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An Exelon Company

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April 15, 2021

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-2021-01 and Formal Case No. 1119

Dear Ms. Westbrook-Sedgwick:

Attached please find Potomac Electric Power Company's 2021 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 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

2021 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)

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INTRODUCTION[1]

Potomac Electric Power Company (Pepco) herein presents its 2021 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 2020 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.

[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").

Summary

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

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

In 2000 in Formal Case No. 991, the Commission issued Order No. 11716 requiring Pepco to 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 2020 Manhole Events. Appendix 3B includes a discussion of the 2020 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: 2021 COMPREHENSIVE PLAN

SECTION 1.1– SYSTEM PLANNING[2]

[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. 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.*

> *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.*

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 for use 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 that 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 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.

1.1.1 The Current Load Forecasting Process[3]

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 to plan for longer duration projects. Short-term, summer-peak forecasts are developed for three years 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

[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

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.

As part of the 2022-2031 Ten-Year Load Forecast, which Pepco will provide in the 2022 ACR, Pepco will employ the results of its updated Distribution System Planning Load Forecasting (DSP-LF) program. The DSP-LF program is currently in the testing phase and is expected to be in use later in 2021. Please note that the updated and enhance load forecasting program will cause changes not just to the results of the forecasts themselves, but also the methodology and process. Thus, the information, data, and process contained in this 2021 report will be modified for the 2022 report.

The DSP-LF application will assist Capacity Planning engineers in evaluating plans that include Non-Wire Alternatives (NWA), satisfying the need for more improved modeling of the many time varying effects on system operation, such as PV generation and battery charge/discharge cycles; understanding the effects on both the seasonal peaks and the annual energy use; and considering the use of NWAs in solutions to load growth.

The DSP-LF application evaluates 8,760-hour DER, load and weather data, including future 8760-hour load, generation, and proposed system changes, and produces an 8,760-hour 90/10 forecast each year for 10 years into the future for feeders, substation power transformers, and substations.

1.1.2 Peak Load Forecasting Process

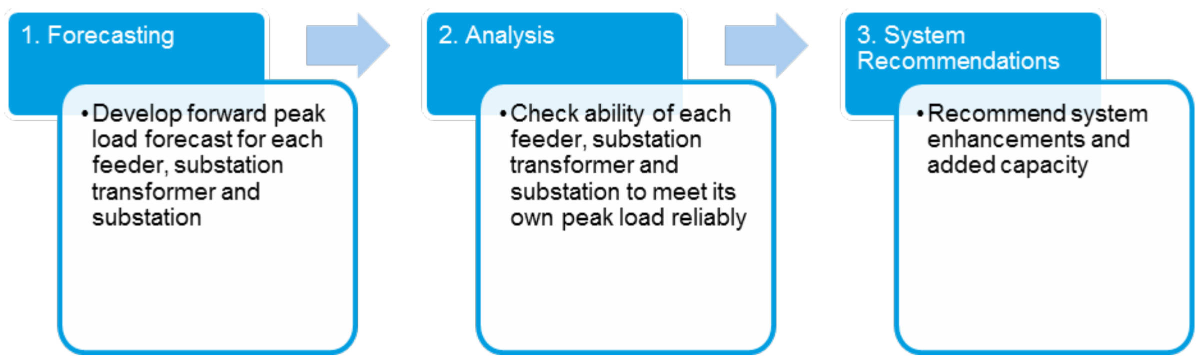
As described in Figure 1.2-A, the development of the peak load forecast is the first step in Pepco's distribution system planning process. The development of the forecast is a critical step, because it has an impact on the outcomes of each subsequent step in the process and, ultimately, the timing and 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.

[4] Consistent with PHI's regulatory obligations to provide safe, reliable electric service to its customers

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

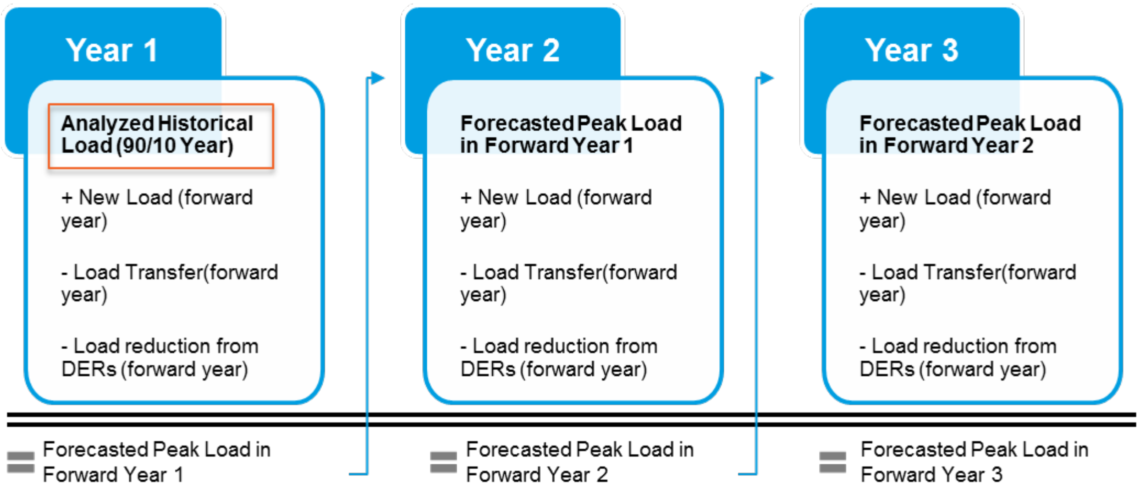


1.1.3 Short-Range and Long-Range Peak Load Forecasts

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 in Pepco's region) system peak load forecast. The short-range forecast is generally formulated in accordance with the calculation detailed in Figure 1.2-B[5].

[5] Specific circumstances may merit variations in this calculation process.

Figure 1.1-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 load[6] 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, this value may be negative such as when an existing customer facility closes. New loads are

[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.

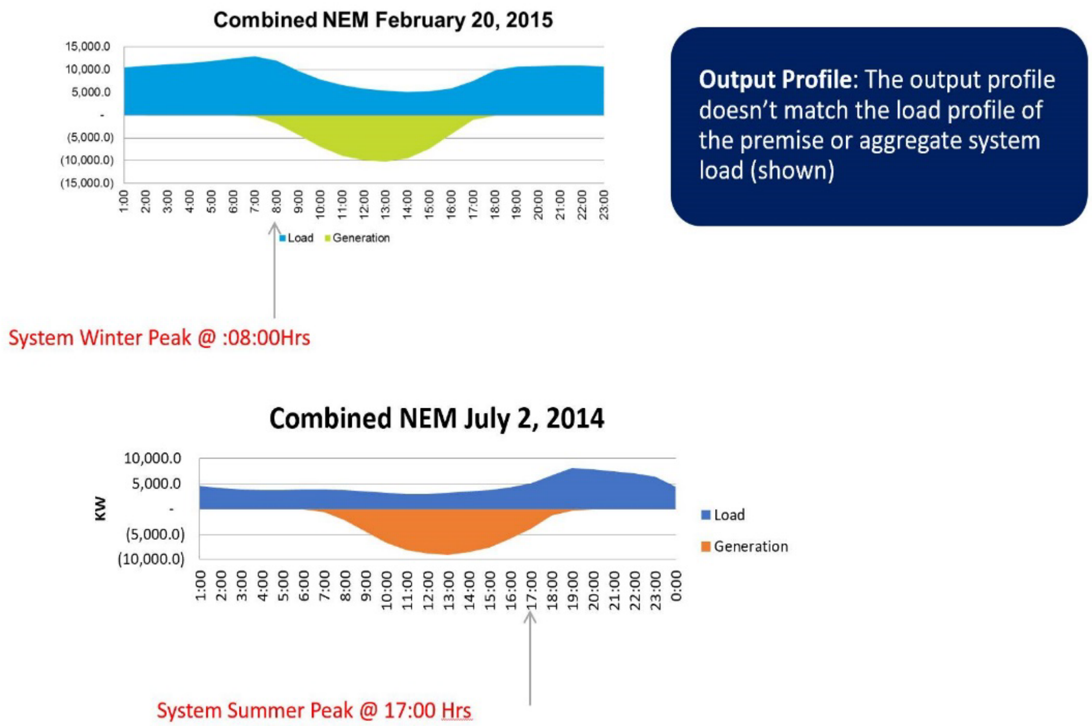
[8] On occasion, this method will result in a value that is less than the peak load encountered in the year prior to the current.This may occur because actual load growth on a feeder is greater than what Pepco would arrive at through its calculation (i.e., the addition of new load only from new build). 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.

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 re-routing feeders from one substation to 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. As a result, these projects are accounted for in the process. 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. Figure 1.2-C shows the effects of Net Energy Metering facilities on feeder peak loading.

Figure 1.1-C: Impacts of PV on Feeder Peak Loading



1.1.4 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. 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.

1.1.5 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.

1.1.6 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.

1.1.7 Factors Guiding the Consideration of DERs in Pepco's Peak Load Forecast

DERs are considered in the peak load forecast and, therefore, are reflected in the entirety of the distribution planning process that 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.

1.1.7.1 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.
- A commercial customer installs a large diesel generator that 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 that relates the hourly capacity factor9 of the DERs, the hour of the peak

[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.

load on the component, and the total nameplate capacity on the component. Therefore, this would not be considered a firm resource counted toward reducing peak load on the distribution feeder, substation transformer, and substation from which this customer is provided service.

- 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 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.

This 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

[10] IEEE 1547.

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 transfers[11] 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.

1.1.7.2 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.

1.1.8 Customer Growth Projections and Historical Comparisons[12]

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 (2015-2020) 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.

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[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;…*

1.1.9 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 2021 to 2030. 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 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 2015 to 2020, 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.

1.1.10 Incorporation of Field Information into the Planning Process[13]

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: DC Historical Customer Counts per Substation

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

			2015			2016			2017			2018			2019			2020			2015 - 2020 Avg. Trend		
Ward 1	Substation Number	KVLEV	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total	Res.	Comm.	Total
	10	13.8	20856	1487	22343	21159	1546	22705	20386	1441	21827	21026	1461	22487	21337	1461	22798	27218	1905	29123			
	13 (4kV)	4.33	2805	247	3052	2799	254	3053	750	74	824	670	76	746	654	69	723	0	0	0			
	13 (13kV)	13.8	7976	671	8647	7899	658	8557	8499	698	9197	8648	712	9360	8734	723	9457	0	0	0			
	25	13.8	10256	1099	11355	10494	1114	11608	12506	1213	13719	12911	1210	14121	13101	1221	14322	13041	1221	14262			
	Subtotal - Ward 1		**41893**	**3504**	**45397**	**42351**	**3572**	**45923**	**42141**	**3426**	**45567**	**43255**	**3459**	**46714**	**43826**	**3474**	**47300**	**40259**	**3126**	**43385**	**-0.79%**	**-2.26%**	**-0.90%**
Ward 2	Substation Number	KVLEV																					
	2	13.8	9816	1821	11637	9936	1908	11844	10256	1895	12151	10486	1915	12401	10558	1912	12470	10486	1877	12363			
	12	13.8	6316	1402	7718	6337	1467	7804	6340	1454	7794	6315	1466	7781	6688	1474	8162	6789	1441	8230			
	18	13.8	3274	494	3768	3270	577	3847	3318	534	3852	3351	540	3891	3494	550	4044	3695	550	4245			
	21	13.8	44	222	266	44	222	266	43	238	281	57	248	305	56	238	294	55	239	294			
	52	13.8	9059	1432	10491	8697	1500	10197	9399	1336	10735	9417	1350	10767	9528	1358	10886	9566	1345	10911			
	74	13.8	4	19	23	4	19	23	4	19	23	4	19	23	4	22	26	4	22	26			
	124	13.8	3023	1022	4045	3036	1073	4109	3108	1042	4150	3408	1049	4457	3257	1040	4297	3209	1035	4244			
	197	13.8	504	590	1094	510	697	1207	510	705	1215	514	730	1244	513	715	1228	501	692	1193			
	Subtotal - Ward 2		**32040**	**7002**	**39042**	**31834**	**7463**	**39297**	**32978**	**7223**	**40201**	**33552**	**7317**	**40869**	**34098**	**7309**	**41407**	**34305**	**7201**	**41506**	**1.38%**	**0.56%**	**1.23%**
Ward 3	Substation Number	KVLEV																					
	38 (13kV)	13.8	5385	358	5743	4861	288	5149	3420	268	3688	3410	270	3680	3425	253	3678	3443	257	3700			
	77	13.8	6217	585	6802	6242	619	6861	6068	616	6684	6081	617	6698	6079	616	6695	6066	616	6682			
	93	4.33	704	13	717	711	17	728	715	15	730	716	14	730	711	15	726	721	16	737			
	129	13.8	18060	1297	19357	18065	1351	19416	19071	1355	20426	19181	1333	20514	19022	1337	20359	19110	1338	20448			
	145	4.33	362	36	398	362	34	396	362	35	397	363	35	398	365	35	400	235	32	267			
	146	4.33	622	15	637	1147	60	1207	1129	59	1188	1132	63	1195	1127	61	1188	1131	60	1191			
	Subtotal - Ward 3		**31350**	**2304**	**33654**	**31388**	**2369**	**33757**	**30765**	**2348**	**33113**	**30883**	**2332**	**33215**	**30729**	**2317**	**33046**	**30706**	**2319**	**33025**	**-0.41%**	**0.13%**	**-0.38%**
Ward 4	Substation Number	KVLEV																					
	27	13.8	8115	621	8736	8128	633	8761	7565	564	8129	7161	513	7674	7192	522	7714	7190	526	7716			
	190	13.8	21126	1496	22622	22013	1558	23571	23098	1621	24719	23497	1612	25109	23435	1584	25019	28546	1987	30533			
	Subtotal - Ward 4		**29241**	**2117**	**31358**	**30141**	**2191**	**32332**	**30663**	**2185**	**32848**	**30658**	**2125**	**32783**	**30627**	**2106**	**32733**	**35736**	**2513**	**38249**	**4.09%**	**3.49%**	**4.05%**
Ward 5	Substation Number	KVLEV																					
	133	13.8	16507	1804	18311	16768	1761	18529	17385	1756	19141	17807	1797	19604	18124	1785	19909	17945	1785	19730			
	212	13.8	8873	369	9242	9475	454	9929	11065	718	11783	12226	789	13015	12625	812	13437	13771	831	14602			
	Subtotal - Ward 5		**25380**	**2173**	**27553**	**26243**	**2215**	**28458**	**28450**	**2474**	**30924**	**30033**	**2586**	**32619**	**30749**	**2597**	**33346**	**31716**	**2616**	**34332**	**4.56%**	**3.78%**	**4.50%**
Ward 6	Substation Number	KVLEV																					
	Sta. 'B'	13.8	13691	1315	15006	15191	1356	16547	15848	1226	17074	4075	187	4262	4068	188	4256	0	16	16			
	33	13.8	0	2	2	0	2	2	0	2	2	0	2	2	0	2	2	0	0	0			
	117	13.8	1259	351	1610	1266	428	1694	1275	376	1651	1270	396	1666	1275	383	1658	1274	383	1657			
	161	13.8	3425	663	4088	3319	724	4043	3319	640	3959	3339	627	3966	3336	625	3961	3393	610	4003			
	223	13.8	0	0	0	0	0	0	1482	160	1642	14876	1219	16095	16866	1237	18103	24209	1450	25659			
	Subtotal - Ward 6		**18375**	**2331**	**20706**	**19776**	**2510**	**22286**	**21924**	**2404**	**24328**	**23560**	**2431**	**25991**	**25545**	**2435**	**27980**	**28876**	**2459**	**31335**	**9.46%**	**1.07%**	**8.64%**
Ward 7	Substation Number	KVLEV																					
	7	13.8	40455	3108	43563	42594	3444	46038	43314	3439	46753	43022	3403	46425	43645	3398	47043	43619	3318	46937			
	Subtotal - Ward 7		**40455**	**3108**	**43563**	**42594**	**3444**	**46038**	**43314**	**3439**	**46753**	**43022**	**3403**	**46425**	**43645**	**3398**	**47043**	**43619**	**3318**	**46937**	**1.52%**	**1.32%**	**1.50%**
Ward 8	Substation Number	KVLEV																					
	8 (4kV)	4.33	353	95	448	358	97	455	371	93	464	9	55	64	12	51	63	12	48	60			
	8 (13kV)	13.8	7455	741	8196	7503	733	8236	5268	467	5735	5315	485	5800	5352	484	5836	5367	480	5847			
	136	13.8	15300	1260	16560	15324	1248	16572	17618	1515	19133	17934	1518	19452	17607	1466	19073	18336	1468	19804			
	168	13.8	5466	593	6059	5466	575	6041	5500	576	6076	5473	570	6043	5507	577	6084	5613	683	6296			
	Subtotal - Ward 8		**28574**	**2689**	**31263**	**28651**	**2653**	**31304**	**28757**	**2651**	**31408**	**28731**	**2628**	**31359**	**28478**	**2578**	**31056**	**29328**	**2679**	**32007**	**0.52%**	**-0.07%**	**0.47%**
	DC TOTAL		**247308**	**25228**	**272536**	**252978**	**26417**	**279395**	**258992**	**26150**	**285142**	**263694**	**26281**	**289975**	**267697**	**26214**	**293911**	**274545**	**26231**	**300776**	**2.11%**	**0.78%**	**1.99%**

Table 1.2-B: Historical District of Columbia Loads

Historical District of Columbia Loads									
Loads in Mega-Volt-Amperes (MVA)									
Ward 1	**Sub. Number**		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
	10		135.7	143.0	125.6	127.1	127.5	140.1	
	13 (4.33kV)		9.4	9.9	3.1	2.5	2.2	0.0	
	13		31.7	33.0	31.9	34.3	33.6	7.6	
	25		39.1	44.0	50.2	51.0	56.0	46.4	
	Subtotal - Ward 1		**215.9**	**229.9**	**210.8**	**214.9**	**219.3**	**194.1**	Avg. Trend = -2.11%
Ward 2	**Sub. Number**		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
	2		151.7	154.1	147.6	146.9	143.1	115.9	
	12		105.9	106.6	104.2	102.5	100.8	90.3	
	18		126.9	134.3	128.3	126.0	127.7	104.2	
	21		36.4	36.3	37.1	39.9	33.7	25.1	
	52		175.9	175.8	157.0	154.7	159.7	129.5	
	74		43.8	43.3	41.0	41.8	42.3	28.4	
	124		99.7	101.5	98.5	96.2	93.4	78.0	
	197		116.5	117.5	112.4	107.2	104.1	82.6	
	Subtotal - Ward 2		**856.8**	**869.4**	**826.1**	**815.2**	**804.8**	**654.0**	Avg. Trend = -5.26%
Ward 3	**Sub. Number**		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
	38		46.3	47.3	37.5	36.7	38.7	38.3	
	38 (4.33kV)		0.0	0.0	0.0	0.0	0.0	0.0	
	77		70.0	68.7	64.3	64.9	66.9	65.8	
	93 (4.33kV)		3.2	5.4	3.0	3.4	4.4	3.2	
	129		151.5	162.1	159.3	162.7	153.5	144.6	
	145 (4.33kV)		2.5	3.1	2.4	2.6	2.5	3.3	
	146 (4.33kV)		3.6	5.8	5.4	4.8	5.4	5.4	
	Subtotal - Ward 3		**277.1**	**292.4**	**271.9**	**275.1**	**271.4**	**260.6**	Avg. Trend = -1.22%
Ward 4	**Sub. Number**		**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	
	27		31.4	34.1	34.1	36.4	35.6	29.7	
	190		84.0	88.9	89.0	87.3	90.5	94.9	
	Subtotal - Ward 4		**115.4**	**123.0**	**123.1**	**123.7**	**126.1**	**124.6**	Avg. Trend = 1.55%

Table 1.2-B (con't)

Historical District of Columbia Loads

Loads in Mega-Volt-Amperes (MVA)

		2015	2016	2017	2018	2019	2020		
Ward 5	**Sub. Number**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**		
	133	97.0	108.2	101.8	106.2	103.4	95.3		
	212	79.5	83.9	106.9	116.2	122.1	107.0		
	Subtotal - Ward 5	**176.5**	**192.1**	**208.7**	**222.4**	**225.5**	**202.3**	Avg. Trend =	2.77%
Ward 6	**Sub. Number**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**		
	Sta. 'B'	110.7	119.3	123.1	56.5	55.7	23.6		
	33	16.5	17.1	16.4	16.1	15.8	0.0		
	117	104.1	112.7	104.5	101.4	105.7	82.3		
	161	114.7	112.3	108.5	107.1	103.1	86.1		
	223	0.0	0.0	0.0	78.0	77.5	117.2		
	Subtotal - Ward 6	**346.0**	**361.4**	**352.5**	**359.1**	**357.8**	**309.2**	Avg. Trend =	-2.22%
Ward 7	**Sub. Number**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**		
	7	160.2	158.5	159.7	162.3	159.1	150.3		
	Subtotal - Ward 7	**160.2**	**158.5**	**159.7**	**162.3**	**159.1**	**150.3**	Avg. Trend =	-1.27%
Ward 8	**Sub. Number**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**		
	8 (4.33kV)	1.5	1.6	1.2	0.9	0.8	0.7		
	8	25.9	27.6	17.5	22.5	24.4	25.7		
	136	80.3	89.5	91.2	93.4	93.9	93.2		
	168	19.3	20.7	20.6	20.5	22.7	18.1		
	Subtotal - Ward 8	**127.0**	**139.4**	**130.5**	**137.3**	**141.8**	**137.7**	Avg. Trend =	1.63%
	DC TOTAL	**2274.9**	**2366.1**	**2283.3**	**2310.0**	**2305.8**	**2032.8**	Avg. Trend =	-2.23%

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-C: Forecasted District of Columbia Loads

Forecasted District of Columbia Loads											
Loads in Mega-Volt-Amperes (MVA)											
Ward 1	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	10	163.0	163.2	163.6	163.9	164.1	164.5	164.7	165.1	165.5	165.9
	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	56.9	56.9	56.9	56.9	56.8	56.8	56.8	56.7	56.6	56.5
	Subtotal - Ward 1	**219.9**	**220.1**	**220.5**	**220.8**	**220.9**	**221.3**	**221.5**	**221.8**	**222.1**	**222.4**
										Avg. Trend =	0.13%
Ward 2	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	2	174.6	174.7	174.8	174.9	175.0	175.1	175.2	175.3	175.4	175.5
	12	120.6	120.7	120.8	120.8	120.9	121.0	121.1	121.1	121.1	121.1
	18	142.4	143.2	143.5	143.8	144.1	144.3	144.5	144.7	144.9	145.0
	21	40.3	40.3	40.3	40.3	40.3	40.3	40.3	40.3	40.3	40.3
	52	191.0	191.4	191.8	192.2	192.6	193.0	193.4	193.8	194.1	194.4
	74	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7	46.7
	124	113.0	113.1	113.2	113.3	113.4	113.5	113.6	113.7	113.8	113.9
	197	127.9	128.1	128.3	128.5	128.7	128.9	129.1	129.3	129.5	129.7
	Subtotal - Ward 2	**956.5**	**958.2**	**959.4**	**960.5**	**961.7**	**962.8**	**963.9**	**964.9**	**965.8**	**966.6**
										Avg. Trend =	0.12%
Ward 3	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	38	46.0	46.1	46.2	46.3	46.4	46.5	46.6	46.7	46.8	46.9
	38 (4.33kV)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	77	75.1	75.9	76.7	76.9	77.1	77.3	77.5	77.7	77.9	78.1
	93 (4.33kV)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
	129	179.4	182.4	185.0	187.8	189.0	189.3	189.6	189.9	190.2	190.5
	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)	5.3	5.3	5.3	5.2	5.2	5.2	5.2	5.2	5.2	5.2
	Subtotal - Ward 3	**312.3**	**316.2**	**319.7**	**322.7**	**324.2**	**324.8**	**325.4**	**326.0**	**326.6**	**327.2**
										Avg. Trend =	0.52%
Ward 4	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
	27	32.1	32.3	32.4	32.4	32.4	32.4	32.4	32.4	32.4	32.4
	190	121.2	124.0	126.8	129.6	132.4	134.2	136.0	137.8	139.6	141.4
	Subtotal - Ward 4	**153.3**	**156.3**	**159.2**	**162.0**	**164.8**	**166.6**	**168.4**	**170.2**	**172.0**	**173.8**
										Avg. Trend =	1.40%

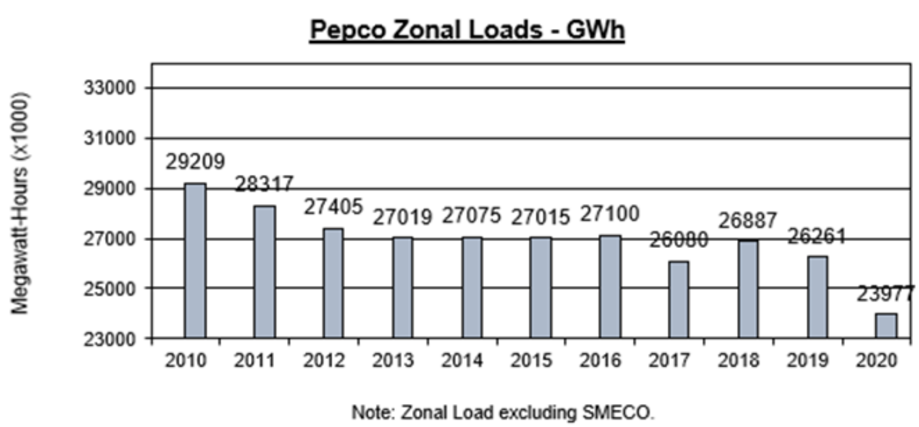
Table 1.2-C (con't)

Forecasted District of Columbia Loads Loads in Mega-Volt-Amperes (MVA)												
Ward 5	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	
	133	110.9	111.4	111.9	117.4	122.9	128.4	133.9	134.4	134.9	135.4	
	212	173.3	194.3	207.2	217.8	223.7	230.3	235.6	236.6	237.6	238.3	
	Subtotal - Ward 5	**284.2**	**305.7**	**319.1**	**335.2**	**346.6**	**358.7**	**369.5**	**371.0**	**372.5**	**373.7**	
											Avg. Trend =	3.09%
Ward 6	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	
	Sta. 'B'	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	33	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
	117	122.5	122.6	122.7	122.8	122.9	123.0	123.1	123.2	123.3	123.4	
	161	119.4	120.0	121.0	121.6	123.7	124.6	125.5	126.1	126.7	127.3	
	223	164.4	195.7	198.1	200.4	202.8	205.1	207.4	209.8	212.1	214.4	
	Subtotal - Ward 6	**437.3**	**438.3**	**441.8**	**444.8**	**449.4**	**452.7**	**456.0**	**459.1**	**462.1**	**465.1**	
											Avg. Trend =	0.69%
Ward 7	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	
	7	172.4	178.3	181.1	181.4	181.7	182.0	182.3	182.6	182.9	183.2	
	Subtotal - Ward 7	**172.4**	**178.3**	**181.1**	**181.4**	**181.7**	**182.0**	**182.3**	**182.6**	**182.9**	**183.2**	
											Avg. Trend =	0.68%
Ward 8	**Sub. Number**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**	
	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	132.8	143.3	158.3	175.8	188.3	192.3	193.3	194.3	195.3	196.3	
	168	23.8	23.8	23.8	25.1	26.4	27.7	29.0	29.0	29.0	29.0	
	Subtotal - Ward 8	**156.6**	**167.1**	**182.1**	**200.9**	**214.7**	**220.0**	**222.3**	**223.3**	**224.3**	**225.3**	
											Avg. Trend =	4.12%
	DC TOTAL	**2692.5**	**2740.2**	**2782.9**	**2828.3**	**2864.0**	**2888.9**	**2909.3**	**2918.9**	**2928.3**	**2937.3**	
											Avg. Trend =	0.97%

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, DERs, NWAs and known new business loads; the last eight years do not show planned transfers but do incorporate forecasted DERs as well as planned and forecasted new business load.

On a system basis, Pepco's control area loads over the ten-year period between 2010 and 2020 are provided below in Figure 1.2-D.

Table 1.2-D Pepco Zonal Load



Pepco's projected monthly and annual zonal loads for 2021 are provided in Table 1.2-E. 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.

Table 1.2-E Pepco Zonal Load

2021 Forecast -- Pepco Zonal Load*

(x 1,000)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
MWh	2,058	1,841	1,885	1,606	1,726	2,018	2,328	2,272	1,905	1,772	1,755	2,001	23,166

*Excludes SMECO load

Power Factors and Energy Loses[14]

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 that 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

[14] n Order No. 10133 (at 10 and 12), the Commission directed Pepco to include performance factors relating to the transmission and distribution (T&D) system in future PIPs.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.

the summer peak. Table 1.2-F below provides the percent of all Pepco's 4 kV and 13 kV distribution substations that had power factors ≥ 91% at the summer peak hour for the years 2011 - 2020. In 2020, 90% of the 4 kV and 13 kV substations had a power factor of ≥ 0.91 at the summer peak hour.

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

Table 1.2-F: Power Factor

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
% of 4 kV and 13 kV Substations with Power Factor □ 0.98	95%	96%	97%	97%	97%	97%	96%	92%	89%	91%
Total Number of 4 kV and 13 kV Distribution Substations (Pepco system-wide)	116	116	115	115	113	112	112	113	113	112

Annual System Energy Losses[15]

Table 1.2-F shows a ten-year comparison of annual system energy losses for PJM and adjacent utilities. 2010 through 2019 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 2019 are 4.52% or approximately 17% lower than the group average of 5.28%.

% Annual System Energy Losses:

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

[15] Industry comparison of annual system energy losses is presented in Table 1.2-G.

Table 1.2-G

UTILITY	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Atlantic City Electric Company	4.63%	5.61%	5.52%	5.15%	5.74%	5.78%	5.06%	6.27%	4.46%	5.88%
Baltimore Gas & Electric Co. #	5.77%	6.41%	6.17%	6.51%	6.24%	7.54%	6.36%	6.48%	6.67%	6.99%
Delmarva Power & Light Co.	5.25%	5.54%	4.52%	7.26%	5.39%	5.72%	7.92%	4.90%	4.77%	5.14%
Jersey Central Power & Light Co.	5.59%	6.35%	5.71%	8.39%	8.32%	8.60%	7.97%	7.99%	7.24%	6.27%
Metropolitan Edison Company	4.87%	4.71%	6.21%	5.30%	5.35%	7.41%	9.93%	7.95%	8.43%	7.32%
Pennsylvania Electric Company	5.45%	5.90%	6.08%	7.12%	8.23%	7.57%	6.35%	3.92%	6.67%	7.23%
PPL Electric Utilities Corp.	6.93%	6.55%	6.58%	6.66%	6.41%	6.07%	6.12%	6.12%	5.72%	5.93%
PECO Energy Company	5.25%	4.23%	5.67%	5.81%	5.69%	5.63%	5.69%	5.17%	5.13%	5.35%
Potomac Edison Company #	4.28%	2.07%	4.79%	5.12%	0.96%	1.96%	2.54%	3.09%	2.96%	2.42%
Potomac Electric Power Co.	4.38%	4.14%	4.12%	3.59%	4.01%	3.19%	2.90%	3.46%	3.79%	4.52%
Public Service Electric & Gas	4.13%	4.86%	3.99%	5.32%	4.25%	4.62%	4.58%	4.34%	3.78%	3.97%
Virginia Electric & Power Co. #	3.97%	3.12%	1.65%	2.07%	-0.79%	0.89%	-0.35%	1.20%	2.11%	2.29%
ANNUAL AVG.	**5.04%**	**4.96%**	**5.09%**	**5.69%**	**4.98%**	**5.42%**	**5.42%**	**5.07%**	**5.14%**	**5.28%**

ADJACENT UTILITY

Substation Additions and Enhancements[16]

The discussion below updates the information provided in the 2020 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-H 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

[16] In the 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…
Moreover, 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;

approved budgets. In-service dates are, therefore, tentative and are adjusted as in-service dates become nearer.

Table 1.2-H: Substation Additions and Enhancements

#	Project Cost	Project Description	Projected In-Service Date	Areas Served
2	**$138.6 million**	**Mt. Vernon Square Sub.** – Build new substation to relieve predicted network overloads.	June 2023	NoMa, Mt. Vernon Triangle, Shaw
3	**$191.7 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	**$151.9 million**	**Champlain Sub. –** Upgrade Champlain as a new 230/69/34 kV substation to resupply downtown distribution substations.	December 2027	Downtown

Justification of Substation Additions and Enhancements

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. **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

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	35.5	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	0.6	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

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	141.3	173.3	194.3	207.2	217.8	223.7	230.3	235.6	236.6	237.6	238.3
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 Substation will provide relief to the Northeast Sub. 212 Southwest LVAC Network Group, which is expected reach 98% its firm capacity in 2023 and exceed its firm capacity approximately 7% in 2024. Northeast Sub. 212 is expected to be at 97% of its firm capacity by 2023. Due to space limitations in the streets around the Northeast substation, no new feeder groups can be extended to relieve these overloads.

Long-term growth exceeding 140 MVA 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): $138.6 million

Current Status: In design stages.

In-service Date: June 2023.

Alternative: There were several alternatives provided by Pepco in Formal Case No. 1144, including to delay the construction of the facility until 2024. To facilitate this specific alternative, 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.

2. 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 transition of that facility from a distribution substation to a re-built subtransmission 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 Rating = 39.0 MVA

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	0.0	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: During construction of the new Harvard substation, all load currently supplied from the existing Harvard Sub. 13 in 2020 will be transferred temporarily to nearby substations. After the upgraded Harvard Sub. 13 is placed in 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 transition of Champlain from a distribution substation to a new subtransmission 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. The substation does not meet Pepco's current standard for fault current withstand and are configured in a non-standard way that 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): $191.7 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: The alternative to rebuilding the Harvard Substation would require construction of a new 210 MVA, 138/34 kV substation near Buzzard Point, from which three (3) new 34 kV "radial" underground circuits would be extended approximately 5.3 miles to the Harvard Substation. All existing equipment would be upgraded at the Harvard Substation; however, the capacity of the substation would remain at 80 MVA. Upgrading the Harvard Substation would require replacement of individual transformers and switchgear. This alternative would cost more overall than the selected alternative and would not increase overall substation capacity as much as the selected alternative. Pepco currently does not have adequate substation capacity in the area to transfer the entire load from the Harvard and Champlain Substations to other substations.

3. Upgrade Champlain Sub. 25 to 230/69 kV substation (2027 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 substation with an ultimate capacity of around 570 MVA. It will have three 230 kV / 69 kV transformers with room for a fourth 230 kV / 69 kV transformer. From the upgraded Champlain Sub. 25, four new 69 kV supplies will be extended to serve F Street Sub. 74 and Georgetown Sub. 12. 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 Street Sub. 74

Summer Rating = 82.0 MVA

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	45.7	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	0.3	0.4	0.4	0.5	0.6	0.6	0.7	0.8	0.8	0.9	1.0

Facility: Georgetown Sub. 12

Summer Rating = 134.0 MVA

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	121.5	120.6	120.7	120.8	120.8	120.9	121.0	121.1	121.1	121.1	121.1
Cumulative DER Impacts Since 2011	1.7	1.8	1.8	1.8	1.8	1.9	1.9	1.9	1.9	1.9	1.9

Facility: L Street Sub. 21

Summer Rating = 62.0 MVA

	2020 History	2021 Anticipated	2022 Anticipated	2023 Anticipated	2024 Anticipated	2025 Anticipated	2026 Anticipated	2027 Anticipated	2028 Anticipated	2029 Anticipated	2030 Anticipated
Net Load Forecast (MVA)	40.3	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	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

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 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: The last incarnation of the Champlain Substation was put into service in the mid-1950's, although some portions of the site are older. Further, many of the Champlain Substation's air circuit breakers were installed in 1960 and 1976. The Champlain Substation's transformers were installed in 1954. While Pepco's inspections have found that this equipment is in good condition due to Pepco's ongoing maintenance programs, it is all operating well beyond its recommended lifespans. In addition, the 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 69 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 the 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): $151.9 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: December 2027

Alternative: The alternative to rebuilding the Champlain Substation would require replacing the three existing 69 kV supply feeders from the Takoma Substation (5.4 miles) to Champlain Substation. The Champlain Substation would still need to be rebuilt, and, in addition, Pepco would need to build a new downtown substation. The new downtown substation would require the purchase of additional land. A new downtown substation would require extending three 230 kV "radial" underground circuits a total of approximately 5.0 miles from the Takoma Substation to the new downtown substation.

1.1.11 Distribution Projects[17][18]

Overhead and Underground Distribution Projects[19]

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

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

Pepco DC 2014 - 2020 Capital Budgets (Dollars in Millions)							
Distribution	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Customer Driven	$53.0	$55.4	$67.2	$68.7	$71.3	$85.4	89.3
Reliability	133.7	127.5	121.2	114.8	157.6	176.0	197.8

17 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…

18 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;

19 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.

Load	36.4	51.8	45.0	20.4	71.9	62.9	71.9
TOTAL	$223.1	$234.7	$233.4	$203.9	$300.8	$324.3	$359

Pepco's overhead and underground distribution project budgets for the next five years are provided in Table 1.2-I. 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.

Table 1.2-J: Planned Overhead and Underground Distribution Projects

Distribution Construction	2021	2022	2023	2024
Customer Driven	74.68	80.08	71.99	81.18
Reliability	245.25	241.83	285.30	252.28
Load	84.22	49.48	70.95	55.80
TOTAL	404.15	371.39	428.24	389.25

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.

Section 1.1.12

Pepco's overhead and underground distribution project variances for 2020 are provided here in Table 1.2-K, in accordance with Order No. 18644.

Table 1.2-K: Routine Overhead and Underground Distribution Project Variances

Pepco DC 2020 Capital Budget Variances (Dollars in Millions)			
Distribution Construction	**2020 Budget**	**2020 Actual**	**Variance**
Customer Driven	$89.3	$86.7	($2.6)
Reliability	197.8	173.8	($24)
Load	71.9	39.3	(32.6)
TOTAL	$359	$299.9	($59.1)

SECTION 1.2 – 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.

1.2.1 Technology: Monitoring, Automation, and Information Systems

Systems and Technology[20]

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

1.2.2 SCADA[21]

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 remotely operate the system to protect equipment. Any change of electric system status at the

[20] 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.
[21] 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.

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.

1.2.3 Substation Automation[22]

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 (Q1 2022)
- Texas Ave Sub. 111 (Q2 2022)
- Fort Dupont Sub. 58 (Q3 2022)
- Fort Davis Sub. 100 (Q4 2022)

[22] 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.

1.2.4 Distribution Automation (DA)

As part of the DA projects, eighteen 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 eighteen13kV 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)
- Linden (located in MD but serves some DC customers)
- Wood Acres (located in MD but serves some DC customers)

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 Buzzard Point network group, 86 network transformers in Sub 161 south group, 72 network transformers in Sub 18 Central group, 78 network transformers in Sub 212 South group, 61 network transformers in Sub 212 Southeast group, 56 network transformers in Sub 25 Central group, 59 network transformers in Sub 52 South group, 79 network transformers in Sub 52 West group, 29 network transformers in Sub 6 North group, 61 network transformers in Sub 7 Central group. Pepco has planned to complete the rest of 48 network transformers in Sub 6 North group in 2021.

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 isolate a transformer very quickly 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.

1.2.5 Outage Management System (OMS)[23]

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

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[23] 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;

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 2020.

1.2.6 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.

1.2.7 Power Delivery Information System Projects[24]

Pepco's Power Delivery Information System Projects are provided in Table 1.2-A. Included in Table 1.2-A are historical information system projects for the years 2016 - 2020. All costs are for those allocated to the District of Columbia.

[24] 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:…
(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.

Table 1.2-A: Historical Information System Projects

Rollup-1	Estimated DC Portion 2016	Estimated DC Portion 2017	Estimated DC Portion 2018	Estimated DC Portion 2019	Estimated DC Portion 2020
ROLLUP ($000s)					
Customer Systems	782	2,295	10,634	4,544	5,734
Smart Grid Systems	514	585	1,594	1,792	1,561
Meter Systems	0	0	0	0	74
Network Operating Center (NOC)	6	80	1	0	0
Energy Supply Systems	35	0	0	0	0
Operations Systems	102	1,176	1,147	143	765
Energy Management System (EMS)	1,298	742	2,023	2,301	4,200
Engineering Systems	260	33	38	422	680
Field technologies	0	133	0	0	0
Work Management	315	1,763	7,233	2,951	3,626
Planning and Performance	0	80	255	548	1,214
Subtotal IT Capital (DC Portion)	**3,312**	**6,886**	**22,925**	**12,701**	**17,855**

Note: List does not include Smart Grid meters, Smart Grid communication network, distribution automation, or Telecom.

Equipment Standards & Inspections

Equipment Inspections[25]

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.

[25] 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.\

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

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

Table 1.3-B: Equipment Inspections

Equipment	Inspection	Periodicity	Maintenance Methodology
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	Preventive
	Routine Inspection and Test	Every 4, 8, or 16 years based on criticality, or more frequently as recommended by Equipment Condition Assessment Process.	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
	Predictive Maintenance (PDM) Tasks	Annually	Predictive

Substation Circuit Breakers – Air Magnetic	Routine Test	6 Years or more frequently as recommended by Equipment Condition Assessment Process.	Preventive

Equipment	**Inspection**	**Periodicity**	**Maintenance Methodology**
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	3 – 4 Years, or more frequently as recommended by Equipment Condition Assessment Process	Preventive
	Diagnostic Testing	3 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

Equipment	Inspection	Periodicity	Maintenance Methodology
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

Equipment	Inspection	Periodicity	Maintenance Methodology
Substation – Fire Protection	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

Equipment	Inspection	Periodicity	Maintenance Methodology
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

Equipment	Inspection	Periodicity	Maintenance Methodology
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

Equipment	Inspection	Periodicity	Maintenance Methodology
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, 2020. 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.

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.

Table 1.3-C: Distribution Equipment Net Book Value

Potomac Electric Power Company			
DC Distribution Plant, Reserve, Net Book Value - 2020			
DC DISTRIBUTION PLANT	**Book Cost**	**Reserve**	**Net Book Value**
E-3601-Land	91,672,521	-	91,672,521
E-3602-Land Rights	994,445	119,177	875,268
E-3610-Structures and Improvements	83,797,136	31,432,865	52,364,271
E-3620-Station Equipment	755,805,958	179,412,487	576,393,471
E-3640-Poles, Towers, and Fixtures	178,143,014	30,233,705	147,909,309
E-3650-O/H Conductors and Devices	191,377,663	48,267,417	143,110,246
E-3660-U/G Conduit	1,034,206,983	331,795,936	702,411,047
E-3670-U/G Conductors and Devices	1,099,235,393	258,570,773	840,664,620
E-3680-Line Transformers	625,433,827	178,446,315	446,987,512
E-3691-O/H Services	17,541,791	(1,371,260)	18,913,051
E-3692-U/G Services	121,187,298	74,045,561	47,141,737
E-3693-U/G Cable Services	179,783,761	68,175,670	111,608,091
E-3700-Meters	20,936,404	3,203,788	17,732,616
E-3701- AMI Meters	63,540,663	26,368,246	37,172,417
E-3711-Install on Customer Premises	1,367,203	1,250,913	116,290
E-3731-Overhead Street Lighting	201,953	(153,400)	355,353
E-3732-Underground Street Lighting	9,428,818	6,878,451	2,550,367
E-3734-Dusk to Dawn Street Lighting	50,315	32,601	17,714
Total DC Distribution Plant, Reserve, NBV	**4,474,705,146**	**1,236,709,245**	**3,237,995,901**

Overhead Feeder Inspection Program [26]

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 approximately 200 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.

[26] 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;

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

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.[27]

- 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.

[27] 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 2020

In 2020, 101 District of Columbia feeders were inspected as part of the Overhead Feeder Inspection Program. Sixty-one (61) conditions were identified.

2020

Feeder	Condition
14058	Visual/Thermal scan identified-Split Cross Arm - Affecting Hardware
14058	Visual/Thermal scan identified-Loose Insulator
14058	Visual/Thermal scan identified-Split Cross Arm - Affecting Hardware (x2)
14058	Visual/Thermal scan identified-Insulator - Loose/Leaning
14200	Visual/Thermal scan identified-Floating Primary Wire
14200	Visual/Thermal scan identified-Broken/Loose Tie Wire
14200	Visual/Thermal scan identified-Floating Primary Wire
14200	Visual/Thermal scan identified-Broken/Loose Tie Wire
14716	Visual/Thermal scan identified-Broken Arrestor
14716	Visual/Thermal scan identified-Blown Arrestor
14716	Visual/Thermal scan identified-Blown Arrestor
00365	Visual/Thermal scan identified-Decayed Cross Arm
00365	Visual/Thermal scan identified-Missing Pole Tag
00365	Visual/Thermal scan identified-Split Cross Arm - Minor
00365	Visual/Thermal scan identified-Missing Pole Tag
00365	Visual/Thermal scan identified-Broken Cross Arm Brace (x2)

Feeder	Condition
00367	Visual/Thermal scan identified-Decayed Cross Arm
00367	Visual/Thermal scan identified-Broken Cross Arm Brace
00367	Visual/Thermal scan identified-Missing Pole Tag
00368	Visual/Thermal scan identified-Broken Insulator
00368	Visual/Thermal scan identified-Decayed Cross Arm
00368	Visual/Thermal scan identified-Floating Primary Jumper
00368	Visual/Thermal scan identified-Split Cross Arm – Affecting Hardware
00386	Visual/Thermal scan identified-Decayed Cross Arm
00099	Visual/Thermal scan identified-Decayed Cross Arm
00119	Visual/Thermal scan identified-Insulator - Wooden Deadend
00177	Visual/Thermal scan identified-Decayed Cross Arm
00229	Visual/Thermal scan identified-Decayed Cross Arm
00309	Visual/Thermal scan identified-Split Cross Arm – Affecting Hardware
00309	Visual/Thermal scan identified-Loose Insulator
00324	Visual/Thermal scan identified-Broken Cross Arm Brace
00345	Visual/Thermal scan identified-Decayed Cross Arm (x2)
00476	Visual/Thermal scan identified-Broken Cross Arm Brace (x2)
00495	Visual/Thermal scan identified-Cracked Cross Arm
14132	Visual/Thermal scan identified-Leaning/Bent Cross Arm
14133	Visual/Thermal scan identified-Broken Arrestor
14135	Visual/Thermal scan identified-Broken Cross Arm Brace
14146	Visual/Thermal scan identified-Broken/Loose Tie Wire (x2)
14146	Visual/Thermal scan identified-Floating Primary Wire (x2)

Feeder	Condition
14900	Visual/Thermal scan identified-Split Cross Arm - Major
14900	Visual/Thermal scan identified-Leaning Insulator
00366	Visual/Thermal scan identified-Split Cross Arm - Minor
15169	Visual/Thermal scan identified-Split Cross Arm - Minor
15169	Visual/Thermal scan identified-Broken/Loose Tie Wire
15170	Visual/Thermal scan identified-Broken/Loose Tie Wire
15174	Visual/Thermal scan identified-Fraying Primary Wire
15705	Visual/Thermal scan identified-Fraying Primary Wire
15001	Visual/Thermal scan identified-Loose Tie Wire
15001	Visual/Thermal scan identified-Floating Primary Wire
15001	Visual/Thermal scan identified-Floating Primary Wire
15001	Visual/Thermal scan identified-Split Cross Arm - Major
15001	Visual/Thermal scan identified-Loose Tie Wires (x2)
15001	Visual/Thermal scan identified-Missing Pole Tag
15001	Visual/Thermal scan identified-Split/Leaning Cross Arm
15010	Visual/Thermal scan identified-Damaged Insulator
15013	Visual/Thermal scan identified-Missing Pole Tag
15013	Visual/Thermal scan identified-Leaning Insulator
15013	Visual/Thermal scan identified-Decayed Cross Arm
15013	Visual/Thermal scan identified-Decayed Cross Arm
15755	Visual/Thermal scan identified-Broken Pole
15801	Visual/Thermal scan identified-Fraying Primary Wire

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.

2021

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

2022

56	309	479	14136	14752	15012	15198
97	324	481	14139	14753	15013	15199
99	333	482	14140	14755	15014	15457
119	345	485	14145	14756	15085	15458
120	347	489	14146	14758	15130	15459
128	366	495	14150	14811	15165	15632
132	367	14006	14158	14812	15169	15701
167	368	14035	14159	14900	15170	15705
177	369	14054	14200	15001	15171	15755
178	385	14055	14713	15006	15172	15756
181	386	14058	14715	15007	15173	15801
183	388	14132	14716	15008	15174	
227	394	14133	14717	15009	15175	
229	413	14134	14718	15010	15177	
308	476	14135	14719	15011	15197	Total-101

1.2.8 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 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).[28]

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 2020 Pepco planted 344 trees in the District of Columbia and contributed $8,294 to the DC Tree Fund (in the form of special tree removal 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

[28] 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.

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 2020 customer communications, which is an example of pertinent information that is relayed to customers as bill inserts and other means of communication.

Industry Comparisons[29]

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 2019 and 2020, using the MSO reporting criteria and has indicated both of these reliability results on the following charts. Note that Pepco's 2020 reliability results that are reported in the following graphs are not directly comparable to the data used in the 2019 study. See Figure 1.3-A through Figure 1.3-C.

[29] 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

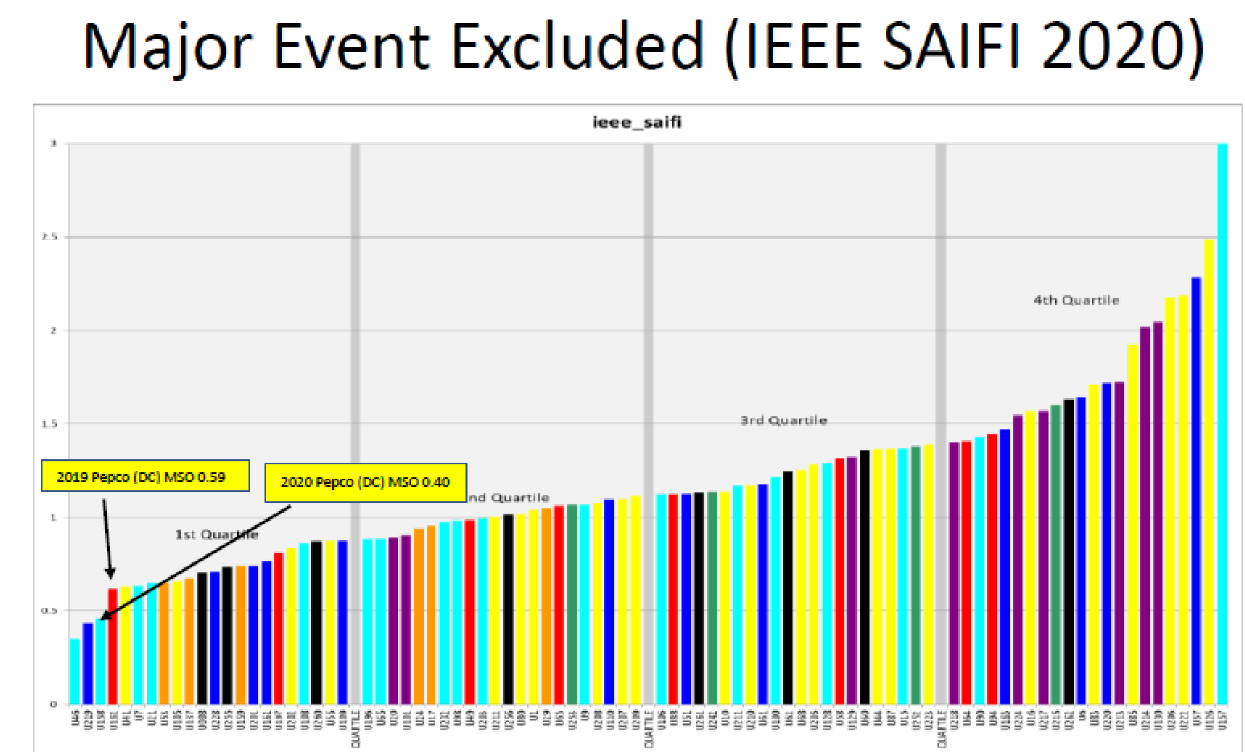

Figure 1.3-A

Figure 1.3-B

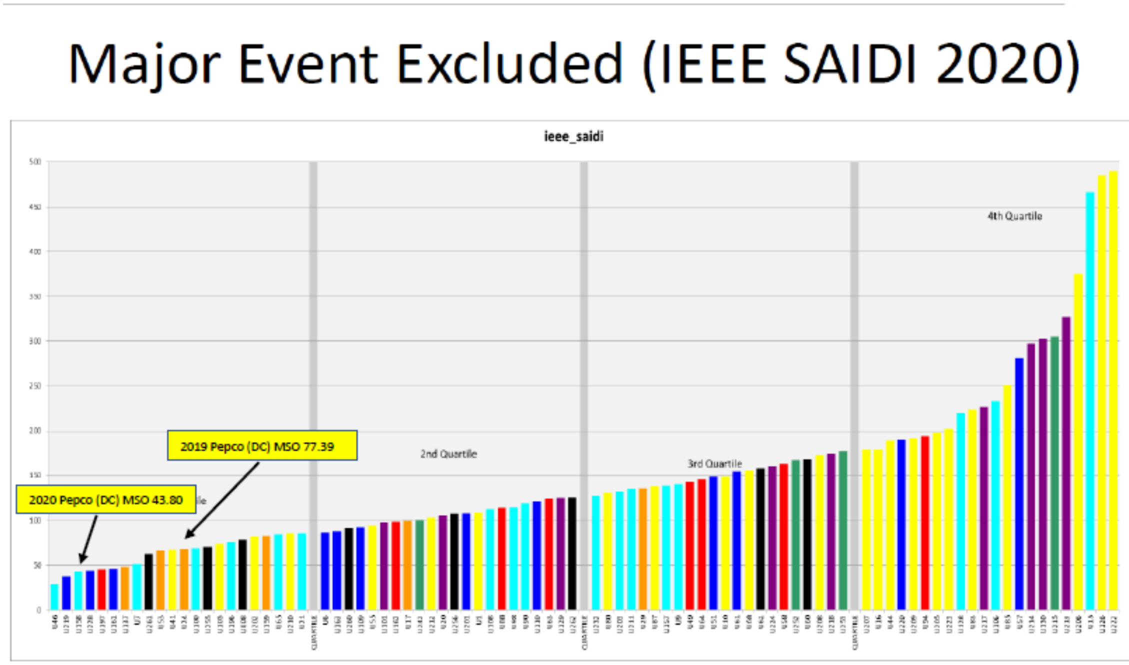

Figure 1.3-B

Figure 1.3-C

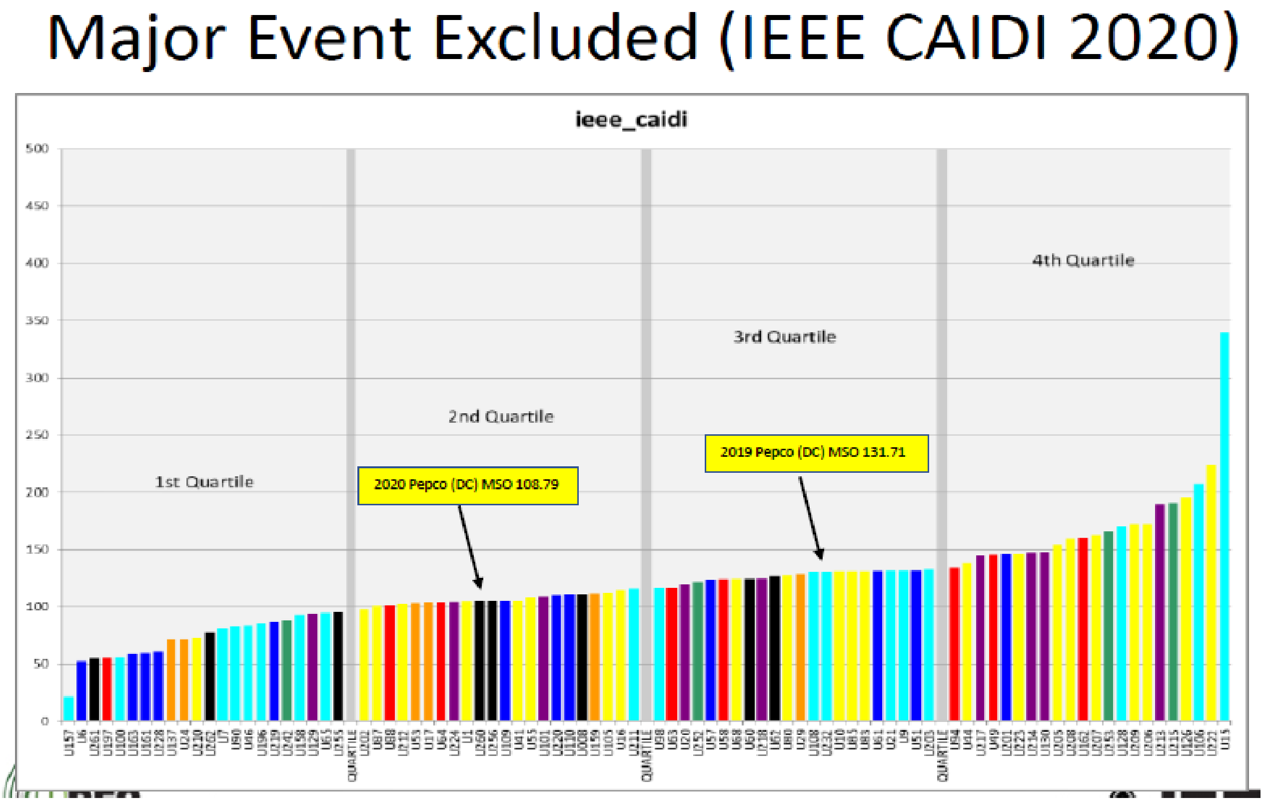

Figure 1.3-C

Best Practices

Implementation of Twenty Best Practices[30][31][32][33]

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:

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[30] 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.

[31] 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

[32] 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;

[33] 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;

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.

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

			Approximate Costs Attributable to District of Columbia											
			2015		2016		2017		2018		2019		2020	
Best Practice #	Activity Supporting Best Practices	Average Hourly ATP*	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost	Hours	Cost
	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	2500	$240,000.00
4-Jan	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	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	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	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	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	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	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	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	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	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	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	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	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	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	80	$7,680.00

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

ECA Teams[34][35][36]

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 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

[34] 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;

[35] 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).

[36] 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.

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 meetings for 2020 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

Meeting – 1st through 4th Qt. 2020

TRANSFORMERS:

Location	EPS	ITN	Position	2020 Spend	Status
Sub 083 Blue Plains	PC17SS102	70020	R-23106	$ 1,602,818	In-Progress
Sub 083 Blue Plains	PC17TS102	70021	R-23107	$ 252,773	Completed
Sub 092 Nebraska Ave	PC18QS008	70024	T1	$ 1,725,258	Completed
Sub 168 Naval Research	PC18QS128	73762	T1	$ 2,443,115	In-Progress
Sub 168 Naval Research	PC19QS056	73762	T2	$ 2,762	Completed
Sub 121 Bells Mill	PM17SS105	70045	T5	$ 2,766,470	In-Progress
Sub 121 Bells Mill	PM17QS172	70043	T1	$ 6,700	In-Progress
Sub 150 Twining City	PC18QS012	73734	T2	$ 639,534	Completed

BREAKERS:

Location	EPS	ITN	Position	2020 Spend	Status
Sub 162 Bowie	PM17SS140	73556	8A;4A	$ 97,700	Completed
Sub.123 Ritchie	PM18QS001	73758	69006	$ 69,816	Completed
Sub 118 Quince Orchard	PM19SS017	66860	2A	$ 69,718	In-Progress
Sub 002 O Street	PC17SS109	70006	1B	$ 40,531	In-Progress
Sub 002 O Street	PC17SS108	70006	2B	$ 69,094	In-Progress
Sub 002 O Street	PC17SS110	70006	3B	$ 41,637	In-Progress
Sub 002 O Street	PC17SS111	70006	4B	$ 30,784	In-Progress
Sub 121 Bells Mill	PM17SS123	73556	5B	$ 162,396	In Progress

BATTERIES:

Location	EPS	ITN	Position	2020 Spend	Status
Sub 72 Camp Springs	PM20QS012	70603	Z-072-1	$45,777	Completed
Sub 79 Hunting Hills	PM17QS173	70603	Z-079-1	$35,855	Completed
Sub 84 Palmers Corner	PM18QS011	70603	Z-084-1	$11,409	Completed
Sub 162 Bowie	PM17SS159	70605	Z-162-1	$19,664	Completed
Sub 7 Benning	PC19QS094	70602	Z-007-1	$83,665	Completed
Sub 7 Benning	PC19QS095	70602	Z-007-2	$20,292	Completed
Sub 124 22nd St	PC19QS096	70602	Z-124-1	$15,712	Completed
Sub 111 Texas Ave	PC20QS132	70602	Z-111-1	$15,063	Completed

Meeting Attendees:

1st through 4th Qt. 2020

Title	Department
Manager Transmission & Substation Engineering	PSC Equipment Standards
Principal 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

1.2.9 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

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 takes 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 has the ability to disable 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 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 2020, Pepco held Service Center Drills at the Forestville Service Center on September 18 and at Rockville Service Center on September 25. In addition, the Pepco IMT (Incident Management Team) held their annual Drill on May 28 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: 2020 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.[37] Later, Order No. 16623 emphasized a focus on reliability for the ACR.

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

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[37] 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.

2020 PIWG Activities

The PIWG met five times in 2020. The 2020 PIWG meeting dates and meeting minutes filing dates are as follows:

Table 2.1-A

2020 PIWG Meeting Dates and Meeting Minutes Filing Dates

Meeting Date	Filing Date of the Meeting Minutes (See Formal Case No. 766 and PEPPIWG)
Feb. 28	Mar. 13
May 8	May 21
Aug. 25	Sep. 3
Nov. 13	Nov. 20
Dec. 18	Dec. 31

SECTION 2.1 – 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 2020 PIP projects, with a strong emphasis on reliability.

The 2020 PIP projects were as follows:

- 4 kV Distribution Substation Automation Projects

- 4 kV to 13 kV Conversion Projects
- DA Projects
- Priority Feeder Projects

2.1.1 PIP Project Status

The year-end 2020 status of the 2020 PIP Projects is included in Table 2.1-A.

Table 2.1-A: 2020 PIP Projects

Item	Description	PIP Project Year	2020 Project Amounts[1] (x1000)		Cost Variance Actual from Budget
			Budget	Actual	
1	4 kV Distribution Substation Automation Projects[38]	2020	$574,193	$645,405	($71,212)
2	4 kV to 13 kV Conversion Projects	2020	$12,111	$4,738	($5,531)
3	Distribution Automation Projects	2020	$9,200	$3,400	($5,800)
4	Priority Feeder Projects	2020	$3,685	$1,352	($2,332)

2.1.2 PIP Project Detail

Detail addressing each of the 2020 PIP projects – including work completed in 2020, work forthcoming in 2021, and longer-term plans – is provided below.

[38] The 4 kV Distribution Substation Automation Projects in this table only includes ITN # 70187.

4 kV Distribution Substation Automation Projects

The substation automation work continues at Macarthur Boulevard Sub 152 and is expected to be completed in the spring of 2021. The construction at Texas Avenue Sub. 1 1 1 is expected to be completed in the summer of 2022.

4 kV to 13 kV Conversion Projects[39][40]

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 110.9 megawatts of 4 kV load on the Pepco system, mostly in the District of Columbia. Over the next ten years, approximately 22 megawatts (including growth) will be converted to 13 kV service. Allowing for load growth, approximately 100 megawatts

[39] 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;

[40] 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;

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 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 2021. The overall budget for the 4 kV conversion projects is still in line with the Company's long-term conversion plan.

Status: In 2020 Pepco spent $4,737,629 on its 4 to 13 kV conversion projects, $7,374,277 less than the budget of $12,111,906. The deviation between the 2020 budget and actual expenditures is due to a combination of work being delayed by re-design, permitting and work time.

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.

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.

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. Due to the unanticipated non-constructability of the previous plans, all construction was placed on hold and Pepco revised the conversion work and released a new Construction Recommendation Plan in 2020.

The revised plan is a combination of traditional 4kV conversion work, load transfers to neighboring LVAC networks and possible consideration of other solutions. The new designs plan around the

"K" Street bridge crossing and the re-supply of load from Feeders 29 and 91 to other substations. Under the current schedule, work to retire the remaining five feeders should be completed by 2023. However, Pepco continues to encounter delays due to the network conversion portion which requires checking customer premises. The 2020 budget was $154,598 and approximate spend for 2020 was $118,802.

Georgetown Sub. Conversion Budget:

2021 – 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$2,335	$3,668	$3,769	$0	$0	$9,772

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.

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:

100% of the Harvard 4 kV load has been converted to 13kV by the summer of 2020. Recently completed phases of the project utilized existing 13kV feeders from Harvard Sub. 13 and Florida

Avenue Sub. 10 to complete the conversion of load along Irving Street, Warder Street, Quebec Place, and Florida Avenue. The 2020 budget was $1,446,574 and approximately $1,760,387 was spent in 2020.

Harvard Sub. Conversion Budget:

2021 – 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$0	$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 2020, 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 2020 was 2,057,735 Approximately $647,550 was spent in 2020. 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 the summer of 2021.

North Capitol Sub. Conversion Budget:

2021 – 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$2,452	$0	$0	$0	$0	$2,452

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 Hains 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.

These projects are included in the Load Growth program.

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 2021. The budget for 2020 was $6,864,818 Approximately $639,254 was spent in 2020.

12th Street Sub. Conversion Budget:

2021 – 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$3,092	$0	$0	$0	$0	$3,092

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 2020 budget for this project was $241,631 and $19,833 was spent in 2020. The work to convert the remaining 0.9 MVA to Feeders 15173 and 15178 is scheduled to be completed in 2021. 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 2021.

Anacostia Sub. Conversion Budget:

2021 – 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$700	$0	$0	$0	$0	$700

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. Construction anticipated to begin in late

2021. The 2020 budget for this project was $1,346,550 and approximately $1,551,803 was spent in 2020.

G" Street Sub. Conversion Budget:

2021– 2025 Budget (Figures in Thousands of Dollars)

2021	2022	2023	2024	2025	Total
$7,341	$13,649	$13,549	$13,277	$14,834	$62,649

2.2 DA PROJECTS

Distribution Automation 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 28 more feeders identified for ASR activation in 2021. 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 candidate feeders for ASR feeder scheme deployment in 2021 timeframe. This set of feeders will primarily benefit customers in Ward 8.

ASR Feeders Planned for 2021 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
St Barnabas 59	15082	0.001717662
St Barnabas 59	15083	0.003284233
St Barnabas 59	15084	0.001185329
St Barnabas 59	15085	0.00605845
St Barnabas 59	15086	0.001527037
St Barnabas 59	15087	0.005575771
St Barnabas 59	15088	0.0000595556
St Barnabas 59	15089	0.002815612
St Barnabas 59	15090	0.003304277
St Barnabas 59	15091	0.003304277
St Barnabas 59	15092	0.000896299
Beech road 159	14251	0.000759804
Beech road 159	14252	0.0000658919
Beech road 159	14253	0.001480944
Beech road 159	14255	0.001285892
Beech road 159	14256	0.001285892
Beech road 159	14257	0.002036395
Beech road 159	14258	0.000567704
Beech road 159	14259	0.001881188
Beech road 159	14260	0.000321852
Beech road 159	14261	0.009700642

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 2020 Priority Feeder Projects was approximately $1,500,000.

SECTION 2.3 – PERFORMANCE[41]

Priority Feeders & Aggressive Initiatives

Feeder Performance and Aggressive Initiatives

[41] 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 Performance

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:

SPC = 75% x (Feeder CI / System CI) + 25% x (Feeder CMI / 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 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 2020, there are 773 feeders (4 kV and 13 kV) in the District of Columbia. Sixteen feeders represent 2% of the 773-feeder total. The sixteen 2021 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 2021 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 year[44]*, 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 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 Initiatives[42]

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.

[42] 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;

- 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 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.

Section 2.3.1 2020 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;

Table 2.3A: Priority Feeder program - Completed Corrective Actions

2020 Priority Feeder Program - District of Columbia - Corrective Actions Proposed vs. Completed				
Rank	**Feeder**	**Proposed Corrective Actions, as filed in the 2020 Consolidated Report**	**Detailed Corrective Actions - Completed**	**Explanation of Variances/ Comments**
	14035	• Install/Replace 1050' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	• Install/Replace 1050' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	00328	• Install/Replace 4 Poles •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	• Install/Replace 4 Poles •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15867	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	14136	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	00211	•Due to ongoing work taking place under the G Street Conversion Program, no work is planned on this feeder under the 2020 Priority Feeder Program.	•No Work	No variance
	14711	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15130	• Install/Replace 1700' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	• Install/Replace 1700' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	14261	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15702	• Install/Replace 1 Pole •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	• Install/Replace 1 Pole •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15710	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15021	• Install/Replace 4200' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	• Install/Replace 4200' of Primary Wire •Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	16002	• No mainline work proposed under the 2020 Priority Feeder Program	• No Work	No variance
	15015	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15707	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	•Miscellaneous upgrades such as fuse cutouts, animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.	No variance
	15094	•Due to ongoing work taking place under the Ft Lincoln Area Reliability Improvement Plan, no work is planned on this feeder under the 2020 Priority Feeder Program.	• No Work	No variance
	16003	• No mainline work proposed under the 2020 Priority Feeder Program	• No Work	No variance

Proposed Corrective Actions for 2021 Priority Feeders[43]

The following information provides an overview of the outages and proposed corrective actions for the 2021 Priority Feeders and detailed information regarding the equipment related events and/or outages. Please see Attachment C for maps of the 2021 Priority Feeders reflecting overhead and underground portions, and the 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.

2021 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 2021 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.

Please note that, in a change from previous years' reports, Pepco is now budgeting for the entire class of priority feeders rather than for each feeder. The 2021 budget for priority feeders is $1,832,735.[44]

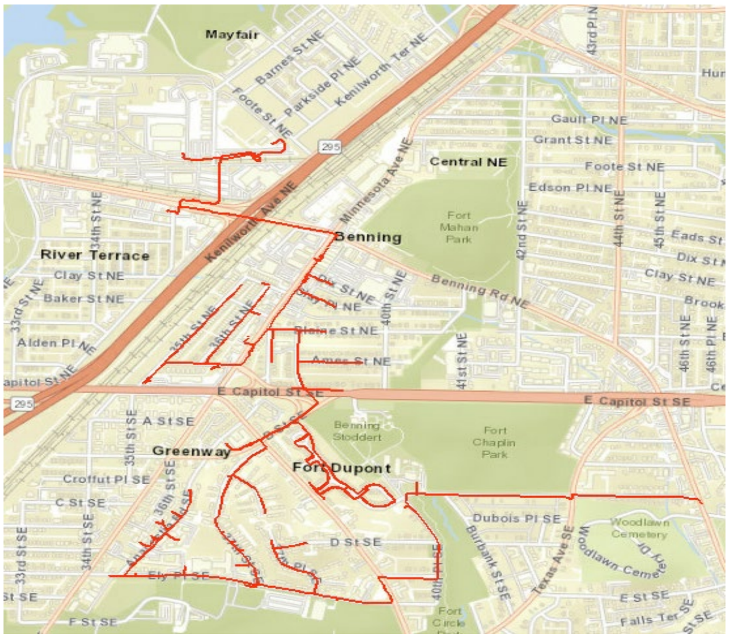
Circuit: 15709

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Benning (7)	2,768	23	1.994	65.2	32.7	62%	38%	9.39	N

[43] 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.

[44] The budget can be adjusted according to the needs of the program.

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Thirty three percent (33%) of customer outages were due to three mainline events; one event was caused by weather/wind, another caused by vandalism, and the third event was caused by equipment failure. Sixty six percent (66%) of customer outages were due to six lateral events. Two events were caused by equipment failure, one event was caused by an animal, one event was caused by foreign contact, one event was caused by vandalism, and one event was caused by trees.

2019: (Oct 18-Sep 19) Thirty eight percent (38%) of customer outages were due to eight mainline events; four events were caused by equipment failure, two were caused by trees, one event was caused by an animal, and one outage event occurred with an unknown cause. Sixty two percent (62%) of customer outages were due to lateral events; eleven outages were due to equipment failure caused by underground cable and fuse events. One event was caused by vandalism, and one event was caused by trees.

2020: (Oct 19-Sep 20) Eighty seven percent (87%) of customer outages were due to twenty-five lateral events. Thirteen outage events were due to equipment failures resulting from issues with individual meters or transformers; three outages were caused by underground cable failure. Four lateral outage events were due to an unknown cause, and the remaining five lateral outages were due to foreign contact, animal, employee, load, and a cable cut. Thirteen percent (13%) of customer outages were caused by mainline events. Three events were caused by an equipment failure at a fuse location, and one event was caused by a breaker event during a scheduled outage.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	1.061	53%
Animal/Bird	0.908	45%
Unknown	0.012	<1%%
Other	0.013	<1%

* Other Category Includes: Foreign Contact, Employee, Cable Cut, Load

Field Observations:

Feeder 15709 serves approximately 2,768 customers in the Benning, Dupont Park, Fort Dupont, Greenway, and River Terrace areas of Washington D.C. The feeder primarily consists of residential customers, with a mix of some commercial customers along the early part of the feeder. The mainline portion of the feeder runs underground from the Benning Substation up to Minnesota Ave NE, where it transitions to overhead and proceeds to run Southwest on Minnesota Ave NE. After turning off of Minnesota Ave NE, the feeder proceeds to run South following a path along Blaine St NE, Burns St NE, B St SE, and 37th St SE. Once the feeder reaches Ely Pl SE, it splits and runs to both the East and to the West. The portion of the feeder to the East runs along Ely Pl SE, Burns St SE, and C St SE, with only a few load points. Headed to the West, the feeder has a much higher customer count, feeding multiple apartment buildings off of Ely Pl SE, Minnesota Ave SE and B St SE. The mainline portion of the feeder is a mix of 477 ACSR Treewire,477 ACSR Bare wire, and PAC cable, with a majority of this being newer construction. There are opportunities to improve animal protection at all large equipment poles.

Previous Actions Taken (Past 3 years):

2018 Area Plan

Feeders 15709 and 14812 reconductored with 477 ACSR Tree wire from the North side of East Capitol St NW, heading southwest along B St SE, and then to the intersection of Ridge Rd SE and 37th St SE.

Reconductor two spans of mainline with 477 ACSR Tre wire along 37th St SE

Reconductor 14 spans of mainline with 477 ACSR Tree wire along Ely Pl SE

Install fuses at three unfused laterals.

Benning Feeder Extension

Convert single phase primary conductor along B St SE between Minnesota Ave SE and Railroad Tracks to three phase primary to allow for all load on feeder from N.C. Recloser on Ely Pl SE, east of Anacostia Rd SE, heading north along Minnesota Ave SE, and West on B St SE to be transferred to feeder 14806.

Planned Remediation (Current Year):

Mainline work includes addressing animal and BIL concerns at large equipment locations, installing fused cutouts, and installing phase spacers along spans with excessive slack.

Milestones/Schedule:

	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

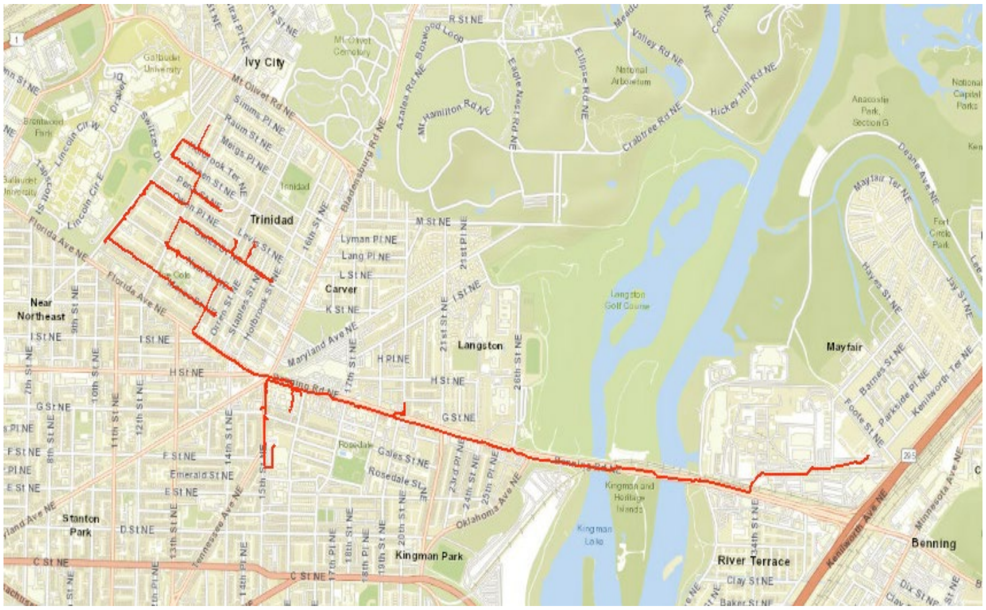
Anticipated Benefits:

The work planned will improve animal protection on the feeder, as well as added protection when high wind events occur, thereby improving the feeder performance.

Circuit: 14712

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Benning (7)	1,359	15	2.911	342.2	117.6	0%	100%	5.51	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of customer outages were fused lateral events; eight outage events were caused by equipment failure; three outages had an unknown cause, and two outages were due to cable cuts.

2019: (Oct 18-Sep 19) Forty percent (40%) of customer outages were mainline events. The two mainline outage events were caused by equipment failure. Sixty percent (60%) of customer outages were lateral events; two events caused by underground cable failure and one event caused by a cable cut.

2020: (Oct 19-Sep 20) Thirty three percent (33%) of customer outages were mainline events; eight events caused outages all relating to underground cable and transformer failures. Sixty six percent (66%) of customer outages were fused lateral events; ten events were caused by equipment failure; and six events were due to an unknown cause.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	2.188	75%
Unknown	0.723	25%

Field Observations:

Feeder 14712 serves approximately 1,359 customers in the Carver/Langston and Kingman Park neighborhoods in NE Washington, DC. This feeder is 100% underground construction and feeds residential customers.

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

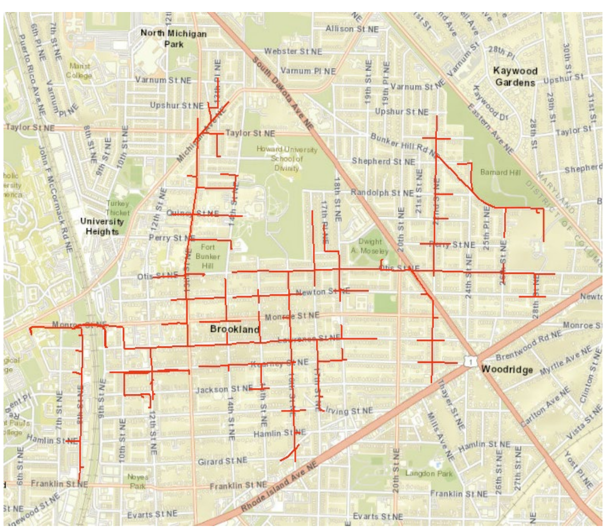
Anticipated Benefits:

The work on this feeder to address animal/BIL deficiencies will help to improve the resiliency of the feeder, thereby supplying a more reliable service to customers served by this feeder.

Circuit: 14022

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	12th & Irving (133)	1,901	18	2.227	86.3	38.8	80%	20%	5.63	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of eight customer outages were fused lateral events. Four outage events were caused by equipment failure; two were caused by trees; one outage event occurred due to lightning; and one outage had an unknown cause.

2019: (Oct 18-Sep 19) One hundred percent (100%) of ten customer outages were due to fused lateral events. Three of these outage events were caused by equipment failure; three outages were caused by lightning; two events were caused by animals. The remaining two events occurred for an unknown cause.

2020: (Oct 19-Sep 20) Thirty four percent (34%) of twenty-six customer outages were mainline events. Of the nine mainline outages, three were due to trees; three were caused by an unknown reason; the remaining three mainline outages were caused by animals, equipment failure, and weather. Sixty six percent (66%) of outages were lateral events. Five lateral outage events were caused by animals, four outages were caused by equipment failures, four outages were caused by trees, two outages were caused by weather, and the remaining two outages were caused by other factors.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Unknown	1.99	89%
Tree	0.138	6%
Equipment Failure	0.065	3%
Weather	0.027	1%
Animal	0.011	<1%
Other*	0.001	<1%

* Other Category Includes: Vandalism, Employee

Field Observations:

Feeder 14022 serves approximately 1,901 customers in the Brookland, Edgewood, and North Michigan Park neighborhoods in NE Washington, D.C. The overhead portion of the feeder that runs to the West, along 9th St NE, has been hardened in recent years and exclusively feeds industrial customers. The eastern portion of the feeder runs along Lawrence Ave NE and branches off in multiple directions to supply power to residential customers and create ties to other feeders in the surrounding area. These portions of the mainline branch off and run along 13th St NE, 16th Pl NE to the south, and 16th Pl NE to the north continuing along Otis St NE and 22nd St NE. A majority of the feeder has had work completed on it in recent years to reconductor the mainline with 477 ACSR Treewire. Areas of the mainline along 16th St NE, Otis St NE, and 22nd St NE contain older structures with copper wires, which leave the feeder vulnerable. There are also opportunities throughout the feeder to address animal and lightning concerns at large equipment poles.

Previous Actions Taken (Past 3 years):

No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Reconductor ~724’ of existing 4/0 ACSR Treewire along Kearny St NE with 477 ACSR Treewire

Reconductor ~3,818’ of existing copper primary along 16th St NE and Otis St NE with 477 ACSR Treewire

Reconductor ~569’ of existing copper primary along 22nd St NE with 477 ACSR Treewire

Install fused cutouts on unfused laterals and relocate existing cutouts to the mainline pole at laterals that are exposed to outage potential.

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Milestones/Schedule:

	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

Anticipated Benefits:

The reconductoring work will allow Feeder 14022 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.

Circuit: 14758

County	Substation	Customers	Number of	Oct. 2019-Sept. 2020 Reliability Indices	Feeder Miles	Repeated

		Served	Outages	(In Hours)						Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Nrl (168)	2,169	19	1.361	93.3	68.6	66%	34%	10.08	N

Feeder Map and Location:

Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Fifty percent (50%) of twenty customer outages were mainline events. There were four outages caused by equipment failures; three outage events were caused by vandalism; two outages were caused by animals; one outage was caused by weather. Ninety percent (90%) of the ten lateral outage evens on this feeder were due to equipment failures; the remaining outage event was caused by vandalism.

2019: (Oct 18-Sep 19) Fourteen percent (14%) of seventy-four outage events were mainline events. Seven outage events were caused by equipment failures; two events were caused by foreign contact; one event was caused by a motor vehicle; and one event was caused by trees. Eighty-six percent (86%) of outage events on the feeder were fused lateral events. Of the lateral events that occurred, ninety-six percent (96%) of the outages were due to one isolated equipment failure. The remaining two outage events were separate events that were also caused by equipment failure.

2020: (Oct 19-Sep 20) Thirty-six percent (36%) of twenty-two outage events on this feeder were mainline outages. Three outages were caused by foreign contact; two outages were caused by equipment failure; another two outages were caused by trees, and one mainline outage event occurred due to an unknown cause. There were fourteen lateral outages on this feeder, making up sixty four percent (64%) of outage events. Eleven lateral outage events due to equipment failure; ten of these eleven outages were in relation to one isolated downed wire issue. The remaining three lateral outage events on this feeder were caused by animals.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Tree	0.976	72%
Unknown	0.287	21%
Equipment Failure	0.081	6%
Animal	0.016	1%
Foreign Contact	0.062	<1%

Field Observations:

Feeder 14758 serves approximately 2,169 customers in the Anacostia Naval Station – Bolling Air Force Base, Bellevue, and Washington Highlands neighborhoods in SE Washington D.C. The mainline portion of this feeder originates on Chesapeake St SW, just east of Interstate-295 and proceeds to run east along Chesapeake St SW. The mainline also runs to the south along Martin Luther King Jr Ave SW and branches in multiple directions including southwest along Blue Plains Dr SW to feed the Metro station, south along Martin Luther King Jr Ave supplying power to apartment buildings and industrial customers, and heading east along Galveston St SW to tie into multiple feeders along South Capitol St SW. The mainline portion of the feeder is about an equal split of newer construction that utilizes PAC cable for longer stretches where there is not any load present and older construction with copper wire still in place.

Previous Actions Taken (Past 3 years):

As a result of multiple outage events, ~1,750' of mainline conductor was reconductored with PAC cable along Martin Luther King Jr Ave SE between Chesapeake St SW and Galveston St SW.

Planned Remediation (Current Year):

Mainline:

Reconductor ~1,617' of copper wire with 477 Treewire along Galveston St SW, from Martin Luther King Jr Ave SW to S Capitol St SW.

Reconductor ~500' of copper wire with 477 Treewire within the ROW off DC Village Ln SW.

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Ongoing work is taking place on this feeder to convert the older construction to underground cable along Martin Luther King Jr Ave SW, as well as feeds to/within The Vista and The Gardens Apartment buildings.

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	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

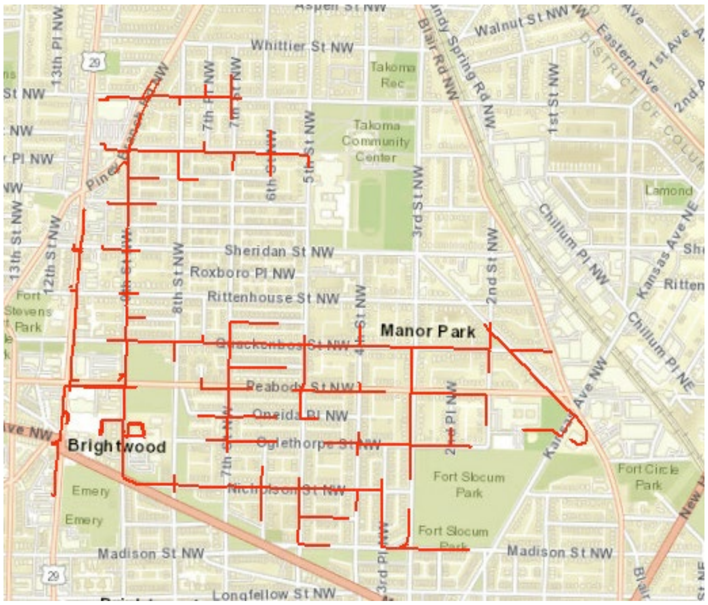
Anticipated Benefits:

The reconductoring work will allow Feeder 14758 to reliably tie into and back feed from other feeders in the surrounding area, while also increasing resiliency against weather and any vegetation issues. The other minor work on this feeder to address animal/BIL deficiencies will also help to improve the resiliency of the feeder, thereby providing a more reliable service to customers served by this feeder.

Circuit: 15010

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Ft Slocum (190)	1,830	13	1.35	154	114.2	81%	19%	8.24	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Twenty percent (20%) of fifteen customer outages were caused by three mainline events; one event was caused by equipment failure; one event was caused by weather; one event was due to an unknown cause. Eighty percent (80%) of customer outage events were due to fused lateral outages. Four outages were caused by equipment failures; four outages were caused by trees; two outages were caused by animals. The remaining two lateral outages were caused by weather and vandalism.

2019: (Oct 18-Sep 19) One hundred percent (100%) of fifteen customer outages were due to fused lateral events on this feeder. Nine outage events were caused by trees; four outages were caused by equipment failure; one outage was caused by weather, and one outage occurred due to an unknown cause.

2020: (Oct 19-Sep 20) Twenty percent (20%) of fifteen customer outages were due to mainline events. Two outages were caused by equipment failure; one outage was caused by weather. Eighty percent (80%) of customer outages on this feeder were caused by fused lateral events. Four outage events were caused by equipment failures; three outages were caused by trees; three outage events occurred due to animals; two outage events took place due to an unknown cause.

Feeder Performance (Oct 19-Sep 20)

Outage Causeby SAIFI	**SAIFI**	**% of Feeder SAIFI**
Equipment Failure	1.04	77%
Weather	0.147	11%
Tree	0.106	8%
Animal	0.034	3%
Unknown	0.016	1%

Field Observations:

Feeder 15010 serves approximately 1,830 customers in the Brightwood neighborhood in NW Washington D.C. The mainline portion of the feeder originates out of the Ft Slocum Substation and runs to the north on North Dakota Ave NW before heading to the west along Quackenbos St NW feeding residential customers along Quackenbos St NW. As the feeder reaches 9th St NW, it splits and heads both north and south along 9th St NW providing service to both residential and commercial customers along 9th St NW and Georgia Ave NW. A majority of the mainline portion of this feeder consists of older construction with copper wire within the breaker zone and along the feeder heading to the north along 9th St NW, while the portion of the feeder heading to the south is newer construction with 4/0 ACSR Bare wire and newer construction.

Previous Actions Taken (Past 3 years):

No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Milestones/Schedule:

	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

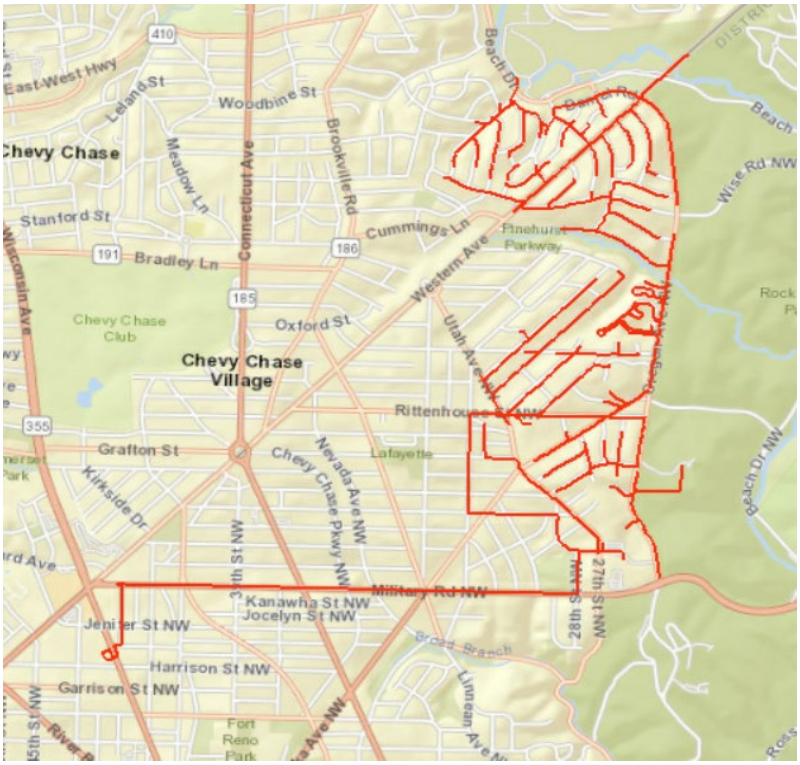
Anticipated Benefits:

The work on this feeder to address animal/BIL deficiencies will help to improve the resiliency of the feeder and provide a more reliable option to tie into and back feed from other feeders in the surrounding area, thereby providing a more reliable service to customers served by this feeder.

Circuit: 14900

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Harrison (38)	1,348	20	1.82	198	109	74%	26%	17.18	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Eight percent (8%) of customer outages were due to three mainline events. Two mainline outages were caused by equipment failure, and one outage was caused by trees. Ninety-two percent (92%) of customer outages were caused by fused lateral events. Fourteen outages were caused by equipment failure; seven outages were caused by trees; four outages were caused by animals; four outages occurred due to an unknown cause; one outage occurred due to weather and one outage was caused by a cable cut.

2019: (Oct 18-Sep 19) Twenty two percent (22%) of customer outages were due to mainline outages. One hundred percent (100%) of mainline outages were caused by trees. Seventy-eight percent (78%) of customer outages were due to fused lateral events. Seven outage events were caused by equipment failure; seven events were caused by trees; four outages occurred due to an unknown cause; three outages were caused by animals; two outages were caused by foreign contact; one outage was caused by weather.

2020: (Oct 19-Sep 20) Thirteen percent (13%) of thirty customer outages were mainline events. Three outages were caused by equipment failure; one outage was caused by trees. Eighty seven percent (87%) of customer outages were due to fused lateral events. Eight outage events were caused by weather; six outages were caused by equipment failure; five outage events were caused by trees; three outages occurred due to an unknown cause; two outages occurred due to animals and two outages were caused by overload.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Equipment Failure	1.015	55%
Weather	0.477	26%
Tree	0.216	12%
Unknown	0.096	5%
Animal	0.030	1%
Load	0.020	1%

Field Observations:

Feeder 14900 serves approximately 1,348 customers in the Barnaby Woods and Hawthorne neighborhoods in NW Washington D.C., extending into the Chevy Chase neighborhood in Montgomery County, MD. A majority of the breaker zone for this feeder consists of newer construction, utilizing both PAC Cable and 4/0 ACSR Treewire, that has been implemented to address heavy vegetation concerns along the pole line. The lone area within the breaker zone that consists of older construction with copper wire is along Utah Ave NW, from Rittenhouse St NW to the tie switch just northwest of 31st Pl NW. The laterals on this feeder run to residential customers and have sufficient fused cutouts in place to attempt to minimize any interruptions that may be experienced along the many laterals.

Previous Actions Taken (Past 3 years):

DC Plug program has ongoing work to convert a portion of this feeder along Oregon Ave NW to underground, to remediate heavy tree canopy along this roadway.

Planned Remediation (Current Year):

Mainline:

Reconductor ~825' of copper wire with 477 ACSR Treewire along Utah Ave NW, from Rittenhouse St NW to tie switch.

Relocate cutouts to mainline poles where potential threats exist at current locations.

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Milestones/Schedule:

	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

Anticipated Benefits:

The reconductoring work will allow Feeder 14900 to reliably tie into and back feed from other feeders in the surrounding area, while also increasing resiliency against weather and any vegetation issues.

Ongoing DC Plug work will provide a large benefit to the overall reliability of the feeder as well. The other minor work on this feeder to address animal/BIL deficiencies will also help to improve the resiliency of the feeder, thereby providing a more reliable service to customers served by this feeder.

Circuit: 15197

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Ft. Slocum (190)	1,300	11	1.79	174	96.6	65%	35%	12.16	N

Feeder Map and Location:

Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Twenty six percent (26%) of customer outages were due to five mainline events. Two outages were caused by animals; one outage caused by equipment failure; one outage caused by weather and one outage occurred due to an unknown cause. Seventy four percent (74%) of outages were due to fused lateral events. Seven fused lateral events were caused by equipment failure; three outages were caused by animals; three outages were caused by trees and one outage occurred due to an unknown cause.

2019: (Oct 18-Sep 19) Forty-two percent (42%) of twenty-eight outages occurred on the mainline of the feeder. Nine outages were caused by equipment failure; one outage was caused by a motor vehicle; one outage was caused by a tree and one outage occurred due to an unknown cause. Fifty eight percent (58%) of outages were caused by fused lateral events. Seven outages were caused by equipment failure; three outages occurred due to an unknown cause; two outages were caused by trees; two outages were caused by motor vehicles; one outage was caused by animals and one outage was caused by an overload.

2020: (Oct 19-Sep 20) Forty percent (40%) of twenty customer outages were caused by mainline events. Five outages were caused by equipment failures and three outages were caused by an unknown cause. Sixty percent (60%) of customer outages were fused lateral events. Five outages were caused by animals; four outages were caused by equipment failures; one outage was caused by weather; one outage occurred due to an unknown cause and one outage was caused by an employee.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Equipment Failure	1.109	62%
Unknown	0.656	36%
Animal	0.035	2%
Weather	0.008	<1%
Other*	0.008	<1%

* Other Category Includes: Employee

Field Observations:

Feeder 15197 serves approximately 1,300 customers in the Crestwood, Petworth, and Sixteenth Street Heights neighborhoods in NW Washington D.C. The mainline portion of the feeder originates out of the

Ft Slocum Substation and runs a significant distance transitioning back and forth between underground cable and PAC cable, while the PAC cable opens up to create taps to tie switches and residential customers along the way. The western most portion of the feeder does open up to an open wire configuration, with tree wire in place to address vegetation concerns as it enters into and serves residential customers in the Crestwood neighborhood. The mainline is well protected from vegetation threats and existing fused cutouts provide sufficient protection to vulnerabilities along laterals.

Previous Actions Taken (Past 3 years):

No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Milestones/Schedule:

	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

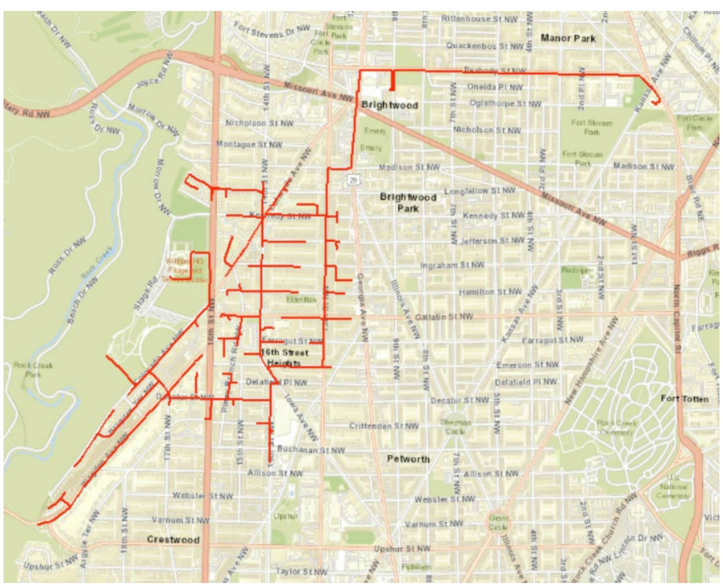
Anticipated Benefits:

The work on this feeder to address animal/BIL deficiencies will help to improve the resiliency of the feeder and provide a more reliably option to tie into and back feed from other feeders in the surrounding area, thereby providing a more reliable service to customers served by this feeder.

Circuit: 15001

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Ft. Slocum (190)	1,341	24	1.59	130	81.8	76%	24%	9.62	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of customer outages were fused lateral events on this feeder. Six outage events were caused by equipment failure; six outages were caused by trees; two outages were caused by weather; two outages were caused by motor vehicles; one outage was caused by animals and one outage was caused by an overload.

2019: (Oct 18-Sep 19) Forty five percent (45%) of customer outages were due to mainline events. Eight outage events were due to an isolated incident caused by trees and one outage was caused by animals. Fifty five percent (55%) of customer outages were due to lateral events. Five events were caused by equipment failures; two events occurred due to unknown causes; two events were caused by trees; one event was caused by animals and one outage was caused by a motor vehicle.

2020: (Oct 19-Sep 20) Ninety percent (90%) of thirty-two customer outages were lateral events. Ten outages were caused by equipment failure; six outages were scheduled outages; five outages were caused by trees; two outages were caused by animals; two outages were caused by motor vehicles; two outages were caused by load issues and two outages occurred due to an unknown cause. Ten percent (10%) of customer outages on this feeder were mainline events. Two outages were caused by animals and one outage occurred due to an unknown cause.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	0.498	31%
Tree	0.349	22%
Scheduled	0.299	18%
Other*	0.297	18%
Unknown	0.149	11%

Field Observations:

Feeder 15001 serves approximately 1,341 customers in the Brightwood Park, Petworth, Sixteenth Street Heights, and Crestwood neighborhoods in NW Washington D.C. The mainline portion of this feeder originates out of the Ft Slocum Substation and runs west underground up to 13th St NW. The feeder transitions to overhead wire and runs south along 13th St NW, Emerson St NW, 14th St NW, and Decatur St NW serving a mix of residential and commercial customers along the entirety of the feeder. The mainline along 13th St NW is a mix of newer construction with 477 ACSR Treewire and older construction with copper wire, while the remainder of the mainline has been hardened with 4/0 ACSR Treewire to help remediate vegetation threats along the pole line.

Previous Actions Taken (Past 3 years):

No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Reconductor ~2,300’ of copper wire along 13th St NW from Kennedy St NW to Emerson St NW with 477 ACSR Treewire

Replace damaged or aged crossarms and poles throughout the mainline portion of the feeder.

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

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	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments				

Completed Remediation Work: N/A

Anticipated Benefits:

The reconductoring work on Feeder 15001 will address the remaining weak points along the mainline on this feeder, while also increasing resiliency against weather and any vegetation issues. The other minor work on this feeder to address animal/BIL deficiencies will also help to improve the resiliency of the feeder, thereby providing a more reliable service to customers served by this feeder.

Circuit: 14023

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	12th & Irving (133)	529	17	3.43	480	139.9	39%	61%	5.78	Y

Feeder Map and Location:

Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Sixty six percent (66%) of customer outages were due to eight mainline events. Three outages were caused by weather; three outages were caused by trees; one outage occurred due to an unknown cause and one outage occurred due to a cable cut. Thirty three percent (33%) of customer outages were caused by fused lateral events. Two outages were caused by animals; one outage was caused by an equipment failure and one outage was caused by trees.

2019: (Oct 18-Sep 19) Fifty percent (50%) of ten customer outages on this feeder were caused by mainline events. Three outage events were caused by weather and two outages were caused by equipment failures. The five lateral events on this feeder which made up fifty percent (50%) of outages were caused by two equipment failures; two tree incidents and one outage occurred with an unknown cause.

2020: (Oct 19-Sep 20) Thirty four percent (34%) of twenty-three customer outages were mainline events. Five mainline outage events were caused by equipment failures and three outage events were caused by weather. Sixty six percent (66%) of the twenty-three customer outages were fused lateral events. Five outage events were caused by animals; five outage events were caused by weather; four outages were caused by equipment failure and one outage was caused by an overload.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Equipment Failure	2.011	58%
Weather	1.368	40%
Animal	0..055	2%
Other*	0.149	<1%

*Other Category Includes: Load

Field Observations:

Feeder 14023 serves approximately 529 customers in the Brentwood, Brookland, and Eckington neighborhoods in NE Washington D.C. The mainline portion of the feeder originates out of the 12th & Irving Substation and runs along 10th St NE, Rhode Island Ave NE, 12th St NE and Brentwood Rd NE servicing mostly industrial and commercial customers, with some residential customers as well. The early portion of this feeder running along 10th St NE and Rhode Island Ave NE is a mix of old and new construction with existing copper wire still in place and has experienced a variety of issues that have led to outages. The remainder of the mainline is a mix of construction with 4/0 ACSR Bare wire in place along 12th St NE and Brentwood Rd NE.

Previous Actions Taken (Past 3 years):

2019 – Reconductor six spans of mainline with Treewire along Brentwood Rd NE at 12th St NE

Planned Remediation (Current Year):

Mainline:

Reconductor 1,500' of 1/0 Copper Primary with 477 ACSR Tree Wire in Breaker Zone along 10th St NE and Rhode Island Ave NE.

Replace aged crossarms in Breaker Zone along Brentwood Rd NE.

Install Phase Spacers at midspan for spans that have excessive slack in the 2nd zone along Brentwood Rd NE.

Address any animal, lightning, phase-to-phase, and phase-to-ground issues at large equipment locations.

Milestones/Schedule:

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

Completed Remediation Work: N/A

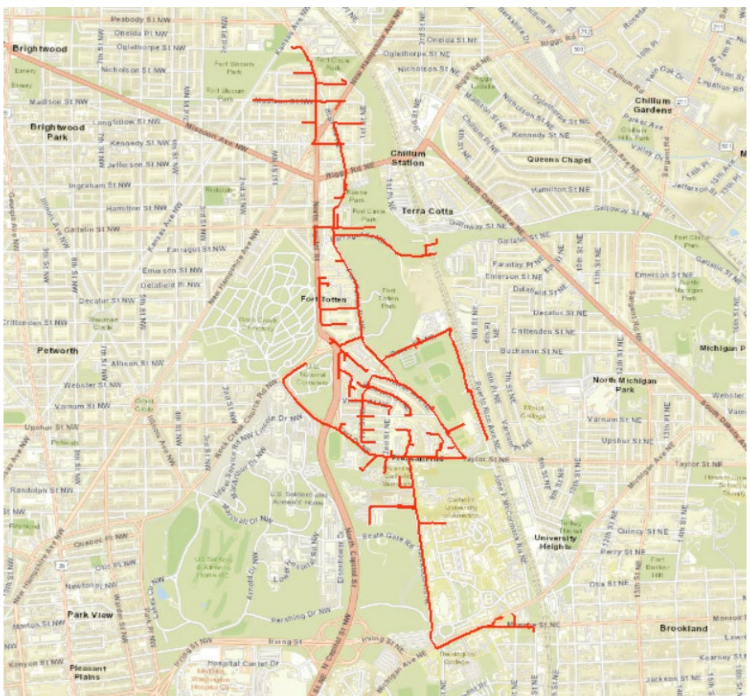
Anticipated Benefits:

The reconductoring work on Feeder 14023 will address the area at the beginning of the feeder that has experienced frequent issues that have resulted in outages to the entire feeder. Reconductoring portions of this feeder will also allow to reliably tie into and back feed from other feeders in the surrounding area, while also increasing resiliency against weather and any vegetation issues. Phase spacers along Brentwood Rd NE will increase resiliency of the feeder during high wind weather events.

Circuit: 15013

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Ft Slocum (190)	1,824	43	1.20	61	50.7	75%	25%	10.12	Y

Feeder Map and Location



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Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) Twenty one percent (21%) of nineteen customer outages on this feeder were mainline events. Three outages were caused by weather and one event was caused by trees. Seventy nine percent (79%) of nineteen customer outages were due to fused lateral events. Eight outage events were caused by equipment failure; three outages were caused by weather; one outage was caused by vandalism; one outage was caused by an overload; one outage occurred due to an unknown cause and one outage was caused by trees.

2019: (Oct 18-Sep 19) Thirty five percent (35%) of fourteen customer outages were mainline events. Four outages were caused by one weather event, and one outage was caused by an equipment failure. Sixty five percent (65%) of fourteen customer outages on this feeder were lateral outages. Four lateral outages were caused by equipment failures; three outages were caused by animals; one outage was caused by a motor vehicle and one outage was caused by trees.

2020: (Oct 19-Sep 20) Six percent (6%) of forty-six customer outages on this feeder were mainline outage events. One outage was caused by an overload, one outage was caused by trees, and one outage was caused by animals. Ninety-four percent (94%) of the forty-six outages on this feeder were lateral events. Thirty-four outage events were caused by equipment failures, seventy six percent (76%) of which were due to a localized incident of a downed wire. Five outages were attributed to trees; two outages were caused by motor vehicles; one outage was caused by vandalism and one outage was caused by an overload.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Equipment Failure	1.002	83%
Load	0.075	6%
Tree	0.077	6%
Animal	0.040	3%
Other*	0.020	2%

*Other Category Includes: Motor Vehicle, Vandalism

Field Observations:

Feeder 15013 originates from the Fort Slocum substation in northwest Washington, DC, and serves approximately 1,824 customers. The feeder is 75% overhead and 25% underground and provides power to both residential and commercial customers. The mainline emerges from the substation along Blair Rd NW where the feeder runs south, continuing to North Capitol St NW The mainline trunk continues to the south until Kennedy St NE where it runs east, then heads to the southeast along Blair Rd NE. The mainline trunk of the feeder continues in this manner along Rock Creek Church Rd NE until the mainline trunk branches off onto Farragut St NE where the feeder ends at a riser pole. In the other direction, the line continues to the south along Fort Totten Dr NE with several lateral branches off the main trunk around Bates Rd NE, Allison St NE, and Hawaii Ave NE. The feeder continues down Fort Totten Dr NE until Taylor St NE, where the feeder then turns to the west and runs along Fort Dr NE up to Rock Creed Church Rd NW. The feeder also branches off of Taylor St NE along Harewood Rd NE to the south until turning to the east along Michigan Ave NE and ending underground in the vicinity of Michigan Ave NE and Monroe St NE.

Previous Actions Taken (Past 3 years):

No work performed within last 3 years.

Planned Remediation (Current Year):

Mainline:

Reconductor ~2,900' of primary conductor in the breaker zone to address areas of undersized conductors as well as 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	N/A	N/A	N/A	N/A

Actual	N/A	N/A	N/A	N/A
Variance Comments				

Completed Remediation Work: N/A

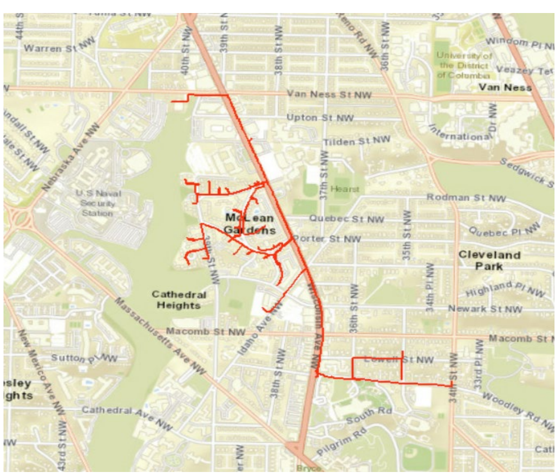
Anticipated Benefits:

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 as possible. 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.

Circuit: 14150

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Van Ness (129)	874	10	2.05[4]	224	109.2	13%	87%	4.37	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) There were 0 mainline events. One hundred percent (100%) of the twelve outages were caused by lateral outages. Six outages were caused by equipment failures; five outages occurred due to unknown causes; one outage was caused by vandalism.

2019: (Oct 18-Sep 19) Sixteen percent (16%) of eighteen outages on this feeder were mainline events. Two outages occurred due to an unknown cause and one outage was caused by an equipment failure. Eighty four percent (84%) of eighteen outages were lateral events. The outages were caused exclusively by two transformer events, resulting in the sole outage cause of equipment failure.

2020: (Oct 19-Sep 20) Thirty six percent (36%) of eleven customer outages on the feeder were mainline events. Two outages were caused by equipment failures; one outage was caused by animals and one outage was caused by an employee. Sixty four percent (64%) of eleven customer outages were lateral outages. All seven lateral outages were the result of an equipment failure during one localized event.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Employee	0.937	45%
Animal	0.924	45%
Equipment Failure	0.192	10%

Field Observations:

Feeder 14150 serves approximately 874 customers in Northwest Washington D.C. Originating from the Van Ness Substation; this circuit is 13% overhead and 87% underground. The mainline provides both residential and commercial service. In the small section with overhead there is insulated primary conductor with crossarm construction on poles in good condition.

Previous Actions Taken (Past 3 years):

No work performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Installing fuses at unfused laterals to provide mainline protection from faults downstream and further sectionalize the feeder. 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	N/A	N/A	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments				

Completed Remediation Work: N/A

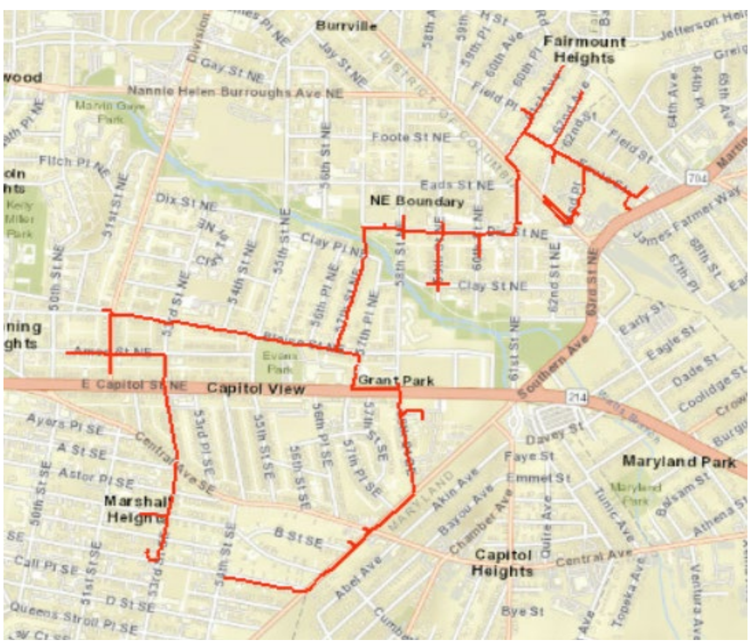
Anticipated Benefits:

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.

Circuit: 00372

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Seat Pleasant (30)	756	26	2.292	189	82.8	98%	2%	4.40	N

Feeder Map and Location:



<u>Outage Data Summary (Past 3 years)</u>:

2018: (Oct 17-Sep 18) Twenty two percent (22%) of nine customer outages were due to mainline outage events. One outage event was due to trees, and one outage event occurred due to an unknown cause. Seventy eight percent (78%) of nine customer outages were due to lateral outages. Five outages were caused by equipment failure and two outages were due to foreign contact.

2019: (Oct 18-Sep 19) There were 0 mainline events on this feeder. One hundred percent (100%) of the six outage events on this feeder were lateral outages. Three outages were caused by equipment failure; one outage was caused by a motor vehicle; one outage event was caused by a tree and one outage event occurred due to trees.

2020: (Oct 19-Sep 20) Eighteen percent (18%) of the twenty-seven customer outages on this feeder were mainline events. Two outages were caused by motor vehicles; one outage was caused by equipment failure; one outage was caused by fire and one outage occurred due to an unknown cause. The lateral outage events attributed to eighty two percent (82%) of the outages on this feeder. Seventeen outages were caused by trees, exclusively caused by two isolated events. There were four outages caused by equipment failure and one outage caused by an employee.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Source Lost	1.002	44%
Fire	1.002	44%
Tree	0.232	10%
Motor Vehicle	0.011	<1%
Other*	0.039	<1%

*Other Category Includes: Equipment Failure, Employee

Field Observations:

Feeder 00372 serves approximately 756 customers in Northeast Washington D.C. Originating from the Seat Pleasant Substation; most of this circuit consists of overhead construction (98% overhead and 2% underground). The mainline provides both residential and commercial service. The mainline emerges from the substation on 59th St SE and heads north. The feeder then continues on Blaine St NE to the east, following to the south on 58th St SE and ending along Southern Ave. To the north of Blaine St NE, the feeder runs along 57th St NE. The mainline of the feeder then heads to the east along Dix St NE, proceeding until 61st St NE, then runs north along 61st St NE. The end of the feeder extends into Prince George's County, Maryland where it branches off and ends on Foote St and 61st Ave. The devices, poles, and conductor on this feeder are generally in good condition, however there are a couple of areas that have older poles and conductors.

Previous Actions Taken (Past 3 years):

This feeder was upgraded under the 2020 Comprehensive Feeder Program where wires, poles and equipment were upgraded to improve performance.

Planned Remediation (Current Year):

Mainline:

No work is being performed on this feeder.

Milestones/Schedule:

	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

Anticipated Benefits:

No work is being performed on this feeder under the Priority Feeder program.

Circuit: 15166

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Alabama Ave (136)	1,251	11	1.31[7]	75	57.2	72%	28%	10.64	N

Feeder Map and Location:

Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of thirteen customer outages on this feeder were lateral events. Five outage events were caused by equipment failure; four outages were caused by animals; two outages were caused by trees; one outage was caused by an employee and one outage occurred due to an unknown cause.

2019: (Oct 18-Sep 19) One hundred percent (100%) of five customer outages were fused lateral events. Three events were caused by equipment failure; one event was caused by a load issue and one outage event occurred due to an unknown cause.

2020: (Oct 19-Sep 20) Seventy four percent (74%) of eleven customer outages on this feeder were mainline events. Six outage events were caused by equipment failure and one outage on the mainline occurred due to vandalism. Thirty six percent (36%) of customer outages were fused lateral events. Three outages were caused by foreign contact and one outage was caused by equipment failure.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Foreign Contact	1.134	85%
Equipment Failure	0.182	14%
Vandalism	0.001	1%

Field Observations:

Feeder 15166 serves approximately 1,251 customers in southeast Washington D.C. Originating from the Alabama Ave Substation; this circuit provides service to both commercial and residential customers. This feeder is largely overhead (72% overhead and 28% underground), and emerges from the substation along Mississippi Ave SE near the intersection of 15th St SE. The mainline of the feeder takes off to the west along Mississippi Ave SE and branches off both north and south along 13th St SE as well as providing coverage to the north of Mississippi Ave NE along 6th St SE. Overall the condition of the poles, conductors, and equipment along this feeder are good and the areas that contain vegetation are well mitigated.

Previous Actions Taken (Past 3 years):

No previous actions have been taken on this feeder in the past three years.

Planned Remediation (Current Year):

Mainline:

Reconductor approximately 1,300’ of primary wire in the breaker zone and install fuses at unfused laterals.

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

Milestones/Schedule:

	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

Anticipated Benefits:

The reconductoring work taking place on this feeder will improve the capacity of the conductor in the breaker zone of the feeder and will also provide covered conductors to mitigate issues with phase contact and tree 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.

Circuit: 14766

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Little Falls (77)	599	12	1.69[1]	81	48	30%	70%	9.67	N

Feeder Map and Location:

Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of twenty-two customer outages on this feeder were lateral events. Thirteen outages were caused by equipment failure; three outages were caused by weather; two outages were caused by an employee; one outage was caused by animals; one outage occurred due to a load issue; one outage was caused by voltage and one outage was caused by trees.

2019: (Oct 18-Sep 19) Sixty six percent (66%) of nine customer outages were mainline outage events. Three outages were caused by animals and three outages were caused by equipment failure. Thirty three percent (33%) of customer outages were caused by lateral events. Two lateral outages occurred due to animals and one outage event occurred due to equipment failure.

2020: (Oct 19Sep 20) Forty one percent (41%) of twelve customer outages were mainline outage events. All five outages were caused by animals and are all part of one localized outage issue. Fifty nine percent

(59%) of customer outages were lateral events. Three outages were caused by animals; two outages were caused by trees; one outage was caused by equipment failure and one outage occurred due to an unknown cause.

Feeder Performance (Oct 19Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Animal	1.666	98%
Equipment Failure	0.017	1%
Tree	0.006	<1%
Unknown	0.002	<1%

Field Observations:

Feeder 14766 serves approximately 599 customers in northwest Washington D.C. Originating from the Little Falls Substation, most of this circuit consists of underground construction (30% underground, and 70% overhead). The Breaker Zone is almost entirely underground, rising up at the intersection of Fordham Rd NW and Tilden St NW then branching off to the north along Fordham Rd NW and running east along Upton St NW. The feeder also branches off through the mainline to several side streets. There is a large URD loop at the northwest end of the feeder. The feeder has consistent vegetation throughout the mainline, however the tree cover and undergrowth is not a substantial cause of issues on this circuit.

Previous Actions Taken (Past 3 years):

No work has taken place on this feeder in the previous three years.

Planned Remediation (Current Year):

Mainline:

Reconductor approximately 550’ of primary wire with covered treewire in the Breaker Zone and along 46th St NW.

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	N/A	N/A
Actual	N/A	N/A	N/A	N/A
Variance Comments				

Completed Remediation Work: N/A

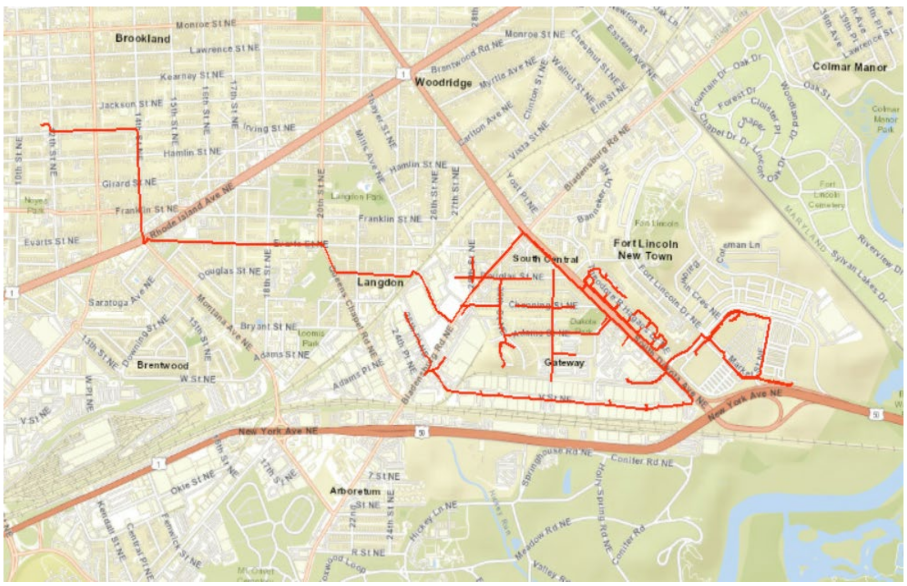
Anticipated Benefits:

Reconductoring the breaker zone portion of the feeder where copper primary wire exists will mitigate weak areas of the feeder and prevent issues with inadequate conductor size from causing issues on this feeder in the future. 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.

Circuit: 14005

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	12th & Irving (133)	472	10	1.379	191	138.7	39%	61%	8.75	N

Feeder Map and Location:



Outage Data Summary (Past 3 years):

2018: (Oct 17-Sep 18) One hundred percent (100%) of three customer outages on this feeder were lateral events. One event was caused by a motor vehicle; one event was caused by equipment failure; and one event was caused by trees.

2019: (Oct 18-Sep 19) Thirty three percent (33%) of three customer outages were mainline outage events. The only mainline outage on the feeder for this year was caused by a motor vehicle. Sixty six percent (66%) of customer outages were lateral events, and both of these outages were caused by equipment failure.

2020: (Oct 19-Sep 20) Seventy three percent (73%) of fifteen customer outages were mainline events. Seven outages were caused by trees and four mainline outages were caused by motor vehicles. Twenty seven percent (27%) of customer outages on this feeder were fused lateral events. Two outages were caused by equipment failure; one outage was caused by a load issue and one outage was caused by trees.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	SAIFI	% of Feeder SAIFI
Tree	1.235	89%
Motor Vehicle	0.139	10%
Equipment Failure	0.031	1%
Other*	0.002	<1%

*Other Category Includes: Load

<u>Field Observations:</u>

Feeder 14005 serves approximately 472 customers in northeast Washington D.C. Originating from the 12th & Irving substation, most of this circuit consists of underground construction (39% overhead, 61% underground). The breaker zone is almost entirely underground, rising near the intersection of Bladensburg Rd NE and Channing St NE. The mainline of the feeder splits off at 30th St NE and runs north-south from Douglas St NE to Adams St NE. The mainline of the feeder runs east along Adams St NE until it intersects with South Dakota Ave NE. The last portion of the feeder runs along South Dakota Ave NE with overhead along the mainline and URD loops spurring from it. The equipment and poles on this circuit are in condition throughout, however there are some areas of vulnerability due to conductor size and insulation and equipment protection.

Previous Actions Taken (Past 3 years):

No work is performed within the last 3 years.

Planned Remediation (Current Year):

Mainline:

Reconductor approximately 4,700’ of primary wire with covered treewire along Adams St and along South Dakota Ave.

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

Milestones/Schedule:

	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

Anticipated Benefits:

Reconductoring the undersized primary wire on this feeder will mitigate weak areas of the feeder and prevent issues with inadequate conductor size from causing issues on this feeder in the future. 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.

Circuit: 14133

County	Substation	Customers Served	Number of Outages	Oct. 2019-Sept. 2020 Reliability Indices (In Hours)			Feeder Miles			Repeated Last 2 Years?
				SAIFI	SAIDI	CAIDI	OH	UG	Total	
DC	Van Ness (129)	322	21	1.86[6]	203	108.9	59%	41%	7.23	N

Feeder Map and Location:

<u>Outage Data Summary (Past 3 years)</u>:

2018: (Oct 17-Sep 18) Seventy four percent (74%) of twenty-three customer outages on this feeder were lateral events. Eight outages were caused by trees; four outages were caused by equipment failures; two outages were caused by animals; two outages were caused by weather and one outage event occurred due to an unknown cause. Twenty six percent (26%) of outages were mainline events. Three outages were caused by trees; two outages were caused by equipment failure and one outage event was caused by weather.

2019: (Oct 18-Sep 19) Sixty percent (60%) of fifteen customer outages were lateral outage events. Five outages were caused by trees; two outages were caused by weather; one outage was caused by animals and one outage was caused by equipment failure. Forty percent (40%) of customer outages were mainline events. All six mainline events were caused by trees.

2020: (Oct 19-Sep 20) Eighty six percent (86%) of twenty-three customer outages on this feeder were lateral events. Fifteen outages were caused by trees and five outages were caused by animals. Fourteen percent (14%) of customer outages were mainline outage events. Two outages were caused by animals and one outage event was caused by trees.

Feeder Performance (Oct 19-Sep 20)

Outage Cause by SAIFI	**SAIFI**	**% of Feeder SAIFI**
Animal	1.040	55%
Tree	0.826	45%

Field Observations:

Feeder 14133 serves approximately 322 customers in northwest Washington D.C. Originating from the Van Ness substation, most of this circuit consists of overhead construction (59% underground, and 41% overhead). The breaker zone is almost entirely underground, rising up approximately ten spans prior to the first recloser. The mainline emerges along Ablemarle St NW and heads directly east, then branches off to the north and runs along Linnean Ave NW. The mainline of the feeder also continues along Ablemarle St NW until the mainline ends shortly before Broadbranch Rd NW. This feeder is challenged by consistent tree outages along Broadbranch Rd NW, and the poles, devices, and conductors on the mainline of this circuit are in good condition.

Previous Actions Taken (Past 3 years):

No work is performed within the 3 years.

Planned Remediation (Current Year):

Mainline:

The mainline of this feeder will undergo a reconductoring upgrade to replace 1/0 Copper wire with 477 ACSR Treewire along Linnean Ave NW. Additionally, the feeder will be assessed for minor protection issues and will have lightning and animal protection improvements, as necessary. As a project separate from the 2021 Priority Feeder program, this feeder will be undergoing improvements along the lateral line on Broadbranch Rd NW. The existing conductor will be replaced with single phase spacer cable in order to mitigate tree risks.

Milestones/Schedule:

	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

Anticipated Benefits:

The performance of this feeder was driven by animal and tree issues. The proposed work to replace and upgrade these conductors, poles, and equipment will improve performance for customers fed by this feeder.

Review of 2019 Priority Feeder Program (Least Reliable Feeders)

Activities conducted to improve the performance of each of the feeders in the 2019 Priority Feeder Program are identified in Table 2.4-A

Table 2.4-A

2019 2% Priority Feeder Program - District of Columbia -Completed Corrective Actions							
Rank	Feeder ID	Substation	Category OH	Category UG	SPC Value	Completion Time	Corrective Actions
	14014	12th Irving (133)	92%	8%	0.01621	N/A	•Feeder improvements being made separately under the 12th & Irving Area Reliability Improvement Plan
	14023	12th Irving (133)	43%	57%	0.00629	2nd Quarter 2019	•Install/Replace 525' of Primary Wire with Treewire •Install/Replace 525' of existing neutral with Triplex •Install/Replace 1 gang switch •Install/Replace 1 pole •Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	14093	12th Irving (133)	78%	22%	0.01131	N/A	• No work was perfomred
	14132	Van Ness (129)	48%	52%	0.01022	2nd Quarter 2019	•Removal of Gang Switch •Install fused cutouts •Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	14717	Benning (007)	87%	13%	0.04806	N/A	• Feeder improvements being made separately under the Benning Area Reliability Improvement Plan
	14786	New Jersey (161)	0%	100%	0.02308	N/A	• Feeder improvements being made separately under the New Jersey Area Reliability Improvement Plan
	14900	Harrison (038)	74%	26%	0.01314	N/A	• Underground cable upgrade performed outside of Priority Feeder program
	15003	Ft Stocum (190)	94%	6%	0.03066	N/A	• Feeder improvements made prior to 2019 Priority Feeder program due to major outage events
	15013	Ft Stocum (190)	75%	25%	0.02485	2nd Quarter 2019	• Install/Replace 560' of Primary wire with Treewire •Replace 1 Gang Switch •Replace 2 Poles •Replace 1 Transformer • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	15172	Alabama Ave (136)	82%	18%	0.01729	2nd Quarter 2019	• Install/Replace 2 fused cutouts • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	15176	Alabama Ave (136)	65%	35%	0.02059	2nd Quarter 2019	• Install/Replace 2980' of Primary wire with Treewire • Install/Replace 2670' of Secondary Wire with Tiplex • Replace 1 Pole • Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	15177	Alabama Ave (136)	83%	17%	0.02023	2nd Quarter 2019	•Install/Replace 370' of Primary Wire with tree wire •Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, missing grounds, uninsulated down guys, etc.
	15764	Florida Ave (010)	0%	100%	0.03232	N/A	• No work was perfomred
	15197	Ft Stocum (190)	65%	35%	0.02302	2nd Quarter 2019	•Replace Gang Switch Drops •Miscellaneous upgrades such as animal guards, lightning arrestors, crossarms, etc
	16000	Waterfront (223)	84%	16%	0.01190	N/A	• Feeder is part of Waterfront project and is being addressed separately
	16001	Waterfront (223)	85%	15%	0.01080	N/A	• Feeder is part of Waterfront project and is being addressed separately

Aggressive Correction Action Program[45]

Annual Program for Repeat Priority Feeders

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 2019 Priority Feeder Program reappeared on the 2021 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 2021.

2.4.1 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

[45] 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.

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 [46][47]

The 2020 year-end actuals for SAIFI and SAIDI were 0.40 and 44 respectively.

Presented in Table 2.4-B1-B2 are the SAIDI, SAIFI and CAIDI values for the past five years at IEEE- 2.5 Beta Criteria. These reliability indices are provided for all sustained interruptions and all sustained interruptions excluding major events. A sustained interruption is defined as an

[46] 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

[47] 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.

interruption of five (5) minutes or greater. Table 2.4-B1 shows performance indices including and excluding PEPCO major event days. Table 2.4-B2 shows performance indices including and excluding District of Columbia major event days only.

Table 2.4-B1

Pepco System Indices 2016-2020 2.5 Beta (MED Exclusive - IEEE 1366-2012 Std, Pepco System Wide Based)					
SAIFI	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	0.98	0.68	0.90	0.73	0.58
Sustained Less Major Storms	0.98	0.68	0.71	0.65	0.54
SAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.81	1.03	2.70	1.22	0.92
Sustained Less Major Storms	1.81	1.03	0.98	0.97	0.78
CAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.85	1.52	3.02	1.67	1.59
Sustained Less Major Storms	1.85	1.52	1.37	1.49	1.45

Table 2.4-B2

District of Columbia System Indices 2016-2020 2.5 Beta (MED Exclusive - IEEE 1366-2012 Std, District of Columbia System Wide Based)					
SAIFI	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	0.82	0.55	0.64	0.59	0.40
Sustained Less Major Storms	0.82	0.55	0.54	0.49	0.37
SAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.92	0.96	1.82	1.29	0.73
Sustained Less Major Storms	1.92	0.96	0.88	0.92	0.65
CAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	2.35	1.73	2.83	2.20	1.81
Sustained Less Major Storms	2.35	1.73	1.64	1.86	1.74

Presented in Table 2.4-B3-B4 are the SAIFI, SAIDI and CAIDI values for the past five years at IEEE- using MSO Criteria. Please note that the data presented in Tables 2.4-B3 and 2.4-B4 provide data using a different methodology (MSO criteria) than previous years. This change in the presentation of data can cause changes to historically reported data due to the different exclusion criteria**.**

Table 2.4-B3

Pepco System Indices 2016-2020 MSO Criteria (MED Exclusive - IEEE 1366-2012 Std, Pepco System Wide Based)					
SAIFI	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	0.98	0.68	0.90	0.73	0.58
Sustained Less Major Storms	0.98	0.66	0.69	0.73	0.55
SAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.81	1.03	2.70	1.22	0.92
Sustained Less Major Storms	1.80	1.01	0.93	1.22	0.82
CAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.85	1.52	3.02	1.67	1.59
Sustained Less Major Storms	1.85	1.52	1.35	1.67	1.48

Table 2.4-B4

District of Columbia System Indices 2016-2020 MSO Criteria (MED Exclusive - IEEE 1366-2012 Std, District of Columbia System Wide Based)					
SAIFI	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	0.82	0.55	0.64	0.59	0.40
Sustained Less Major Storms	0.82	0.55	0.53	0.59	0.40
SAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	1.92	0.96	1.82	1.29	0.73

Sustained Less Major Storms	1.92	0.96	0.86	1.29	0.73

CAIDI (HOURS)	**2016**	**2017**	**2018**	**2019**	**2020**
Sustained Outages	2.35	1.73	2.83	2.20	1.81
Sustained Less Major Storms	2.35	1.73	1.63	2.20	1.81

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 (2020)

Table 2.4-B5

2020 IEEE MED Exclusive		
District of Columbia Reliability Statistics	SAIFI	SAIDI (Hours)
Excluding all cross-border feeders	0.29	0.55
Including all cross-border feeders	0.44	0.75

2020 DC MSO (& COMAR) Exclusive		
District of Columbia Reliability Statistics	SAIFI	SAIDI (Hours)
Excluding all cross-border feeders	0.31	0.61
Including all cross-border feeders	0.47	0.83
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.

Comparison of Cross-Border Feeder Reliability Performance[48]

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 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.

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

[48] The following is in response to the Commission's directive to:
[I]include 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).

Table 2.4-B6

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	-	-	3	545	4%	96%
183	Chesapeake Street	181	-	-	148	378	13%	87%
205	Seat Pleasant	30	Fort Chaplin	70	4	486	1%	99%
308	Harrison	38-6	Westmoreland	93	4	569	72%	28%
327	Fort Dupont	58	Texas Ave.	111	59	249	5%	95%
328	Fort Dupont	58	Fort Davis	100	54	356	2%	98%
333	Chesapeake Street	181	-	-	60	488	9%	91%
366	Seat Pleasant	30	53rd Street, SE	48	2	489	3%	97%
368	53rd Street, SE	48	Fort Davis	100	64	529	4%	96%
372	Seat Pleasant	30	53rd Street, SE	48	198	580	4%	96%
388	53rd Street, SE	48	-	-	3	625	3%	97%
451	Fort Davis	100	Texas Ave.	111	84	130	4%	96%
476	Quesada	89	Oliver Street	146	3	305	17%	83%
14014	12th & Irving	133	-	-	697	1379	9%	91%
14015	12th & Irving	133	-	-	108	856	17%	83%
14016	12th & Irving	133	-	-	25	683	34%	66%
14031	Suitland	134	-	-	264	1013	13%	87%
14035	Suitland	134	-	-	390	851	36%	64%
14261	Beech Road	159	-	-	373	990	7%	93%
14352	Harrison	38	-	-	4	28	100%	0%
14717	Benning	7	-	-	32	1529	26%	74%
14758	N.R.L.	168	-	-	2	2171	33%	67%
14890	Harrison	38	-	-	151	180	32%	68%
14893	Harrison	38	-	-	6	8	100%	0%
14900	Harrison	38	-	-	290	1070	25%	75%
14987	Grant Avenue	183	-	-	935	1190	24%	76%
15085	St. Barnabas Road	59	-	-	767	823	37%	63%
15094	Bladensburg	175	-	-	1031	1485	61%	39%
15130	Walker Mill Road	15	-	-	769	1275	31%	69%
15171	Alabama Avenue	136	-	-	7	1822	42%	58%
15198	Takoma	27	-	-	97	1615	18%	82%
15199	Takoma	27	-	-	252	1780	29%	71%
15648	Little Falls	77	-	-	0	1	100%	0%
15649	Little Falls	77	-	-	1	0	100%	0%
15711	Benning	7	-	-	86	1573	12%	88%
15944	Van Ness	129	-	-	84	1752	12%	88%
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-B7

PEPCO 4 & 13KV CROSS JURISDICTIONAL FEEDERS SERVING MAJORITY MARYLAND 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	190	151	2%	98%
365	53rd Street, SE	48	Fort Dupont	58	515	227	13%	87%
14032	Suitland	134	-	-	564	74	26%	74%
14033	Suitland	134	-	-	1696	261	13%	87%
14102	Tuxedo	148	-	-	927	69	10%	90%
14263	Linden	156	-	-	1811	66	20%	80%
14270	Linden	156	-	-	741	6	44%	56%
14271	Linden	156	-	-	724	622	22%	78%
14593	Sligo	9	-	-	140	3	100%	0%
14595	Sligo	9	-	-	113	1	100%	0%
14768	Little Falls	77	-	-	1270	8	26%	74%
14769	Little Falls	77	-	-	1279	1	19%	81%
14896	Harrison	38	-	-	613	354	14%	86%
14949	Wood Acres	154	-	-	1392	21	7%	93%
14979	Grant Avenue	183	-	-	1050	200	6%	94%
15082	St. Barnabas Road	59	-	-	2028	187	61%	39%
15086	St. Barnabas Road	59	-	-	610	192	32%	68%
15090	St. Barnabas Road	59	-	-	1408	62	12%	88%
15100	Bladensburg	175	-	-	665	653	45%	55%
15131	Walker Mill Road	15	-	-	1295	337	42%	58%
15132	Walker Mill Road	15	-	-	1834	105	20%	80%
15200	Takoma	27	-	-	835	605	14%	86%
15264	Takoma	27	-	-	998	653	14%	86%
15501	Little Falls	77	-	-	36	22	100%	0%
15502	Little Falls	77	-	-	16	7	100%	0%
15503	Little Falls	77	-	-	19	3	100%	0%
15504	Little Falls	77	-	-	152	1	100%	0%
15505	Little Falls	77	-	-	39	0	100%	0%
15506	Little Falls	77	-	-	430	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.								

2.4.2 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 growth[49]

Response: See discussion for Neighborhood Item A below.

(B) Neighborhoods with decreased planned spending on 4 kV to 13 kV conversions[50]

(C) Neighborhoods with decreased planned spending on 4 kV to 13 kV conversions that are among previously identified Most Susceptible Neighborhoods[51]

(D) Explanation of how reduced conversion spending will improve reliability in Most Susceptible Neighborhoods[52]

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

(E) Neighborhoods served by Priority Feeders

Response: See Priority Feeder discussion.[53]

[49] 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.)…

[50] 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…

[51] 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.)…

[52] 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.

[53] 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 Feeders[54]

Response: See Repeat Priority Feeder discussion.

(G) Neighborhoods served by equipment subject to failure data rate analysis[55]

Response: See Failure Data Rate Analysis discussion.

(H) Updated list of Most Susceptible Neighborhoods for Calendar Year 2011[56]

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

(I) Neighborhood information to be included in 2012 Consolidated Report[57]

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

(J) Directive to identify neighborhoods affected by changed plans[58]

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

(K) Directive to provide information on neighborhoods[59]

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

Neighborhood Item A.

Neighborhoods with Increased Load Growth

[54] 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.)...

[55] 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.)…

[56] 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.

[57] Order No. 16623 states the following at paragraph 46:
…This information should be included in the 2012 Consolidated Report

[58] Order No. 16623 states the following at paragraph 55:
55. Pepco is DIRECTED to identify neighborhoods affected by changed plans consistent with paragraph 35;

[59] Order No. 16623 states the following at paragraph 60:
60. Pepco is DIRECTED to provide information on neighborhoods consistent with paragraph 46;

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.[60] (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.

Neighborhood Items B, C, D.

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

Pepco does not currently estimate a material decrease in planned spending in 2021 compared to 2020 as conversions continue in the 12th Street SW, Georgetown, and North Capitol areas. Conversions will continue in North Capitol and 12th St. substations areas in 2021with the goal to have all load served by Spring of 2021 and Fall of 2021, respectively. Pepco is planning to complete the Anacostia 4 kV conversion project in 2021 with the conversion of the last remaining 4kV Feeder supplied from Anacostia Sub. 8.

Neighborhood Item F.[61]

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.

[60] Redevelopment Land Agency.
[61] In Order No. 15941 issued on August 18, 2010, the Commission stated at paragraphs 13 and 16, the following:

Table 2.4-C

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	Barney Circle, Capitol Hill, Navy Yard
233	2010, 2016	East Potomac Park, LadyBird Johnson Park, National Mall - West Potomac Park, Southwest Federal Center
14001	2011, 2013	Bloomingdale, Eckington, Edgewood, Ledroit Park, Pleasant Plains
14004	2002, 2006	Bloomingdale, Eckington, Ledroit Park
14005	2001, 2021	Fort Lincoln, Gateway, Langdon
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, 2021	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
14133	2011, 2021	Forest Hills, North Cleveland Park
14136	2010, 2012, 2014, 2020	Cathedral Heights, Cleveland Park, Glover Park, McLean Gardens
14146	2002, 2005	Georgetown, Observatory Circle, Woodland-Normanstone Terrace, Woodley Park
14150	2012, 2021	American University Park, Cleveland Park, McLean Gardens
14200	2009, 2011, 2013, 2015, 2018	Bloomingdale, 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, Baylor Gardens, Randle Highlands, Twining
14712	2007, 2021	Kingmand Park, Mayfair, Near Northeast, Trinidad
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	Bellevue, Congress Heights, Washington Highlands
14758	2003, 2012, 2014, 2017, 2021	Anacostia Naval Station - Bolling Air Force Base, Bellevue, Washington Highlands
14766	2002, 2006, 2021	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, Gallaudet, 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, 2021	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, 2021	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, 2021	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, 2021	Crestwood, Petworth, Sixteenth Street Heights
15199	2001, 2004, 2010, 2012, 2014	Brightwood, Colonial Village, Riggs Park, Shepherd Park, Takoma
15206	2008, 2010	Bloomingdale, 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, 2021	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-Norman stone Terrace, Woodley Park
15943	2008, 2010, 2012, 2016	Burleith, Georgetown, Glover Park
15945	2011, 2013, 2015, 2018	American University Park, Tenleytown

Neighborhood Item H.

Most Susceptible Neighborhoods by Ward with Most Frequent Non-Major Outages in 2020

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.

Table 2.4-D

Neighborhood	Ward	CEMI3+ 2019	CEMI3+ 2020	Priority Feeders 2020	Priority Feeders 2021
American University Park	Ward 3	43	955		14150,14766
Trinidad	Ward 5	8	935	15702	14712
Brookland	Ward 5	1	456		14022,14023
Cleveland Park	Ward 3	576	308	15867,14136	14150
Washington Highlands	Ward 8	0	276		14758,15166
Congress Heights	Ward 8	0	268		15166
Bellevue	Ward 8	630	190		14758
Deanwood	Ward 7	914	102	15707	
Benning Ridge	Ward 7	482	14	15130	
Anacostia	Ward 8	1,089	5		14758
Fort Dupont	Ward 7	370	4	15710	15709
Capitol Hill	Ward 6	2,486	0	211,15702,16002,16003	
Civic Betterment	Ward 7	357	0	15130	
Fort Davis	Ward 7	363	0	14035,328,15130	
Fort Lincoln	Ward 5	1,020	0	15094	14005
Marshall Heights	Ward 7	366	0	15130	372
Southwest Waterfront	Ward 6	701	0		

Table 2.4-E CEMIn Including Storms (MSO)

Year	CEMI3
2012	25.73%
2013	10.93%
2014	7.15%
2015	6.75%
2016	8.73%
2017	5.11%
2018	7.44%
2019	3.99%
2020	2.12%

From the analysis above, the 17 worst neighborhoods between 2019 and 2020 combined yielded 10 unique feeders to be remediated in 2021. Most of the feeders have been selected as part of a recent reliability program that also represents each neighborhood in this list. Additionally, the neighborhood list presented in this analysis represents 48% of the total DC customers that experienced three or more outages in 2020. See summary below:

- Feeders 15702, 15867, 14136, 15707, 15130, 15710, 00211, 16002, 16003, 14035, 00328, and 15094 were part of the 2020 Priority Feeder Program. The benefits on this work and other coincident work will be realized in 2021 and beyond.
- All remaining priority feeders are part of the 2021 Priority Feeder Program. The remediation work on these feeders is described above.

EQUIPMENT FAILURE RATES[62]

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 daily review outage data and field crew comments as part of outage reviews, 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 Modes[63]

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.

Analysis of Top Three Equipment Failure Modes[64]

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

[62] 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.
[63] 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.
[64] 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.

corrective actions to remediate these failures in the future based on root cause determination where appropriate.

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

Table 2.4-E – Event Detail for Equipment Failures

Equipment Type	Number of Outages	% NI	CI	% CI	CMI	% CMI	SAIFI	CAIDI	SAIDI
Cable	201	22.38%	12241	42.09%	1996401.15	43.11%	0.04	163	6.41
Wire - Bare	37	4.12%	2212	7.61%	255531.33	5.52%	0.01	116	0.82
Switch	32	3.56%	1680	5.78%	214468.30	4.63%	0.01	128	0.69
Transformer	81	9.02%	1573	5.41%	530138.47	11.45%	0.01	337	1.70
Joint Failure	12	1.34%	1381	4.75%	432113.00	9.33%	0.00	313	1.39
PAC / Spacer Cable	7	0.78%	1305	4.49%	118861.62	2.57%	0.00	91	0.38
Connection(i.e. Loose)	63	7.02%	1039	3.57%	131488.68	2.84%	0.00	127	0.42
Wire - Covered	36	4.01%	829	2.85%	24475.12	0.53%	0.00	30	0.08
Pole	7	0.78%	812	2.79%	226831.07	4.90%	0.00	279	0.73
Fuse	45	5.01%	652	2.24%	88638.78	1.91%	0.00	136	0.28
ACR	3	0.33%	584	2.01%	50510.93	1.09%	0.00	86	0.16
Capacitor	1	0.11%	546	1.88%	45318.00	0.98%	0.00	83	0.15
Crossarm	10	1.11%	474	1.63%	10225.35	0.22%	0.00	22	0.03
Cutout	27	3.01%	394	1.35%	48222.73	1.04%	0.00	122	0.15
Transformer - Subsurface	8	0.89%	295	1.01%	104286.08	2.25%	0.00	354	0.33
Bushing	25	2.78%	140	0.48%	34913.00	0.75%	0.00	249	0.11
None	5	0.56%	118	0.41%	5939.00	0.13%	0.00	50	0.02
Splice	7	0.78%	87	0.30%	2877.00	0.06%	0.00	33	0.01
Service	4	0.45%	25	0.09%	2141.08	0.05%	0.00	86	0.01
Distr. Ckt. Breaker	2	0.22%	5	0.02%	3151.90	0.07%	0.00	630	0.01
Meter	4	0.45%	4	0.01%	434.08	0.01%	0.00	109	0.00
Lightning Arrestor	2	0.22%	2	0.01%	215.78	0.00%	0.00	108	0.00
Termination	1	0.11%	1	0.00%	175.85	0.00%	0.00	176	0.00
Elbow Insert	1	0.11%	1	0.00%	505.00	0.01%	0.00	505	0.00
Total Primaries	621	69.15%	26400	90.77%	4327863.32	93.45%	0.08	164	13.89

Total Secondaries	277	30.85%	2686	9.23%	303235.68	6.55%	0.009	113	0.973

Total Primaries & Secondaries	898	100.00%	29086	100.00%	4631099.00	100.00%	0.093	159	14.86

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, bare wire and switch issues, accounting for 55.5% of total customers impacted and 53.3% of total customer minutes of interruption.

Cable Failure Analysis

Based on OMS data, the District of Columbia experienced 201 primary outages caused by cable failures during the period of analysis which affected 12,241 customers. There were 3 significant events that occurred accounting for 31.3% of the cable failure customer interruptions and 12.3 % of the cable failure customer minutes of interruption. The first event occurred on 6/4/2020 out of the Ft Slocum substation. A primary cable failure event occurred on feeder 15011 due to a getaway fault causing 1,473 customer interruptions and 34,026 customer minutes of interruption. Crews patrolled circuit, isolated and tagged OH cable before fully restoring load. A second event occurred on 9/12/2020 out of the Benning substation. A primary cable failure event occurred on feeder 14712 tripped due to getaway fault causing 1,319 customer interruptions and 196,726 customer minutes of interruption. Crews isolated UG cable repaired multiple faults and restored load. A third event occurred on 11/4/2020 out of the 12th & Irving substation. A primary cable failure event occurred on feeder 14008 due to a getaway fault causing 1,036 customer interruptions and 14,499 customer minutes of interruption. Crews isolated OH cable, repaired fault, and restored load.

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.

Table 2.4-F – Cable Failure Rates

2020 (Jan 1 - Dec 31)	Mode of Failure: Cable Failure (Primary)			
	CI	%	CMI	%
YE Total	12,241	42.09%	1,996,401	43.11%
3 Major Events*	3,828	31.27%	245,251	12.28%

Analysis of these 201 cable failure events as reported by OMS revealed that 31.3% of the customers impacted by cable failure can be attributed to three events. See summary below:

Table 2.4-F1 details the primary cable failure events causing the largest customer impact.

Table 2.4-F1 – Event Detail for Cable Failures

Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG%	Comment
15011	Ft Slocum	6/4/2020	1473	34,026	Getaway fault	2.99	43%	Load restored, no further action required
14712	Benning	9/12/2020	1,319	196,726	Cable fault between two tapholes	5.53	100%	Repair made, no further action required
14008	12th & Irving	11/14/2020	1036	14,499	Feeder tripped due to getaway fault	3.06	42%	Repair made, no further action required
Total:			**3,828**	**245,251**				

Loose Connections Analysis

Based on OMS data, the District of Columbia experienced 37 bare wire related outages during the period of analysis which affected 2,212 customers. There were four significant events that attributed to 90.6% of the customers impacted and 89% of the customer minutes of interruption. The first event occurred on 5/19/2020 out of the 12th & Irving substation. Wires down on feeder 14023 accounted for 541 customer interruptions an d118,424 customer minutes of interruptions. Crews made repairs and restored all customers. The second event occurred on 8/2/2020 out of the 12th & Irving substation. A and C phase wires down on feeder 14023 accounted for 519 customer interruptions and 35,176 customer minutes of interruption. Crews made repairs and restored all load. The third event occurred on 7/2/2020 out of the Randle Hiland substation. C phase wires down on feeder 00118 accounted for 487 customer interruptions and 11,688 customer minutes of interruption. Crews repaired the C phase wire and restored all customers. The fourth event occurred on 6/12/20 out of the Benning substation. C phase wires down on feeder 15711 accounted for 456 customer interruptions and 62,184 customer minutes of interruption. Crews made repairs and restored all customers.

Table 2.4-G – Loose Connections Rates

2020	Mode of Failure: Wire-Bare (Primary)			
(Jan 1 - Dec 31)	CI	%	CMI	%
YE Total	2,212	7.61%	255,531	5.52%
X Major Events*	2,003	90.55%	227,472	89.02%

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

Analysis of these 37 events as reported by OMS revealed that 90.6% of the customers impacted by bare wires can be attributed to four events. See summary below:

Table 2.4-G1 details the primary loose connections events causing the largest customer impact.

Table 2.4-G1 – Event Detail for Loose Connections

Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG%	Comment
14023	12th & Irving	5/19/2020	541	118,424	All 3 phases down	3.04	57%	Repair made, no further action required
14023	12th & Irving	8/2/2020	519	35,176	A and C phases down	3.04	57%	Repair made, no further action required
00118	Randle Hiland	7/2/2020	487	11,688	C phase down	0.11	3%	Repair made, no further action required
15711	Benning	6/12/2020	456	62,184	C phase down	1.35	12%	Repair made, no further action required
Total:			**2,003**	**227,472**				

Switch Failure Analysis

Based on OMS data, the District of Columbia experienced 32 switch related outages during the period of analysis which affected 1,680 customers. There were 2 significant events that accounted for 61% of the customer interruptions and 48% of the customer minutes of interruption. The first event occurred on 12/3/2020 out of the Florida Ave substation. A blown fuse box was found on feeder 15770 accounting for 584 customer interruptions and 82,147 customer minutes of interruption. Crews made ties to restore the load. The second event occurred on 7/4/2020 out of the Van Ness substation. An open switch was found on feeder 14146 accounting for 447 customer interruptions and 21,098 customer minutes of interruption. Crews made repairs and restored load to all customers.

Table 2.4-H Switch Failure Rates

2020	Mode of Failure: Switch (Primary)			
(Jan 1 - Dec 31)	CI	%	CMI	%
YE Total	1,680	5.78%	214,468	4.63%
X Major Events*	1,031	61.37%	103,245	48.14%

* % related to the total number of primary bare wire events

Analysis of these 32 events as reported by OMS revealed that 61% of the customers impacted by switch failure can be attributed to two events. See summary below:

Table 2.4-H1 details the primary switch failure events causing the largest customer impact.

Table 2.4-H1 Event Detail for Switch Failure Rates

Feeder	Substation	Date	CI	CMI	Cause	UG Miles	UG%	Comment
15770	Florida Ave	12/3/2020	584	82,147	Blown fuse box	5.17	100%	Repair made, no further action required
14146	Van Ness	7/4/2020	447	21,098	Open switch	3.97	48%	Repair made, no further action required
Total:			**1,031**	**103,245**				

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 most 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.

2.4.3 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 Mobile application at the time of restoration. Through the 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.

Table 2.4-I

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
NON PHI	**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 - Rdwy Grate	ACE - Pleasantville
FD Disconn- Reconnected	Fog	Dist Secondary - UG	Capacitor	Cleared/Cut in Clear	Avoided Dispatch	Capacitor	+/-	Cover - Sdwk 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, +/-	MH Fire	Bay - Operations
Utility - CATV		Traffic Signal	Fuse	Made Tie	Fire	Fuse	C, +/-	MH Smoking	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			

- **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 2020.

Table 2.4-J

Equipment Type	NI	% NI	CI	% CI	CMI	% CMI	SAIFI	CAIDI	SAIDI
ACR	3	0.33%	584	2.01%	50510.93	1.09%	0.00	86	0.16
Bushing	25	2.78%	140	0.48%	34913.00	0.75%	0.00	249	0.11
Cable	201	22.38%	12241	42.09%	1996401.15	43.11%	0.04	163	6.41
Capacitor	1	0.11%	546	1.88%	45318.00	0.98%	0.00	83	0.15
Connection(i.e. Loose)	63	7.02%	1039	3.57%	131488.68	2.84%	0.00	127	0.42
Crossarm	10	1.11%	474	1.63%	10225.35	0.22%	0.00	22	0.03
Cutout	27	3.01%	394	1.35%	48222.73	1.04%	0.00	122	0.15
Distr. Ckt. Breaker	2	0.22%	5	0.02%	3151.90	0.07%	0.00	630	0.01
Elbow Insert	1	0.11%	1	0.00%	505.00	0.01%	0.00	505	0.00
Fuse	45	5.01%	652	2.24%	88638.78	1.91%	0.00	136	0.28
Joint Failure	12	1.34%	1381	4.75%	432113.00	9.33%	0.00	313	1.39
Lightning Arrestor	2	0.22%	2	0.01%	215.78	0.00%	0.00	108	0.00
Meter	4	0.45%	4	0.01%	434.08	0.01%	0.00	109	0.00
None	5	0.56%	118	0.41%	5939.00	0.13%	0.00	50	0.02
PAC / Spacer Cable	7	0.78%	1305	4.49%	118861.62	2.57%	0.00	91	0.38
Pole	7	0.78%	812	2.79%	226831.07	4.90%	0.00	279	0.73
Service	4	0.45%	25	0.09%	2141.08	0.05%	0.00	86	0.01
Splice	7	0.78%	87	0.30%	2877.00	0.06%	0.00	33	0.01
Switch	32	3.56%	1680	5.78%	214468.30	4.63%	0.01	128	0.69
Termination	1	0.11%	1	0.00%	175.85	0.00%	0.00	176	0.00
Transformer	81	9.02%	1573	5.41%	530138.47	11.45%	0.01	337	1.70
Transformer - Subsurface	8	0.89%	295	1.01%	104286.08	2.25%	0.00	354	0.33
Wire - Bare	37	4.12%	2212	7.61%	255531.33	5.52%	0.01	116	0.82
Wire - Covered	36	4.01%	829	2.85%	24475.12	0.53%	0.00	30	0.08
Total Primaries	621	69.15%	26400	90.77%	4327863.32	93.45%	0.08	164	13.89
Total Secondaries	277	30.85%	2686	9.23%	303235.68	6.55%	0.01	113	0.97
Total Primaries & Secondaries	898	100.00%	29086	100.00%	4631099.00	100.00%	0.09	159	14.86

VM BUDGET, TREE-RELATED OUTAGES[65][66]

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 2013-2020 and the 2021 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.

[65] 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.
[66] 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 2020, there was variance of $316,388 (underspent), or approximately 13% 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.

Table 2.4-K1

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	$2,052,518
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	$2,368,906
Variance	($134,225)	($51,036)	$85,918	$65,374	$47,015	$775,206	$397,367	316,388
Tree Trimming - DC								
Notes:								
1. Excludes pole inspections, substation mowing costs								

Yearly Data on Tree Trimming & Tree-Related Outages

In accordance with Order No. 15621,[67] 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 2020, 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.

[67] 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 2020 Vegetation Management Plan

Circuit	Voltage	Ward
52	4 KV	DC WARD 3
56	4 KV	DC WARD 8
58	4 KV	DC WARD 2
60	4 KV	DC WARD 3
63	4 KV	DC WARD 3
64	4 KV	DC WARD 3
65	4 KV	DC WARD 3
75	4 KV	DC WARD 3
82	4 KV	DC WARD 3
87	4 KV	DC WARD 3
97	4 KV	DC WARD 7
101	4 KV	DC WARD 3
102	4 KV	DC WARD 3
104	4 KV	DC WARD 3
119	4 KV	DC WARD 8
120	4 KV	DC WARD 8
128	4 KV	DC WARD 3
144	4 KV	DC WARD 3
164	4 KV	DC WARD 8
165	4 KV	DC WARD 8
167	4 KV	DC WARD 7
178	4 KV	DC WARD 8
181	4 KV	DC WARD 3
183	4 KV	DC WARD 8
205	4 KV	DC WARD 7
292	4 KV	DC WARD 3
294	4 KV	DC WARD 8
309	4 KV	DC WARD 3
323	4 KV	DC WARD 8
324	4 KV	DC WARD 8
329	4 KV	DC WARD 8
332	4 KV	DC WARD 8
333	4 KV	DC WARD 8
366	4 KV	DC WARD 7
372	4 KV	DC WARD 7
394	4 KV	DC WARD 3
411	4 KV	DC WARD 8
467	4 KV	DC WARD 3
14002	13 KV	DC WARD 5
14005	13 KV	DC WARD 5
14006	13 KV	DC WARD 5
14007	13 KV	DC WARD 5
14008	13 KV	DC WARD 5
14009	13 KV	DC WARD 5
14010	13 KV	DC WARD 5
14014	13 KV	DC WARD 5
14015	13 KV	DC WARD 5

Circuit	Voltage	Ward
14016	13 KV	DC WARD 5
14017	13 KV	DC WARD 5
14019	13 KV	DC WARD 5
14020	13 KV	DC WARD 5
14021	13 KV	DC WARD 5
14022	13 KV	DC WARD 5
14023	13 KV	DC WARD 5
14054	13 KV	DC WARD 4
14055	13 KV	DC WARD 7
14058	13 KV	DC WARD 7
14093	13 KV	DC WARD 5
14132	13 KV	DC WARD 3
14133	13 KV	DC WARD 3
14134	13 KV	DC WARD 3
14135	13 KV	DC WARD 4
14136	13 KV	DC WARD 3
14139	13 KV	DC WARD 3
14140	13 KV	DC WARD 3
14144R	13 KV	DC WARD 3
14145	13 KV	DC WARD 3
14146	13 KV	DC WARD 3, DC WARD 2
14150	13 KV	DC WARD 3
14159	13 KV	DC WARD 7
14200	13 KV	DC WARD 5
14261	13 KV	DC WARD 8, DC WARD 7
14701	13 KV	DC WARD 8
14702	13 KV	DC WARD 8, DC WARD 7
14707	13 KV	DC WARD 8
14709	13 KV	DC WARD 8
14711	13 KV	DC WARD 7
14713	13 KV	DC WARD 7, DC WARD 5
14716	13 KV	DC WARD 7
14717	13 KV	DC WARD 7
14718	13 KV	DC WARD 8
14719	13 KV	DC WARD 8
14752	13 KV	DC WARD 8
14753	13 KV	DC WARD 8
14755	13 KV	DC WARD 8
14756	13 KV	DC WARD 8
14758	13 KV	DC WARD 8
14765	13 KV	DC WARD 3
14766	13 KV	DC WARD 3
14767	13 KV	DC WARD 3
14768	13 KV	DC WARD 3
14806	13 KV	DC WARD 7
14808	13 KV	DC WARD 7
14809	13 KV	DC WARD 7
14811	13 KV	DC WARD 7
14812	13 KV	DC WARD 7
14813	13 KV	DC WARD 7
15085	13 KV	DC WARD 5, DC WARD 4

Circuit	Voltage	Ward
15178	13 KV	DC WARD 8
15179	13 KV	DC WARD 8
15198	13 KV	DC WARD 5, DC WARD 4
15199	13 KV	DC WARD 4
15200	13 KV	DC WARD 4
15264	13 KV	DC WARD 5, DC WARD 4
15457	13 KV	DC WARD 5
15701	13 KV	DC WARD 5
15702	13 KV	DC WARD 5
15705	13 KV	DC WARD 7
15706	13 KV	DC WARD 7
15707	13 KV	DC WARD 7
15709	13 KV	DC WARD 7
15710	13 KV	DC WARD 7, DC WARD 5
15711	13 KV	DC WARD 7
15801	13 KV	DC WARD 3
15867	13 KV	DC WARD 3
15943	13 KV	DC WARD 3, DC WARD 2
15944	13 KV	DC WARD 3
15945	13 KV	DC WARD 3
15946	13 KV	DC WARD 3
15947	13 KV	DC WARD 3
15949	13 KV	DC WARD 3
15950	13 KV	DC WARD 3
15997	13 KV	DC WARD 3
34927	34 KV	DC WARD 7

Tree-Related Outages in 2020 (Inclusive IEEE 1366 – 2012 Std)

Table 2.4-K2

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
2647402	1/16/2020	10:44	13:45	181	Dist Primary - OH	Tree ROW - Limb	5	905	144
2647402	1/16/2020	12:29	13:45	76	Dist Primary - OH	Tree ROW - Limb	6	456	144
2652713	2/5/2020	13:31	14:22	51	Dist Secondary - OH	Tree Outside ROW - Limb	1	51	14767
2655070	2/14/2020	6:22	7:09	47	Dist Primary - OH	Tree Outside ROW - Down	24	1128	14261
2655107	2/14/2020	6:22	8:40	138	Dist Primary - OH	Tree Outside ROW - Down	12	1656	14261
2655103	2/14/2020	6:22	7:26	64	Dist Primary - OH	Tree Outside ROW - Down	22	1408	14261
2656830	2/20/2020	10:16	13:53	217	Dist Secondary - OH	Tree ROW - Limb	1	217	14900
2659558	3/3/2020	8:53	10:29	96	Dist Secondary - OH	Tree ROW - Limb	1	96	14007
2659645	3/3/2020	13:01	13:17	16	Dist Primary - OH	Tree ROW - Limb	94	1504	14765
2659786	3/3/2020	22:12	1:00	167.58333	Dist Secondary - OH	Tree ROW - Limb	4	670.3333333	15946
2665398	3/28/2020	10:56	12:42	105.2	Dist Secondary - OH	Tree Outside ROW - Limb	1	105.2	414
2666506	4/2/2020	14:27	16:02	94.033333	Dist Secondary - OH	Tree Outside ROW - Limb	1	94.03333333	380
2667529	4/8/2020	4:20	4:31	10.033333	Dist Primary - OH	Tree Row - Down	387	3882.9	15945
2667529	4/8/2020	4:20	4:30	9.0333333	Dist Primary - OH	Tree Row - Down	611	5519.366667	15945
2667535	4/8/2020	4:23	6:53	149.63333	Dist Primary - OH	Tree Row - Down	112	16758.93333	308
2667535	4/8/2020	4:23	8:36	252.08333	Dist Primary -	Tree Row - Down	58	14620.83333	308

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2667569	4/8/2020	4:31	17:37	786	Dist Secondary - OH	Tree Outside ROW - Down	1	786	15945
2667545	4/8/2020	4:31	17:39	787.46667	Dist Primary - OH	Tree Row - Down	13	10237.06667	14767
2667549	4/8/2020	4:32	10:33	361	Dist Primary - OH	Tree Outside ROW - Down	7	2527	15944
2667550	4/8/2020	4:33	13:23	530	Dist Secondary - OH	Tree Outside ROW - Down	2	1060	309
2667559	4/8/2020	4:37	13:55	558	Dist Primary - OH	Tree Row - Down	18	10044	15945
2667570	4/8/2020	4:50	13:12	501.21667	Dist Secondary - OH	Tree Outside ROW - Down	15	7518.25	15945
2667611	4/8/2020	5:59	6:05	6	Dist Primary - OH	Tree Outside ROW - Down	10	60	15944
2667720	4/8/2020	10:26	10:39	13	Dist Secondary - OH	Tree Outside ROW - Down	1	13	309
2667746	4/8/2020	11:07	16:49	341.66667	Dist Primary - OH	Tree Row - Down	1	341.6666667	14767
2667559	4/8/2020	11:43	13:55	132	Dist Primary - OH	Tree Row - Down	12	1584	15945
2667770	4/8/2020	12:15	13:53	98	Dist Primary - OH	Tree Row - Down	1	98	15946
2667782	4/8/2020	12:40	17:31	291	Dist Secondary - OH	Tree Outside ROW - Down	13	3783	15945
2674434	4/8/2020	13:00	14:08	68	Dist Secondary - OH	Tree Outside ROW - Down	1	68	309
2670659	4/9/2020	14:21	15:17	56	Dist Primary - OH	Tree ROW - Limb	1	56	15174
2668329	4/9/2020	15:18	17:28	129.35	Dist Primary - OH	Tree ROW - Limb	12	1552.2	82
2668335	4/9/2020	15:24	17:28	123.86667	Dist Primary - OH	Tree ROW - Limb	9	1114.8	82
2668354	4/9/2020	15:32	17:28	115.95	Dist Primary -	Tree ROW - Limb	8	927.6	102

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2668431	4/9/2020	16:26	17:00	34	Dist Secondary - OH	Tree ROW - Limb	1	34	14016
2668848	4/10/2020	11:58	13:29	91	Dist Secondary - OH	Tree Outside ROW - Limb	18	1638	15013
2669098	4/10/2020	14:10	16:14	123.11667	Dist Secondary - OH	Tree ROW - Limb	1	123.1166667	369
2669224	4/11/2020	8:00	8:19	19	Dist Secondary - OH	Tree Vine	10	190	451
2669697	4/13/2020	13:51	15:51	119.81667	Dist Secondary - OH	Tree Row - Down	1	119.8166667	327
2669964	4/13/2020	15:43	16:38	54.15	Dist Secondary - OH	Tree Row - Down	19	1028.85	387
2670031	4/13/2020	16:30	17:45	74.4	Dist Secondary - OH	Tree Outside ROW - Limb	1	74.4	15013
2670198	4/13/2020	19:50	21:28	97.466667	Dist Primary - OH	Tree Outside ROW - Down	8	779.7333333	14767
2670203	4/13/2020	20:04	21:28	84	Dist Primary - OH	Tree Outside ROW - Down	1	84	14767
2670204	4/13/2020	20:04	21:28	83.3	Dist Primary - OH	Tree Outside ROW - Down	1	83.3	14767
2670266	4/14/2020	5:40	7:37	116.15	Dist Secondary - OH	Tree ROW - Limb	1	116.15	15012
2671370	4/18/2020	14:56	20:45	349.51667	Dist Primary - OH	Tree Outside ROW - Down	51	17825.35	14133
2671395	4/18/2020	16:28	20:45	257.51667	Dist Primary - OH	Tree Outside ROW - Down	17	4377.783333	14133
2671391	4/18/2020	16:28	16:38	10.8	Dist Primary - OH	Tree Row - Down	147	1587.6	14133
2671397	4/18/2020	16:39	20:45	246.76667	Dist Primary - OH	Tree Outside ROW - Down	7	1727.366667	14133
2671412	4/18/2020	20:23	21:25	62	Dist Primary - OH	Tree Outside ROW - Down	521	32302	347
2671428	4/18/2020	20:23	5:47	564	Dist Primary -	Tree Row - Down	65	36660	347

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2672089	4/21/2020	16:05	16:10	5.15	Dist Primary - OH	Tree ROW - Limb	337	1735.55	102
2673143	4/26/2020	6:38	8:33	114.38333	Dist Primary - OH	Tree Vine	4	457.5333333	15944
2673940	4/29/2020	15:46	19:08	202	Dist Primary - OH	Tree Row - Down	5	1010	14987
2674024	4/29/2020	17:57	19:08	71	Dist Primary - OH	Tree Row - Down	4	284	14987
2674354	4/30/2020	18:12	18:54	41.366667	Dist Primary - OH	Tree ROW - Limb	16	661.8666667	15010
2675115	5/4/2020	0:54	1:44	50	Dist Secondary - OH	Tree Outside ROW - Down	1	50	15085
2677246	5/9/2020	9:08	10:23	75	Dist Primary - OH	Tree Outside ROW - Limb	22	1650	15012
2679869	5/10/2020	7:01	9:22	141	Dist Primary - OH	Tree ROW - Limb	1	141	14133
2677390	5/10/2020	7:01	9:20	139	Dist Primary - OH	Tree ROW - Limb	9	1251	14133
2677390	5/10/2020	8:59	9:20	21	Dist Primary - OH	Tree ROW - Limb	6	126	14133
2679870	5/10/2020	8:59	9:22	23	Dist Primary - OH	Tree ROW - Limb	1	23	14133
2678130	5/12/2020	12:13	12:20	7	Dist Secondary - OH	Tree Outside ROW - Down	1	7	118
2678487	5/13/2020	14:49	15:07	18	Dist Secondary - OH	Tree ROW - Limb	1	18	132
2678928	5/15/2020	10:27	12:10	102.1	Dist Primary - OH	Tree ROW - Limb	10	1021	65
2679601	5/17/2020	9:13	9:24	11	Dist Primary - OH	Tree ROW - Limb	36	396	102
2680652	5/19/2020	17:25	20:52	207.13333	Dist Primary - OH	Tree Row - Down	1	207.1333333	14806
2680958	5/19/2020	17:25	11:29	1083.2667	Dist Primary -	Tree Row - Down	1	1083.266667	14806

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2680658	5/19/2020	17:26	18:56	90	Dist Primary - OH	Tree Row - Down	436	39240	99
2680755	5/19/2020	17:46	18:10	23.55	Dist Primary - OH	Tree Row - Down	165	3885.75	15801
2680763	5/19/2020	17:46	19:08	82.516667	Dist Primary - OH	Tree Row - Down	822	67828.7	15801
2680869	5/19/2020	18:28	22:18	230	Dist Secondary - OH	Tree Row - Down	1	230	308
2680923	5/19/2020	19:23	22:59	216.5	Dist Primary - OH	Tree Row - Down	1	216.5	15801
2680961	5/19/2020	20:57	23:02	124.33333	Dist Primary - OH	Tree Row - Down	1	124.3333333	14806
2681103	5/20/2020	1:43	3:02	79	Dist Primary - OH	Tree Row - Down	1	79	14987
2681370	5/20/2020	14:19	19:41	322	Dist Primary - OH	Tree Outside ROW - Down	21	6762	132
2682083	5/22/2020	14:02	15:39	97	Dist Secondary - OH	Tree Outside ROW - Limb	1	97	467
2682285	5/23/2020	5:47	8:05	137.16667	Dist Secondary - OH	Tree ROW - Limb	1	137.1666667	15006
2683699	5/28/2020	16:55	17:34	39	Dist Secondary - OH	Tree Outside ROW - Limb	1	39	15707
2684098	5/29/2020	14:28	17:18	169.68333	Dist Secondary - OH	Tree ROW - Limb	1	169.6833333	388
2684255	5/29/2020	23:27	2:03	156	Dist Primary - OH	Tree Outside ROW - Down	9	1404	14133
2685629	6/2/2020	16:27	17:33	65.533333	Dist Primary - OH	Tree Vine	13	851.9333333	15172
2686201	6/3/2020	17:37	19:26	109	Dist Primary - OH	Tree Outside ROW - Limb	13	1417	14987
2687063	6/5/2020	2:28	3:36	67.9	Dist Secondary - OH	Tree Outside ROW - Limb	1	67.9	15801
2687312	6/5/2020	10:51	17:47	416	Dist Secondary -	Tree Outside ROW - Limb	9	3744	14022

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2687424	6/5/2020	15:49	19:10	200.23333	Dist Secondary - OH	Tree Row - Down	1	200.2333333	476
2687556	6/5/2020	19:59	20:57	57.4	Dist Primary - OH	Tree Outside ROW - Down	93	5338.2	14765
2688198	6/7/2020	9:01	9:11	10	Dist Secondary - OH	Tree Outside ROW - Limb	1	10	15173
2688545	6/8/2020	15:14	15:41	27	Dist Secondary - OH	Tree ROW - Limb	1	27	14766
2688653	6/9/2020	1:24	3:55	151	Dist Primary - OH	Tree Outside ROW - Down	67	10117	15001
2688675	6/9/2020	1:24	5:40	256	Dist Primary - OH	Tree Outside ROW - Down	7	1792	15001
2692955	6/16/2020	20:38	21:06	28	Dist Secondary - OH	Tree Outside ROW - Limb	1	28	15175
2693649	6/17/2020	20:29	21:09	39.416667	Dist Primary - OH	Tree Outside ROW - Limb	15	591.25	14035
2694491	6/19/2020	19:45	20:04	19	Dist Secondary - OH	Tree ROW - Limb	1	19	15015
2696684	6/24/2020	16:39	17:33	54	Dist Secondary - OH	Tree ROW - Limb	1	54	15021
2697381	6/25/2020	19:05	5:00	595	Dist Secondary - OH	Tree Outside ROW - Down	1	595	15944
2697776	6/26/2020	5:23	5:43	20	Dist Secondary - OH	Tree ROW - Limb	9	180	102
2698408	6/27/2020	17:15	20:37	201.3	Dist Primary - OH	Tree Outside ROW - Limb	20	4026	15009
2698433	6/27/2020	17:30	20:04	153.85	Dist Primary - OH	Tree ROW - Limb	49	7538.65	15018
2698447	6/27/2020	17:31	20:49	198	Dist Secondary - OH	Tree Outside ROW - Limb	1	198	15009
2698905	6/28/2020	20:44	22:47	122.56667	Dist Secondary - OH	Tree Outside ROW - Limb	1	122.5666667	65
2701834	7/4/2020	19:55	22:43	167.91667	Dist Primary -	Tree Outside ROW - Limb	28	4701.666667	15018

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2702701	7/6/2020	18:47	1:47	419.81667	Dist Primary - OH	Tree ROW - Limb	26	10915.23333	15175
2702741	7/6/2020	18:47	14:15	1167.15	Dist Primary - OH	Tree Outside ROW - Limb	13	15172.95	15171
2702850	7/6/2020	18:51	1:47	416.23333	Dist Primary - OH	Tree ROW - Limb	13	5411.033333	15175
2702809	7/6/2020	18:52	4:01	548.06667	Dist Primary - OH	Tree Outside ROW - Limb	131	71796.73333	15171
2702848	7/6/2020	18:56	1:29	392.15	Dist Primary - OH	Tree ROW - Limb	15	5882.25	15175
2702889	7/6/2020	19:01	4:54	592.75	Dist Primary - OH	Tree Outside ROW - Down	8	4742	144
2702919	7/6/2020	19:04	21:29	144.96667	Dist Primary - OH	Tree Outside ROW - Down	111	16091.3	347
2702985	7/6/2020	19:06	17:10	1323.9833	Dist Secondary - OH	Tree ROW - Limb	1	1323.983333	15944
2703119	7/6/2020	19:09	22:11	182	Dist Primary - OH	Tree Outside ROW - Down	48	8736	495
2703118	7/6/2020	19:10	22:11	181	Dist Primary - OH	Tree Outside ROW - Down	16	2896	496
2703005	7/6/2020	19:10	5:40	2070	Dist Primary - OH	Tree Outside ROW - Limb	1	2070	15173
2703023	7/6/2020	19:11	20:48	1537	Dist Primary - OH	Tree Outside ROW - Down	34	52258	15171
2703048	7/6/2020	19:14	1:29	375	Dist Primary - OH	Tree ROW - Limb	118	44250	15175
2703117	7/6/2020	19:20	22:11	170.26667	Dist Primary - OH	Tree Outside ROW - Down	23	3916.133333	15170
2703115	7/6/2020	19:21	15:04	1183	Dist Secondary - OH	Tree Row - Down	9	10647	15711
2703543	7/6/2020	20:43	21:29	45.5	Dist Primary - OH	Tree Row - Down	17	773.5	347
2703530	7/6/2020	20:43	21:29	45.366667	Dist Primary -	Tree Row - Down	194	8801.133333	347

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2703545	7/6/2020	20:44	21:29	44.966667	Dist Primary - OH	Tree Row - Down	31	1393.966667	347
2703534	7/6/2020	20:44	21:29	44.666667	Dist Primary - OH	Tree Row - Down	17	759.3333333	347
2703535	7/6/2020	20:44	21:29	44.416667	Dist Primary - OH	Tree Row - Down	29	1288.083333	347
2703550	7/6/2020	20:45	21:29	43.866667	Dist Primary - OH	Tree Row - Down	17	745.7333333	347
2703541	7/6/2020	20:45	22:11	85.1	Dist Primary - OH	Tree Outside ROW - Down	34	2893.4	347
2703542	7/6/2020	20:46	22:11	84.833333	Dist Primary - OH	Tree Row - Down	33	2799.5	347
2703547	7/6/2020	20:47	22:11	83.833333	Dist Primary - OH	Tree Row - Down	14	1173.666667	347
2703557	7/6/2020	20:49	22:11	81.75	Dist Primary - OH	Tree Row - Down	22	1798.5	347
2703569	7/6/2020	20:49	22:11	81.5	Dist Primary - OH	Tree Row - Down	23	1874.5	347
2703571	7/6/2020	20:52	22:11	78.55	Dist Primary - OH	Tree Row - Down	15	1178.25	347
2703601	7/6/2020	21:00	22:11	70.516667	Dist Primary - OH	Tree Row - Down	17	1198.783333	347
2703602	7/6/2020	21:02	22:11	69	Dist Primary - OH	Tree Row - Down	16	1104	347
2703622	7/6/2020	21:09	22:11	62	Dist Primary - OH	Tree Row - Down	1	62	347
2704052	7/7/2020	0:14	12:33	739	Dist Secondary - OH	Tree ROW - Limb	1	739	499
2704069	7/7/2020	0:35	1:02	26.75	Dist Primary - OH	Tree Outside ROW - Down	416	11128	368
2704133	7/7/2020	0:35	1:02	26.75	Dist Primary - OH	Tree Outside ROW - Down	416	11128	368
2704072	7/7/2020	0:38	1:02	23.683333	Dist Primary -	Tree Outside ROW - Down	13	307.8833333	368

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2704077	7/7/2020	0:40	1:02	21.433333	Dist Primary - OH	Tree Outside ROW - Down	15	321.5	368
2704079	7/7/2020	0:42	1:02	19.9	Dist Primary - OH	Tree Outside ROW - Down	14	278.6	368
2704084	7/7/2020	0:43	1:02	18.1	Dist Primary - OH	Tree Outside ROW - Down	16	289.6	368
2704085	7/7/2020	0:44	1:02	17.766667	Dist Primary - OH	Tree Outside ROW - Down	11	195.4333333	368
2704105	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	1	7	368
2704102	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	5	35	368
2704103	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	1	7	368
2704107	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	9	63	368
2704109	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	1	7	368
2704106	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	1	7	368
2704100	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	11	77	368
2704098	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	6	42	368
2704108	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	6	42	368
2704104	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	12	84	368
2704099	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	5	35	368
2704101	7/7/2020	0:55	1:02	7	Dist Primary - OH	Tree Outside ROW - Down	1	7	368
2704130	7/7/2020	1:12	7:32	379.95	Dist Secondary -	Tree ROW - Limb	23	8738.85	15170

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2704206	7/7/2020	1:58	13:12	673.46667	Dist Primary - OH	Tree ROW - Limb	49	32999.86667	14767
2704222	7/7/2020	2:04	13:14	669.6	Dist Primary - OH	Tree ROW - Limb	8	5356.8	14767
2704274	7/7/2020	2:15	13:16	661	Dist Primary - OH	Tree ROW - Limb	3	1983	14767
2704408	7/7/2020	3:53	4:05	11.783333	Dist Primary - OH	Tree Outside ROW - Down	22	259.2333333	15171
2704463	7/7/2020	4:56	11:15	378.25	Dist Primary - OH	Tree Row - Down	156	59007	15172
2705097	7/7/2020	5:06	11:15	369	Dist Primary - OH	Tree Outside ROW - Down	157	57933	15172
2704885	7/7/2020	9:26	22:40	2233.5333	Dist Primary - OH	Tree Outside ROW - Limb	8	17868.26667	144
2704889	7/7/2020	9:36	14:48	311.1	Dist Primary - OH	Tree Vine	19	5910.9	15172
2703023	7/7/2020	11:48	20:48	539.83333	Dist Primary - OH	Tree Outside ROW - Down	34	18354.33333	15171
2705138	7/7/2020	11:52	2:50	897.86667	Dist Secondary - OH	Tree ROW - Limb	1	897.8666667	14031
2705169	7/7/2020	12:06	18:40	394	Dist Secondary - OH	Tree ROW - Limb	1	394	15949
2705623	7/7/2020	19:47	23:20	212.31667	Dist Secondary - OH	Tree Outside ROW - Down	25	5307.916667	14765
2707372	7/11/2020	15:20	22:57	456.56667	Dist Primary - OH	Tree ROW - Limb	1	456.5666667	14017
2709117	7/16/2020	17:30	18:22	51.266667	Dist Primary - OH	Tree ROW - Limb	18	922.8	15013
2709164	7/16/2020	20:41	21:42	60.216667	Dist Primary - OH	Tree Outside ROW - Limb	1	60.21666667	14133
2709163	7/16/2020	20:42	21:42	60	Dist Primary - OH	Tree ROW - Limb	2	120	14133
2709162	7/16/2020	20:42	21:42	60	Dist Primary -	Tree ROW - Limb	1	60	14133

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2709944	7/19/2020	6:57	9:30	152.63333	Dist Secondary - OH	Tree Outside ROW - Down	27	4121.1	372
2710624	7/20/2020	9:45	14:05	260	Dist Secondary - OH	Tree Outside ROW - Down	1	260	308
2711743	7/21/2020	23:12	1:56	164	Dist Primary - OH	Tree ROW - Limb	34	5576	345
2711805	7/21/2020	23:12	2:29	197	Dist Primary - OH	Tree ROW - Limb	235	46295	345
2711755	7/21/2020	23:19	0:04	45	Dist Secondary - OH	Tree Outside ROW - Limb	1	45	75
2711938	7/22/2020	9:24	15:11	346.46667	Dist Primary - OH	Tree Vine	13	4504.066667	15172
2712154	7/22/2020	13:45	16:57	191.76667	Dist Secondary - OH	Tree Outside ROW - Limb	1	191.7666667	292
2712297	7/22/2020	15:51	20:55	303.8	Dist Primary - OH	Tree Outside ROW - Limb	17	5164.6	52
2712371	7/22/2020	16:03	22:44	400.65	Dist Primary - OH	Tree ROW - Limb	16	6410.4	496
2712384	7/22/2020	16:04	17:28	83.2	Dist Primary - OH	Tree ROW - Limb	22	1830.4	15012
2712604	7/22/2020	16:30	2:14	583.31667	Dist Primary - OH	Tree ROW - Limb	1	583.3166667	15950
2712816	7/22/2020	17:14	0:34	439.55	Dist Primary - OH	Tree Outside ROW - Limb	5	2197.75	15001
2713120	7/22/2020	17:35	0:38	423	Dist Primary - OH	Tree Outside ROW - Limb	2	846	15001
2713842	7/23/2020	11:27	11:34	7	Dist Secondary - OH	Tree Outside ROW - Limb	23	161	14987
2714162	7/23/2020	18:50	20:01	70.1	Dist Secondary - OH	Tree Outside ROW - Limb	1	70.1	75
2714195	7/23/2020	20:36	22:04	87.15	Dist Primary - OH	Tree ROW - Limb	11	958.65	144
2714202	7/23/2020	20:44	22:05	80.083333	Dist Primary -	Tree ROW - Limb	3	240.25	144

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2714203	7/23/2020	20:47	21:38	50.85	Dist Primary - OH	Tree Outside ROW - Limb	1872	95191.2	14758
2714203	7/23/2020	20:47	23:06	139.18333	Dist Primary - OH	Tree Outside ROW - Limb	245	34099.91667	14758
2714207	7/23/2020	20:49	0:54	245	Dist Primary - OH	Tree Outside ROW - Down	605	148225	14755
2714207	7/23/2020	20:49	22:47	118.75	Dist Primary - OH	Tree Outside ROW - Down	624	74100	14755
2714930	7/23/2020	20:51	22:47	115.83333	Dist Primary - OH	Tree Outside ROW - Down	65	7529.166667	14755
2714212	7/23/2020	20:52	22:05	72.683333	Dist Primary - OH	Tree Outside ROW - Limb	7	508.7833333	144
2714248	7/23/2020	20:58	3:04	366	Dist Primary - OH	Tree ROW - Limb	148	54168	14022
2714248	7/23/2020	20:58	11:06	848	Dist Primary - OH	Tree ROW - Limb	11	9328	14022
2714248	7/23/2020	20:58	23:46	168	Dist Primary - OH	Tree ROW - Limb	48	8064	14022
2714248	7/23/2020	20:58	3:04	366	Dist Primary - OH	Tree ROW - Limb	21	7686	14007
2714248	7/23/2020	20:58	9:52	774	Dist Primary - OH	Tree ROW - Limb	7	5418	14022
2714248	7/23/2020	20:58	10:05	787	Dist Primary - OH	Tree ROW - Limb	32	25184	14022
2720617	7/23/2020	21:58	1:43	225	Dist Primary - OH	Tree Outside ROW - Limb	1	225	372
2720611	7/23/2020	21:58	1:43	225	Dist Primary - OH	Tree Outside ROW - Limb	1	225	372
2720595	7/23/2020	21:58	1:43	225	Dist Primary - OH	Tree Outside ROW - Limb	1	225	372
2720603	7/23/2020	21:58	1:43	225	Dist Primary - OH	Tree Outside ROW - Limb	1	225	372
2720608	7/23/2020	21:58	1:43	225	Dist Primary -	Tree Outside ROW - Limb	1	225	372

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2720597	7/23/2020	21:59	1:44	225	Dist Primary - OH	Tree Outside ROW - Limb	1	225	372
2714789	7/23/2020	22:03	1:45	222	Dist Primary - OH	Tree Outside ROW - Limb	119	26418	372
2714834	7/23/2020	22:08	1:43	214.88333	Dist Primary - OH	Tree Outside ROW - Limb	16	3438.133333	372
2714248	7/23/2020	23:39	9:52	613	Dist Primary - OH	Tree ROW - Limb	8	4904	14022
2714207	7/24/2020	0:32	0:54	21.683333	Dist Primary - OH	Tree Outside ROW - Down	57	1235.95	14755
2720612	7/24/2020	0:33	0:41	8	Dist Primary - OH	Tree Outside ROW - Limb	1	8	372
2720605	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720604	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720598	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720594	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720610	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720591	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2720621	7/24/2020	0:34	0:41	7	Dist Primary - OH	Tree Outside ROW - Limb	1	7	372
2715347	7/24/2020	9:34	21:47	732.76667	Dist Secondary - OH	Tree Outside ROW - Limb	1	732.7666667	15867
2718359	7/30/2020	18:53	19:18	25	Dist Secondary - OH	Tree Outside ROW - Limb	1	25	14017
2719960	8/4/2020	3:25	4:30	64.133333	Dist Secondary - OH	Tree ROW - Limb	1	64.13333333	14031
2720111	8/4/2020	9:06	11:14	128	Dist Primary -	Tree Outside ROW - Limb	211	27008	499

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2720107	8/4/2020	9:10	10:53	102.56667	Dist Primary - OH	Tree Vine	1	102.5666667	14133
2720252	8/4/2020	10:02	19:36	573.15	Dist Primary - OH	Tree Outside ROW - Down	5	2865.75	144
2722070	8/8/2020	3:17	5:42	144.55	Dist Primary - OH	Tree Outside ROW - Down	186	26886.3	14900
2722243	8/9/2020	0:10	11:30	679.81667	Dist Primary - OH	Tree Outside ROW - Down	2	1359.633333	15950
2722231	8/9/2020	0:10	2:56	166.4	Dist Primary - OH	Tree Outside ROW - Down	56	9318.4	15950
2722231	8/9/2020	0:11	2:56	165.48333	Dist Primary - OH	Tree Outside ROW - Down	16	2647.733333	15950
2722311	8/9/2020	11:14	12:11	57	Dist Primary - OH	Tree Row - Down	1	57	15711
2722344	8/9/2020	13:27	19:50	383	Dist Primary - OH	Tree Outside ROW - Down	12	4596	14900
2722974	8/10/2020	18:03	21:16	193	Dist Primary - OH	Tree Outside ROW - Down	90	17370	14900
2722987	8/10/2020	18:22	21:20	178	Dist Primary - OH	Tree Outside ROW - Down	1	178	14900
2723457	8/12/2020	9:45	10:22	37	Dist Secondary - OH	Tree ROW - Limb	1	37	14261
2725297	8/16/2020	22:50	0:13	82.466667	Dist Secondary - OH	Tree Outside ROW - Limb	1	82.46666667	15085
2725375	8/17/2020	8:02	14:58	415.88333	Dist Primary - OH	Tree Row - Down	1	415.8833333	14016
2726672	8/20/2020	19:49	20:01	12	Dist Secondary - OH	Tree ROW - Limb	1	12	117
2728980	8/27/2020	23:49	0:21	31.466667	Dist Secondary - OH	Tree Outside ROW - Limb	87	2737.6	15013
2731328	9/2/2020	16:14	17:55	100.71667	Dist Secondary - OH	Tree ROW - Limb	1	100.7166667	15130
2735117	9/3/2020	17:25	4:02	637	Dist Secondary -	Tree Outside ROW - Limb	1	637	117

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2732092	9/3/2020	17:36	2:51	555	Dist Primary - OH	Tree ROW - Limb	9	4995	14767
2732606	9/3/2020	17:44	4:30	646	Dist Primary - OH	Tree Outside ROW - Down	7	4522	14005
2731811	9/3/2020	17:45	18:02	17.2	Dist Primary - OH	Tree Outside ROW - Down	65	1118	14005
2731811	9/3/2020	17:45	18:50	65.066667	Dist Primary - OH	Tree Outside ROW - Down	35	2277.333333	14005
2731811	9/3/2020	17:45	2:54	548.9	Dist Primary - OH	Tree Outside ROW - Down	71	38971.9	14005
2731811	9/3/2020	17:45	18:01	16	Dist Primary - OH	Tree Outside ROW - Down	155	2480	14005
2732132	9/3/2020	17:45	5:21	695.86667	Dist Primary - OH	Tree ROW - Limb	1	695.8666667	14133
2732120	9/3/2020	17:46	21:45	238.76667	Dist Primary - OH	Tree Outside ROW - Down	53	12654.63333	14005
2732238	9/3/2020	17:56	6:37	761	Dist Secondary - OH	Tree Outside ROW - Limb	15	11415	490
2732421	9/3/2020	19:00	19:05	5.3333333	Dist Primary - OH	Tree Outside ROW - Down	83	442.6666667	14005
2732460	9/3/2020	19:12	4:07	534.13333	Dist Secondary - OH	Tree Outside ROW - Limb	1	534.1333333	14014
2735120	9/4/2020	1:43	2:36	53	Dist Secondary - OH	Tree Outside ROW - Limb	1	53	117
2732889	9/4/2020	3:00	4:18	77.9	Dist Primary - OH	Tree Outside ROW - Down	114	8880.6	14005
2736948	9/14/2020	12:07	13:28	80.4	Dist Primary - OH	Tree Outside ROW - Limb	1	80.4	476
2737864	9/14/2020	17:16	17:48	32	Dist Secondary - OH	Tree Outside ROW - Limb	1	32	347
2738358	9/18/2020	17:21	19:31	129.28333	Dist Secondary - OH	Tree ROW - Limb	1	129.2833333	14009
2738497	9/19/2020	11:19	12:59	99.416667	Dist Primary -	Tree Outside ROW - Limb	1	99.41666667	15950

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2738500	9/19/2020	11:52	13:01	68.366667	Dist Primary - OH	Tree Outside ROW - Limb	1	68.36666667	15950
2740269	9/25/2020	11:12	12:36	84	Dist Secondary - OH	Tree Outside ROW - Limb	1	84	14900
2740492	9/26/2020	3:21	4:37	75.85	Dist Secondary - OH	Tree Outside ROW - Limb	1	75.85	14031
2741395	9/30/2020	8:00	10:40	159.91667	Dist Secondary - OH	Tree Outside ROW - Limb	1	159.9166667	102
2741468	9/30/2020	11:19	13:24	124.58333	Dist Primary - OH	Tree Outside ROW - Limb	1	124.5833333	14987
2742041	10/2/2020	12:19	12:58	39	Dist Secondary - OH	Tree Outside ROW - Limb	10	390	14261
2743762	10/8/2020	13:56	17:36	219.16667	Dist Secondary - OH	Tree Outside ROW - Down	1	219.1666667	467
2744426	10/8/2020	6:46	8:55	128.86667	Dist Primary - OH	Tree ROW - Limb	6	773.2	15950
2746847	10/21/2020	9:21	10:24	62.633333	Dist Primary - OH	Tree ROW - Limb	13	814.2333333	15018
2749045	10/29/2020	7:22	10:43	201.66667	Dist Secondary - OH	Tree ROW - Limb	1	201.6666667	14093
2749104	10/29/2020	11:18	12:40	82	Dist Primary - OH	Tree Outside ROW - Limb	1	82	15013
2749262	10/29/2020	18:45	1:15	390	Dist Primary - OH	Tree Outside ROW - Down	7	2730	64
2749873	11/1/2020	13:41	13:54	13	Dist Secondary - OH	Tree Outside ROW - Down	1	13	15175
2750066	11/1/2020	21:34	2:35	301	Dist Primary - OH	Tree Row - Down	63	18963	15801
2750319	11/1/2020	21:34	2:35	301	Dist Primary - OH	Tree Row - Down	33	9933	15801
2750315	11/1/2020	23:20	9:51	631	Dist Primary - OH	Tree Outside ROW - Down	4	2524	15867
2750340	11/1/2020	23:34	2:25	170.11667	Dist Secondary -	Tree ROW - Limb	1	170.1166667	15130

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2750431	11/2/2020	5:13	9:09	235.81667	Dist Primary - OH	Tree Outside ROW - Limb	1	235.8166667	14900
2750888	11/2/2020	8:20	10:42	141.51667	Dist Secondary - OH	Tree ROW - Limb	1	141.5166667	15711
2750996	11/2/2020	9:45	10:37	52.5	Dist Primary - OH	Tree Outside ROW - Limb	188	9870	14900
2751818	11/3/2020	6:53	12:51	358.03333	Dist Primary - OH	Tree Outside ROW - Down	1	358.0333333	14133
2753919	11/11/2020	9:00	9:37	36.033333	Dist Primary - OH	Tree ROW - Limb	351	12647.7	15018
2753875	11/11/2020	9:00	9:37	36.766667	Dist Primary - OH	Tree ROW - Limb	265	9743.166667	15018
2753938	11/11/2020	10:31	12:45	134	Dist Primary - OH	Tree ROW - Limb	17	2278	14093
2753961	11/11/2020	11:17	14:01	164	Dist Primary - OH	Tree Outside ROW - Limb	54	8856	14900
2753961	11/11/2020	11:17	11:30	13	Dist Primary - OH	Tree Outside ROW - Limb	405	5265	14900
2754017	11/11/2020	11:53	12:45	51.966667	Dist Primary - OH	Tree Outside ROW - Limb	12	623.6	14093
2754105	11/11/2020	12:22	14:01	98.9	Dist Primary - OH	Tree Outside ROW - Limb	40	3956	14900
2754105	11/11/2020	12:22	14:10	107.9	Dist Primary - OH	Tree Outside ROW - Limb	11	1186.9	14900
2754105	11/11/2020	12:22	15:19	176.9	Dist Primary - OH	Tree Outside ROW - Limb	2	353.8	14900
2754626	11/12/2020	8:26	10:05	98.533333	Dist Primary - OH	Tree Vine	39	3842.8	14767
2755677	11/15/2020	19:23	21:04	101.1	Dist Primary - OH	Tree ROW - Limb	888	89776.8	14987
2755677	11/15/2020	19:23	19:53	30	Dist Primary - OH	Tree ROW - Limb	1233	36990	14987
2756460	11/17/2020	16:13	16:43	29.383333	Dist Secondary -	Tree Vine	25	734.5833333	15001

Event ID	Date of Outage	Begin Time	End Time	Outage Duration	Sub Cause	Outage Cause	Customers Affected	Customer Minutes	Feeder
					OH				
2757951	11/23/2020	4:22	6:33	130.16667	Dist Secondary - OH	Tree Outside ROW - Limb	1	130.1666667	15021
2758040	11/23/2020	11:04	12:00	56	Dist Secondary - OH	Tree Outside ROW - Limb	1	56	15006
2758386	11/24/2020	14:54	18:39	224.85	Dist Secondary - OH	Tree ROW - Limb	1	224.85	82
2759333	11/30/2020	7:25	11:41	255.78333	Dist Primary - UG	Tree Outside ROW - Down	13	3325.183333	75
2759531	11/30/2020	11:19	11:44	25.433333	Dist Primary - UG	Tree Outside ROW - Down	1	25.43333333	75
2764338	12/16/2020	16:54	18:12	77.283333	Dist Primary - OH	Tree ROW - Limb	62	4791.566667	14133
2764379	12/16/2020	18:07	18:54	46.216667	Dist Secondary - OH	Tree Outside ROW - Down	11	508.3833333	451

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 2015 to 2020, based on the Major Service Outage ("MSO") exclusion criteria.

Table 2.4-K4

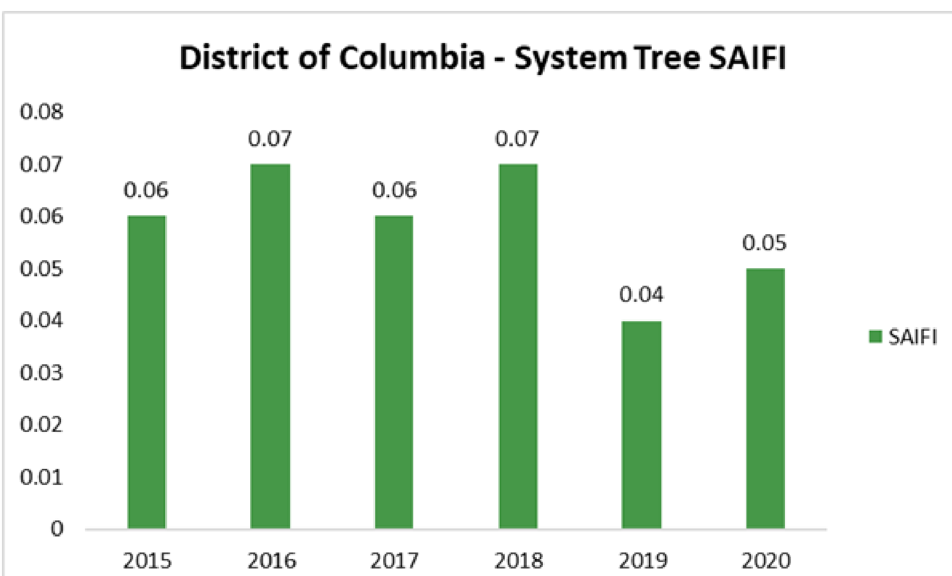
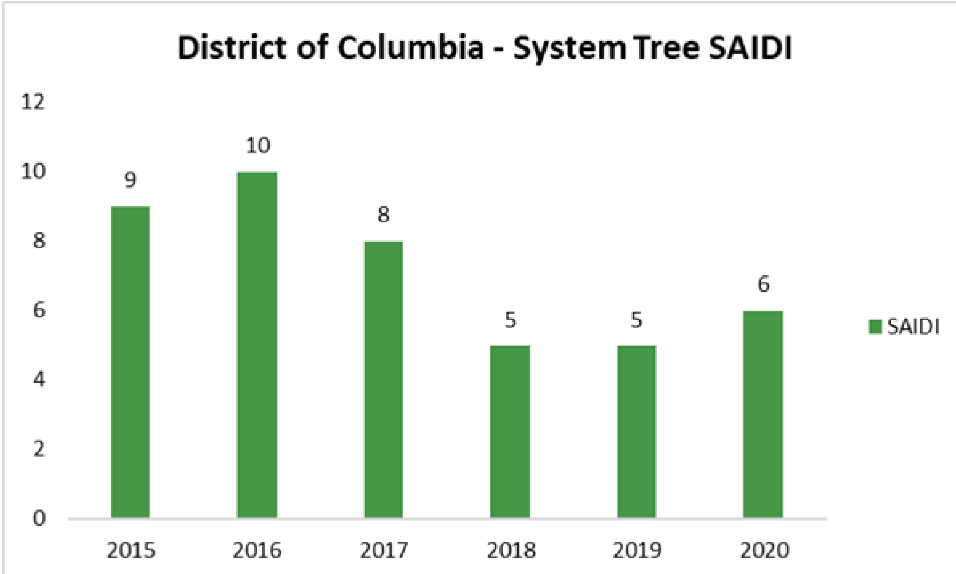


Table 2.4-K5



2.4.4 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 on the footnote.[68]

[68] Progress on current corrective action plans [on customer calls answered] shall be included in the utility's annual Consolidated Report.

Electricity Quality of Service Standards Results

January – December 2020 Aggregate Totals

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.

3601	Reporting Requirements for Service Outages, Incidents and Power Quality Complaints							
Standards			2020 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.**	247	100%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		
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)**.	247	100% (Except for ward data)	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		
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			2020 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.**	5	100%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		
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)**.	5	100% (Except for ward data)	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		

3601	**Reporting Requirements for Service Outages, Incidents and Power Quality Complaints**						
Standards			**2020 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.**	247	98%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		
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)**.	247	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**.	0	100%			

3601	**Reporting Requirements for Service Outages, Incidents and Power Quality Complaints**						
Standards			**2020 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, 2020 and Nov. 15 2020 in FC Nos. 982 & 1002	NA			

3602	Customer Service Standards						
Standards			2020 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	720,979 (Total calls) Call answering rate = 95%	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%**	3,401 (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			2020 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, 2020 and Nov. 15 2020 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						
Standards			2020 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 4/11/2020	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 4/1/2020	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	5	96%	See FC Nos. 982 & 1002, Pepco's Quarterly EQSS filings dated April 30, 2020; July 30, 2020; October 30, 2020; and February 1, 2021.		
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. 16700.	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						
Standards			2020 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.	2	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.)						
Standards			2020 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)**.	2	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 2020, there was 1 (of 247) non-major outages that extended beyond 24 hours.

Percentage of Non-Major Outages that Extended Beyond 24 Hours

Table 2.4-L

Total number of Non-Major Outages extending beyond 24 hours	5
Total number of Non-Major Outages: January 1 - December 31, 2020	247
Percentage of Non-Major Outages extending beyond 24 hours	2%

Table 2.4-M: 2020 Non-Major Outages Extending Beyond 24 Hours

2020 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 Exeeding 24 Hours to Restore	Feeder No.
52	77	DC20-07	JUNE	9	UG	Manhole fire was reported by DC Fire Dept. A solid primary manhole cover was found displaced, no smoke and no fire. The crew found a failed 500 3/C PILC in duct line. Crew replaced cable. Event #2688783	3220 Connecticut Ave & Macomb St, NW	NW	3	1149	2325 (6/11)	59	30	5	This event occurred due to circuit failure. Feeder tripped and fire was reported. Feeder had to be cleared and station tagged. Repairs required the replacement of 670 feet of PILC and EPR cable.	14148R
61	101		JUNE	21	OH	Manhole Network Cable Failure/ feeder tripped; services dropped (15378) – Permanent repairs, services restored. Event# 2694797	1025 Connecticut Ave NW	NW	2	1365 (6/19)	701	41	6	1	This was a significant event that impacted multiple circuits. Repairs required replacing several stretches of cable in multiple locations.	15378
77	126		JULY	21	UG	Cable failure/services dropped (00063) - Temporary repairs, restored services. Event# 2710830	Vicinity of 34th St NW & Massachusetts Ave	NW	3	1656 (7/20)	2239	29	43	6	This event was an outage on 4KV circuit. This outage had a long duration due to repairs that had to be made to another 4KV circuit that was also damaged. Work was also required by overhead crews in order to isolate and ground circuit which took substantial time. Portable generation was provided to several customers in an effort to minimize disruption.	63
80	144		JULY	24	UG	Cable failure/service dropped (15204) Event# 2713987- Permanent repairs, services restored.	421 Q St NW	NW	2	1411 (7/23)	2126	31	14	1	This event was on a 13kV distribution feeder. Load was tied off after the fault was isolated. Permanent repairs were delayed due to resources needing to be called in off shift.	15204
85	154		AUGUST	2	UG	Cable failure/service dropped (15706) -Repaired, permanent repairs Event# 2718986	320 40th St NE	NE	7	1046 (8/1)	1157	25	11	1	This event was a B & C phase fault to a customer's switch gear. Customer coordination delayed the repairs, and assistance from overhead crews was also required. Customer also wanted repairs to be completed off shift since they still had partial power and were able to operate at limited capacity.	15706

PART 3: 2020 MANHOLE EVENT REPORT

PART 3: 2020 MANHOLE EVENT REPORT[69]

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 2020. The appendices provide detail regarding manhole events, and Pepco's manhole inspection program.

SECTION 3.1 – 2020 MANHOLE EVENT INTRODUCTION

Pepco herein submits its annual Manhole Event Report for 2020 in accordance with Order Nos. 11716, 13812, 15620 and 16091.

[69] 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…

<u>Summary of 2020 Manhole Events</u>

During 2020, there were a total of 22 reportable manhole events in the District of Columbia. Of these 22 manhole events, 13 were classified as Smoking Manholes (S), 5 were classified as Manhole Explosions (E), and 4 were classified as Manhole Fires (F). 13 out of the 22 events occurred on the 13 kV system. Of these, 7 were classified as Smoking Manholes (S), 4 were classified as Manhole Explosions (E) and 4 were classified as Fires (F). The 2 events occurring on the 4 kV system were classified as Smoking Manhole (S). Appendix 3A is a list of the 2020 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

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 2020, targeted PILC replacement was performed on eight feeders, shown below in Table 3.1.

Table 3.1: PILC Replacement Status

Year	Feeder ID	PILC Replaced (ft)
2020	15307	4629
2020	15308	7717
2020	15309	7081
2020	15310	7434
2020	15311	5056
2020	15312	5733
2020	14531	2490
2020	14537	1149

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 83 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.

Table 3.2: PILC Replacement: 2001-Present

Years	*PILC Replaced Footage*	*PILC Replaced Mileage*
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
2020	41,289	7.82
Total	***440,350***	***82.52***

Underground (UG) Failure Analysis

The results of Pepco's annual UG failure analyses are presented below, in compliance with Order No. 12735 paragraph 138.[70]

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.

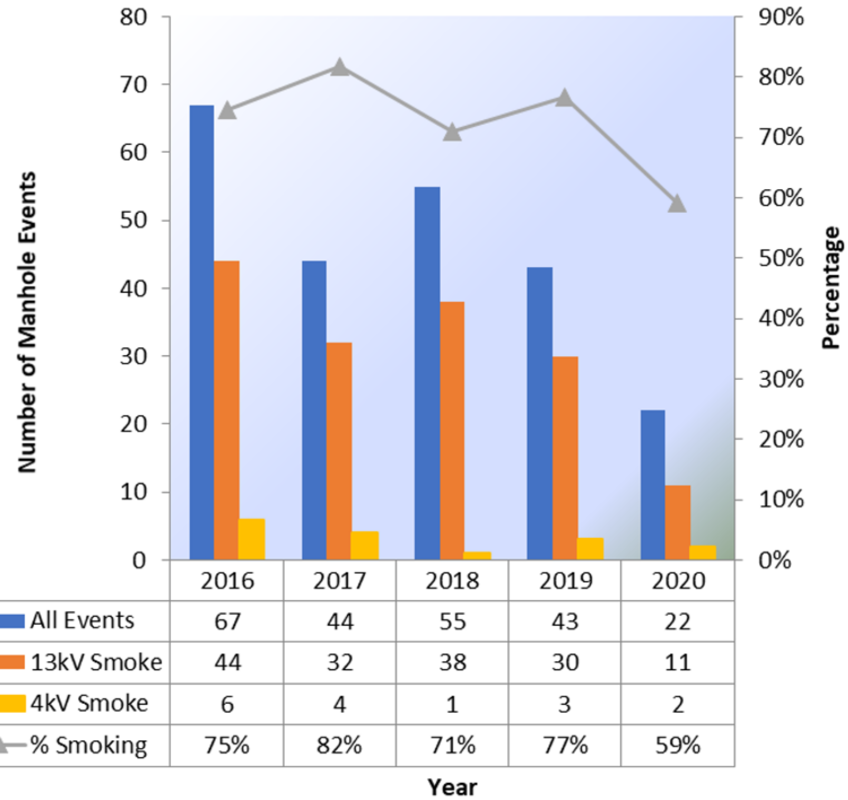
There are three types of manhole reportable events:

- Explosions
- Fires
- Smoking

Of these three types, from 2016 – 2020 smoking manhole events account for most of all manhole events experienced in the District. See Figure 3.3.

[70] 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;

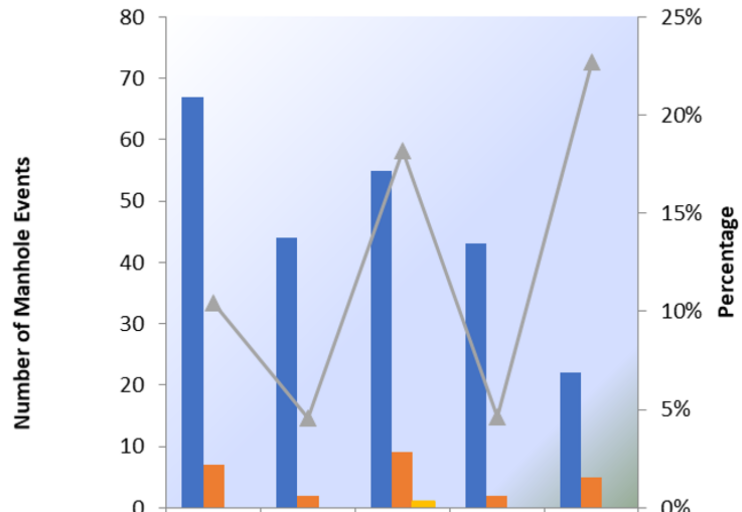
Figure 3.3: Manhole Events - Smoking (2016-2020)



	2016	2017	2018	2019	2020
All Events	67	44	55	43	22
13kV Smoke	44	32	38	30	11
4kV Smoke	6	4	1	3	2
% Smoking	75%	82%	71%	77%	59%

Figure 3.7 breakdown the number 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.

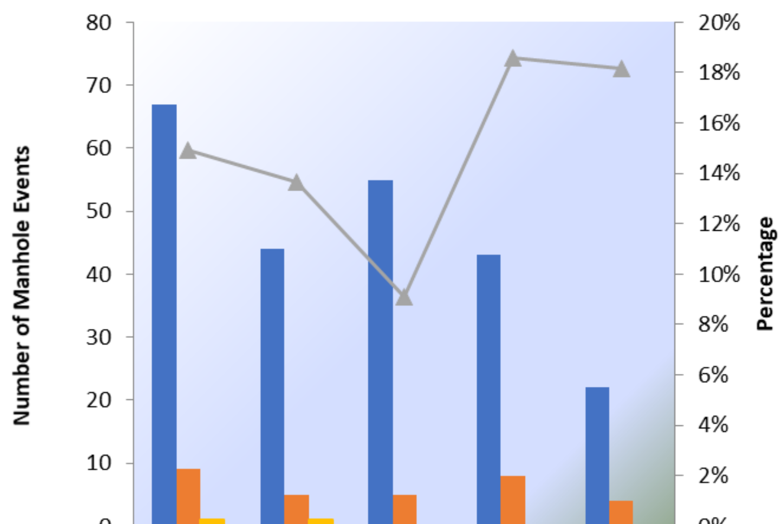
Figure 3.4: Manhole Events - Explosions (2016-2020)



	2016	2017	2018	2019	2020
All Events	67	44	55	43	22
13kV Explosions	7	2	9	2	5
4kV Explosions	0	0	1	0	0
% Explosions	10%	5%	18%	5%	23%

Year

Figure 3.5: Manhole Events - Fires (2016-2020)

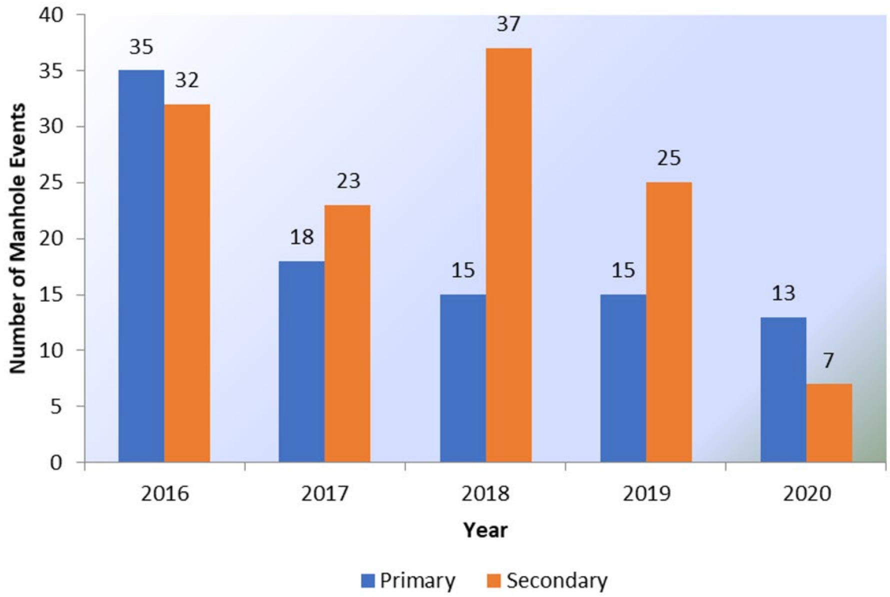


	2016	2017	2018	2019	2020
All Events	67	44	55	43	22
13kV Fires	9	5	5	8	4
4kV Fires	1	1	0	0	0
% Fires	15%	14%	9%	19%	18%

Year

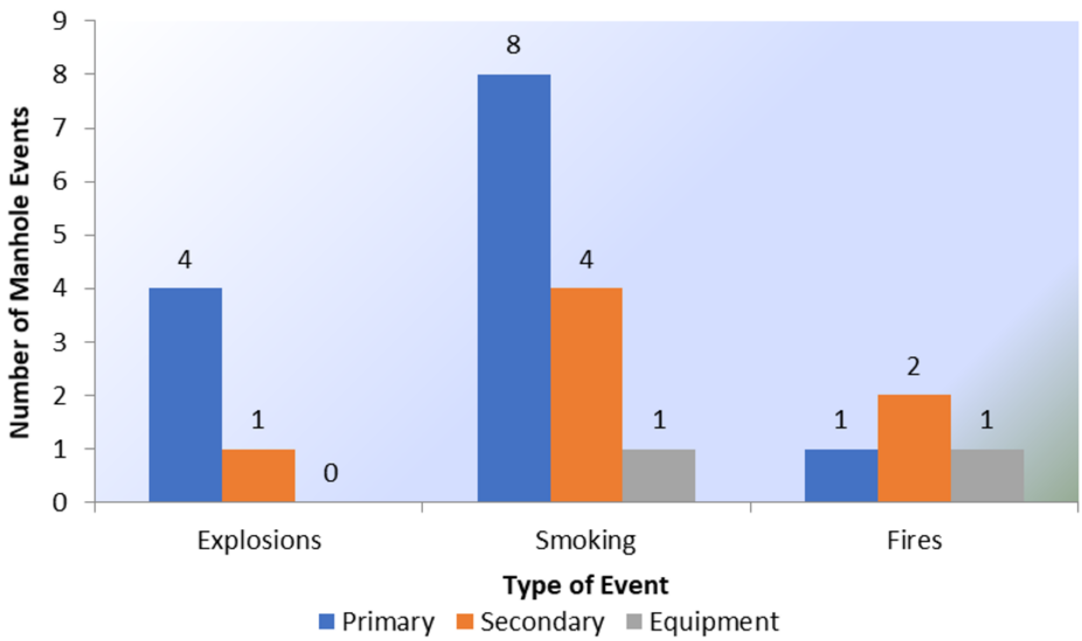
Since 2016, on average most of the manhole events experienced in the District have occurred on Pepco's secondary equipment. See Figure 3.6.

Figure 3.6: Manhole Events by Type of Equipment (2016-2020)



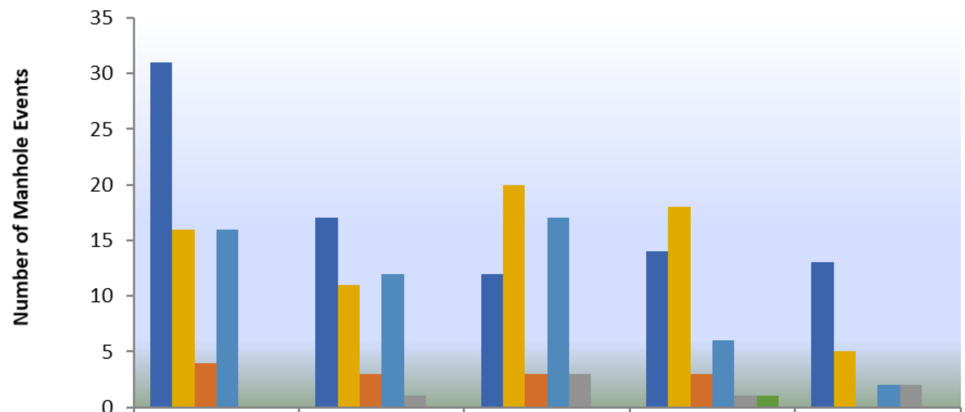
In 2020, two manhole fires occurred on the secondary systems. Smoking manholes occurred more on the primary system, and manhole explosions occurred more on the primary system. Figure 3.7 below depicts this breakdown.

Figure 3.7: Manhole Events by Type and Equipment (2020)



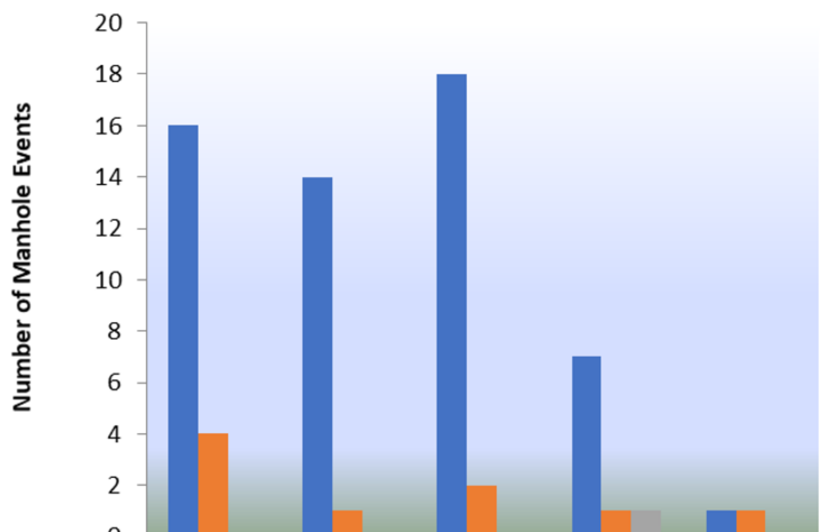
Slotted manhole covers are designed to minimize the frequency and impact of manhole events by allowing gas and smoke to vent from manholes in the event of an underground failure. This provides an early warning and prevents build-up of gases to potentially explosive proportions; thereby allowing energy 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 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 3-8 and Figure 3-7 for a breakdown of manhole event by event type, voltage class, and cover type.

Figure 3.8: Manhole Events by Type, Equipment, and Manhole Cover (2016-2020)



	2016	2017	2018	2019	2020
Solid Primary	31	17	12	14	13
Solid Secondary	16	11	20	18	5
Slotted Primary	4	3	3	3	0
Slotted Secondary	16	12	17	6	2
Grated Primary	0	1	3	1	2
Grated Secondary	0	0	0	1	0

Figure 3.9: Slotted Manhole Events by Type (2015-2020)



	2016	2017	2018	2019	2020
Slotted Smoking	16	14	18	7	1
Slotted Fire	4	1	2	1	1
Slotted Explosions	0	0	0	1	0

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 2016, the leading cause of manhole reportable events in the District is insulation-related, such as insulation deterioration. See Figures 3.10 through 3.14.

Figure 3.10: Selected Failure Causes (2016)

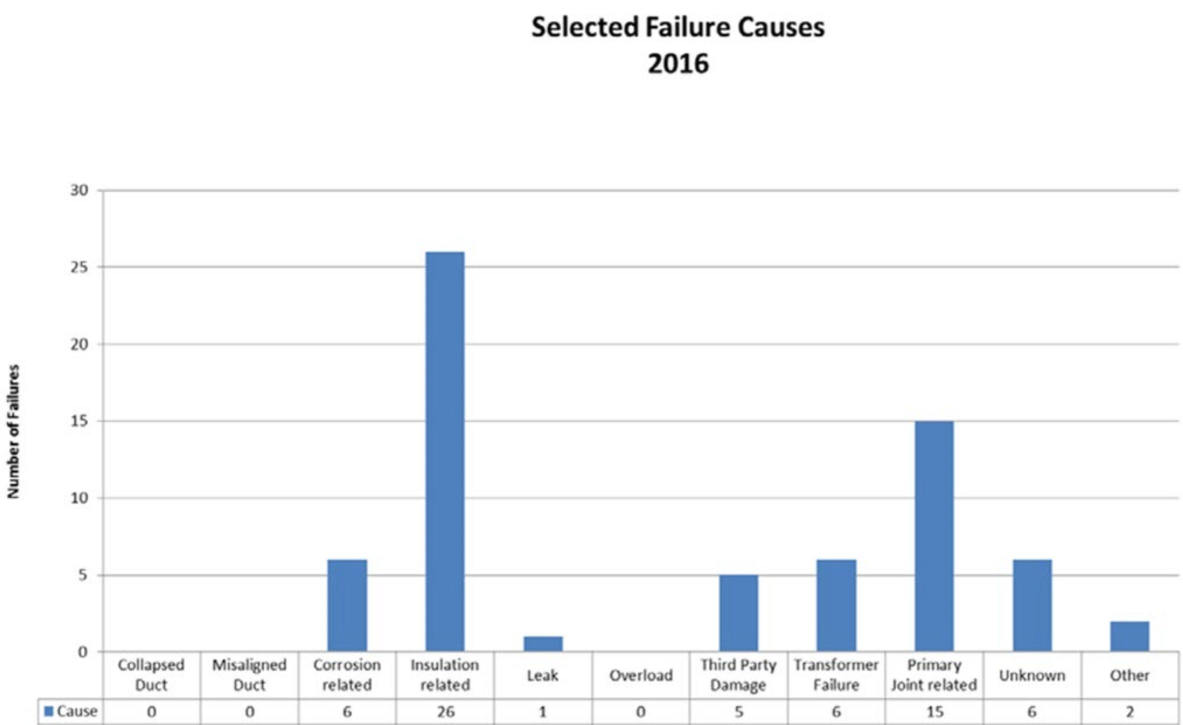


Figure 3.11: Selected Failure Causes (2017)

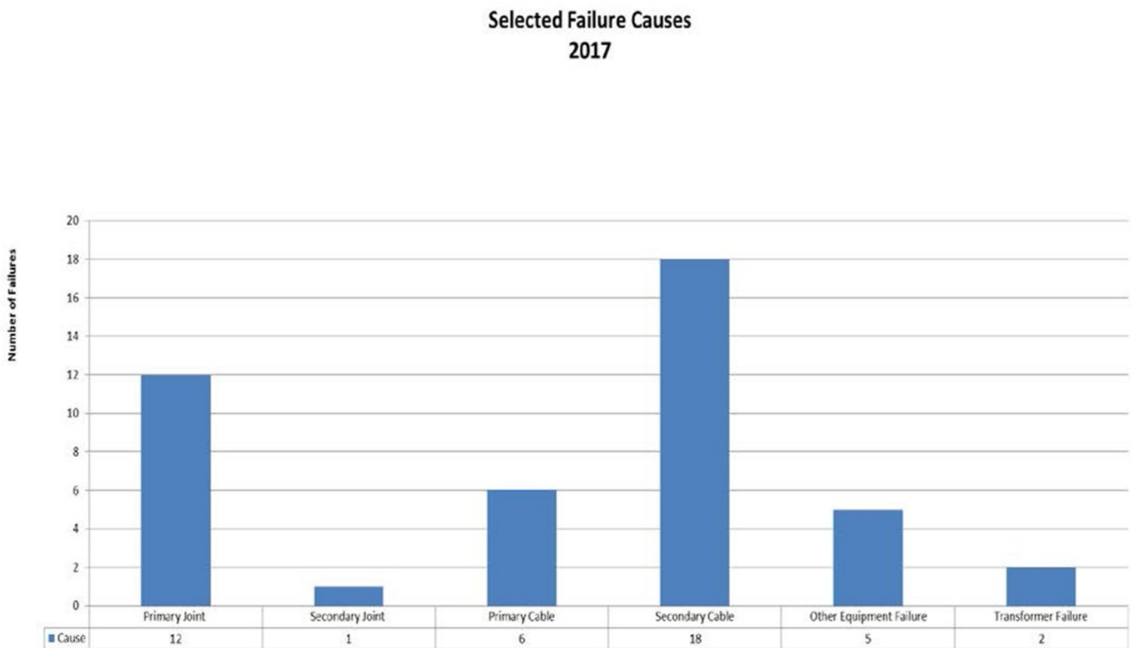


Figure 3.12 Selected Failure Causes (2018)

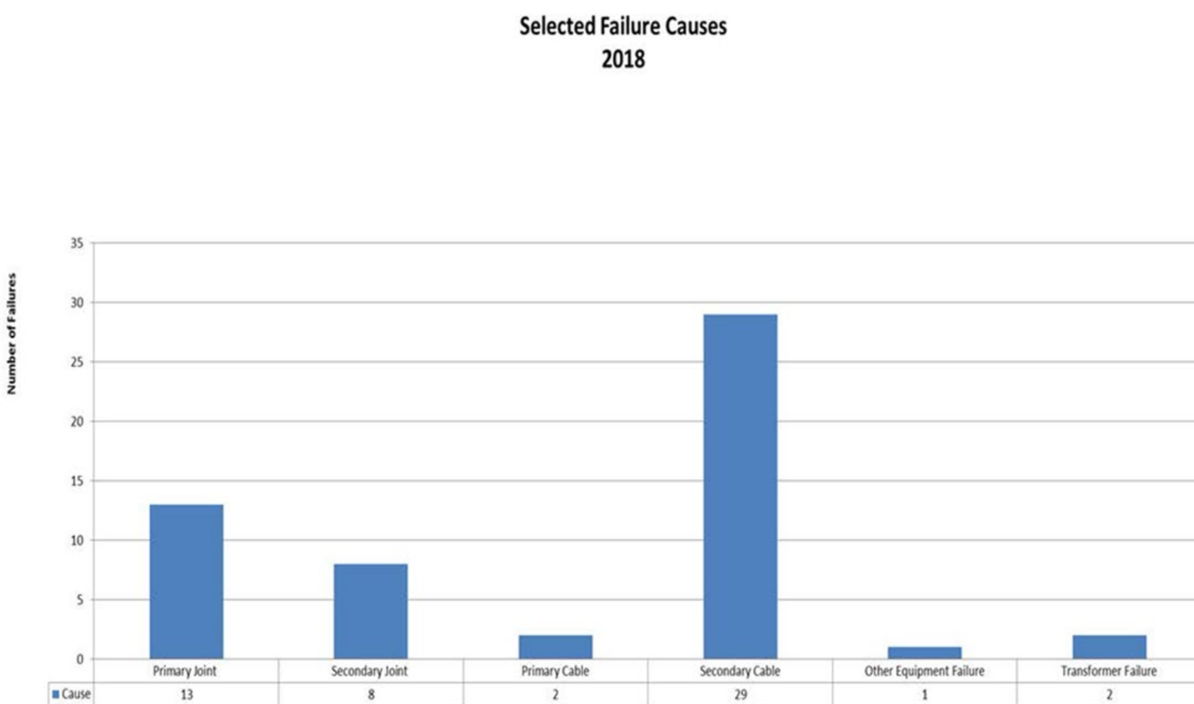


Figure 3.13 Selected Failure Causes (2019)

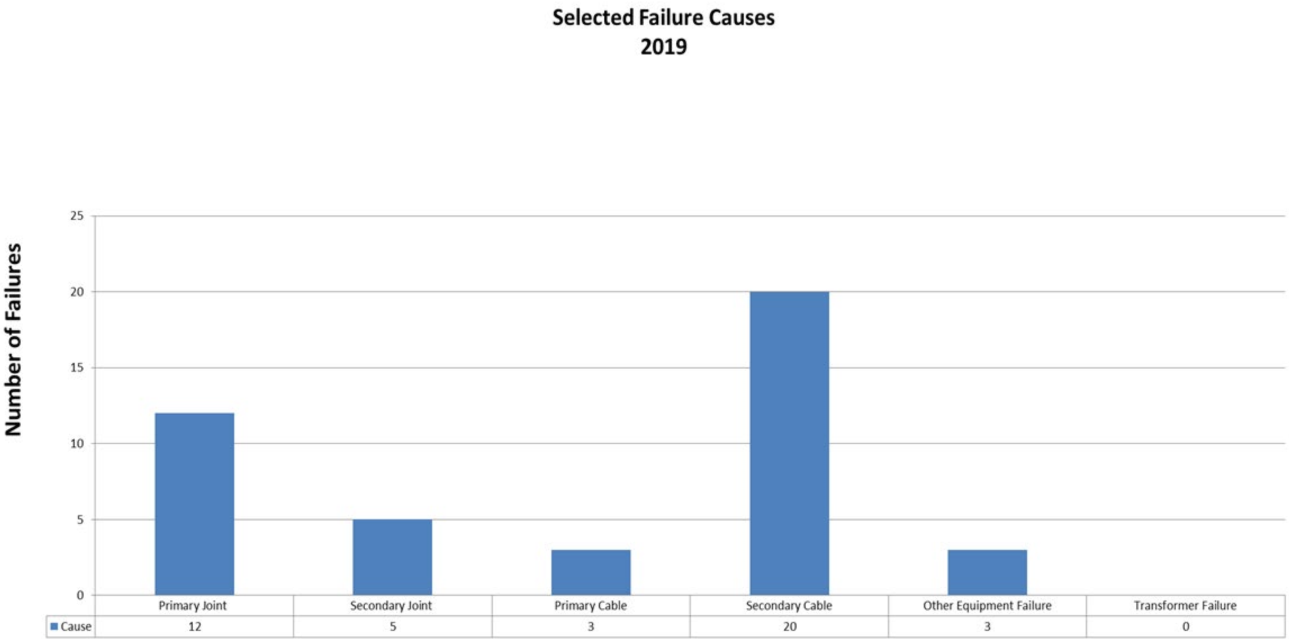
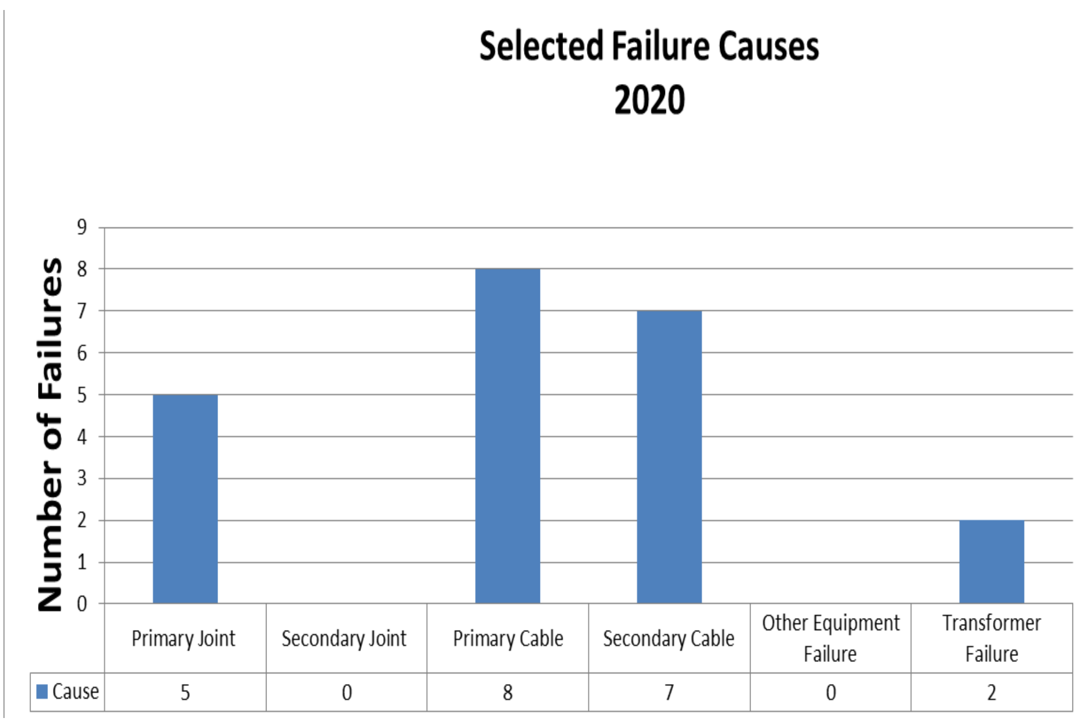


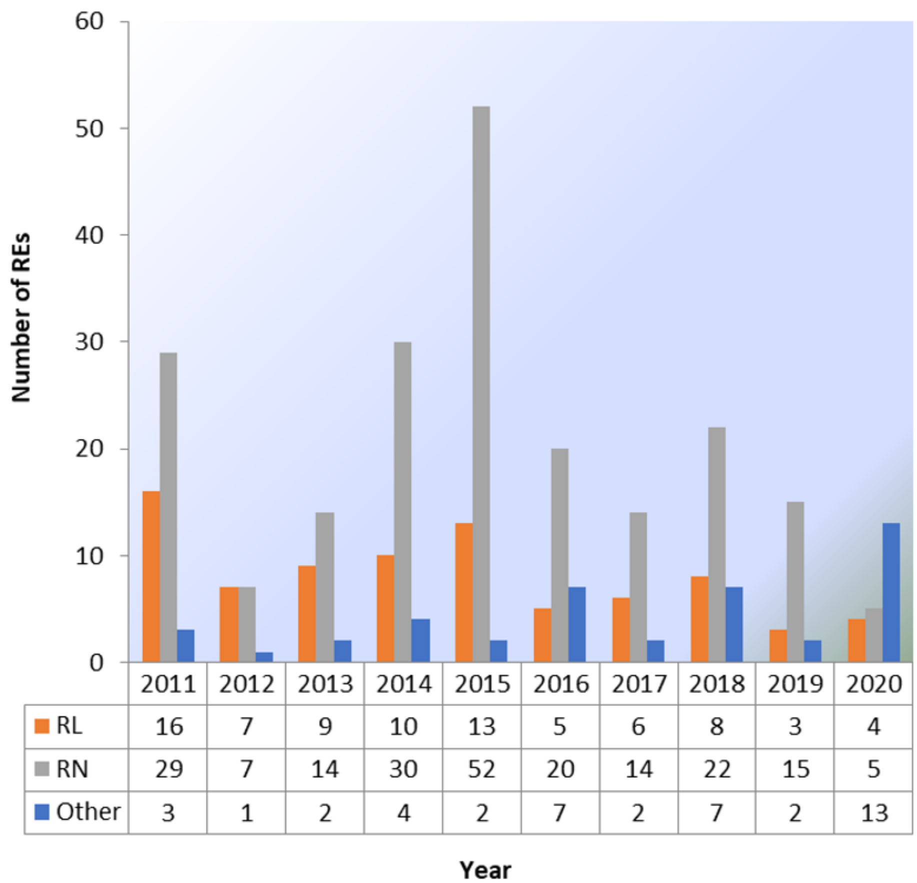
Figure 3.14 Selected Failure Causes (2020)



Selected Failure Causes (2020)

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.

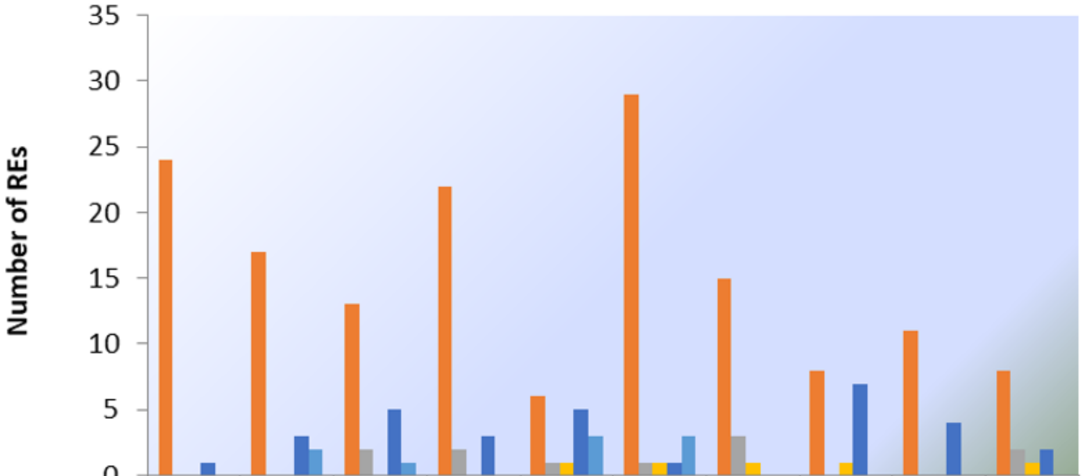
Figure 3.15: Insulation Type of Secondary REs (2011-2020)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
RL	16	7	9	10	13	5	6	8	3	4
RN	29	7	14	30	52	20	14	22	15	5
Other	3	1	2	4	2	7	2	7	2	13

PILC is the predominant primary cable on the Pepco underground system. Consequently, most primary cable reportable events involve PILC cable (Figure 3.16).

Figure 3.16: Insulation Type of Primary REs (2011-2020)

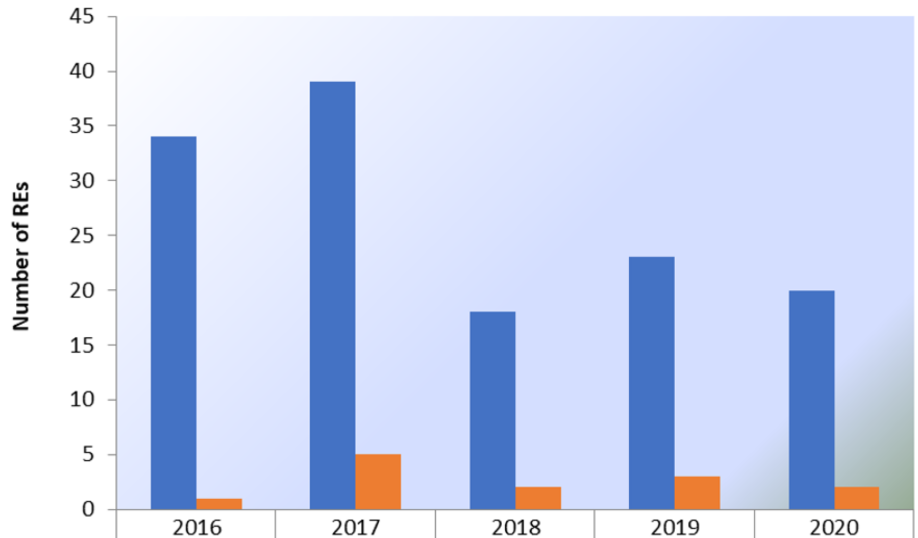


	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
PILC	24	17	13	22	6	29	15	8	11	8
RL	0	0	2	2	1	1	3	0	0	2
RN	0	0	0	0	1	1	1	1	0	1
EPR	1	3	5	3	5	1	0	7	4	2
Other	0	2	1	0	3	3	0	0	0	0

Year

The majority of reportable events involving primary equipment occur on 13 kV feeders (Figure 3.17). 4 kV is a vintage technology and the majority of Pepco's underground system is 13 kV.

Figure 3.17: Voltage Class of Primary REs (2016-2020)

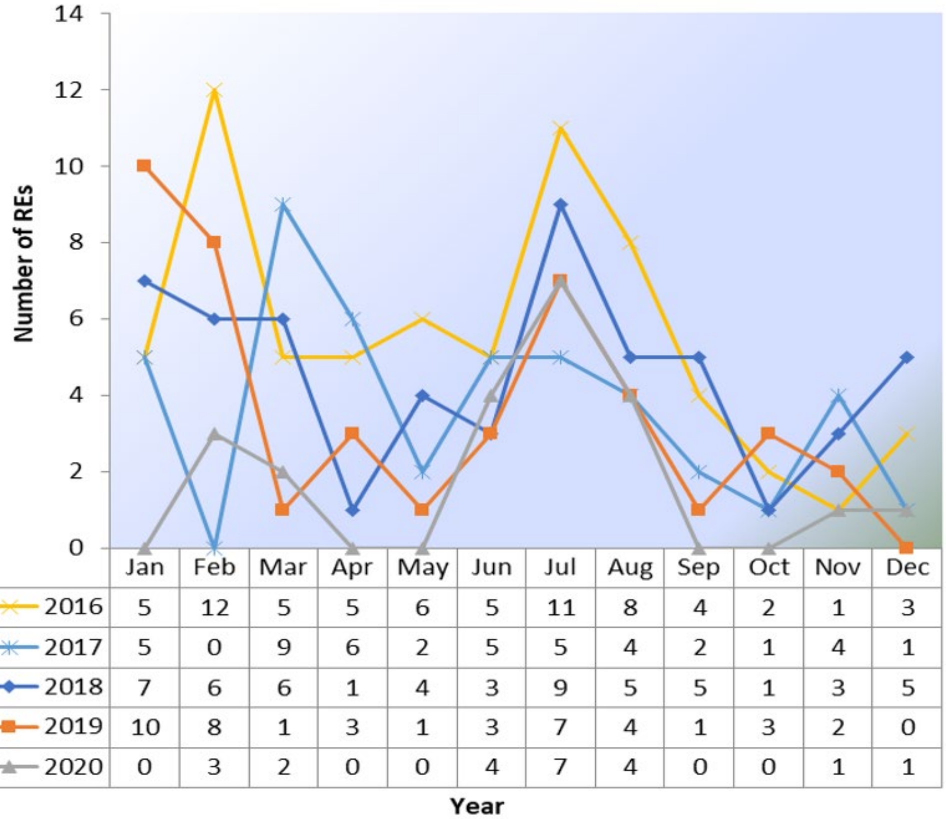


	2016	2017	2018	2019	2020
13kV	34	39	18	23	20
4kV	1	5	2	3	2

Year

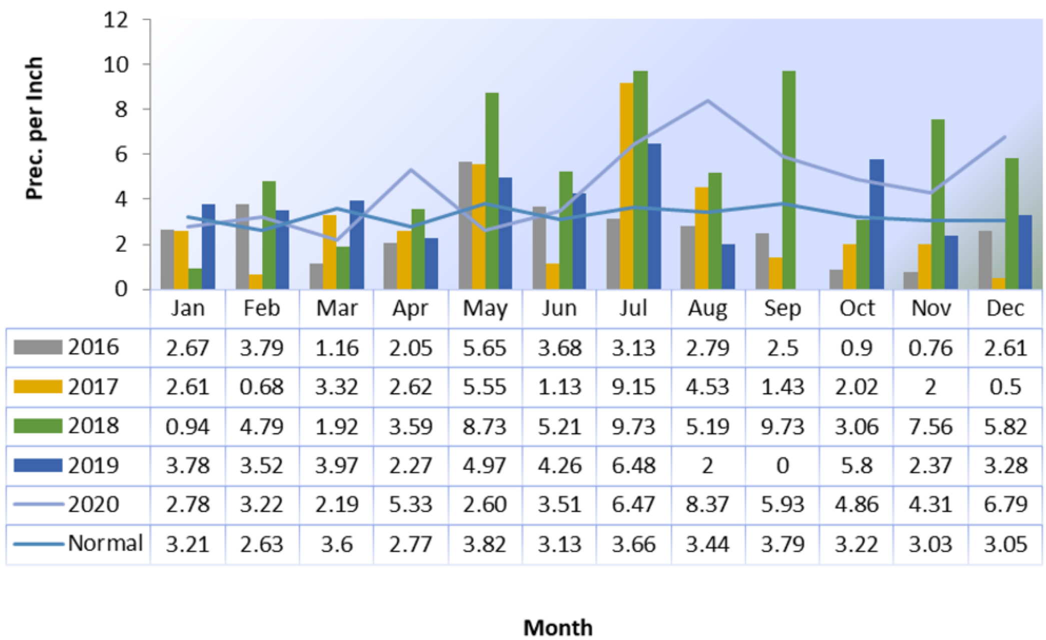
In addition, moisture plays a major role in the deterioration of both primary and secondary cable insulation. When a significant amount of precipitation occurs in the District, moisture and contaminants from the street, such as motor oil, lawn chemicals, etc., enter into the manholes and affect cable 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 3.18 and 3.19 suggests that total moisture accumulation affects the number of reportable events.

Figure 3.18: Reportable Events by Month (2015-2020)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	5	12	5	5	6	5	11	8	4	2	1	3
2017	5	0	9	6	2	5	5	4	2	1	4	1
2018	7	6	6	1	4	3	9	5	5	1	3	5
2019	10	8	1	3	1	3	7	4	1	3	2	0
2020	0	3	2	0	0	4	7	4	0	0	1	1

Figure 3.19: Total Precipitation in Inches by Month (2016-2020)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016	2.67	3.79	1.16	2.05	5.65	3.68	3.13	2.79	2.5	0.9	0.76	2.61
2017	2.61	0.68	3.32	2.62	5.55	1.13	9.15	4.53	1.43	2.02	2	0.5
2018	0.94	4.79	1.92	3.59	8.73	5.21	9.73	5.19	9.73	3.06	7.56	5.82
2019	3.78	3.52	3.97	2.27	4.97	4.26	6.48	2	0	5.8	2.37	3.28
2020	2.78	3.22	2.19	5.33	2.60	3.51	6.47	8.37	5.93	4.86	4.31	6.79
Normal	3.21	2.63	3.6	2.77	3.82	3.13	3.66	3.44	3.79	3.22	3.03	3.05

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 [71]

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 2020.

Historical Slotted Manhole Cover Program [72]

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.

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[71] 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;

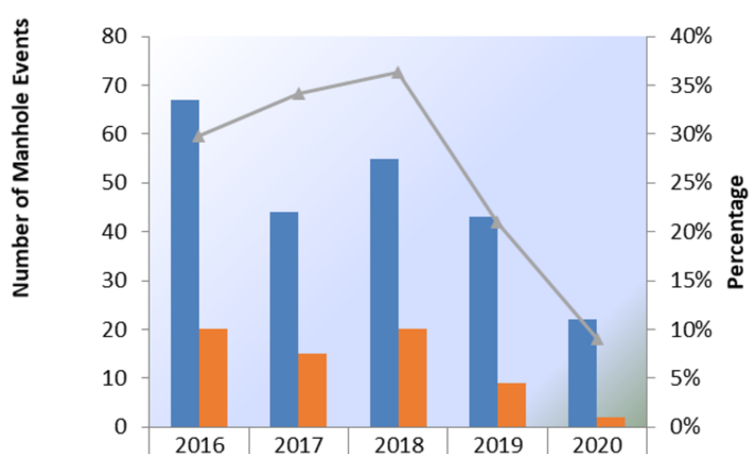
[72] In Order No. 16091 issued on December 10, 2010, the Commission stated among other things, at paragraph 59, the following:
59. … (4) include trend analysis for "Use of Slotted Manhole Covers;"

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 22 reportable manhole events that occurred in the District of Columbia in 2020, 2 involved manholes fitted with slotted covers.

Over the five-year period from 2016 through 2020, there were 231 reportable manhole events. Of these, 66 (29%) occurred in manholes with slotted covers. See Figure 3.20.

Figure 3.20: Manhole Events Involving Slotted Covers



	2016	2017	2018	2019	2020
All Events	67	44	55	43	22
# Events Slotted Covers	20	15	20	9	2
% Slotted	30%	34%	36%	21%	9%

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 29% 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.

Cable Splice or Joint Records[73]

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 contains information from the "Splice Manifest" report for 2020 maintenance work performed. The splicer and foreman names have been redacted from the table.

Table 3.3: 2020 Splice Data (District of Columbia)

Date	Location	Type of Splice
1/23/2020	SW Corner 11th & H St., NW	Test Cap 350 3/c and below
3/19/2020	11th & H St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
3/19/2020	11th & H St., NW	3-1C, #2 Loadbreak Elbows
3/23/2020	2501 Calvert St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
3/23/2020	2501 Calvert St., NW	200 AMP Elbows
3/31/2020	4340 Conn. Ave., NW	200 AMP Elbows
3/31/2020	4340 Conn. Ave., NW	3-1/C PILC to #2 URD Tape Jt.
4/2/2020	2800 Quebec, NW	200 AMP Elbows
4/2/2020	2800 Quebec St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
4/12/2020	800 N. Capitol St., NW	200 AMP Elbows
4/12/2020	800 N. Capitol St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
4/15/2020	2501 Calvert St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
4/15/2020	2501 Calvert St., NW	200 AMP Elbows
4/26/2020	20th & S St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0

[73] 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.

Date	Location	Type of Splice
4/26/2020	20th & S St., NW	200 AMP and 600 AMP Deadbreaks
4/28/2020	2446 Wisc. Ave., NW	3-1/c Cold Shrink Potheads 350 to 600
4/28/2020	2446 Wisc. Ave., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/1/2020	Arlington Memorial Bridge	200 AMP Elbows
5/1/2020	5900 Blair Rd., NW	3-1/c Cold Shrink Potheads 350 to 600
5/1/2020	5900 Blair Rd., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/4/2020	16th & Mass. Ave., NW	3-1/C PILC to #2 URD Tape Jt.
5/4/2020	16th & Mass. Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
5/7/2020	E St. b/w 6th & 7th St., NE	3-1/C URD Slip on Splices
5/7/2020	E St. b/w 6th & 7th St., NE	3-1/C URD Slip on Splices
5/7/2020	4th & M St., SE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/7/2020	4th & M St., SE	3-1/c 500 or 600 Straight Heat Shrink Splices
5/7/2020	4th & M St., SE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/8/2020	N. Brook Lane	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/8/2020	N. Brook Lane	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/11/2020	10th & NY Ave., NW	Heat Shrink Test Cap
5/12/2020	1st & Michigan, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
5/12/2020	1st & Michigan, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
5/13/2020	15th & Vermont St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/14/2020	15th & Vermont St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
5/20/2020	K St., NW	Heat Shrink Test Caps
6/17/2020	13th & Irving, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
6/17/2020	13th & Irving, NW	200 AMP Elbows
6/22/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/22/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/23/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/23/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/23/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/23/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/23/2020	Conn. & L St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
6/26/2020	14th & Indep. Ave., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
6/26/2020	14th & Indep. Ave., SW	200 AMP Elbows
7/7/2020	1st & Indiana, NW	Heat Shrink Test Caps
7/23/2020	Potomac & M St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
7/23/2020	Potomac & M St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
7/23/2020	Potomac & M St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
7/24/2020	34th & Mass. Ave., NW	Tape Joint 2/0 to #2 URD
7/24/2020	34th & Mass. Ave., NW	Tape Joint #2 RL #2 URD
7/24/2020	Potomac & M St., NW	Cold Shrink Y
7/25/2020	19th & T St., NW	200 AMP Elbows
7/29/2020	17th & WV Ave., NE	3-1/c Cold Shrink Potheads #2 to 4/0
7/29/2020	17th & WV Ave., NE	3-1/c Cold Shrink Potheads #2 to 4/0
7/30/2020	1501 Eckington Pl., NE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0

Date	Location	Type of Splice
7/31/2020	9th & G St., NW	Single Branch Joint 350 3/c to 600 3/c
8/3/2020	4th & E St., SW	3-1/C URD Slip on Splices
8/13/2020	1255 23rd St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
8/13/2020	1255 23rd St., NW	200 AMP Elbows
8/13/2020	4th & G St., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
8/14/2020	918 P St., NW	3-1/C URD Slip on Splices
8/14/2020	918 P St., NW	3-1/C URD Slip on Splices
8/17/2020	11th & O St., NW	200 AMP Elbows
8/17/2020	10th & O St., NW	3-1/C URD Slip on Splices
8/25/2020	24th & Mass. Ave., NW	3-1/C URD Slip on Splices
8/25/2020	24th & Mass. Ave., NW	3-1/C URD Slip on Splices
8/26/2020	Constitution Ave., NW	200 AMP Elbows
8/26/2020	Constitution Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
8/27/2020	12th & D St., SW	200 AMP Elbows
8/27/2020	12th & D St., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
8/27/2020	6th & L St., SE	3-1/C URD Slip on Splices
8/27/2020	5th & L St., SE	3-1/C URD Slip on Splices
8/31/2020	2nd & D St., SE	3-1/C URD Slip on Splices
8/31/2020	2nd & D St., SE	3-1/C URD Slip on Splices
9/2/2020	Half & L St., SE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/2/2020	Half & K St, SE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/3/2020	14th & K St., NW	3-1C, #2 Loadbreak Elbows
9/10/2020	2116 F St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/10/2020	2116 F St., NW	200 AMP Elbows
9/13/2020	4th & G St., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/13/2020	4th & G St., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/14/2020	SWC Montello Ave. & Quen St., NE	3-1/C URD Slip on Splices
9/14/2020	SWC Montello Ave. & Quen St., NE	3-1/C URD Slip on Splices
9/15/2020	Trinidad & Florida Ave., NE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
9/15/2020	Trinidad & Morris St., NE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
9/16/2020	9th & French, NW	3-1/C URD Slip on Splices
9/16/2020	9th & French, NW	3-1/C URD Slip on Splices
9/17/2020	14th & Indep. Ave., SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/17/2020	14th & Indep. Ave., SW	3-1/C URD Slip on Splices
9/21/2020	16th & Pine St., NW	3-1/C URD Slip on Splices
9/21/2020	16th & Lamont St., NW	3-1/C URD Slip on Splices
9/21/2020	Raoul Wallenberg & Indep. Ave., SW	200 AMP Elbows
9/21/2020	Indep. Ave., f/o Wallenberg, SW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/22/2020	39th & Rodman, NW	200 AMP Elbows

Date	Location	Type of Splice
9/22/2020	39th & Rodman, NW	200 AMP Elbows
9/23/2020	10th & H St, NW	3-1/C URD Slip on Splices
9/23/2020	10th & H St, NW	3-1C, #2 Loadbreak Elbows
9/24/2020	65 K St., NE	200 AMP Elbows
9/24/2020	65 K St., NE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/27/2020	1012 14th St., NW	200 AMP Elbows
9/27/2020	1 Thomas Circle, NW	Test Cap 350 3/c and below
9/30/2020	15th & M St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
9/30/2020	15th & M St., NW	200 AMP Elbows
10/1/2020	1369 Savannah Pl, SE	3-1/C URD Slip on Splices
10/1/2020	1369 Savannah Pl, SE	200 AMP Elbows
10/1/2020	8 Eckington, NE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
10/1/2020	8 Eckington, NE	200 AMP Elbows
10/2/2020	23rd & Conn. Ave., NW	Double Branch Joint 4/0 3/c and below
10/3/2020	23rd & Conn. Ave., NW	Double Branch Joint 4/0 3/c and below
10/4/2020	N. Cap. & O St., NW	3-1/C 4/0 or 350 Straight Heat Shrink Splices
10/4/2020	N. Cap. & O St., NW	3-1/C 4/0 or 350 Straight Heat Shrink Splices
10/6/2020	10th & G St., NW	3-1/C #2 PILC Test Caps
10/8/2020	14th & Penn. Ave., NW	200 AMP Elbows
10/8/2020	14th & Penn. Ave., NW	200 AMP Elbows
10/20/2020	Potomac Ave., & Grace St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
10/20/2020	3230 Grace St., NW	3-1C, #2 Loadbreak Elbows
10/21/2020	38th & Porter, NW	200 AMP and 600 AMP Deadbreaks
10/21/2020	38th & Porter, NW	200 AMP Elbows
10/21/2020	38th & Porter, NW	3-1/C URD Slip on Splices
10/25/2020	1012 14th St., NW	200 AMP Elbows
10/25/2020	1 Thomas Circle, NW	3-1/C 4/0 or 350 Straight Heat Shrink Splices
10/25/2020	1 Thomas Circle, NW	3-1C, #2 Loadbreak Elbows
10/27/2020	2022 H St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
10/30/2020	N/E/C 6th & Howard St., NW	3-1/C URD Slip on Splices
11/3/2020	North Cap. & Mass. Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/3/2020	North Cap. & Mass. Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/4/2020	3rd & M St., SE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
11/4/2020	3rd & M St., SE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
11/5/2020	Mass Ave. & N. Capitol, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/5/2020	Mass Ave. & N. Capitol, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/9/2020	635 Mass. Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/9/2020	635 Mass. Ave., NW	200 AMP Elbows
11/11/2020	101 Indep. Ave., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
11/11/2020	Gallatin & S. Dakota, NE	3/c P.L. to 3 1/c EPR or XLP Trif. Joint 500 to 600
11/11/2020	Hamilton & S. Dakota, NE	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600

Date	Location	Type of Splice
11/12/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/12/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/13/2020	S. Dakota & Galloway St., NE	3-1C, #2 Loadbreak Elbows
11/13/2020	S. Dakota & Galloway St., NE	3-1C, #2 Loadbreak Elbows
11/13/2020	S. Dakota & Galloway St., NE	3-1C, #2 Loadbreak Elbows
11/13/2020	S. Dakota & Galloway St., NE	200 AMP and 600 AMP Deadbreaks
11/13/2020	S. Dakota & Galloway St., NE	3-1/C URD Slip on Splices
11/13/2020	S. Dakota & Galloway St., NE	3-1C, #2 Loadbreak Elbows
11/16/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/16/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/18/2020	Potomac Ave. & S. Capitol, SE	3-1/C URD Slip on Splices
11/18/2020	Potomac Ave. & S. Capitol, SE	3-1/C URD Slip on Splices
11/19/2020	L St. & Vermont Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/19/2020	Vermont & L St., NW	3-1/C URD Slip on Splices
11/23/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/23/2020	Vermont & L St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
11/25/2020	10th & G St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/1/2020	New Jersey & D St., SE	3-1/C URD Slip on Splices
12/1/2020	New Jersey & D St., SE	3-1/C URD Slip on Splices
12/3/2020	10th & G St., NW	200 AMP Elbows
12/3/2020	10th & G St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/4/2020	400 Virginia Ave., SW	3-1C, #2 Loadbreak Elbows
12/4/2020	400 Virginia Ave., SW	3-1/C URD Slip on Splices
12/4/2020	Florida Ave., & 11th St., NW	200 AMP Elbows
12/4/2020	Florida Ave., & 11th St., NW	200 AMP Elbows
12/4/2020	Florida Ave., & 11th St., NW	200 AMP Elbows
12/6/2020	2119 Champlain St., NW	3-1/c Cold Shrink Potheads 350 to 600
12/7/2020	325 P St., SW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
12/8/2020	2616 Conn. Ave., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/8/2020	2616 Conn. Ave., NW	200 AMP Elbows
12/9/2020	1458 Columbia Rd., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/9/2020	1458 Columbia Rd., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/16/2020	4th & J St., NW	3-1/c #2 URD Test Caps
12/17/2020	450 K St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/17/2020	12th & Penn Ave., SE	200 AMP and 600 AMP Deadbreaks
12/17/2020	12th & Penn Ave., SE	200 AMP and 600 AMP Deadbreaks
12/18/2020	SEC 4th & I St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/18/2020	300 Blk I St., NW	200 AMP Elbows
12/18/2020	4th & I St., NW	3-1/C URD Slip on Splices

Date	Location	Type of Splice
12/18/2020	5th & G St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/18/2020	5th & G St., NW	3-1/C URD Slip on Splices
12/18/2020	4th & I St., NW	200 AMP Elbows
12/21/2020	3rd & R St., NE	Separable 3 Way Cable Joint
12/22/2020	44th & Reservoir Rd., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/22/2020	44th & Reservoir Rd., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/22/2020	44th & Reservoir Rd., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/24/2020	Florida Ave., & T St., NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/24/2020	Florida Ave., & T St., NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
12/24/2020	Florida Ave., & T St., NW	3-1/c 500 or 600 Straight Heat Shrink Splices
12/24/2020	Florida Ave., & T St., NW	Separable 3 Way Cable Joint
12/25/2020	Champlain Sub	3-1/c Cold Shrink Potheads 350 to 600
12/25/2020	Champlain Sub	3-1/c Cold Shrink Potheads 350 to 600
12/26/2020	4005 Van Ness, NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
12/26/2020	4005 Van Ness, NW	Cold Shrink Y
12/26/2020	4005 Van Ness, NW	3/c P.L. to 3 1/c EPR or XLP Trif. Joint #2 - 1/0 or 4/0
12/26/2020	4005 Van Ness, NW	3/C P.L.to 3-1/C EPR or XLP Trif. Jt. 350 to 600
12/26/2020	4005 Van Ness, NW	Cold Shrink Y
12/27/2020	3rd & R St., NE	3-1/c 500 or 600 Straight Heat Shrink Splices
12/27/2020	3rd & R St., NE	Cold Shrink Y

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Appendix 3A: 2020 Manhole Events[74]

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

[74] 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;

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;

- 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 2020 Manhole Events is provided in the following table:

Table 3A-1

2020 MANHOLE EVENT REPORT - DISTRICT OF COLUMBIA

As of : 4/5/21

EVENT No.	DATE	LOCATION	WARD	Quad	FDR	EVENT TYPE	Failure Type	Prim/Sec	Cable Size	Insulation	MANHOLE COVER	MH Size	DESCRIPTION/CAUSE	ACTION
DC20-01	2/6/2020	22nd & L St, NW	2	NW	14422	Smoke	Secondary Cable	Secondary	250 KCM	RN	Slotted	28'x28'	Burning 250 secondaries in duct line	cut cables in hole before and after to isolate. Pulled in new cable to make permanent repairs
DC20-02	2/18/2020	1200 Independence Ave, SW	2	SW	15309	Smoke	Primary Joint	Primary	4/0 AWG	PILC	Solid	6'x12'	Blown Branch Joint	Made permanent repairs
DC20-03	2/27/2020	2305 New York Ave, NE	5	NE	14016	Explosion	Primary Joint	Primary	500 KCM	PILC	Solid	4'x6'	Blown straight joint	Made permanent repairs
DC20-04	3/19/2020	1220 12th St, SE	6	SE	228	Smoke	Primary Joint	Primary	#2 AWG	RN	Solid	4'x4'	Blown single phase branch joint	Remade blown single phase branch joint
DC20-05	3/28/2020	Connecticut Ave & Woodley Rd, NW	3	NW	15338	Smoke	Primary Cable	Primary	350 KCM	RL	Solid	6'x7'	Faulted primary lead cable	Replaced 330ft of 350kcm lead cable on Woodley Rd @ 784397-724742
DC20-06	6/7/2020	19th & Constitution Ave, NE	6	NE	229	Smoke	Secondary Cable	Secondary	250 KCM	RL	Solid	3'x3'	Burned secondary mains	Made repairs replacing 2 stretches onf R/L 250 mains w/ R/N 250 from 806385-365704 to 806385-418487
DC20-07	6/9/2020	3220 Connecticut Ave & Macomb St, NW	3	NW	14148R	Explosion	Primary Cable	Primary	500 KCM	PILC	Solid	6'x12'	Failed 500 3/C PILC in duct line S/O 783400-628536	Replaced 670 feet of 500 3/C PILC with 600 flat strap 3-1/C RN.
DC20-08	6/19/2020	Connecticut Ave & L St, NW	2	NW	Multiple	Fire	Secondary Cable	Secondary	N/A	PILC	Solid	5'x12'	Secondary buss ties burnt into primary causing multiple feeder failures	Pulled 3 ways to repairs feeders 15376, 15377, 15378, 15379, 15380, 15381, 14616, 14617. Removed PILC cable, installed RN
DC20-09	6/28/2020	Wisconsin Avenue & N Street, N.W.	2	NW	14559	Smoke	Secondary Cable	Secondary	250 KCM	RL	Solid	6'x18'	Secondary mains in 2 M/Hs from xfmr #781390-765887	Made permanent repairs
DC20-10	7/1/2020	3504 International Dr	3	NW	15867	Fire	Equipment	Equipment	500 KCM	RN	Grated	6'x18'	Bank 333 burnt up primary and secondary cables	Replaced bank 333kva w/ 1000kva subsrface, replace 3 phase primary to TH 357538, replace 3 sets of service secondary
DC20-11	7/3/2020	9th St & Jefferson St NW	4	NW	15197	Smoke	Primary Cable	Primary	500 KCM	PILC	Solid	6'x10'	Failed 500 3/C PILC joint	Replaced 420' of 500 3/c PILC with 50 flat strap RN
DC20-12	7/4/2020	3031 Cathedral Ave, NW	3	NW	14146	Fire	Primary Cable	Primary	250 KCM	PILC	Solid	3X3	Burned secondary mains	Made permanent repairs
DC20-13	7/5/2020	3240 Grace St NW	2	NW	4556&1455	Smoke	Primary Cable	Primary	#2 AWG	EPR	Solid	6'X10'	#2PILC 3/C to #2 3-1/C # 2 URD Trificating Joint	Feeder Test capped out to network transformer 781389-640866
DC20-14	7/6/2020	320 1st Street, N.W.	6	NW	14631	Smoke	Primary Joint	Primary	#2 AWG	PILC	Solid	6'X10'	Blown joint on Feeder 14631	Made permanent repairs
DC20-15	7/20/2020	North Capitol & H St. NE	5	NE	15467	Smoke	Primary Cable	Primary	#2 AWG	PILC	Solid	5'x10'	feeder # 15467 Joint falt in M H #797388-319646 replaced 110 feet of #2 URD to MH #797388-279625 Per repairs	Made permanent repairs
DC20-16	7/27/2020	1500 Eckington Pl. NE	5	NE	15457	Fire	Secondary Cable	Secondary	250 KCM	EPR	Slotted	5'x10'	Manhole fire due to secondary insulation failure. Multiple feeders in the hole tripped.	Test cap feeders and replaced cable.
DC20-17	8/13/2020	1255 23rd St. NW	2	NW	14543	Smoke	Equipment	Equipment	N/A	N/A	Grated	6'X18'	Failed network transformer# 785390-691691 primary door was blown off and oil in the mahole	Replaced Faulted Network Transformer W/New Transformer 1500kVA 120/208 sec Voltage
DC20-18	8/13/2020	49th St. & Hillbrook Ln.	3	NW	75	Smoke	Primary Cable	Primary	#2 AWG	RL	Solid	4'X5'	RL cable faulted at the edge of Duct line	Installed 60' of #2 URD R/S/C Made perm. Repairs
DC20-19	8/17/2020	4th & Constitution Ave NE	6	NE	15875	Smoke	Secondary Cable	Secondary	500 KCM	RN	Solid	4'X6'	Failed secondary cable straight joint	De-Energize secondary cable to remake secondary straight joints
DC20-20	8/21/2020	307 T St NE.	5	NE	15457	Explosion	Primary Cable	Primary	350 KCM	PILC	Solid	6'X10'	Failure in the cable 40' away from the MH in the duct line.	Cable was replaced with RN and two heat shrink transition splices. There was another fault after repairs were completed on 15458 at same location due to colateral damage from the first event. UG crews had to replace the cable the second time. One heat shrink transition splice and a set of straight joints.
DC20-21	11/30/2020	402 New Jersey Ave, SE	6	SE	16002	Explosion	Secondary Cable	Secondary	#2 AWG	RN	Solid	3'x3'	Burned secondary mains	Replaced secondary mains back to transformer 797382-955750
DC20-22	12/25/2020	3rd St, NE & R St, NE	5	NE	15459	Explosion	Primary Joint	Primary	500 KCM	EPR	Solid	6'x15'	BØ of Y-splice in 4/0 3-1/c cable	Replaced 600 flat strap cable, made new Y-splice & three 600 straight splices

Table 3A-2

2020 MANHOLE EVENT REPORT - DISTRICT OF COLUMBIA

As of : 4/7/21

EVENT No.	DATE	Work Order	LOCATION	Event Voltage	FAILURE MODE	REPEAT EVENT	4kV / 13kV	Manhole Condition	NO. OF CUST.	Outage (hr/min)	Repair Duration	DATE INSPECTED BY SIEMENS	LAST INSPECTION	Facility ID	Personal injury or property damage
DC20-01	2/6/2020		22nd & L St, NW	120/208V	Secondary Cable	No	13kV	Water below cable	0				6/3/2011	785389-997745	No
DC20-02	2/18/2020		1200 Independence Ave, SW	13kV	Primary Joint	No	13kV	Water below cable	0				N/A	792383-236918	No
DC20-03	2/27/2020		2305 New York Ave, NE	13kV	Primary Joint	No	13kV	Water above cable	114	7693	67		4/18/2018	807394-994708	No
DC20-04	3/19/2020		1220 12th St, SE	4kV	Primary Joint	No	4kV	Water below cable	111	529	633		3/15/2017	803379-232814	No
DC20-05	3/28/2020		Connecticut Ave & Woodley Rd, NW	13kV	Primary Cable	No	13kV	Water below cable/debris	0				2/27/2019	784397-892692	No
DC20-06	6/7/2020		19th & Constitution Ave, NE	120/240V	Secondary Cable	No	13kV	Water above cable	0				7/23/2018	806385-365704	No
DC20-07	6/9/2020		3220 Connecticut Ave & Macomb St, NW	13kV	Primary Cable	No	13kV	Debris/Water below cable	5				9/9/2019	783400-628536	No
DC20-08	6/19/2020		Connecticut Ave & L St, NW	13kV	Secondary Cable	No	13kV	Debris	103				7/26/2010	788389-463770	No
DC20-09	6/28/2020		Wisconsin Avenue & N Street, N.W.	13kV	Secondary Cable	No	13kV	Water below cable					3/21/2019	781390-765887	No
DC20-10	7/1/2020		3504 International Dr	13kV	Equipment	No	13kV	Clean	0				6/18/2015	781403-365533	No
DC20-11	7/3/2020		9th St & Jefferson St NW	13kV	Primary Cable	No	13kV	Debris	1446	1549	97		1/25/2013	792408-622556	No
DC20-12	7/4/2020		3031 Cathedral Ave, NW	13kV	Primary Cable	No	13kV	Debris					N/A	782399-665005	No
DC20-13	7/5/2020		3240 Grace St NW	13kV	Primary Cable	No	13kV	Debris					N/A	781389-599866	No
DC20-14	7/6/2020		320 1st Street, N.W.	13kV	Primary Joint	No	13kV	Mud below cable					N/A	796386-300357	No
DC20-15	7/20/2020		North Capitol & H St. NE	13kV	Primary Cable	No	13kV	Water below cable					5/23/2013	797388-319646	No
DC20-16	7/27/2020		1500 Eckington Pl. NE	13kV	Secondary Cable	No	13kV	Debris					N/A	798391-403960	No
DC20-17	8/13/2020		1255 23rd St. NW	13kV	Equipment	No	13kV	Oil in the manhole	0				7/2/2014	785390-691691	No
DC20-18	8/13/2020		49th St. & Hillbrook Ln.	4kV	Primary Cable	No	4kV	Clean	315	1			5/4/2017	772401-481891	No
DC20-19	8/17/2020		4th & Constitution Ave NE	120/240V	Secondary Cable	No	13kV	Clean	48	50	50		N/A	799385-742519	No
DC20-20	8/21/2020		307 T St NE.	13kV	Primary Cable	No	13kV	Clean					11/16/2017	799394-334073	No
DC20-21	11/30/2020		402 New Jersey Ave, SE	120/208V	Secondary Cable	No	13kV	Clean	56	151			N/A	797382-914887	No
DC20-22	12/25/2020		3rd St, NE & R St, NE	13kV	Primary Joint	No	13kV	Water above cable					7/8/1905	799393-338019	No

Table 3A-3

Notes:			
22 events :13 primary (8 S, 1 F, 4 E), 7 secondary (4 S, 2 F, 1 E), 2 Equipment (1 S, 1 F, 0 E)			
2 events involved slotted manhole covers (1 S, 1 F,0 E),			
18 events involved solid manhole covers (11 S, 2 F, 5 E)			
2 events involved grated manhole covers (1 S, 1 F, 0 E)			
Event category breakdown:			
Smoking manholes	13		
Manhole fires	4		
Manhole explosions	5		
Total:	22		
Northwest	12	Georgetown:	2
Northeast	7		
Southwest	1		
Southeast	2		
Total:	22		

Events Summary 13kV			
20 events : 11 primary (6 S, 1 F, 4 E), 7 secondary (4 S, 2 F, 1 E) , 2 Equipment (1 S, 1 F, 0 E)			
Event category breakdown:			
Smoking manholes	11		
Manhole fires	4		
Manhole explosions	5		
Total:	20	Georgetown:	2

Events Summary 4kV			
2 events : 2 primary (2 S, 0 F, 0 E), 0 secondary (0 S, 0 F, 0 E),			
Event category breakdown:			
Smoking manholes	2		
Manhole fires	0		
Manhole explosions	0		
Total:	2	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

First Quarter 2020 - Summary		Third Quarter 2020 - Summary	
Insulation Deterioration by Cable Type:		Insulation Deterioration by Cable Type:	
Paper Insulated Lead Cable (PILC)	2	Paper Insulated Lead Cable (PILC)	5
Rubber Lead (RL)	1	Rubber Lead (RL)	1
Rubber Neoprene (RN)	2	Rubber Neoprene (RN)	2
Ethylene Propylene Rubber (EPR)	0	Ethylene Propylene Rubber (EPR)	2
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	0 a/	Non-Cable related	1 b/
TOTAL	5	TOTAL	11

Second Quarter 2020 - Summary		Fourth Quarter 2020 - Summary	
Insulation Deterioration by Cable Type:		Insulation Deterioration by Cable Type:	
Paper Insulated Lead Cable (PILC)	2	Paper Insulated Lead Cable (PILC)	0
Rubber Lead (RL)	2	Rubber Lead (RL)	0
Rubber Neoprene (RN)	0	Rubber Neoprene (RN)	1
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	0 a/	Non-Cable related	0
TOTAL	4	TOTAL	2

a/ Transformer
b/ Network Transformer

Appendix 3B: 2020 Manhole Inspection Program[75]

[75] 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 10,614 manholes were inspected in 2020

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.

Inspection Priority Definitions

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:

<ins>P10:</ins> 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 year's 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.

Current Program Status

During 2020, the MIP has identified the following remediation Priorities:

	Priorities Count	Percentage of CY 2020 Priorities
Priority Code 10	88	3%
Priority Code 20	16	1%
Priority Code 30	18	1%
Priority Code 40	3157	96%

Inspectors are conducting more comprehensive and thorough inspections which have resulted in a substantial increase in Priorities found. In 2020, approximately 31% 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.

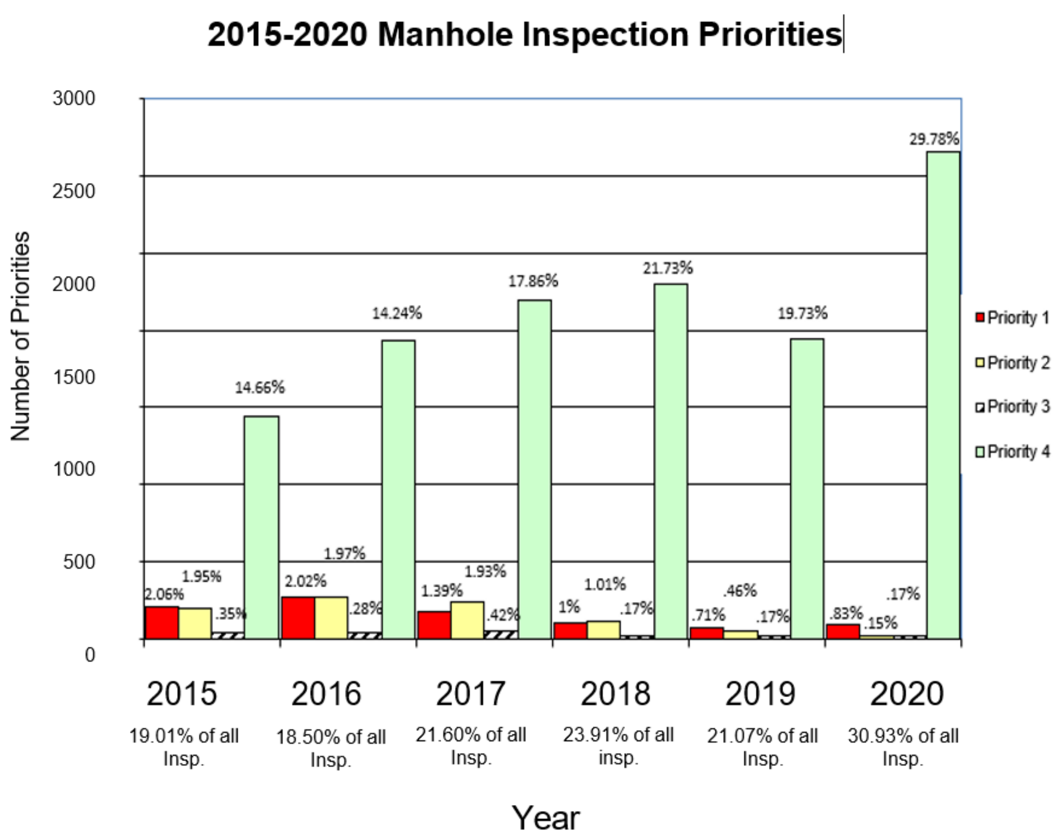
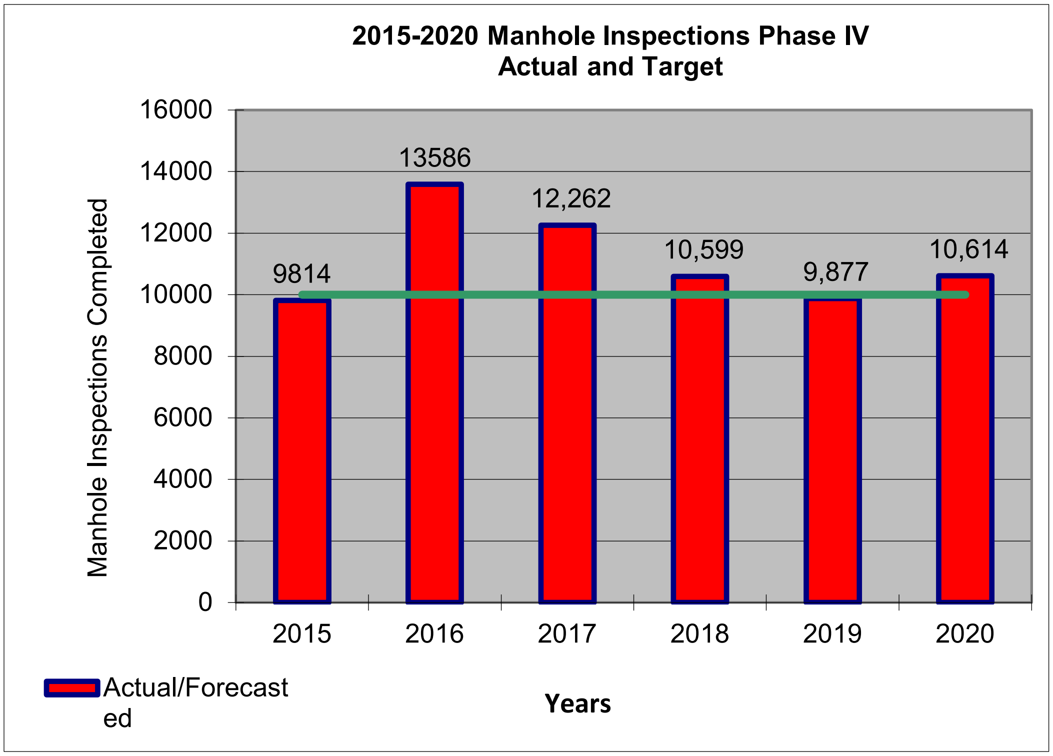


Figure 3.2-B1: Manhole Inspection Priorities – Phase IV

With the implementation of the Manhole Inspection Quality Control (QC) Program, inspection Priorities have increased from 1,866 in 2015 to 3,279 Priorities in 2020. The majority of the increase is related to Priority 40 conditions, which are not considered an imminent risk and must be remediated within 12 months and the increase can be attributed at least in part to more rigorous inspections.

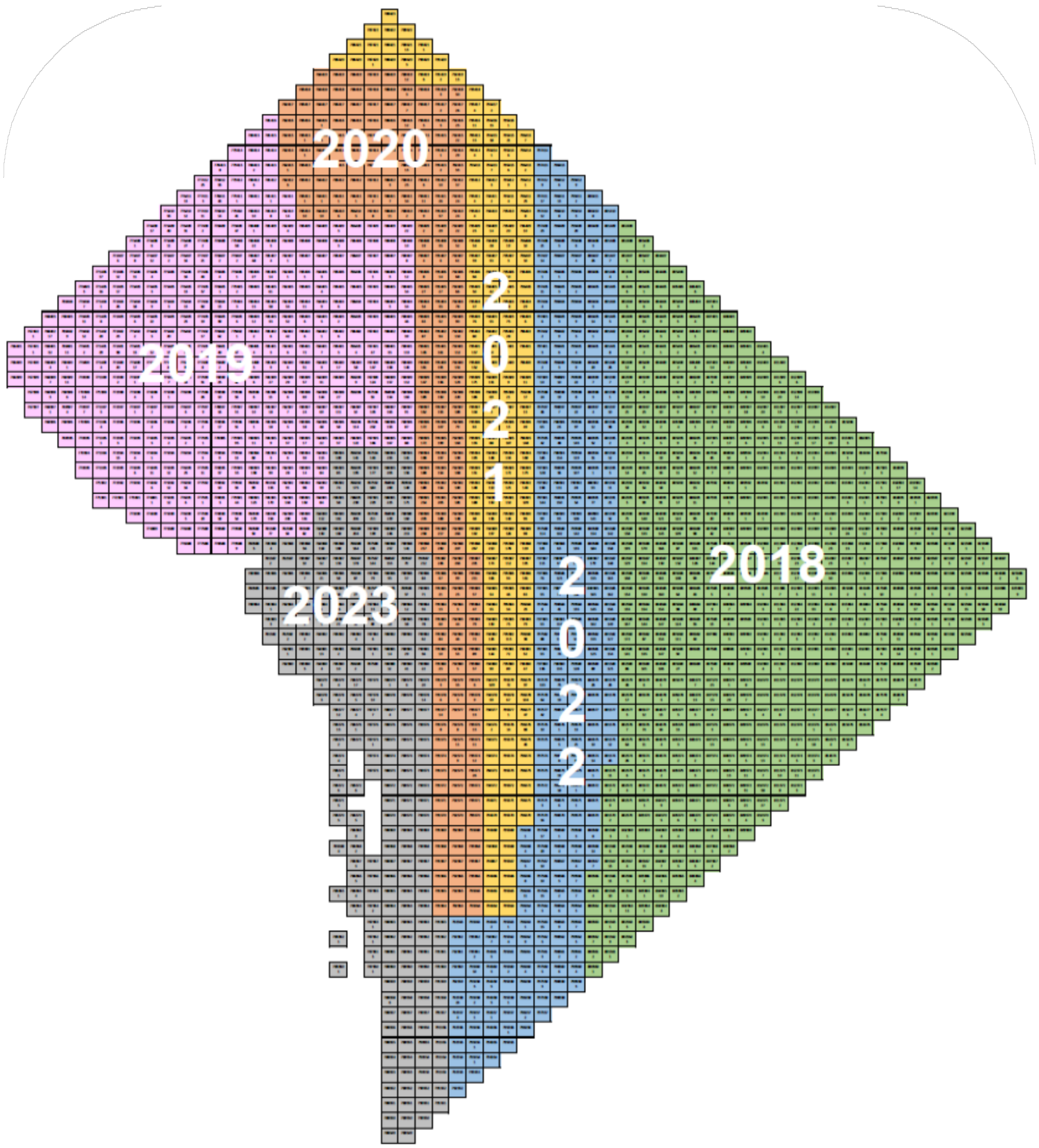
Figure 3.2-B2: Manhole Inspections Completed – Phase IV



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 for one year.

Figure 3.2- B3: 2018-2023 Manhole Inspection Plan



Quality Control Program

The manhole inspection program QA/QC process is broken into three parts that is to be followed by Aldridge Electric:

- Office Review: A minimum of 15% of the inspected locations are to be reviewed in office after the inspections are complete and the information is uploaded into the manhole inspection database. This review process consists of the following:
    - o Review photos to ensure quality of 360 and Still shots labeled accurately
    - o Verify if manhole cleaning is required based off photos
    - o Verify Output of assessment pdf is accurately filled out
    - o Verify CM work
    - o Verify all manhole locations deemed out of scope or missing.
- Field Inspection Review: A minimum of 8% of the inspected location are reviewed which include a review of inspectors' work (setup, assessment, safety, etc.) on site at the time of inspection, by the field leadership team.
    - o 2 AE Foreman training and performing quality inspections full time
    - o 1 AE General Foreman providing oversite and quality inspections when available
    - o 1 AE Construction Manager overseeing subcontractor full time
- Field CM Review Process: A minimum of 7% of the inspected locations are reviewed by Foreman and PM daily with 360 completion photos to verify accuracy of work performed. A completion log is filled out by crew leader for every manhole worked.
    - ▪ 1 AE Foreman performing quality inspections full time
    - ▪ 1 AE General Foreman providing oversite and quality inspections when available
    - ▪ Verify installed items vs. called out items in assessment
    - ▪ Field Lead identifies all CM work is complete
    - ▪ Verify 360 photo taken upon completion
    - ▪ Crew leader reviewing original assessment to verify accuracy at every location visited

2020 Quality Control Metrics

OFFICE REVIEW (15% Min)			
Month	Locations Visited	QA/QC Performed	%
JANUARY	342	342	100.00%
FEBRUARY	717	717	100.00%
MARCH	960	960	100.00%
APRIL	790	790	100.00%
MAY	1240	1240	100.00%
JUNE	1715	1715	100.00%
JULY	1531	1531	100.00%
AUGUST	1612	1612	100.00%
SEPTEMBER	1368	1368	100.00%
OCTOBER	1661	1661	100.00%
NOVEMBER	1087	1087	100.00%
DECEMBER	752	752	100.00%

FIELD ASSESSMENTS (8% Min)			
Month	Assessments Completed	QA/QC Performed	%
JANUARY	322	30	9.30%
FEBRUARY	641	58	9.00%
MARCH	890	72	8.10%
APRIL	717	65	9.10%
MAY	1067	90	8.40%
JUNE	1422	136	9.60%
JULY	1180	102	8.60%
AUGUST	1256	125	10.00%
SEPTEMBER	1083	93	8.60%
OCTOBER	1309	118	9.00%
NOVEMBER	923	85	9.20%
DECEMBER	715	60	8.40%

FIELD CMs PERFORMED (7% Min)			
Month	CMs Completed	QA/QC Performed	%
JANUARY	0	0	0%
FEBRUARY	0	0	0%
MARCH	0	0	0%
APRIL	0	0	0%
MAY	0	0	0%
JUNE	0	0	0%
JULY	48	48	100%
AUGUST	61	30	49%
SEPTEMBER	106	42	40%
OCTOBER	152	68	45%
NOVEMBER	231	96	42%
DECEMBER	169	52	31%

Appendix 3C: Network Accuracy Procedure Report[76]

[76] 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

Status Report of the Analysis of the Remaining District of Columbia Networks, in Accordance with the Network Accuracy Procedure.

As reported in 2020, 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 Arial 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

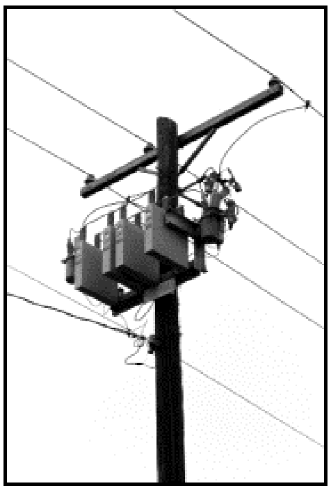
See Cable Joint

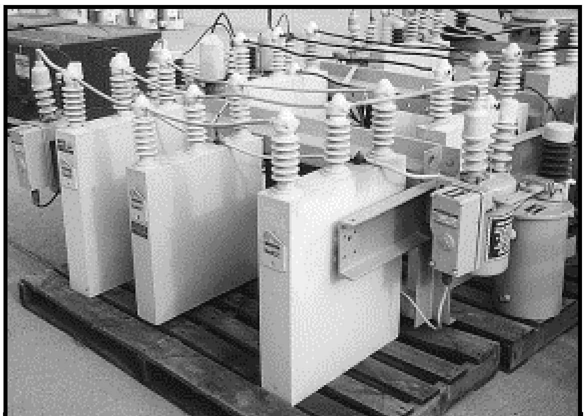
CAIDI (Customer Average Interruption Duration Index)

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.

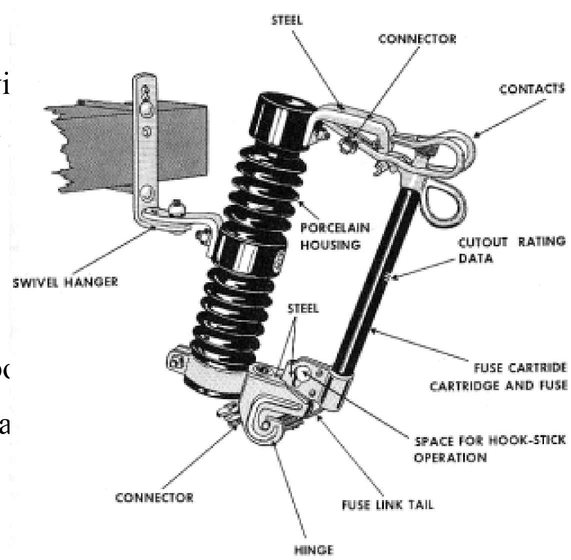
Efficiency

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 wi interrupts the circuit when the current exceeds a particular

Fuse Cutout

A device that is used to de-energize and re- energize compo protects the line and components from the effect of overloa

Fuse Element

The part of a fuse that melts and interrupts the circuit when excessive current flow occurs.

Ground

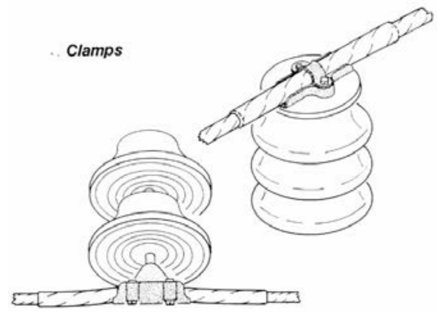
A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the earth or to some conducting body that serves in place of the earth.

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)

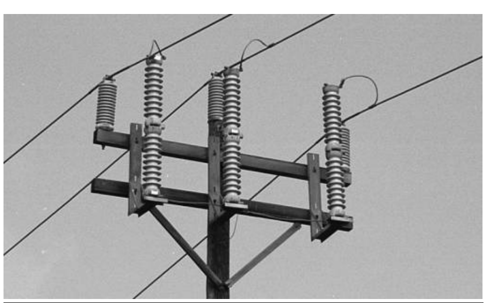
A unit of electric power equal to one thousand watts.

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.

$$pf = \frac{\sum Watts}{\sum RMS\ VoltsxAmperes}$$

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

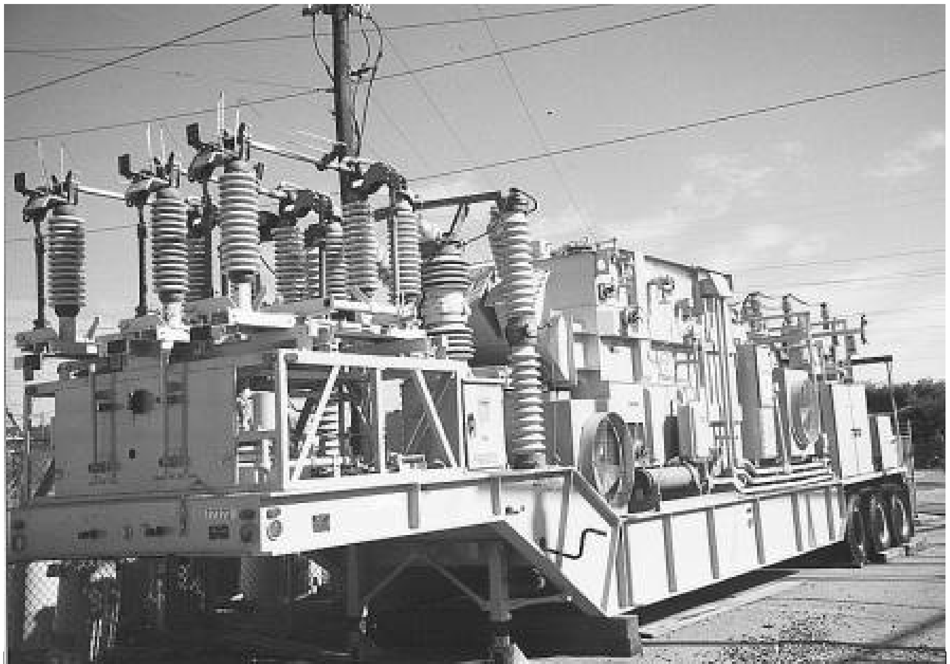
An abnormal connection of relatively low resistance, whether made accidentally or intentionally, between two points of different potential in a circuit.

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

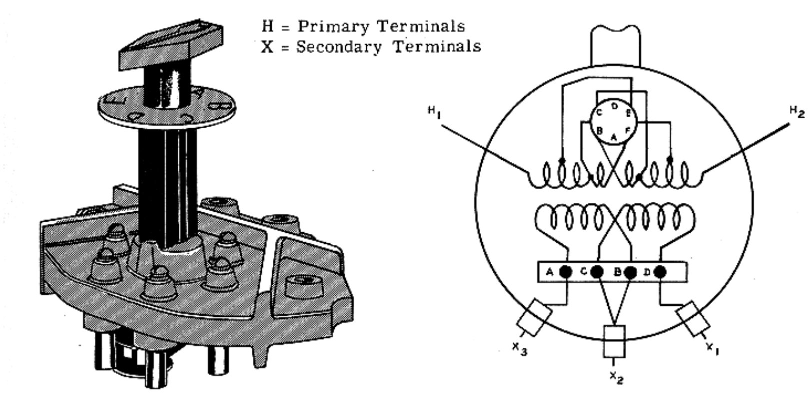
Switchgear

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

Typical Internal Wiring of Transformer with Tap Changer

Tap Changer

A device for changing the turns ratio of a transformer.

Telemetering

Transmission of intelligence such as meter readings over a 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.

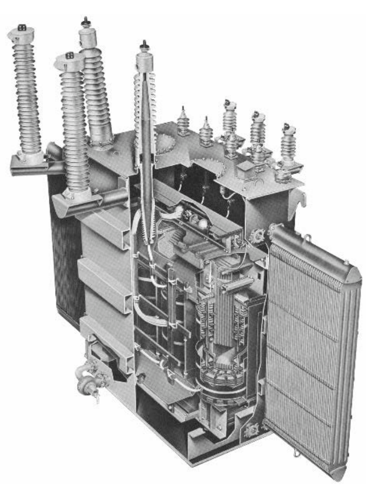
Three-Wire System

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:

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:

Customer growth projections by District of Columbia wards (including historical comparisons);

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:

The 2003 PIP is hereby APPROVED, provided that PEPCO:

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:

The 2004 Consolidated Report: Productivity Improvement Plan and Comprehensive Plan is hereby APPROVED, provided that PEPCO:

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:…

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

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:

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.

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:

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. <u>Decision.</u> 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.*

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

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:

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;

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;

The number of primary cable problems found;

The number of secondary cable problems found;

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;

The number of manholes with problems;

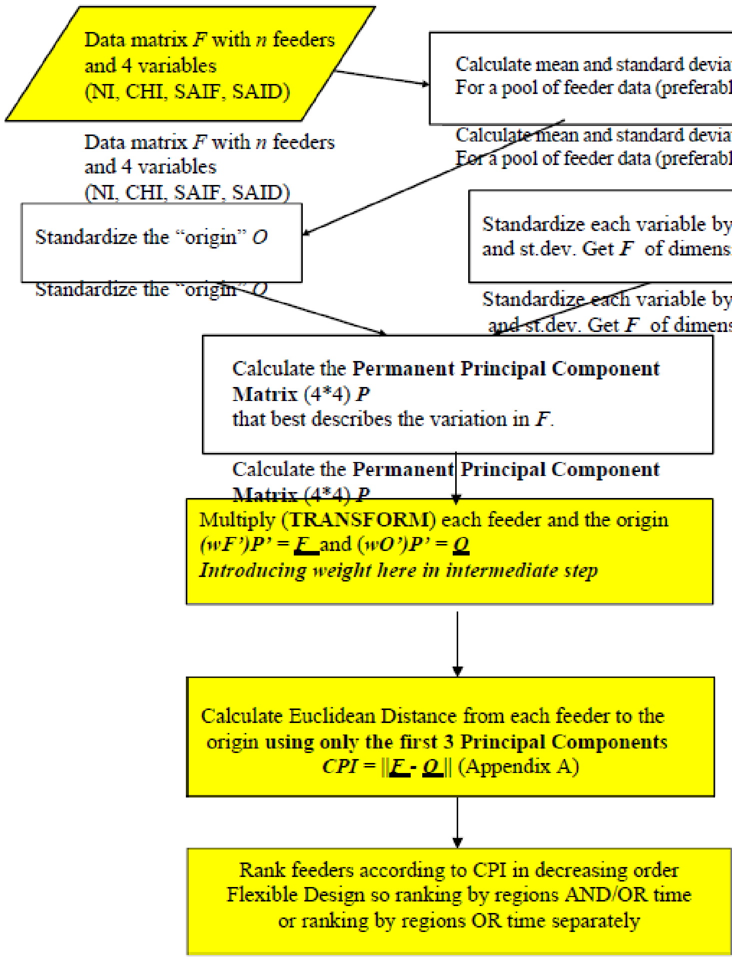
The corrective actions taken for each cable and manhole problem found; and

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.*

<u>DESCRIPTION OF CALCULATION PROCESS</u>

The following flow chart (Figure 4.4-B) illustrates the process for calculating the Composite Performance Index for a feeder.

<u>Figure 4.4-B -- Illustration of CPI Concep</u>



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

$$originalFeeders = F = \begin{bmatrix} f_{1,NI} & f_{1,CHI} & f_{1,SAIF} & f_{1,SAID} \\ f_{2,NI} & . & . & . \\ . & . & . & . \\ f_{n,NI} & . & . & f_{n,SAID} \end{bmatrix}$$

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

$$M = \Sigma * W = \begin{bmatrix} \sigma_{NI} & 0 & 0 & 0 \\ 0 & \frac{w_{CHI}}{\sigma_{CHI}} & 0 & 0 \\ 0 & 0 & \frac{w_{SAIF}}{\sigma_{SAIF}} & 0 \\ 0 & 0 & 0 & \frac{w_{SAID}}{\sigma_{SAID}} \end{bmatrix}$$

Transformation

$$\hat{F} = F * M * P'$$

$$\hat{F} = \begin{bmatrix} f_{1a} & f_{1b} & f_{1c} & f_{1d} \\ f_{2a} & . & . & . \\ . & . & . & . \\ f_{na} & . & . & f_{nd} \end{bmatrix}$$

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

PHI

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 intergrated 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.

Proj - Project Group	Prod - Descr	ITN Name	2020 CapEx Actuals 1/1/ - 12/31
74083	Distribution - DC	74083: Waterfront Sub - Establish Waterfront North LVAC Network Group	466,548
75093	Distribution - DC	75093: NB Commercial Pepco DC	219,804
75095	Distribution - DC	75095: PEPCO DC NB Network Commercial	32,509
62161	Distribution - DC	62161: New Jersey Ave Reliability Initiative - Pepco DC	242,669
62215	Distribution - DC	62215: Pepco DC DC PLUG FEEDER 00308	4,850,617
62219	Distribution - DC	62219: Pepco DC DC PLUG FEEDER 14900	673,564
62221	Distribution - DC	62221: Pepco DC PLUG FEEDER 00368	1,351,501
62222	Distribution - DC	62222: Pepco DC DC PLUG FEEDER 14758	1,027,078
70031	Distribution - DC	70031: 1005 1ST ST NE- NBC (DLPCS1W029)	(5,021)
70060	Distribution - DC	70060: 13.8kV Swgr Replacement - Pepco DC (UDSPRD8KD)	1,583,980
70096	Distribution - DC	70096: 13kV Distribution Cutovers "F" St to "L" St (UDLPLM7W27)	2,916,439
70117	Distribution - DC	70117: 1550 1ST ST SW- NBC (DLPCS6W036)	(22,449)
70177	Distribution - DC	70177: 301/331 N St NE- NBC (DLPCS6W044)	1,240,804
70187	Distribution - DC	70187: 4kv Substation Automation - DC (UDSPRD8H)	572,351
70433	Distribution - DC	70433: Alabama Ave Sub 136: Extend 7 Fdrs to Retire Anacostia (UDLPLWF1)	771,991
70439	Distribution - DC	70439: Anacostia Sub : Convert 4 to 13kv & Retire Sub (UDLPLWF3)	10,844
70442	Distribution - DC	70442: Animal Guards in Dist Subs: Pepco DC (UDSPRD8JD)	225,683
70554	Distribution - DC	70554: BBNL 808 Bladensburg Road NE-NBC (DLPCS6W023)	703,265
70602	Distribution - DC	70602: Batt & Chgr Replacement Distri. Subs. - DC (UDSPRD8ED)	264,011
70762	Distribution - DC	70762: Pepco DC - ACR/SF6 Control Install/Replace	238,674
70897	Distribution - DC	70897: Cable Pepco DC (UDLPRM4BCX)	1,059,191
71011	Distribution - DC	71011: Champlain - New 34kV Sub (UDSPRD8AD8)	682,173
71012	Distribution - DC	71012: Champlain - New 69kV Sub (DSPRD8AD17)	706,268
71015	Distribution - DC	71015: Champlain to L Street 34kV (UDLPRM4WA8)	406,311
71119	Distribution - DC	71119: Comprehensive Feeder Improvements - Pepco DC (UDLPRM63D)	1,500,696
71138	Distribution - DC	71138: Convert Alabama Ave. Sub 136 Feeder 15178 and 15165 from a 3-wire to a 4-	236,158
71214	Distribution - DC	71214: DC Highway Relocations (UDLPCH0W)	1,605,873
71222	Distribution - DC	71222: DC- Ground Test Device Installation Program (UDSPRD8GTD)	292,002
71231	Distribution - DC	71231: DDOT DC South Capital Street Relocation 34kV UG (UDLPCSCAP2)	237,835
71411	Distribution - DC	71411: Dist Feeder Load Relief - DC (UDLPLM7W)	189,088
71426	Distribution - DC	71426: Pepco DC CM Distribution Substation Capital	2,667,978
71448	Distribution - DC	71448: Distribution Pole Replacements - Pepco DC (UDLPRM4BE)	337,437
71605	Distribution - DC	71605: Emergency Restoration OH PEP DC (DLPRM32DXX)	2,723,367
71612	Distribution - DC	71612: Emergency Restoration UG PEP DC (UDLPRM32DX)	15,807,335
71615	Distribution - DC	71615: Emergency Restoration: Network Transfs & Protectors (UDLPRM3K1)	1,398,283
71630	Distribution - DC	71630: F St Sub Rebuild (69kV) (UDSPLM718A)	59,810
71631	Distribution - DC	71631: F St Sub Rebuild (UDSPLM717A)	119,317
71721	Distribution - DC	71721: Ft Lincoln Reliability Initiative - Pepco DC (UDLPRM4LRD)	60,132
71731	Distribution - DC	71731: G St 4kV Conversion (UDLPRGST1)	1,551,803
71855	Distribution - DC	71855: Harrison Sub: Construct New Sub (UDSPLNW2)	2,676,848
71859	Distribution - DC	71859: Harrison Sub: Extend New Dist Fdrs to 38 (UDLPLNW3)	1,746,452
71864	Distribution - DC	71864: Harvard Rebuild - Distribution Upgrade to 230/13kV, 210 MVA (UDSPRD8AD2)	11,206,186
71867	Distribution - DC	71867: Harvard Rebuild - 13 kV Harvard Load Transfers (UDLPRM4WA6)	9,489,907
72137	Distribution - DC	72137: L St Sub Capacity Expansion Work (UDSPLM722A)	177,783
72268	Distribution - DC	72268: Misc. Reliability Improvements - Pepco DC (UDLPRM4BA)	3,120,663
72355	Distribution - DC	72355: Meter Equipment DC (DLPCMR2DXX)	1,909,709
72359	Distribution - DC	72359: Meter Install DC (UDLPCMR2DX)	1,927,659
72525	Distribution - DC	72525: Mt Vernon Sq Sub: Construct 230/13kv Sub (UDSPLMV3)	9,570,716
72529	Distribution - DC	72529: Mt Vernon Sq Sub: Extend LVAC (UDLPLMV1)	90,236
72733	Distribution - DC	72733: Navy Yard: Transfer to Waterfront Sub. 223 (UDLPLWF7)	1,421
72746	Distribution - DC	72746: Pepco DC - Network RMS - Line	191,336
72750	Distribution - DC	72750: Network Xfmr&Prot Repl Planned: Benni (UDLPRM4BN)	9,418,951
72810	Distribution - DC	72810: North Capitol 4kV Conversion - Pepco DC (UDLPRM8BC)	647,550
72840	Distribution - DC	72840: Northeast Sub. 212 East Network Group (NEW) (UDLPLM7W14)	121,133
72978	Distribution - DC	72978: PILC REPLACEMENT PLANNED (UDLPRPLIC)	9,780,558
72997	Distribution - DC	72997: Padmount Transformer Replacements - Pepco DC (UDLPRM4BO)	18,815
73032	Distribution - DC	73032: Pep-DC Damage Equipment Replacements (UDLPOEMGD)	4,410,900
73042	Distribution - DC	73042: Pumping Plant Upgrades - Pepco DC (UDLPRM9PD)	76,599

Proj - Project Group	Prod - Descr	ITN Name	2020 CapEx Actuals 1/1/ - 12/31
73052	Distribution - DC	73052: Pepco DC: Substation Ventilation (UDSPRD8LD)	2,130,488
73054	Distribution - DC	73054: Pepco DC: Add Sub Condition Monitoring Points (UDSPRD9D5)	1,565,395
73055	Distribution - DC	73055: Benning Area Plan - Pepco DC (UDLPRM4WA2)	1,539,957
73179	Distribution - DC	73179: Planned Rubber/Lead Secondary Replacement (UDLPRM4WA9)	5,784,581
73250	Distribution - DC	73250: Priority Feeder Improvements - Pepco DC (UDLPRM4BF)	1,452,683
73332	Distribution - DC	73332: Recloser Installations (ACR) - Pepco DC (UDLPRM4DJ)	2,063,576
73368	Distribution - DC	73368: Repl 69kV SCFF UG Supl-Georgetown, F St, 22nd St (UDLPRM5SG)	845,065
73371	Distribution - DC	73371: Repl Eng Generators Dist Sub: Pepco DC (UDSPRD8UD)	287,586
73696	Distribution - DC	73696: NRL- Blue Plains DC Water Redundant 69kV Supply	1,113,256
73734	Distribution - DC	73734: Sub 150 Twining City T2 - B-0551 (ECA) (UDSPRD8TC1)	639,534
73762	Distribution - DC	73762: Sub.168 Naval Research-Replace T1 & T2 Transformer (DSPRD8AD11)	4,184,640
73781	Distribution - DC	73781: Substation Improvements and Additions - DC (UDSPRD8AD)	4,546,874
73787	Distribution - DC	73787: Substation Retirements-DC. (UDSPRD8RN)	51,246
73839	Distribution - DC	73839: Takoma to Sligo 69kV Line: Install Three 69kV Feeders (UDLPLM72	6,271,884
73902	Distribution - DC	73902: Transformer Load Management (TLM) Pep - DC (UDLPLM7W21)	338,881
73918	Distribution - DC	73918: Trinidad Sub 106 - Retire (UDSPRD8RO)	11,875
73932	Distribution - DC	73932: 12th St 4kV Conversion - Pepco DC (UDLPRM8BU)	639,254
74033	Distribution - DC	74033: Van Ness SWGR Replacement (Dist Line) - Pepco DC (UDLPRM4WA1)	107,825
74082	Distribution - DC	74082: Waterfront Half-loop Extensions - Pepco DC (UDLPRM4BP1)	665,178
74083	Distribution - DC	74083: Waterfront Sub - Establish Waterfront North LVAC Network Group	1,654,792
74084	Distribution - DC	74084: Waterfront Sub - Install 4th Transformer (UDSPLM7WF4)	1,878,232
74087	Distribution - DC	74087: Waterfront Sub-Extend Fdrs: Transfer HV, Metro, Distrib frm Sta	559,628
74093	Distribution - DC	74093: Waterfront Sub: Construct Third LVAC Group (UDLPLWF6)	938,312
74349	Distribution - DC	74349: Benning 4kV Area-Phase Balancing to Fix Voltage Drop Issues (UD	228,691
74350	Distribution - DC	74350: Pepco DC Fire Protection Distribution (UDSPRD8DC1)	10,960,089
74352	Distribution - DC	74352: FEP Physical Security - Pepco (DC): 22nd Street Sub 124 (UDSPRD	193,601
74353	Distribution - DC	74353: FEP Physical Security - Pepco (DC): 9th Street Sub 117 (UDSPRD8	232,409
74383	Distribution - DC	74383: FEP Physical Security - Pepco (DC): 12th & Irving Sub 133 (	352,632
74590	Distribution - DC	74590: DDOT DC South Capitol Street Bridge Conduit (UDLPLM7001)	11,512,172
75092	Distribution - DC	75092: NB Residential Pepco DC	20,035,713
75092	Distribution - DC	75093: NB Commercial Pepco DC	21,931,333
75093	Distribution - DC	75095: PEPCO DC NB Network Commercial	4,371,365
94237	Distribution - DC	94237: PEPCO Misc ACCTG Projects	(2,274,245)
62223	Pepco General	62223: Pepco DC DC PLUG FEEDER 14007	154,703
62224	Pepco General	62224: Pepco DC DC PLUG FEEDER 15009	177,971
62269	Pepco General	62269: FEP Physical Security - Pepco (DC): New Jersey Ave Sub 161	662,591
62504	Pepco General	62504: Pepco DC Alabama Ave Breakers Installation	2,462,806
62900	Pepco General	62900: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Substation	46,618
62935	Pepco General	62935: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Distribution	22,563
63429	Pepco General	63429: Pepco DC - ITE Air Circuit Breakers	1,122,059
63506	Pepco General	63506:PEPCO(DC) FEP Physical Security-Little Falls	745,704
63507	Pepco General	63507:PEPCO(DC) FEP Physical Security-Florida Ave	357,327
63509	Pepco General	63509:PEPCO(DC):FEP- Physical Security-Georgetown	5,663
63510	Pepco General	63510:PEPCO(DC): FEP- Physical Security-Northeast	4,590
63511	Pepco General	63511: PEPCO DC Dist FEP Physical Security: Southwest	4,484
63556	Pepco General	63556:Pepco DC DC Plug Feeder 00308 - Removal	256,320
63628	Pepco General	63628 Pepco DC Dist: Substation Infrastructure - DC	216,013
63632	Pepco General	63632: Pepco: DC- Storm Water Retention Credit	466,281
63635	Pepco General	63635: Pepco DC- Yards ML 1A & Parcel G	1,113,793
63661	Pepco General	63661: Pepco DC- Yards ML 1B	460,648
63677	Pepco General	63677: Pepco DC: Dist- Spare Transformer Florida T3	1,389,976
63680	Pepco General	63680: Pepco DC Dist: Buzzard 230/34kV Substation	2,350,821
63697	Pepco General	63697: Pepco DC- 1615 Eckington Place, NE	1,086,966
63698	Pepco General	63698: PEPCO DC Parks at Walter Reed	2,233,195
63700	Pepco General	63700: Pepco DC- 1501 Harry Thomas Way, NE	607,350
63702	Pepco General	63702: Pepco DC- 680 Rhode Island Avenue, NE (Blocks 1A, 1B, 2B)	819,287
63704	Pepco General	63704: Pepco DC- 600 Rhode Island Avenue, NE	415,056
63710	Pepco General	63710: Pepco DC- 2607 Reed Street, NE	58,160

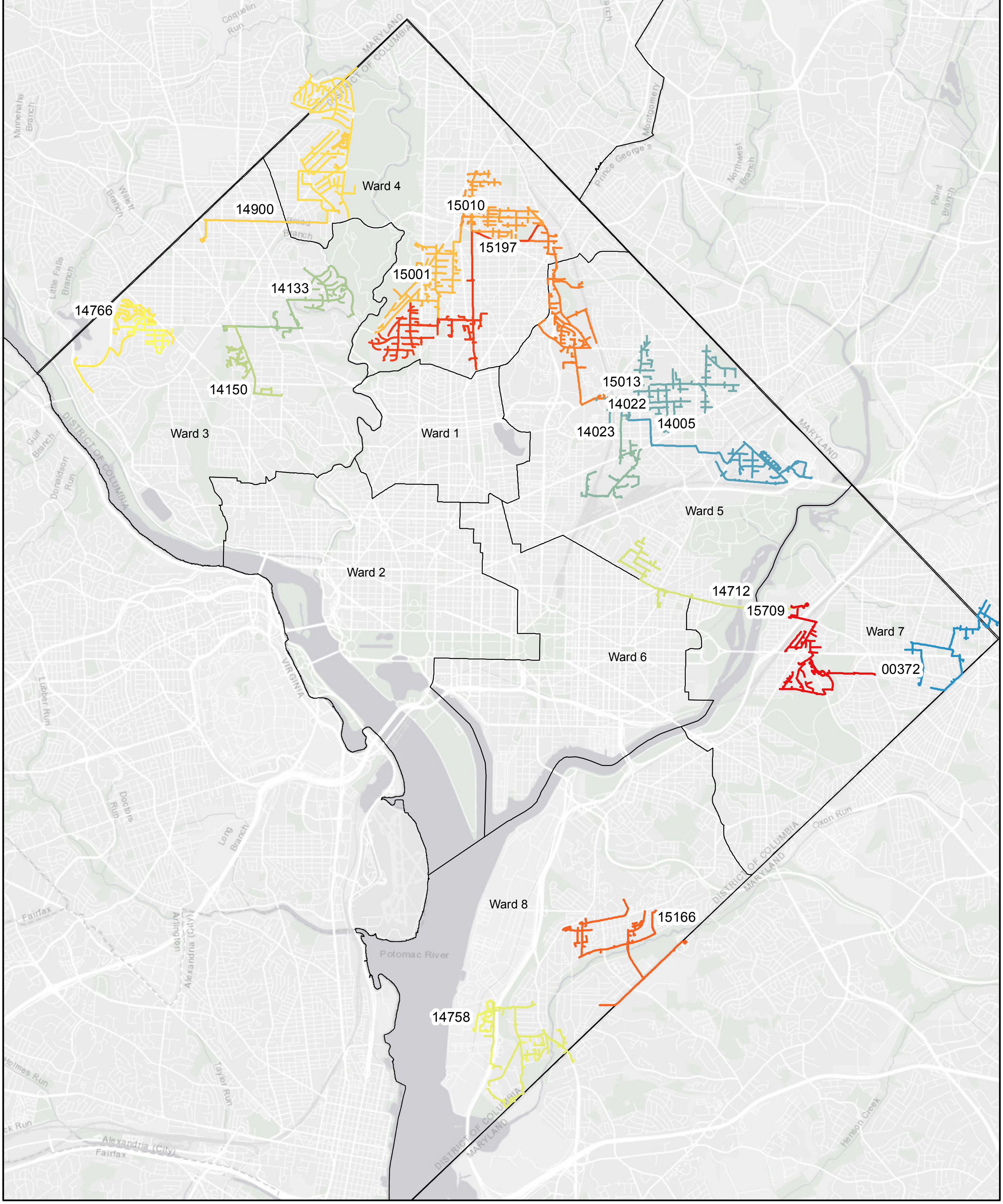
Proj - Project Group	Prod - Descr	ITN Name	2020 CapEx Actuals 1/1/ - 12/31
63718	Pepco General	63718: Pepco DC- 1676 Maryland Ave NE	5,203,827
63725	Pepco General	63725: Pepco DC- 500 Penn Ave NE	7,096
63727	Pepco General	63727: Pepco DC- 1500 Harry Thomas WY NE	410,091
63736	Pepco General	63736: PEPCO DC 300 MORSE ST NE 2 SPOT NTWK 208V	714,814
63923	Pepco General	63923: Pepco DC DC Plug Second Biennial Install	(199,145)
64102	Pepco General	64102: PEPCO DC CM Georgetown Sub 12 Pumps, Bushing & Gasket Replacements	649,934
64396	Pepco General	64396: PEPCO DC: Dist- Three 42MVA Spare Transformers	483,836
64407	Pepco General	64407: PEPCO DC DIST-33MVA Spare Transformer	434,865
64724	Pepco General	64724: PEPCO DC: Mobile Distribution Transformer for Urban Area	166,571
64794	Pepco General	64794: PEPCO DC 4669 South Capitol St SW Distribution	80,880
64796	Pepco General	64796: PEPCO DC 4669 South Capitol St SW Telecom	3,842
64922	Pepco General	64922 PEPCO DC: DIST-Two 56 MVA Spare Transformers	1,235,042
64993	Pepco General	64993: PEPCO DC Dist Florida Ave 4T LTC & Bushing	123,746
65194	Pepco General	65194: Harvard Rebuild - 13 kV Harvard Re-Load	133,813
65551	Pepco General	65551 Pepco DC- DIST:Benning Sub. 41 69kV T8 Replacement	1,511,157
65553	Pepco General	65553: PEPCO DC: DIst- Benning Sub. 41 69kV GIS	187,108
65555	Pepco General	65555: PEPCO:DC-DIST:22nd Street, Sub. 124.T4	7,303
65583	Pepco General	65583: Pepco DC 1300 4th ST NE	1,084,046
70190	Pepco General	70190: 500 Morse Street NE- NBC (DLPCS6W045)	616,811
72752	Pepco IT Projects	72752: New Business DC (UDLPCS6WX)	31,854
		Sub Total:	**252,532,281**

Proj - Project Group	Prod - Descr	ITN Name	2021 CapEx Adj Budget 1/1 - 12/31
62161	Pepco Distribution - DC	62161: New Jersey Ave Reliability Initiative - Pepco DC	5,256,981
62215	Pepco Distribution - DC	62215: Pepco DC DC PLUG FEEDER 00308	74,444
62219	Pepco Distribution - DC	62219: Pepco DC DC PLUG FEEDER 14900	959,901
62221	Pepco Distribution - DC	62221: Pepco DC PLUG FEEDER 00368	1,170,181
62222	Pepco Distribution - DC	62222: Pepco DC DC PLUG FEEDER 14758	1,439,659
70060	Pepco Distribution - DC	70060: 13.8kV Swgr Replacement - Pepco DC (UDSPRD8KD)	3,025,251
70096	Pepco Distribution - DC	70096: 13kV Distribution Cutovers "F" St to "L" St (UDLPLM7W27)	8,180,934
70187	Pepco Distribution - DC	70187: 4kv Substation Automation - DC (UDSPRD8H)	507,740
70439	Pepco Distribution - DC	70439: Anacostia Sub : Convert 4 to 13kv & Retire Sub (UDLPLWF3)	700,420
70442	Pepco Distribution - DC	70442: Animal Guards in Dist Subs: Pepco DC (UDSPRD8JD)	553,793
70602	Pepco Distribution - DC	70602: Batt & Chgr Replacement Distri. Subs. - DC (UDSPRD8ED)	514,159
70897	Pepco Distribution - DC	70897: Cable Pepco DC (UDLPRM4BCX)	4,601,458
71011	Pepco Distribution - DC	71011: Champlain - New 34kV Sub (UDSPRD8AD8)	875,499
71012	Pepco Distribution - DC	71012: Champlain - New 69kV Sub (DSPRD8AD17)	358,468
71015	Pepco Distribution - DC	71015: Champlain to L Street 34kV (UDLPRM4WA8)	3,616,828
71119	Pepco Distribution - DC	71119: Comprehensive Feeder Improvements - Pepco DC (UDLPRM63D)	4,184,665
71204	Pepco Distribution - DC	71204: Pepco DC - Distribution Smart Sensors	329,313
71214	Pepco Distribution - DC	71214: DC Highway Relocations (UDLPCH0W)	2,623,114
71222	Pepco Distribution - DC	71222: DC- Ground Test Device Installation Program (UDSPRD8GTD)	41,946
71231	Pepco Distribution - DC	71231: DDOT DC South Capital Street Relocation 34kV UG (UDLPCSCAP2)	930,210
71411	Pepco Distribution - DC	71411: Dist Feeder Load Relief - DC (UDLPLM7W)	2,834,362
71417	Pepco Distribution - DC	71417: Dist Sub Bushing Replacement: Pepco DC (UDSPRD8FD)	35,943
71418	Pepco Distribution - DC	71418: Dist Sub Bushing Replacement: Pepco DC (UDSPRD8FV)	50,170
71438	Pepco Distribution - DC	71438: Distribution Automation Place Holder - Pepco DC (UDLPRDA1D)	1,348
71440	Pepco Distribution - DC	71440: Distribution DC - HPFF System Cathodic Protection Program (UDLP	859,565
71441	Pepco Distribution - DC	71441: Distribution Feeder Load Relief DC (UDSPLM7W)	1,155,107
71448	Pepco Distribution - DC	71448: Distribution Pole Replacements - Pepco DC (UDLPRM4BE)	1,930,834
71605	Pepco Distribution - DC	71605: Emergency Restoration OH PEP DC (DLPRM32DXX)	2,938,154
71612	Pepco Distribution - DC	71612: Emergency Restoration UG PEP DC (UDLPRM32DX)	15,214,827
71615	Pepco Distribution - DC	71615: Emergency Restoration: Network Transfs & Protectors (UDLPRM3K1)	668,210
71630	Pepco Distribution - DC	71630: F St Sub Rebuild (69kV) (UDSPLM718A)	1,113,001
71631	Pepco Distribution - DC	71631: F St Sub Rebuild (UDSPLM717A)	3,015,517
71721	Pepco Distribution - DC	71721: Ft Lincoln Reliability Initiative - Pepco DC (UDLPRM4LRD)	3,353,648
71731	Pepco Distribution - DC	71731: G St 4kV Conversion (UDLPRGST1)	9,976,881
71855	Pepco Distribution - DC	71855: Harrison Sub: Construct New Sub (UDSPLNW2)	219,522
71864	Pepco Distribution - DC	71864: Harvard Rebuild - Distribution Upgrade to 230/13kV, 210 MVA (UDSPRD8AD2)	18,839,695
71987	Pepco Distribution - DC	71987: Improve/Add Substation Enclosures (UDSPRD8D2)	2
72004	Pepco Distribution - DC	72004: Install 4th 230/69kV 224MVA transformer #12 at Benning (UDSPLM7	656
72064	Pepco Distribution - DC	72064: Install Smart Relays & Replace RTU's -DC (UDSPRD8SD)	116,252
72137	Pepco Distribution - DC	72137: L St Sub Capacity Expansion Work (UDSPLM722A)	1,127,276
72268	Pepco Distribution - DC	72268: Misc. Reliability Improvements - Pepco DC (UDLPRM4BA)	3,148,049
72355	Pepco Distribution - DC	72355: Meter Equipment DC (DLPCMR2DXX)	1,948,929
72359	Pepco Distribution - DC	72359: Meter Install DC (UDLPCMR2DX)	2,030,824
72525	Pepco Distribution - DC	72525: Mt Vernon Sq Sub: Construct 230/13kv Sub (UDSPLMV3)	8,043,449
72529	Pepco Distribution - DC	72529: Mt Vernon Sq Sub: Extend LVAC (UDLPLMV1)	1,963,234
72685	Pepco Distribution - DC	72685: NERC Physical Security Pepco Dist Sub.- DC (UDSPRD8VD)	7,032
72733	Pepco Distribution - DC	72733: Navy Yard: Transfer to Waterfront Sub. 223 (UDLPLWF7)	6
72746	Pepco Distribution - DC	72746: Pepco DC - Network RMS - Line	1,982,037
72750	Pepco Distribution - DC	72750: Network Xfmr&Prot Repl Planned: Benni (UDLPRM4BN)	5,005,769
72810	Pepco Distribution - DC	72810: North Capitol 4kV Conversion - Pepco DC (UDLPRM8BC)	697,250
72978	Pepco Distribution - DC	72978: PILC REPLACEMENT PLANNED (UDLPRPLIC)	12,439,857
72997	Pepco Distribution - DC	72997: Padmount Transformer Replacements - Pepco DC (UDLPRM4BO)	393,361
73032	Pepco Distribution - DC	73032: Pep-DC Damage Equipment Replacements (UDLPOEMGD)	161,434
73042	Pepco Distribution - DC	73042: Pumping Plant Upgrades - Pepco DC (UDLPRM9PD)	210,733
73045	Pepco Distribution - DC	73045: Pepco DC Reg: Salvage Scrap Wire/Cable (UDLPOSV5D)	(999,990)
73052	Pepco Distribution - DC	73052: Pepco DC: Substation Ventilation (UDSPRD8LD)	5
73054	Pepco Distribution - DC	73054: Pepco DC: Add Sub Condition Monitoring Points (UDSPRD9D5)	50,908
73179	Pepco Distribution - DC	73179: Planned Rubber/Lead Secondary Replacement (UDLPRM4WA9)	10,921,867
73250	Pepco Distribution - DC	73250: Priority Feeder Improvements - Pepco DC (UDLPRM4BF)	1,832,735
73332	Pepco Distribution - DC	73332: Recloser Installations (ACR) - Pepco DC (UDLPRM4DJ)	551,237
73348	Pepco Distribution - DC	73348: Pepco DC - Regulator Control Install/Replace	399,974

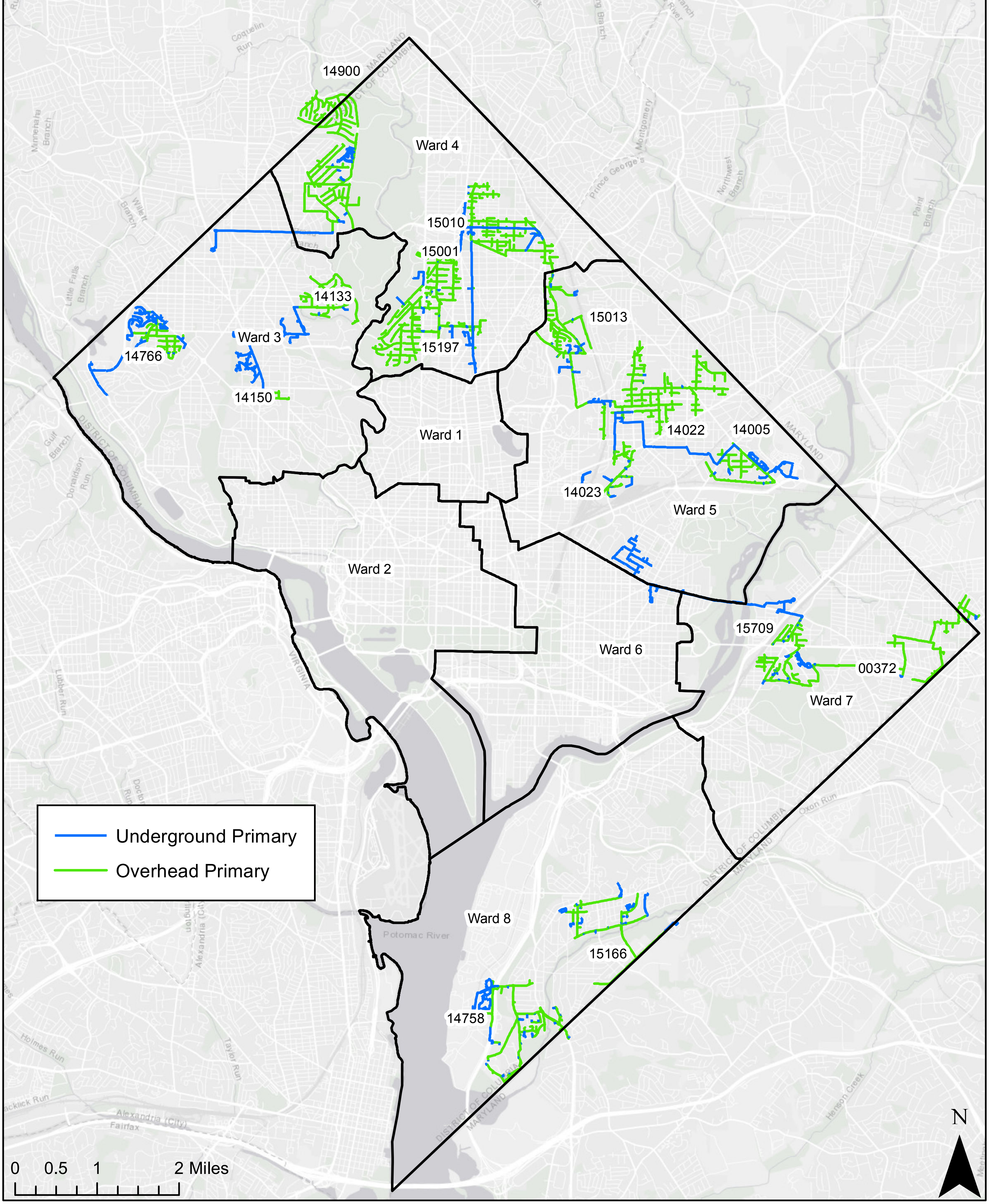
Proj - Project Group	Prod - Descr	ITN Name	2021 CapEx Adj Budget 1/1 - 12/31
73368	Pepco Distribution - DC	73368: Repl 69kV SCFF UG Supl-Georgetown, F St, 22nd St (UDLPRM5SG)	3,396,917
73371	Pepco Distribution - DC	73371: Repl Eng Generators Dist Sub: Pepco DC (UDSPRD8UD)	69,952
73399	Pepco Distribution - DC	73399: Replace Deteriorated Dist Transformers DC (UDSPRD9GD)	27,481
73452	Pepco Distribution - DC	73452: Retire Anacostia 4kV and 13kV Substations (UDSPRD8RW1)	895,321
73651	Pepco Distribution - DC	73651: TripSaver Installations - Pepco DC (UDLPRM4WJ)	234,475
73696	Pepco Distribution - DC	73696: NRL- Blue Plains DC Water Redundant 69kV Supply	202,543
73698	Pepco Distribution - DC	73698: Sta. C Replace RTU, breakers & Station Service (UDSPRD8SB)	573,736
73762	Pepco Distribution - DC	73762: Sub.168 Naval Research-Replace T1 & T2 Transformer (DSPRD8AD11)	8,931
73787	Pepco Distribution - DC	73787: Substation Retirements-DC. (UDSPRD8RN)	216,477
73839	Pepco Distribution - DC	73839: Takoma to Sligo 69kV Line: Install Three 69kV Feeders (UDLPLM72	4,234,182
73902	Pepco Distribution - DC	73902: Transformer Load Management (TLM) Pep - DC (UDLPLM7W21)	708,359
73918	Pepco Distribution - DC	73918: Trinidad Sub 106 - Retire (UDSPRD8RO)	2,470
73932	Pepco Distribution - DC	73932: 12th St 4kV Conversion - Pepco DC (UDLPRM8BU)	3,091,579
74033	Pepco Distribution - DC	74033: Van Ness SWGR Replacement (Dist Line) - Pepco DC (UDLPRM4WA1)	2,387,350
74083	Pepco Distribution - DC	74083: Waterfront Sub - Establish Waterfront North LVAC Network Group	57,502
74085	Pepco Distribution - DC	74085: Waterfront Sub - Install 5th Transformer (UDSPLM7WF3)	16,616
74087	Pepco Distribution - DC	74087: Waterfront Sub-Extend Fdrs: Transfer HV, Metro, Distrib frm Sta	1,878,502
74093	Pepco Distribution - DC	74093: Waterfront Sub: Construct Third LVAC Group (UDLPLWF6)	1,751
74354	Pepco Distribution - DC	74354: PEP - Wedge for DC Dist Sub (UDSPSPDACR)	(21,522,420)
74590	Pepco Distribution - DC	74590: DDOT DC South Capitol Street Bridge Conduit (UDLPLM7001)	22,048,462
75093	Pepco Distribution - DC	75093: NB Commercial Pepco DC	32,770,932
75095	Pepco Distribution - DC	75095: PEPCO DC NB Network Commercial	1,346,344
62223	Pepco General	62223: Pepco DC DC PLUG FEEDER 14007	857,914
62224	Pepco General	62224: Pepco DC DC PLUG FEEDER 15009	848,182
62504	Pepco General	62504: Pepco DC Alabama Ave Breakers Installation	1,655,559
62900	Pepco General	62900: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Substation	2,214,221
62935	Pepco General	62935: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Distribution	65,009
63208	Pepco General	63208: Pepco DC Alabama Ave. Sub 136 Feeder 15166 Battery Fiber/Telecom	130,835
63344	Pepco General	63344: PEPCO DC Feeder 15165 Extension	578,084
63429	Pepco General	63429: Pepco DC - ITE Air Circuit Breakers	178,013
63509	Pepco General	63509:PEPCO(DC):FEP- Physical Security-Georgetown	206,621
63510	Pepco General	63510:PEPCO(DC): FEP- Physical Security-Northeast	207,720
63511	Pepco General	63511: PEPCO DC Dist FEP Physical Security: Southwest	410,256
63514	Pepco General	63514:PEPCO(DC): FEP-Physical Security-Van Ness	11,604
63556	Pepco General	63556:Pepco DC DC Plug Feeder 00308 - Removal	36,025
63628	Pepco General	63628 Pepco DC Dist: Substation Infrastructure - DC	516,518
63632	Pepco General	63632: Pepco: DC- Storm Water Retention Credit	200,600
63635	Pepco General	63635: Pepco DC- Yards ML 1A & Parcel G	57,462
63643	Pepco General	63643: Pepco DC Dist: Drainage and Driveway Remediation	150,844
63661	Pepco General	63661: Pepco DC- Yards ML 1B	230,256
63666	Pepco General	63666: Pepco DC 1000 South Capitol St SE	802,815
63679	Pepco General	63679: Pepco DC: Dist-Mobile Transformer	50
63680	Pepco General	63680: Pepco DC Dist: Buzzard 230/34kV Substation	4,226,541
63698	Pepco General	63698: PEPCO DC Parks at Walter Reed	6,544,217
63725	Pepco General	63725: Pepco DC- 500 Penn Ave NE	176,926
64120	Pepco General	64120:PEPCO(DC):Dist-Station Service Transformer Replacement Buckets	115,552
65194	Pepco General	65194: Harvard Rebuild - 13 kV Harvard Re-Load	2,026,244
65534	Pepco General	65534: PEPCO DC Replace Three (3) I Street Transformers	1,120
65537	Pepco General	65537: PEPCO DC O Street Sub 2, Transformer # 2 Spare	157
65551	Pepco General	65551 Pepco DC- DIST:Benning Sub. 41 69kV T8 Replacement	82,119
65553	Pepco General	65553: PEPCO DC: DIst- Benning Sub. 41 69kV GIS	5,352,951
65554	Pepco General	65554 Pepco DC - Dist: Little Falls T4 Install	193,223
65555	Pepco General	65555: PEPCO:DC-DIST:22nd Street, Sub. 124.T4	1,105,029
65559	Pepco General	65559: Pepco DC - Dist Replace L St Switchgear	(49,497)
74082	Pepco General	74082: Waterfront Half-loop Extensions - Pepco DC (UDLPRM4BP1)	1,109,128
74350	Pepco General	74350: Pepco DC Fire Protection Distribution (UDSPRD8DC1)	2,533,158
63056	Pepco IT Projects	63056: Pepco DC CM Non-emergency Dist Sub Cap	80,882
63645	Pepco IT Projects	63645: Pepco DC - UG SCADA Interrupter Install/Replace	1,816,862
63647	Pepco IT Projects	63647: Pepco DC - UG SCADA Interrupter Control Install/Replace	479,942
64355	Pepco IT Projects	64355: Pepco DC: Roof Replacements Distribution	343,974
64357	Pepco IT Projects	64357: Pepco DC: Sub Ventilation Distribution	77,846

Proj - Project Group	Prod - Descr	ITN Name	2021 CapEx Adj Budget 1/1 - 12/31
64365	Pepco IT Projects	64365: Pepco DC: Sub Imprv. & add. Distribution	904,399
75092	Pepco IT Projects	75092: NB Residential Pepco DC	24,963,576
		Sub Total:	**268,275,037**

District Of Columbia Priority Feeders 2021



District Of Columbia Priority Feeders 2021



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) 2012-2020 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

Exelon®

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 2020, PHI has had a 21% reduction in OSHA recordable injuries, 29% reduction in Days Away Restricted Time Cases. This was PHI's best safety performance since 2014 (a 43% improvement from 2016 merger performance).

PHI initiated the following safety programs in 2020:

- Focused observation initiative implemented by leadership to ensure employee adherence to required COVID-19 PPE behaviors within field teams and crews.
- Alignment with other Exelon Utilities on screening strategy for employees working in high-density, critical infrastructure workspaces
- Developed shift work strategies that promote less employee interaction while maintaining necessary support levels.
- 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) 2019 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	Second Quartile
2020	0.94	Second Quartile

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.

pepco
An Exelon Company

Bill Sullivan
Vice President
Technical Services

EP8603
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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: 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 2020 conformed to the plan.

Sincerely,

Will Sull

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:

As discussed above, Pepco is retiring the 34 kV Transformer sources at L Street Substation and replacing them with 69kV transformer sources. As a result of this change, some of the construction dates have changed below.

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-Containd 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.

Updated Construction Schedule:

L Street Substation: 2023-2025
F Street Substation: 2025-2028
I Street Substation: 2029-2030
69kV Supplies: 2022-2028
34kV Supplies: 2019-2025
13kV Supplies: 2019-2029

Updated Construction Schedule:

Please see above updated construction scheduled as of April 15, 2021

CERTIFICATE OF SERVICE

I hereby certify that a copy of Potomac Electric Power Company's Annual Consolidated Report was served this April 15, 2021 on all parties in PEPACR 2021-01 and Formal Case No. 1119 by electronic mail.

Ms. Brinda Westbrook-Sedgwick
Commission Secretary
Public Service Commission
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/s/ *Dennis P. Jamouneau*

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