	38%
Other*	0.288	11%
Equipment Failure	0.271	11%
Animal	0.044	2%
Weather	0.000	<1%

*Other Category Includes: Employee, Vandalism

Field Observations:

Feeder 15707 serves approximately 3,167 customers in Northeast Washington D.C. Originating from the Benning Substation; most of this circuit consists of overhead construction (91% overhead and 9% underground). The mainline provides both residential and commercial service in the Upper Central NE and Deanwood areas. The mainline emerges from the substation on Minnesota Ave NE. From here the feeder twists and turns through various residential streets. There is a variety of conductor sizes, included 4/0 ACSR Tree-wire, 477 ACSR Bare and 477 ACSR Tree-wire. Newer construction in the 2nd, 4th, 5th, and 6th Zones were part of the 2018 Area Plan work. There is a mix of armless and crossarm construction.

Previous Actions Taken (Past 3 years):

- This feeder was upgraded under the Benning Area Plan where wires, poles and equipment were upgraded and re-configured to improve performance.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	4/1/2020	5/15/2020
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$24,800	N/A	N/A	N/A

Anticipated Benefits:

The minor work being performed as part of the priority feeder program will further improve the feeder performance and annual/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

13.) Circuit: 15710

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices			Feeder Miles			Repeated Last 2 Years?
				(In Hours)			OH	UG	Total	
				SAIFI	SAIDI	CAIDI				
DC	Benning (7)	2,207	17	2.06	93	573	79%	21%	8.15	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Fifty-six percent (56%) of customer outages were due to one mainline event; which was caused by equipment failure. Five percent (5%) of customer outages were due to two fused lateral events; one event was caused by foreign contact and one event was caused by a motor vehicle. Thirty-nine percent (39%) of customer outages were due to nineteen localized transformer events; six events were caused by animal contact, eight events were caused by equipment failure, one event was caused by foreign contact, one event was caused by load, one event was caused by a motor vehicle, one event was caused by tree contact and one event was caused by vandalism.

2018: (Oct 17-Sep 18) Ninety-four percent (94%) of customer outages were due to three mainline events; two events were caused by foreign contact and one event was caused by windy conditions. Two percent (2%) of customer outages were due to three fused lateral events; one event was caused by lightning, one event was caused by windy conditions, one event was due to an unknown cause. Four (4%) of customer outages were due to twelve localized transformer events; five events were caused by animal contact, three events were caused by equipment failure, one event was caused by foreign contact, one event was caused by tree contact, one event was due to an unknown cause and one event was caused by windy conditions.

2019: (Oct 18-Sep 19) Ninety-seven percent (97%) of customer outages were due to three mainline events; two events were caused by motor vehicles and one event was due to an unknown cause. One percent (1%) of customer outages were due to one fused lateral event; which was caused by a motor vehicle. Two percent (2%) of customer outages were due to fourteen localized transformer events; five events were caused by animal contact, one was caused by an employee, six were caused by equipment failures, one was caused by foreign contact and one was caused by vandalism.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Hit	1.014	49%
Unknown	1.002	49%
Animal	0.023	1%
Equipment Failure	0.022	1%
Other*	0.001	<1%

* Other Category Includes: Contractor, Employee

Field Observations:

Feeder 15710 serves approximately 2,207 customers in Northeast Washington D.C. Originating from the Benning Substation; this circuit provides service to both commercial and residential customers. The mainline is largely overhead, and emerges from the substation near the intersection of Benning Rd and 36th St. The 2nd and 3rd Zones south of the substation provide coverage in local Benning neighborhoods. There is a loop of 477 ACSR Tree-wire currently in construction as part of the Benning Extension work. To the west, the 2nd and 3rd Zones mainly consist of 477 ACSR Tree-wire with a mix of armless and crossarm construction. The condition of the poles and equipment in this area is fair. The insulated conductor provides protection from several concerning areas with vegetation.

Previous Actions Taken (Past 3 years):

- 2017 - actions taken includes primary wire, pole, crossarm, animal guard and fused cutout.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators. Install phase spacers at the midspan of the single span tap off pole 814387-580430

Milestones/Schedule:

There is no scheduled work being performed on this feeder as part of the Priority Feeder

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
8,084	N/A	NA	NA

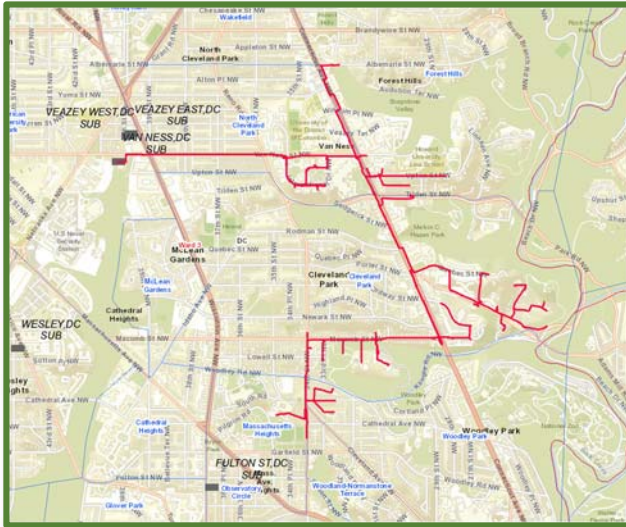
Anticipated Benefits:

Phase spacer install will prevent any potential phase slapping between the bare conductors along this slack span. The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

14.) Circuit: 15867

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Van Ness (129)	648	16	3.20	361	774	42%	58%	7.13	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Ninety-nine percent (99%) of customer outages were due to six mainline events; five events were caused by tree contact and one event was caused by equipment failure. Less than one percent (<1%) of customer outages were due to two fused lateral events; one event was caused by animal contact and one event was caused by equipment failure. Less than one percent (<1%) of customer outages were due to three localized transformer events; two events were caused by equipment failures and one event was caused by tree contact.

2018: (Oct 17-Sep 18) There were 0 mainline events. Fifty-four percent (54%) of customer outages were due to seven fused lateral events; three events were caused by tree contact, one event was caused by animal contact, one event was caused by equipment failure, two events were due to unknown causes. Forty-six percent (46%) of customer outages were due to nine localized transformer events; two events were caused by animal contact, three were caused by equipment failure, one was caused by tree contact, two were due to unknown causes, one was due to windy conditions.

2019: (Oct 18-Sep 19) Ninety-three percent (93%) of customer outages were due to fourteen mainline events; five events were caused by animal contact and nine events were caused by equipment failure. Seven percent (7%) of customer outages were due to twelve localized transformer events; seven events were caused by equipment failure, one was caused by a motor vehicle, one was

caused by tree contact, two were due to an unknown cause and one was due to lightning.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	2.045	64%
Animal	1.000	31%
Weather	0.111	3%
Tree	0.043	1%
Unknown	0.003	<1%
Equipment Hit	0.002	<1%

Field Observations:

Feeder 15867 serves approximately 648 customers in northwest Washington D.C. Originating from the Van Ness Substation, most of this circuit consists of underground construction (58% underground, and 42% overhead). The Breaker Zone is almost entirely underground, rising several times to switches/SF6 ties to other feeders. The mainline emerges in two areas. One near the intersection of Connecticut Ave NW and Macomb St NW, and the other near the intersection of Porter St and Connecticut Ave. This circuit provides service to both residential and commercial customers. There are two areas with concerning vegetation issues. The first is in the Breaker Zone along Upton St, there is heavy tree coverage. The second area is on Macomb St NW between 34th St NW and Connecticut Ave NW. Overall the feeder’s poles, devices, and conductors are in good condition.

Previous Actions Taken (Past 3 years):

- 2017 – Tree wire installation, lightning arrestor, animal guard and crossarm work.
- New two switches installation.

Planned Remediation (Current Year):

Mainline:

- Mainline work includes crossarms, fused cut-outs, lightning arrestors, animal guards, down-guys, head-guys, anchors and fault indicators.

Milestones/Schedule:

Work on this feeder will require approximately 3 months to be completed.

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	3/15/2019	5/15/2019
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
\$5,300	TBD	TBD	TBD

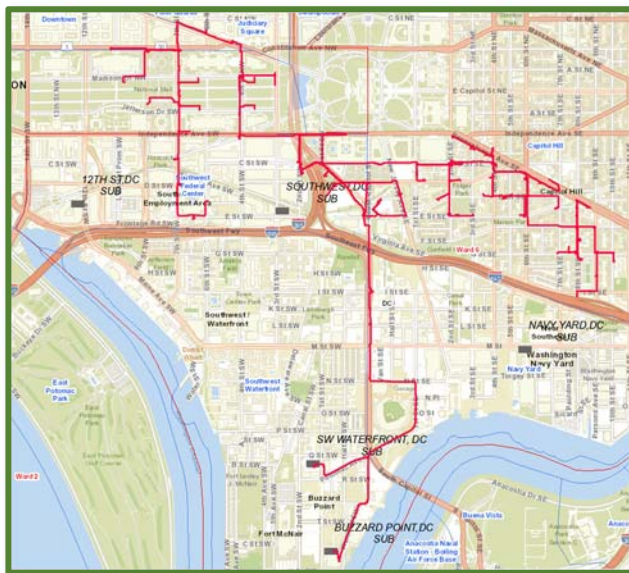
Anticipated Benefits:

The minor work being performed as part of the priority feeder program will further improve the feeder performance and animal/BIL deficiencies, thereby providing added resiliency and more reliable service to the customers served by this feeder.

15.) Circuit: 16002

County	Substation	Customers Served	Number of Outages	Oct. 2018-Sept. 2019 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Waterfront (223)	1,442	29	2.92	471	876	0%	100%	12.75	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Feeder was not in service. Data is unavailable.

2018: (Oct 17-Sep 18) Twenty-six percent (26%) of customer outages were due to seven mainline events; all of the events were caused by equipment failures. Fifty-four percent (54%) of customer outages were due to four fused lateral events; two events were due to cable-cut, two events were due to equipment failures. Twenty

percent (20%) of customer outages were due to six localized transformer events; five events were caused by equipment failures and one event was caused by load.

2019: (Oct 18-Sep 19) Eighty-three percent (83%) of customer outages were due to eleven mainline events; all the events were caused by equipment failure. Eleven percent (11%) of customer outages were due to three fused lateral events; all the events were due to equipment failures. Six percent (6%) of customer outages were due to nineteen localized transformer events; seventeen of the events were caused by equipment failure, one event was caused by a motor vehicle and one event was due to an unknown cause.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	2.915	99%
Equipment Hit	0.001	<1%
Unknown	0.001	<1%

Field Observations:

Feeder 16002 serves approximately 1,320 customers in southwest Washington D.C. Originating from the Waterfront substation, most of this circuit consists of underground construction (100% underground). This circuit provides service to both residential and commercial customers. Feeder 16002 is a radial feeder which was transferred over from Buzzard point sub to the Waterfront Substation.

Previous Actions Taken (Past 3 years):

- No work is performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

- No work will take place under the Priority Feeder Program. The Waterfront area is currently being evaluated holistically for improvements to include URD Cable Replacements, PILC replacements and equipment replacements. A few Oil Switches that were identified as needing replacement are currently being replaced due to age and condition to mitigate future performance issues.

Milestones/Schedule:

There will be no work planned on this feeder as part of the 2019 Priority Feeder Program

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A**Budget/Actuals**

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
N/A	N/A	N/A	N/A

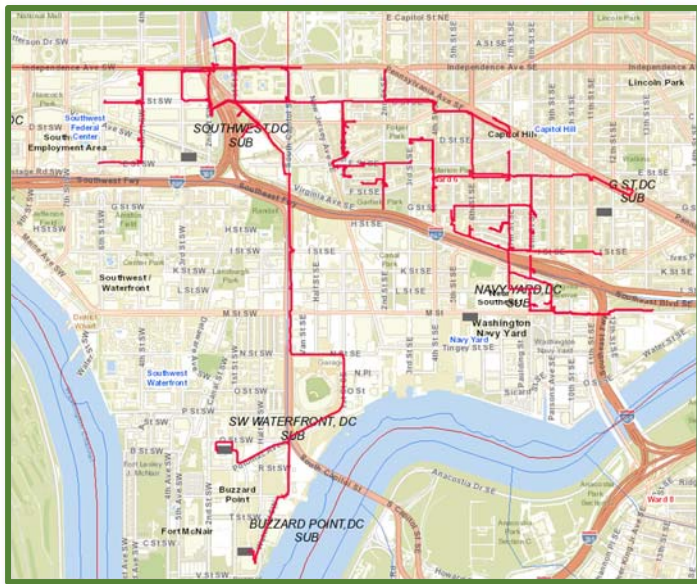
Anticipated Benefits:

The performance of this feeder was driven by failures in the UG cable and equipment infrastructure. The proposed work to replace and upgrade these equipment and cable, along with the ongoing switch replacements will improve performance for customers fed by this feeder.

16.) Circuit: 16003

<u>County</u>	<u>Substation</u>	<u>Customers Served</u>	<u>Number of Outages</u>	<u>Oct. 2018-Sept. 2019 Reliability Indices</u>			<u>Feeder Miles</u>			<u>Repeated Last 2 Years?</u>
				<u>(In Hours)</u>			<u>OH</u>	<u>UG</u>	<u>Total</u>	
				<u>SAIFI</u>	<u>SAIDI</u>	<u>CAIDI</u>				
DC	Waterfront (223)	1,773	32	4.38	852	195	0%	100%	13.07	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2017: (Oct 16-Sep 17) Feeder was not in service. Data unavailable.

2018: (Oct 17-Sep 18) There were 0 mainline events and 0 fused lateral events. One hundred percent (100%) of customer outages were due to six localized transformer events; four events were caused by equipment failures and two events were due to unknown causes.

2019: (Oct 18-Sep 19) Ninety-two percent (92%) of customer outages were due to twenty-two mainline events; all the events were caused by equipment failures. Five percent (5%) of customer outages were caused by four fused lateral events; all the events were caused by equipment failures. Three percent (3%) of customer outages were due to twenty localized transformer events; all the events were caused by equipment failures.

Feeder Performance (Oct 18-Sep 19)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
------------------------------	--------------	--------------------------

Equipment Failure	4.377	100%
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Field Observations:

Feeder 16003 serves approximately 1,490 customers in southwest Washington D.C. Originating from the Waterfront substation, most of this circuit consists of underground construction (100% underground). This circuit provides service to both residential and commercial customers. Feeder 16003 is a radial feeder which was transferred over from Buzzard point sub to the Waterfront Substation.

Previous Actions Taken (Past 3 years):

- No work is performed within the 3 years.

Planned Remediation (Current Year):

Mainline:

- No work will take place under the Priority Feeder Program. The Waterfront area is currently being evaluated holistically for improvements to include URD Cable Replacements, PILC replacements and equipment replacements. A few Oil Switches that were identified as needing replacement are currently being replaced due to age and condition to mitigate future performance issues.

Milestones/Schedule:

There will be no work planned on this feeder as part of Priority Feeder Program

	Design Complete	Permitting Complete	Release to Construction	Construction Complete
Proposed	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments	N/A	N/A	N/A	N/A

Completed Remediation Work: N/A

Budget/Actuals

Estimated Budget	Actuals	Variance (Estimated Cost vs. Actuals)	% Variance (Estimated Cost vs. Actuals)
N/A	N/A	N/A	N/A

Anticipated Benefits:

The performance of this feeder was driven by failures in the UG cable and equipment infrastructure. The proposed work to replace and upgrade these equipment and cable, along with the ongoing switch replacements will improve performance for customers fed by this fee.

2.4.1.3 REVIEW OF 2018 PRIORITY FEEDER PROGRAM (LEAST RELIABLE FEEDERS)

Activities conducted to improve the performance of each of the feeders in the 2018 Priority Feeder Program are identified in Table 2.4-A

2018 2% Priority Feeder Program - District of Columbia -Completed Corrective Actions							
Rank	Feeder ID	Substation	Category		SPC Value	Completion Time	Corrective Actions
			OH	UG			
1	15021	Ft Stocum (190)	92%	8%	0.04171	1st Quarter 2018	<ul style="list-style-type: none"> • Replace 6 Poles • Replace 1 Transformer • Installed/Replaced 1 Capacitor Bank • Approximately 1100' of tree trimming • Installed/Replaced 700' of Tree Wire • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
2	15173	Alabama AVE (136)	90%	10%	0.03955	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 13,000' of Primary Wire • Install/Replace 1 transformer • Install/Replace 1 pole • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
3	15094	Bladensburg (175)	49%	51%	0.03094	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 300' of Primary Wire • Install/Replace 275' of Neutral • Install/Replace 7 transformers • Install/Replace 3 poles • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
4	15709	Benning 007	63%	37%	0.02969	1st Quarter 2020	<ul style="list-style-type: none"> • No mainline work is proposed due to the Feeder being included in the Benning Area Plan
5	15174	Alabama AVE (136)	68%	32%	0.02884	1st Quarter 2019	<ul style="list-style-type: none"> • Install/Replace 464' of Primary Wire • Miscellaneous upgrades such as animal guards, lightning arrestors • Crossarms
6	15170	Alabama AVE (136)	43%	57%	0.01934	N/A	<ul style="list-style-type: none"> • No work was performed.
7	14200	12th & Irving (133)	48%	52%	0.01733	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 2,100' of Primary Wire • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, etc. • We cut all re-conductoring work.
8	15198	Takoma (027)	85%	15%	0.01727	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 1 transformer
9	14767	Little Falls (77)	72%	28%	0.01405	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 2 Gang Switch Drops, Animal guard, fuse, lightning arrestors.
10	15945	Van Ness 129	95%	5%	0.01344	1st Quarter 2019	<ul style="list-style-type: none"> • Install/Replace 990' of Secondary Wire • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
11	14031	Suitland 134	88%	12%	0.01332	N/A	<ul style="list-style-type: none"> • No work was performed.
12	14135	Van Ness (129)	81%	19%	0.01237	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 2166' of Primary Wire with tree wire • Install/Replace 1972' of #2 secondary main line open wire with 4/0 triplex. • Install/Replace 3 poles • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
13	368	53rd Street (48)	96%	4%	0.01031	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 6 poles • Install/Replace 1 transformer • Install 1 ACR • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, etc
14	118	Randle Highlands (71)	98%	2%	0.00825	1st Quarter 2019	<ul style="list-style-type: none"> • Install/Replace 22 poles • Install/Replace 1 transformer • Remove Gangswitch • Install 1 ACR • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, etc
15	144	Westmoreland MC (93)	58%	42%	0.00614	2nd Quarter 2018	<ul style="list-style-type: none"> • Install/Replace 10 poles • Install/Replace 4 transformers • Install 1 ACR • Miscellaneous upgrades such as fuse cutouts, fault indicators, animal guards, lightning arrestors, crossarms, etc
16	451	Ft Davis (100)	97%	3%	0.00269	1st Quarter 2019	<ul style="list-style-type: none"> • Install/Replace 1350' of Primary Wire • Install/Replace 8 poles • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, etc.

Table 2.4-A

2.4.1.4 AGGRESSIVE CORRECTIVE ACTION PROGRAM

Annual Program for Repeat Priority Feeders⁴⁷

The review of the 16 feeders selected for the 2% Priority Feeder initiative with previous year selections show that three feeders (15021 and 15094) which were in the 2018 Priority Feeder Program reappeared on the 2020 Priority Feeder Program. When a feeder repeats, additional aggressive corrective actions are implemented. All of the corrective actions listed in Section 2.4.1.2 will be completed in 2020.

⁴⁷ In Order No. 15152 issued on Pepco's 2008 Consolidated Report, the Commission stated (at paragraph 72):

72. *PEPCO is **DIRECTED**, beginning with the 2009 Consolidated Report, to identify the feeders that are part of the separate annual program of corrective actions for reappearing least reliable feeders, describe the corrective actions planned for each feeder and the projected dates for completion of the corrective actions and explain whether the corrective actions improved the performance of these feeders consistent with paragraph 59 of this Order.*

2.4.2 RELIABILITY STATISTICS*

Service Reliability Indices

SAIDI, SAIFI, and CAIDI are the specific indices used and provide information about both the duration and frequency of outages for customers. These indices are described as follows:

- **SAIDI** - System Average Interruption Duration Index. Designed to provide information about the average time (in aggregate) that the customers served in a predefined area are interrupted.
- **SAIFI** - System Average Interruption Frequency Index. Designed to give information about the average frequency of sustained interruptions per customer served in a predefined area.
- **CAIDI** - Customer Average Interruption Duration Index. Designed to provide information about the average time required to restore service to the average customer experiencing a sustained interruption.

Each index is calculated several times; once with all outage data and then according to the specific significant event exclusions specified. The expectation is that the indices calculated with significant event related outage data excluded will provide a reflection of system performance under normal operating conditions. The indices calculated with all outage data will provide a reflection of the impact of significant events on the system. It is important to note that a year-to-year comparison of reliability indices calculated with all outage data would not be appropriate. The indices during a year in which major storms or events impact an electric utility will be substantially different from the indices during a year in which no such issues arise.

Service Outage Statistics^{48,49}

The 2019 year-end actuals for SAIFI and SAIDI were 0.59 and 77 respectively.

Presented in Table 2.4-B1-B2 are the SAIDI, SAIFI and CAIDI values for the past five years. These reliability indices are provided for all sustained interruptions and all sustained

⁴⁸ In Order No. 16623 paragraphs 48, 62 and 63, the Commission stated the following:

48. ...Therefore, we hereby require that Pepco include reliability calculations using District of Columbia-only data and relying on a Major Service Outage exclusion in the 2012 Consolidated Report and in future Consolidated Reports. We also require that Pepco include in its 2012 Consolidated Report a revised version of its reliability calculations from the 2010 and 2011 Consolidated Reports using D.C.-only data and excluding Major Service Outages. Pepco shall also include calculations of reliability indices for the entire Pepco system using system-wide data and Major Event Day exclusions, as well as reliability indices for Pepco D.C. using D.C.-only MEDs in the 2012 Consolidated Report and in future Consolidated Reports, so that we may make comparisons. For purposes of this requirement, the “reliability calculations” contained in the Consolidated Report include all calculations of SAIDI, SAIFI and CAIDI, discussion of failure rate data, and selection of Priority Feeders. (Footnote: Because the Aggressive Corrective Action Program requires the identification of feeders that have been listed as Priority Feeders in the past using system-wide, MED-excluding data, we will allow Pepco to continue to select ACAP feeders using that data. However, we require that a list of Priority Feeders using the new method of calculation be included in the 2012 Consolidated Report.)
62. Pepco is DIRECTED to include in the 2012 Consolidated Report reliability calculations using District of Columbia-only data and excluding Major Service Outages consistent with paragraph 48;
63. Pepco is DIRECTED to include in the 2012 Consolidated Report a revised version of the reliability calculations contained in the 2010 and 2011 Consolidated Report using District of Columbia-only data and excluding Major Service Outages consistent with paragraph 48.

⁴⁹ In Order No. 16700 issued February 12, 2012, paragraphs 10 and 11, the Commission stated:

10. In establishing out new reliability performance standards, we decided that Pepco should be given a reasonable amount of time to “ramp up” to our new requirements. Therefore, we made the new SAIDI and SAIFI standards effective beginning in 2013. By replacing the prior rule with a new one, and giving Pepco a transition period, we created a “gap” in reliability measures. We saw no harm in a temporary suspension of reliability benchmarks, recognizing that the standards in effect for 2013 through 2020 would require significant improvement on Pepco’s part, starting at once. For example, in order to meet our 2013 SAIDI target, Pepco must make either about a 9% improvement in both 2012 and 2013 or about an 18% improvement in 2013. Therefore, we saw no risk that Pepco would suffer a significant “backslide” in reliability because there were no effective standards in place for 2011 or 2012.
11. We do not believe that reestablishment (for the years 2011 and 2012) of the standards to which Pepco was previously held is necessary. (Footnote: We note that not all states have Electric Quality of Service Standards. For example, Pepco presently operates in Maryland without standards but is required to provide annual reliability indices pursuant to COMAR 20.50.07.06.) Nor has Pepco provided any reason for that reestablishment. Consequently, we decline to make the clarification that Pepco requests. However, we do expect that Pepco will continue to report on its reliability performance in its annual Consolidated Report and we concur with OPC in its suggestion that Pepco coordinate its data reporting so that Pepco calculations are a consistent “apples to apples” comparison from 2011 through 2013 and beyond. Therefore, as OPC has requested, we require Pepco to include in its annual report a description of its performance and a calculation of whether it would have met the appropriate SAIFI, SAIDI and CAIDI standards had they been in effect.
14. Pepco shall include in its 2012 and 2013 annual Consolidated Reports calculations of SAIDI, SAIFI, and CAIDI as described in paragraph 11.

interruptions excluding major events. A sustained interruption is defined as an interruption of five (5) minutes or greater.

Pepco System Indices 2015-2019					
(MED Exclusive - IEEE 1366-2003 Std, Pepco System Wide Based)					
SAIFI	2015	2016	2017	2018	2019
Sustained Outages	0.96	0.98	0.68	0.90	0.73
Sustained Less Major Storms	0.96	0.98	0.68	0.71	0.65
SAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	1.88	1.81	1.03	2.70	1.22
Sustained Less Major Storms	1.88	1.81	1.03	0.98	0.97
CAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	1.96	1.85	1.52	3.02	1.67
Sustained Less Major Storms	1.96	1.85	1.52	1.37	1.49

Table 2.4-B1

District of Columbia Indices 2015-2019					
(MED Exclusive - IEEE 1366-2003 Std, Pepco System Wide Based)					
SAIFI	2015	2016	2017	2018	2019
Sustained Outages	0.69	0.82	0.55	0.64	0.59
Sustained Less Major Storms	0.69	0.82	0.55	0.54	0.49
SAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	1.87	1.92	0.96	1.82	1.29
Sustained Less Major Storms	1.87	1.92	0.96	0.88	0.92
CAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	2.73	2.35	1.73	2.83	2.20
Sustained Less Major Storms	2.73	2.35	1.73	1.64	1.86

Table 2.4-B2

Tables 2.4-B3 and 2.4-B4 show annual indices for 2015 through 2019. Table 2.4-B3 shows performance indices Including and Excluding District of Columbia Major Service Outages, and Table 2.4-B4 shows performance indices Including and Excluding District of Columbia-only MEDs.

District of Columbia Indices 2015-2019					
(IEEE 1366-2003, DC Based)					
SAIFI	2015	2016	2017	2018	2019
Sustained Outages	0.69	0.82	0.55	0.64	0.62
Sustained Less Major Storms	0.69	0.82	0.55	0.54	0.53
SAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	1.87	1.92	0.96	1.82	1.36
Sustained Less Major Storms	1.87	1.92	0.96	0.99	0.98
CAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	2.73	2.34	1.73	2.83	2.19
Sustained Less Major Storms	2.73	2.34	1.73	1.82	1.87

Table 2.4-B3

District of Columbia Indices 2015-2019					
(Major Service Outage Criteria- DC Based)					
SAIFI	2015	2016	2017	2018	2019
Sustained Outages	0.69	0.82	0.55	0.64	0.59
Sustained Less Major Storms	0.69	0.82	0.55	0.53	0.59
SAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	1.87	1.92	0.96	1.82	1.29
Sustained Less Major Storms	1.87	1.92	0.96	0.86	1.29
CAIDI (HOURS)					
	2015	2016	2017	2018	2019
Sustained Outages	2.73	2.34	1.73	2.83	2.20
Sustained Less Major Storms	2.73	2.34	1.73	1.63	2.20

Table 2.4-B4

Order No. 16975 states the following at paragraphs 62 and 106:

62. **Decision:** *The Commission directs Pepco to provide SAIDI and SAIFI statistics in the future Consolidated Reports calculated by both including and excluding cross-border feeders. Pepco shall identify which feeders it treats as “cross-border” for this purpose.*

106. *Pepco is DIRECTED to provide SAIDI and SAIFI information consistent with paragraph 62 herein;*

District of Columbia Reliability Inclusive and Exclusive of Cross-Border Feeders (2019)

2019 IEEE MED Exclusive		
District of Columbia Reliability Statistics	SAIFI	SAIDI (Hours)
Excluding all cross-border feeders	0.36	0.74
Including all cross-border feeders	0.56	1.03

2019 DC MSO (& COMAR) Exclusive		
District of Columbia Reliability Statistics	SAIFI	SAIDI (Hours)
Excluding all cross-border feeders	0.44	1.07
Including all cross-border feeders	0.67	1.42

Table 2.4- B5

*Note- COMAR is a Maryland criteria and MSO is a DC criteria.
MSO and COMAR are not compatible with each other.

Table 2.4-B5

Comparison of Cross-Border Feeder Reliability Performance⁵⁰

Pepco calculates reliability indices on a feeder level in the same way regardless of the location of a feeder. For feeders that have customers in both the District of Columbia and Maryland, the indices for these feeders are included for reporting purposes with the jurisdiction in which the majority of customers on these feeders reside. Because feeders may switch between jurisdictions over time, to make their impact on reliability performance

⁵⁰ The following is in response to the Commission’s directive to:
[I]nclude in its 2015 Annual Consolidated Report an explanation of the metric or metrics it will use to report upon the reliability performance of its cross-jurisdictional feeders. This explanation is also to describe how Pepco’s chosen metric(s) will allow reliability performance to be compared from year-to-year, when the jurisdictional status of a feeder changes between Maryland and the District
In The Matter of the Annual Consolidated Report of the Potomac Electric Power Company, Formal Case No. PEPACR-2014-01, Order No. 17816 at P 241 (February 27, 2015).

clear, Pepco presents system reliability performance both with and without both feeders assigned to the District of Columbia and Maryland, thereby allowing comparisons across different years.

PEPCO 4 & 13KV CROSS JURISDICTIONAL FEEDERS SERVING MAJORITY DC CUSTOMERS

(Based on customers served, not physical presence)

Feeder No.	Substation Name	Substation No.	Substation Name	Substation No.	MD Customers	DC Customers	% UG	% OH
120	Chesapeake Street	181	-	-	2	557	4%	96%
183	Chesapeake Street	181	-	-	146	423	13%	87%
205	Seat Pleasant	30	Fort Chaplin	70	3	548	1%	99%
308	Westmoreland	93	Oliver Street	146	4	568	33%	67%
327	Fort Dupont	58	Texas Ave.	111	56	244	5%	95%
328	Fort Dupont	58	Fort Davis	100	53	349	3%	97%
333	Chesapeake Street	181	-	-	59	493	8%	92%
366	Seat Pleasant	30	53rd Street, SE	48	6	492	3%	97%
368	53rd Street, SE	48	Fort Davis	100	64	539	4%	96%
372	Seat Pleasant	30	53rd Street, SE	48	197	559	3%	97%
388	53rd Street, SE	48	-	-	3	627	3%	97%
451	Fort Davis	100	Texas Ave.	111	84	129	4%	96%
476	Quesada	89	Oliver Street	146	3	306	17%	83%
14014	12th & Irving	133	-	-	680	1375	8%	92%
14015	12th & Irving	133	-	-	105	1335	13%	87%
14016	12th & Irving	133	-	-	25	633	37%	63%
14031	Suitland	134	-	-	260	985	13%	87%
14035	Suitland	134	-	-	215	845	17%	83%
14261	Beech Road	159	-	-	369	945	8%	92%
14352	Harrison	38	-	-	4	34	100%	0%
14717	Benning	7	-	-	80	2385	13%	87%
14758	N.R.L.	168	-	-	1	2168	34%	66%
14890	Harrison	38	-	-	150	178	32%	68%
14893	Harrison	38	-	-	6	9	100%	0%
14900	Harrison	38	-	-	286	1066	26%	74%
14987	Grant Avenue	183	-	-	926	1189	24%	76%
15085	St. Barnabas Road	59	-	-	753	827	37%	63%
15094	Bladensburg	175	-	-	873	1162	60%	40%
15130	Walker Mill Road	15	-	-	754	1221	33%	67%
15171	Alabama Avenue	136	-	-	9	1735	43%	57%
15198	Takoma	27	-	-	96	1612	18%	82%
15199	Takoma	27	-	-	253	1669	30%	70%
15648	Little Falls	77	-	-	-	1	100%	0%
15649	Little Falls	77	-	-	1	-	100%	0%
15705	Benning	7	-	-	33	2071	30%	70%
15944	Van Ness	129	-	-	85	1451	13%	87%

Note: Feeders 15648 and 15649 supply the Dalecarlia Pumping Station (DC) and the Army Map Service (MD)

Note: Feeders with two source substations listed are 4 kV primary network feeders and are supplied from two substations.

Table 2.4-B6

PEPCO 4 & 13KV CROSS JURISDICTIONAL FEEDERS SERVING MAJORITY MD CUSTOMERS								
(Based on customers served, not physical presence)								
Feeder No.	Substation Name	Substation No.	Substation Name	Substation No.	MD Customers	DC Customers	% UG	% OH
152	Fort Dupont	58	Randle Highlands	71	186	149	2%	98%
365	53rd Street, SE	48	Fort Dupont	58	492	208	13%	87%
14032	Suitland	134	-	-	566	74	24%	76%
14033	Suitland	134	-	-	1693	253	13%	87%
14102	Tuxedo	148	-	-	910	61	9%	91%
14263	Linden	156	-	-	1816	72	20%	80%
14271	Linden	156	-	-	725	615	23%	77%
14593	Sligo	9	-	-	15	7	100%	0%
14595	Sligo	9	-	-	113	1	100%	0%
14768	Little Falls	77	-	-	1282	2	26%	74%
14896	Harrison	38	-	-	605	350	15%	85%
14949	Wood Acres	154	-	-	1373	21	7%	93%
14979	Grant Avenue	183	-	-	1026	193	6%	94%
15082	St. Barnabas Road	59	-	-	2014	188	61%	39%
15086	St. Barnabas Road	59	-	-	585	194	31%	69%
15090	St. Barnabas Road	59	-	-	1351	64	11%	89%
15100	Bladensburg	175	-	-	674	644	46%	54%
15131	Walker Mill Road	15	-	-	1273	341	42%	58%
15132	Walker Mill Road	15	-	-	1816	104	20%	80%
15200	Takoma	27	-	-	824	603	16%	84%
15264	Takoma	27	-	-	990	649	15%	85%
15501	Little Falls	77	-	-	36	23	100%	0%
15502	Little Falls	77	-	-	17	9	100%	0%
15503	Little Falls	77	-	-	14	3	100%	0%
15504	Little Falls	77	-	-	152	2	100%	0%
15505	Little Falls	77	-	-	44	-	100%	0%
15506	Little Falls	77	-	-	434	9	100%	0%
15501- 15506 are part of the Little Falls Network Group and all are involved in serving at least one DC customer								
14593 is part of the Sligo South LVAC Network group that supplies mainly Maryland Customers.								

Note: Feeders with two source substations listed are 4 kV primary network feeders and are supplied from two substations.

Table 2.4-B7

2.4.3 NEIGHBORHOOD ANALYSIS

Starting with Order No. 16623, the Commission has required a specific focus on neighborhoods in the Consolidated Report. This section addresses each of the neighborhood subjects required by the Commission.

In response to the Commission's requirements for reporting the neighborhoods impacted by reliability issues and remediation work, Pepco developed a comprehensive list of the feeders serving District of Columbia customers and the neighborhoods served by each in May of 2012. In order to provide neighborhood identification that is both accurate and consistent from one submission to another, Pepco is now using assessment neighborhoods as defined by the District of Columbia Office of Tax and Revenue (OTR) Real Property Tax Administration (RPTA). Pepco is assessing new methods to programmatically identify the neighborhoods each Pepco feeder serves and plans to further discuss these plans in the future.

Neighborhood Analysis Requirements

(A) Neighborhoods warranting infrastructure improvements due to increased load growth⁵¹

Response: See discussion for Neighborhood Item A below.

(B) Neighborhoods with decreased planned spending on 4 kV to 13 kV conversions⁵²

(C) Neighborhoods with decreased planned spending on 4 kV to 13 kV conversions that are among previously identified Most Susceptible Neighborhoods⁵³

(D) Explanation of how reduced conversion spending will improve reliability in Most Susceptible Neighborhoods⁵⁴

Response: See discussion for Neighborhood Items B, C, and D below.

(E) Neighborhoods served by Priority Feeders⁵⁵

Response: See Priority Feeder discussion.

⁵¹ Order No. 16623 states the following at paragraph 35:

35. We find Pepco's explanation to be credible, but require further information on the neighborhoods in the District impacted by Pepco's changed plans. Specifically, we direct Pepco to identify those neighborhoods which warrant further infrastructure improvements due to increased load growth, including any explanation and data on Pepco's forecasts of load growth in those neighborhoods. (Footnote: In identifying neighborhoods, Pepco should use the methodology it used for defining and selecting neighborhoods in its May 20, 2011 submission to the Commission, or provide an explanation of why that methodology was not used. See F.C. Nos. 766, 982 and 991, Response of the Potomac Electric Power Company to Order No. 16347, May 20, 2011, Attachment 2.)...

⁵² Order No. 16623 states the following at paragraph 35:

...Similarly, we require Pepco to identify those neighborhoods where planned spending on 4 kV to 13 kV conversion projects has decreased...

⁵³ Order No. 16623 states the following at paragraph 35:

...Further, we require that Pepco indicate if any of the neighborhoods it identifies pursuant to this paragraph is among the Most Susceptible Neighborhoods identified in Order No. 14626, Appendix A. (Footnote: See F.C. Nos. 766, 982, and 991, Order No. 16426, July 7, 2011, Appendix A.)...

⁵⁴ Order No. 16623 states the following at paragraph 35:

If any of the neighborhoods identified in this paragraph is among those Most Susceptible Neighborhoods, Pepco is directed to provide a full explanation of how its changed plans will improve reliability in that neighborhood.

⁵⁵ Order No. 16623 states the following at paragraph 46:

46. In connection with the second prong of our reliability efforts, our neighborhood initiative, we believe it is important to know whether any of the Priority Feeders are the feeders which serve the Most Susceptible Neighborhoods in the District. Beginning in the 2012 Consolidated Report, we require that Pepco identify the neighborhoods served by any Priority Feeders...

(F) Neighborhoods served by Repeat Priority Feeders⁵⁶

Response: See Repeat Priority Feeder discussion.

(G) Neighborhoods served by equipment subject to failure data rate analysis⁵⁷

Response: See Failure Data Rate Analysis discussion.

(H) Updated list of Most Susceptible Neighborhoods for Calendar Year 2011⁵⁸

Response: See Neighborhood Item H, Most Susceptible Neighborhoods update below.

(I) Neighborhood information to be included in 2012 Consolidated Report⁵⁹

Response: This information was included in the 2012 Consolidated Report as specified above.

(J) Directive to identify neighborhoods affected by changed plans⁶⁰

Response: See discussion for Neighborhood Items A, B, C, and D below.

(K) Directive to provide information on neighborhoods⁶¹

Response: See discussion for Neighborhood Items E, F, G, H, and I.

⁵⁶ Order No. 16623 states the following at paragraph 46:

...and any Repeat Priority Feeder (those in the ACAP program). (Footnote: In identifying neighborhoods, Pepco should use the methodology it used for defining and selecting neighborhoods in its May 20, 2011 submission to the Commission, or provide an explanation of why that methodology was not used. See F.C. Nos. 766, 982 and 991, Response of the Potomac Electric Power Company to Order No. 16347, May 20, 2011, Attachment 2.)...

⁵⁷ Order No. 16623 states the following at paragraph 46:

...Further, we require that Pepco identify the neighborhoods served by any equipment subject to the failure data rate analysis proposed by Pepco at the October 18, 2011 PIWG meeting for inclusion in the 2012 Consolidated Report. (Footnote: See October 18, 2011 PIWG Meeting Minutes at 1.)...

⁵⁸ Order No. 16623 states the following at paragraph 46:

We also require Pepco to update its list of Most Susceptible Neighborhoods to identify the neighborhood in each Ward experiencing the most frequent non-major outages in Calendar Year 2011.

⁵⁹ Order No. 16623 states the following at paragraph 46:

...This information should be included in the 2012 Consolidated Report.

⁶⁰ Order No. 16623 states the following at paragraph 55:

55. Pepco is DIRECTED to identify neighborhoods affected by changed plans consistent with paragraph 35;

⁶¹ Order No. 16623 states the following at paragraph 60:

60. Pepco is DIRECTED to provide information on neighborhoods consistent with paragraph 46;

Neighborhood Item A.

Neighborhoods with Increased Load Growth

Pepco forecasts load by substation using identified PNB load along with the load reducing effects of net energy metering and conservation programs (and DERs generally) to develop short term forecasts and uses trends plus knowledge of future planned development to develop a long term forecast for each substation in the Pepco system.

There are areas where Pepco anticipates above average load growth and these include the Mt. Vernon Square/Convention Center neighborhood (R.L.A.⁶² (N.E.) assessment neighborhood), NoMa (R.L.A. (N.E.) assessment neighborhood), the Washington Navy Yard/Southwest (R.L.A. (S.W.) assessment neighborhood) neighborhood and the area around St. Elizabeth's Hospital and Columbia Heights.

Mt. Vernon Square/Convention Center and NoMa

Pepco added one new transformer to the existing Florida Avenue Substation in 2014 and one new transformer to the existing Northeast Substation in the Mt. Vernon Square/Convention Center (Old City 2 assessment neighborhood) and NoMa neighborhoods. Pepco is planning to build a new substation near the area of Mt. Vernon Square in 2023 to address load growth in the NoMa (R.L.A. (N.E.) assessment neighborhood) and the Mt. Vernon Triangle (Old City 2 assessment neighborhood) areas.

Washington Navy Yard/Southwest

The Waterfront Substation went into service in December 2017 in the Buzzard Point (Old City 1 assessment neighborhood) area to address load growth in the Washington Navy Yard and Southwest (R.L.A. (S.W.) assessment neighborhood) neighborhoods.

St. Elizabeth's Hospital

⁶² Redevelopment Land Agency.

Pepco added two shunt reactors at its Alabama Avenue substation that will increase existing substation capacity to serve load in the St. Elizabeth's Hospital area.

Columbia Heights

Pepco has installed a fourth transformer at Florida Avenue Sub. 10 in 2014 to increase capacity at that substation. Pepco is also planning to rebuild the Harvard 13 kV substation in 2024, increasing its capacity from 42.0 MVA to ultimately 210 MVA.

Neighborhood Items B, C, D.

Neighborhoods with Decreased Planned Spending on 4 kV to 13 kV Conversions

No neighborhoods will see an appreciable reduction in planned spending in 2019 compared to 2018 as conversions continue in the 12th Street SW, Georgetown, Harvard, and North Capitol areas. Conversions will continue in Harvard and North Capitol areas in 2020 with the goal to have all load served by the Harvard and North Capitol substations completed by end of 2020.

Pepco is planning to complete the Anacostia 4 kV conversion project in 2020 with the conversion of the last remaining 4kV Feeder supplied from Anacostia Sub. 8.

Neighborhood Item F.⁶³

Table 2.4-C lists the feeders that have appeared more than once on the 2% Priority Feeder list, the years they appeared, and the neighborhoods they serve.

⁶³ In Order No. 15941 issued on August 18, 2010, the Commission stated at paragraphs 13 and 16, the following:

13. Beginning with the 2011 Consolidated Report, Pepco shall identify any feeders that have appeared more than once on the Priority Feeder List, by year from the first Priority Feeder List in 2002, so that it shall be apparent how many times each feeder has appeared on the Priority Feeder List...

16. Pepco IS DIRECTED to identify in its 2011 and successive Consolidated Reports, each feeder that has appeared more than once on the Priority Feeder List.

Feeder	Years Appeared on Priority Feeder List Since 2001	Neighborhoods
27	2003, 2007, 2009	Shaw
53	2009, 2014	Columbia Heights, Park View
82	2007, 2015	Chevy Chase, Forest Hills, North Cleveland Park, Tenleytown Wakefield
211	2015, 2020	Capitol Hill
212	2014, 2016	Capitol Hill
227	2003, 2016	Barney Circle, Capitol Hill
228	2011, 2017	Bamey Circle, Capitol Hill, Navy Yard
233	2010, 2016	East Potomac Park, Lady Bird Johnson Park, National Mall - West Potomac Park, Southwest Federal Center
14001	2011, 2013	Bloomingtondale, Eckington, Edgewood, Le droit Park, Pleasant Plains
14004	2002, 2006	Bloomingtondale, Eckington, Ledroit Park
14006	2002, 2013, 2015	Brookland, Edgewood, Stronghold
14007	2001, 2003, 2005, 2008	Brookland, Michigan Park, Woodbridge, Catholic University, North Michigan Park
14008	2002, 2004, 2008, 2011	Brentwood, Ivy City, Langdon
14009	2013, 2017	Brookland, Catholic University, Eckington, Edgewood, Stronghold
14014	2001, 2004, 2006, 2013, 2017, 2019	Brookland, Langdon, Woodridge
14015	2001, 2004, 2009	Brookland, Michigan Park, Woodbridge, Catholic University, North Michigan Park
14016	2003, 2016	Arboretum, Fort Lincoln, Gateway, Ivy City, Langdon, National Arboretum, Woodridge
14017	2006, 2015	Brookland, Catholic University, Michigan Park, Stronghold
14023	2006, 2019	Brentwood, Brookland, Eckington
14031	2014, 2018	Dupont Park, Fairfax Village, Good Hope, Hillcrest, Naylor Gardens, Penn Branch
14054	2004, 2007	Columbia Heights, Sixteenth Street Heights
14093	2001, 2019	Arboretum, Brentwood, Brookland, Gateway, Langdon, National Arboretum
14136	2010, 2012, 2014, 2020	Cathedral Heights, Cleveland Park, Glover Park, McLean Gardens
14146	2002, 2005	Georgetown, Observatory Circle, Woodland-Normanstone Terrace, Woodley Park
14200	2009, 2011, 2013, 2015, 2018	Bloomingtondale, Brookland, Catholic University, Edgewood, Stronghold
14261	2017, 2020	Garfield Heights, Good Hope, Hillcrest, Naylor Gardens
14701	2001, 2003, 2010, 2012, 2017	Buena Vista
14702	2015, 2017	Anacostia, Fairlawn, Good Hope, Greenway, Naylor Gardens, Randle Highlands, Twining
14717	2001, 2003, 2007, 2009, 2012, 2014, 2017, 2019	Burrville, Deanwood, East Corner, Lincoln Heights, Mayfair
14729	2004, 2006	Columbia Heights, Park View, Petworth, Sixteenth Street Heights
14753	2003, 2009, 2014, 2017	Bellevue, Washington Highlands
14755	2002, 2017	Belleue, Congress Heights, Washington Highlands
14758	2003, 2012, 2014, 2017	Anacostia Naval Station - Boiling Air Force Base, Bellevue, Washington Highlands
14766	2002, 2006	American University Park, Potomac Heights, Spring Valley
14767	2002, 2008, 2015, 2018	Berkley, Kent, Potomac Heights, The Palisades, Wesley Heights
14786	2007, 2013, 2016, 2019	Brentwood, Capitol Hill, Galludet, Judiciary Square, Mount Vernon Square, Near Northeast
14787	2005, 2008, 2013	Capitol Hill, Gallaudet, Mount Vernon Square, Near Northeast, NoMa
14788	2007, 2013	Capitol Hill, Near Northeast, NoMa
14890	2008, 2011	American University Park, Chevy Chase, Friendship Heights
14900	2002, 2007, 2009, 2011, 2013, 2016, 2019	Bamaby Woods, Chevy Chase, Hawthorne
15009	2005, 2009, 2012, 2014	Manor Park, Riggs Park, Takoma
15011	2001, 2003, 2008, 2016	Brightwood, Sixteenth Street Heights
15012	2001, 2005	Manor Park, Petworth, Sixteenth Street Heights
15013	2003, 2006, 2017, 2019	Catholic University, Fort Totten, Manor Park, Pleasant Hill, Riggs Park, Stronghold
15014	2009, 2012, 2015, 2017	Fort Totten, Manor Park, Riggs Park
15016	2002, 2005	Manor Park, Riggs Park
15021	2005, 2014, 2018, 2020	Brightwood, Brightwood Park, Manor Park, Shepherd Park
15085	2014, 2017	Washington Highlands
15094	2012, 2018, 2020	Fort Lincoln, Woodridge
15130	2014, 2016, 2020	Benning Ridge, Civic Betterment, Fort Davis, Marshall Heights
15166	2010, 2013	Congress Heights, Shipley Terrace, Washington Highlands
15170	2006, 2010, 2015, 2018	Douglas, Good Hope, Naylor Gardens, Skyland
15171	2002, 2005, 2014	Congress Heights, Shipley Terrace, Washington Highlands
15172	2006, 2010, 2012, 2019	Buena Vista, Douglas, Saint Elizabeths
15173	2014, 2018	Anacostia, Buena Vista, Douglas, Garfield Heights, Knox Hill, Naylor Gardens, Shipley Terrace, Woodlands
15174	2010, 2013, 2015, 2018	Garfield Heights, Knox Hill, Shipley Terrace, Skyland, Woodlands
15197	2001, 2007, 2005, 2019	Grestwood, Petworth, Sixteenth Street Heights
15199	2001, 2004, 2010, 2012, 2014	Brightwood, Colonial Village, Riggs Park, Shepherd Park, Takoma
15206	2008, 2010	Bloomingtondale, Ledroit Park, Logan Circle, Mount Vernon Square, Shaw, Tuxton Circle
15701	2001, 2003, 2005, 2010, 2015	Brentwood, Carver, Gallaudet, Ivy City, Kingman Park, Langston, Trinidad
15702	2005, 2012, 2016, 2020	Capitol Hill, Carver, Langston, National Arboretum, Near Northeast, Trinidad
15703	2004, 2006	Bamey Circle, Capitol Hill, Carver, Kingman Park, Langston
15705	2003, 2009, 2011, 2013, 2017	Deanwood, Eastland Gardens, Kenilworth, Mayfair
15706	2009, 2011, 2016	Benning, Benning Heights, Benning Ridge, Fort Dupont, Hillbrook, Mahaning Heights, Marshall Heights
15707	2007, 2010, 2013, 2016, 2020	Deanwood, Hillbrook, Lincoln Heights, Mahaning Heights
15709	2004, 2006, 2008, 2010, 2018	Benning, Dupont Park, Fort Dupont, Greenway, River Terrace
15710	2013, 2017, 2020	Benning, Benning Heights, Fort Dupont, Greenway, Kingman Park, Mahaning Heights, River Terrace
15801	2002, 2005, 2008, 2010, 2013	Kent, Potomac Heights, The Palisades
15867	2002, 2008, 2014, 2020	Cleveland Park, Forest Hills, North Cleveland Park, Woodland-Normanstone Terrace, Woodley Park
15943	2008, 2010, 2012, 2016	Burleigh, Georgetown, Glover Park
15945	2011, 2013, 2015, 2018	American University Park, Tenleytown

Table 2.4-C

Neighborhood Item H.**Most Susceptible Neighborhoods by Ward with Most Frequent Non-Major Outages in 2019****Most Susceptible Neighborhood Analysis**

Pepco was directed to provide analysis regarding the neighborhoods that were most susceptible to outages as determined by outage data. Pepco's original approach as previously filed was based upon identifying where there was a SAIFI / SAIDI impact on a Ward basis based upon the feeders that served specific neighborhoods in that Ward. Pepco has now taken a more defined geospatial approach of determining the most susceptible neighborhoods based on customer's experiencing multiple interruptions (CEMI) within that individual neighborhood. Neighborhoods in which greater than 250 customers experienced 3 or more outages in a single year within the last two years were selected. The outage analysis is inclusive of major service outages (MSOs) in order to capture the true experience of the customer. See Table 2.4D for the analysis of the most susceptible neighborhoods.

Neighborhood	Ward	CEMI3+ 2019	Priority Feeders 2019	Priority Feeders 2020
Capitol Hill	6	2486	14786, 16001	211/15702/16002
Anacostia	8	1089	15176, 15177	-
Fort Lincoln	5	1020	-	15094
Deanwood	7	914	14717	15707
Southwest Waterfront	6	701	16000, 16001	-
Bellevue	8	630	-	-
Cleveland Park	3	576	-	14136/15867
Benning Ridge	7	482	-	15130
Fort Dupont	7	370	-	15710
Marshall Heights	7	366	-	15130
Fort Davis	7	363	-	328/14035/15130
Civic Betterment	7	357	-	15130

Table 2.4-D

From the analysis above, the 12 worst neighborhoods combined yielded 11 unique feeders. The majority of the feeders have been selected as part of a recent reliability program that also represent each neighborhood in this list. Additionally, the neighborhood list presented in this analysis represents 80% of the total DC customers that experienced three or more outages in 2019. See summary below:

- Feeders 14786, 14717, 15176, 15177, 16000 and 16001 were part of the 2019 Priority Feeder Program. The benefits on this work and other coincident work will be realized in 2020 and beyond.
- All remaining priority feeders are part of the 2020 Priority Feeder Program. The remediation work on these feeders is described above.
- Feeder 14758 in Bellevue had feeder strengthening work in 2019 and the benefits of this work will be realized in 2020 and beyond. This feeder is also slated to be converted to completely underground under DC Plug's 1st Biennial Plan, with projected completion date of September 2023.

2.4.4 EQUIPMENT FAILURE RATES⁶⁴

Pepco continues improvements to the quality of outage data. Outage data records are screened at multiple check points for accuracy. Control Center personnel review outage data daily for accuracy and make necessary edits to reflect actual circumstances. Asset Management staff performs several validation screens monthly to catch other data entry errors. Reliability Engineering staff periodically review outage data and field crew comments as part of reliability improvement programs and when questionable data is encountered and works with Control Center staff to resolve remaining issues.

Analysis of Top Three Equipment Failure Modes⁶⁵

This information identifies and analyzes the top three equipment failure modes in the District of Columbia with regards to total customers affected. In addition, it identifies feeders for corrective actions to remediate these failures in the future based on root cause determination where appropriate.

⁶⁴ Order No. 16975 states the following at paragraphs 95 and 118:

85. Decision: In its Comments, OPC identifies several instances in which outage data is inconsistent or erroneous. Pepco itself has identified several areas in which it can improve outage data quality. In an effort to ensure that the Commission and OPC is receiving accurate outage data, the Commission requires Pepco to report in its 2013 Consolidated Report on its efforts to improve the collection and accuracy of information regarding outages.

114. Pepco is DIRECTED to report on outage data quality improvement consistent with paragraph [95] herein.

⁶⁵ In Order No. 16091, the Commission stated among other things, at paragraph 59, the following:

59. ... (5) ... If data on failure rates for all variables is available for manhole events, Pepco shall include such information in its 2011 Consolidated Report. If such data is unavailable, we require the members of PIWG to discuss the need for and the availability of such data include in the 2011 Consolidated Report the PIWG conclusions and recommendations, if any.

For purposes of this analysis, the following definitions are established.

- Events – number of outage events
- CI – number of customers interrupted
- CMI – Customer minutes of interruption
- SAIFI – System Average Interruption Frequency Index
- SAIDI – System Average Interruption Duration Index
- CAIDI – Customer Average Interruption Duration Index

Table 2.4-E details the reliability impacts of primary equipment failures tracked by Pepco.

Equipment Type	Number of Outages	Pct % NI	CI	Pct % CI	CMI	Pct % CMI	SAIFI	CAIDI	SAIDI
Cable	227	19.04%	32,310	30.93%	4,971,836.18	31.29%	0.106	154	16.28
Transformer	123	10.32%	25,943	24.83%	5,792,935.42	36.45%	0.085	223	18.96
Lightning Arrestor	8	0.67%	8,166	7.82%	1,104,495.75	6.95%	0.027	135	3.62
Connection(i.e. Loose)	90	7.55%	4,637	4.44%	401,831.70	2.53%	0.015	87	1.32
Wire - Bare	11	0.92%	3,874	3.71%	185,575.02	1.17%	0.013	48	0.61
Joint Failure	10	0.84%	3,277	3.14%	339,231.37	2.13%	0.011	104	1.11
Switch	18	1.51%	3,046	2.92%	498,881.83	3.14%	0.010	164	1.63
Wire - Covered	15	1.26%	3,037	2.91%	449,309.80	2.83%	0.010	148	1.47
PAC / Spacer Cable	2	0.17%	2,688	2.57%	39,074.20	0.25%	0.009	15	0.13
Switch - Gang Op	1	0.08%	2,374	2.27%	118,858.27	0.75%	0.008	50	0.39
Elbow Insert	26	2.18%	1,987	1.90%	301,493.98	1.90%	0.007	152	0.99
ACR	2	0.17%	1,972	1.89%	186,455.00	1.17%	0.006	95	0.61
Fuse	68	5.70%	1,812	1.73%	195,935.72	1.23%	0.006	108	0.64
Crossarm	4	0.34%	1,622	1.55%	201,179.48	1.27%	0.005	124	0.66
Insulator	2	0.17%	1,299	1.24%	77,407.40	0.49%	0.004	60	0.25
Distr. Ckt. Breaker	3	0.25%	1,172	1.12%	158,633.83	1.00%	0.004	135	0.52
Regulator	1	0.08%	963	0.92%	34,750.00	0.22%	0.003	36	0.11
Transformer - Subsurface	21	1.76%	635	0.61%	97,650.63	0.61%	0.002	154	0.32
Cutout	18	1.51%	437	0.42%	45,852.85	0.29%	0.001	105	0.15
Bushing	20	1.68%	133	0.13%	17,509.50	0.11%	0.000	132	0.06
None	7	0.59%	7	0.01%	3,396.00	0.02%	0.000	485	0.01
Splice	1	0.08%	6	0.01%	5,077.60	0.03%	0.000	846	0.02
Meter	6	0.50%	6	0.01%	602.80	0.00%	0.000	100	0.00
Service	1	0.08%	4	0.00%	560.00	0.00%	0.000	140	0.00
Transformer - Padmount	1	0.08%	4	0.00%	64.00	0.00%	0.000	16	0.00
Termination	1	0.08%	1	0.00%	334.00	0.00%	0.000	334	0.00
Autotransformer	1	0.08%	1	0.00%	115.00	0.00%	0.000	115	0.00
Total Primaries	688	57.72%	101,413	97.08%	15,229,047.33	95.83%	0.332	150	49.85
Total Secondaries	504	42.28%	3049	2.92%	661988.55	4.17%	0.010	217	2.17
Total Primary and Secondary	1192	100.00%	104,462.00	100.00%	15,891,035.88	100.00%	0.342	152	52.02

Table 2.4-E – Event Detail for Equipment Failures

Based on the number of customer outages, as shown above in highlighted rows, the top three classes of primary equipment failures contributing to SAIFI are cable, loose connections, and bare wire issues, accounting for 60.2% of total customers impacted and 70.3% of total customer minutes of interruption.

Cable Failure Analysis

Based on OMS data, the District of Columbia experienced 227 primary outages caused by cable failures during the period of analysis which affected 32,310 customers. There were 4 significant events that occurred accounting for 32% of the cable failure customer interruptions and 16.3% of the cable failure customer minutes of interruption. The first event occurred on 10/25/2019 out of the Benning substation. A primary cable failure event

occurred on feeder 15709 tripped due to blown fuse causing 2,752 customer interruptions and 17,429 customer minutes of interruption. Isolated cable fault replaced fuse and closed tie restoring all load. A second event occurred on 3/31/2019 out of Benning substation. A primary cable failure event occurred on feeder 15709 tripped due to getaway fault causing 1,847 customer interruptions and 18,562 customer minutes of interruption. Crews isolated UG fault, tie made, and load restored. A third event occurred on 9/29/2019 out of Waterfront substation. A primary cable failure event occurred on feeder 16003 tripped due to a blown fuse causing 1,339 customer interruptions and 283,019 customer minutes of interruption. Crews isolated UG fault between oil switches, made repair and restored all load.

A fourth event occurred on 1/1/2019 out of Bladensburg substation. A primary cable failure event occurred on feeder 15094, which tripped due to getaway fault causing 1,005 customer interruptions and 73,046 customer minutes of interruption. Crews isolated UG fault, a tie was made and all load restored.

Cables are selected for remediation based on outage history and repeat outages on sections of cable or repeat outages in neighborhoods. A program is in place to install interrupters on underground primary cable. An interrupter is a similar device to the recloser in that it can isolate the fault and restore service to customers that are not on the same section of the feeder as the outage. This will reduce the number of customer interruptions caused by cable failures and assist repair crews in locating the outage.

2019 (Jan.1-Dec 31)	Mode Of Failure: (Cable Failure (Primary))			
	CI	%	CMI	%
YE Total	32,310	30.93%	4,971,836	31.29%
4 Major Events*	6,943	32.00%	392,058	16.30%

*% related to the total number of primary cable failure events

Table 2.4-F1 – Cable Failure Rates

Analysis of these 227 cable failure events as reported by OMS revealed that 47.8% of the customers impacted by cable failure can be attributed to nine events. See summary below:

Table 2.4-F2 details the primary cable failure events causing the largest customer impact.

Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG %	Comments
15709	Benning A23013 7	3/31/2019	2,756	56,786	Feeder tripped due to getaway cable	3.58	38%	Priority feeder 2004,2006,2008,2010,2018
15702	Benning A23013 7	7/10/2019	2,568	265,741	UG Cable Fault	11.28	95%	Priority feeder 2005,2012,2016,2020
15094	Bladensburg 175	1/11/2019	2,482	508,013	Feeder tripped due to getaway cable	13.19	61%	Priority feeder 2018,2020
16003	Waterfront 223	9/29/2019	1,788	408,981	UG Cable Fault	13.29	100%	2020 Priority Feeder
15197	Ft Slocum 190	12/29/2019	1,416	149,022	Feeder tripped due to pac cable fault	4.31	35%	Priority feeder 2001,2005,2007,2019
16002	Waterfront 223	9/29/2019	1,384	555,823	UG cable fault	12.55	100%	2020 Priority Feeder
14136	Van Ness 129	5/24/2019	1,383	109,612	Blown fuse, cable burned up	6.22	76%	Priority feeder 2010,2012,2014,2020
15943	Van Ness 129	7/14/2019	1,046	183,177	B & C cable fault	11.40	77%	Priority feeder 2008,2010,2011,2012,2016
15867	Van Ness 129	6/19/2019	649	75,296	Lead joint blown in MH	4.15	58%	Priority feeder 2002,2008,2014,2020
Total			15,472	2,312,451				

Table 2.4-F2 – Event Detail for Cable Failures

Loose Connections Analysis

Based on OMS data, the District of Columbia experienced 90 loose connections related outages during the period of analysis which affected 4,637 customers. There were two significant events that attributed to 74.9% of the customers impacted and 76.1% of the customer minutes of interruption due to primary loose connections, accounting for 3,063 customers and 250,785 customer minutes, respectively. The first significant event occurred on 1/1/2019 on NRL substation feeder 14758 and accounted for 1,755 customer interruptions and 152,685 customer minutes of interruption due to A phase wire down. Crews made repairs and restored all customers. The second significant event occurred on 7/19/2019 on feeders 15197 out of Ft Slocum substation impacting 1,308 customers for a total of 98,100 minutes of interruptions due to tripped feeder. Crew isolated the fault and restored all customers.

2019 (Jan.1-Dec 31)	Mode Of Failure: (Loose Connections)			
	CI	%	CMI	%
YE Total	4,637	4.44%	401,832	2.53%
2 Major Events*	3,063	74.90%	250,785	76.10%

*% related to the total number of primary cable failure events

Table 2.4-G1 – Loose Connections Rates

- Analysis of these 90 events as reported by OMS revealed that 71.79% of the customers impacted were impacted by loose connections. See summary below:

Table 2.4-G2 details the primary loose connections events causing the largest customer impact.

Loose connections								
Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG %	Comments
14758	NRL 168	1/11/2019	1,862	168,692	A Phase down	3.40	34%	Priority feeder 2003,2012,2014,2017
15197	Ft Slocum 190	7/19/2019	1,405	113,620	Disclosed C phase	4.31	35%	Priority feeder 2001,2005,2007,2019
Total			3,267	282,312				

Table 2.4-G2 – Event Detail for Loose Connections

Transformer Failure Analysis

Based on OMS data, the District of Columbia experienced 123 transformer outages during the period of analysis which affected 25,943 customers. There were 9 significant events that accounted for 62% of the transformer failure customer interruptions and 50% of the transformer failure customer minutes of interruption. The first 8 significant outages all occurred on 7/27/2019 at Florida Ave. substation impacting feeders 7 resulting in 14,516 customer interruptions for a total of 2,819,685 minutes due to complete loss of substation. The 9th significant outage occurred on 7/9/2019 at Alabama Ave substation, feeder 15177 impacting 1,090 customer interruptions for a total of 26,160 customer minutes of interruptions due to ACR tripping due to repairs on another device.

2019 (Jan.1-Dec 31)	Mode Of Failure: Transformer			
	CI	%	CMI	%
YE Total	25,943	24.83%	5,792,935	36.45%
2 Major Events*	15,606	62.04%	2,845,845	49.96%

*% related to the total number of primary cable failure events

Table 2.4-H1 – Transformer Failure Rates

- Analysis of these 123 events as reported by OMS revealed that 61% of the customers were impacted by transformer failure. See summary below:

Table 2.4-H2 details the primary bare wire failure events causing the largest customer impact.

Transformer								
Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG %	Comments
15762	Florida Ave 10	7/27/2019	2,802	140,100	Loss of substation	6.52	100%	Priority feeder 2005
15763	Florida Ave 10	7/27/2019	2,063	103,150		6.18	100%	
15764	Florida Ave 10	7/27/2019	2,006	100,300		5.56	100%	Priority feeder 2019
15339	Florida Ave 10	7/27/2019	1,776	1,319,568		3.57	100%	
15769	Florida Ave 10	7/27/2019	1,677	83,850		5.76	100%	
15761	Florida Ave 10	7/27/2019	1,487	71,847		5.07	100%	
15337	Florida Ave 10	7/27/2019	1,445	72,250		3.90	100%	
15341	Florida Ave 10	7/27/2019	1,260	928,620		3.48	100%	
15177	Alabama Ave 136	7/9/2019	1,090	26,160	ACR trip	1.93	17%	Priority feeder 2019
Total			15,606	2,845,845				

Table 2.4-H2 – Event Detail for Transformer Failures

Order No. 16975 states the following at paragraphs 68 and 109:

68. **Decision:** *Pepco is directed to report on efforts to reduce equipment failure in the 2013 Consolidated Report and in future Consolidated Reports.*
109. *Pepco is **DIRECTED** to report on its efforts to reduce equipment failure consistent with paragraph 68 herein;*

Analysis of effort to reduce equipment failure rates

The analysis of the top three causes of equipment failure outages in the District of Columbia shows the impacts of ongoing efforts to improve Pepco's overall system and the effectiveness of numerous programs currently in progress as part of Pepco's Reliability program. As shown in the detail above, most of the issues that contributed to the top three equipment failure modes during the evaluation period have been or are scheduled to be addressed in various elements of the Reliability program. All other issues occurred on feeders with historically good performance and were repaired permanently at the time of the restoration and require no further action.

Improvements in the overall impact of equipment failures bear testament to the effectiveness of Pepco's Reliability program in identifying and remediating the most impactful equipment failure modes, ideally those which contribute to the majority of customer outages. Programs such as DC PLUG, priority and comprehensive feeder remediation, and recloser installation and ASR schemes are mitigating the impacts of equipment failures and providing better overall reliability for DC customers. Other pilot programs such as installing interrupters on the underground system are being analyzed to determine the benefits and how to employ them in the near future.

As noted in the above analysis, cable failure remains the largest contributor to customer outages caused by equipment failure. From this analysis there is no identifiable trend for the cable failures. Pepco is continuing to look at cable failures to identify sections of cable that have failed multiple times and is taking a proactive approach with its URD cable replacement program.

2.4.5 OUTAGE CAUSES

Interruptions to electric service can be caused by a range of occurrences, such as downed trees or limbs on power lines; high winds and lightning; heavy rain, snow, or ice; animals on equipment or power lines; traffic accidents that damage poles and equipment; underground construction accidents; and equipment failures.

The eight main outage causes in the OMS are:

- Animal – Outage caused by contact between Birds, Squirrels, Snakes and Other small animals and the distribution system;
- Equipment Failure - Includes Equipment Failures Only;
- Equipment Hit - Includes Cable Cuts, Motor Vehicle Hits and Foreign Contact;
- Others - Includes Employee, Fire, Load Shedding, Source Lost, Vandalism, Voltage;
- Overload - Includes Overloading only;
- Tree - Includes Outside ROW- Limb, Outside ROW-Down, Inside ROW-Limb, and Inside ROW-Down;
- Unknown - Includes Unknown Only indicates that the field responder did not know the cause of the outage; and
- Weather - Includes Flood, Ice, Lightning, Wind.

The following table reflects the outage cause options from which crews select when entering data into the Advantex Mobile application at the time of restoration. Through the Advantex Mobile NMS (Network Management System) completion window, crews have the ability to enter the event restoration information through drop down menus that are represented in the following table as well as any additional information through a free form text field. The outage cause selections are later classified into the categories above for reporting purposes. The detailed outage causes are maintained to assist in analysis of not only the cause of the outage but also the corrective actions necessary to reduce future outages.

An explanation of the selection categories from the drop-down menus follows Table 2.4-I below.

Select 1	Select 1	Select 1	Select 1	Select up to 3	Select 1	Select 1	Select 1	Select up to 7	Select up to 4
NONPHI	Weather	Class	Device	Action	Cause/Problem	Equipment Failure Select if Equipment Failure Cause selected	Phase	Manhole	Follow-Up Area
APGE	Clear	Dist Primary - OH	ACR	Assisted	Animal/Bird	ACR	A	Cable Burnout Visible	ACE - Cape May
Bad Address	Extreme Cold	Dist Primary - UG	Autotransformer	Braced	Animal/Other	Autotransformer	B	Cable Smoking	ACE - Glassboro
Cust Equip	Extreme Heat	Dist Primary - URD	Bushing	Bypassed	Animal/Snake	Bushing	C	Cover - Double Action	ACE - Operations
FD Disconn- Left Disconn	Ice	Dist Secondary - OH	Cable	Closed	Animal/Squirrel	Cable	ABC	Cover - Rdw k Grate	ACE - Pleasantville
FD Disconn- Reconnected	Fog	Dist Secondary - UG	Capacitor	Cleared/Cut in Clear	Avoided Dispatch	Capacitor	+/-	Cover - Sdw k Grate	ACE - Winslow
N/R (No Response)	Rain	Dist Secondary - URD	Connection (i.e. Loose)	Disconn	Cable Cut - Billable	Connection (i.e. Loose)	AB	Cover - Slotted	Bay - Centreville
N/R Volt Checks OK	Snow	Network	Crossarm	Isolated	Cable Cut - Marked Wrong	Crossarm	AC	Cover Displaced	Bay - Exmore
No Access	Windy	St. Lgt.	Cutout	Jumpered	Cable Cut - Unknown	Cutout	BC	Gas Present	Bay - Harrington
Ok by Phone	Thunder/Lightning	Substation	Distr. Ckt. Breaker	Left MLSO	Employee	Distr. Ckt. Breaker	A, +/-	Joint Smoking	Bay - Millsboro
Ok on Arrival		Sub-Transmission	Elbow/Insert	Made Safe	Equipment Failure	Elbow/Insert	B, +/-	MHFire	Bay - Operations
Utility - CATV		Traffic Signal	Fuse	Made Tie	Fire	Fuse	C, +/-	MHSmoking	Bay- Salisbury
Utility - Phone		Transmission	Insulator	Notified Customer	Foreign Contact	Insulator	AB, +/-	Structure Damage	Claims
Utility - Other			Joint Failure	Perm Repairs	Load	Joint Failure	AC, +/-	Water Above Cable	Forestry
			Lightning Arrestor	Reconnected	Load Shedding	Lightning Arrestor	BC, +/-	Water Below Cable	NC - Christiana
			Meter	Referred	Motor Vehicle	Meter	ABC, +/-	Other	NC - North East
			Meter - Primary	Removed	Scheduled	Meter - Primary			NC - Operations
			"Mole"	Repaired	Source Lost	"Mole"			Pepco - BSID
			None	Replaced	Tree ROW - Limb	None			Pepco - Conduit
			PAC/ Spacer Cable	Temp Repairs	Tree ROW - Down	PAC/ Spacer Cable			Pepco - Cust Design DC
			Pole	Voltage Check	Tree Outside ROW - Limb	Pole			Pepco - Cust Design MD
			Regulator		Tree Outside ROW - Down	Regulator			Pepco - Cust Operations
			Relay		Unknown	Relay			Pepco - Distribution Test
			Sectionalizer		Vandalism	Sectionalizer			Pepco - Line Clearance
			Service		Voltage - F/L or H/L	Service			Pepco - Meter
			Splice		Weather / Flood	Splice			Pepco - OH Forestville
			Street Light / Traffic		Weather / Ice	Street Light / Traffic			Pepco - OH Rockville
			Switch		Weather / Lightning	Switch			Pepco - Operations
			Switch - Gang Op		Weather / Salt	Switch - Gang Op			Pepco - UG Benning
			Termination		Weather / Wind	Termination			Pepco - UG Rockville
			Transclosure			Transclosure			Pepco - URD - Rockville
			Transformer			Transformer			Pepco - URD Forestville
			Transformer - Padmount			Transformer - Padmount			
			Transformer - Subsurface			Transformer - Subsurface			
			Wire - Bare			Wire - Bare			
			Wire - Covered			Wire - Covered			

Table 2.4-1

- **Non-PHI** - If the event is not caused by Pepco equipment or if it is impossible to complete the request (e.g. bad address) crews must select one item from the Non-PHI list box of the MDS restoration screen indicating the circumstances, such as other utility, customer equipment, APGE (advise party to get electrician). If a selection is made from this list, the crew can complete and close ticket without further information. If no selection is made, then the event is on Pepco equipment and additional information is needed to complete the record.
- **Weather** - Crew must select from the list the observed weather conditions at the time of the outage.
- **Class** - Crew must select one item from the drop-down list describing the construction type.
- **Device** - Crew must select the clearing device.
- **Action** - Crew selects the action taken to restore the event/outage.
- **Cause/problem** - Crew must select the cause of the event. A ticket cannot be closed without a cause selection if the event was on Pepco equipment.
- **Equipment Failure** - Crew must enter information about the failed device related to the event if equipment failure is the cause / problem selected.
- **Phase** - Selection box for the phase(s) impacted by the event/outage.
- **Manhole** - Selection box for items describing the contents of a manhole.
- **Follow-up Area** - For an event that needs additional work but does not require immediate attention, a crew may select a follow-up area. For example, in the case of a URD cable failure where all load is restored through a common tie, the event would have a follow-up selection.

The most common causes of power outages are equipment failures and vegetation. High winds, heavy rain or snow and ice can cause trees or branches to topple and tear down power lines. Tree limbs brushing or resting on the lines cause short circuits and blown fuses. As shown in Table 2.4-I, there are several different equipment types that fall under the “Equipment Failure” category. One such type is fuse-related outages. The job of the fuse is to protect equipment. If a fuse blows, it is not an equipment failure but rather the fuse is performing its designed function. As a result, there are fewer actual “Equipment Failures” than are captured by the OMS.

If a non-Pepco construction crew digs a foot or two in the wrong direction, damage to an underground power line could cause an instant disruption of electric service or could cause damage that may not result in a power outage until days, weeks or months later.

Vehicles that damage utility poles or equipment can also cause power outages. Small animals, like squirrels, sometimes chew into lines or come into contact with a piece of equipment and an energized line, causing a fault and subsequent interruption of electric service.

An event classified as "Unknown" indicates that the field responder did not know the cause of the outage and this classification is used most frequently where a service interruption results from the operation of a protective device such as a fuse or recloser. These devices protect the electric distribution system from damage by sensing fault current on a particular circuit and activating a break in the flow of current. Typically, if there is no discernable damage to the circuit and the cause of the fault is not evident in the vicinity of the protective device that was activated, the device will be replaced or reset and the circuit re-energized. If the device holds (no fault current is detected), the field responder may report "Equipment Failure" or "Unknown" as a cause and move on to the next trouble call assigned. The operation of these protective devices are not equipment failures because the fuse or recloser is operating correctly when it opens to isolate a fault further down the line. Occasionally, the field responder may find a probable cause some distance from the protective device involved (such as a tree branch on the ground underneath the overhead lines), but, for the most part, crews are focused on restoration of service rather than full investigation of the cause of any interruption (where this is not immediately evident).

Tables 2.4-J contains District of Columbia outage cause data for calendar year 2019.

Primary Equipment Failures		Number of Customers: 305,487					Sum of SAIFI	Sum of CAIDI	SAIDI
Equipment Type	NI	NI %	CI	CI %	CMI	CMI %			
ACR	2	0.2%	1,972	1.9%	186,455	1.2%	0.006	95	0.61
Autotransformer	1	0.1%	1	0.0%	115	0.0%	0.000	115	0.00
Bushing	20	1.7%	133	0.1%	17,510	0.1%	0.000	132	0.06
Cable	227	19.0%	32,310	30.9%	4,971,836	31.3%	0.106	154	16.28
Connection(i.e. Loose)	90	7.6%	4,637	4.4%	401,832	2.5%	0.015	87	1.32
Crossarm	4	0.3%	1,622	1.6%	201,179	1.3%	0.005	124	0.66
Cutout	18	1.5%	437	0.4%	45,853	0.3%	0.001	105	0.15
Distr. Ckt. Breaker	3	0.3%	1,172	1.1%	158,634	1.0%	0.004	135	0.52
Elbow Insert	26	2.2%	1,987	1.9%	301,494	1.9%	0.007	152	0.99
Fuse	68	5.7%	1,812	1.7%	195,936	1.2%	0.006	108	0.64
Insulator	2	0.2%	1,299	1.2%	77,407	0.5%	0.004	60	0.25
Joint Failure	10	0.8%	3,277	3.1%	339,231	2.1%	0.011	104	1.11
Lightning Arrestor	8	0.7%	8,166	7.8%	1,104,496	7.0%	0.027	135	3.62
Meter	6	0.5%	6	0.0%	603	0.0%	0.000	100	0.00
None	7	0.6%	7	0.0%	3,396	0.0%	0.000	485	0.01
PAC / Spacer Cable	2	0.2%	2,688	2.6%	39,074	0.2%	0.009	15	0.13
Regulator	1	0.1%	963	0.9%	34,750	0.2%	0.003	36	0.11
Service	1	0.1%	4	0.0%	560	0.0%	0.000	140	0.00
Splice	1	0.1%	6	0.0%	5,078	0.0%	0.000	846	0.02
Switch	18	1.5%	3,046	2.9%	498,882	3.1%	0.010	164	1.63
Switch - Gang Op	1	0.1%	2,374	2.3%	118,858	0.7%	0.008	50	0.39
Termination	1	0.1%	1	0.0%	334	0.0%	0.000	334	0.00
Transformer	123	10.3%	25,943	24.8%	5,792,935	36.5%	0.085	223	18.96
Transformer - Padmount	1	0.1%	4	0.0%	64	0.0%	0.000	16	0.00
Transformer - Subsurface	21	1.8%	635	0.6%	97,651	0.6%	0.002	154	0.32
Wire - Bare	11	0.9%	3,874	3.7%	185,575	1.2%	0.013	48	0.61
Wire - Covered	15	1.3%	3,037	2.9%	449,310	2.8%	0.010	148	1.47
Grand Total	688	57.7%	101,413	97.1%	15,229,047	95.8%	0.332	150	49.85

Table 2.4-J

2.4.6 VM BUDGET, TREE-RELATED OUTAGES^{66 67}

Table 2.4-K1 shows District of Columbia distribution tree trimming expenses (not including poles, substation mowing, or storm-related tree trimming) and budgets. Provided are actual and budgeted amounts for 2013-2019 and the 2020 budget.

Pepco's VM program includes increased trimming above all three-phase and single-phase lines. For three-phase lines it also includes the removal (with permission) of any limbs identified by Pepco Arborist planners that have a probability of breaking and falling into the conductors.

⁶⁶ In Order No. 16623 at paragraphs 37 and 56, the Commission ordered the following:

37. *Decision: ... We require Pepco to explain why it has decreased its budget for tree trimming over the last seven years, if tree trimming is the most important factor impacting customers suffering from power outages. Pepco should include that explanation in the 2012 Consolidated Report.*

56. *Pepco is DIRECTED to provide an explanation of its budget for tree trimming consistent with paragraph 37.*

⁶⁷ Order No. 16975 states the following at paragraphs 43 and 99:

43. *Decision: The Commission finds Pepco's explanation of its budget variance for the single year 2011 insufficient to explain budget variances that totaled 26.9% below budget for five of the last six years. Therefore, the Commission requires Pepco to explain the budget variances that have occurred from 2006-2011 in its 2013 Consolidated Report. Additionally, we agree with Staff Recommendation #3 and require Pepco to include an explanation of any budget variance in its vegetation management expenditures and its EIVM expenditures in future years' Consolidated Reports. We are extremely concerned about the explanation provided in the Consolidated Report for why vegetation management expenditures were below budget in five of the last six years. Pepco stated that "while actual expenditures were below budget, work was completed consistent with planning." This is an inadequate explanation for a repeated failure to spend budgeted amounts on tree-trimming – arguably, the "most important factor impacting customers suffering from power outages." We therefore require Pepco to expand upon its explanation. If Pepco means that, through efficiencies, all the work intended to be accomplished in the budget was actually accomplished for less, then we direct Pepco to document what was intended to be included in the budget and what efficiencies were achieved so that the budgeted work was accomplished at a lower cost. The Commission also requires Pepco to explain what impact these efficiencies had on the budget process in subsequent years. If Pepco's statement about planning has some other meaning, we direct Pepco to provide it and to show what "planning" was involved, by whom and when. We also expect a precise and detailed explanation of why such planning would result in expenditures consistently, and significantly, below the budgeted amounts for a number of years. Further, we agree with OPC's suggestion that Pepco explain why its program does not include increased trimming above the three phase tap line or the single tap lines. Pepco is directed to provide this information in the 2013 Consolidated Report.*

99. *Pepco is DIRECTED to provide an explanation of budget variances for its own vegetation management work as directed in paragraph 43 herein;*

Explanation of Variance in Pepco D.C. O&M Tree Trimming Costs

In 2019, there was variance of \$397,367 (underspent), or approximately 16% percent, from the annual VM budget. Due to vegetation management's aggressive routine maintenance program, the cyclical costs associated with the program have reduced. Since DC is on a two-year schedule, all feeders are inspected and maintained every two years. This has resulted in less associated maintenance costs for the program.

Pepco District of Columbia O & M Tree Trimming Costs								
	2013	2014	2015	2016	2017	2018	2019	2020
Actual								
Tree Trimming - DC	\$2,352,567	\$2,164,336	\$2,238,654	\$2,269,634	\$2,365,759	\$1,705,410	\$2,124,929	
Budget/Forecast								
Tree Trimming - DC	\$2,218,342	\$2,113,300	\$2,324,572	\$2,335,008	\$2,412,774	\$2,480,616	\$2,522,296	\$2,361,114
Variance	(\$134,225)	(\$51,036)	\$85,918	\$65,374	\$47,015	\$775,206	\$397,367	
Tree Trimming - DC								
Notes:								
1. Excludes pole inspections, substation mowing costs								

Table 2.4-K1

Yearly Data on Tree Trimming & Tree-Related Outages

In accordance with Order No. 15621,⁶⁹ presented in the following tables, is Pepco’s “yearly data on vegetation management by feeder and wards (or multiple wards) compared to the Company’s tree down and tree limb outage causes listed in its monthly power outage reports.” The tables list the outages coded as tree-related in 2019, also sorted by feeder, allowing for a comparison between the two sets of tables. It is possible that additional outages may have been caused by trees but with causes coded as weather or unknown if fallen trees or limbs were not found at the site.

⁶⁹ In Order No. 15621 at paragraph 5, the Commission ordered the following:

5. Pepco shall file within the Company’s annual Consolidated Reports to the Commission, yearly data on tree trimming by feeder and wards (or multiple wards) compared to the Company’s tree down and tree limb outage causes listed in its monthly power outage reports beginning with the Company’s 2010 Consolidated Report.

Pepco District of Columbia 2019 Vegetation Management Plan

Feeder	Ward	Voltage Class
52	DC Ward 3	4KV
56	DC Ward 8	4KV
57	DC Ward 2	4KV
58	DC Ward 2	4KV
60	DC Ward 3	4KV
63	DC Ward 3	4KV
64	DC Ward 3	4KV
65	DC Ward 3	4KV
66	DC Ward 1	4KV
75	DC Ward 3	4KV
82	DC Ward 3	4KV
87	DC Ward 3	4KV
96	DC Ward 8	4KV
97	DC Ward 6	4KV
101	DC Ward 3	4KV
102	DC Ward 3	4KV
119	DC Ward 8	4KV
120	DC Ward 8	4KV
122	DC Ward 8	4KV
128	DC Ward 3	4KV
144	DC Ward 3	4KV
164	DC Ward 8	4KV
165	DC Ward 8	4KV
167	DC Ward 6	4KV
177	DC Ward 8	4KV
178	DC Ward 8	4KV
181	DC Ward 3	4KV
183	DC Ward 8	4KV
199	DC Ward 3	4KV
205	DC Ward 7/MD PG Town of Seat Pleasant	4KV
234	DC Ward 8	4KV
271	DC Ward 8	4KV
292	DC Ward 8	4KV
294	DC Ward 8	4KV
309	DC Ward 3	4KV
323	DC Ward 8	4KV
324	DC Ward 8	4KV
325	DC Ward 8	4KV
329	DC Ward 8	4KV
330	DC Ward 8	4KV
332	DC Ward 8	4KV
333	DC Ward 8	4KV
343	DC Ward 8	4KV
353	DC Ward 8	4KV
366	MD PG Town of Seat Pleasant	4KV
372	MD PG Town of Seat Pleasant	4KV
394	DC Ward 3	4KV
411	DC Ward 8	4KV

467	DC Ward 3	4KV
480	DC Ward 8	4KV
14005	DC Ward 5	13KV
14006	DC Ward 5	13KV
14007	DC Ward 5	13KV
14008	DC Ward 5	13KV
14009	DC Ward 5	13KV
14014	DC Ward 5	13KV
14015	DC Ward 5	13KV
14016	DC Ward 5	13KV
14017	DC Ward 5	13KV
14019	DC Ward 5	13KV
14020	DC Ward 5	13KV
14021	DC Ward 5	13KV
14022	DC Ward 5	13KV
14023	DC Ward 5	13KV
14054	DC Ward 1	13KV
14055	DC Ward 7	13KV
14058	DC Ward 7	13KV
14093	DC Ward 5	13KV
14132	DC Ward 3	13KV
14133	DC Ward 3	13KV
14134	DC Ward 3	13KV
14135	DC Ward 3	13KV
14136	DC Ward 3	13KV
14139	DC Ward 3	13KV
14140	DC Ward 3	13KV
14145	DC Ward 3	13KV
14146	DC Ward 3	13KV
14150	DC Ward 3	13KV
14159	DC Ward 7	13KV
14200	DC Ward 5	13KV
14261	DC Ward 7	13KV
14700	DC Ward 8	13KV
14701	DC Ward 8	13KV
14702	DC Ward 8	13KV
14703	DC Ward 8	13KV
14707	DC Ward 8	13KV
14709	DC Ward 8	13KV
14713	DC Ward 7	13KV
14716	DC Ward 7	13KV
14717	DC Ward 7	13KV
14718	DC Ward 8	13KV
14719	DC Ward 8	13KV
14732	DC Ward 1	13KV
14752	DC Ward 8	13KV
14753	DC Ward 8	13KV
14755	DC Ward 8	13KV
14756	DC Ward 8	13KV
14758	DC Ward 8	13KV
14765	DC Ward 3	13KV
14766	DC Ward 3	13KV
14767	DC Ward 3	13KV
14768	DC Ward 3	13KV
14806	DC Ward 7	13KV

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14808	DC Ward 7	13KV
14809	DC Ward 7	13KV
14811	DC Ward 7	13KV
14812	DC Ward 7	13KV
14813	DC Ward 7	13KV
15135	MD Feeder	13KV
15198	DC Ward 4	13KV
15199	DC Ward 4	13KV
15200	DC Ward 4	13KV
15264	DC Ward 5	13KV
15457	DC Ward 5	13KV
15701	DC Ward 7	13KV
15702	DC Ward 7	13KV
15705	DC Ward 7	13KV
15706	DC Ward 7	13KV
15707	DC Ward 7	13KV
15709	DC Ward 7	13KV
15710	DC Ward 7	13KV
15755	DC Ward 6	13KV
15756	DC Ward 6	13KV
15801	DC Ward 3	13KV
15867	DC Ward 3	13KV
15930	DC Ward 3	13KV
15943	DC Ward 3	13KV
15944	DC Ward 3	13KV
15945	DC Ward 3	13KV
15947	DC Ward 3	13KV
15949	DC Ward 3	13KV
15950	DC Ward 3	13KV
14144R	DC Ward 3	13KV
15204R	DC Ward 2	13KV
15204W	DC Ward 2	13KV
15207R	DC Ward 2	13KV
15207W	DC Ward 2	13KV

Table 2.4-K2 2019 VM Plan

**Tree-Related Outages in 2019
(Inclusive IEEE 1366 – 2012 Std)**

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
2517314	1/5/2019	7:33	8:46	73	Dist Secondary - OH	Tree Outside ROW - Limb	1	73	14717
2518651	1/9/2019	10:10	11:20	70	Dist Secondary - OH	Tree ROW - Limb	1	70	387
2521523	1/19/2019	23:34	13:40	846	Dist Primary - OH	Tree Outside ROW - Down	15	12690	14133
2521523	1/20/2019	1:40	13:40	719	Dist Primary - OH	Tree Outside ROW - Down	4	2877.1333333	14133
2521815	1/19/2019	23:34	15:09	935	Dist Primary - OH	Tree Outside ROW - Down	4	3740	14133
2521871	1/20/2019	14:57	16:46	109	Dist Primary - OH	Tree ROW - Limb	1	108.5333333	15950
2521894	1/20/2019	15:19	16:23	63	Dist Primary - OH	Tree Row - Down	123	7800.25	14031
2521968	1/20/2019	16:23	17:30	67	Dist Primary - OH	Tree Row - Down	10	670	14715
2521970	1/20/2019	15:19	17:31	131	Dist Primary - OH	Tree Row - Down	223	29305.91667	14031
2522017	1/20/2019	15:19	19:15	235	Dist Primary - OH	Tree Row - Down	219	51556.25	14031
2522442	1/21/2019	9:24	11:43	139	Dist Secondary - OH	Tree ROW - Limb	1	138.5666667	499
2522576	1/21/2019	11:48	13:08	80	Dist Primary - OH	Tree Row - Down	14	1114.4	133
2522663	1/21/2019	15:10	16:41	90	Dist Primary - OH	Tree Row - Down	2	180.6	133
2523733	1/24/2019	16:13	19:39	206	Dist Primary - OH	Tree Outside ROW - Down	15	3090	14031
2525287	1/30/2019	12:03	14:18	134	Dist Primary - OH	Tree Outside ROW - Down	224	30019.73333	14701
2525287	1/30/2019	12:58	14:18	80	Dist Primary - OH	Tree Outside ROW - Down	5	400	14701
2528692	2/11/2019	0:08	2:38	150	Dist Primary - OH	Tree ROW - Limb	25	3750	14261
2530343	2/16/2019	16:46	17:17	31	Dist Secondary - OH	Tree Outside ROW - Down	1	31	14093
2532415	2/25/2019	7:11	8:55	103	Dist Primary - OH	Tree ROW - Limb	24	2472.8	15197
2532543	2/25/2019	8:24	19:55	691	Dist Primary - OH	Tree Outside ROW - Down	60	41460	14133
2532626	2/25/2019	8:57	13:56	299	Dist Secondary - OH	Tree Row - Down	1	299	15010
2532761	2/25/2019	9:48	17:20	452	Dist Primary - OH	Tree Row - Down	149	67412.56667	15094
2532964	2/25/2019	11:07	14:29	201	Dist Secondary - OH	Tree Outside ROW - Limb	1	201.1833333	15010
2533371	2/25/2019	13:30	13:53	23	Dist Primary - OH	Tree Outside ROW - Limb	22	506	82
2533911	2/26/2019	12:43	14:10	87	Dist Secondary - OH	Tree Outside ROW - Limb	1	87	15709
2535145	3/2/2019	12:28	15:02	153	Dist Secondary - OH	Tree ROW - Limb	1	153.1166667	15003
2535699	3/4/2019	16:31	17:40	69	Dist Primary - OH	Tree Outside ROW - Down	20	1380	181
2538738	3/16/2019	16:18	18:11	113	Dist Secondary - OH	Tree ROW - Limb	1	112.9166667	14261
2542830	3/31/2019	16:51	19:57	185	Dist Primary - OH	Tree Row - Down	13	2408.033333	14133
2542841	3/31/2019	16:51	17:55	63	Dist Primary - OH	Tree Row - Down	37	2339.633333	14133
2543122	4/1/2019	15:21	15:48	27	Dist Secondary - OH	Tree Outside ROW - Limb	1	27	15706
2545079	4/10/2019	13:20	15:27	126	Dist Primary - OH	Tree Outside ROW - Down	20	2524.333333	181
2545947	4/14/2019	14:33	15:16	43	Dist Secondary - OH	Tree Outside ROW - Limb	1	43.43333333	183
2546023	4/14/2019	21:15	21:45	31	Dist Secondary - OH	Tree Outside ROW - Limb	1	30.85	14717
2546071	4/15/2019	1:53	11:30	577	Dist Secondary - OH	Tree ROW - Limb	1	577	205
2546073	4/15/2019	1:54	7:46	352	Dist Secondary - OH	Tree Outside ROW - Limb	1	352	14717
2546337	4/15/2019	7:47	9:16	89	Dist Secondary - OH	Tree Outside ROW - Limb	1	89	15709
2546381	4/15/2019	9:53	11:02	69	Dist Secondary - OH	Tree Row - Down	1	69	414
2546427	4/15/2019	10:27	12:20	112	Dist Secondary - OH	Tree Row - Down	15	1681.5	14261
2546619	4/15/2019	12:25	13:22	57	Dist Primary - OH	Tree Outside ROW - Down	24	1368	117
2546630	4/15/2019	13:25	17:04	218	Dist Secondary - OH	Tree Outside ROW - Limb	1	218.2166667	349
2546745	4/15/2019	14:44	17:11	146	Dist Secondary - OH	Tree Outside ROW - Limb	1	146.2	14008
2546988	4/15/2019	19:23	19:38	15	Dist Secondary - OH	Tree Outside ROW - Down	82	1235.466667	15709
2548502	4/20/2019	14:15	16:10	114	Dist Primary - OH	Tree ROW - Limb	1	114.4333333	14890
2551823	5/1/2019	11:09	11:34	25	Dist Secondary - OH	Tree ROW - Limb	1	25	101
2554965	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	53	8904	15001
2554965	5/12/2019	3:05	8:44	339	Dist Primary - OH	Tree ROW - Limb	90	30510	15001
2557120	5/20/2019	7:26	12:52	325	Dist Primary - OH	Tree Outside ROW - Limb	1	325.3666667	14015
2557257	5/20/2019	12:14	14:53	158	Dist Secondary - OH	Tree Outside ROW - Limb	5	792.0833333	15197
2557740	5/22/2019	0:39	0:50	11	Dist Secondary - OH	Tree Outside ROW - Down	1	11	14767
2558804	5/23/2019	15:50	16:01	11	Dist Primary - OH	Tree ROW - Limb	6	68	14709
2558824	5/23/2019	15:52	4:06	734	Dist Primary - OH	Tree Outside ROW - Limb	1087	797858	15177
2558833	5/23/2019	15:53	5:39	826	Dist Primary - OH	Tree Row - Down	72	59485.2	328
2558836	5/23/2019	15:56	17:46	110	Dist Primary - OH	Tree Outside ROW - Down	743	81730	14702
2558836	5/23/2019	15:56	23:09	433	Dist Primary - OH	Tree Outside ROW - Down	1	433	14702
2558836	5/23/2019	15:56	23:30	454	Dist Primary - OH	Tree Outside ROW - Down	1	454	14702
2558836	5/23/2019	15:56	1:31	575	Dist Primary - OH	Tree Outside ROW - Down	321	184575	14702
2558840	5/23/2019	15:58	22:35	396	Dist Secondary - OH	Tree Outside ROW - Limb	14	5549.833333	99
2559053	5/23/2019	16:11	3:17	666	Dist Primary - OH	Tree Outside ROW - Down	21	13986	494
2559500	5/23/2019	19:32	6:40	668	Dist Primary - OH	Tree Outside ROW - Down	1	668.0833333	15177
2559603	5/23/2019	16:08	3:17	668	Dist Primary - OH	Tree Outside ROW - Down	9	6012.75	345
2559606	5/23/2019	20:16	1:31	315	Dist Primary - OH	Tree Outside ROW - Down	23	7245	479
2559658	5/23/2019	20:39	22:34	115	Dist Primary - OH	Tree Outside ROW - Down	10	1150	15014
2559949	5/23/2019	15:52	5:52	840	Dist Primary - OH	Tree Outside ROW - Down	21	17640	15177
2559958	5/24/2019	4:49	6:00	71	Dist Primary - OH	Tree Outside ROW - Down	6	428	14709
2559982	5/24/2019	6:35	6:46	11	Dist Primary - OH	Tree Outside ROW - Down	1	10.95	15177
2559988	5/24/2019	6:40	6:49	9	Dist Primary - OH	Tree Outside ROW - Down	1	8.55	15177
2560009	5/24/2019	7:15	10:41	205	Dist Secondary - OH	Tree Outside ROW - Limb	1	205.4833333	15130
2560718	5/26/2019	10:40	14:25	224	Dist Primary - OH	Tree Vine	1	224.4333333	15011
2562443	5/30/2019	13:04	19:41	398	Dist Secondary - OH	Tree Row - Down	1	397.7166667	15010

2562450	5/30/2019	13:04	19:41	398	Dist Secondary - OH	Tree Row - Down	1	397.7166667	15010
2562459	5/30/2019	13:28	19:37	369	Dist Secondary - OH	Tree Row - Down	1	368.9666667	15010
2562551	5/30/2019	16:13	18:10	117	Dist Secondary - OH	Tree Outside ROW - Limb	1	116.5833333	14261
2562771	5/24/2019	3:11	3:51	40	Dist Secondary - OH	Tree Outside ROW - Limb	1	40	244
2562787	5/31/2019	8:27	13:48	321	Dist Primary - OH	Tree Vine	2	642	14132
2563276	6/1/2019	15:45	16:57	72	Dist Secondary - OH	Tree Outside ROW - Limb	1	72	14031
2563282	6/1/2019	16:14	17:35	81	Dist Secondary - OH	Tree ROW - Limb	1	81	479
2563462	6/2/2019	12:27	13:01	34	Dist Primary - URD	Tree Vine	1	34	14753
2563541	6/2/2019	17:57	20:25	148	Dist Primary - OH	Tree Outside ROW - Down	27	3996	14017
2563541	6/2/2019	18:11	21:35	204	Dist Primary - OH	Tree Outside ROW - Down	18	3672	14017
2563566	6/2/2019	18:07	22:00	232	Dist Primary - OH	Tree Outside ROW - Down	13	3016.216667	15018
2564439	6/3/2019	17:48	19:02	73	Dist Secondary - OH	Tree Outside ROW - Limb	1	73.2	309
2564515	6/3/2019	23:16	4:56	340	Dist Primary - OH	Tree Row - Down	1	340	15801
2565101	6/5/2019	10:20	12:17	117	Dist Primary - OH	Tree ROW - Limb	1	117	15945
2566805	6/10/2019	13:36	14:38	62	Dist Primary - OH	Tree Outside ROW - Limb	28	1729.466667	15867
2567872	6/13/2019	17:48	21:42	233	Dist Primary - OH	Tree ROW - Limb	122	2845.466667	14007
2568272	6/14/2019	12:16	14:03	106	Dist Primary - OH	Tree ROW - Limb	7	745.2666667	14146
2569628	6/18/2019	11:38	15:01	203	Dist Primary - OH	Tree Outside ROW - Limb	29	5879.75	15177
2570271	6/19/2019	13:16	13:40	24	Dist Secondary - OH	Tree Outside ROW - Limb	1	24	15012
2570363	6/19/2019	16:38	19:17	158	Dist Secondary - OH	Tree Row - Down	1	158.4333333	15173
2572475	6/25/2019	11:26	12:40	74	Dist Primary - OH	Tree Outside ROW - Limb	4	294.8666667	15946
2573507	6/27/2019	20:23	20:49	26	Dist Secondary - OH	Tree Outside ROW - Limb	1	26	15010
2574916	6/25/2019	12:36	15:43	187	Dist Secondary - OH	Tree Outside ROW - Limb	1	187	15013
2575193	6/26/2019	9:42	10:35	53	Dist Secondary - OH	Tree Outside ROW - Down	1	53	15706
2576740	7/3/2019	9:06	9:27	21	Dist Secondary - OH	Tree Outside ROW - Limb	1	21	490
2577176	7/4/2019	0:47	2:03	76	Dist Primary - OH	Tree Row - Down	1233	93708	14987
2577176	7/4/2019	0:47	3:10	143	Dist Primary - OH	Tree Row - Down	834	119262	14987
2577176	7/4/2019	0:47	20:27	1180	Dist Primary - OH	Tree Row - Down	61	71980	14987
2577691	7/5/2019	11:37	11:53	16	Dist Primary - OH	Tree Outside ROW - Limb	340	5411.666667	167
2577920	7/5/2019	18:51	22:23	212	Dist Secondary - OH	Tree ROW - Limb	1	212	14015
2578207	7/6/2019	19:17	21:24	126	Dist Primary - OH	Tree Outside ROW - Limb	20	2523.666667	14765
2578215	7/6/2019	19:24	19:57	32	Dist Primary - OH	Tree Outside ROW - Limb	14	451.9666667	101
2578220	7/6/2019	19:31	0:23	292	Dist Primary - OH	Tree Row - Down	32	9340.266667	15943
2578224	7/6/2019	19:35	21:33	118	Dist Primary - OH	Tree Outside ROW - Limb	4	472	14765
2578226	7/6/2019	19:35	21:23	108	Dist Primary - OH	Tree Outside ROW - Limb	4	432	52
2578252	7/6/2019	19:43	21:24	101	Dist Primary - OH	Tree Outside ROW - Limb	1	101	14765
2578253	7/6/2019	19:43	21:33	110	Dist Primary - OH	Tree Outside ROW - Limb	1	110	14765
2578268	7/6/2019	19:46	23:40	233	Dist Primary - OH	Tree ROW - Limb	10	2333	14031
2578332	7/6/2019	20:00	1:20	320	Dist Secondary - OH	Tree Outside ROW - Limb	1	320	97
2578429	7/6/2019	20:12	3:29	437	Dist Secondary - OH	Tree ROW - Limb	6	2619.5	244
2578441	7/6/2019	20:16	23:54	219	Dist Primary - OH	Tree ROW - Limb	1	218.6166667	14031
2578597	7/6/2019	21:18	0:23	185	Dist Primary - OH	Tree Row - Down	1	185	15943
2578771	7/7/2019	2:31	3:29	58	Dist Secondary - OH	Tree ROW - Limb	16	928	244
2578833	7/7/2019	8:01	8:30	29	Dist Primary - OH	Tree Outside ROW - Limb	18	518.4	490
2578931	7/7/2019	13:35	15:05	91	Dist Secondary - OH	Tree Outside ROW - Down	1	90.58333333	14765
2578992	7/7/2019	18:38	19:54	76	Dist Secondary - OH	Tree Outside ROW - Limb	1	76	14007
2579059	7/4/2019	18:21	23:24	303	Dist Primary - OH	Tree ROW - Limb	1	303	15001
2579078	7/8/2019	7:43	13:00	317	Dist Primary - OH	Tree ROW - Limb	3	951	14017
2579583	7/8/2019	18:51	19:25	34	Dist Secondary - OH	Tree ROW - Limb	1	34	292
2580061	7/9/2019	17:42	18:46	63	Dist Primary - OH	Tree Outside ROW - Limb	1107	69980.85	15177
2580788	7/11/2019	2:31	3:29	57	Dist Primary - OH	Tree Vine	1	57.46666667	15172
2580811	7/11/2019	8:12	11:42	209	Dist Secondary - OH	Tree ROW - Limb	1	209.3833333	14023
2580974	7/6/2019	19:41	7:09	688	Dist Secondary - OH	Tree Outside ROW - Limb	1	688	490
2580987	7/11/2019	14:05	14:27	22	Dist Secondary - OH	Tree ROW - Limb	6	132	14031
2581091	7/11/2019	16:05	18:49	164	Dist Primary - OH	Tree Outside ROW - Limb	3	492	14017
2581490	7/11/2019	20:37	22:31	114	Dist Primary - OH	Tree ROW - Limb	12	1368	14987
2581627	7/12/2019	2:05	2:58	54	Dist Secondary - OH	Tree Outside ROW - Down	1	53.63333333	414
2581891	7/12/2019	11:39	14:35	175	Dist Primary - OH	Tree ROW - Limb	78	13657.8	15010
2582813	7/15/2019	13:01	15:13	131	Dist Primary - OH	Tree Vine	4	525.9333333	15944
2584247	7/17/2019	17:32	18:57	85	Dist Primary - OH	Tree Outside ROW - Limb	22	1870	65
2584258	7/17/2019	17:34	6:00	746	Dist Primary - OH	Tree Outside ROW - Down	38	28341.03333	15945
2584293	7/17/2019	17:42	19:57	136	Dist Primary - OH	Tree ROW - Limb	2172	294487	14758
2584332	7/17/2019	17:48	4:55	667	Dist Secondary - OH	Tree Outside ROW - Limb	1	667	14767
2584337	7/17/2019	17:49	13:04	1155	Dist Secondary - OH	Tree Outside ROW - Limb	1	1154.933333	15946
2584544	7/17/2019	18:17	12:10	1072	Dist Primary - OH	Tree Outside ROW - Down	20	21442.33333	394
2584863	7/18/2019	7:41	8:13	32	Dist Secondary - OH	Tree Outside ROW - Limb	13	416	15010
2585092	7/18/2019	4:09	5:56	107	Dist Primary - OH	Tree ROW - Limb	6	642	14135
2585126	7/18/2019	7:12	8:49	96	Dist Primary - OH	Tree Row - Down	5	481.3333333	394
2585520	7/18/2019	14:20	16:03	103	Dist Secondary - OH	Tree Outside ROW - Limb	1	102.9	15018
2585690	7/18/2019	19:59	20:27	28	Dist Primary - OH	Tree ROW - Limb	46	1288	144
2586634	7/20/2019	14:36	15:06	30	Dist Secondary - OH	Tree Outside ROW - Limb	1	30	14014
2586747	7/20/2019	19:42	22:26	164	Dist Secondary - OH	Tree ROW - Limb	1	164	14145

2587012	7/21/2019	15:42	18:02	139	Dist Primary - OH	Tree Outside ROW - Limb	16	2225.866667	414
2587869	7/17/2019	18:00	3:20	560	Dist Primary - OH	Tree ROW - Limb	1	560	15012
2587907	7/17/2019	20:42	7:40	658	Dist Secondary - OH	Tree Outside ROW - Limb	1	658	15010
2588421	7/22/2019	20:37	6:15	578	Dist Primary - OH	Tree Row - Down	4	2312	52
2588422	7/22/2019	20:37	22:12	95	Dist Primary - OH	Tree ROW - Limb	692	65740	14136
2588433	7/22/2019	20:42	3:55	433	Dist Primary - OH	Tree ROW - Limb	10	4330	117
2588482	7/22/2019	20:46	23:35	169	Dist Primary - OH	Tree Vine	15	2534.25	15001
2588574	7/22/2019	20:50	21:47	57	Dist Primary - OH	Tree ROW - Limb	860	49020	15021
2588574	7/22/2019	20:50	23:06	136	Dist Primary - OH	Tree ROW - Limb	101	13736	15021
2588688	7/23/2019	2:14	2:34	20	Dist Primary - OH	Tree Outside ROW - Limb	49	980	15949
2589113	7/24/2019	0:29	3:15	166	Dist Primary - OH	Tree Outside ROW - Down	12	1992	14133
2589353	7/24/2019	14:06	16:55	169	Dist Secondary - OH	Tree Outside ROW - Down	1	168.9	476
2589639	7/25/2019	10:28	11:56	87	Dist Secondary - OH	Tree Outside ROW - Down	1	87.18333333	128
2589906	7/26/2019	1:09	2:22	73	Dist Primary - OH	Tree Outside ROW - Limb	81	5903.55	345
2591199	7/28/2019	3:11	4:30	79	Dist Secondary - UG	Tree Outside ROW - Down	1	78.66666667	211
2592044	7/22/2019	21:00	21:47	47	Dist Primary - OH	Tree ROW - Limb	1	47	15021
2592050	7/23/2019	0:28	0:52	24	Dist Primary - OH	Tree ROW - Limb	1	24	15021
2592157	7/30/2019	18:04	22:47	283	Dist Primary - OH	Tree ROW - Limb	14	3962	309
2592237	7/29/2019	19:43	20:31	48	Dist Secondary - OH	Tree Outside ROW - Limb	1	48	132
2592524	7/31/2019	18:38	22:10	211	Dist Primary - OH	Tree Outside ROW - Limb	71	15011.76667	15197
2593913	8/5/2019	14:46	18:39	233	Dist Primary - OH	Tree Vine	6	1397.9	15174
2594515	8/6/2019	20:03	23:38	216	Dist Primary - OH	Tree Outside ROW - Down	188	40595.46667	14900
2594981	8/7/2019	8:28	10:30	122	Dist Primary - OH	Tree ROW - Limb	8	972	14900
2596131	8/8/2019	14:13	19:54	340	Dist Secondary - OH	Tree Outside ROW - Down	1	340.1833333	15706
2596262	8/9/2019	6:34	6:52	18	Dist Primary - OH	Tree Outside ROW - Limb	1	18	14261
2598735	8/16/2019	18:09	19:58	108	Dist Secondary - OH	Tree ROW - Limb	1	108.2666667	133
2599997	8/20/2019	16:37	17:56	79	Dist Primary - OH	Tree Outside ROW - Down	1999	15721	82
2599997	8/20/2019	16:37	20:37	240	Dist Primary - OH	Tree Outside ROW - Down	139	33360	82
2599997	8/20/2019	16:37	6:26	829	Dist Primary - OH	Tree Outside ROW - Down	9	7461	82
2600006	8/20/2019	16:42	22:04	322	Dist Primary - OH	Tree ROW - Limb	4	1287.6	15946
2600010	8/20/2019	16:42	22:01	319	Dist Primary - OH	Tree Outside ROW - Down	67	21403.15	413
2600010	8/20/2019	16:42	22:02	320	Dist Primary - OH	Tree Outside ROW - Down	6	1920	413
2600027	8/20/2019	16:50	22:30	340	Dist Primary - OH	Tree ROW - Limb	8	2720	102
2600045	8/20/2019	16:47	17:00	1453	Dist Primary - OH	Tree Row - Down	13	18889	101
2600059	8/20/2019	16:49	0:32	462	Dist Primary - OH	Tree Row - Down	18	8318.7	60
2600100	8/20/2019	17:06	21:51	285	Dist Secondary - OH	Tree Outside ROW - Limb	17	4845	15006
2600214	8/20/2019	17:24	21:28	244	Dist Primary - OH	Tree Row - Down	71	17324	15173
2600217	8/20/2019	17:25	19:00	95	Dist Primary - URD	Tree Outside ROW - Limb	1	94.76666667	14135
2600254	8/20/2019	17:32	0:15	402	Dist Secondary - OH	Tree ROW - Limb	1	402.35	14702
2600390	8/20/2019	17:56	20:05	129	Dist Secondary - OH	Tree Outside ROW - Down	1	129	15175
2600535	8/20/2019	18:30	18:37	7	Dist Primary - OH	Tree Outside ROW - Down	484	3484.8	309
2600580	8/20/2019	18:49	18:57	8	Dist Primary - OH	Tree Outside ROW - Down	200	1600	101
2600696	8/20/2019	17:19	22:13	294	Dist Primary - OH	Tree ROW - Limb	392	115248	328
2600714	8/20/2019	19:41	20:00	19	Dist Secondary - OH	Tree Outside ROW - Down	15	283.75	15175
2600737	8/20/2019	19:53	2:58	425	Dist Primary - URD	Tree Outside ROW - Limb	1	425	15950
2600749	8/20/2019	19:39	19:58	19	Dist Primary - OH	Tree Row - Down	12	228	14135
2600820	8/20/2019	20:37	22:35	118	Dist Primary - OH	Tree ROW - Limb	9	1062	82
2600836	8/20/2019	20:37	22:35	118	Dist Primary - OH	Tree ROW - Limb	12	1416	82
2600843	8/20/2019	21:26	21:52	25	Dist Primary - OH	Tree Outside ROW - Limb	220	5514.666667	451
2601073	8/21/2019	5:13	18:29	796	Dist Secondary - OH	Tree Outside ROW - Limb	1	795.8	368
2601292	8/21/2019	11:19	12:18	58	Dist Primary - OH	Tree Vine	1	58.45	14133
2601420	8/21/2019	15:29	16:21	51	Dist Secondary - OH	Tree ROW - Limb	1	51.28333333	387
2601610	8/21/2019	23:19	1:25	125	Dist Secondary - OH	Tree Outside ROW - Down	1	125.2833333	15175
2602485	8/24/2019	14:09	14:17	8	Dist Secondary - OH	Tree Outside ROW - Limb	1	8	117
2602641	8/25/2019	13:18	15:22	124	Dist Secondary - OH	Tree ROW - Limb	10	1238.5	15174
2603198	8/20/2019	16:57	3:46	649	Dist Secondary - OH	Tree ROW - Limb	1	649	102
2603314	8/22/2019	20:06	22:56	170	Dist Secondary - OH	Tree ROW - Limb	1	170	99
2603319	8/22/2019	22:36	22:56	20	Dist Secondary - OH	Tree ROW - Limb	1	20	99
2603937	8/23/2019	11:30	12:37	67	Dist Secondary - OH	Tree Outside ROW - Down	1	67	14007
2607280	9/7/2019	18:13	19:14	61	Dist Secondary - OH	Tree Outside ROW - Down	2	122	372
2607629	9/9/2019	12:19	13:26	67	Dist Primary - OH	Tree Outside ROW - Limb	149	9983	82
2607629	9/9/2019	12:19	13:38	79	Dist Primary - OH	Tree Outside ROW - Limb	52	4108	82
2607629	9/9/2019	12:19	14:43	144	Dist Primary - OH	Tree Outside ROW - Limb	53	7632	82
2607629	9/9/2019	12:19	14:47	148	Dist Primary - OH	Tree Outside ROW - Limb	84	12432	82
2607629	9/9/2019	12:19	16:34	255	Dist Primary - OH	Tree Outside ROW - Limb	12	3060	82
2607950	9/5/2019	2:32	4:20	108	Dist Secondary - OH	Tree Outside ROW - Limb	1	108	15012
2609407	9/13/2019	12:56	13:51	55	Dist Primary - OH	Tree ROW - Limb	393	21615	328
2609699	9/14/2019	16:00	17:04	64	Dist Secondary - OH	Tree ROW - Limb	1	64	15018
2610177	9/16/2019	13:42	16:01	139	Dist Secondary - OH	Tree ROW - Limb	1	139	14767
2612015	9/22/2019	7:18	9:09	111	Dist Primary - OH	Tree ROW - Limb	32	3552	14900
2613019	9/25/2019	18:47	0:33	346	Dist Primary - OH	Tree Vine	1	345.75	15173
2613408	9/27/2019	9:08	9:33	25	Dist Primary - OH	Tree Outside ROW - Down	14	350	14008

2613945	9/29/2019	8:12	9:54	102	Dist Secondary - OH	Tree Outside ROW - Limb	1	102	369
2614161	9/30/2019	10:40	11:34	53	Dist Primary - OH	Tree ROW - Limb	15	801	15946
2614221	9/30/2019	12:11	15:05	173	Dist Secondary - OH	Tree Outside ROW - Limb	1	173.3833333	14014
2616754	10/8/2019	14:22	16:17	115	Dist Primary - OH	Tree Outside ROW - Limb	69	7935	14146
2618286	10/13/2019	13:33	15:09	96	Dist Primary - OH	Tree Vine	3	288	14766
2619290	10/16/2019	11:24	18:40	436	Dist Secondary - OH	Tree Outside ROW - Limb	1	435.9	467
2620051	10/16/2019	22:43	23:51	68	Dist Primary - OH	Tree ROW - Limb	17	1149.766667	15013
2620114	10/17/2019	4:37	6:23	106	Dist Primary - OH	Tree Outside ROW - Limb	10	1058.666667	117
2620124	10/17/2019	5:23	7:23	119	Dist Primary - OH	Tree ROW - Limb	18	2142.3	14145
2620339	10/17/2019	12:43	13:28	45	Dist Secondary - OH	Tree ROW - Limb	1	45	14093
2620715	10/18/2019	11:10	12:50	99	Dist Secondary - OH	Tree Outside ROW - Limb	1	99.23333333	15705
2624996	10/31/2019	15:34	20:40	305	Dist Primary - OH	Tree ROW - Limb	48	14649.6	14765
2625007	10/31/2019	15:59	17:55	116	Dist Primary - OH	Tree Outside ROW - Limb	27	3132	15199
2625231	10/31/2019	20:40	22:35	115	Dist Primary - OH	Tree Row - Down	347	39905	15001
2625257	10/31/2019	20:54	0:01	187	Dist Primary - OH	Tree ROW - Limb	40	7480	15010
2625257	10/31/2019	23:11	0:01	50	Dist Primary - OH	Tree ROW - Limb	139	6950	15010
2625264	10/31/2019	20:59	2:13	314	Dist Primary - OH	Tree Outside ROW - Limb	5	1570	15867
2625335	10/31/2019	21:31	2:21	289	Dist Secondary - OH	Tree Outside ROW - Limb	1	289.3	414
2625337	10/31/2019	21:32	18:02	1230	Dist Primary - OH	Tree Row - Down	61	75007.63333	14767
2625461	10/31/2019	20:40	23:43	183	Dist Primary - OH	Tree Row - Down	194	35502	15001
2625781	10/31/2019	20:40	19:54	1395	Dist Primary - OH	Tree Row - Down	13	18132.61667	15001
2625896	11/1/2019	0:54	2:29	95	Dist Secondary - OH	Tree Row - Down	1	95.25	15944
2626032	11/1/2019	6:03	7:39	95	Dist Primary - OH	Tree ROW - Limb	3	285.4	14767
2630071	11/12/2019	16:29	17:55	85	Dist Primary - OH	Tree ROW - Limb	21	1786.05	387
2633735	11/25/2019	0:17	1:30	73	Dist Secondary - OH	Tree ROW - Limb	1	72.51666667	128
2634020	11/25/2019	14:58	16:42	103	Dist Secondary - OH	Tree ROW - Limb	1	103.2166667	14767
2634203	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634205	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634208	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634210	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634211	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634213	5/12/2019	3:05	5:53	168	Dist Primary - OH	Tree ROW - Limb	1	168	15001
2634817	11/28/2019	4:26	5:26	59	Dist Primary - OH	Tree Outside ROW - Limb	10	590.3333333	15198
2639118	12/14/2019	7:46	10:25	158	Dist Primary - OH	Tree ROW - Limb	4	633.9333333	132
2639827	12/17/2019	19:12	21:05	113	Dist Primary - OH	Tree Outside ROW - Down	11	1243	14133
2639859	12/17/2019	19:12	23:07	235	Dist Primary - OH	Tree Outside ROW - Down	1	235	14133
2640596	12/19/2019	15:09	17:52	163	Dist Secondary - OH	Tree Outside ROW - Limb	16	2608	387
2642515	12/28/2019	13:45	13:54	9	Dist Primary - OH	Tree Outside ROW - Down	504	4284	65

Table 2.4-K3

Pepco tracks the District of Columbia System Tree SAIFI and SAIDI to measure the effectiveness of VM. Tree SAIFI and SAIDI measures the level of vegetation-caused outages. The following tables present data showing the System Tree SAIFI and SAIDI (in minutes) for the Pepco District of Columbia service territory for 2014 to 2018, based on the Major Service Outage (“MSO”) exclusion criteria.

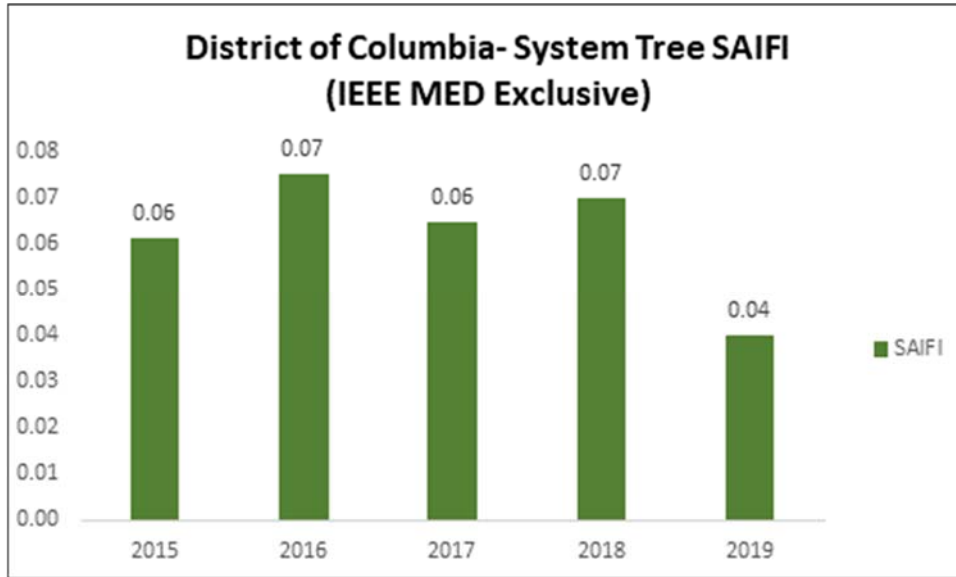


Table 2.4-K4

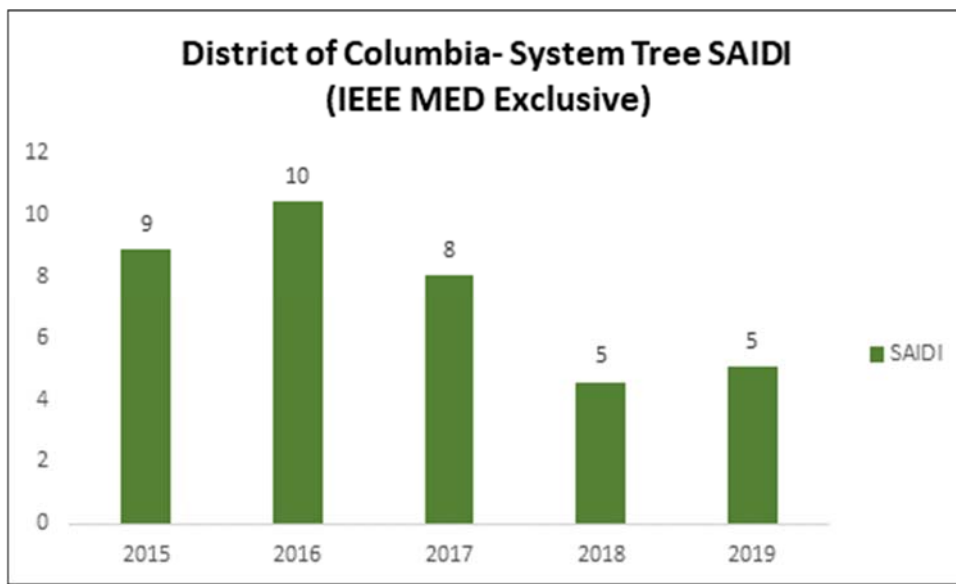


Table 2.4-K5

2.4.7 ELECTRICITY QUALITY OF SERVICE STANDARDS (EQSS)

The Commission introduced the EQSS to establish standards and requirements for ensuring that electric utilities operating in the District of Columbia meet an adequate level of quality and reliability in the electric service provided to District residents. On February 29, 2008, the Commission issued a Notice of Final Rulemaking (NOFR) on the EQSS. The EQSS are now adopted as Chapter 36, Electricity Quality of Service Standards in Title 15 of the District of Columbia Municipal Regulations. Subsequently on July 25, 2008, the Commission issued a NOFR on Compliance Reporting. Pepco and all electricity suppliers within the District of Columbia were directed to collect EQSS data on a monthly basis and retain the reporting data for seven (7) years. Further, quarterly submissions, containing monthly data, are to be filed with the Commission on April 30, July 30, October 30 and January 30 for the prior three (3) months respectively. Specific Consolidated Report requirements from the EQSS portion of the D.C.M.R. are listed below.

Progress on current corrective action plans [on customer calls answered] shall be included in the utility's annual Consolidated Report.

The utility shall report the actual call center performance during the reporting period in the annual Consolidated Report of the following year.

Progress on any current corrective action plans [on call abandonment rates] will be included in the utility's annual Consolidated Report.

The utility shall report the actual performance obtained during the reporting period in the annual Consolidated Report of the following year.

The utility shall complete installation of new residential service requests within ten (10) business days of the start date for the new installation.

Progress on any current corrective action plans [on new residential service installation requests] will be included in the utility's annual Consolidated Report.

The utility shall report the actual performance obtained during the reporting period in the annual Consolidated Report of the following year.

3603.5 The utility shall report on the progress of the corrective action plan [on repeat least performing feeders] in the Annual Consolidated Report submitted to the Commission.

The utility shall report on the number and percentage of non-major service outages that extend beyond the twenty-four (24) hour standard and the reasons each such outage extended beyond the twenty-four (24) hour standard.

The report drafted pursuant to Section 3603.8 shall be included in the annual Consolidated Report on reliability data.

The utility shall report on the progress of the corrective action plan [on SAIFI, SAIDI and CAIDI benchmarks] in the annual Consolidated Report submitted to the Commission.

The utility shall also, per the orders of the Commission, continue current requirements of reporting annual reliability indices of SAIFI, SAIDI and CAIDI (with and without major events) in the annual Consolidated Report of the following year.

Electricity Quality of Service Standards Results

January – December 2019 Aggregate Totals

3601 Reporting Requirements for Service Outages, Incidents and Power Quality Complaints							
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3601.2/ 3601.6	Report major and non-major service outages by telephone and e-mail within one (1) hour after the utility has determined that a major service outage occurred or after the utility becomes aware of the incident.	Report by telephone and e-mail within one (1) hour .	252	100%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		
3601.3/ 3601.8	Each telephone and e-mail report on major and non-major outages should contain a) the location, b) Wards affected, c) # of customers out of service, d) cause of the outage, e) the estimated repair time, and, for major outages, f) notification of progress to major outage status.	Each 3601.3 report must contain (a) - (f) , each 3601.8 report must contain (a) - (e) .	252	100% (Except for ward data)	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		
3601.4	Report periodically (frequency to be determined by the Commission's Office of Engineering) regarding the status of the major service outage.	TBD	NA	NA			
3601 Reporting Requirements for Service Outages, Incidents and Power Quality Complaints							
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3601.5	Specific restoration information, including restoration times, shall be provided to District customers by customer service representatives and the automated voice response unit.	TBD	NA	NA			
3601.9/ 3601.11	Report by telephone all manhole incidents (smoking manholes, manhole fires, manhole explosions) and all incidents that result in the loss of human life and/or personal injury requiring hospitalization within thirty (30) minutes upon receiving notice of the incident.	Report within 30 minutes of receiving notice of incident.	41	100%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		
3601.10/ 3601.12	Telephone and e-mail reporting of incidents to include: a/b) location/description of the incident, b/c) Ward, c/d) customers and/or persons affected, d/e) cause of incident, e) estimated repair and/or restoration time (for manhole incidents), and f) steps utility will take to provide assistance (for personal injury incidents).	Each 3601.10 report must contain (a) - (e) , each 3601.12 report must contain (a) - (f) .	48	100% (Except for ward data)	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		

3601 Reporting Requirements for Service Outages, Incidents and Power Quality Complaints		2018 Aggregate Totals					
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3601.13/ 3601.15	Written reports concerning non-major service outages and/or manhole incidents shall be submitted to OE and OPC within five (5) days from the date of the event occurrence. Written reports on the loss of human life/personal injury shall be submitted within five (5) days of receiving notice of the incident.	Submit 3601.13 report within 5 days of event , and 3601.15 report within 5 days of receiving notice .	273	98%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		
3601.14/ 3601.16	At a minimum: each written report on non-major service outages and/or manhole incidents shall state, a) description, b) location, c) Wards, d) time of the outage, e) repair and restoration times, f) duration of outage(s) in hrs/min., g) total # of customers, h) total # of manholes, i) classification of the manhole incident(s); each written report on loss of human life and/or personal injury shall state, a) description, b) location, c) Ward, d) exact time, e) total # of customers, f) assistance steps, g) time it took assistance to arrive, h) steps to prevent reoccurrence.	Each 3601.14 report must contain (a) - (i), each 3601.16 report must contain (a) - (h).	273	100%			
3601.17	Provide a detailed report on non-major service outages, manhole incidents, and/or incidents that result in the loss of human life or personal injury to the Productivity Improvement Working Group (PIWG) every quarter.	Submit all applicable reports to the PIWG every quarter .	2	100%			
3601 Reporting Requirements for Service Outages, Incidents and Power Quality Complaints		2018 Aggregate Totals					
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3601.18	File a written report concerning major service outages within 3 weeks following the end of the outage.	File the required written report to each office within three (3) weeks of the end of a major service outage.	0	NA			
3601.19	Specifies minimum requirements for the contents of the written report for major service outages. Please refer to the EQSS for (a)-(o) as they are very detailed and are not listed here.	Each written report must contain information from (a) - (o).	NA	NA			
3601.2	Submit a written report on the Outage Management System's (OMS) actual performance during the major service outage within 30 days after restoration efforts are completed.	Submit written report within 30 days after restoration.	NA	NA			
3601.21/ 3601.23	Record and report the number of power quality complaints received, types of complaints received, results of subsequent investigations, corrective actions taken, and the time it took to resolve the customer's problem.	Submit the report 45 days after each six (6) month reporting period.	2 See reports filed May 15, 2019 & Nov. 15 2019 in FC Nos. 982 & 1002	NA			

3602	Customer Service Standards						
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3602.1	Maintain a customer service (walk-in) office located in the District of Columbia.	Notify location of one (1) office.	701 9th St NW, Washington, DC 20068	100%			
3602.2	Answer at least seventy (70) percent of all customers' phone calls received within thirty (30) seconds and maintain records delineating customer phone calls answered by a utility representative or an automated operator system. Utility shall measure and report on the average customer wait time for a customer transferred from an automated operator system to a utility representative.	70% of received calls answered within 30 seconds	971,914 (Total calls) Call answering rate = 92%	100%			
3602.4/ 3602.6/ 3602.7	Develop a corrective action plan if 3602.2 standard is not met. Report on the progress of current corrective action plans and actual call center performance in the annual Consolidated Report.	Written corrective action plan in CR	NA	NA			
3602.8	Call abandonment rate must be maintained below ten (10) percent.	Call abandonment rate below 10%	8,174 (Calls abandoned) Call abandonment rate = 1%	100%			
3602.10/ 3602.12/ 3602.13	Develop a corrective action plan if 3602.8 standard is not met. Report on the progress of current corrective action plans and actual call center performance in the annual Consolidated Report.	Written corrective action plan in CR	NA	NA			
3602	Customer Service Standards (cont'd.)						
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3602.14	Complete installation of new residential service requests within ten (10) business days of the start date for the new installation.	Service requests installed within 10 days of start.	NA	NA			
3602.16	Submit a written report on its performance in 3602.14 every six (6) months.	One report every six (6) months.	2 See reports filed May 15, 2019 & Nov. 15 2019 in FC Nos. 982 & 1002	NA			
3602.19/ 3602.21/ 3602.22	Develop a corrective action plan if 3602.14 standard is not met. Report on the progress of current corrective action plans and actual performance in the annual Consolidated Report.	Written corrective action plan in CR		NA			

3603 Reliability Standards			2018 Aggregate Totals				
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3603.1	Implement a plan to improve the performance of the two (2) percent least performing feeders.	Written plan identifying the 2% LP feeders targeted.	See Consolidated Report Filed 4/2/2019	100%			
3603.3/ 3603.5	If the utility fails to comply with 3603.1, a corrective action plan is required. Report on the progress of the corrective action in the Consolidated Report.	Written corrective action plan in CR	See Consolidated Report Filed 4/2/2019	100%			
3603.7/ 3603.8	Complete service restoration within 24 hours following a non-major service outage. Report on the number and percentages of outages that extend beyond the 24 hour standard and the causes for the extended outages.	Restoration within 24 hrs. Written report on 24 hr exceedance in CR	246	100%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2019; July 30, 2019; October 30, 2019; and January 30, 2020.		
3603.10/ 3603.11/ 3603.12/ 3603.13	Utility shall not exceed the benchmark levels established for the System Average Interruption Frequency Index (SAIFI), System Average Interruption Duration Index (SAIDI), and the Customer Average Interruption Duration Index (CAIDI).	Refer to Order No. 18148.	NA (Refer to Order No. 18148)	NA			
3603.14/ 3603.16/ 3603.17	Develop a corrective action plan if 3603.10 standard is not met. Report on the progress of current corrective action plans and actual performance in the annual Consolidated Report.	Document Corrective action plan in CR	NA	NA			
3604 Billing Error Notification			2018 Aggregate Totals				
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3604.1	Inform Commission and OPC of a billing error when it affects 100 or more customers or the number of affected customers is equal to or more than two (2) percent of the utility's or service provider's customer base (whichever is less). If the customer base is less than 100, report errors when two (2) or more customers are affected.	Notices when 100, or 2%, or 2 or more customers are affected.	2	100%			
3604.2/ 3604.3	Submit an initial billing error notification (by e-mail) within one (1) business day of discovering or being notified of the error, submit a written report within 14 calendar days and a final written report within 60 calendar days.	Initial notification within one (1) b/day, 1st written report within 14 c/days, final written report within 60 c/days.	4	100%			
3604.4	Initial billing error notification shall contain: a) type of billing error, b) when discovered, c) how discovered, and d) # of customers affected.	Notification must contain (a) - (d).	NA	NA			
3604.5	Follow-up written report shall contain: a) type of billing error, b) when it occurred, c) # of customers affected, d) the cause of the error and correction status, and, e) timeline for completing correction plan.	Report must contain (a) (e), and show closeout of (d) within 60 days.	NA	NA			
3604 Billing Error Notification (cont'd.)			2018 Aggregate Totals				
Standards			2018 Aggregate Totals				
Section	Standard	Measure	Total # of Events	% Compliant (w/measure)	Corrective Action	Due Date	Status
3604.6/ 3604.7	Final written report shall contain: a) type of billing error, b) when it occurred, c) # of customers affected, d) duration of the billing error(s), e) corrective and preventive measures taken, and, f) lessons learned, if any. Commission shall determine whether further investigation is necessary.	Report must contain (a) (f).	4	100%			

Non-Major Outages. Restoration Completion Within 24 Hours

In accordance with Section 3603.8 in the EQSS, Pepco is to include in the Consolidated Report the number and percentage of non-major customer outages that extend beyond the 24 hour standard and the causes for these extended service outages. A Major Service Outage in the District of Columbia, as defined in Section 3699.1, Definitions, of the EQSS states, “*customer interruption occurrences and durations during time periods when 10,000 or more of the electric utility’s District of Columbia customers are without service and the restoration effort due to this major service outage takes more than 24 hours.*”

Table 2.4-I provide the required information.

For 2019, there was 1 (of 251) non-major outages that extended beyond 24 hours.

Percentage of Non-Major Outages that Extended Beyond 24 Hours

Total number of Non-Major Outages extending beyond 24 hours	1
Total number of Non-Major Outages: January 1 - December 31, 2019	251
Percentage of Non-Major Outages extending beyond 24 hours	0.4%

Table 2.4-L

2019 Non-Major Outage Reporting to the Public Service Commission of the District of Columbia - Outages Exceeding 24 Hours

Report Sequence Number	Outage Sequence Number	Manhole Sequence Number*	Month	Day of Outage	OH or UG	Outage Cause/ Incident Description	Location	Quadrant	Ward	Time of Outage/ Incident	Actual Restoration Time	Duration of Outage Hours / min		Max No. of Cust. Affected	Reason for Outage Exceeding 24 Hours to Restore	Feeder No.
	176		August	20	OH	Tree down/feeder services dropped (00101) removed, service restored, permanent repairs	Vicinity of Van Ness St NW & 38 th St NW	NW	3	1647	1700 (8/21)	24	17	19	On August 20 at 16:47 a customer reported a tree down on lines with fire in front of his home on sidewalk. Upon arrival crew found multiple lines involved as well as a pole and crossarms. Tree removal crew was contacted and they removed the tree. The Crew then arrived and repaired the primary and crossarms. A total of 19 customers were affected by this outage and all customers were restored at 17:00 on August 21, 2019.	101

Table 2.4-M: 2019 Non-Major Outages Extending Beyond 24 Hours

PART 3: 2019 MANHOLE EVENT REPORT

PART 3: 2019 MANHOLE EVENT REPORT⁷⁰

Part 3 of the Consolidated Report includes manhole event information, underground failure analysis results, detailed tracking trends in reportable events based on manhole cover type, and Pepco's cable splice records for 2019. The appendices provide detail regarding manhole events, and Pepco's manhole inspection program.

⁷⁰ In Order No. 16091 issued on December 10, 2010, the Commission stated at paragraphs 56, 59, 65, and 66 the following:

56. *Decision.* *Pepco has agreed to make the recommended changes in the 2011 Consolidated Report with the exception of data on failure rates. We require that the members of the PIWG discuss the need for and feasibility of providing data on failure rates in future Consolidated Reports and include in the 2011 Consolidated Report the PIWG conclusions and recommendations, if any.*
59. *Decision.* *We adopt the Staff's recommendation and require Pepco to: (1) combine the Manhole Events portion of the failure analysis report with Part 3 of the Consolidated Report; (2) include data in the 2011 Consolidated Report that separates 4 kV primary failures from 13 kV primary failures; (3) include data in the 2011 Consolidated Report that separates 4 kV from 13 kV manhole events; (4) include trend analyses for "Use of Slotted Manhole Covers;" and (5) include in the Cable Splice or Joint Database section of the Consolidated Report, cable type, age, type of splice and other pertinent information, except that cable type and age can be excluded if unavailable. If data on failure rates for all variables is available for manhole events, Pepco shall include such information in its 2011 Consolidated Report. If such data is unavailable, we require the members of PIWG to discuss the need for and the availability of such data include in the 2011 Consolidated Report the PIWG conclusions and recommendations, if any.*
65. *Pepco IS DIRECTED to include a discussion of failure data rates in the agenda for the Productivity Improvement Working Group, consistent with Paragraphs 56 and 59 of this Order; and*
66. *Pepco IS DIRECTED to include additional Manhole Event data in the 2011 Consolidated Report, consistent with Paragraph 59 of this Order.*

In Order No. 15152 paragraphs 76 and 66, the Commission ordered the following:

76. *PEPCO is DIRECTED to include as part of the 2009 Consolidated Report a proposed plan for significantly reducing manhole events consistent with paragraph 66 of this Order...*

SECTION 3.1 – 2019 MANHOLE EVENT INTRODUCTION

Pepco herein submits its annual Manhole Event Report for 2019 in accordance with Order Nos. 11716, 13812, 15620 and 16091.

Summary of 2019 Manhole Events

During 2019, there were a total of 43 reportable manhole events in the District of Columbia. Of these 43 manhole events, 33 were classified as Smoking Manholes (S), 2 were classified as Manhole Explosions (E), and 8 were classified as Manhole Fires (F). 40 out of the 43 events occurred on the 13 kV system. Of these, 30 were classified as Smoking Manholes (S), 2 were classified as Manhole Explosions (E) and 8 were classified as Fires (F). The 3 events occurring on the 4 kV system were classified as Smoking Manhole (S). Appendix 3A is a list of the 2019 manhole events, categorized and described as directed in Order Nos. 11716, 13812, 15620 and 16091.

SECTION 3.2 – UNDERGROUND FAILURE ANALYSIS

Order No. 17074 Requirement

Order No. 17074 states the following at paragraphs 38 and 40:

38. *The Order further noted OPC's statement that according to Pepco, its replacement program would screen all feeders by collecting the number of underground faults experienced by each feeder in the last ten years and feeders with five or more faults ("5-in1-10") would be further analyzed for replacement. [Footnote: See F.C. 766-ACR-12, Order No. 16975, paragraph 75.] ...Thus, we direct Pepco to report on the results of its screening program along with Pepco's recommendations for further analysis and replacement in the ACR starting with 2013.*
40. *... Some progress should have been made in the development of a tracking mechanism for PILC actual replacement and Pepco should be able to report on the actualization of its strategy with data that will help the Commission to better understand Pepco's future plans for PILC replacement and examine the results of its PILC Replacement Strategy. Thus, the Company is required to report on the actualization of its PILC Replacement Strategy in the ACR and to include in the report the information identified in Recommendations 8(c), (d) and (e). If the requested information is not available, Pepco shall provide a reasonable substitute that will allow the Commission to assess the progress that Pepco has made and intends to make in the implementation of its PILC Replacement Strategy for the ten-year period from 2012 to 2021.*

Pepco Response – Corrective Actions

Pepco is currently in the process of analyzing available data of the underground electric system faults in the District of Columbia. Feeders with at least five faults within ten years were identified for further analysis. From that list of feeders, those that are already being addressed as part of Pepco’s Reliability program and/or other strategies—or programs that would address these issues on the feeders—were removed to avoid duplication of efforts.

In 2019, targeted PILC replacement was performed on twenty-four feeders, shown below in Table 3.1.

Year	Feeder ID	PILC Replaced (ft)
2019	15307	6517
2019	15308	1131
2019	15309	1212
2019	15310	1164
2019	15311	5373
2019	15312	5811
2019	14360	1584
2019	14361	1584
2019	14362	1584
2019	14363	1584
2019	14364	1584
2019	14365	1584

Table 3.1: PILC Replacement Status

In Pepco's 2001 "Alternative Design Proposal to Pepco's 15kV Paper Insulated Lead Covered Power Cables (PILC)" study, Pepco estimated there were 1,109 miles of primary lead cables on the Pepco system in the District of Columbia. Given the current configuration of the District of Columbia underground system, which includes varied duct and manhole sizes, it is not possible to know how many of those miles are non-replaceable. Reconfiguring the manholes and ducts would allow most of Pepco's PILC cable to be replaceable, albeit at significant cost and time. As stated in Pepco's PILC Replacement Strategy, in line with most other electric utilities and with industry best practice, Pepco has not committed to replacing a fixed number of miles of PILC each year and has not identified a year by which full replacement of primary PILC would be expected. Instead, Pepco is seeking opportunistic replacement based on conditions, which it expects to be a more cost-effective replacement strategy.

Consequently, Pepco cannot provide an estimate of the number of miles of PILC that will be replaced by EPR for the 10 year period from 2012 through 2021. Since 2001, Pepco has replaced 75 miles of PILC in the District of Columbia both through the opportunistic replacement approach, and planned jobs. This data is reflected in Table 3.2 below.

<i>Years</i>	<i>PILC Replaced Footage</i>	<i>PILC Replaced Mileage</i>
2001	0	0
2002	0	0
2003	0	0
2004	7,733	1
2005	27,981	5
2006	14,322	3
2007	26,341	5
2008	26,217	5
2009	28,217	5
2010	25,593	5
2011	17,824	3
2012	35,571	7
2013	17,037	3
2014	25,882	5
2015	23,414	4.4
2016	14,158	2.7
2017	27,936	5.3
2018	50,123	9.5
2019	30,712	5.8
<i>Total</i>	<i>399,061</i>	<i>74.7</i>

Table 3.2: PILC Replacement: 2001-Present

Underground (UG) Failure Analysis

The results of Pepco's annual UG failure analyses are presented below, in compliance with Order No. 12735 paragraph 138.⁷¹

In analyzing the performance of the Pepco UG system, it is necessary to distinguish three different measures of system performance:

- Equipment Failures
- Outages
- Reportable Events (RE)

An RE is a reported explosion, fire, or smoke in a manhole. Some Pepco equipment failures may result in customer outages, REs or both. However, not all Pepco equipment failures result in an outage and/or an RE. This is due to the redundancy of some components of the system, especially on secondary networks. In fact, for the underground secondary networks, most equipment failures do not result in customer outages because each network is fed by multiple primary feeders, and each customer can be fed from multiple transformers and secondary mains, making them less susceptible to outages. Further, some underground outages or events are not initiated by equipment failures, but are in fact caused by accidents, such as dig-ins by excavation contractors, failures of non-Pepco equipment, such as District of Columbia owned streetlight cables or gas company equipment.

There are three types of manhole reportable events:

- Explosions
- Fires
- Smoking

Of these three types, from 2015– 2019 smoking manhole events account for the majority of all manhole events experienced in the District. See Figure 3.1.

⁷¹ In Order No. 12735, paragraph 138, the Commission ordered the following:
138.Pepco shall file a report that summarizes the results of the failure analyses conducted for the calendar year 2002, 30 days from the issuance date of this Report and Order, and subsequently, to file an annual report on the results of the failure analysis group to the PIWG;

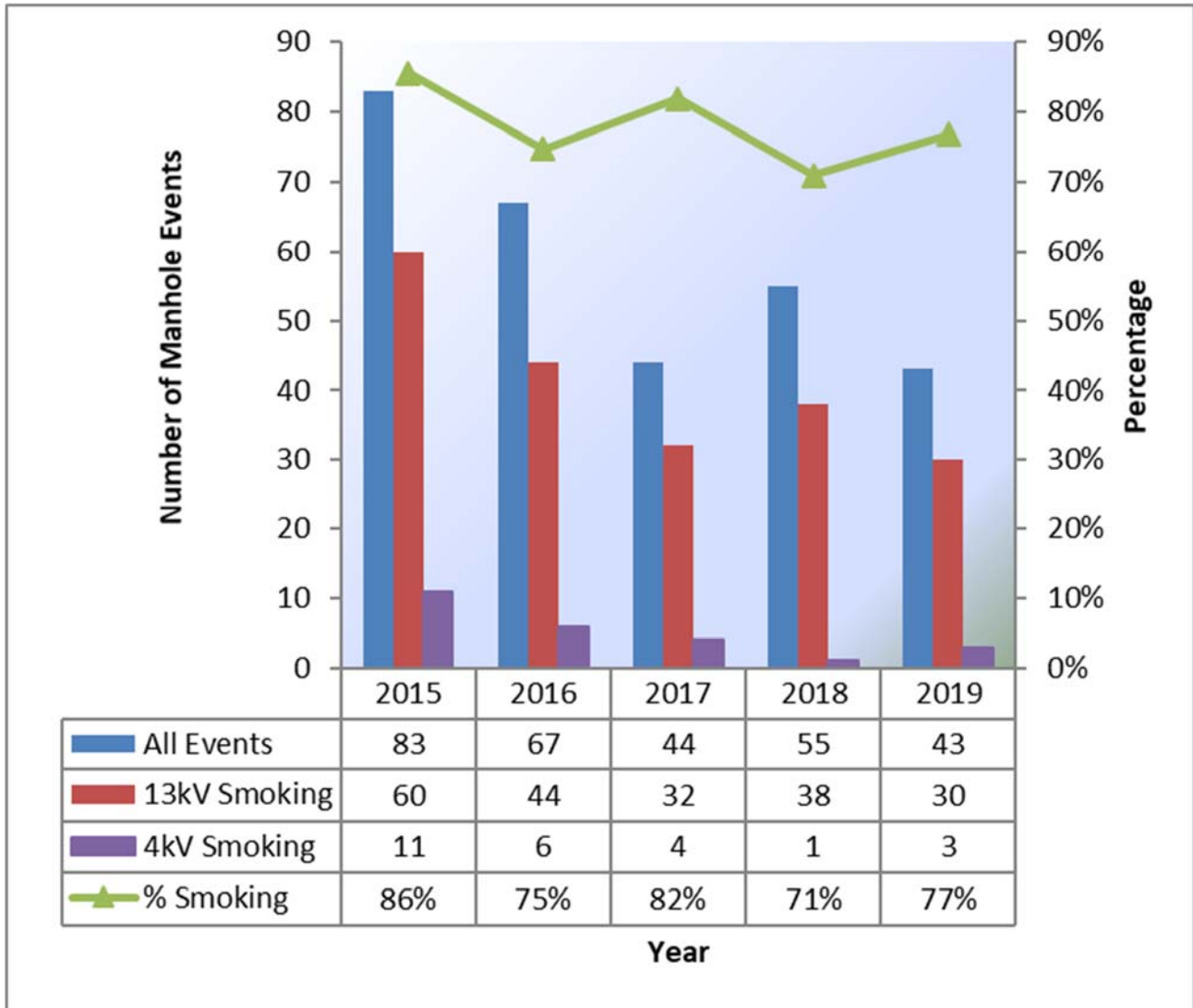


Figure 3.1: Manhole Events - Smoking (2015-2019)

Figures 3.2 and 3.3 breakdown the percentage of manhole fires and manhole explosions as compared to the total number of events. As reflected below, explosions and fires occur less frequently than smoking manholes.

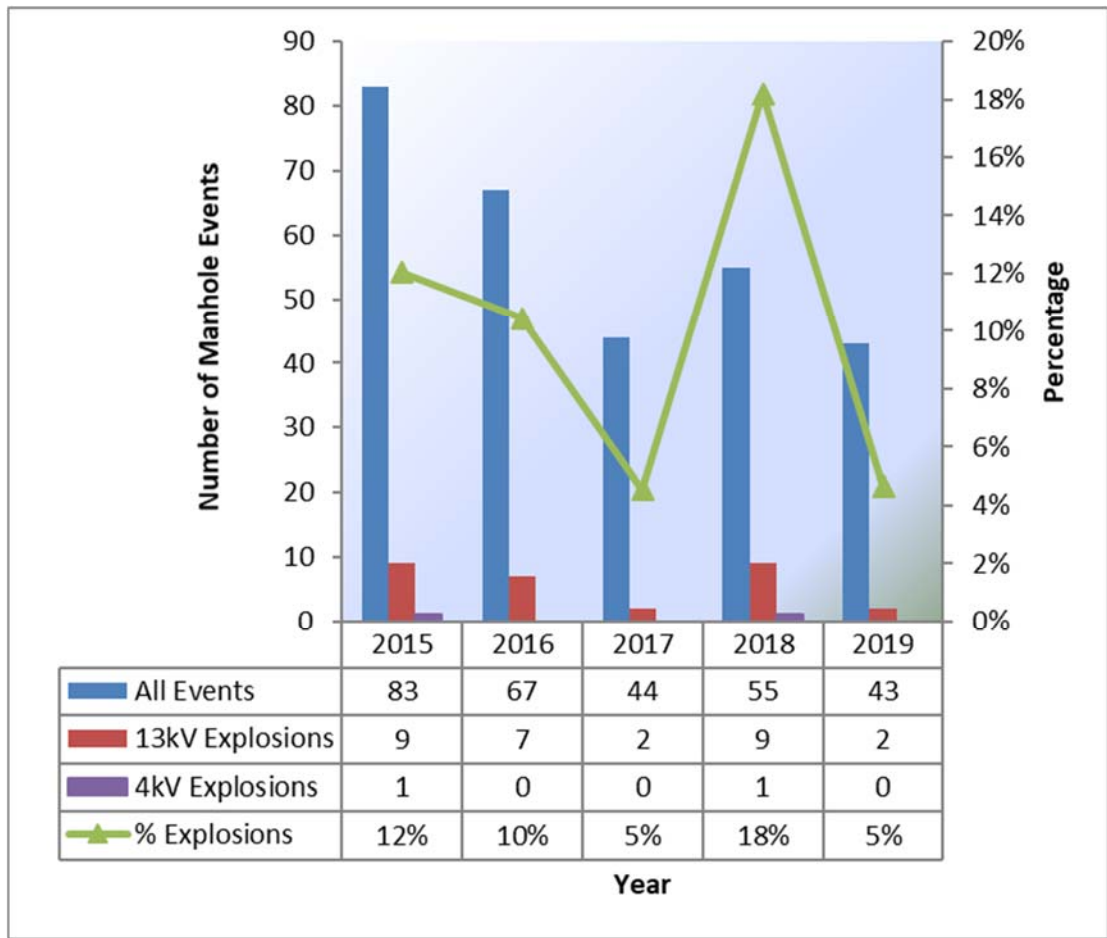


Figure 3.2: Manhole Events - Explosions (2015-2019)

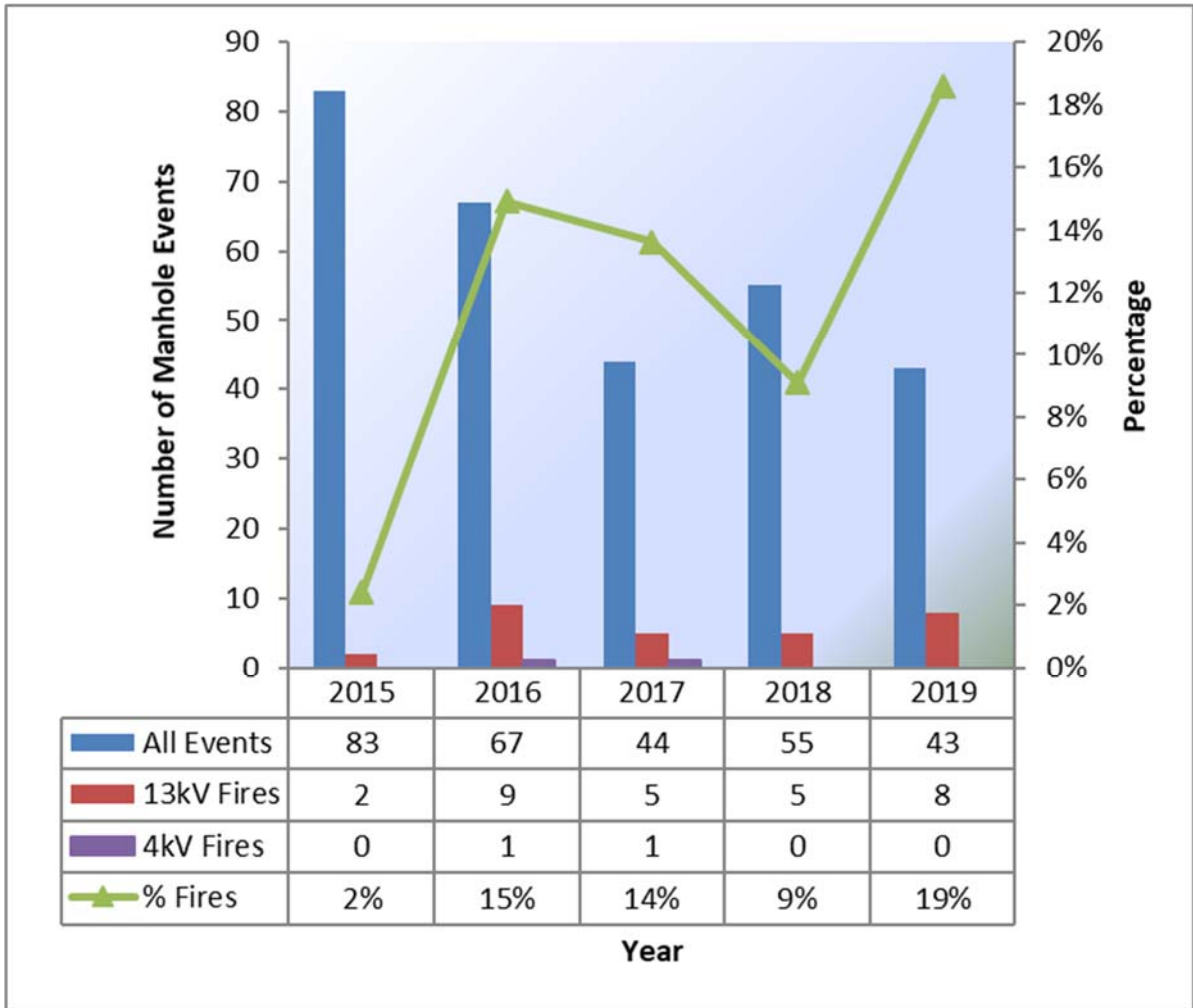


Figure 3.3: Manhole Events - Fires (2015-2019)

Since 2015, on average the majority of the manhole events experienced in the District have occurred on Pepco’s secondary equipment. See Figure 3.4.

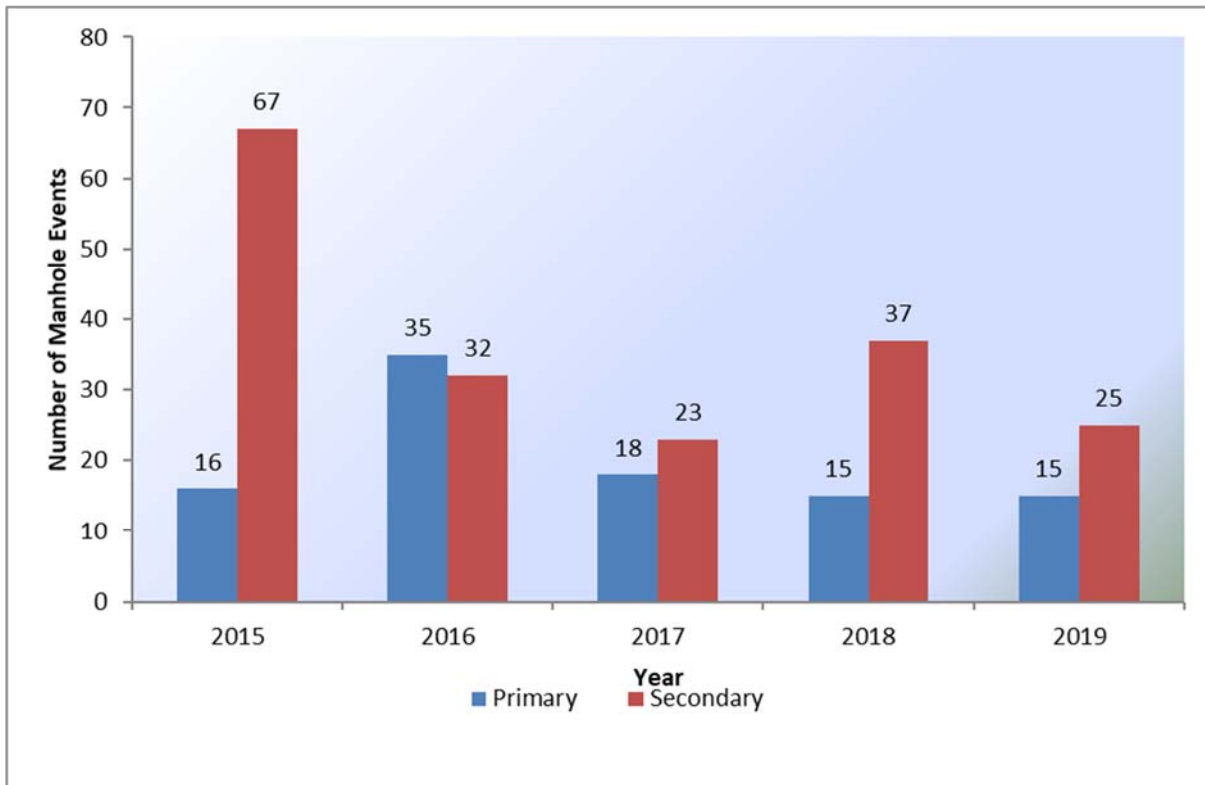


Figure 3.4: Manhole Events by Type of Equipment (2015-2019)

In 2019, manhole explosions occurred slightly more on the secondary systems. Smoking manholes occurred more on the secondary system, and manhole fires occurred slightly more on the primary system. Figure 3.5 depicts this breakdown. See Figure 3.5.

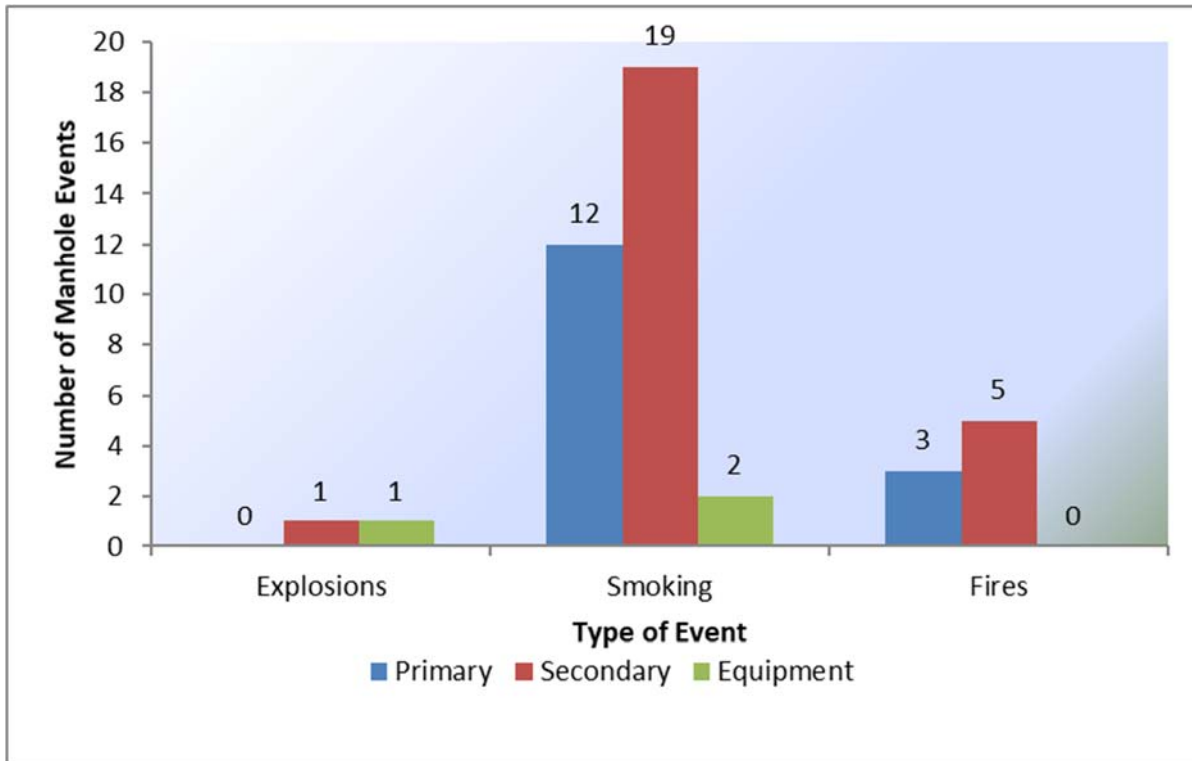


Figure 3.5: Manhole Events by Type and Equipment (2019)

Slotted manhole covers are designed to minimize the frequency and impact of manhole events by allowing gas and smoke to vent from manholes in the event of an underground failure. This provides an early warning and prevents build-up of gases to potentially explosive proportions; thereby allowing energy to disperse more easily should an event occur. The tradeoff when installing slotted covers is that they allow more water and street run-off contaminants to enter into the manhole than solid covers. More analysis on the effects of slotted covers and manhole events is presented in the slotted MH cover section of this report. See Figure 3-6 and Figure 3-7 for a breakdown of manhole event by event type, voltage class, and cover type.

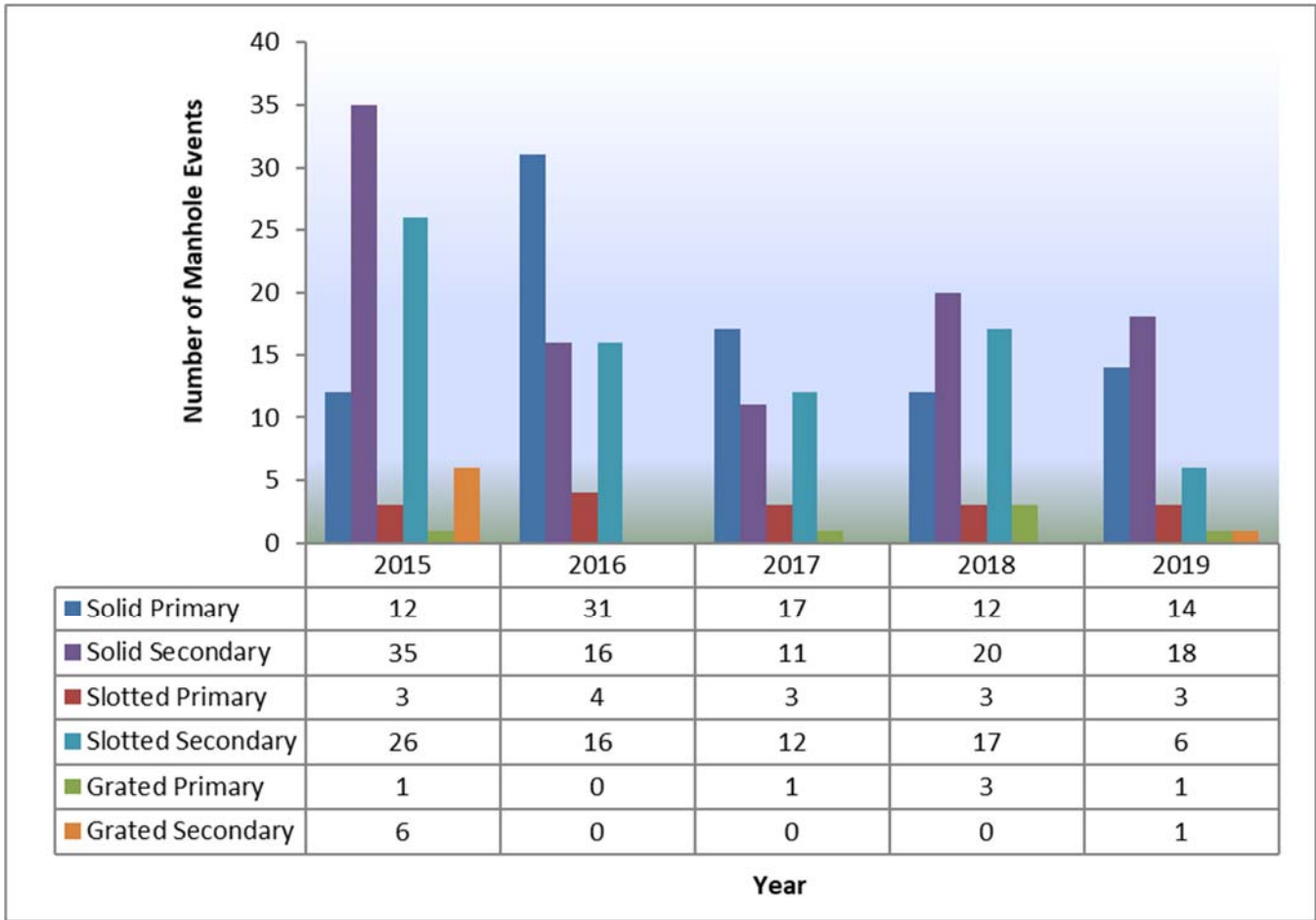


Figure 3.6: Manhole Events by Type, Equipment, and Manhole Cover (2015-2019)

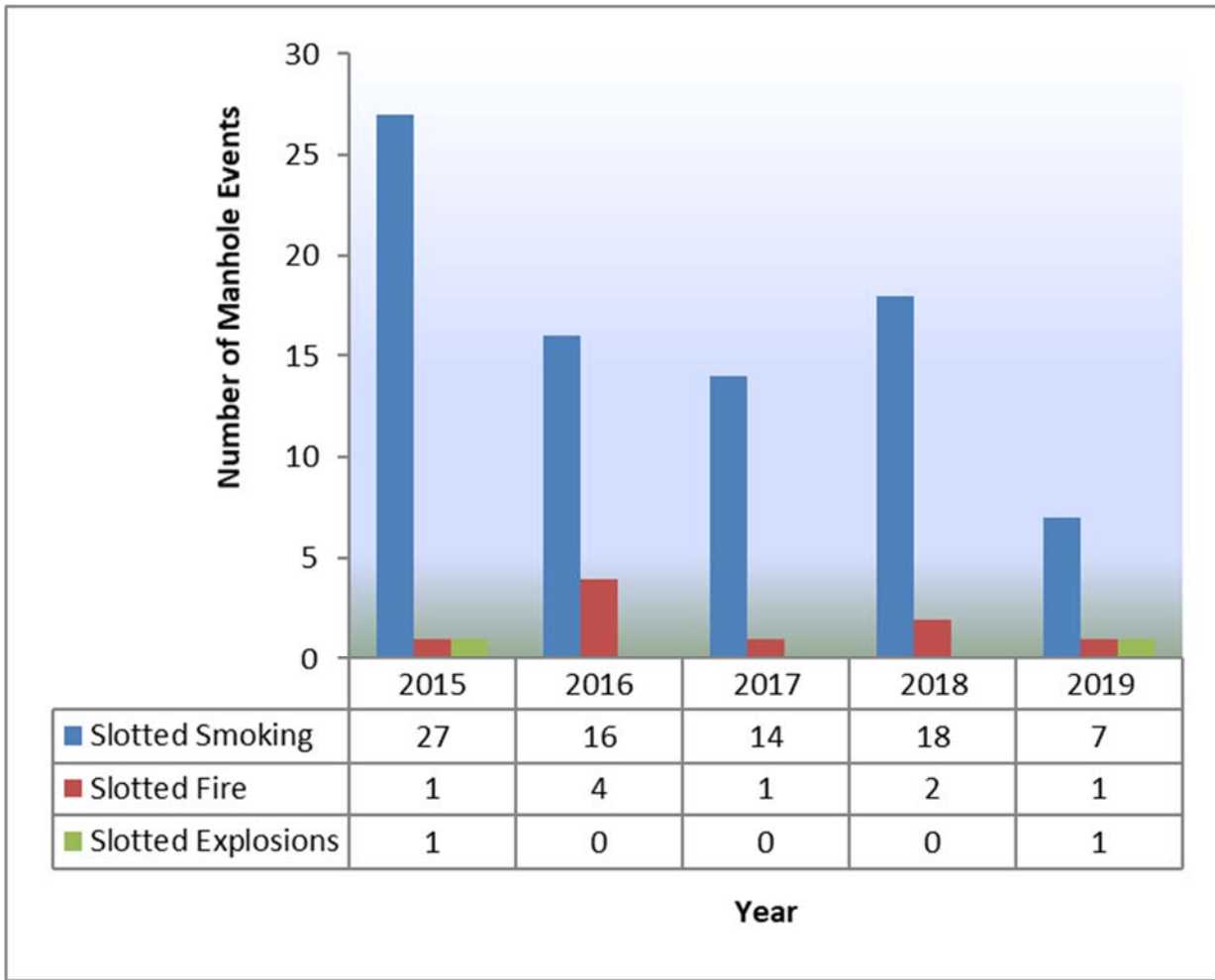


Figure 3.7: Slotted Manhole Events by Type (2015-2019)

By design, primary cable is more insulated than secondary cable. Whereas primary cable and its accessories are designed to their voltage rating and are shielded, secondary cable and its accessories are not shielded. As a result of less physical protection, secondary cable and its accessories are more likely to fail due to a breach in the insulation. Since 2014, the leading cause of manhole reportable events in the District is insulation-related, such as insulation deterioration. See Figures 3.8 through 3.12.

Selected Failure Causes 2015

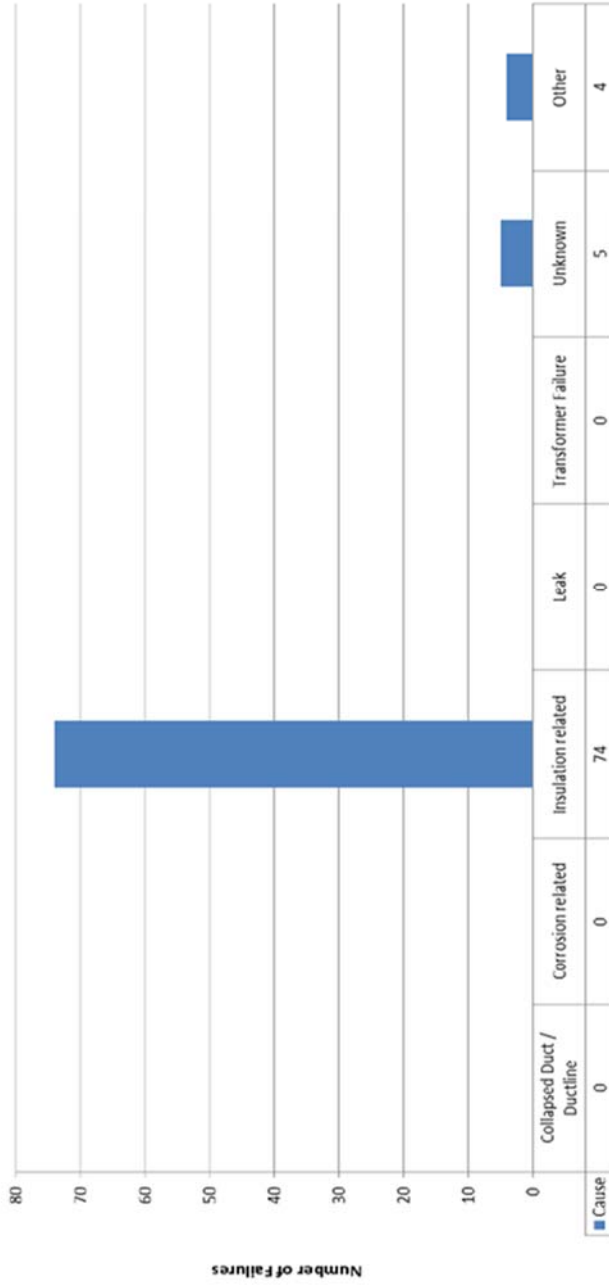


Figure 3.8: Selected Failure Causes (2015)

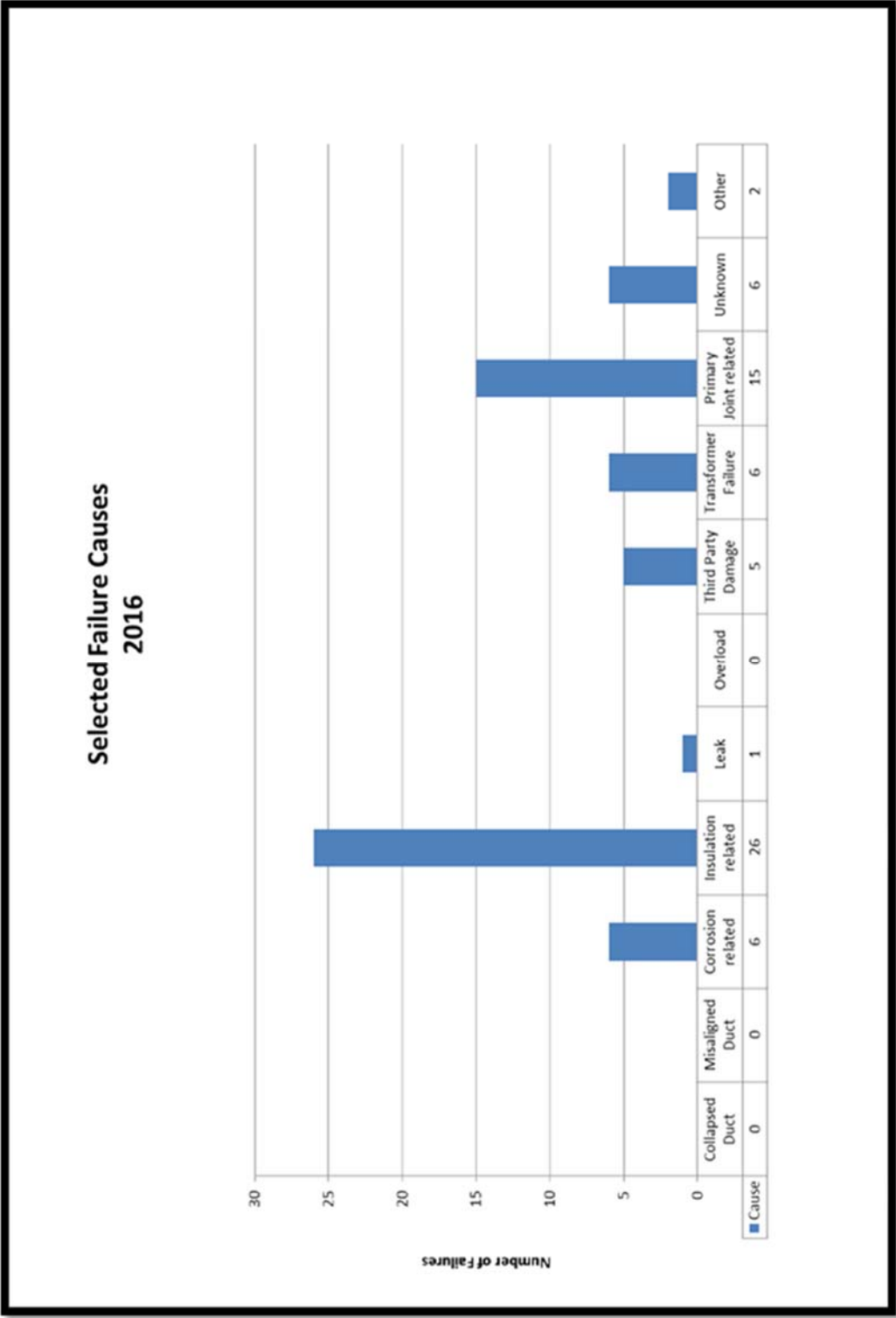


Figure 3.9: Selected Failure Causes (2016)

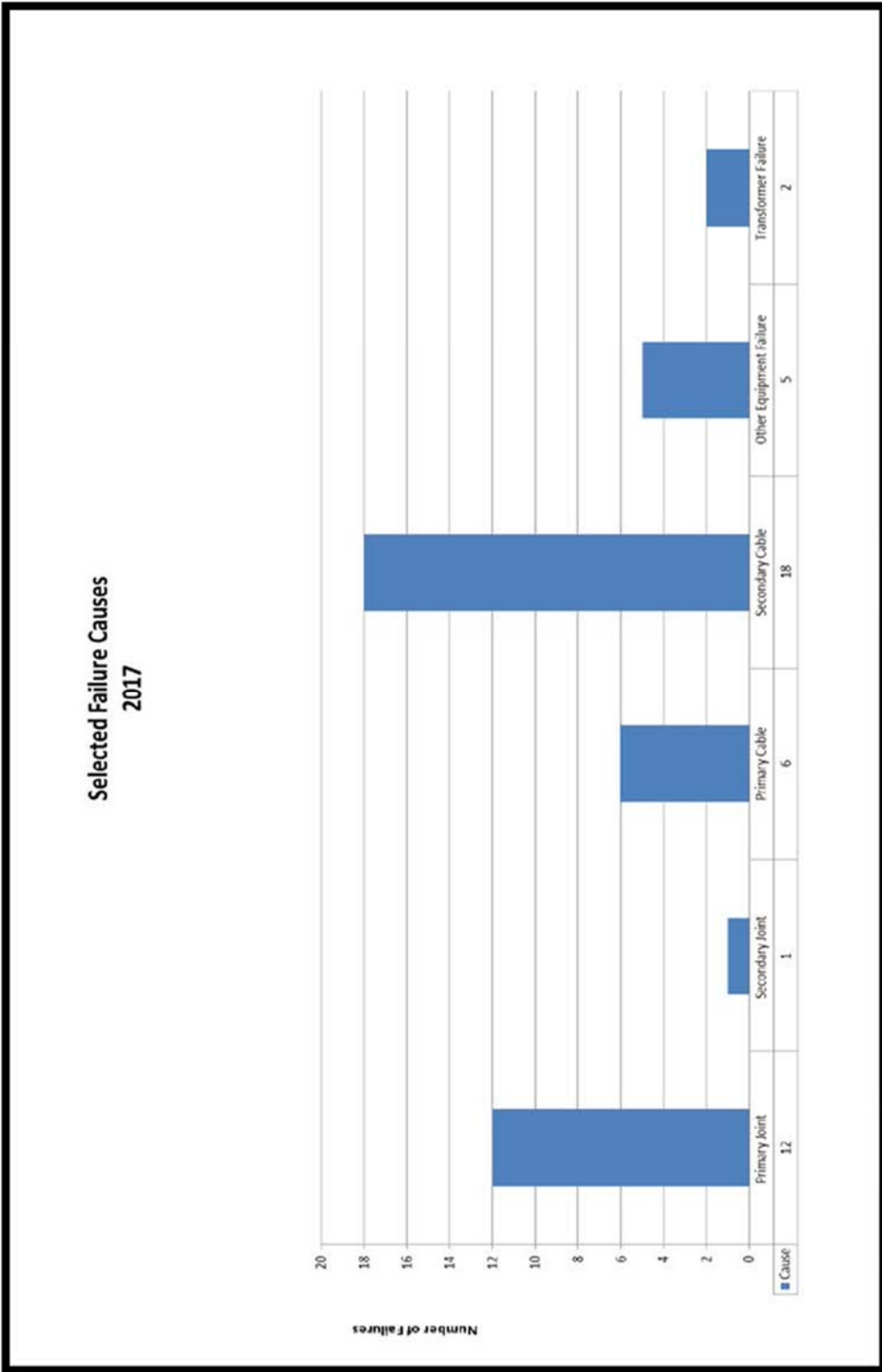


Figure 3.10: Selected Failure Causes (2017)

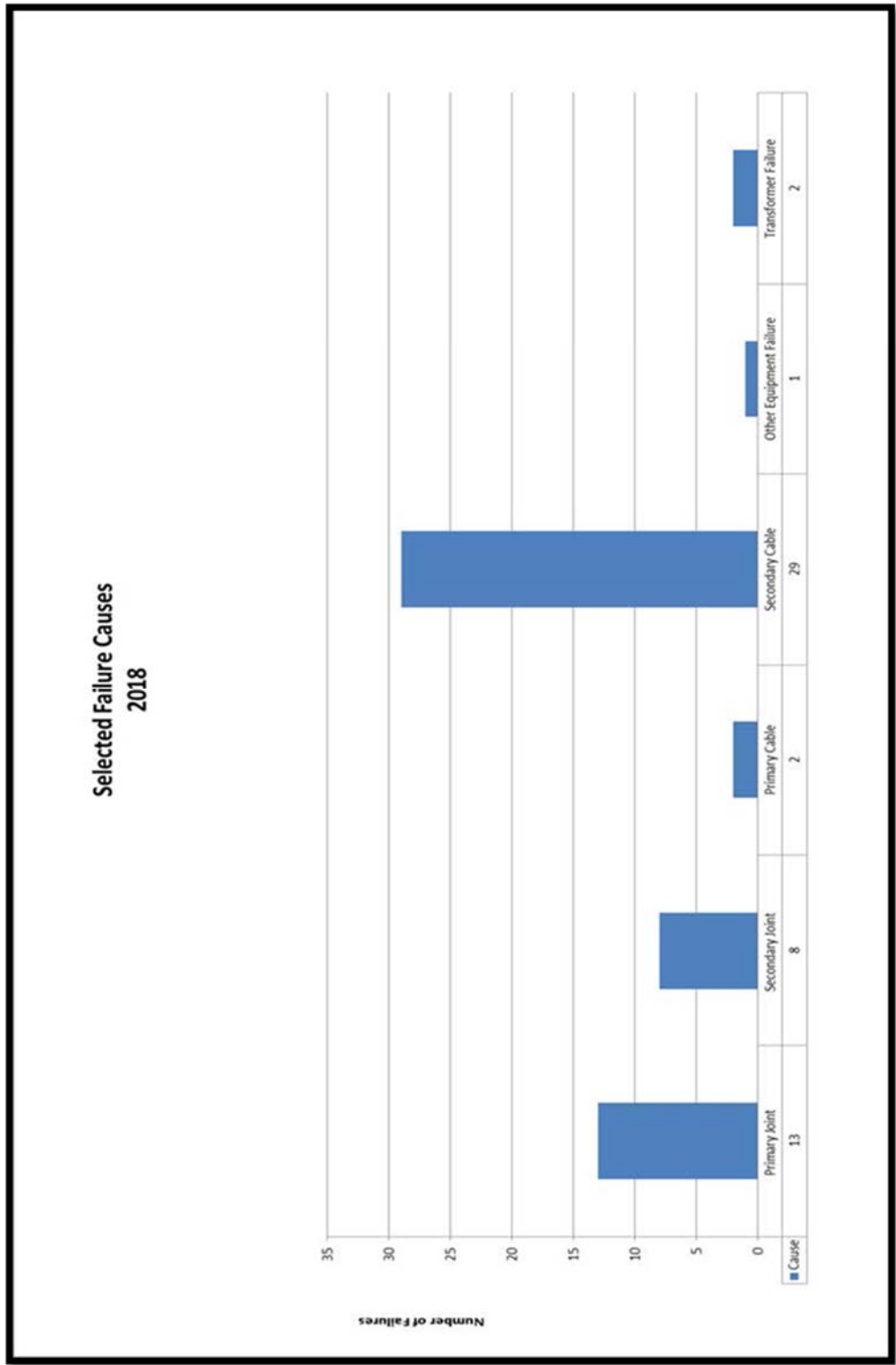


Figure 3.11 Selected Failure Causes (2018)

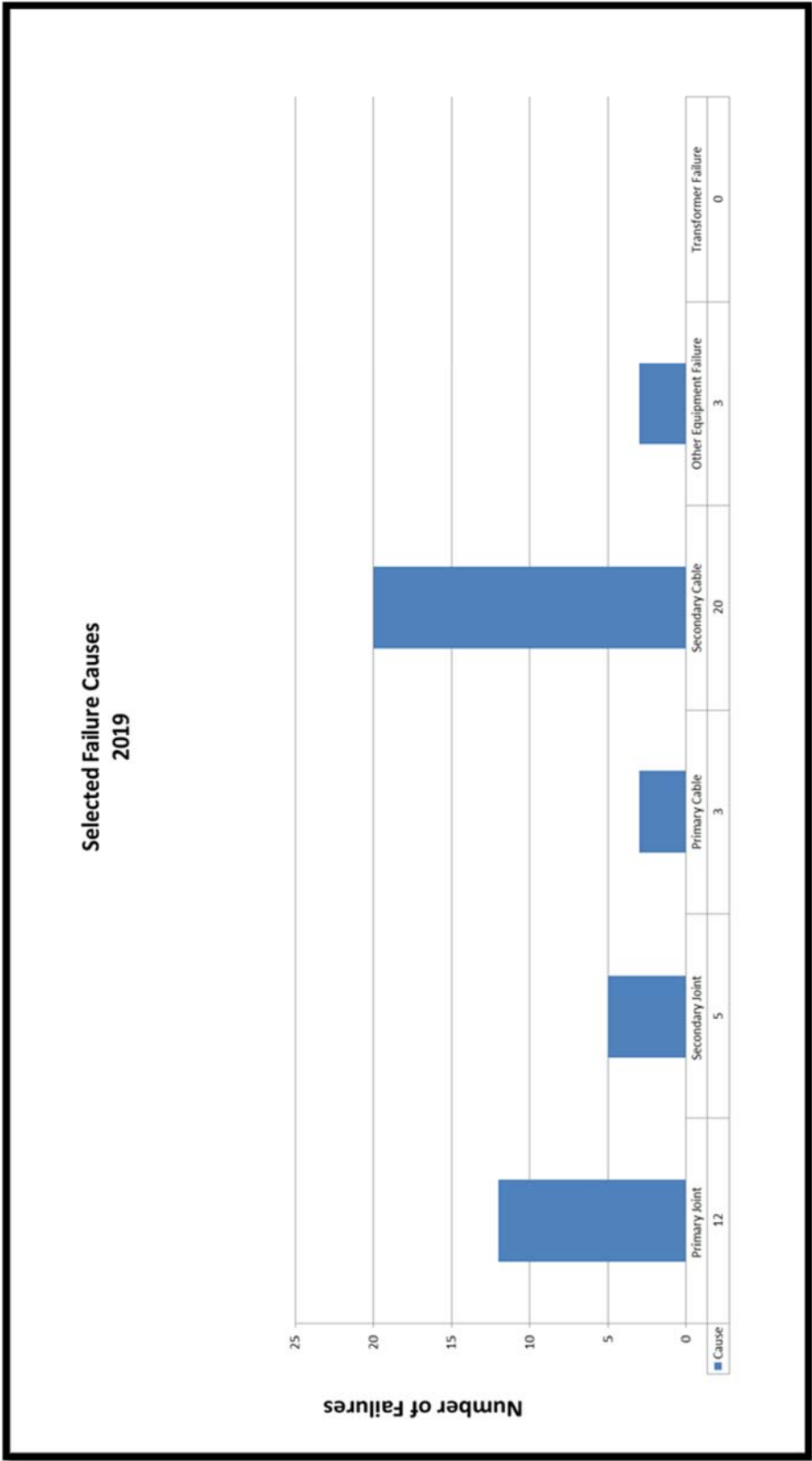


Figure 3.12 Selected Failure Causes (2019)

The type of insulation related to cable and joint failures resulting in a reportable event for secondary equipment does not provide a discernible trend in reportable events caused by Rubber Lead (RL), Rubber Neoprene (RN), or other insulation types (Figure 3.13). RL secondary cable is an outdated technology and has not been installed on the system for more than twenty years. It is not possible to trend future reportable events associated with this cable type.

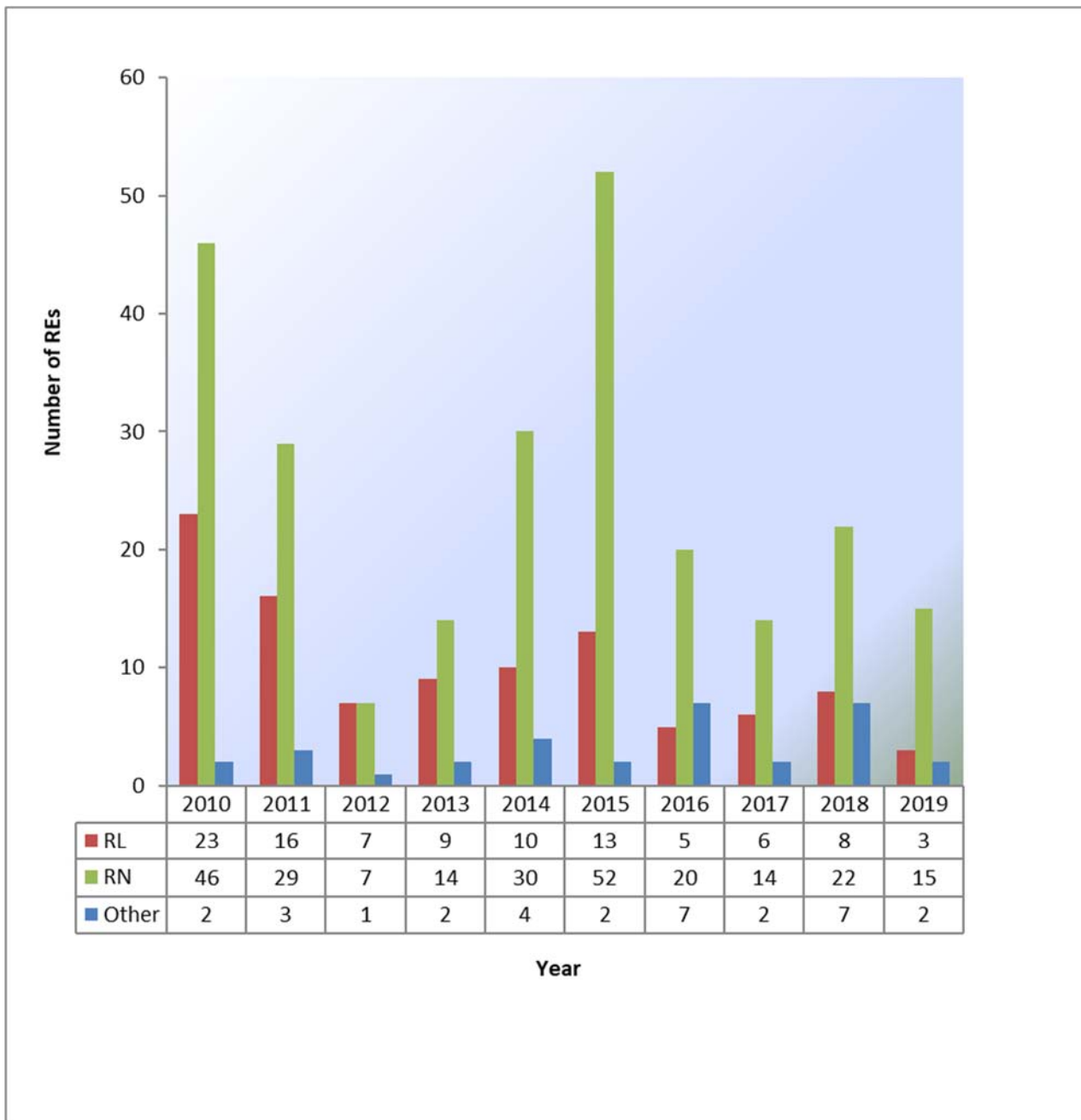


Figure 3.13: Insulation Type of Secondary REs (2010-2019)

PILC is the predominant primary cable on the Pepco underground system. Consequently, most primary cable reportable events involve PILC cable (Figure 3.14).

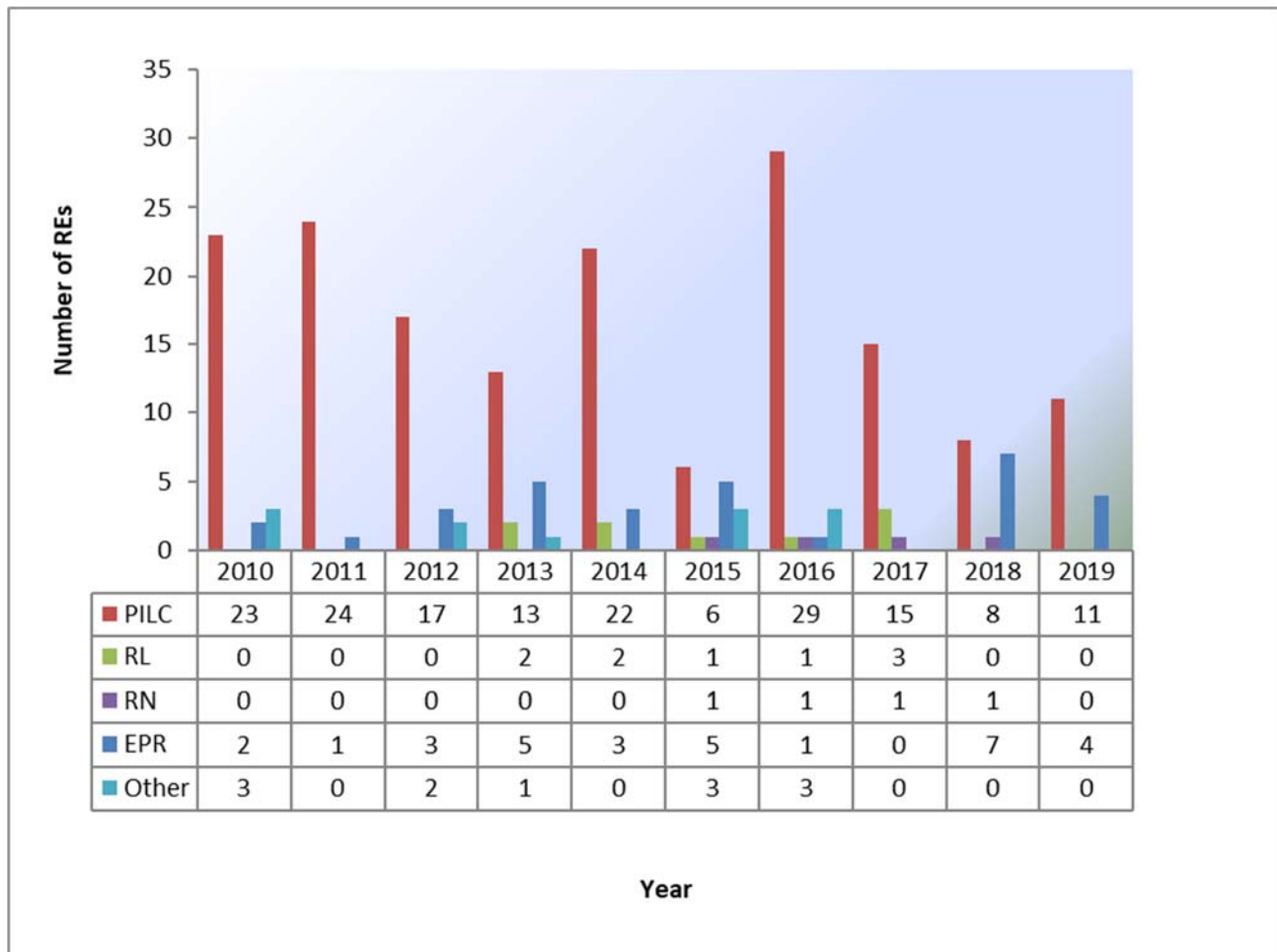


Figure 3.14: Insulation Type of Primary REs (2010-2019)

The majority of reportable events involving primary equipment occur on 13 kV feeders (Figure 3.15). 4 kV is a vintage technology and the majority of Pepco’s underground system is 13 kV.

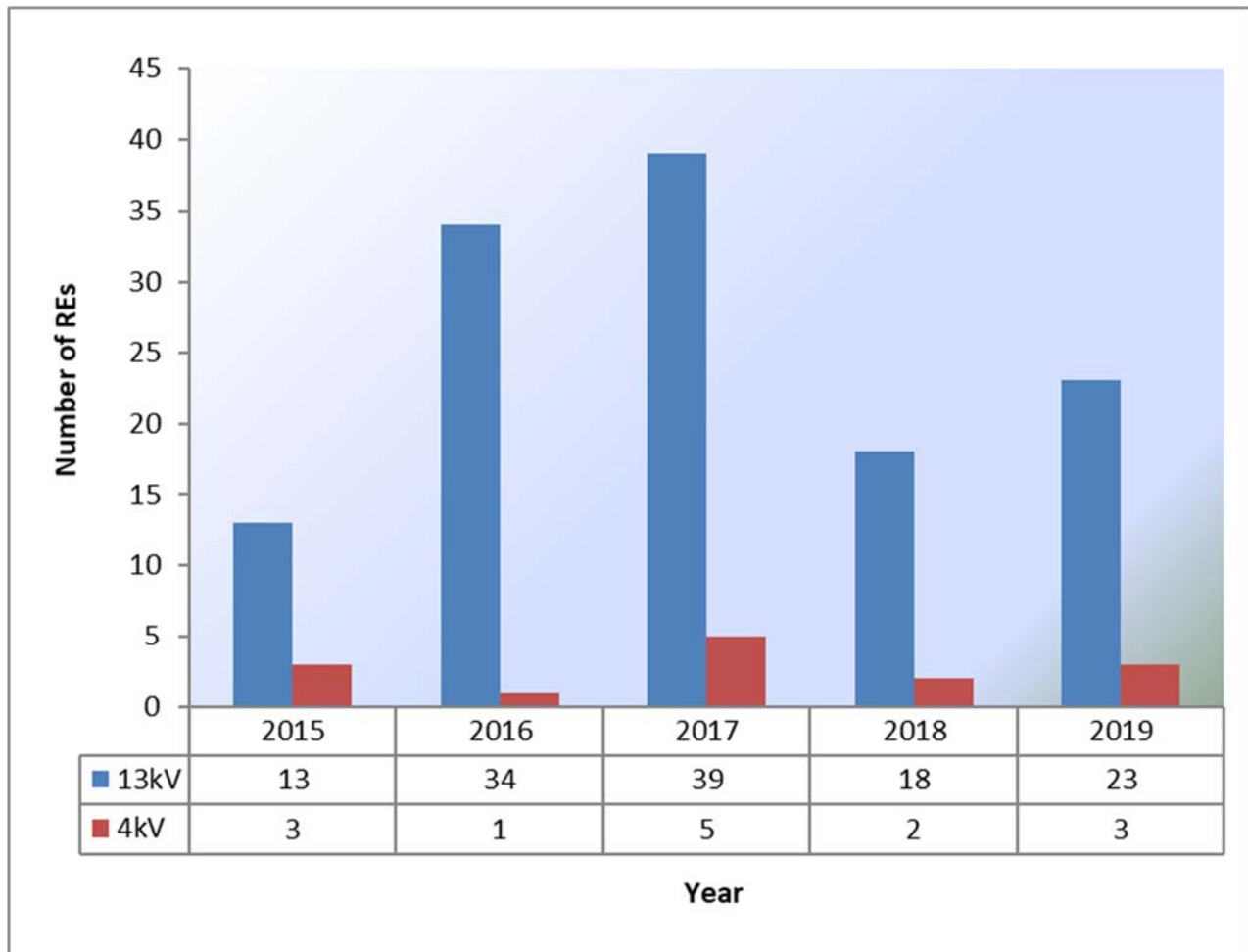


Figure 3.15: Voltage Class of Primary REs (2015-2019)

In addition, moisture plays a major role in the deterioration of both primary and secondary cable insulation. When a significant amount of precipitation is received in the District, moisture and contaminants from the street, such as motor oil, lawn chemicals, etc., enter into the manholes and affect cable insulation. Additionally, snow/ice melt chemicals ingress after a storm can also penetrate cable insulation and lead to failure. While moisture affects all cable insulation, since secondary cable is not as robust or of the same design as primary cable, secondary cable is inherently more likely to fail under adverse weather conditions. A comparison of Figures 3.16 and 3.17 suggests that total moisture accumulation affects the number of reportable events.

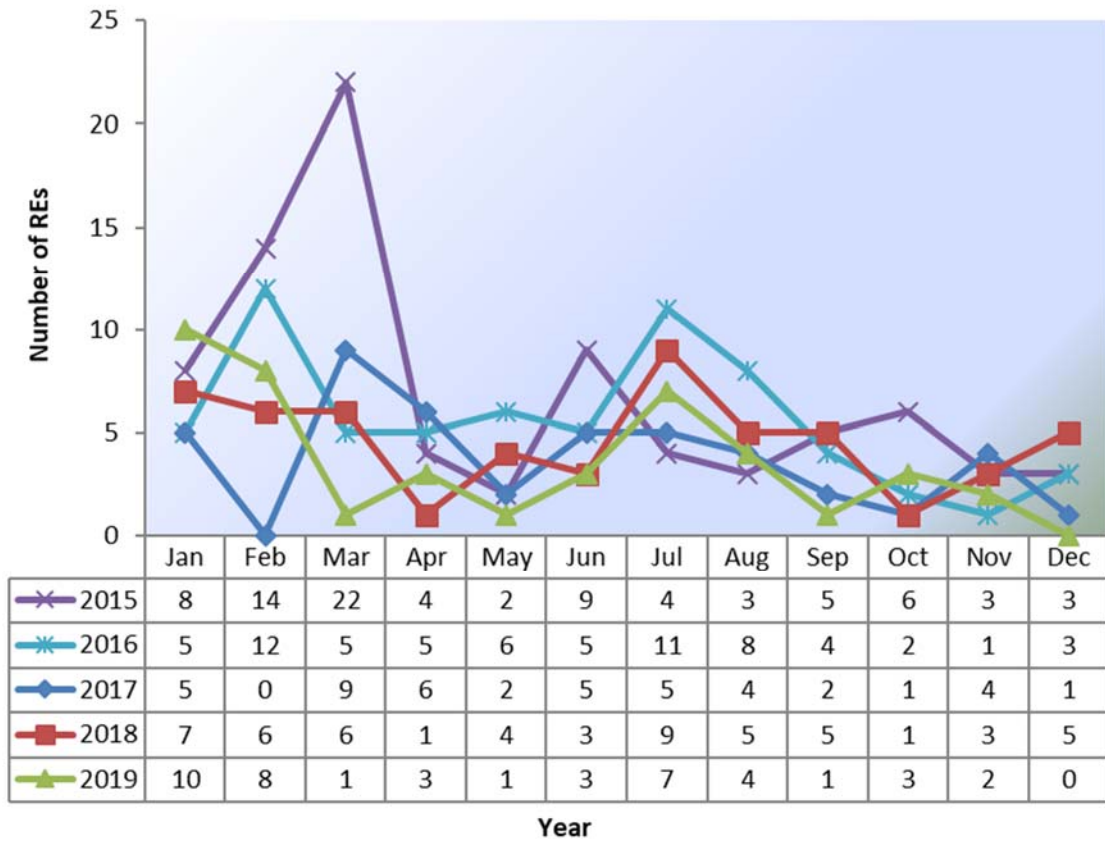


Figure 3.16: Reportable Events by Month (2015-2019)

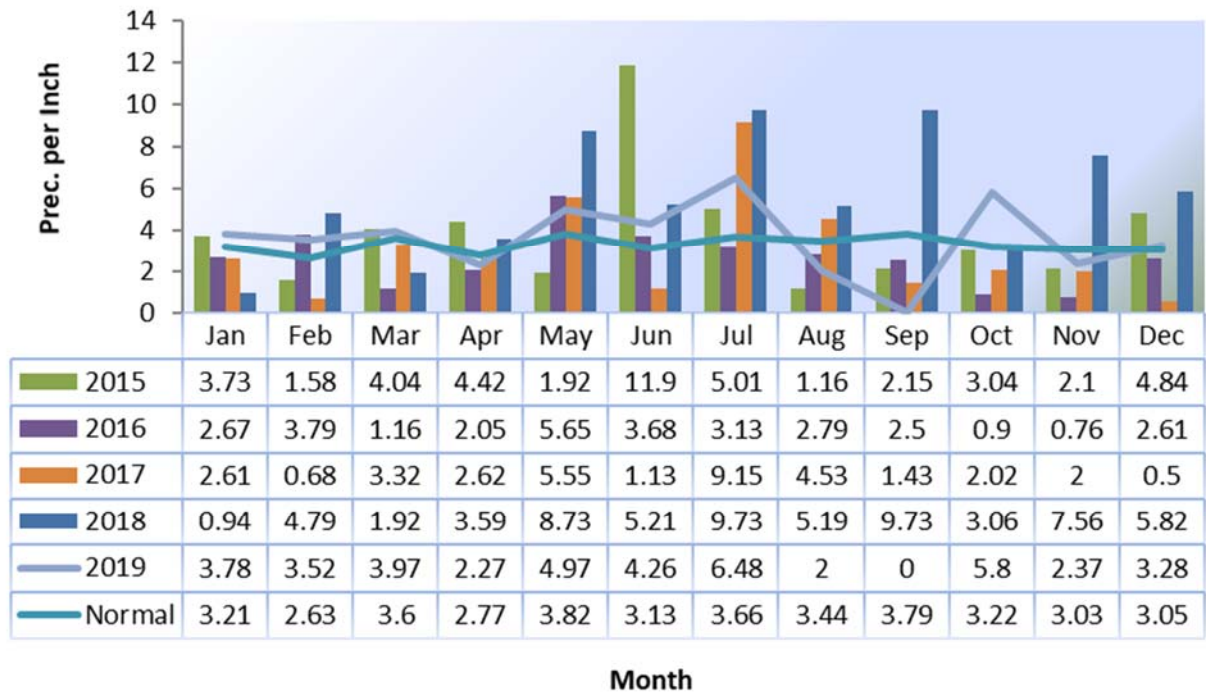


Figure 3.17: Total Precipitation in Inches by Month (2015-2019)

The Failure Analysis Section will show failure analysis for all manhole incidents in the District in order to determine trends and remediation activities.

Slotted Manhole Covers ⁷²

New Slotted Manhole Cover Program Locations

In its 2013 Consolidated Report, Pepco discussed its criteria for selecting areas for installation of slotted manhole covers. This included areas with high load growth and potential business development. There were no slotted covers installed in 2019.

⁷² Order No. 16975 states the following at paragraphs 74 and 111:

85. Decision: ... We agree with the Staff that a manhole replacement program that concluded in 2004 may no longer be appropriate, given business development in new areas of the District. We therefore require Pepco to reexamine the criteria used to select locations for the installation of slotted manhole covers and to report on this reexamination in the 2013 Consolidated Report.

114. Pepco is DIRECTED to revisit criteria used to select locations for installing slotted manhole covers consistent with paragraph 74 herein;

Historical Slotted Manhole Cover Program⁷³

Pepco installed grated manhole covers over single and three-phase transformer installations, and network transformer installations in roadways and sidewalks. Their purpose is to assist in the dissipation of heat from the transformers. To explore the potential of an expanded application of vented manhole covers to non-transformer locations, Pepco contracted the Electric Power Research Institute (EPRI) to simulate manhole explosions. The simulations were specifically designed to test the effectiveness of solid, slotted and grated manhole covers in minimizing displacement of covers under fault conditions. The test data showed that the installation of slotted covers minimizes the frequency and impact of manhole events in three main ways:

- Energy released may escape through the slotted cover without lifting or displacing it;
- Smoke can provide an early warning of cable faults, thus preventing more serious events from occurring; or
- Explosions or fires may be avoided by the dissipation of combustible gases.

Based on these findings, Pepco installed custom-designed, slotted manhole covers in high volume pedestrian traffic areas of the District of Columbia where the low voltage alternating current network exists. The installation of slotted manhole covers has enhanced public safety while minimizing potential damage to underground electric facilities. The installation program was concluded in 2004 with an overall total of 7,880 slotted manhole covers having been installed.

In Order No. 14093, the Commission approved Pepco's proposal to suspend further slotted manhole installations provided the Company submit an analysis of manhole events and failure rates associated with slotted covers, including recommended actions for 2008 by October 27, 2007, and continue to monitor debris accumulation in manholes with slotted covers. Pepco filed its analysis on August 21, 2007.

Pepco realizes that the openings in the covers, while allowing gases to vent, also allow rain, snow, dirt, debris and chemicals into manholes. As a result, Pepco continues to monitor debris accumulation in manholes with slotted covers. Of the 43 reportable manhole events that

⁷³ In Order No. 16091 issued on December 10, 2010, the Commission stated among other things, at paragraph 59, the following:

59. ...*(4) include trend analyses for "Use of Slotted Manhole Covers;"*

occurred in the District of Columbia in 2019, 15 involved manholes fitted with slotted covers. Over the five-year period from 2015 through 2019, there were 292 reportable manhole events. Of these, 102 (35%) occurred in manholes with slotted covers. See Figure 3.20.

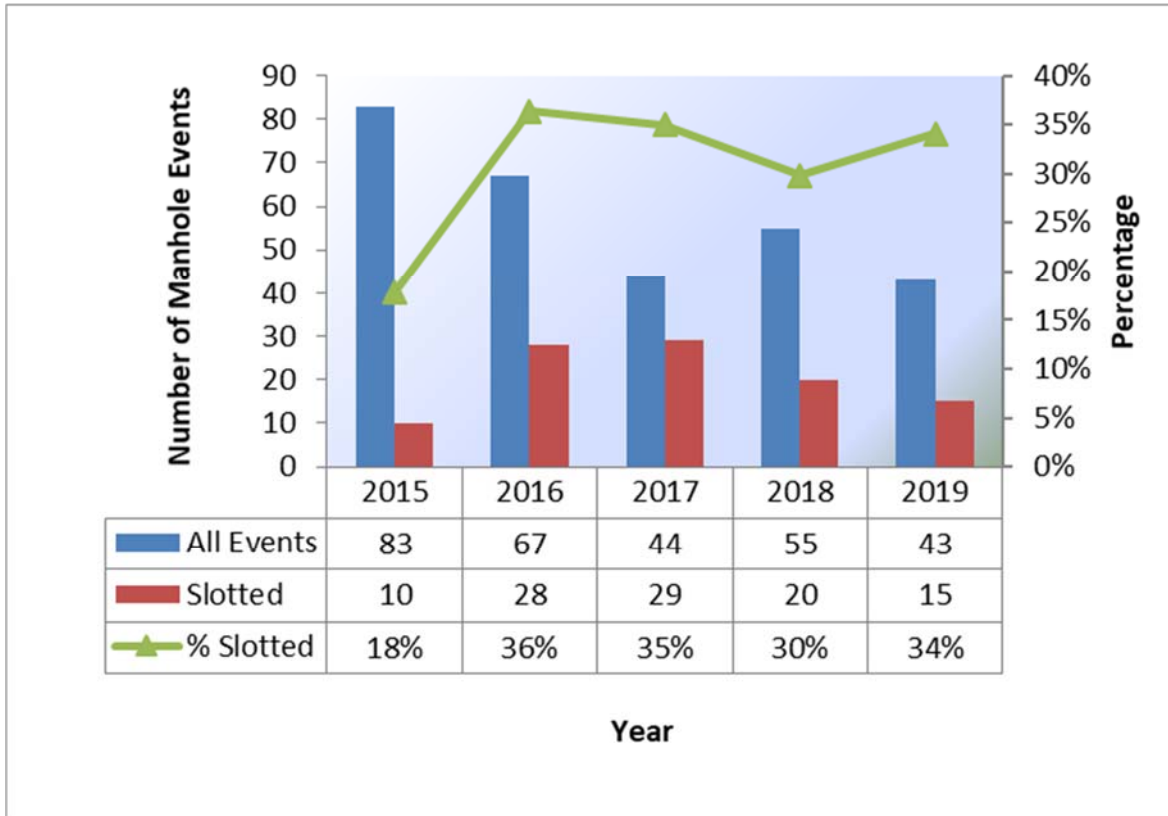


Figure 3.20: Manhole Events Involving Slotted Covers

The rate of manhole events on these slotted covers is disproportional to the total population of these covers on the system. Currently there are slotted covers deployed on about 13% of manholes within the Pepco system yet we are consistently seeing slotted covers account for upwards of 34% of the total manhole events each year. This, coupled with the fact that the current Pepco designed slotted covers are not 100% ADA compliant has led Pepco to reconsider the design for vented manhole covers.

With the support of EPRI, an Exelon utility peer group was formed to research manhole events and mitigation techniques. As a result of this research group, all Exelon utilities have aligned on a new design for vented manhole covers. These new

manhole covers use a 3% vented design as compared to the current 23% slotted cover. Additionally, the new manhole cover design is fully ADA compliant. A deployment strategy is currently being developed for these new manhole covers, with the initial plan to only use these covers on new construction jobs located in non-roadway applications. Once Pepco has more experience with these deployments, plans will be shared in future PIWG meetings.

Cable Splice or Joint Records⁷⁵

Quality of workmanship is also being monitored as part of Pepco's program to reduce underground failures. Pepco repair crews complete a "Splice Manifest" report which records, among other things, the location, date, type of splice, the splicer's name and the foreman's name. Table 3.6 will contain information from the "Splice Manifest" report for 2019 maintenance work performed once completed. The splicer and foreman names have been redacted from the table.

⁷⁵ In Order No. 16091, the Commission stated among other things, at paragraph 59, the following:

59. ...*(5) include in the Cable Splice or Joint Database section of the Consolidated Report, cable type, age, type of splice and other pertinent information, except that cable type and age can be excluded if unavailable.*

Appendix 3A: 2019 Manhole Events^{77 78}

⁷⁷ In Order No. 11716 ordering paragraph 3, the Commission ordered the following:

3. *PEPCO shall file an annual report on the previous calendar year's manhole incidents;*

⁷⁸ Order No. 16975 states the following at paragraphs 72 and 110:

72. *Decision: We accept the Staff's recommendation and require Pepco to include grid numbers and Siemens' inspection dates on manhole event reports. Each year over 200 manholes are selected through stratified sampling criteria and inspected by Siemens. Including grid numbers and inspection dates will help to identify manhole events traced to the manholes recently inspected, manholes located along Pepco's Priority Feeders, and manholes with and adjacent to recent manhole events. This will enhance independent/third party validation and quality assurance of the manhole inspection program.*

110. *Pepco is DIRECTED to provide grid numbers consistent with paragraph 72 herein;*

As required by Order 16975, the grid numbers and Siemens' inspection dates have been included in the Manhole Event data reported below.

New Manhole Event Information

At the December 13, 2011 and February 16, 2012 PIWG meetings, it was decided that the following types of additional information related to manhole events would be included in future Consolidated Reports. The following categories of information have been included in this year's Consolidated Report.

- Incident Date
- Work Order/Request #
- Address
- Grid Number
- Feeder Number
- Manhole cover type (solid, slotted, roadway, round, sidewalk)
- Manhole Condition (clean, water below cable, water above cable, debris above cable)
- Voltage class (600V, 4kV, 13kV, 34kV, 69kV)
- Type of equipment (transformer, protector, cable, switch, straight joint, branch joint, trifurcating joint, transition joint, other)
- Equipment description: details specifics of the equipment such as size, insulation, phases, type of joint
- Repair description: details repair work
- A description of the failure mode (not previously recorded)
- A determination if the failure is a repeating event at this location (not previously recorded)

Pepco undertook a substantial database conversion during 2012 to make these additions to enhance summary reporting and analysis. The duration of the repair effort, which was outstanding in the database conversion effort as of the 2013 Consolidated Report, is now included within the database.

The listing of 2019 Manhole Events is provided in the following table.

Event #	Date	Facility ID	Address	Ward	Quad	Feeder	Event Type	Failure Type	Cable Size	Insulation	Manhole Cover	Dis placed Cover?	Manhole Size	Event Voltage
DC19-01	1/13/2019	790392-640484	1413 Q St NW	2	NW	14994	Fire	Secondary Cable	250 KCM	RN	Solid	Yes	3'x3'	120/208V
DC19-02	1/13/2019	791394-529914	2029 13th st NW	1	NW	15770	Smoke	Secondary Joint	250 KCM	RN	Slotted	No	3'x3'	120/240V
DC19-03	1/14/2019	792403-900701	830 Upshur St NW	4	NW	15197	Smoke	Secondary Cable	250 KCM		Solid	No	3'x3'	120/208V
DC19-04	1/14/2019	797379-118282	1252 Carrolsburg Pl SW	6	SW	16000	Smoke	Secondary Cable	#2 AWG	RN	Solid	No	2'3"x2'3"	120/240V
DC19-05	1/17/2019	800381-968694	7th & G St SE	6	SE	16327	Smoke	Primary Joint	500 KCM	PLC	Solid	No	6'x12'	13kV
DC19-06	1/19/2019	790402-570706	3922 14th St NW	4	NW	14722	Smoke	Secondary Cable	#2 AWG	RN	Solid	No	2'x2'5"x	120/208V
DC19-07	1/19/2018	796386-762777	400 New Jersey Ave. NW	6	NW	14414	Smoke	Secondary Joint	N/A	RN	Slotted	No	28'x28'	120/208V
DC19-08	1/23/2019	790393-415572	1420 S St NW	2	NW	15763	Smoke	Secondary Cable	250 KCM	RN	Solid	Yes	3'x3'	120/240V
DC19-09	1/25/2019	799383-774288	C St, 4th St, SE	6	SE	16003	Smoke	Primary Joint	#2 AWG	EPR	Solid	No	28'x28'	13kV
DC19-10	1/29/2019	801385-273127	720 A St NE	6	NE	15874	Fire	Secondary Joint	250 KCM	RN	Solid	Yes	3'x3'	120/208V
DC19-11	2/4/2019	799390-897038	R/O 1127 4th St NE	6	NE	14786	Smoke	Secondary Cable	2/0 AWG	RL	Solid	No	28'x28"	120/240V
DC19-12	2/5/2019	791383-928027	12th & D st SW	6	SW	211	Smoke	Secondary Cable	1/0 AWG	RL	Solid	No	28'x28"	120/208V
DC19-13	2/12/2019	798383-980828	2nd & Penn Ave. SE	6	SE	16003	Smoke	Secondary Cable	250 KCM	RN	Slotted	No	3'x3'	120/208V
DC19-14	2/12/2019	790387-848185	14th & Penn Ave. NW	2	NW	14565	Smoke	Secondary Cable	250 KCM	RN	Solid	No	5'X8'	120/208V
DC19-15	2/14/2019	780390-248879	35th & N St NW	2	NW	15996	Smoke	Secondary Cable	350 KCM	RN	Slotted	No	3'X3'	120/240V
DC19-16	2/20/2019	791388-673338	1250 H St. NW	2	NW	223	Smoke	Secondary Cable	250 KCM	RN	Solid	No	3'X3'	120/240V
DC19-17	2/27/2019	793415-830325	6907 6th St NW	4	NW	15695	Smoke	Primary Cable	600 KCM	PLC	Solid	Yes	6'x12'	13kV
DC19-18	2/28/2019	799383-342008	3rd & D St. SE	6	SE	16002	Smoke	Secondary Cable	#4 AWG	RL	Solid	No	6'x8'	120/240V
DC19-19	3/2/2019	803392-856150	1700 Block of W. Virginia Ave. NE	5	NE	15701	Smoke	Secondary Joint	250 KCM	RN	Solid	Yes	3'x3'	120/240V
DC19-20	4/8/2019	802381-290280	700 Block of 11th St. SE	6	SE	228	Smoke	Secondary Cable	250 KCM	RN	Grated	No	2'3"x2'3"	120/240V
DC19-21	4/28/2019	779400-317970	Wisconsin Ave & McComb St NW	3	NW	14325	Explosion	Secondary Cable	500 KCM	PLC	Solid	No	5.5'x12'	13kV
DC19-22	4/30/2019	793387-601890	701 G St NW	2	NW	15479	Smoke	Secondary Joint	#2 AWG	PLC	Slotted	No	5.5'x17'	13kV
DC19-23	5/24/2019	777399-105430	4100 Cathedral Ave NW	3	NW	15943	Smoke	Primary Cable	500 KCM	PLC	Solid	No	6'x10'	13kV
DC19-24	6/4/2019	801380-733893	8131 Str SE	6	SE	16320	Smoke	Equipment	#2 AWG	PLC	Solid	No	4'x7'	13kV
DC19-25	6/12/2019	783390-423362	29th & M St NW	2	NW	15401	Explosion	Equipment	N/A	N/A	Slotted	Yes	6'x20'	13kV
DC19-26	6/19/2019	782403-478176	3945 Connecticut Ave NW	3	NW	15867	Smoke	Primary Joint	#2 AWG	PLC	Solid	Yes	4'x7'	13kV
DC19-27	7/8/2019	788395-007313	18th & Wyoming Ave. NW	1	NW	14524	Smoke	Equipment	N/A	N/A	Solid	Yes	6'x20'	13kV
DC19-28	7/10/2019	805389-135408	Bladensburg Rd & Oates St NE	5	NE	15702	Fire	Primary Joint	500 KCM	PLC	Solid	Yes	6'x10'	13kV
DC19-29	7/14/2019	791400-833986	11th & Otis Pl NW	1	NW	14054	Fire	Secondary Cable	500 KCM	RN	Slotted	Yes	5'x5'	120/240V
DC19-30	7/17/2019	782402-175435	3042 Rodman St NW	3	NW	14146	Fire	Primary Joint	500 KCM	PLC	Grated	No	6'x12'	13kV
DC19-31	7/19/2019	792385-826503	800 Constitution Ave NW	2	NW	14603	Smoke	Primary Cable	#2 AWG	EPR	Solid	No	6'x12'	13kV
DC19-32	7/22/2019	787389-110299	20th & K St NW	2	NW	15420	Smoke	Primary Joint	600 KCM	PLC	Solid	Yes	6'x12'	13kV
DC19-33	7/23/2019	779399-290993	Woodley Rd & Wisconsin Ave NW	3	NW	14150	Smoke	Primary Joint	500 KCM	EPR	Solid	No	6'x12'	13kV
DC19-34	8/8/2019	791400-833986	11th & Otis Pl NW	1	NW	14054	Smoke	Secondary Cable	250 KCM	RN	Solid	No	5'x5'	120/240V
DC19-35	8/10/2019	794387-268739	6th & G St. NW	2	NW	14634	Smoke	Primary Joint	4/0 AWG	PLC	Solid	Yes	5'x12'	13kV
DC19-36	8/12/2019	793385-191638	9th & Constitution Ave NW	2	NW	14604	Smoke	Primary Joint	#2 AWG	PLC	Slotted	No	6'x5'	13kV
DC19-37	8/14/2019	798395-895882	2318 2nd St Ne	5	NE	14009	Smoke	Secondary Cable	2/0 AWG	PLC	Solid	No	2'x2'	120/208V
DC19-38	9/30/2019	796383-394326	Washington Ave & C St SW	6	SW	16002	Smoke	Primary Joint	600 KCM	EPR	Solid	Yes	6'x10'	13kV
DC19-39	10/2/2019	777404-351156	Van Ness & 41st St NW	3	NW	14327	Smoke	Primary Joint	500 KCM	PLC	Slotted	No	6'x12'	13kV
DC19-40	10/30/2019	788391-992752	1414 17th St. NW	2	NW	14391	Fire	Secondary Cable	250 KCM	PLC	Solid	Yes	4'x6'	13kV
DC19-41	10/30/2019	788391-921767	1414 17th St. NW	2	NW	14391	Fire	Secondary Cable	250 KCM	PLC	Solid	Yes	4'x6'	13kV
DC19-42	11/4/2019	786393-735830	Connecticut Ave & Bancroft Pl, NW	2	NW	14736	Smoke	Secondary Cable	#2 AWG	EPR	Solid	No	4'x4'	13kV
DC19-43	11/15/2019	778402-507822	3801 Rodman St. NW	3	NW	14136	Fire	Primary Joint	500 KCM	PLC	Solid	No	6'x12'	13kV

Table 3A-1

Event #	Date	Facility ID	Address	Description/Cause	Manhole Condition	Action Taken	Last Inspector	Repeat Event (last 3 years)
DC19-01	1/13/2019	790382-640484	1413 Q St NW	250k CM 3 phase cable burnt up in MH & duct line	Dirt	Replaced cable, replaced cable in MH	NA	No
DC19-02	1/13/2019	791384-528914	2029 13th St NW	Bare #2 and bare secondary joint causing smoke	Water above cable	re-tape cable and splice	3/23/2017	No
DC19-03	1/14/2019	792403-900701	830 Upsuhr St NW	failed 3 phase secondary mains	Clean	Replaced 3 phase secondary mains	11/20/2015	No
DC19-04	1/14/2019	797379-118282	1262 Carrolburg Pl SW	#2 RN/#2 BC	Clean	Made temporary repairs until customer receives heavy up	3/22/2017	No
DC19-05	1/17/2019	800381-988594	7th & G St SE	blown joint	water above cable	replace cable	NA	No
DC19-06	1/19/2019	790402-570706	3802 14th St NW	Duct line broke down	Clean	Place temporary splice above ground	NA	No
DC19-07	1/19/2018	796386-762777	400 New Jersey Ave NW	Street light #6 hvlink	Water above cable	Replaced faulted hvlink with the same, made perm. Repairs	NA	No
DC19-08	1/23/2019	790383-415672	1420 S St NW	Secondary mains burning	Clean	Install new 250RN secondary Cable	8/8/2014	No
DC19-09	1/25/2019	799383-774288	C St 4th St SE	Primary connection on test point module, blown elbow	Water below cable	Isolated fault by removing cable from switch to test point	5/8/2018	No
DC19-10	1/29/2019	801385-273127	720 A St NE	Remade Secondary joints on A & B Phase	Debris	Remade Secondary joints on A & B Phase	NA	No
DC19-11	2/4/2019	799390-897038	R/O 1127 4th St NE	Secondary mains burning	Debris	Had manhole cleaned and replaced from MH #799389-879038 to 799389-897928	6/28/2013	No
DC19-12	2/5/2019	791383-928027	12th & D St SW	1.0 lead cable burned in hole	Debris	Permanent repairs - hvlink	NA	No
DC19-13	2/12/2019	798383-980828	2nd & Penn Ave SE	Secondary mains burning	Debris	Removed 3 sets of 250RN and 1 set of 500RN that were burned with 500RN, perm. Repairs made	1/30/2017	No
DC19-14	2/12/2019	790387-848185	14th & Penn Ave NW	Replaced old cables that burned	Debris	Isolated 3 phase 250 mains in 790387-858185 making perm. Repairs	5/15/2012	No
DC19-15	2/14/2019	780390-248879	35th & N St NW	Secondary cable burned in MH under dirt	Debris	Remove 350k CM R/L mains, install 500k CM RN, made perm. Repairs	8/21/2012	No
DC19-16	2/20/2019	791388-873338	1260 H St NW	Secondary cable burn, conduit breakdown	Water above cable	Repair two sets of 250 RN cable & A 40 BC cable. There was a conduit breakdown which took additional hours to repair.	6/1/2017	No
DC19-17	2/27/2019	793415-830325	6907 6th St NW	Fault found in straight cable close to duct	Water below cable	Pulled in 830 feet of 3-C 500 flat, made 2 sets of joints	5/15/2012	No
DC19-18	2/28/2019	799383-342008	3rd & D St SE	burned secondary	Debris	isolated secondary cable one hole south	NA	No
DC19-19	3/2/2019	803392-858150	1700 Block of W. Virginia Ave. NE	Joint failure	Debris	Cleaned MH for safety, isolated MH from MH north of it, Remade 250 straight joint, return all load to normal	1/30/2013	No
DC19-20	4/8/2019	802381-290280	700 Block of 11th St SE	secondary cables burned	Water below cable	removed 60 2.0 RL and installed 250RN. Installed 600 250RN, 4.0 B/C	NA	No
DC19-21	4/28/2019	779400-317970	Wiscons in Ave & McComb St NW	Blown cable outside of branch	Water below cable	replace 680 feet of 500 PILC 3/c with 680 feet of 500 PILC 3/c	5/11/2017	No
DC19-22	4/30/2019	793387-601890	701 G St NW	Tape transition joint, 120' of #2 URD cables	Water below cable	Replace one transition joint & 3 elbows. Remove 1/c PILC 3ph #2 with 1/c URD 3ph #2.	12/19/2014	No
DC19-23	5/24/2019	777389-105430	4100 Cathedral Ave NW	feeder cables burned up	water below cable	made repairs	3/27/2013	No
DC19-24	6/4/2019	801380-733893	813 I St SE	blown #2 test caps	clean	Remade test caps	10/14/2015	No
DC19-25	6/12/2019	783390-423382	29th & M St NW	primary cabinet blew on network transformer	Water below cable	Made test caps, replace transformer	NA	No
DC19-26	6/19/2019	782403-478178	3945 Connecticut Ave NW	Blown 3/C straight joint	Water below cable	Replaced cable	12/20/2012	No
DC19-27	7/8/2019	788395-007313	18th & Wyoming Ave NW	primary cabinet blew on network transformer	Water below cable	Made test caps, replace transformer	7/18/2018	No
DC19-28	7/10/2019	805389-135408	Bladensburg Rd & Oates St NE	3 phase blown 500 heat shrink	Water above cable	Replaced cable due to MH fire, 78' 500 flat trap	8/18/2017	No
DC19-29	7/14/2019	791400-833898	11th & Ots Pl NW	Blown 500 legs spiders secondary mains	Clean	replaced cable 550 & 250	1/30/2017	No
DC19-30	7/17/2019	782402-175436	3042 Rodman St NW	Blown straight joint	Water below cable	Remove 600 PILC 3C, install 600 EPR 3-1/c flat strap cable R/S/C in MH 782402-175435 & 775366	NA	No
DC19-31	7/19/2019	792385-826503	800 Constitution Ave NW	Blown #2 heat shrink, joint blew in half	Water above cable	Remove 40 3/C PILC 600 3/c PILC. Install #2 URD, 600	6/5/2017	No
DC19-32	7/22/2019	787389-110299	20th & K St NW	Blown heat shrink branch joint	water below cable	flat strap. Remove branch, replace with H splices.	5/22/2017	No
DC19-33	7/23/2019	779399-290993	Woodley Rd & Wiscons in Ave NW	Blown joint	Debris	replace cables, repair joints	1/30/2017	Yes - 7/14/2019
DC19-34	8/8/2019	791400-833898	11th & Ots Pl NW	burned secondary and melted joints	Debris	made 4 to #2 URD heat shrink and #2 URD to #2 poly tape joints	10/20/2016	No
DC19-35	8/10/2019	794387-268739	6th & G St NW	Blown heat shrink	Water below cable	Replaced cable due to #2 to 4/0 splice blown in MH	NA	No
DC19-36	8/12/2019	793385-191638	9th & Constitution Ave NW	Blown heat shrink	Debris	Made temporary repairs	11/2/2017	No
DC19-37	8/14/2019	798395-896882	2318 2nd St NE	lead mains burned	Debris	replaced cable and spliced	NA	No
DC19-38	9/30/2019	798383-394326	Washington Ave & C St SW	Blown 3/C transition joint	Water below cable	Break down 2 branch joints, remove install cable R/S/C	8/3/2017	No
DC19-39	10/2/2019	777404-351156	Van Ness & 41st St NW	Blown branch joint	water below cable	removed 250 secondary, install 500 RN (involving feeders 14390, 14391, 14394, 14374	7/13/2016	No
DC19-40	10/30/2019	788391-992752	1414 17th St NW	burned secondary cables	clean	removed 250 secondary, install 500 RN (involving feeders 14390, 14391, 14394, 14374	2/13/2017	No
DC19-41	10/30/2019	788391-921787	1414 17th St NW	burned secondary cables	clean	Cut out splice and replaced cable to next manhole, remade splice	9/15/2016	Yes - 6/5/2018
DC19-42	11/4/2019	788393-736830	Connecticut Ave & Bancroft Pl NW	Blown splice on straight joint	Water below cable	Remade tape joint	NA	No
DC19-43	11/15/2019	778402-507822	3801 Rodman St NW	Blown transition joint	Clean			

Table 3A-2

Notes:
 43 events :15 primary (12 S, 3 F, 0 E), 25 secondary (19 S, 5 F, 1 E), 3 Equipment (2 S, 0 F, 1 E)
 9 events involved slotted manhole covers (7 S, 1 F,1 E),
 32 events involved solid manhole covers (25 S,6 F, 1 E)
 2 events involved grated manhole covers (1 S, 1 F, 0 E)

Event category breakdown:

Smoking manholes	33	
Manhole fires	8	
Manhole explosions	2	
Total:	43	

Northwest	29	Georgetown:	2
Northeast	5		
Southwest	3		
Southeast	6		
Total:	43		

Events Summary 13kV
 40 events : 15 primary (12 S, 3 F, 0 E), 22 secondary (16 S, 5 F, 1 E) , 3 Equipment (2 S, 0 F, 1 E)

Event category breakdown:

Smoking manholes	30		
Manhole fires	8		
Manhole explosions	2		
Total:	40	Georgetown:	1

Events Summary 4kV
 3 events : 0 primary (0 S, 0 F, 0 E), 3 secondary (3 S, 0 F, 0 E),

Event category breakdown:

Smoking manholes	3		
Manhole fires	0		
Manhole explosions	0		
Total:	3	Georgetown:	0

Events Summary 69kV
 0 events :0 primary (0 S, 0 F, 0 E)

Event category breakdown:

Smoking manholes	0		
Manhole fires	0		
Manhole explosions	0		
Total:	0	Georgetown:	0

a/ Transformer
 b/ Network Transformer

<u>First Quarter 2019 - Summary</u>		<u>Third Quarter 2019 - Summary</u>	
Insulation Deterioration by Cable Type:		Insulation Deterioration by Cable Type:	
Paper Insulated Lead Cable (PILC)	2	Paper Insulated Lead Cable (PILC)	6
Rubber Lead (RL)	3	Rubber Lead (RL)	0
Rubber Neoprene (RN)	13	Rubber Neoprene (RN)	2
Ethylene Propylene Rubber (EPR)	1	Ethylene Propylene Rubber (EPR)	3
Cross Link Polyethylene (XLP)	0	Cross Link Polyethylene (XLP)	0
Other (Braided)	0	Other (Braided)	0
Other	0	Other (URD)	0
Non-Pepco	0	Non-Pepco	0
Non-Cable related	1 a/	Non-Cable related	1 b/
TOTAL	20	TOTAL	11
<u>Second Quarter 2019 - Summary</u>		<u>Fourth Quarter 2019 - Summary</u>	
Insulation Deterioration by Cable Type:		Insulation Deterioration by Cable Type:	
Paper Insulated Lead Cable (PILC)	5	Paper Insulated Lead Cable (PILC)	4
Rubber Lead (RL)	0	Rubber Lead (RL)	0
Rubber Neoprene (RN)	1	Rubber Neoprene (RN)	0
Ethylene Propylene Rubber (EPR)	0	Ethylene Propylene Rubber (EPR)	1
Cross Link Polyethylene (XLP)	0	Cross Link Polyethylene (XLP)	0
Other (Braided)	0	Other (Braided)	0
Other (URD)	0	Other	0
Non-Pepco	0	Non-Pepco	0
Non-Cable related	1 a/	Non-Cable related	0
TOTAL	7	TOTAL	5

Table 3A-3

Appendix 3B: 2019 Manhole Inspection Program⁷⁹

⁷⁹ In Order No. 11716, the Commission stated the following:

PEPCO is hereby directed to include the following information in its [manhole inspection] reports beginning in July 2000:

- 1. The general location of the manholes inspected, including the street or streets where the manholes are located and the blocks bounding the street, e.g., M Street, NW, between 23rd and 28th streets;*
- 2. The number of manholes inspected in the month, broken down as to the number of manholes containing primary cables only, both primary and secondary cables, and secondary cables only;*
- 3. The number of primary cable problems found;*
- 4. The number of secondary cable problems found;*
- 5. The type of cable problems found in each manhole, categorized as to the physical degradation or damage of the cable, overheating, overloading, damaged splice and deteriorated cable or splice due to age;*
- 6. The number of manholes with problems;*
- 7. The corrective actions taken for each cable and manhole problem found; and*
- 8. Other general condition of the manhole such as whether it contained water, oil, grease, debris, and whether the manhole cover and the manhole are in good mechanical condition.*

APPENDIX 3B - MANHOLE INSPECTION PROGRAM (MIP)

Pepco began development of its manhole inspection program in 1999. By the end of 2006, Pepco had performed a total of 79,295 inspections, completing Phase I. Phase II of the Company's Manhole Inspection Program began in 2007 and was completed in the first quarter of 2013 with a total of 69,670 inspections. Phase III of the Company's Manhole Inspection Program began in 2013 and was completed in 2018 with a total of 66,836 inspections. Phase IV of the manhole inspection program is currently underway. A total of 9,877 manholes were inspected in 2019 as part of Phase IV. Pepco is required to inspect all of its approximately 60,000 manholes over a six-year cycle, which equates to approximately 10,000 per year.

Manhole inspections represent a significant undertaking that involve the visual assessment of the underground manholes and vaults and the equipment contained in them, taking load readings of low voltage cables and reviewing the integrity of cable splices. Supervisory personnel review records and corrective actions are identified and tracked. Data obtained during the inspections can be used to ascertain whether the secondary cables are overloaded or are likely to be overloaded under peak load conditions using appropriate de-rating factors and factors to simulate peak conditions. Inspections are also designed to identify load variations between phases which could indicate possible imbalanced conditions. By identifying such instances and taking appropriate actions, Pepco will continue to improve and maintain the reliability of its system.

Pepco's Manhole Inspection Program (MIP) inspection priority scheme previously consisted of four remediation time frames as shown below. The four-priority remediation scheme, in place since October 2001, was renumbered at the beginning of 2004 from 0-3 to 1-4 to coincide with other Company maintenance activities.

Inspection Priority Definitions (2019-Present)

- **Priority 1 (Urgent):** Corrective action required immediately, or within 5 days:
Perform repairs immediately or within 5 days where the identified deficiencies have caused outages, or present imminent risk of causing outages, or serious safety or environmental risk.
 - Cable smoking
 - Joint smoking

- Insulation damage – Bare Conductor
 - Burnout visible
 - Loading greater than 140% of rating
 - Heating greater than 200° F
 - Elevated Gas Readings Reported to Gas Company
- **Priority 2:** Corrective action required within 6 months of inspection
- Insulation damage
 - Loading between 120% and 140% of rating
 - Heating between 175° F and 200° F
 - Open limiters
- Assess cable leak, joint swelling, joint leaking, deformed joint, and neutral corroded condition information to determine Priority 2 or 3.
- **Priority 3:** Corrective action required within 12 months of inspection
- Braided cable
 - Loading between 100% and 120% of rating
 - Heating between 150° F and 175° F
- Assess upright support condition information to determine Priority 3 or 4.
- **Priority 4:** Corrective action required within 18 months of inspection
- Re-racking primary cables and secondary cables
 - Cables not secured
 - Structural repairs
 - Retag feeders and buses
- **Non-Reportable Referrals:**
- Water
 - Debris
 - Cracked wall
 - Other

Exelon Utilities Corrective Maintenance Prioritization

As a result of the merger, new procedures and processes are in place across the Pepco region for planning and prioritizing corrective maintenance activities. Beginning in 2019, Pepco has adopted the Exelon work screening and prioritization practices in the manhole inspection program. All corrective maintenance reportable conditions (CMs) are classified into one of four categories under the Exelon model: P10, P20, P30, or P40. A description of each deficiency is shown below.

P10: Immediate response required; work item until complete or until corrective actions allow the downgrading of the priority. Priority 10 CMs should not exceed 3 days. These items have a direct and immediate impact to safety, SAIFI, or SAIDI.

P20: Priority 20 CMs are usually completed within 14 days and should not exceed 30 days. corrective plans shall be created for Priority 20 CMs that exceed 30 days. These items have a high probability of affecting SAIFI, SAIDI, or safety.

P30: Priority 30 CMs are typically completed within 9 months and should absolutely not exceed 1 year. A corrective plan shall be created for priority 30 CMs that exceed 1 year. These items have a moderate probability of affecting SAIFI or CAIDI if not addressed within a years timeframe. For priority 30 CMs that require completion before the 9 month target, an agreed upon need date shall be established through the work screening process. All changes in proposed need date require approval.

P40: Work not meeting the criteria for a P10, P20, or P30 shall be considered a P40 and completed not to exceed the predominant maintenance cycle interval. Impact on SAIFI or CAIDI would only result if the condition rapidly degrades. A priority 40 CM shall not exceed 1 year past the determined preventative maintenance cycle for the associated equipment class.

In 2019 and early 2020, Pepco provided several updates and briefings on its manhole inspection program, practices, and new inspection contract.

Current Program Status

During 2019, the MIP has identified the following remediation Priorities:

		Percentage of CY 2019
	<u>Priorities Count</u>	<u>Priorities</u>
Priority Code 10	70	3%
Priority Code 20	45	2%

Priority Code 30	17	1%
Priority Code 40	1949	94%

Inspectors are conducting more comprehensive and thorough inspections which have resulted in a substantial increase in Priorities found. In 2019, approximately 21% of the manholes inspected revealed potential areas of concern that have been or are in the process of being addressed. Figure 3.2-B1 provides a graphical representation of the number of manholes and the percentage of overall inspections with priority conditions during Phase IV.

Phase IV - Inspection Priorities

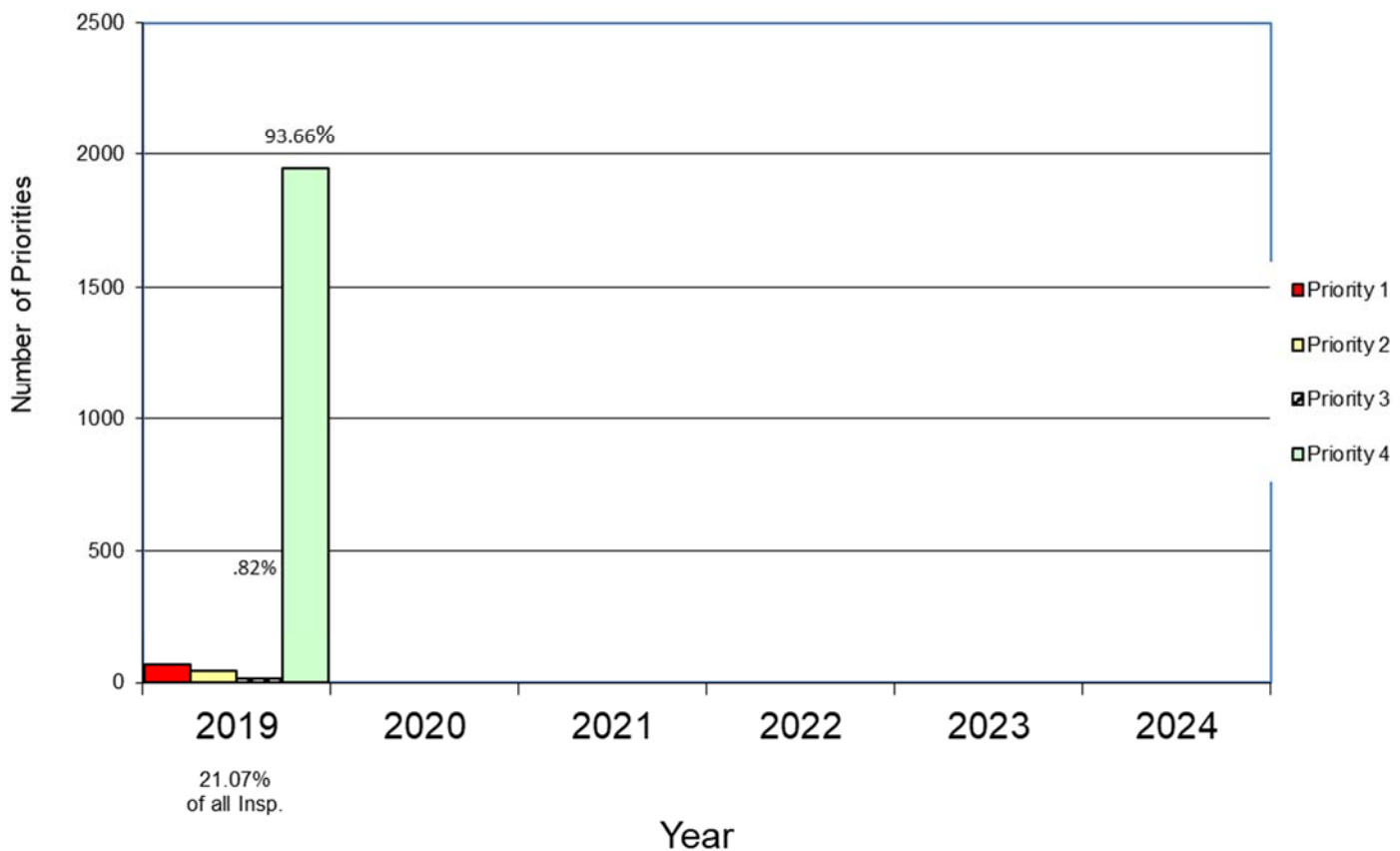


Figure 3.2-B1: Manhole Inspection Priorities – Phase IV

With the implementation of the Manhole Inspection Quality Control (QC) Program, inspection Priorities have increased from 155 in 2006 to 2,081 Priorities in 2019. The majority of the increase is related to Priority 4 conditions, which are not considered an imminent risk and must be remediated within 24 months.

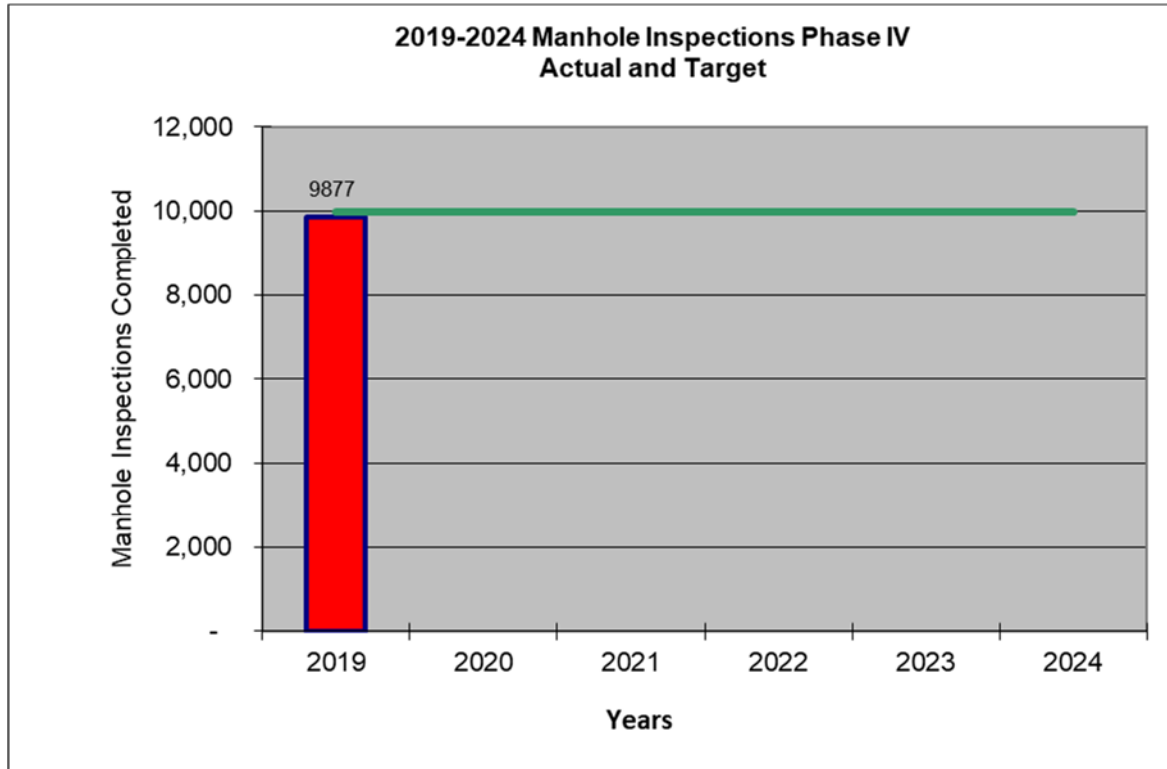


Figure 3.2-B2: Manhole Inspections Completed – Phase IV

In 2017, a comprehensive analysis on the manhole population in the District was performed using GIS extracts. Using these records, a more efficient inspection plan was created for the next complete cycle in the District. Additionally, the tracking mechanism for manhole inspections was changed for inspections occurring in 2018 and forward. Previously, inspections were assigned on a 1,000’ x 1,000’ “plat” basis rather than by individual manholes. This left room for gaps and a small number of missing inspections. Moving forward, all manhole inspections will be tracked on an individual manhole level, leaving no room for errors or missing inspections.

With the new GIS extract that was performed, a grouping of manholes based on geographic location was performed in order to solidify the inspection plan for the next 6 years. Figure 3.3 below shows the manhole inspection map of the District for years 2018-2023. Each colored region has an equivalent number of manholes within it, equally divided between 6 inspection years. This plan will improve the crew efficiency and future corrective maintenance work planning as crews won’t be moving all across the city during one year.

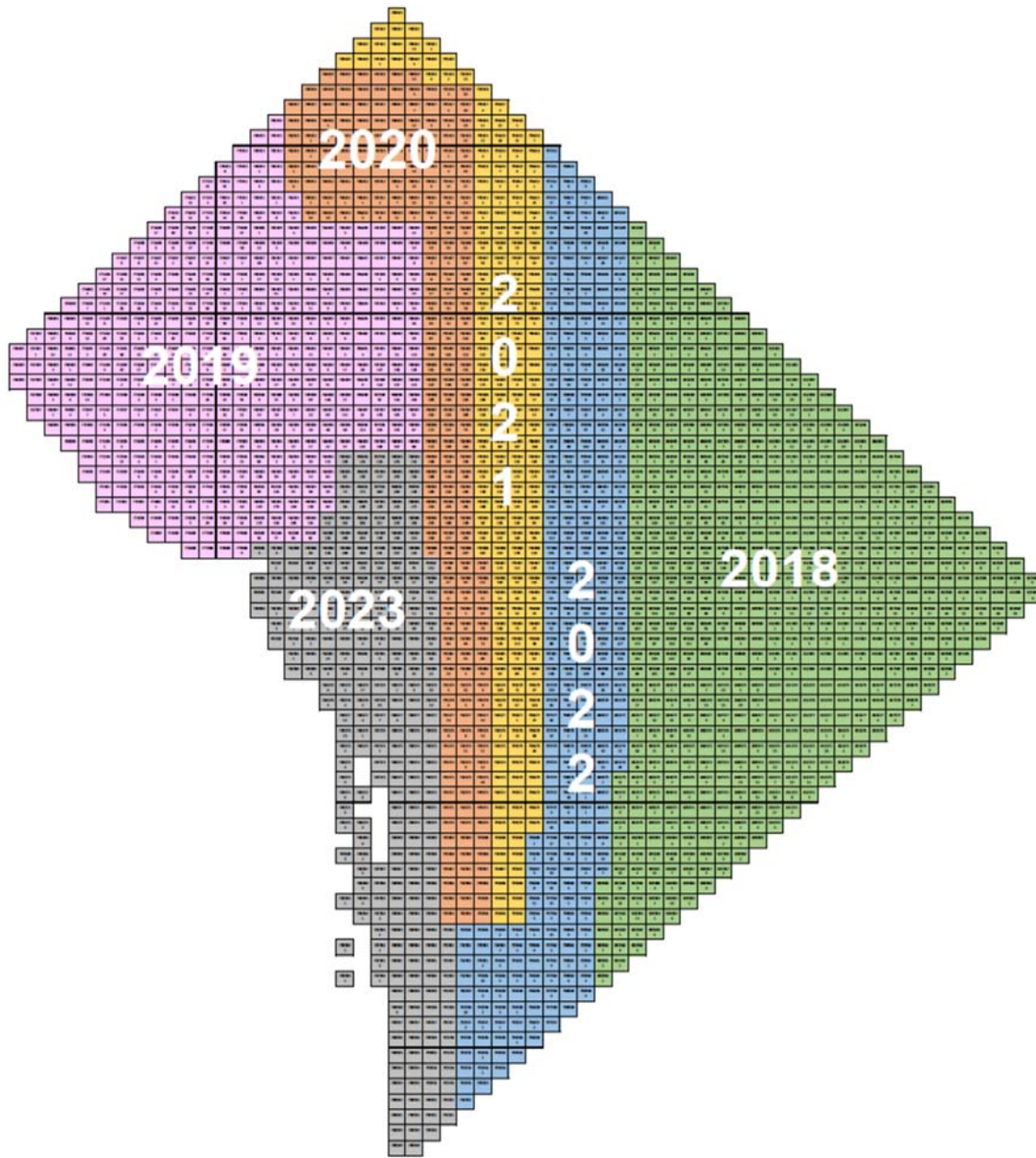


Table 3.3: 2018-2023 Manhole Inspection Plan

Quality Control Program

The Commission’s technical consultant, Siemens, conducted 215 manhole inspections between July and September 2007. As a result of Siemens’ findings, the Company initiated a Quality Control (QC) Program. Effective August 27, 2007, Pepco instituted a QC Program for its Manhole Inspection Program to minimize internal data inconsistencies. The QC Program uses a statistically valid sampling plan based upon Military Standard 105E. Since on average Pepco inspects 2,500

manholes per quarter, the lot size parameter used is “1201 to 3200” with an Acceptable Quality Level (“AQL”)⁸⁰ equal to 2.5%.

Utilizing the “Double” sampling procedure, Pepco will re-inspect 80 manholes per quarter. If the number of non-conforming items is three (3) or less, the lot is accepted. However, if the number of non-conforming items is seven (7) or more, the entire lot will be rejected and all manholes for the quarter will be reinspected.

If the number of non-conforming items is between four (4) and six (6) inclusive, 80 additional manholes will be reinspected. If the total number of non-conforming items (sum of nonconforming items in both samples) is eight (8) or less, the lot is accepted. However, if the total number of non-conforming items is nine (9) or more, the entire lot will be rejected and all manholes for the quarter will be reinspected. See Figure 3.2B-3.

⁸⁰ It is common to use an AQL of 1% for major defects, and 2.5% for minor defects. Values of AQL that are 10% or less are suitable for percent nonconforming or nonconformities per 100 items. Values of AQL over 10% are only suitable for nonconformities per 100 items. Source: www.sqconline.com

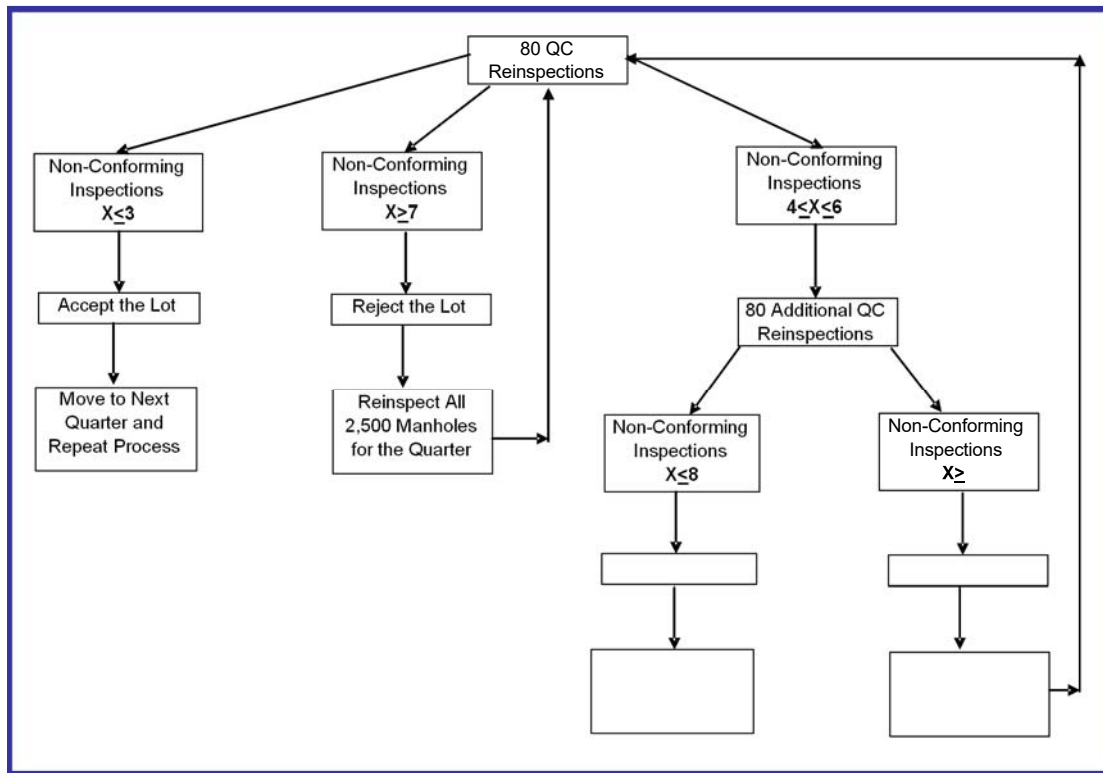


Figure 3.2-B3: QC Program Process Diagram

(“AQL”) equal to 2.5%, Pepco’s quarterly QC inspections have been accepted since the third quarter of 2007. Specifics for the 2019 QC Program results are as follows:

2019 QC Program Results

1 st Qtr. 2019	Accepted: No Failures
2 nd Qtr. 2019	Accepted: No Failures
3 rd Qtr. 2019	Accepted: No Failures
4 th Qtr. 2019	Accepted: No Failures

The following criteria must be satisfied in order for the manhole inspection to be considered acceptable.

- The reportable conditions recorded must be consistent with those found during re-inspection. If a reportable condition has been remedied prior to the re-inspection, the QC inspection will consist of verifying the repair.
- The inspection record must contain (1) grid number location and (2) cover type. Both of these fields must be accurate.

Other items that should be accurate and included on the inspection form but are not grounds for rejecting the inspection include the (1) inspector's name, (2) date of inspection, (3) gas percentage reading, (4) cover size, (5) manhole size and (6) manhole type. If one of these items is either inaccurate or missing from the inspection form, the inspector responsible will be notified and discussions on performance improvements will be conducted.

Although Pepco is pleased with the 2019 results, the Company is fully aware that the success of the QC Program can only be measured over sustained periods of time. As such, Pepco is committed to the QC Program to ensure the accuracy, reliability and thoroughness of its manhole inspection program.

Appendix 3C: Network Accuracy Procedure Report⁸²

⁸² In Order No. 16709 paragraphs 9 and 10, the Commission ordered the following:

9. *The Commission is satisfied that Pepco has developed a reasonable plan to ensure that its underground cables are adequately sized for existing and future loads. However, we do want to monitor Pepco's diligence in performance and the results of implementation of its network modeling, GIS updates, and timely network technology improvements going forward. We, therefore, direct the Company to file periodic reports to keep the Commission and interested parties apprised of the status of several ongoing projects as follows:*
 - a. *Pepco is directed to provide a detailed status report on those eight networks that are currently undergoing analysis under the Company's Network Accuracy Procedure including the corrective actions that were identified by December 2011. This report on the eight networks should be added to the Company's 2012 Consolidated Report or filed as a Supplement to the 2012 Consolidated Report if the 2012 Report has already been filed or it is too late to include it for publication in the 2012 Report; and*
 - b. *Pepco is directed to file a detailed status report on the results of its modeling and analysis and the implementation of its remedial actions on all of its remaining networks under its Network Accuracy Procedure. This report on the remaining networks should also be added to the 2012 Consolidated Report (or filed as a Supplement to the 2012 report if the 2012 Report has already been filed or it is too late to include it for publication in the 2012 Report) with updates in each subsequent year's report. The status report on those remaining networks shall include corrective actions that have been scheduled and those that have been completed.*

THEREFORE, IT IS ORDERED THAT:

10. *Pepco shall comply with the directives set forth in paragraph 9 herein.*

Network Accuracy Procedure Report

I. Status Report of the Analysis of the Remaining District of Columbia Networks, in Accordance with the Network Accuracy Procedure.

As reported in 2019, all investigations of Pepco's LVAC networks in the District of Columbia have been completed. Pepco has adopted the network accuracy procedure and intends to continue reviewing the accuracy of the LVAC networks, however Pepco will not report further on this procedure's results in the ACR.

PART 4: REFERENCES

SECTION 4.1 – ABBREVIATIONS AND ACRONYMS

2005 Plan	-	Vegetation Management Plan for Utility Tree Pruning – D.C.
A&G	-	Administrative & General
AC	-	Alternating Current
ACR	-	Automatic Circuit Reclosers
AFP	-	Assist Fire/Police
AMI	-	Advanced Metering Infrastructure
ANSI	-	American National Standards Institute
AQL	-	Acceptable Quality Level
ASR	-	Automatic Sectionalizing and Restoration
CAD	-	Computer Aided Design
CAIDI	-	Customer Average Interruption Duration Index
CBM	-	Condition Based Maintenance
CIC	-	Crisis Information Center
CIS	-	Customer Information System
CMT	-	Crisis Management Team
COG	-	Council of Governments
COOP	-	Continuity of Operations
CPI	-	Composite Performance Index
CRP	-	Comprehensive Reliability Plan
DA	-	Distribution Automation
D.C.	-	District of Columbia
DDOT	-	District of Columbia Department of Transportation
DGA	-	Dissolved Gas in oil Analysis
DOE	-	Department of Energy
DOT	-	Department of Transportation
DPWT	-	Department of Public Works and Transportation
DRTU	-	Digital Remote Terminal Unit
E	-	Manhole Explosion
ECA	-	Equipment Condition Assessment
EMA	-	Emergency Management Agency
EMF	-	Electromagnetic Field
EMS	-	Energy Management System
EOC	-	Emergency Operations Center
EOP	-	Emergency Operations Plan
EPR	-	Ethylene Propylene Rubber cable
EPRI	-	Electric Power Research Institute
EQSS	-	Electricity Quality of Service Standards
ERIP	-	Emergency Restoration Improvement Project
ETR	-	Estimated Time of Restoration
F	-	Manhole Fire
FAA	-	Federal Aviation Administration
FEMA	-	Federal Emergency Management Agency

FERC	-	Federal Energy Regulatory Commission
FTE	-	Full Time Equivalent
GIS	-	Geographic Information System
GWD	-	Graphical Work Design
GWh	-	Gigawatt-hour
HMPE	-	High Molecular weight Polyethylene
HSEMA	-	Homeland Security and Emergency Management Agency
HVCA	-	High-Volume Call Answering
IEEE	-	Institute of Electrical and Electronics Engineers
ICS	-	Incident Command System
IMT	-	Incident Management Team
ISA	-	International Society of Arboriculture
IST	-	Incident Support Team
kV	-	Kilovolt
LTC	-	Load Tap Changer
LVAC	-	Low Voltage Alternating Current (Network)
MDS	-	Mobile Dispatch System
MDT	-	Mobile Data Terminal
MED	-	Major Event Day
MIP	-	Manhole Inspection Program
MOV	-	Metal Oxide Varistor
MVA	-	Megavolt Ampere
MVAR	-	Megavolt Ampere Reactive
MWh	-	Megawatt-hour
NERC	-	North American Electric Reliability Corporation
NIMS	-	National Incident Management System
NOC	-	Network Operating Center
NOFR	-	Notice of Final Rulemaking
OCB	-	Oil Circuit Breaker
OH	-	Overhead
O&M	-	Operations and Maintenance
OMS	-	Outage Management System
OPC	-	Office of the People's Counsel
OTR	-	Office of Tax and Revenue
P&A	-	Planning & Analysis
PAC	-	Phase Angle Control or Pre-assembled Aerial Cable
PCA	-	Palisades Citizens Association
PCB	-	Polychlorinated Biphenyls
PDM	-	Predictive Maintenance
Pepco	-	Potomac Electric Power Company
PH	-	Pepco Holdings LLC
PIP	-	Productivity Improvement Plan
PIWG	-	Productivity Improvement Working Group
PILC	-	Paper Insulated Lead Cable
PJM	-	PJM Interconnection
PLC	-	Power Line Carrier
PNB	-	Prospective New Business report
QC	-	Quality Control

RCM	-	Reliability Centered Maintenance
RE	-	Reportable Event
RFC	-	Reliability First Corporation
RL	-	Rubber Lead
RN	-	Rubber Neoprene
ROW	-	Right of Way
RPTA	-	Real Property Tax Administration
RTO	-	Regional Transmission Organization
RTU	-	Remote Terminal Unit
S	-	Smoking Manhole
SAIDI	-	System Average Interruption Duration Index
SAIFI	-	System Average Interruption Frequency Index
SCADA	-	Supervisory Control and Data Acquisition
SEC	-	Security Exchange Commission
SGIG	-	Smart Grid Investment Grant
SMECO	-	Southern Maryland Electric Cooperative
SOS	-	Standard Offer Service
StormMan	-	Oracle Storm Management module/function
T&D	-	Transmission and Distribution
TGR	-	Tree Growth Regulator
TOA	-	Transformer Oil Analyst
UFA	-	Urban Forestry Administration
UG	-	Underground
URD	-	Underground Residential Distribution
VAR	-	Volt-ampere Reactive
VLf	-	Very Low Frequency
VM	-	Vegetation Management
WMIS	-	Work Management Information System
XLPE	-	Cross Link Polyethylene

SECTION 4.2 – TECHNICAL TERMS AND DIAGRAMS

This section contains definitions, explanations and diagrams used in discussing electric system operations, design characteristics, and performance.

Alternating Current (AC)

A current, which reverses at regularly recurring intervals of time and that has alternately positive and negative values.

Ampere

The "ampere" is the basic unit of current equal to the flow of one coulomb of charge passing a point in one second. It is also the amount of current that is allowed to flow when a difference of potential of one volt is applied to a resistance of one ohm.

Ampere-hour

The flow of current per hour. Ten ampere-hours is equal to the flow of 10 amperes for a period of one hour or the flow of one ampere for ten hours.

Arrester

A device that provides an alternate path for surge currents caused by over-voltage resulting from lightning or switching surges.

Battery

Two or more cells electrically connected for producing electric energy. A device that transforms chemical energy into electric energy.

Cable Joint

A connection between two or more separate lengths of cable with the conductors in one length connected individually to conductors in other lengths and with the protecting sheaths so connected as to extend protection over the joint.

Cable Rack

A device usually secured to the wall of a manhole, cable raceway, or building to provide support for cables.

Cable Splice

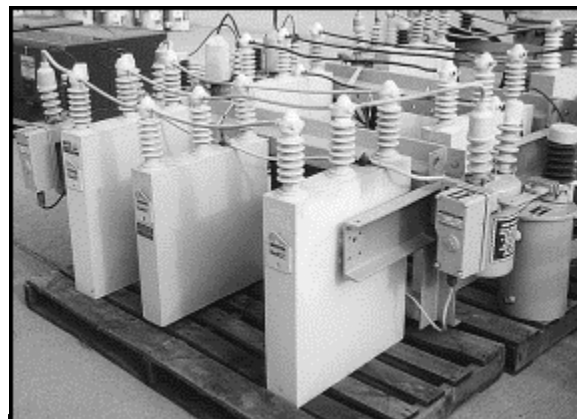
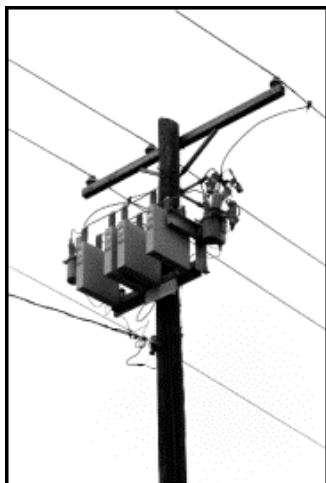
See Cable Joint

CAIDI (Customer Average Interruption Duration Index)

Represents the average time required to restore service to the average customer per sustained interruption. Mathematically equal to SAIDI divided by SAIFI.

Capacitor

An electrical device for storing a charge of electricity and returning it to the line. It is used to balance the inductance of a circuit, since its action is opposite in phase to that of inductive apparatus; it throws the current ahead of the electromotive force in phase. It is made of alternate plates of tinfoil and insulating material. The size of plates and the thickness of insulating material determine the capacity for holding electric charge. Capacity is measured, practically, in micro-farads, millionths of a farad.



Capacitors

Circuit

A conductor or system of conductors through which an electric current is intended to flow.

Circuit Breaker

A device designed to open and close a circuit by non-automatic overload of current without damage to itself when properly applied within its rating.

Conductor

A material that allows the flow of electricity; a metal wire, in the center of an electrical cable, through which current flows.

Conduit

A pipe, most often made of polyvinyl chloride, used for the installation of cables underground.

CPI (Composite Performance Index)

A distribution feeder performance measuring index created by combining 4 industry standard reliability indicators. The indicators used in CPI are Number of Interruptions (NI), Number of Customer Hours of Interruption (CHI), System Average Interruption Frequency (SAIF) and System Average Interruption Duration (SAID).

Cycle

One complete set of positive and negative values of an alternating current.

Duct

A single enclosed runway for conductors or cables.

Duct Bank

An arrangement of conduit providing one or more continuous ducts between two points.

Efficiency

The ratio of the useful output to the input of energy, power, quantity of electricity, etc.

Fault Current

A current that flows from one conductor to ground or to another conductor owing to an abnormal connection (including an arc) between the two. Note: A fault current flowing to ground may be called a ground fault current.

Fuse

An electrical safety device consisting of, or including, a wire or strip of fusible metal that melts and interrupts the circuit when the current exceeds a particular amperage.

Fuse Cutout

A device that is used to de-energize and re-energize components. A fuse cutout contains a fuse, which protects the line and components from the effect of overloads and faults.

Fuse Element

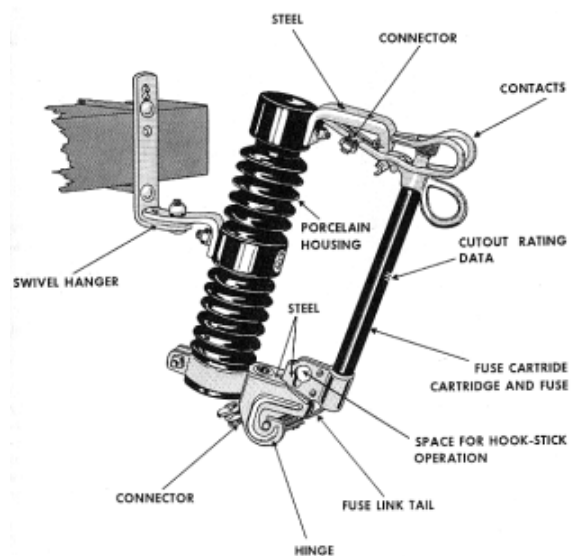
The part of a fuse that melts and interrupts the circuit when excessive current flow occurs.

Ground

A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth or to some conducting body that serves in place of the earth.

Inductance

The process that produces a voltage due to interaction of a conductor, a magnetic field, and relative motion between them.



Insulator

A material that offers a great deal of resistance to electron flow.

Kilowatt-Ampere (kVA)

The unit of apparent power in alternating current circuits as distinguished from kilowatts which represent true power.

Kilowatt (kW)

A unit of electric power equal to one thousand watts.

Kilowatt-hour (kWh)

The work performed by one kilowatt of electric power during one hour.

Lightning Arrester

A device that has the property of reducing the voltage of a surge applied to its terminals by the surge current to ground. It is capable of interrupting follow current if present and restores itself to original operating conditions.

Load Factor

The ratio of the average load over a designated period of time to the peak load occurring in that period.

Low Voltage (LV)

600 volts and lower.

Manhole

A subsurface chamber, large enough for a man to enter, in the route of one or more conduit runs and affording facilities for placing and maintaining in the runs, conductors, cables, and any associated apparatus.

Megawatt (MW)

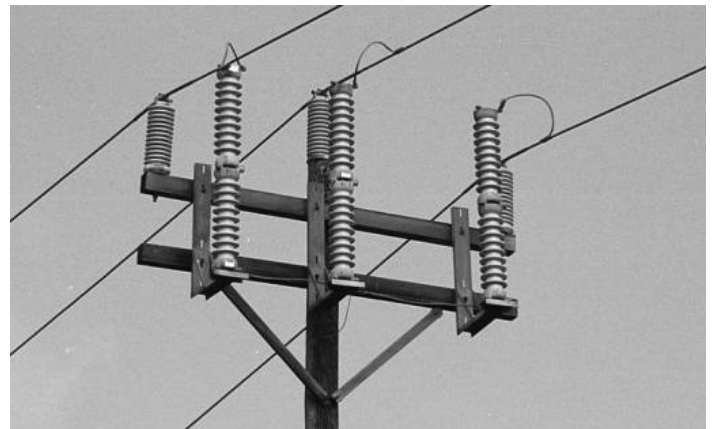
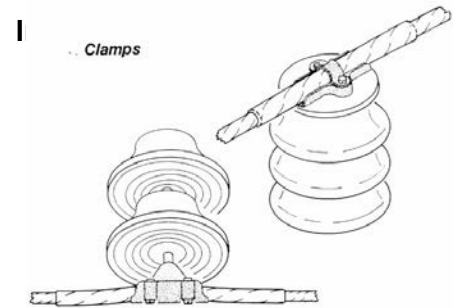
One million watts.

Network

An aggregation of interconnected conductors consisting of feeders, mains, and services.

Overload

A load greater than the rated load of an electrical device.



Paper-Insulated Lead Cable (PILC)

A primary cable designed with paper insulation wrapped around a shielded conductor and covered with a flexible lead covering.

Phase

The relative time of change in values of current or electromotive force. Values that change exactly together are in phase. Difference in phases is expressed in degrees, a complete cycle or double reversal being taken as 360 deg. A 180-deg phase difference is complete opposition in phase.

Polychlorinated Biphenyls (PCB)

A toxic environmental contaminant requiring special handling and disposal in accordance with US Environmental Protection Agency Regulations. No longer used in transformers.

Pothead

A device used to protect the connection between a URD and an overhead system. A pothead also provides a termination for the URD cable insulation.

Power

The rate of doing work or the rate of expending energy. The unit of electrical power is the watt. Power is calculated by multiplying current time voltage.

Power Factor (pf)

The ratio of the actual power of an alternating current as measured by a wattmeter, to the apparent power, as indicated by ammeter and voltmeter reading. The power factor of an inductor, capacitor or insulator is an expression of their losses. The ratio of total watts to the total root-mean-square (RMS) volt-amperes. It is a mathematical term whose value is less than or equal to unity, or one. This term is used to show the relationship between volt-amperes (which is the basis for rating transformers, generators, etc.) and watts which is the measure of usable power delivered. A low power factor results in a lower usable power delivery or consumption for a given value of electric current than would result with a high power factor. The result of a low power factor is higher losses through the wires, cables, and other electrical apparatus.

$$pf = \frac{\sum \text{Watts}}{\sum \text{RMS Volts} \times \text{Amperes}}$$

Preassembled Aerial Cable (PAC)

Preassembled Aerial Cable (PAC) is an installation of three single underground cables triplexed together and installed on the overhead distribution system in heavily wooded areas. Each of the three conductors is a fully insulated cable grouped together in a package that is supported by a metallic messenger. The installation is more robust than tree wire and has the ability to withstand falling tree limbs.

Primary Circuit

The higher voltage circuit in a URD system that carries power to the transformers.

Protective Relay

A relay whose function is to detect conditions of an abnormal or dangerous nature and to initiate appropriate control circuit action.

Reactive Power

The product of voltage and the out-of-phase component of alternating current, generally measured in kilovars (kVAR). Reactive power decreases the substation's ability to deliver real power and increases system losses.

Reactor

A device, the primary purpose of which is to introduce reactance into a circuit.



230 kV Reactor

Real Power

The rate, generally measured in kilowatts (kW), of generating, transferring, or using energy. The power which serves the customers' end-use electrical devices and the power for which the customer is metered.

Relay

An electric device that is designed to interpret input conditions in a prescribed manner and, after specified conditions are met, to respond to cause contact operation or similar abrupt change in associated electric control circuits.

Remote Terminal Unit (RTU)

A device that controls substation equipment.

SAIDI (System Average Interruption Duration Index)

Average time customers are interrupted. Mathematically equal to the sum of Customer Interruption Hours divided by Total Number of Customers Served.

SAIFI (System Average Interruption Frequency Index)

Average frequency of sustained interruptions per customer. Mathematically equal to the sum of Number of Customer Interruptions divided by Total Number of Customers Served.

SCADA (Supervisory Control and Data Acquisition) System

A system that allows dispatchers to monitor and control substation equipment from a central location; also provides documentation for record keeping.

Secondary

Referring to the energy output side of transformers or the conditions (voltages) usually encountered at this location.

Short-Circuit

An abnormal connection of relatively low resistance, whether made accidentally or intentionally, between two points of different potential in a circuit.

Splice

A joint used for connecting in series, two lengths of conductor or cable.

Substation

An assemblage of equipment for purposes other than generation or utilization, through which electric energy in bulk is passed for the purpose of switching or modifying its characteristics. Note: A substation is of such size or complexity that it incorporates one or more buses, a multiplicity of circuit breakers, and usually is either the sole receiving point of commonly more than one supply circuit, or it sectionalizes the transmission circuits passing through it by means of circuit breakers.



Mobile Substation

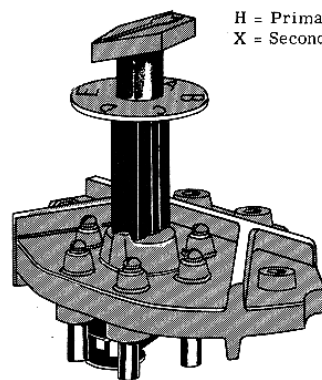
Switchgear

A general term covering switching and interrupting devices and their combination with associated control, metering, protective, and regulating devices, also assemblies of these devices with associated interconnections, accessories, enclosures, and supporting structures, used primarily in connection with the generating, transmission, distribution and conversion of electric power.

Tap

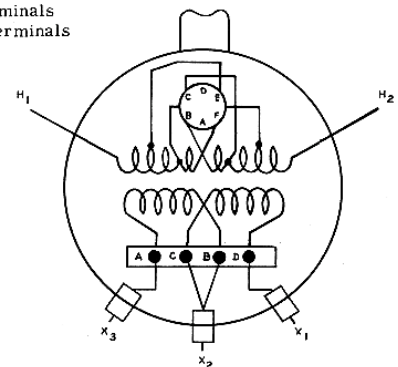
Connections that allow a transformer’s turns ratio to be adjusted by adding turns to or subtracting turns from the transformer’s primary or secondary winding. A connection brought out of a winding at some point between its extremities to permit changing the voltage or current ratio (general). An intermediate point in an electric circuit where a connection may be made.

A Tap Changer is Used to Adjust the Turns Ratio of a Transformer



No Load Tap Changer

H = Primary Terminals
X = Secondary Terminals



Typical Internal Wiring of Transformer with Tap Changer

Tap Changer

A device for changing the turns ratio of a transformer.

Telemetry

Transmission of intelligence such as meter readings over a fairly long distance, usually from stations to the dispatcher's office, by direct wire or carrier current.

Three-Phase Circuit

A combination of circuits energized by alternating voltages that differ in phase by one-third, that is, 120 degrees.

Three-Wire System

A system of electric supply comprising three conductors, one of which, known as the neutral wire, is maintained at a potential midway between the potential of the other two, referred to as the outer conductors. There are two distinct voltages of supply, one being twice the other.

Transformer

A component used to change AC voltage to meet specific requirements. A device consisting of a winding with tap or taps, or two or more coupled windings, with or without a magnetic core, for introducing mutual coupling between electric circuits.

Transmission Line

A line used for electric-power transmission.

URD System

A local distribution system designed primarily to be buried in the ground and to serve residential customers.

VAR

Reactive volt-amperes.

Volt

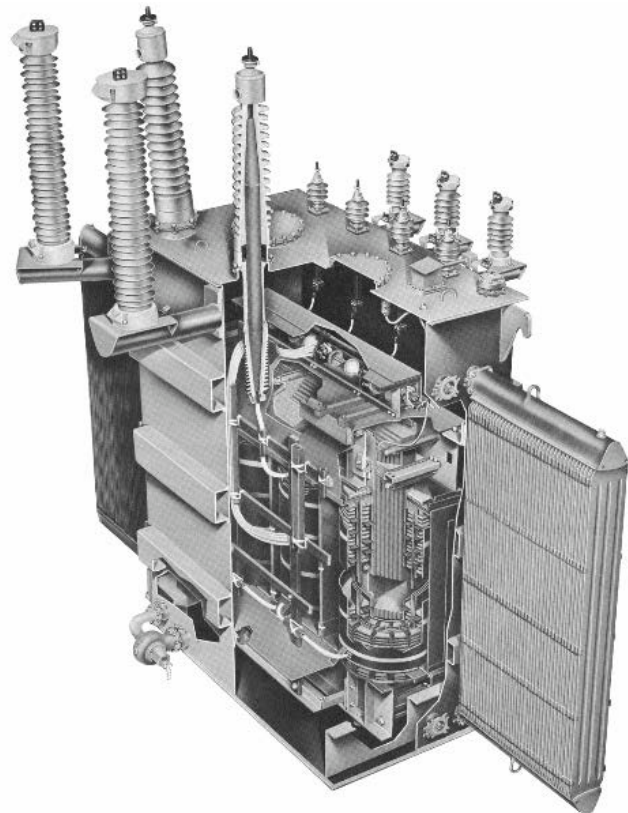
Unit of measure for voltage. One volt is defined as the voltage necessary to drive a current of one ampere through a resistance of one ohm.

Voltage

Electric potential or potential difference expressed in volts.

Watt

Unit of measure for electric power, equal to the amount of power produced when one volt causes one ampere of current to flow.



Watt-hour

Basic unit used to measure electrical energy. Watt-hours are determined by multiplying power by time. One watt-hour is the amount of energy used when one watt of power is delivered to an electrical device for one hour.

SECTION 4.3 – SELECTED COMMISSION ORDERS

COMPREHENSIVE PLAN

System Planning

The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001. The Commission requested that the Company provide a Comprehensive Plan detailing proposed changes to the electric system for the purposes of meeting load growth or maintaining system reliability. On pages 143-144 of the hearing transcript, Pepco's witness Mr. Gausman explained the nature of the Company's existing plans for the distribution and transmission systems:

We have plans for each of our substations in D.C., and in each of those plans we address the needs for that location, what the growth forecast is, what type of construction is going to be needed for expansion in the distribution system in each of those locations... Now when you go up to the transmission level or the substation supply level, there you have a plan that is addressing a larger area of the town because you're looking at the whole capacity of the system.

The Company expanded its responses to the Commission's requests in the first filed Comprehensive Plan. Since that date, the Company's Comprehensive Plans have been expanded based on several Commission directives. The report that follows either expands upon the discussion in the initial hearings requesting the Consolidated Report or responds to subsequent Commission directives as cited below.

The following section of the report addresses system plans based on forecasted load growth.

In Order No. 12804 paragraph 53 B, the Commission stated the following:

53. The 2003 PIP is hereby APPROVED, provided that PEPCO:

(b) Submit quarterly reports to the PIWG as well as a report in the 2004 and subsequent PIPs on its plans for implementing the recommendations for alleviating the anticipated transmission constraints identified in the RTEP report;

Load Forecasting

In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, the following topics were discussed, as cited on pages 141-144 of the hearing transcript:

- *Comprehensive long-term planning on the underground system*
- *Pepco's 10-year construction plans*
- *Distribution load growth forecasts by substation*
- *Transmission/substation supply load growth forecasts*

In order No. 12735 issued on May 16, 2003 the Commission stated at paragraph 139, the following:

139. PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:

- (a) Customer growth projections by District of Columbia wards (including historical comparisons);*
- (b) Load growth projections encompassing commercial and residential development by District of Columbia wards (including historical comparisons);*

The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

In Order No. 12804 paragraph 53, the Commission stated the following:

53. The 2003 PIP is hereby APPROVED, provided that PEPCO:

- (a) Provide the projected zonal and projected default (i.e., SOS) load data for the District of Columbia to the PIWG on a quarterly basis as well as in the 2004 and subsequent PIPs;...*

Power Factors

In Order No. 10133, the Commission directed Pepco to include performance factors relating to the transmission and distribution (T&D) system in future PIPs.

“PEPCO...was directed to...provide in future PIP reports forecasts of plant performance factors which are based on analyses of both the projected performance and the prior year's actual performance”(page 10, Section B).

“...the Commission finds it entirely appropriate to include performance measures for PEPCO's transmission and distribution in the mix of issues examined by the PIWG and reported in the PIP”(page 12, third paragraph).

By way of compliance with the above requirements, in the September 1993 PIWG Meeting, Pepco proposed reporting performance data on its 13 kV distribution substation power factors.

Substation

In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, Commissioner Meyers stated the following (page 266 of the hearing transcript):

But what we were talking about here yesterday was that the comprehensive plan would include... any rebuilt substations you might have; any new substations you might have...

Distribution

In the initial November 5-7, 2001 hearings requiring the production of the Comprehensive Plan, Commissioner Meyers stated the following (pages 266-267 of the hearing transcript):

But what we were talking about here yesterday was that the comprehensive plan would include... anything that you might envision to account for distribution load growth...

In Order No. 12735 issued on May 16, 2003, the Commission stated the following at paragraphs 74 and 135:

74. During the November 2001 hearings the Commission requested that PEPCO submit a comprehensive plan to include a current assessment of, and future plans for, its underground distribution and network facilities.¹⁷⁹ The Commission requested the plan as a tool to evaluate PEPCO's planning methodology and to assess PEPCO's ability to anticipate and respond to changing conditions in its underground distribution system...

135. PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:

(c) Listing of underground distribution projects, such as the Adams-Morgan neighborhood project (including budgets, time schedules, and expected benefits) by secondary vs. primary system by District of Columbia wards affected, but not specific locations;

The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

Technology

In Order No. 12804 paragraph 53 E, the Commission stated the following:

53. The 2003 PIP is hereby APPROVED, provided that PEPCO:

(e) Provide to the PIWG, quarterly status reports on the new Technology Initiatives being undertaken by Pepco. An annual status report should be included in the 2004 and future PIPs. The status reports should include current accomplishments, plans for the future, and anticipated completion dates.

SCADA

The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001. On page 313 of the hearing transcript, Commissioner Meyers stated the following:

We're going to ask Pepco to please include a section on reporting and monitoring in the comprehensive plan... And just as a quick for instance of this real-time systems control and data acquisition system, SCADA, what could it do? Give me a for instance there.

DA

In Order No. 12804 paragraph 53 E, the Commission stated the following:

53. The 2003 PIP is hereby APPROVED, provided that PEPCO:

(e) Provide to the PIWG, quarterly status reports on the new Technology Initiatives being undertaken by Pepco. An annual status report should be included in the 2004 and future PIPs. The status reports should include current accomplishments, plans for the future, and anticipated completion dates.

OMS

In Order No. 13422 on the 2004 Consolidated Report, paragraph 66, the Commission stated the following:

66. The 2004 Consolidated Report: Productivity Improvement Plan and Comprehensive Plan is hereby APPROVED, provided that PEPCO:

(a) Report in the 2005 Consolidated Report, due February 15, 2005, on the corrective actions taken to fix the OMS;...

CIS

The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001. On page 503 of the hearing transcript, Commissioner Meyers stated the following:

You've been a leader in CADS all along, computer assisted data systems. There's some discussion here about various other types of reporting and monitoring systems...

Power Delivery Information Systems Projects

In Order No. 12735, paragraph 139, the Commission stated the following:

PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:...

(d) Listing of power delivery information system projects with implementation schedules, annual costs, and milestones;

(e) Listing of new technology investigations with decisions, annual costs, and implementation schedules;

...The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

Equipment Standards

The initial requirements for the Comprehensive Plan section of the Consolidated Report were delineated in hearings taking place from November 5-7, 2001. On page 149 of the hearing transcript, Commissioner Meyers stated that the Comprehensive Plan should include:

...not only [the 10-year underground construction budget and 4 kV to 13 kV conversion], but... incorporating standards of what you want this to look like...

Equipment Inspections

In Order No. 16091, paragraphs 46 and 63, the Commission stated the following:

46. Decision. ... we shall require that Pepco provide a list of the types of equipment for which a "run to failure" method applies and those for which a preventive method applies. (Footnote: If other maintenance methods are used, Pepco shall describe them as well.) The Commission requires that Pepco provide an explanation of why different maintenance methods apply to

different types of equipment. We also require a description of the “test procedures” that Pepco uses to assess the performance and remaining life of the equipment. (Footnote: See Pepco comments at 7.) Further, Pepco shall provide an estimate of the current book value of equipment maintained under each method used by Pepco. The 2011 Consolidated Report shall include this description of maintenance policies and methods.

63. *Pepco IS DIRECTED to provide a description of its maintenance policies and methodologies, consistent with paragraph 46 of this Order;*

Storm Readiness / ERIP

In Order No. 15152 at paragraph 71, the Commission ordered the following:

71. *PEPCO is DIRECTED to prepare an action plan to reduce service restoration times and improve SAIDI and CAIDI performance, consistent with Order No. 14643 issued November 30, 2007 and herein, to be included in the 2009 Consolidated Report;*

Order No. 15568 followed, requiring the following:

32. *The Commission directs Pepco to report to each meeting of the PIWG on its Action Plan. That report should include a written description of the steps taken pursuant to the Plan. For example, in connection with the item that includes “Develop a process design and implement training,” Pepco should describe the design and the training given to crews, including the number of employees who have availed themselves of the training. In addition, Pepco should be prepared to answer questions about the progress of the Action Plan from other members of the PIWG.*

52. *Pepco IS DIRECTED to report to each meeting of the PIWG on its Action Plan, consistent with Paragraph 32 of this Order;*

Electricity Quality of Service Standards

Specific Consolidated Report requirements from the EQSS portion of the D.C.M.R. are listed below.

Progress on current corrective action plans [on customer calls answered] shall be included in the utility’s annual Consolidated Report.

The utility shall report the actual call center performance during the reporting period in the annual Consolidated Report of the following year.

Progress on any current corrective action plans [on call abandonment rates] will be included in the utility’s annual Consolidated Report.

The utility shall report the actual performance obtained during the reporting period in the annual Consolidated Report of the following year.

The utility shall complete installation of new residential service requests within ten (10) business days of the start date for the new installation.

Progress on any current corrective action plans [on new residential service installation requests] will be included in the utility's annual Consolidated Report.

The utility shall report the actual performance obtained during the reporting period in the annual Consolidated Report of the following year.

3603.5 The utility shall report on the progress of the corrective action plan [on repeat least performing feeders] in the Annual Consolidated Report submitted to the Commission.

The utility shall report on the number and percentage of non-major service outages that extend beyond the twenty-four (24) hour standard and the reasons each such outage extended beyond the twenty-four (24) hour standard.

The report drafted pursuant to Section 3603.8 shall be included in the annual Consolidated Report on reliability data.

The utility shall report on the progress of the corrective action plan [on SAIFI, SAIDI and CAIDI benchmarks] in the annual Consolidated Report submitted to the Commission.

The utility shall also, per the orders of the Commission, continue current requirements of reporting annual reliability indices of SAIFI, SAIDI and CAIDI (with and without major events) in the annual Consolidated Report of the following year.

Industry Comparisons

In Order No. 15568 paragraph 57, the Commission ordered the following:

57. Pepco IS DIRECTED to provide a report on the Electric Utilities Best Practices, consistent with Paragraph 50 of this Order. This report shall be included in that 2010 Consolidated Report; and shall include the best practices of the electric utility industry on improving reliability and outage restoration (from the Benchmarking Studies). Pepco shall submit a continuous improvement plan, including resourcing, specific performance targets, and milestone dates to achieve the reliability and outage restoration performance of the best (quartile) performing (comparable) utilities in the Benchmarking Studies.

Implementation of Twenty Best Practices

In Order No. 16091 paragraph 61, the Commission stated the following:

61. Pepco IS DIRECTED to include a "2011 Best Practices Report" in its 2011 Consolidated Report describing its on-going implementation of no fewer than twenty of the best practices identified in the 2009 Polaris Program, consistent with Paragraph 22 of this Order;

22. Decision. First, we conclude that Pepco has complied with the requirements of Paragraphs 32 and 52 of Order No. 15568. Second, as to the Staff's Recommendation that Pepco file a "Best Practices Report" from the PA Consulting's 2009 Polaris Transmission and Distribution Benchmarking Program, we agree that a report may be helpful in assuring that best practices continue to be implemented. Therefore, the

Commission shall require that Pepco include in its 2011 Consolidated Report a section entitled “2011 Best Practices Report” in which Pepco shall describe its on-going implementation of no fewer than twenty of the best practices identified in the 2009 Polaris Program included in the 2010 Consolidated Report as Appendix 2D. The twenty best practices selected by Pepco should be those judged to have the most impact on reliability and outage restoration performance. Pepco shall report on all its activities during 2010 to implement these best practices, including data on staffing levels, expenses and results. This requirement is separate from the requirement to produce a “Continuous Improvement Plan,” as is described more fully in Section IV.A.1.f.

PA Consulting Recommendations

In Order No. 15632 issued in these proceedings, the Commission states at paragraph 5 the following:

- 5. Pepco shall file with the Company’s annual Consolidated Reports to the Commission data on the Company’s measures to continue to address each of the recommendations made by PA Consulting and the effectiveness of the Company’s approaches to improve CAIDI and SAIDI to at least the average of PA Consulting benchmarks. This obligation shall begin with the 2010 Consolidated Report.*

In Order No. 15568 issued October 7, 2009 in these proceedings, the Commission states at paragraph 52 the following:

- 52. Pepco IS **DIRECTED** to report to each meeting of the PIWG on its Action Plan, consistent with Paragraph 32 of this Order;*
- 32. The Commission directs Pepco to report to each meeting of the PIWG on its Action Plan. That report should include a written description of steps taken pursuant to the Plan. For example, in connection with the item that includes “Develop a process design and implement training.” Pepco should describe the design and the training given to the crews, including the number of employees who have availed themselves of the training. In addition, Pepco should be prepared to answer questions about the progress of the Action Plan from other members of the PIWG.*

In Order No. 16091 issued in these proceedings, the Commission states at paragraph 22 the following:

22. *Decision. First, we conclude that Pepco has complied with the requirements of Paragraphs 32 and 52 of Order No. 15568.*

PRODUCTIVITY IMPROVEMENT PLAN

Productivity Improvement Plan

In Order No. 15152 on the 2008 Consolidated Report, paragraph 68, the Commission ordered the following:

68. *The Productivity Improvement Working Group, which includes OPC, provided a reasonable definition of a productivity improvement project in 2006. Specifically, the PIWG states:*

T&D productivity improvement projects were considered those projects that will increase T&D system efficiency by reducing losses and improve[ing] system reliability, and which may defer more costly additions to the electric system. (Footnote: F.C. No. 766, Decision on Consideration of OPC's T&D Productivity Improvement Working Group in Response to Commission Order No. 13754, filed July 6, 2006 ("2006 PIWG Report"), at 2.)

The power serving the District's Standard Offer Service customers is now procured through a wholesale procurement process by PEPCO and, as such, productivity improvement is applicable only to transmission and distribution issues. We find the PIWG's definition of a productivity improvement project workable and adopt it here.

69. *The PIWG also provided a reasonable definition of comparative cost analysis for reliability projects. The PIWG suggested that the comparative cost analysis used for reliability projects should "consist of a comparison of the cost of alternative reliability improvement solutions as well as any differences in relative reliability improvement." (Footnote: 2006 PIWG Report at 2.) ...*

Reliability Statistics

Page 190 of the transcript for the November 5-7, 2001 hearings documents Commissioner Cartagena as stating the following:

You testified earlier that you have a 10-year plan for updating the system or addressing whatever changes are required with regards to that. Does that 10-year plan contain reliability goals or other measurable performance objectives? In other words, are there some kinds of standards that we can look at and will give us an idea of whether the company is hitting or missing those standards and objectives with regards to its plan?

This section of the Consolidated Report addresses the Company's performance with respect to reliability standards and Electricity Quality of Service Standards.

Targeted Reliability Indices

In Order No. 12735, paragraph 139, the Commission ordered the following:

PEPCO shall file the additional information not included in its expurgated comprehensive plan as outlined below, within three months of the issuance date of this Report and Order:

(f) Targeted reliability indices (including historical comparisons); and

The summary should cover a 10-year planning horizon while historical comparisons should provide at least five years of history.

Also, in paragraph 142, the Commission directed the Company to file performance indices for the District of Columbia only.

PEPCO is DIRECTED to work with the PIWG to develop target system reliability indices for the District of Columbia, only.

Vegetation Management

In Order No. 15621 at paragraph 5, the Commission ordered the following:

5. Pepco shall file within the Company's annual Consolidated Reports to the Commission, yearly data on tree trimming by feeder and wards (or multiple wards) compared to the Company's tree down and tree limb outage causes listed in its monthly power outage reports beginning with the Company's 2010 Consolidated Report.

Priority Feeders & Aggressive Initiatives

The Electricity Quality of Service Standard D.C.M.R. 3603.6 states the following:

3603.6 The utility shall continue the current reporting of the worst performing (lowest two (2) percent) feeders (utility methodology) and corresponding corrective action plans, with the action taken in year 1 and the subsequent performance in year 2 in the annual Consolidated Report.

In Order No. 15152 paragraph 73, the Commission ordered the following:

73. Pepco is DIRECTED to investigate the viability of the "aggressive" initiatives for all least performing feeders, to file a progress report regarding the implementation of these initiatives where viable as part of the 2009 Consolidated Report, and to file quarterly progress reports thereafter, consistent with paragraph 62 of this Order;

In Order No. 15809 paragraph 11, the Commission ordered the following:

11. *Pepco IS DIRECTED to include in its 2011 Consolidated Report a plan for development and application of “aggressive initiatives” to its underground distribution feeders;*

Repeat Priority Feeders

In Order No. 15152 issued on Pepco’s 2008 Consolidated Report, the Commission stated (at paragraph 72),

72. *PEPCO is DIRECTED, beginning with the 2009 Consolidated Report, to identify the feeders that are part of the separate annual program of corrective actions for reappearing least reliable feeders, describe the corrective actions planned for each feeder and the projected dates for completion of the corrective actions and explain whether the corrective actions improved the performance of these feeders consistent with paragraph 59 of this Order;*

In Order No. 15941 issued on August 18, 2010, the Commission stated at paragraphs 13 and 16, the following:

13. *Beginning with the 2011 Consolidated Report, Pepco shall identify any feeders that have appeared more than once on the Priority Feeder List, by year from the first Priority Feeder List in 2002, so that it shall be apparent how many times each feeder has appeared on the Priority Feeder List...*
16. *Pepco IS DIRECTED to identify in its 2011 and successive Consolidated Reports, each feeder that has appeared more than once on the Priority Feeder List.*

4 to 13 kV Conversions

These projects are a continuation of the 2011 Reliability Projects, as required by Order No. 16091 at paragraph 64 and referenced paragraphs 50 and 53:

64. *Pepco IS DIRECTED to provide detailed schedules and budgets for conversion projects, as well as justification for any non-minor deviations from these , consistent with Paragraphs 50 and 53 of this Order;*
50. *Decision. We agree with the Staff recommendation and require Pepco to provide justification for any deviations from the plan schedules and annual budgets for 4 kV to 13 kV conversion projects in its Consolidated*

Reports, excluding minor deviations of less than 5%. This information may be provided in the discussion of “Reliability Projects.”

53. Decision. *...we have not adopted the Staff’s “replace or rebuild” recommendation. However, we agree that future Consolidated Reports should contain detailed schedules and budgets for Reliability Projects, as well as justification for deviations from those schedules and budgets. We shall require Pepco to submit such schedules in future Consolidated Reports.*

Manhole Event Report

In Order No. 16091 issued on December 10, 2010, the Commission stated at paragraphs 56, 59, 65, and 66 the following:

56. Decision. *Pepco has agreed to make the recommended changes in the 2011 Consolidated Report with the exception of data on failure rates. We require that the members of the PIWG discuss the need for and feasibility of providing data on failure rates in future Consolidated Reports and include in the 2011 Consolidated Report the PIWG conclusions and recommendations, if any.*
59. Decision. *We adopt the Staff’s recommendation and require Pepco to: (1) combine the Manhole Events portion of the failure analysis report with Part 3 of the Consolidated Report; (2) include data in the 2011 Consolidated Report that separates 4 kV primary failures from 13 kV primary failures; (3) include data in the 2011 Consolidated Report that separates 4 kV from 13 kV manhole events; (4) include trend analyses for “Use of Slotted Manhole Covers;” and (5) include in the Cable Splice or Joint Database section of the Consolidated Report, cable type, age, type of splice and other pertinent information, except that cable type and age can be excluded if unavailable. If data on failure rates for all variables is available for manhole events, Pepco shall include such information in its 2011 Consolidated Report. If such data is unavailable, we require the members of PIWG to discuss the need for and the availability of such data include in the 2011 Consolidated Report the PIWG conclusions and recommendations, if any.*
65. *Pepco IS DIRECTED to include a discussion of failure data rates in the agenda for the Productivity Improvement Working Group, consistent with Paragraphs 56 and 59 of this Order; and*
66. *Pepco IS DIRECTED to include additional Manhole Event data in the 2011 Consolidated Report, consistent with Paragraph 59 of this Order.*

In Order No. 15152 paragraphs 76 and 66, the Commission ordered the following:

76. *PEPCO is DIRECTED to include as part of the 2009 Consolidated Report a proposed plan for significantly reducing manhole events consistent with paragraph 66 of this Order...*

In Order No. 12735, paragraph 138, the Commission ordered the following:

Pepco shall file a report that summarizes the results of the failure analyses conducted for the calendar year 2002, 30 days from the issuance date of this Report and Order, and subsequently, to file an annual report on the results of the failure analysis group to the PIWG;

Slotted Manhole Covers

In Order No. 16091 issued on December 10, 2010, the Commission stated among other things, at paragraph 59, the following:

59. *...(4) include trend analyses for “Use of Slotted Manhole Covers;”*
60.

Cable Splice or Joint Database

In Order No. 16091, the Commission stated among other things, at paragraph 59, the following:

59. *...(5) include in the Cable Splice or Joint Database section of the Consolidated Report, cable type, age, type of splice and other pertinent information, except that cable type and age can be excluded if unavailable.*

Failure Rates

In Order No. 16091, the Commission stated among other things, at paragraph 59, the following:

59. *...(5)...If data on failure rates for all variables is available for manhole events, Pepco shall include such information in its 2011 Consolidated Report. If such data is unavailable, we require the members of PIWG to discuss the need for and the availability of such data include in the*

2011 Consolidated Report the PIWG conclusions and recommendations, if any.

Appendix 3A –Manhole Events and Summary of Selected Failures

In Order No. 11716 ordering paragraph 3, the Commission ordered the following:

PEPCO shall file an annual report on the previous calendar year's manhole incidents;

Appendix 3B – Manhole Inspection Program

In Order No. 11716, the Commission stated the following:

PEPCO is hereby directed to include the following information in its [manhole inspection] reports beginning in July 2000:

- 1. The general location of the manholes inspected, including the street or streets where the manholes are located and the blocks bounding the street, e.g., M Street, NW, between 23rd and 28th streets;*
- 2. The number of manholes inspected in the month, broken down as to the number of manholes containing primary cables only, both primary and secondary cables, and secondary cables only;*
- 3. The number of primary cable problems found;*
- 4. The number of secondary cable problems found;*
- 5. The type of cable problems found in each manhole, categorized as to the physical degradation or damage of the cable, overheating, overloading, damaged splice and deteriorated cable or splice due to age;*
- 6. The number of manholes with problems;*
- 7. The corrective actions taken for each cable and manhole problem found; and*
- 8. Other general condition of the manhole such as whether it contained water, oil, grease, debris, and whether the manhole cover and the manhole are in good mechanical condition.*

DESCRIPTION OF CALCULATION PROCESS

The following flow chart (Figure 4.4-B) illustrates the process for calculating the Composite Performance Index for a feeder.

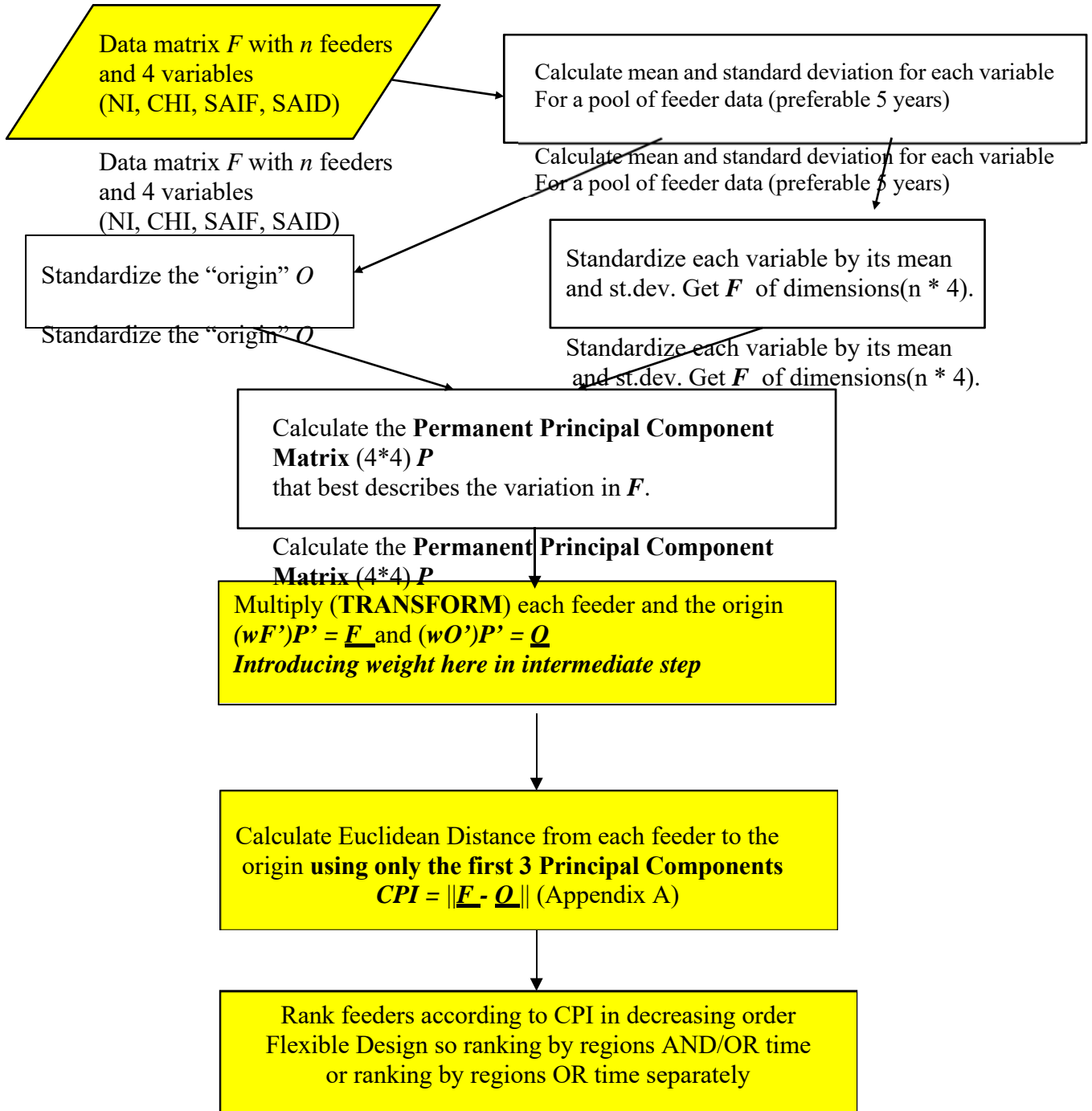


Figure 4.4-B -- Illustration of CPI Concept

Description of Euclidean Distance to Derive CPI

Definitions

Principal Component Matrix (each row is Principal Component vector)

$$P = \begin{bmatrix} PC_1 \\ PC_2 \\ PC_3 \\ PC_4 \end{bmatrix} = \begin{bmatrix} pc_{1,NI} & pc_{1,CHI} & pc_{1,SAIF} & pc_{1,SAID} \\ pc_{2,NI} & pc_{2,CHI} & pc_{2,SAIF} & pc_{2,SAID} \\ pc_{3,NI} & pc_{3,CHI} & pc_{3,SAIF} & pc_{3,SAID} \\ pc_{4,NI} & pc_{4,CHI} & pc_{4,SAIF} & pc_{4,SAID} \end{bmatrix}$$

Original Feeder Data

$$originalFeeders = F = \begin{bmatrix} f_{1,NI} & f_{1,CHI} & f_{1,SAIF} & f_{1,SAID} \\ f_{2,NI} & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ f_{n,NI} & \cdot & \cdot & f_{n,SAID} \end{bmatrix}$$

Weight

$$W = \begin{bmatrix} w_{NI} & 0 & 0 & 0 \\ 0 & w_{CHI} & 0 & 0 \\ 0 & 0 & w_{SAIF} & 0 \\ 0 & 0 & 0 & w_{SAID} \end{bmatrix}$$

Standard Deviation

$$\Sigma = \begin{bmatrix} \sigma_{NI} & 0 & 0 & 0 \\ 0 & \sigma_{CHI} & 0 & 0 \\ 0 & 0 & \sigma_{SAIF} & 0 \\ 0 & 0 & 0 & \sigma_{SAID} \end{bmatrix}$$

Intermediate Calculations

$$M = \Sigma * W = \begin{bmatrix} \sigma_{NI} & 0 & 0 & 0 \\ 0 & \frac{w_{CHI}}{\sigma_{CHI}} & 0 & 0 \\ 0 & 0 & \frac{w_{SAIF}}{\sigma_{SAIF}} & 0 \\ 0 & 0 & 0 & \frac{SAID}{\sigma_{SAID}} \end{bmatrix} w$$

Transformation

$$\hat{F} = F * M * P'$$

$$\begin{bmatrix} f_{1a} & f_{1b} & f_{1c} & f_{1d} \end{bmatrix}$$

$$\hat{F} = \begin{bmatrix} f_{2a} & \cdot & \cdot & \cdot \\ \cdot & \cdot & \cdot & \cdot \\ f_{na} & \cdot & \cdot & f_{nd} \end{bmatrix}$$

Where

F is the original feeder data matrix (size $n*4$)

M is the intermediate calculation matrix (size $4*4$)

P' is the (transposed) principal component matrix (size $4*4$)

Finalization of CPI – Euclidean Distance Method

For each feeder i take the values for the 3 first components of row i in the last matrix above.

$$CPI_{f_i} = \sqrt{f_{ia}^2 + f_{ib}^2 + f_{ic}^2}$$

FACT SHEET



ENVIRONMENTAL STEWARDSHIP & SUSTAINABILITY: VEGETATION MANAGEMENT ON RIGHTS-OF-WAY

A reliable supply of electricity is essential to the safety, security, economy and welfare of our nation and the communities where we live and work. To ensure the safe and reliable delivery of electricity to our customers, PHI must manage vegetation near its transmission and distribution lines and other facilities to prevent interruptions, blackouts and wildfires. PHI's regulated power delivery operations are required to maintain transmission and distribution rights-of-way so that trees, shrubs and other vegetation do not pose preventable hazards to power lines, poles or other facilities. PHI uses "best practices" to manage vegetation around electricity infrastructure, selecting among mechanical, chemical (herbicides), cultural, and biological control methods for the most suitable approach to meeting safety and reliability needs while maintaining or improving habitats for the region's indigenous flora and fauna. PHI employs professional, certified foresters and arborists to administer their vegetation management program.

VEGETATION MANAGEMENT: THE BASICS

- Utilities maintain right-of-way lands on a regular basis in order to provide for the safe transmission and distribution of electricity.
- Utilities must identify and utilize the most direct, least intrusive route possible when constructing power lines, in order to minimize both the amount of land used and any environmental impact.
- Trees and other vegetation beneath power lines must be properly maintained to avoid causing interruptions of electric service by growing into, falling through or knocking down power lines.
- In cooperation with federal, state, and local authorities, PHI, like most utilities, implements integrated vegetation management strategies to minimize overall risk to people and the environment while providing safe and reliable electric service.

HOW DOES PHI MANAGE VEGETATION NEAR ITS POWER LINES?

- PHI carefully selects vegetation management practices that balance environmental concerns, public needs, safety and cost-effectiveness.
- PHI partners with state, regional and local groups to create and maintain numerous natural habitats on its rights-of-way.
- PHI minimizes the use of EPA-approved herbicides through the selection and use of proper application methods, equipment and technology.





- PHI promotes native flora and fauna through integrated vegetation management of our rights-of-way;
- PHI enhances vegetation management projects through cultivation or planting of compatible native vegetation;
- PHI protects native rare species populations that could otherwise be impacted by rights-of-way establishment, construction or maintenance;
- PHI manages rights-of-way areas to maintain wildlife habitat and protect threatened and endangered species habitat; and
- PHI reduces the introduction and control the spread of nonnative invasive species or noxious weeds in rights-of-way and adjacent lands.

Recognized Excellence

- All PHI utilities (Atlantic City Electric, Delmarva Power and Pepco) are active in community outreach and educational efforts to promote its **Right Tree, Right Place** initiative. **Right Tree, Right Place** advocates planting each tree species where it will thrive and not planting large species where they will interfere with power lines once they reach mature height.

- All PHI utilities have been named **Tree Line USA** Utilities by the Arbor Day Foundation. The Tree Line program is sponsored by the foundation in cooperation with the National Association of State Foresters. It recognizes utilities that demonstrate a program of quality tree care, annual tree worker training, public education, tree planting, and energy conservation through tree planting.
- PHI has longstanding commitments to vegetation management and green infrastructure efforts to help promote the sequestration of carbon dioxide by trees and other vegetation to stabilize and gradually reduce greenhouse gas emissions.



ITN	Filing Category	ITN Name	2019 CapEx Actuals 1/1/ - 12/31
74088	Pepco Distribution - DC	74088: Waterfront Sub: New 138/13.8 kV Distribution Sub (UDSPLWF1)	4,567
70926	Pepco Distribution - DC	70926: Capital Power Plant AOC Generator Interconnection (UDSPCCPP)	(130,251)
75238	Pepco Distribution - DC	75238: EU Digital Strategy: Web Enhancements (PEPCO) - Cap	(594)
74443	Pepco Distribution - DC	74443: Benning Service Center Bldgs 54 & 56 New Perimeter Security System ((155,616)
72976	Pepco Distribution - DC	72976: Web Release 2 - My Acct Convergence (PEPCO) - Cap	37,419
73730	Pepco Distribution - DC	73730: Sub 12 Georgetown Underground Feeder Swapping (UDLPLM7W23)	3,686
75229	Pepco Distribution - DC	75229: Property Management Portal (PEPCO) - Cap	35,921
74175	Pepco Distribution - DC	74175: PHI IT WPT Implementation (PEPCO) - Cap	384,182
82731	Pepco Distribution - DC	82731: 17000 MD HP Service Manager O&M ITA35 923000	(37)
74092	Pepco Distribution - DC	74092: Waterfront Sub: Construct New LVAC Groups (UDLPLWF4)	340
71535	Pepco Distribution - DC	71535: Estimation Tool Implementation (PEPCO) - Cap	8,868
75393	Pepco Distribution - DC	75393: DAP - PHI CRM&B Financial Reporting (PEPCO) - Cap	(44)
71876	Pepco Distribution - DC	71876: Heavy Up Station B East Network Group Feeders - Waterfront Sub. 223 (UDLP	430
74357	Pepco Distribution - DC	74357: 433 PARK RD NW - WR 3583788 - NBC (DLPCS1W051)	116,181
75232	Pepco Distribution - DC	75232: PC44 TOU Rate Regulatory Pilots (PEPCO) - Cap	130,324
71861	Pepco Distribution - DC	71861: Fiber Optic - Harrison Sub: Remote - MD PEPCO - Cap	(225,595)
75240	Pepco Distribution - DC	75240: TCPA Compliance (PEPCO) - Cap	(26,678)
70767	Pepco Distribution - DC	70767: Benning Sub. 7 - Transfer portions of Feeder 15703 to Feeders 14152 and 1	2,142,093
75230	Pepco Distribution - DC	75230: Preference Center Release 2 (PEPCO) - Cap	2,194
74171	Pepco Distribution - DC	74171: WMS Integration & Implementation (PEPCO) - Cap	1,982,820
75244	Pepco Distribution - DC	75244: EU Customer Appointment Improvement (PEPCO) - Cap	4,848
70114	Pepco Distribution - DC	70114: 150 I ST SE- BBNL CONDUIT AND CABLE - NBC (DLPCS6W034)	1,077,526
71642	Pepco Distribution - DC	71642: FEP Physical Security - Pepco (DC): L Street Sub 21 (UDSPRD8LS	945,674
71553	Pepco Distribution - DC	71553: EU Analytics - Smart Energy Services 2 - SES 2 (PEPCO) - Cap	1,821,521
74371	Pepco Distribution - DC	74371: 69019 Potomac River Crossing Emergency Rebuild (UDLPRM4ER1)	22,859,223
70880	Pepco Distribution - DC	70880: CRMB Arrears Management Program (AMP) - D.C. (PEPCO) - Cap	93,564
82739	Pepco Distribution - DC	82739: 17000 MD Clearwater Project O&M LEG35 923000	8,562
71644	Pepco Distribution - DC	71644: FEP Physical Security - Pepco (DC): O Street Sub 2 (UDSPRD8PS1)	914,827
71643	Pepco Distribution - DC	71643: FEP Physical Security - Pepco (DC): 10th Street Sub 52 (UDSPRD8	880,345
71641	Pepco Distribution - DC	71641: FEP Physical Security - Pepco (DC): I Street Sub 197 (UDSPRD8I	967,709
71021	Pepco Distribution - DC	71021: Cherry Tree Crossing 2 MW PV - Telemetry - Cap	26,201
73489	Pepco Distribution - DC	73489: Rockville Ops: Construct Pole Barn (CMP156)	2,950,875
82639	Pepco Distribution - DC	82639: EU Analytics - Customer 1 (PEPCO) - Cap	922,961
75239	Pepco Distribution - DC	75239: EU Epay (PEPCO) - Cap	509,504
82747	Pepco Distribution - DC	82747: 17000 MD eDocs 16.2 Upgrade O&M LEG35 923000	52,200
73454	Pepco Distribution - DC	73454: Retire Congress Height Sub. 64 (UDSPRD8RD1)	196,419
75237	Pepco Distribution - DC	75237: EU Digital Solar Toolkit (PEPCO) - Cap	567,859
73488	Pepco Distribution - DC	73488: Rockville Fuel Site Upgrade (CMP336)	1,447,360
70140	Pepco Distribution - DC	70140: 2100 2ND ST SW- NBC (DLPCS6W038)	2,000,754
74093	Pepco Distribution - DC	74093: Waterfront Sub: Construct Third LVAC Group (UDLPLWF6)	1,868,764
70117	Pepco Distribution - DC	70117: 1550 1ST ST SW- NBC (DLPCS6W036)	21,322
75416	Pepco Distribution - DC	75416: EMS Consolidation Implementation (PEPCO) - Cap	339,078
71859	Pepco Distribution - DC	71859: Harrison Sub: Extend New Dist Fdrs to 38 (UDLPLNW3)	5,160,331
72733	Pepco Distribution - DC	72733: Navy Yard: Transfer to Waterfront Sub. 223 (UDLPLWF7)	3,364,049
73734	Pepco Distribution - DC	73734: Sub 150 Twining City T2 - B-0551 (ECA) (UDSPRD8TC1)	652,877
71541	Pepco Distribution - DC	71541: EMS Consolidation Implementation (PEPCO) - Cap	2,810,720
73910	Pepco Distribution - DC	73910: PHI Cascade Implementation (PEPCO) - Cap	1,141,483
74084	Pepco Distribution - DC	74084: Waterfront Sub - Install 4th Transformer (UDSPLM7WF4)	3,425,052
74352	Pepco Distribution - DC	74352: FEP Physical Security - Pepco (DC): 22nd Street Sub 124 (UDSPRD	637,502
71213	Pepco Distribution - DC	71213: DC Distributed RTU HMI Computer Replacement (UDSPRD8CR1)	3,301
71548	Pepco Distribution - DC	71548: EU Analytics - Grid T&D (PEPCO)- Cap	2,417,857
74358	Pepco Distribution - DC	74358: 1002 2nd St NE 3569108 NBC (DLPCS1W052)	69
74383	Pepco Distribution - DC	74383: FEP Physical Security - Pepco (DC): 12th & Irving Sub 133 (403,730
70251	Pepco Distribution - DC	70251: 69kV Lines NRL Sub 168 to Blue Plains Sub 83 (UDLPRM8BB)	56,455
74353	Pepco Distribution - DC	74353: FEP Physical Security - Pepco (DC): 9th Street Sub 117 (UDSPRD8	703,750
73696	Pepco Distribution - DC	73696: Sta A & C Replace 69 kV Breakers (UDSPRD8C1)	2,280
74014	Pepco Distribution - DC	74014: Util Proj Port Mgmt Tool (PEPCO) - Cap	655,527
74033	Pepco Distribution - DC	74033: Van Ness Switchgear Replacement: Distribution Line (UDLPRM4WA1)	37,004
73932	Pepco Distribution - DC	73932: Twelfth St Conversions (UDLPRM8BU)	358,613
94274	Pepco Distribution - DC	94274: ITOC-NOC Consolidation SW	540,332
70177	Pepco Distribution - DC	70177: 301/331 N St NE- NBC (DLPCS6W044)	30,586
71855	Pepco Distribution - DC	71855: Harrison Sub: Construct New Sub (UDSPLNW2)	3,685,603
94275	Pepco Distribution - DC	94275: ITOC-NOC Consolidation HW	344,320
70433	Pepco Distribution - DC	70433: Alabama Ave Sub 136: Extend 7 Fdrs to Retire Anacostia (UDLPLWF1)	12,832
72810	Pepco Distribution - DC	72810: North Capitol Sub 4-13kV conversion (UDLPRM8BC)	79,728

73698	Pepco Distribution - DC 73698: Sta. C Replace RTU, breakers & Station Service (UDSPRD8SB)	(32,817)
75205	Pepco Distribution - DC 75205: EU Analytics - (AMI) Advanced Metering Infrastructure (PEPCO) - Cap	1,419,025
75245	Pepco Distribution - DC 75245: EU TOA Implementation (PEPCO) - Cap	76,440
73839	Pepco Distribution - DC 73839: Takoma to Sligo 69kV Line: Install Three 69kV Feeders (UDLPLM72)	21,189,286
72137	Pepco Distribution - DC 72137: L St Sub Capacity Expansion Work (UDSPLM722A)	173,002
74590	Pepco Distribution - DC 74590: DDOT DC South Capitol Street Bridge Conduit (UDLPLM7001)	5,650,636
71782	Pepco Distribution - DC 71782: Georgetown : 4 to 13 kv Conver Phs 3-8 (UDLPRM8BT)	(4,602)
74087	Pepco Distribution - DC 74087: Waterfront Sub-Extend Fdrs: Transfer HV, Metro, Distrib frm Sta	140,066
71558	Pepco Distribution - DC 71558: Mobile Dispatch/Mapping (PEPCO) - Cap	2,822,580
73087	Pepco Distribution - DC 73087: Pepco MD: Electric Vehicles (CMP1143M)	(119)
71860	Pepco Distribution - DC 71860: Fiber Optic - Harrison Sub: Remote - MD PEPCO - Cap	335,982
72525	Pepco Distribution - DC 72525: Mt Vernon Sq Sub: Construct 230/13kv Sub (UDSPLMV3)	331,165
70439	Pepco Distribution - DC 70439: Anacostia Sub : Convert 4 to 13kv & Retire Sub (UDLPLWF3)	8,213
71630	Pepco Distribution - DC 71630: F St Sub Rebuild (69kV) (UDSPLM718A)	221,679
71631	Pepco Distribution - DC 71631: F St Sub Rebuild (UDSPLM717A)	324,159
70096	Pepco Distribution - DC 70096: 13kV Distribution Cutovers "F" St to "L" St (UDLPLM7W27)	4,995,006
71011	Pepco Distribution - DC 71011: Champlain - New 34kV Sub (UDSPRD8AD8)	291,556
71012	Pepco Distribution - DC 71012: Champlain - New 69kV Sub (DSPRD8AD17)	212,263
71015	Pepco Distribution - DC 71015: Champlain to L Street 34kV (UDLPRM4WA8)	293,625
73368	Pepco Distribution - DC 73368: Repl 69kV SCFF UG Supl-Georgetown, F St, 22nd St (UDLPRM5SG)	1,157,978
71864	Pepco Distribution - DC 71864: Harvard Rebuild - Distribution Upgrade to 230/13kV, 210 MVA (UDSPRD8AD2)	2,386,980
71867	Pepco Distribution - DC 71867: Harvard Rebuild - 13 kV Harvard Load Transfers (UDLPRM4WA6)	15,242,456
71731	Pepco Distribution - DC 71731: G STREET SUB 28 - CONVERT 4KV LOAD AND RETIRE - Line Work (UDLP	316,301
70060	Pepco Distribution - DC 70060: 13.8kV Swgr Replacement - Pepco DC (UDSPRD8KD)	751,731
72033	Pepco Distribution - DC 72033: Pepco MD - Capacitor Control Install/Replace	110,923
71913	Pepco Distribution - DC 71913: Firewall Refresh (PEPCO) MD - Cap	55,614
71231	Pepco Distribution - DC 71231: DDOT DC South Capital Street Relocation 34kV UG (UDLPCSCAP2)	1,141,580
71664	Pepco Distribution - DC 71664: Facilities Improvements DC (CMP130Z)	(30,666)
73055	Pepco Distribution - DC 73055: Pepco DC: Benning Area Plan (UDLPRM4WA2)	8,960,848
72064	Pepco Distribution - DC 72064: Install Smart Relays & Replace RTU's -DC (UDSPRD8SD)	48,051
64420	Pepco Distribution - DC 64420: Firewall Refresh (PEPCO) DC - Cap	93,052
72040	Pepco Distribution - DC 72040: Pepco MD - ACR/SF6 Control Install/Replace	3,971,116
65521	Pepco Distribution - DC 65521: PEPCO MD Whiteflint SG - Cap	772
72681	Pepco Distribution - DC 72681: Smart Grid Infrastructure (PEPCO) MD - Cap	1,930,442
72059	Pepco Distribution - DC 72059: MD - Install Radios Line Eqp Pep (UORPODA1Z)	(509,778)
73042	Pepco Distribution - DC 73042: Pepco DC Distrib - Upgrade Pumping Plants (UDLPRM9PD)	531,139
70602	Pepco Distribution - DC 70602: Batt & Chgr Replacement Distri. Subs. - DC (UDSPRD8ED)	18,318
73224	Pepco Distribution - DC 73224: Post-Deployment AMI Comm Meter to Pole Pepco MD (UORPOPDAMI)	576,873
73223	Pepco Distribution - DC 73223: Post-Deployment AMI Comm Meter to Pole Pepco DC (UORPODCAMI)	496,344
73762	Pepco Distribution - DC 73762: Sub.168 Naval Research-Replace T1 & T2 Transformer (DSPRD8AD11)	2,559,876
73507	Pepco Distribution - DC 73507: Smart Grid Infrastructure (PEPCO) DC - Cap	1,293,265
74083	Pepco Distribution - DC 74083: Waterfront Sub - Establish Waterfront North LVAC Network Group	7,633,947
73078	Pepco Distribution - DC 73078: Communication Tower Infrastructure (PEPCO) MD - Cap	475,716
72840	Pepco Distribution - DC 72840: Northeast Sub. 212 East Network Group (NEW) (UDLPLM7W14)	8,318,104
70442	Pepco Distribution - DC 70442: Animal Guards in Dist Subs: Pepco DC (UDSPRD8JD)	130,073
73371	Pepco Distribution - DC 73371: Repl Eng Generators Dist Sub: Pepco DC (UDSPRD8UD)	595,231
74122	Pepco Distribution - DC 74122: Fiber Optic Builds (PEPCO) MD - Cap	727,965
75442	Pepco Distribution - DC 75442: SSN Mesh Network - Repeaters and APs - DC (PEPCO) - Cap	799,168
70762	Pepco Distribution - DC 70762: Pepco DC - ACR/SF6 Control Install/Replace	1,807,481
70187	Pepco Distribution - DC 70187: 4kv Substation Automation - DC (UDSPRD8H)	403,687
72032	Pepco Distribution - DC 72032: Pepco DC - Capacitor Control Install/Replace	8,504
71870	Pepco Distribution - DC 71870: Harvard Sub - Convert 4-13 kV- CAP GRID (UDLPRM8BY)	2,489,154
70292	Pepco Distribution - DC 70292: 965 FL, Ave, NW - 3572898 - NBC (DLPCS6W040)	1,449,251
71417	Pepco Distribution - DC 71417: Dist Sub Bushing Replacement: Pepco DC (UDSPRD8FD)	59,132
72662	Pepco Distribution - DC 72662: NERC CIP Projects: PHI Integration - Part 2 (PEPCO) - Cap	4,789
64931	Pepco Distribution - DC 64931: Fiber Optic Builds (PEPCO) PC - Cap	186,449
73302	Pepco Distribution - DC 73302: SSN Mesh Network - Masters MD (PEPCO) - Cap	647,524
70432	Pepco Distribution - DC 70432: Alabama Ave Sub 136 - Transfer 1.3 MVA 15177 to 15176 (UDLPLM7W3)	31,083
73053	Pepco Distribution - DC 73053: Pepco DC: 12th & Irving Area Plan (UDLPRM4WA7)	475,519
73861	Pepco Distribution - DC 73861: Tenth St Sub 52 - Transfer 0.5 MVA from Network Fdr. 15327 to Fdr. 15330	115
75095	Pepco Distribution - DC 75095: PEPCO DC NB Network Commercial	1,701,032
71225	Pepco Distribution - DC 71225: PEPCO DC New Load, Servs & St Lights, Non-Network (UDLPCS1W	1,485,243
71223	Pepco Distribution - DC 71223: DC: Facility Relocations(Non-Highway) (UDLPCS3W)	(206,853)
71214	Pepco Distribution - DC 71214: DC Highway Relocations (UDLPCH0W)	885,630
75093	Pepco Distribution - DC 75093: NB Commercial Pepco DC	19,291,868
91933	Pepco Distribution - DC 91933: OCIO Projects - Cap	(315)
93252	Pepco Distribution - DC 93252: 17000 DE BSC Robotic Process Auto O&M CTO06 923000	140,199
82491	Pepco Distribution - DC 82491: 17000 MULTI Controller CTO CTO02 923000	169,182
71871	Pepco Distribution - DC 71871: Harvard Sub. 13 - Transfer Portion Fdr 14732 to Fdr 15991 (UDLPLM7W9)	12,201

74349	Pepco Distribution - DC	74349: Benning 4kV Area-Phase Balancing to Fix Voltage Drop Issues (UD	36,660
85125	Pepco Distribution - DC	85125: EWS Projects - Cap	(325)
72750	Pepco Distribution - DC	72750: Network Xfmr&Prot Repl Planned: Benni (UDLPRM4BN)	16,919,001
72978	Pepco Distribution - DC	72978: PILC REPLACEMENT PLANNED (UDLPRPLIC)	3,043,766
71612	Pepco Distribution - DC	71612: Emergency Restoration UG PEP DC (UDLPRM32DX)	13,965,346
71605	Pepco Distribution - DC	71605: Emergency Restoration OH PEP DC (DLPRM32DXX)	3,131,072
71411	Pepco Distribution - DC	71411: Dist Feeder Load Relief - DC (UDLPLM7W)	186,817
70897	Pepco Distribution - DC	70897: Cable PEP DC (UDLPRM4BCX)	2,289,425
72746	Pepco Distribution - DC	72746: Pepco DC - Network RMS - Line	222,545
73250	Pepco Distribution - DC	73250: Priority Feeder Improvements- PEP DC (UDLPRM4BF)	990,752
73179	Pepco Distribution - DC	73179: Planned Rubber/Lead Secondary Replacement (UDLPRM4WA9)	2,273,524
72359	Pepco Distribution - DC	72359: Meter Install DC (UDLPCMR2DX)	1,909,686
71615	Pepco Distribution - DC	71615: Emergency Restoration: Network Transfs & Protectors (UDLPRM3K1)	128,661
72268	Pepco Distribution - DC	72268: Misc. Reliability Improvements- PEP DC (UDLPRM4BA)	3,702,947
71119	Pepco Distribution - DC	71119: Comprehensive Feeder Improvements- PEPCO:DC (UDLPRM63D)	372,813
73902	Pepco Distribution - DC	73902: Transformer Load Management (TLM) Pep - DC (UDLPLM7W21)	127,121
74331	Pepco Distribution - DC	74331: BSC IT Corp Proj - Cap	67,183
72997	Pepco Distribution - DC	72997: Padmount Transformer Replacements PEP DC (UDLPRM4BO)	1,532
72355	Pepco Distribution - DC	72355: Meter Equipment DC (DLPCMR2DXX)	3,155,077
71448	Pepco Distribution - DC	71448: Distribution Pole Replacements PEP DC (UDLPRM4BE)	274,715
72748	Pepco Distribution - DC	72748: Pepco DC - Network RMS - Telecom	16,093
73032	Pepco Distribution - DC	73032: Pep-DC Damage Equipment Replacements (UDLPOEMGD)	4,911,284
73883	Pepco Distribution - DC	73883: Tools Pepco MD (UOTPOMR1MX)	667,727
73332	Pepco Distribution - DC	73332: Recloser Installations (ACR) - Pepco DC (UDLPRM4DJ)	2,514,803
73651	Pepco Distribution - DC	73651: Pepco-DC: Trip Savers (UDLPRM4WJ)	67,819
73880	Pepco Distribution - DC	73880: Tools DC (UOTPOMR1DX)	1,063,560
71441	Pepco Distribution - DC	71441: Distribution Feeder Load Relief DC (UDSPLM7W)	(4,918)
72316	Pepco Distribution - DC	72316: Pepco MD - Network RMS - Telecom	2,921
73781	Pepco Distribution - DC	73781: Substation Improvements and Additions - DC (UDSPRD8AD)	1,413
73096	Pepco Distribution - DC	73096: Pepco MD: Office Furniture (CMP120M)	54,843
73054	Pepco Distribution - DC	73054: Pepco DC: Add Sub Condition Monitoring Points (UDSPRD9D5)	443,381
73062	Pepco Distribution - DC	73062: Pepco DC: Office Furniture (CMP120D)	90,229
71426	Pepco Distribution - DC	71426: Pepco DC CM Distribution Substation Capital	691,978
73348	Pepco Distribution - DC	73348: Pepco DC - Regulator Control Install/Replace	37,691
73050	Pepco Distribution - DC	73050: Pepco DC: Roof Replacements (UDSPRD8TD)	202,338
73052	Pepco Distribution - DC	73052: Pepco DC: Substation Ventilation (UDSPRD8LD)	640,459
94237	Pepco General	94237: PEPCO Misc ACCTG Projects	(135,734)
80147	Pepco General	80147: BSC Security Projects - Cap	497
74252	Pepco General	74252: Security Controls - Cap	164,088
70604	Pepco General	70604: Batt & Chgr Replacement Trans. Subs. - DC (UTSPRD8ED)	358,111
71193	Pepco General	71193: Customer Reliability Improvement (CEMI)- Benning (UDLPRM4BM)	7,075
74250	Pepco General	74250: A&G Pool - Pepco	(15,514)
72483	Pepco General	72483: Pass Throughs (PEPCO) - Cap	1,138,631
61934	Pepco General	61934: PEPCO DC 600 4th St SW - The Kiley	2,966
62091	Pepco General	62091: Itron Cellular 3G AP Replacement DC (PEPCO) - Cap	788,707
62096	Pepco General	62096: PEPCO DC 1331 K St SE	604,202
62215	Pepco General	62215: Pepco DC DC PLUG FEEDER 00308	3,705,980
62219	Pepco General	62219: Pepco DC DC PLUG FEEDER 14900	585,175
62221	Pepco General	62221: Pepco DC PLUG FEEDER 00368	14,286
62222	Pepco General	62222: Pepco DC DC PLUG FEEDER 14758	8,406
62223	Pepco General	62223: Pepco DC DC PLUG FEEDER 14007	43,434
62224	Pepco General	62224: Pepco DC DC PLUG FEEDER 15009	6,817
62269	Pepco General	62269: FEP Physical Security - Pepco (DC): New Jersey Ave Sub 161	156,163
62504	Pepco General	62504: Pepco DC Alabama Ave Breakers Installation	854,091
62703	Pepco General	62703: Pepco DC Benning Stormdrain replacement project A	335,512
62721	Pepco General	62721: Pepco DC Benning Stormdrain Replacement Project B	334,864
62900	Pepco General	62900: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Substation	61,972
62935	Pepco General	62935: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Distribution	36,437
62978	Pepco General	62978: PEPCO DC Relay at Florida Ave Sub for Harvard Cutover	81,803
63051	Pepco General	63051: PEPCO DC EDD 2019	13,605
63429	Pepco General	63429: Pepco DC - ITE Air Circuit Breakers	192,680
63556	Pepco General	63556: Pepco DC DC Plug Feeder 00308 - Removal	10,779
63632	Pepco General	63632: Pepco: DC- Storm Water Retention Credit	40,710
63635	Pepco General	63635: Pepco DC- Yards ML 1A & Parcel G	21,291
63680	Pepco General	63680: Pepco DC Dist: Buzzard 230/34kV Substation	2,129,947
63698	Pepco General	63698: PEPCO DC Parks at Walter Reed	27,202
63736	Pepco General	63736: PEPCO DC 300 MORSE ST NE 2 SPOT NTWK 208V	493,561
63923	Pepco General	63923: Pepco DC DC Plug Second Biennial Install	196,208
64102	Pepco General	64102: PEPCO DC CM Georgetown Sub 12 Pumps, Bushing & Gasket Replacements	829,574

64396	Pepco General	64396: PEPCO DC: Dist- Three 42MVA Spare Transformers	4,593,472
64407	Pepco General	64407: PEPCO DC DIST-33MVA Spare Transformer	894,595
64724	Pepco General	64724: PEPCO DC: Mobile Distribution Transformer for Urban Area	2,831,732
64794	Pepco General	64794: PEPCO DC 4669 South Capitol St SW Distribution	(78,850)
64796	Pepco General	64796: PEPCO DC 4669 South Capitol St SW Telecom	(25,753)
64917	Pepco General	64917: Pepco DC: Benning Bldg 59 Pole lights	50,634
64922	Pepco General	64922 PEPCO DC: DIST-Two 56 MVA Spare Transformers	3,417,828
64993	Pepco General	64993: PEPCO DC Dist Florida Ave 4T LTC & Bushing	17,929
65155	Pepco General	65155: Pepco DC Benning Manhole Water Sewer Connection	90,368
65207	Pepco General	65207: Pepco DC: Building 41 Heaters	35,587
65250	Pepco General	65250: Pepco DC: Building 56 Transformer Shop Refresh Capital	246,051
65582	Pepco General	65582:PEPCO:DC Directional Overcurrent Relays	188,391
65583	Pepco General	65583: Pepco DC 1300 4th ST NE	11,464
65748	Pepco General	65748: Pepco DC 861 New Jersey Ave SE	846,688
65761	Pepco General	65761: Pepco DC Benning Diagnostic Driving	22,132
66171	Pepco General	66171: PEPCO DC 1310 Vermont Ave NW	12,510
66415	Pepco General	66415: PEPCO DC 3900 WISCONSIN AVE NW - EAST and WEST PODIUM	486,504
66429	Pepco General	66429: PEPCO DC 1112 First St NW	8,001
66440	Pepco General	66440: PEPCO DC 810 New Jersey Ave NW	22,912
66496	Pepco General	66496: PEPCO DC 515 22nd St NW	33,943
66498	Pepco General	66498: Pepco DC Jet U Apts 843-867 21st St NE	2,687
66502	Pepco General	66502: Pepco DC 2017 Rear 2nd Street NE	329
66508	Pepco General	66508: PEPCO DC 1016 17th PI NE	133,559
66559	Pepco General	66559: PEPCO DC 300 Morse St	5,473
66561	Pepco General	66561: Pepco DC 11222 Bladensburg Rd NE	13,580
70190	Pepco General	70190: 500 Morse Street NE- NBC (DLPCS6W045)	(41,218)
71505	Pepco IT Projects	71505: E-Key Program Zone 23 Distribution - DC (UDSPRD8E23)	18,126
71640	Pepco IT Projects	71640: FEP Physical Security - Pepco (DC): Buzzard Pt Sub B (TSPRD8VM01)	(88,834)
74082	Pepco IT Projects	74082: Waterfront Half-loop Extensions (UDLPRM4BP1)	89,192
74350	Pepco IT Projects	74350: Pepco DC Fire Protection Distribution (UDSPRD8DC1)	958,377
74439	Pepco IT Projects	74439: Benning - Replace Storm Sewer Sections from Manhole to Manhole (CMP353)	(8,289)
74533	Pepco IT Projects	74533: Pepco DC: Install AC power to Spare Dist Transformers (UDSPRD8DS1)	69,614
75421	Pepco IT Projects	75421: PEPCO DC 555 E ST SW	756,196
85618	Pepco IT Projects	85618: 17000 DC Recloser Oper Insp & Battery Repl Pep -DC 21200 593000	18,594
86187	Pepco IT Projects	86187: 17000 DC Damage Claims 21440 416000	1,711,290
72752	Pepco IT Projects	72752: New Business DC (UDLPCS6WX)	32,708
75092	Pepco IT Projects	75092: NB Residential Pepco DC	13,585,202
63926	Pepco IT Projects	63926: Pepco-DC: Double Wood Pole Removal	147,420
Sub Total:			308,986,355

ITN	Filing Category	ITN Name	2020 CapEx Adj Budget 1/1 - 12/31
72976	Pepco Distribution - DC	72976: Web Release 2 - My Acct Convergence (PEPCO) - Cap	(42)
74171	Pepco Distribution - DC	74171: WMS Integration & Implementation (PEPCO) - Cap	(82)
70554	Pepco Distribution - DC	70554: BBNL 808 Bladensburg Road NE-NBC (DLPCS6W023)	456,793
82639	Pepco Distribution - DC	82639: EU Analytics - Customer 1 (PEPCO) - Cap	(16)
73456	Pepco Distribution - DC	73456: Retire Fort Carroll Sub. 130 (UDSPRD8SD3)	125,114
70834	Pepco Distribution - DC	70834: Buzzard Point Sta. B- Replace Live Parts 138kv (UDSPRD8Z)	2,132
70058	Pepco Distribution - DC	70058: 12th Street Sub: Retire Sub (UDSPRD8RK)	18,446
74093	Pepco Distribution - DC	74093: Waterfront Sub: Construct Third LVAC Group (UDLPLWF6)	13,697
70117	Pepco Distribution - DC	70117: 1550 1ST ST SW- NBC (DLPCS6W036)	91,078
71859	Pepco Distribution - DC	71859: Harrison Sub: Extend New Dist Fdrs to 38 (UDLPLNW3)	332,350
72733	Pepco Distribution - DC	72733: Navy Yard: Transfer to Waterfront Sub. 223 (UDLPLWF7)	6
73734	Pepco Distribution - DC	73734: Sub 150 Twining City T2 - B-0551 (ECA) (UDSPRD8TC1)	849,044
70031	Pepco Distribution - DC	70031: 1005 1ST ST NE- NBC (DLPCS1W029)	899,219
73754	Pepco Distribution - DC	73754: Sub. 50 Marine D & R All 4kV Electrical (UDSPRD8RM)	74
71541	Pepco Distribution - DC	71541: EMS Consolidation Implementation (PEPCO) - Cap	2,683,892
73910	Pepco Distribution - DC	73910: PHI Cascade Implementation (PEPCO) - Cap	156,922
71138	Pepco Distribution - DC	71138: Convert Alabama Ave. Sub 136 Feeder 15178 and 15165 from a 3-wire to a 4-	1,118,120
74084	Pepco Distribution - DC	74084: Waterfront Sub - Install 4th Transformer (UDSPLM7WF4)	326,651
74352	Pepco Distribution - DC	74352: FEP Physical Security - Pepco (DC): 22nd Street Sub 124 (UDSPRD	325,718
71548	Pepco Distribution - DC	71548: EU Analytics - Grid T&D (PEPCO)- Cap	625,198
74358	Pepco Distribution - DC	74358: 1002 2nd St NE 3569108 NBC (DLPCS1W052)	1,532,737
71721	Pepco Distribution - DC	71721: Ft Lincoln Reliability Initiative (DC) (UDLPRM4LRD)	2,844,855
74383	Pepco Distribution - DC	74383: FEP Physical Security - Pepco (DC): 12th & Irving Sub 133 (864,556
70251	Pepco Distribution - DC	70251: 69kV Lines NRL Sub 168 to Blue Plains Sub 83 (UDLPRM8BB)	276,801
74353	Pepco Distribution - DC	74353: FEP Physical Security - Pepco (DC): 9th Street Sub 117 (UDSPRD8	105,132
73696	Pepco Distribution - DC	73696: Sta A & C Replace 69 kV Breakers (UDSPRD8C1)	234,062
74014	Pepco Distribution - DC	74014: Util Proj Port Mgmt Tool (PEPCO) - Cap	233,118
74033	Pepco Distribution - DC	74033: Van Ness Switchgear Replacement: Distribution Line (UDLPRM4WA1)	2,451,008
73932	Pepco Distribution - DC	73932: Twelfth St Conversions (UDLPRM8BU)	6,655,969
94274	Pepco Distribution - DC	94274: ITOC-NOC Consolidation SW	569,724
70177	Pepco Distribution - DC	70177: 301/331 N St NE- NBC (DLPCS6W044)	772,450
71855	Pepco Distribution - DC	71855: Harrison Sub: Construct New Sub (UDSPLNW2)	4,129,976
94275	Pepco Distribution - DC	94275: ITOC-NOC Consolidation HW	65,249
70433	Pepco Distribution - DC	70433: Alabama Ave Sub 136: Extend 7 Fdrs to Retire Anacostia (UDLPLWF1)	131,006
72810	Pepco Distribution - DC	72810: North Capitol Sub 4-13kV conversion (UDLPRM8BC)	2,041,049
73698	Pepco Distribution - DC	73698: Sta. C Replace RTU, breakers & Station Service (UDSPRD8SB)	457,514
73918	Pepco Distribution - DC	73918: Trinidad Sub 106 - Retire (UDSPRD8RO)	120,476
73452	Pepco Distribution - DC	73452: Retire Anacostia 4kV and 13kV Substations (UDSPRD8RW1)	896,776
72811	Pepco Distribution - DC	72811: North Capitol Sub: Retire Sub (UDSPRD8RJ)	731,453
75205	Pepco Distribution - DC	75205: EU Analytics - (AMI) Advanced Metering Infrastructure (PEPCO) - Cap	2,106,254
75245	Pepco Distribution - DC	75245: EU TOA Implementation (PEPCO) - Cap	159,992
73839	Pepco Distribution - DC	73839: Takoma to Sligo 69kV Line: Install Three 69kV Feeders (UDLPLM72	5,470,842
72004	Pepco Distribution - DC	72004: Install 4th 230/69kV 224MVA transformer #12 at Benning (UDSPLM7	2,693,286
72137	Pepco Distribution - DC	72137: L St Sub Capacity Expansion Work (UDSPLM722A)	422,181
74590	Pepco Distribution - DC	74590: DDOT DC South Capitol Street Bridge Conduit (UDLPLM7001)	18,804,789
71782	Pepco Distribution - DC	71782: Georgetown : 4 to 13 kv Conver Phs 3-8 (UDLPRM8BT)	4,908
74087	Pepco Distribution - DC	74087: Waterfront Sub-Extend Fdrs: Transfer HV, Metro, Distrib frm Sta	1,728,307
71558	Pepco Distribution - DC	71558: Mobile Dispatch/Mapping (PEPCO) - Cap	8,352,672
71866	Pepco Distribution - DC	71866: Harvard Rebuild - Extend Fiber (UOFPOHS)	468
72529	Pepco Distribution - DC	72529: Mt Vernon Sq Sub: Extend LVAC (UDLPLMV1)	1,667,835
72794	Pepco Distribution - DC	72794: New Training Facility Improvement (PHI) (CMP334)	19,387,937
71222	Pepco Distribution - DC	71222: DC- Ground Test Device Installation Program (UDSPRD8GTD)	312,294
73116	Pepco Distribution - DC	73116: Pepco-DC: Fort Slocum Sub 190-Switchgear Repl (UDSPRD8AD1)	4,644,578
73087	Pepco Distribution - DC	73087: Pepco MD: Electric Vehicles (CMP1143M)	202,216
72525	Pepco Distribution - DC	72525: Mt Vernon Sq Sub: Construct 230/13kv Sub (UDSPLMV3)	1,365,674
70439	Pepco Distribution - DC	70439: Anacostia Sub : Convert 4 to 13kv & Retire Sub (UDLPLWF3)	211,548
74085	Pepco Distribution - DC	74085: Waterfront Sub - Install 5th Transformer (UDSPLM7WF3)	241,290
71630	Pepco Distribution - DC	71630: F St Sub Rebuild (69kV) (UDSPLM718A)	1,128,752
71631	Pepco Distribution - DC	71631: F St Sub Rebuild (UDSPLM717A)	1,052,000
74312	Pepco Distribution - DC	74312: PEPCO Mgmt & Compliance POOL Project - Cap	(8,126,561)
94208	Pepco Distribution - DC	94208: PEPCO NERC CIP POOL Project - Cap	46,584
70096	Pepco Distribution - DC	70096: 13kV Distribution Cutovers "F" St to "L" St (UDLPLM7W27)	2,772,803
71011	Pepco Distribution - DC	71011: Champlain - New 34kV Sub (UDSPRD8AD8)	573,949
71012	Pepco Distribution - DC	71012: Champlain - New 69kV Sub (DSPRD8AD17)	564,145
71015	Pepco Distribution - DC	71015: Champlain to L Street 34kV (UDLPRM4WA8)	1,068,682

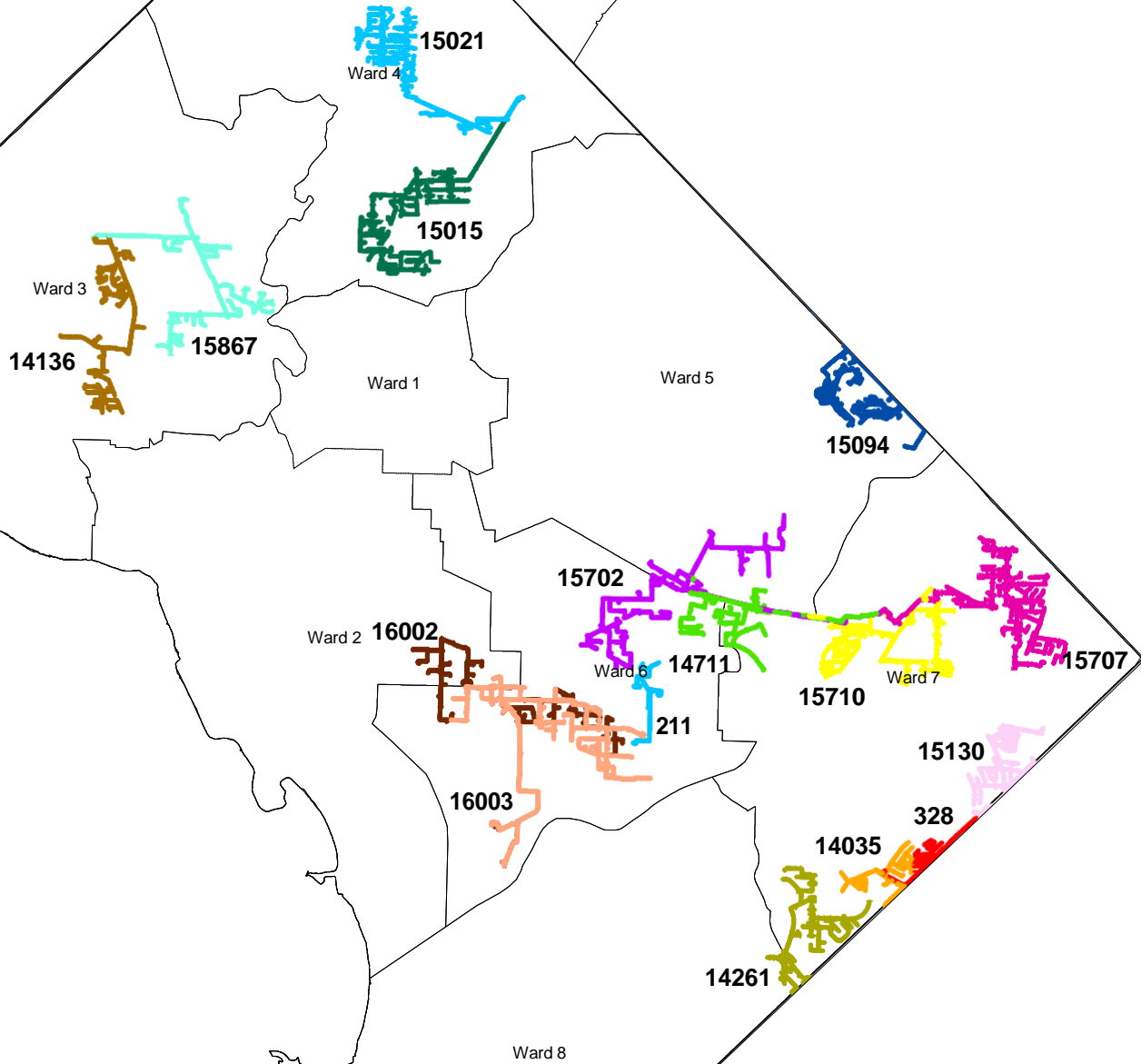
74306	Pepco Distribution - DC	74306: PEPCO BIDA POOL Project - Cap	1,345,554
73368	Pepco Distribution - DC	73368: Repl 69kV SCFF UG Supl-Georgetown, F St, 22nd St (UDLPRM5SG)	1,122,283
71864	Pepco Distribution - DC	71864: Harvard Rebuild - Distribution Upgrade to 230/13kV, 210 MVA (UDSPRD8AD2)	4,822,658
71867	Pepco Distribution - DC	71867: Harvard Rebuild - 13 kV Harvard Load Transfers (UDLPRM4WA6)	4,500,000
71731	Pepco Distribution - DC	71731: G STREET SUB 28 - CONVERT 4KV LOAD AND RETIRE - Line Work (UDLP	1,132,245
73399	Pepco Distribution - DC	73399: Replace Deteriorated Dist Transformers DC (UDSPRD9GD)	3
70060	Pepco Distribution - DC	70060: 13.8kV Swgr Replacement - Pepco DC (UDSPRD8KD)	3,399,655
72685	Pepco Distribution - DC	72685: NERC Physical Security Pepco Dist Sub.- DC (UDSPRD8VD)	6,377
73037	Pepco Distribution - DC	73037: Pepco Building Refresh (CMP339)	1,844,825
72033	Pepco Distribution - DC	72033: Pepco MD - Capacitor Control Install/Replace	593,788
71913	Pepco Distribution - DC	71913: Firewall Refresh (PEPCO) MD - Cap	20,581
71231	Pepco Distribution - DC	71231: DDOT DC South Capital Street Relocation 34kV UG (UDLPCSCAP2)	2,716,646
71664	Pepco Distribution - DC	71664: Facilities Improvements DC (CMP130Z)	962,055
73055	Pepco Distribution - DC	73055: Pepco DC: Benning Area Plan (UDLPRM4WA2)	15,223
72064	Pepco Distribution - DC	72064: Install Smart Relays & Replace RTU's -DC (UDSPRD8SD)	23,908
64420	Pepco Distribution - DC	64420: Firewall Refresh (PEPCO) DC - Cap	600,856
72040	Pepco Distribution - DC	72040: Pepco MD - ACR/SF6 Control Install/Replace	1,606,897
72681	Pepco Distribution - DC	72681: Smart Grid Infrastructure (PEPCO) MD - Cap	1,299,691
72059	Pepco Distribution - DC	72059: MD - Install Radios Line Eqp Pep (UORPODA1Z)	254,552
73042	Pepco Distribution - DC	73042: Pepco DC Distrib - Upgrade Pumping Plants (UDLPRM9PD)	146,884
70602	Pepco Distribution - DC	70602: Batt & Chgr Replacement Distri. Subs. - DC (UDSPRD8ED)	272,925
73224	Pepco Distribution - DC	73224: Post-Deployment AMI Comm Meter to Pole Pepco MD (UORPOPDAMI)	469,444
73787	Pepco Distribution - DC	73787: Substation Retirements-DC. (UDSPRD8RN)	737,523
73223	Pepco Distribution - DC	73223: Post-Deployment AMI Comm Meter to Pole Pepco DC (UORPODCAMI)	521,684
73762	Pepco Distribution - DC	73762: Sub.168 Naval Research-Replace T1 & T2 Transformer (DSPRD8AD11)	4,111,584
73507	Pepco Distribution - DC	73507: Smart Grid Infrastructure (PEPCO) DC - Cap	(136,935)
74083	Pepco Distribution - DC	74083: Waterfront Sub - Establish Waterfront North LVAC Network Group	576,823
73078	Pepco Distribution - DC	73078: Communication Tower Infrastructure (PEPCO) MD - Cap	(27,288)
72840	Pepco Distribution - DC	72840: Northeast Sub. 212 East Network Group (NEW) (UDLPLM7W14)	288,019
71100	Pepco Distribution - DC	71100: Collector to Data Network pMD (UORPOBR1Z)	2,305
70442	Pepco Distribution - DC	70442: Animal Guards in Dist Subs: Pepco DC (UDSPRD8JD)	654,656
73371	Pepco Distribution - DC	73371: Repl Eng Generators Dist Sub: Pepco DC (UDSPRD8UD)	448,510
74122	Pepco Distribution - DC	74122: Fiber Optic Builds (PEPCO) MD - Cap	4,794,819
75442	Pepco Distribution - DC	75442: SSN Mesh Network - Repeaters and APs - DC (PEPCO) - Cap	(296,706)
72013	Pepco Distribution - DC	72013: Pepco MD - Centralized DA Equipment & Control Program	102,510
70569	Pepco Distribution - DC	70569: BENNING INSTALL BB WIRELESS BASE STATION (UORPORBSB)	2,968
70762	Pepco Distribution - DC	70762: Pepco DC - ACR/SF6 Control Install/Replace	1,160,649
70187	Pepco Distribution - DC	70187: 4kv Substation Automation - DC (UDSPRD8H)	282,772
72032	Pepco Distribution - DC	72032: Pepco DC - Capacitor Control Install/Replace	59,471
71417	Pepco Distribution - DC	71417: Dist Sub Bushing Replacement: Pepco DC (UDSPRD8FD)	39,919
73302	Pepco Distribution - DC	73302: SSN Mesh Network - Masters MD (PEPCO) - Cap	1,655,385
73080	Pepco Distribution - DC	73080: SSN Mesh Network (PEPCO) - Cap	27,595
73506	Pepco Distribution - DC	73506: Smart Grid Infrastructure (DPL) MD - Cap	617,309
73957	Pepco Distribution - DC	73957: UF: Collector to Data Network PEPCO DC (UORPOBR1D)	300,129
75095	Pepco Distribution - DC	75095: PEPCO DC NB Network Commercial	23,000,541
71223	Pepco Distribution - DC	71223: DC: Facility Relocations(Non-Highway) (UDLPCS3W)	58,834
71214	Pepco Distribution - DC	71214: DC Highway Relocations (UDLPCH0W)	2,464,167
75093	Pepco Distribution - DC	75093: NB Commercial Pepco DC	21,464,404
82491	Pepco Distribution - DC	82491: 17000 MULTI Controller CTO CTO02 923000	30,745
74349	Pepco Distribution - DC	74349: Benning 4kV Area-Phase Balancing to Fix Voltage Drop Issues (UD	260,285
72750	Pepco Distribution - DC	72750: Network Xfmr&Prot Repl Planned: Benni (UDLPRM4BN)	8,358,618
72978	Pepco Distribution - DC	72978: PILC REPLACEMENT PLANNED (UDLPRPLIC)	10,120,723
71612	Pepco Distribution - DC	71612: Emergency Restoration UG PEP DC (UDLPRM32DX)	18,165,949
71605	Pepco Distribution - DC	71605: Emergency Restoration OH PEP DC (DLPRM32DXX)	5,178,084
71411	Pepco Distribution - DC	71411: Dist Feeder Load Relief - DC (UDLPLM7W)	4,884,747
70897	Pepco Distribution - DC	70897: Cable PEP DC (UDLPRM4BCX)	3,666,804
72746	Pepco Distribution - DC	72746: Pepco DC - Network RMS - Line	2,160,652
73250	Pepco Distribution - DC	73250: Priority Feeder Improvements- PEP DC (UDLPRM4BF)	3,685,005
73179	Pepco Distribution - DC	73179: Planned Rubber/Lead Secondary Replacement (UDLPRM4WA9)	7,581,682
71579	Pepco Distribution - DC	71579: Electric Vehicle Distribution PEPCO - MD (UDL	2,113,042
72359	Pepco Distribution - DC	72359: Meter Install DC (UDLPCMR2DX)	2,430,255
71615	Pepco Distribution - DC	71615: Emergency Restoration: Network Transfs & Protectors (UDLPRM3K1)	2,812,181
72268	Pepco Distribution - DC	72268: Misc. Reliability Improvements- PEP DC (UDLPRM4BA)	2,679,692
71119	Pepco Distribution - DC	71119: Comprehensive Feeder Improvements- PEPCO:DC (UDLPRM63D)	2,438,282
73902	Pepco Distribution - DC	73902: Transformer Load Management (TLM) Pep - DC (UDLPLM7W21)	2,376,962
74331	Pepco Distribution - DC	74331: BSC IT Corp Proj - Cap	1,459,394
72997	Pepco Distribution - DC	72997: Padmount Transformer Replacements PEP DC (UDLPRM4BO)	862,827
72355	Pepco Distribution - DC	72355: Meter Equipment DC (DLPCMR2DXX)	1,800,422

71438	Pepco Distribution - DC	71438: Distribution Automation Place Holder - Pepco DC (UDLPRDA1D)	303,753
71448	Pepco Distribution - DC	71448: Distribution Pole Replacements PEP DC (UDLPRM4BE)	700,986
72924	Pepco Distribution - DC	72924: PEPCO DC SMSG Capital Project (UDLPCSCPDC)	586,870
72748	Pepco Distribution - DC	72748: Pepco DC - Network RMS - Telecom	2,405,748
71440	Pepco Distribution - DC	71440: Distribution DC - HPPF System Cathodic Protection Program (UDLP	581,289
71665	Pepco Distribution - DC	71665: Facilities Improvements Pep MD (CMP132Z)	528,178
74354	Pepco Distribution - DC	74354: PEP - Wedge for DC Dist Sub (UDSPSPDACR)	(18,100,000)
73032	Pepco Distribution - DC	73032: Pep-DC Damage Equipment Replacements (UDLPOEMGD)	276,194
73883	Pepco Distribution - DC	73883: Tools Pepco MD (UOTPOMR1MX)	441,824
73332	Pepco Distribution - DC	73332: Recloser Installations (ACR) - Pepco DC (UDLPRM4DJ)	2,808,451
73651	Pepco Distribution - DC	73651: Pepco-DC: Trip Savers (UDLPRM4WJ)	209,883
73068	Pepco Distribution - DC	73068: Pepco Equipment Refresh (CMP341)	303,342
73880	Pepco Distribution - DC	73880: Tools DC (UOTPOMR1DX)	468,084
71441	Pepco Distribution - DC	71441: Distribution Feeder Load Relief DC (UDSPLM7W)	10,326,507
73058	Pepco Distribution - DC	73058: Pepco DC: Electric Vehicles (CMP1143D)	202,216
71110	Pepco Distribution - DC	71110: Communication Work: Data Network DC (UOFPOF25D)	2,422
72316	Pepco Distribution - DC	72316: Pepco MD - Network RMS - Telecom	1,160,546
73781	Pepco Distribution - DC	73781: Substation Improvements and Additions - DC (UDSPRD8AD)	200,000
72012	Pepco Distribution - DC	72012: Pepco DC - Centralized DA Equipment & Control Program	100,176
71204	Pepco Distribution - DC	71204: Pepco DC - Distribution Smart Sensors	88,988
73096	Pepco Distribution - DC	73096: Pepco MD: Office Furniture (CMP120M)	126,409
73054	Pepco Distribution - DC	73054: Pepco DC: Add Sub Condition Monitoring Points (UDSPRD9D5)	200,000
73369	Pepco Distribution - DC	73369: Pepco MD - DA Battery Replacement	157,646
73062	Pepco Distribution - DC	73062: Pepco DC: Office Furniture (CMP120D)	96,042
71418	Pepco Distribution - DC	71418: Dist Sub Bushing Replacement: Pepco DC (UDSPRD8FV)	25,764
73048	Pepco Distribution - DC	73048: Pepco DC Unscheduled Radio (UORPOR30D)	129
71426	Pepco Distribution - DC	71426: Pepco DC CM Distribution Substation Capital	13,005
71132	Pepco Distribution - DC	71132: Control Center Equipment for Field Device Data - Pepco (UOIPO20)	87,560
73074	Pepco Distribution - DC	73074: Pepco MD Install Radios in Vehicle (UORPORVRM)	470
73043	Pepco Distribution - DC	73043: Pepco DC Install Radios in Vehicle (UORPORVRD)	723
73088	Pepco Distribution - DC	73088: Pepco MD: Green Initiatives (CMP114M)	50,539
73383	Pepco Distribution - DC	73383: Pepco DC - DA Battery Replacement	152,440
71987	Pepco Distribution - DC	71987: Improve/Add Substation Enclosures (UDSPRD8D2)	3
73059	Pepco Distribution - DC	73059: Pepco DC: Green Initiatives (CMP114D)	30,323
73348	Pepco Distribution - DC	73348: Pepco DC - Regulator Control Install/Replace	456,819
71227	Pepco Distribution - DC	71227: DC: Security Systems & Equipment (CMP85D)	948,194
73098	Pepco Distribution - DC	73098: Pepco MD: Security Systems & Equipment (CMP85M)	588,779
73428	Pepco Distribution - DC	73428: Replace SSN Access Point and Repeater Batteries - Forestville,	17,205
73432	Pepco Distribution - DC	73432: Replace SSN Access Point and Repeater Batteries, Rockville MD (17,205
73431	Pepco Distribution - DC	73431: Replace SSN Access Point and Repeater Batteries, DC (UORPOAPRDC	17,205
73052	Pepco Distribution - DC	73052: Pepco DC: Substation Ventilation (UDSPRD8LD)	5
94237	Pepco Distribution - DC	94237: PEPCO Misc ACCTG Projects	364,152
80147	Pepco Distribution - DC	80147: BSC Security Projects - Cap	118,300
70604	Pepco Distribution - DC	70604: Batt & Chgr Replacement Trans. Subs. - DC (UTSPRD8ED)	120,627
71111	Pepco Distribution - DC	71111: Communication Work: Data Network MD (UOFPOF25M)	453,341
71912	Pepco Distribution - DC	71912: IDS design build and install, PEPCO DC (UOFPOF33D)	1,595,194
72983	Pepco Distribution - DC	72983: PJM Joint Owned Facilities-Pepco DC Portion (UJTP1D)	225,466
73045	Pepco Distribution - DC	73045: Pepco DC Reg: Salvage Scrap Wire/Cable (UDLPOSV5D)	(1,000,000)
91907	Pepco Distribution - DC	91907: 17000 DE Pepco BSC Shared Service Costs PFUNA 923000	41,222,927
74250	Pepco Distribution - DC	74250: A&G Pool - Pepco	(74,090)
72483	Pepco Distribution - DC	72483: Pass Throughs (PEPCO) - Cap	2,060,598
62161	Pepco Distribution - DC	62161: Pepco DC New Jersey Ave Reliability Initiative	3,188,447
62214	Pepco Distribution - DC	62214: Pepco DC Plug Third Biennial Installs	160,223
62215	Pepco Distribution - DC	62215: Pepco DC DC PLUG FEEDER 00308	3,913,572
62219	Pepco Distribution - DC	62219: Pepco DC DC PLUG FEEDER 14900	1,412,121
62221	Pepco Distribution - DC	62221: Pepco DC PLUG FEEDER 00368	1,198,574
62222	Pepco Distribution - DC	62222: Pepco DC DC PLUG FEEDER 14758	1,374,741
62223	Pepco General	62223: Pepco DC DC PLUG FEEDER 14007	1,603,713
62224	Pepco General	62224: Pepco DC DC PLUG FEEDER 15009	955,815
62269	Pepco General	62269: FEP Physical Security - Pepco (DC): New Jersey Ave Sub 161	897,829
62504	Pepco General	62504: Pepco DC Alabama Ave Breakers Installation	1,851,471
62900	Pepco General	62900: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Substation	1,409,238
62935	Pepco General	62935: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Distribution	42,492
63051	Pepco General	63051: PEPCO DC EDD 2019	47,685
63208	Pepco General	63208: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Fiber/Telecom	7,705
63344	Pepco General	63344: PEPCO DC Feeder 15165 Extension	509,377
63429	Pepco General	63429: Pepco DC - ITE Air Circuit Breakers	516,549
63506	Pepco General	63506:PEPCO(DC) FEP Physical Security-Little Falls	587,027

63507	Pepco General	63507:PEPCO(DC) FEP Physical Security-Florida Ave	587,027
63509	Pepco General	63509:PEPCO(DC):FEP- Physical Security-Georgetown	575,789
63510	Pepco General	63510:PEPCO(DC): FEP- Physical Security-Northeast	537,061
63511	Pepco General	63511: PEPCO DC Dist FEP Physical Security: Southwest	185,259
63514	Pepco General	63514:PEPCO(DC): FEP-Physical Security-Van Ness	188,117
63556	Pepco General	63556:Pepco DC DC Plug Feeder 00308 - Removal	228,274
63628	Pepco General	63628 Pepco DC Dist: Substation Infrastructure - DC	1,027,140
63632	Pepco General	63632: Pepco: DC- Storm Water Retention Credit	605,426
63635	Pepco General	63635: Pepco DC- Yards ML 1A & Parcel G	758,508
63643	Pepco General	63643: Pepco DC Dist: Drainage and Driveway Remediation	167,724
63661	Pepco General	63661: Pepco DC- Yards ML 1B	1,947,680
63662	Pepco General	63662: Pepco DC- Yards Parcel I	1,219,405
63663	Pepco General	63663: Pepco DC- Warf Phase 2	1,568,864
63666	Pepco General	63666: Pepco DC 1000 South Capitol St SE	559,215
63677	Pepco General	63677: Pepco DC: Dist- Spare Transformer	3,605,916
63679	Pepco General	63679: Pepco DC: Dist-Mobile Transformer	1,036,841
63680	Pepco General	63680: Pepco DC Dist: Buzzard 230/34kV Substation	2,092,546
63697	Pepco General	63697: Pepco DC- 1615 Eckington Place, NE	916,579
63698	Pepco General	63698: PEPCO DC Parks at Walter Reed	6,107,552
63700	Pepco General	63700: Pepco DC- 1501 Harry Thomas Way, NE	194,475
63702	Pepco General	63702: Pepco DC- 680 Rhode Island Avenue, NE (Blocks 1A, 1B, 2B)	701,778
63704	Pepco General	63704: Pepco DC- 600 Rhode Island Avenue, NE	611,700
63710	Pepco General	63710: Pepco DC- 2607 Reed Street, NE	528,929
63718	Pepco General	63718: Pepco DC- 1676 Maryland Ave NE	3,160,167
63722	Pepco General	63722: Pepco DC- 400 Florida Ave NE	630,806
63725	Pepco General	63725: Pepco DC- 500 Penn Ave NE	736,357
63727	Pepco General	63727: Pepco DC- 1500 Harry Thomas WY NE	518,669
63736	Pepco General	63736: PEPCO DC 300 MORSE ST NE 2 SPOT NTWK 208V	129,826
63770	Pepco General	63770: Pepco MD 69kV Corrective Maintenance	1,062,121
63923	Pepco General	63923: Pepco DC DC Plug Second Biennial Install	651,011
64102	Pepco General	64102: PEPCO DC CM Georgetown Sub 12 Pumps, Bushing & Gasket Replacements	206,369
64120	Pepco General	64120:PEPCO(DC):Dist-Station Service Transformer Replacement Buckets	112,548
64396	Pepco General	64396: PEPCO DC: Dist- Three 42MVA Spare Transformers	1,506,767
64407	Pepco General	64407: PEPCO DC DIST-33MVA Spare Transformer	486,736
64724	Pepco General	64724: PEPCO DC: Mobile Distribution Transformer for Urban Area	1,805,875
64794	Pepco General	64794: PEPCO DC 4669 South Capitol St SW Distribution	91,888
64796	Pepco General	64796: PEPCO DC 4669 South Capitol St SW Telecom	25,566
64922	Pepco General	64922 PEPCO DC: DIST-Two 56 MVA Spare Transformers	1,146,423
64993	Pepco General	64993: PEPCO DC Dist Florida Ave 4T LTC & Bushing	51,318
65194	Pepco General	65194: Harvard Rebuild - 13 kV Harvard Re-Load	50,000
65534	Pepco General	65534: PEPCO DC Replace Three (3) I Street Transformers	2,215,920
65537	Pepco General	65537: PEPCO DC O Street Sub 2, Transformer # 2 and # 4 Replacement	2,462,134
65551	Pepco General	65551 Pepco DC- DIST:Benning Sub. 41 69kV T8, T9 Replacement	4,103,552
65553	Pepco General	65553: PEPCO DC: Dist- Benning Sub. 41 69kV GIS	4,103,552
65554	Pepco General	65554 Pepco DC - Dist: Little Falls Rplc 3 Trfrmr and install High side bus 69KV	2,462,134
65555	Pepco General	65555: PEPCO:DC-DIST:22nd Street, Sub. 124. Replace Four (4) Transformers	2,051,770
65556	Pepco General	65556 Pepco DC - Dist 12th & Irv Rplc 3 Transformers	2,051,770
65559	Pepco General	65559: Pepco DC - Dist Replace L St Switchgear	1,641,418
65583	Pepco General	65583: Pepco DC 1300 4th ST NE	30,537
70190	Pepco General	70190: 500 Morse Street NE- NBC (DLPCS6W045)	478,016
71640	Pepco General	71640: FEP Physical Security - Pepco (DC): Buzzard Pt Sub B (TSPRD8VM01)	3,475,092
74082	Pepco General	74082: Waterfront Half-loop Extensions (UDLPRM4BP1)	3,113,871
74350	Pepco General	74350: Pepco DC Fire Protection Distribution (UDSPRD8DC1)	8,575,188
85618	Pepco General	85618: 17000 DC Recloser Oper Insp & Battery Repl Pep -DC 21200 593000	30,193
72752	Pepco IT Projects	72752: New Business DC (UDLPCS6WX)	35,069
75092	Pepco IT Projects	75092: NB Residential Pepco DC	13,511,561
63056	Pepco IT Projects	63056: Pepco DC CM Non-emergency Dist Sub Cap	75,374
63645	Pepco IT Projects	63645: Pepco DC - UG SCADA Interrupter Install/Replace	1,315,394
63647	Pepco IT Projects	63647: Pepco DC - UG SCADA Interrupter Control Install/Replace	302,804
63668	Pepco IT Projects	63668: Pepco DC - Unplanned Replacement DA Controller/Radio/SCADA/Battery	416,274
64355	Pepco IT Projects	64355: Pepco DC: Roof Replacements Distribution	333,701
64357	Pepco IT Projects	64357: Pepco DC: Sub Ventilation Distribution	75,842
64365	Pepco IT Projects	64365: Pepco DC: Sub Imprv. & add. Distribution	1,101,216
72950	Pepco IT Projects	72950: PEPCO-DC - Accrual for Reliability (UDLPRACRD)	(3,399,996)
Sub Total:			433,362,352

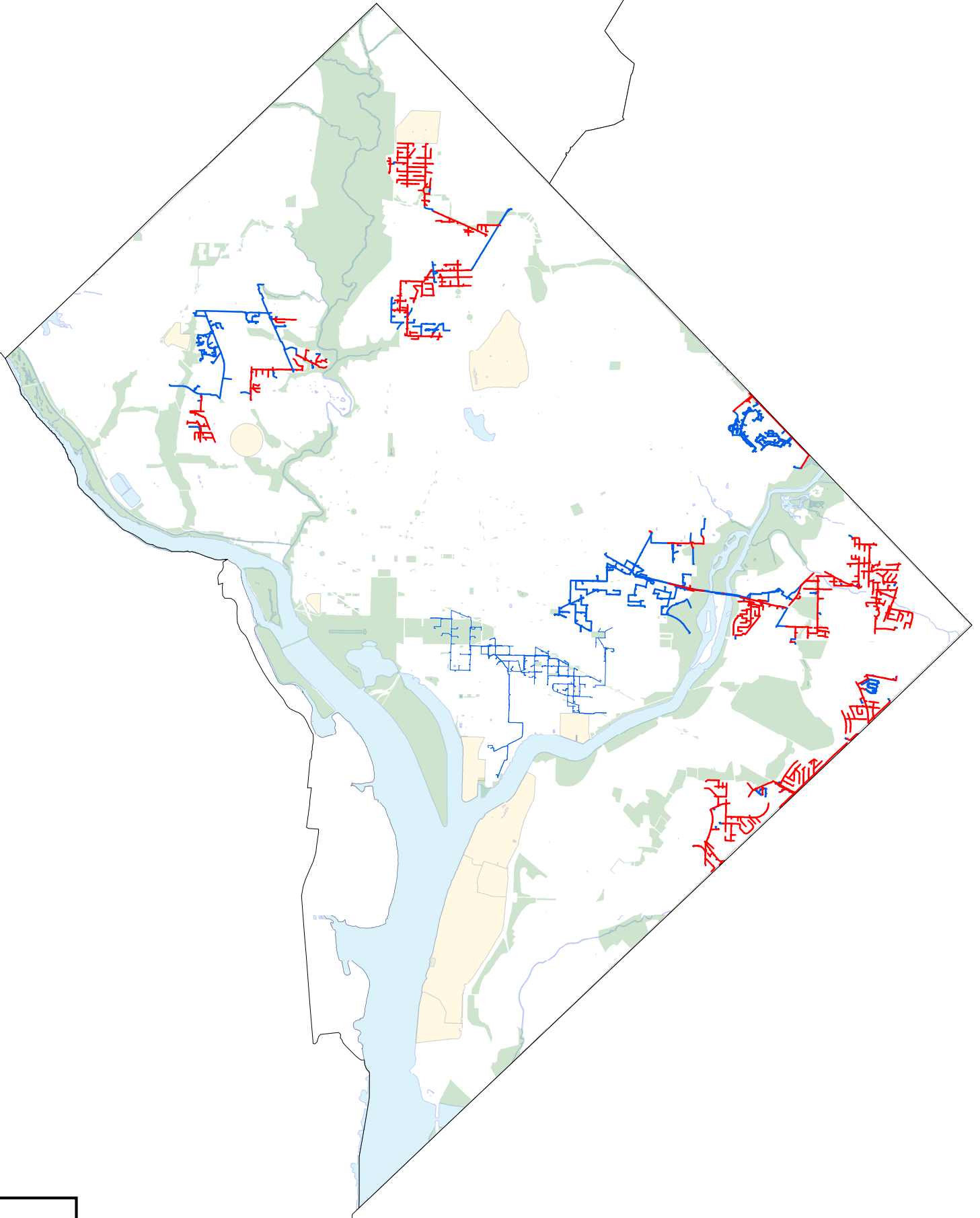
District of Columbia Priority Feeders 2020

Attachment C



District of Columbia Priority Feeders 2020

Attachment C



Legend

- DC_UG_add3
- Overhead
- Underground

Pepco 2020 Safety Merger Commitments

The following attachments reflect the Company's compliance with the merger commitment described in Order No. 18148 Attachment B at P 60, Safety:¹

Exelon is committed to having all its utilities achieve and maintain first quartile performance in safety. Consistent therewith, Pepco will file annual reports on its safety performance and safety initiatives with the Commission as part of its Annual Consolidated Report and will also present this information to the PIWG. Pepco's reporting will include a report by Exelon on its existing safety and cybersecurity policies.

- Exelon Corporate Safety Policy
- Exelon Safety Update
- Pepco Transmission and Distribution Safety Incident rate, Including Edison Electric Institute (EEI) 2012-2019 Rankings
- Exelon Cyber-Security Statement

¹ In the Matter of the Joint Application of Exelon Corporation, Pepco Holdings, Inc., Potomac Electric Power Company, Exelon Energy Delivery Company, LLC and New Special Purpose Entity, LLC for Authorization and Approval of Proposed Merger Transaction, Formal Case No. 1119, Order No. 18148, March 23, 2016, Attachment B at P 60



Dedicated to Safety

Corporate Policy: Safety

Policy Statement

Exelon Corporation will operate all aspects of its businesses in a manner that protects the safety and health of its employees, contractors, customers and the general public. We will foster a safety culture in which everyone believes and demonstrates that accidents, injuries and occupational illnesses are preventable and all employees understand their responsibility for maintaining a safe and healthful workplace. Further, each employee recognizes and accepts his/her right and obligation to question, stop and correct any unsafe conditions or behaviors.

Policy Intent

Exelon shall:

- Create a safety culture to achieve an accident, injury and occupational illness-free workplace;
- Comply with all applicable health and safety laws and regulations, industry and internal company standards, at a minimum;
- Integrate safety risk analysis into business planning, engineering design, and operating decisions, to develop and implement effective hazard control measures and safety performance improvement, engineering out hazards where feasible;
- Promote the value of employee empowerment in the prevention of injuries and illnesses, and maintain an open and honest dialogue with our employees on health and safety issues and performance; and
- Continually improve safety performance to become the safest electric and gas utility in the United States.

Implementation

This policy shall be implemented by establishing and maintaining:

- A corporate-wide safety program that will be integral to the Exelon Management Model based on external standards and best practices;
- Safety councils and committees, including the Exelon Operations Council, to encourage management sponsorship and employee involvement in injury and illness prevention;
- Annual objectives and targets for measuring and continually improving safety performance and recognition of top performing departments and individuals for safety is routine;
- An independent, corporate audit program and business unit self-assessments;
- Safety and health hazard evaluation programs including documented methods for controlling known safety and health hazards;
- Communications and Corrective Action Programs that facilitate the identification and resolution of safety related concerns;
- Training programs for employees and education programs for contractors on safety expectations and responsibilities;
- Employee and management personal accountability for following health and safety fundamentals and procedures; and
- Promote electricity and gas hazard awareness and accident prevention through public safety programs.

To anonymously report any safety concerns, employees or others working on behalf of Exelon can call the Exelon Helpline at 800.233.8442.

Exelon Safety Update

Exelon is committed to having all its utilities achieve and maintain first quartile performance in safety. As of the end of 2019, PHI has had a 22% reduction in OSHA recordable injuries, 23% reduction in Days Away Restricted Time Cases. This was PHI's best safety performance since 2014 (a 39% improvement from 2016 merger performance).

PHI initiated the following safety programs in 2019:

- Participated with the other Exelon Utilities to continue to align safety best practices that were researched and benchmarked against Edison Electric Institute and American Gas Association utilities.
- Sustained Performance Assessment Programs by sharing incidents, lessons learned, and best practices across Exelon utilities through common communication channels.
- Continued the Ergonomic Coach program to provide Triage Support as needed in PHI overhead line school and field crews.
- PHI expanded driver training technologies and continues to leverage driver monitoring system.

Exelon has an established management model that governs key operational areas throughout the enterprise, including the safety function. The corporate Safety Policy, applicable to all Exelon operations, including Pepco Holdings and Pepco, establishes the framework for defining Exelon's industrial safety culture and sets expectations for continuously improving safety performance. It clearly sets expectations for each employee to take personal responsibility for his or her safety.

Underpinning the Safety Policy is the Corporate Industrial Safety Program, which delineates Exelon's requirements for the management of safety for the enterprise and which is based on recognized industry standards including BSI-OHSAS 18001, OSHA Voluntary Protection Program and ANSI Z10.

Detailed procedures (*e.g.*, Hazards Assessments) are maintained to affect the Safety Policy and programs, and they are routinely evaluated to ensure that best practices are utilized.

To ensure alignment and to facilitate learning, a Corporate Safety Council comprised of safety officers from each business addresses strategic safety issues, and a Corporate Safety Peer Group comprised of safety professionals and managers focuses on operational experience and use of best practices. Pepco is represented on both of these functions. In addition, the Exelon Utilities have a Safety Peer Group, with representation from each utility, including Pepco Holdings, who concentrate on improving safety performance in their specific operations.

As part of the safety performance oversight function, Exelon's enterprise-wide safety

performance is reviewed at Quarterly Management Meetings (QMM) and a comprehensive review of the effectiveness of the safety policy and program is reviewed with the senior leadership team annually.

Further, the Exelon Environmental, Health & Safety Audit Program conducts independent assessments of the effectiveness of Exelon's compliance programs at a select number of locations annually. The results of the audits are reported to senior leadership, who have responsibility for affecting any corrective actions required.

Pepco Transmission and Distribution Incident Rate, Including Edison Electric Institute (EEI) 2018 Rankings

Year	Incident Rate	EEI Quartile Ranking
2012	1.89	Third Quartile
2013	1.79	Third Quartile
2014	1.52	Third Quartile
2015	1.68	Fourth Quartile
2016	2.16	Fourth Quartile
2017	1.51	Third Quartile
2018	1.20	Third Quartile
2019	1.05	TBD ²

² EEI safety rankings are not yet available for 2019 data.

Exelon Cyber-Security Statement

As one of the nation's major critical infrastructure providers, Exelon recognizes that the safety, reliability and security of our systems and facilities are a top priority. The company utilizes a risk-based, intelligence-driven security approach to implementing a comprehensive set of cyber and physical security controls, in line with the National Institute of Standards and Technology's (NIST) Cybersecurity Framework to effectively identify, protect, detect, respond to and recover from a spectrum of threats, mitigating the likelihood of successful attacks and their potential impacts. In addition, Exelon has implemented the mandatory regulatory requirements defined within the NERC CIP and NRC standards, ensuring further protection of cyber assets critical to the safe and reliable operation of the BES and Nuclear from cyber threats. Regulated critical cyber assets are isolated within restricted networks, segmented from the enterprise IT environment and the Internet, continuously monitored for malicious activity, and routinely evaluated for vulnerabilities.



An Exelon Company

Bill Sullivan
Vice President
Technical Services

EP8603
701 Ninth Street, NW
8th Floor
Washington, DC 20068
202 -872-2942

April 1, 2020

Ms. Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
1325 G Street, N.W.
Suite 800
Washington, DC 20005

Re: Pepco-DC Vegetation Management

Dear Ms. Westbrook-Sedgwick:

In accordance with Order No. 19119, and Pepco's December 20, 2017 letter electing to adopt performance-based vegetation management reporting, I, Bill Sullivan, hereby verify that Pepco has in place a comprehensive vegetation management plan, which is fully implemented and was in place in 2017, and that its practices during 2017 conformed to the plan.

Sincerely,

A handwritten signature in black ink that reads "Will Sull" with a long horizontal flourish extending to the right.

Bill Sullivan
Vice President
Technical Services

Annual Consolidated Report

Downtown Resupply Description (updated, if appropriate):

The Downtown Resupply project will replace aging 34 kV and 69 kV supply feeders to the L Street, F Street, Georgetown, and 22nd Street Substations. This work along with upgrades to the F Street Substation and extension of new 13 kV feeders will accommodate load transfers from I Street Substation as well as increasing sub-transmission supply capacity and providing reliability benefits to the District of Columbia.

Explanation of Significant changes to Project:

There have been no significant changes to the Downtown Resupply Project as of March 31, 2020.

Cost Estimate (provided in Formal Case No. 1144):

Items	Estimate Net (Lifecycle) (\$)
Downtown Resupply	494,028,210
13kV Distribution Cutovers "F" St to "L" St (UDLPLM7W27)	39,849,304
13kV Distribution Cutovers from "I" St to "F" St & "L" St (UDLPLM7W28)	32,434,952
Champlain to L Street 34kV (UDLPRM4WA8)	102,319,736
F St Sub Rebuild (69kV) (UDSPLM718A)	50,372,188
F St Sub Rebuild (UDSPLM717A)	33,581,458
L St Sub Capacity Expansion Work (UDSPLM722A)	4,011,558
Repl 69kV Self-Contained UG Supl-Georgetown, "F" St, 22nd St Subs (UDLPRM5SG)	177,223,136
Retire "I" St Sub (UDSPRD27RD)	2,081,496
Retirements for Downtown Resupply 34kV and 69kV for DC (UDLPRM4RDR)	35,522,470
Retirements for Downtown Resupply 34kV and 69kV for MD (UDLPRM4DRM)	1,309,199
Retirements for Downtown Resupply 34kV and 69kV for VA (UDLPRM4DRV)	13,322,712
Telecom - 22nd Street Sub (UDFPO22SS)	500,000
Telecom - Fiber for 34-69kV Resupply Champlain, L Street, F Street (UDFPOCL01)	500,000

Telecom - Georgetown Sub (UDFPOGS01)	500,000
Telecom - L Street Sub (UDFPOLS01)	500,000

Current Cost Estimate:

There are no changes to the cost estimate for the Downtown Resupply Project cost estimates as of March 31, 2020.

Construction Schedule (provided in Formal Case No. 1144):

L Street Substation: 2020-2021

F Street Substation: 2022-2026

I Street Substation: 2026-2028

69kV Supplies: 2019-2028

34kV Supplies: 2019-2028

13kV Supplies: 2019-2027

Updated Construction Schedule:

There have been no significant changes to the Downtown Resupply Project construction schedule as of March 31, 2020.

CERTIFICATE OF SERVICE

I hereby certify that a copy of Potomac Electric Power Company's 2020 Annual Consolidated Report was served this April 1, 2020 on all parties in Docket PEPACR and Formal Case No. 1119 by electronic mail.

Ms. Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
of the District of Columbia
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