



October 2013

Mayor's Power Line Undergrounding Task Force

Findings & Recommendations

Final Report

Government of the District of Columbia
Executive Office of the Mayor

by participating agencies and utilities:





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The purpose of the Power Line Underground Task Force was to: “advise the Mayor on the general causes of storm-related power outages in the District, actions that may be taken to reduce future storm-related power outages, and the undergrounding of power lines.”

INTRODUCTION

Background

On August 16, 2012, Mayor Vincent C. Gray issued Executive Order 2012-130, which established the “Mayor’s Power Line Undergrounding Task Force.” The overall objective was to improve electric system reliability/resilience in response to more frequent weather events and their impact on the electric distribution system.

The formation of the Task Force came in the wake of a series of powerful storms that hit the Washington, DC metro area during the past several years. The table on the next page lists the major weather events that occurred between 2003-2012, as well as statistics demonstrating the impact of each storm on electric service within the District of Columbia. The disruptive effect of these storms – specifically as a result of damage done to electric service – cannot be overstated. A November 2012 issue of National Defense online newsletter described the June 29, 2012 Derecho as “a case of power delivery threatening to assume national security proportions.”¹

¹ “Energy Security Starts With Hardening Power Grids,” Michael G. Frodl and John M. Manoyan, National Defense Magazine, November 2012, accessed at <http://www.nationaldefensemagazine.org/archive/2012/November/Pages/EnergySecurityStartsWithHardeningPowerGrids.aspx>



This table features all of the major weather events that have impacted the District of Columbia over the past ten years. It demonstrates a higher frequency of events during the past three years (eight events) compared to the previous seven years (four events).

Particulars of Major Service Outage	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
1										
Date of Major Event	Aug 26		July 23			June 4		July 25	Jan 26	June 22
Customers Out (at Peak)	18,023		21,444			11,775		35,369	32,383	19,561
Customers Out (Total)	323,276*		90,473			24,802		51,631	51,641	29,126
Storm Period (Start to Restoration Completion)	122 Hours		82 Hours			98 Hours		92 Hours	108 Hours	51 Hours
Average Restoration Time	10.2 Hours*		7.3 Hours			7.5 Hours		20.5 Hours	13.5 Hours	8.0 Hours
Cause of Major Event	Thunder storm		Thunder storm			Thunder storm		Thunder storm	Snow-mageddon	Thunder storm
2										
Date of Major Event	Sept 18							Aug 12	Aug 27	June 29
Customers Out (at Peak)	135,138							14,482	38,472	75,896
Customers Out (Total)	546,624*							32,830	76,966	107,321
Storm Period (Start to Restoration Completion)	244 Hours							64 Hours	128 Hours	180 Hours
Average Restoration Time	55.9 Hours*							6.7 Hours	15.1 Hours	34.2 Hours
Cause of Major Event	Hurricane Isabel							Thunder storm	Hurricane Irene	Derecho
3										
Date of Major Event										Sept 8
Customers Out (at Peak)										13,140
Customers Out (Total)										16,260
Storm Period (Start to Restoration Completion)										38 Hours
Average Restoration Time										5.0 Hours
Cause of Major Event										Thunder storm
4										
Date of Major Event										Oct 29
Customers Out (at Peak)										9,694
Customers Out (Total)										21,459
Storm Period (Start to Restoration Completion)										54 Hours
Average Restoration Time										5.0 Hours
Cause of Major Event										Hurricane Sandy**

*Includes customers out in Pepco Maryland territory; **Not an official Major Service Outage

Table 1 – Historical Major Events in the District of Columbia (2003-2012)

TASK FORCE MEMBERS

CO-CHAIRMEN:

Allen Y. Lew, City Administrator, Office of the City Administrator

Joseph Rigby, Chairman of the Board, President, CEO, Pepco Holdings, Inc.

MEMBERS:

Yvette Alexander, Councilmember, Council of the District of Columbia

Keith Anderson, Director, Department of the Environment

Terry Bellamy, Director, Department of Transportation

Karen Campbell, Vice President, State Government Affairs, Mid-Atlantic Region, Verizon

Matthew Frumin, Resident Representative – Ward 3

Natwar Gandhi, Chief Financial Officer, Office of the Chief Financial Officer

Eric Goulet, Budget Director, Office of Budget and Finance

Herbert Harris, Jr., Resident Representative – Ward 7

William Howland, Director, Department of Public Works

Betty Ann Kane, Chairman, Public Service Commission

Sandra Mattavous-Frye, People's Counsel, Office of the People's Counsel

Brian McDermott, Engineering Supervisor, DC Water and Sewer Authority

Steven Price, Division Head, Construction & Field Operations, Washington Gas

Paul A. Quander, Jr., Deputy Mayor, Office of the Deputy Mayor of Public Safety and Justice

Donna Rattley-Washington, Vice President, Government Affairs, Comcast Cable

Thomas K. Steel, Jr., Vice President and Regulatory Counsel, RCN



Purpose

The purpose of the Task Force was to pool the collective resources available in the District to produce an analysis of the technical feasibility, infrastructure options and reliability implications of undergrounding new or existing overhead electric distribution facilities in the District. These resources included a legislative body, regulators, utility personnel, community representatives, experts and other parties who could contribute in a meaningful way to the Task Force. The financing and required legislative or regulatory actions associated with undergrounding were also evaluated. This analysis was intended to help provide a path forward for ultimately improving the reliability during severe weather events.

Mayor's Directive

The Executive Order assigned the Task Force with evaluating:

- A. The general causes of storm-related outages in the District;²
- B. Examining the information related to major storm-related power outages in the District in the past ten (10) years, including the number of customers impacted by the outages and the duration of the outages;
- C. The cost and feasibility of undergrounding existing overhead power lines in the District, including undergrounding all power lines, undergrounding only mainline primary lines, and undergrounding targeted assets, as well as the impacts of undergrounding on reliability and restoration time;
- D. Other potential effects of the undergrounding of power lines, including impacts on the environment, infrastructure, health and safety, and quality of life; and
- E. Other options that may be explored instead of, or in addition to, undergrounding power lines to reduce the number of customers impacted by power outages due to storms and to reduce the duration of such power outages.

² Although the Taskforce was convened in response to storm-related outage events, outages caused by deliberate acts would be equally disruptive. The Federal Bureau of Investigation has long noted its concern regarding the possibility that terrorists may target the electrical power grid and other infrastructure facilities. According to the National Consortium for the Study of Terrorism and Responses to Terrorism, Washington, DC ranks within the top 5 United States cities as potential targets of terrorism. Undergrounding electrical lines provides an additional layer of protection from potential attacks on the infrastructure, in addition to mitigating weather-related events.



Recommendations of the Task Force Co-Chairs

The Task Force Co-chairs support the adoption of the recommendations reached by the Task Force Committees, as described in greater detail in this report. There remain, however, complex issues related to the financing of the recommended projects. These issues will require new legislation and action to be taken by the Public Service Commission. It is also clear that a significant plan needs to be implemented in order to upgrade the electric distribution infrastructure so that it may withstand more frequent weather events. This is due to the following circumstances identified by the Task Force:

- a) Electric power distribution service in the District of Columbia is vulnerable to equipment failures on the overhead system of the electric company, caused by high winds, flooding, lightning strikes, snow and ice accumulations, foreign contact between overhead equipment and animals, trees and other objects, and by other causes. In the past, this damage has caused loss of electric power over extended periods of time for residential and commercial customers, including critical infrastructure customers and other high priority users of electricity. It can be expected that, without significant reliability enhancement measures, similar outages on the electric company's overhead distribution system will continue to occur with more frequent weather events; and
- b) The frequency of electric power outages within the District can be expected to decrease when overhead power lines in vulnerable locations are relocated underground. Consequently, selectively undergrounding certain overhead power lines can be expected to minimize the economic, social and other impacts on the District's electricity users caused by more frequent weather events.

In an effort to avoid undue delay in realizing the reliability benefits of the projects, the Task Force Co-chairs offer the following recommendations in order to immediately implement investment as part of the Game Changing nearly \$1 billion program:

1. The Co-chairs of the Task Force recommend that the Mayor accept these recommendations and immediately begin to develop an implementation plan that will allow the required legislative and regulatory actions to be completed in the shortest time possible. Upon appropriate approval of required legislative actions, the work required to design and construct new underground facilities could begin;
2. The first stage of undergrounding (feeder selection, customer education and design) should commence within 90 days of Public Service Commission approval of the undergrounding plan and the financing order, and will involve the



undergrounding of up to 60 circuits of high voltage distribution lines. This approach is consistent with the approach of Scenario 3³ as outlined in this report. By starting with this set of feeders, significant reliability improvements can be expected at a lower cost than if Scenario 3 were implemented for the entire system. Feeder selection will be made in accordance with the criteria established by the Technical Committee and will include poorest performing feeders in Wards 3, 4, 5, 7 and 8 where overhead distribution lines currently exist;

3. The Public Service Commission should implement an Electric Utility Improvement Charge, upon review of the Utility application, in order to facilitate timely recovery of the investment and associated expenses needed for the upgrades concurrently with the investments being made. The Public Service Commission should also approve a financing order that would allow for the recovery of the cost associated with the securitized revenue bonds issued by the District of Columbia to finance a portion of this project. The project would therefore be funded through a combination of Pepco investments (\$500 million), funding provided by the District as part of DDOT Capital Improvement funding (\$62 million⁴), and funds obtained from securitized bonds (\$375 million);
4. The Executive Branch and Pepco should continue to evaluate various financing plans and funding sources explored by the Task Force for additional investments going forward. Achieving manageable bill impact for all customers should remain as a primary financial consideration; and
5. The District Department of Transportation and Pepco will develop operating procedures that outline the process to coordinate work in order to sequence undergrounding of the electric system with capital improvement funding. Where practical, the District may construct portions of the conduit system in accordance with Pepco standards in order to further reduce the overall cost. This coordination of work should also extend to the other projects that result in the major reconstruction of roadways.

In addition to the Co-chairs' recommendations above, the five Committees of the Task Force have also made recommendations.

³ In scenario 3, the primary mainline and laterals will be undergrounded. In addition, the overhead primary wire and equipment as well as the pole mounted transformers will be removed from the poles. New transformers will be placed on the ground or underground in manholes and will be supplied from the underground lines. The existing overhead secondary and service lines will be left in place. This was the scenario with the largest benefits-to-costs comparison.

⁴ The \$62 million from DDOT is the level of funding included within the current budget. Additional funding up to a total of \$125 million may be requested in the future if appropriate to complete selected work.



Recommendations of the Committees

The Task Force has carefully studied the issue of undergrounding power lines to improve electric system reliability and public safety in the District of Columbia during all kinds of weather, including storms and “blue sky” conditions. The five different Committees of the Task Force (Technical, Finance, Emergency Response, Planning & Research and Legislative & Government Affairs) collaborated with a number of expert resources to analyze the complexities of the issue, develop options, and quantify costs and benefits in order to make recommendations for the Mayor.

The process involved balancing the advantages and disadvantages of undergrounding with other reliability enhancement options, as well as fully exploring the financial implications associated with a program of this magnitude. The options considered were all above and beyond the significant steps that have already been taken by the District and Pepco to improve electric system reliability. After careful review of the options, the Task Force Committees have proposed the following recommendations.

- **Proceed with the selective undergrounding of power lines in the District:**
 - Implement a 7 to 10 year undergrounding program focused on up to 60 distribution lines. This would cost nearly \$1 billion and would limit the average expenditures in any one year to approximately \$200 million;
 - Underground the primary mainline and lateral portions of the feeder, retain the secondary lines and communication lines overhead;
 - Coordinate where possible with other construction projects in the District to reduce costs and combine efforts;
 - Coordinate with the Economic Development Strategy for the District of Columbia;
 - Take advantage of joint construction techniques;
 - Devise a strategy for the Public Service Commission oversight of the undergrounding program and its implementation; and
 - Include in legislation direction and a timeline for the Public Service Commission to review and approve the plan. Also include details regarding the delivery of regular updates that detail the status of the plan and a review of the sharing of cost between the District and Pepco. Legislation will also provide for Pepco to maintain, operate and own the facilities following construction, consistent with its obligation to provide electric distribution service within the District of Columbia.



- **Proceed immediately with legislation to authorize a \$937 million Phase 1 initiative that focuses on undergrounding primary mainlines and laterals for approximately 60 priority feeders that are most likely to experience outages:**

 - The \$937 million shall be funded as follows:
 - Up to \$500 million authorized through a Pepco traditional utility rate surcharge;
 - Up to \$375 million authorized through a utility rate securitization in bonds, through one or more series, issued by the District of Columbia. These revenue bonds are outside the District's debt cap, because electric rates are not part of the General Fund; and
 - \$62 million in savings by synchronizing with approved roadwork.
 - The District shall be responsible for work enhancing roads and construction of vaults, conduits, and manholes in coordination with DDOT road improvement projects;
 - Ratepayer contributions shall be through regulated distribution rates. This is the most equitable way to distribute the cost and will be allocated among customer classes consistent with cost allocation methods as approved by the Public Service Commission;
 - The impact on customer rates will on average be a 3.22% (\$3.25) increase for residential customers in year seven and between 1% and 9.22% for commercial customers. These increases reflect average usage and for commercial customers the individual financial impact will vary between customers; and
 - Low-income electricity users (Residential Aid Discount customers) shall be exempted from any undergrounding surcharges.

- **All relevant District agencies, including DC Water, should immediately begin exploring possible coordination with Pepco for synchronization of planned capital projects, new development, and roadwork with undergrounding opportunities to take advantage of economies of scale and construction savings;**

- **Recommend a legislative review and analysis for a Phase 2 and a Phase 3, at years six and fourteen. Before the Council authorizes additional phases the Finance Committee recommends that:**

 - The Council shall hold a public hearing and community briefing in each quadrant of the city;
 - The Executive, the People's Counsel, the Public Service Commission, and Pepco shall issue written reports and recommendations on the effectiveness of the previous phase, the overall impact on the consumer bill, the reliability impact of implementing the next phase, the impact on tree canopy, and a recommendation as to whether to authorize the next phase; and



- The recommendations of the Public Service Commission and the People's Counsel should be carefully considered by the Council in determining whether to authorize the next phase.
- **Future work must be approved by the Council and could include the following:**
 - Phase 2, if approved, will fund the undergrounding of primary mainlines and laterals for the remaining overhead feeders, or alternative options based on the recommendations in the reports provided to the Council; and
 - Phase 3, if approved, will fund the undergrounding of all secondary and service lines and the potential removal of all poles if communication lines are approved for undergrounding.
- **Pepco to prepare a timeline of the undergrounding project for submission to the Public Service Commission:**
 - A timeline of the undergrounding project for a three year period which, including all major assumptions such as level of spending on undergrounding per year, will provide a realistic assessment of the schedule of the proposed undergrounding project for the lines identified in each three year plan.
- **Develop a public awareness and stakeholder communications plan with budget and engage in extensive consumer education:**
 - Develop and submit a timeline for the electric customer education plan implementation. This implementation should be conducted as soon as possible and in advance of the beginning of substantial construction;
 - Educate District customers: the Task Force feels strongly that there must be an extensive effort to educate District electric customers in simple terms about:
 - The near- and long-term plans for undergrounding;
 - The benefits to be obtained from undergrounding;
 - The cost of undergrounding, including cost allocation;
 - The process by which distribution facilities will be selected for undergrounding;
 - The implications of undergrounding for District residential and commercial customers; and
 - Discussion of alternatives to undergrounding and the undergrounding of selective sections of circuits.
- **Approval of legislation and develop a process at the Public Service Commission to implement the undergrounding program:**
 - Identification of legislation required to support ultimate financing options, to direct the creation of an undergrounding surcharge mechanism;



- The Public Service Commission has the authority to approve the implementation of unique construction programs performed by the utilities within the District of Columbia. The Public Service Commission sets rates, approves special cost recovery mechanisms and has a well-established process for prudence review of cost expended when these costs are being requested to be added to rate base. The Commission will establish the process to be used to gather stakeholder input to the annual construction plan;
 - Reporting and processes will need to be created to set forth the roles and spending limits for Pepco and DDOT consistent with the recommendations of this report, and provide for the Public Service Commission to monitor each parties' compliance with those requirements; and
 - The District of Columbia Department of Transportation should consider adjusting permit and right-of-way fees and processes and consider waiving the public inconvenience fee in order to reduce the overall cost of the program and to expedite the review process in order to reduce the time to construction.
- **Improve emergency preparedness and storm restoration processes:**
 - Avoid impediments to public safety during undergrounding construction through enhanced coordination between public safety organizations and utility work crews for the purpose of identification of road closures and restrictions;
 - Overlay project planning and priority facilities mapping to ensure necessary precautions are taken to prevent electric service disruptions to these facilities during construction;
 - Integrate the communication sector into the District's EOC system;
 - Establish an EOC-compatible wire down recovery strategy for communication services during storm events; and
 - Mandate backup generators for nursing home facilities.
- **Integrate a workforce participation strategy into the undergrounding program:**
 - Examine local workforce participation models to identify best practices that encourage District hiring for capital projects. (For example, the District's Workforce Incentive Program takes advantage of financial benefits – 5 percent of the general contractor fee, and 10 percent of subcontractor payroll when resident participation targets are achieved – to help stimulate local hiring);
 - Collaborate with employment and vocational development centers to identify prospects for preparing District residents for new technologies and operation and maintenance opportunities related to electric utility services; and
 - Develop a workforce participation strategy that aids the contractors, government and District residents, and supports the District



Government's objective of increasing the participation of its residents on capital projects. Incorporate skill-building and competency development programs, as viable.

- **Communication services will work with the electric utility to coordinate undergrounding and improve reliability for customers, where viable:**
 - Undergrounding of communication lines will only be recommended where complete undergrounding of electric facilities is recommended. This recommendation could be driven by economic development objectives or infrastructure improvement projects that may provide further justification for undergrounding of all lines and equipment; and
 - Joint trenching activities, as applicable, will be used to reduce the cost for all utilities.

- **To help ensure that best practices are implemented for the vegetation management program, the following actions should be considered:**
 - UFA should ensure that its review cycle and tree management activities appropriately target areas where trees have negatively impacted the reliability of the electric distribution system;
 - UFA and Pepco should work together to ensure that the location and types of trees planted in areas where power lines are overhead are selected so as to minimize the likelihood of interference with the electric distribution system; and
 - UFA and Pepco should coordinate vegetation management issues related to power line undergrounding. As part of this process, UFA and Pepco should review the District's tree planting schedule, with locations outlined, to ensure that planned planting will not be adversely impacted by the approved power line undergrounding plan.

In order to successfully implement these recommendations, there will need to be continued close collaboration between the District government bodies, Pepco, the Public Service Commission and other stakeholders. In addition, a communication plan needs to be developed that provides a clear overview of the need for this program, the benefits expected to be derived and the financial impact on customers. The allocation of cost will be determined by the Public Service Commission in accordance with the approved legislation. Current expectations are that the cost will be allocated in the same manner as approved in the last Pepco base rate case. These allocations have historically assigned more of the cost recovery to commercial customers, therefore a significant portion of the communication plan needs to provide outreach to this group of customers.



Engineering Alternatives Evaluated

Before coming to its recommendations, the Task Force identified and evaluated many short, medium and long-term measures to mitigate the impact of electric service outages in the District. The measures evaluated are summarized in the table below.

Short Term	Medium Term	Long Term
Reliability Enhancement Plan (REP) (<i>underway</i>); <ul style="list-style-type: none"> • Vegetation Management; • Improving Priority Feeders; • Preparing for System Growth; • Installing Advanced Technologies & Distribution Automation; • Improving Additional Feeders; and • Selective Undergrounding. Electric Quality of Service Standards (<i>implemented</i>); Major Service Outage Restoration Plan (<i>implemented</i>); and Advanced Metering Infrastructure deployment (<i>underway</i>).	Improve Emergency Preparedness and Storm Restoration Processes; Enhanced Vegetation Management; Customer Outreach & Education on Undergrounding; and Increased supply into the District of Columbia by adding new substations and supply capacity.	Undergrounding of Power Lines – estimated \$1 billion (undergrounding/overhead combination based on most severe outages) to \$5 billion (undergrounding all power lines throughout the District) multi-year program; and Alternative Generation and Micro Grids; <ul style="list-style-type: none"> • Distributed Generation; • Energy Storage; and • Micro Grids.

Table 2 – Short, Medium and Long-Term Measures

Task Force Organization

The Task Force consisted of representatives of the Mayor’s Office and other District agencies, Pepco, the Council of the District of Columbia, the Public Service Commission,



the People's Counsel, stakeholder businesses and resident representatives. Monthly Task Force meetings were convened during the period of August 2012 through January 2013 to discuss existing conditions, engineering assessments, and strategic options for improving electric power reliability – particularly during severe weather. This work included an extensive review of technical reports and costs and benefits scenarios. Sub-Committees were formed to prepare targeted analysis and recommendations related to five functional areas: Technical, Finance, Emergency Response, Planning & Research and Legislative & Government Affairs.

Notably, the Technical Committee analyzed outage data for a 32-month period ending August 2012 and evaluated five different undergrounding options for the District of Columbia. This extensive review of outage data during all types of weather provided the information needed for the Task Force to examine the reliability improvement benefits that could be achieved from undergrounding the electric distribution system.



A summary of the functional scope of each Committee is as follows.

Committee	Responsibilities
Technical	<ul style="list-style-type: none"> • Examine existing generation, transmission and distribution systems and connectivity with other jurisdictions, and impact on District planning; and • Assess reliability conditions and define undergrounding options including key processes and scheduling, and coordination with other infrastructure improvements.
Finance	<ul style="list-style-type: none"> • Estimate the costs of various undergrounding options (in coordination with the Technical Committee); and • Determine potential sources of funding for undergrounding, including: customer rate/fees, District capital funds, federal capital improvement funds and federal homeland security and disaster assistance funds.
Emergency Response	<ul style="list-style-type: none"> • Examine storm response of Pepco and agencies, as well as restoration practices; identify strategies to improve coordination; Review impact of tree maintenance programs; and define improvements to enhance reliability.
Planning & Research	<ul style="list-style-type: none"> • Review experience of other jurisdictions that have converted to underground wiring, improved storm response, and strengthened overall system reliability; and • Determine which current District plans (e.g. road reconstruction, development projects) should be coordinated with undergrounding.
Legislative & Government Affairs	<ul style="list-style-type: none"> • Determine the legislative and regulatory changes needed to implement undergrounding, or to improve storm response, or system reliability; and • Draft specific provisions where appropriate.

Table 3 – Committees and Responsibilities

Committee members are listed in their respective Committee sections of this report.



IMPLEMENTATION PLAN

The implementation of the undergrounding program in the District of Columbia will be a complex undertaking with many stages of activities. There are significant milestones that must be achieved before actual undergrounding construction work can begin. The implementation plan will involve a multi-year program to underground power lines across five different Wards in the District, which is a major construction initiative. The cost estimate for this extensive project is up to \$1 billion over a 7 to 10 year implementation period. Construction work will be performed in dense urban neighborhoods. Identifying the feeders, coordinating with pipeline construction projects, obtaining permits and managing other logistical activities will need to be accomplished according to a rigorous production timeline in order to complete the undergrounding program on schedule and within budget.

Implementation planning is based on a 7 to 10 year timeline for phased construction of the undergrounding initiative. Conceptually, the first 9 to 10 months after approval of the undergrounding strategy will focus on fieldwork assessment, engineering, design, permitting, and resource mobilization, including contracting. Undergrounding construction for the initial group of five feeders (covering approximately 3,000 customers) is targeted to start actual construction activities in 2014. The remaining undergrounding is based on a production schedule that allows for completion without inordinate construction stress on residents, neighborhoods, and businesses. The work planning process will coordinate construction with DDOT projects scheduled for the same timeline, as well as economic development priorities that might influence sequencing and neighborhoods.

This multi-year program cannot be successful without proactive assistance from the District, in partnership with Pepco. The following basic provisions will be essential:

- The City Administrator and Pepco appoint a manager that can be the implementation champion, facilitator, and problem-solver, as necessary. This manager assembles and leads a Task Force of key officials from District agencies, and is empowered to direct agencies on project related issues;
- Core District agencies assign staff to support the project, with authority to make decisions on behalf of the agency. The agency representatives may be located with the project design team to facilitate close coordination;
- The District provides expedited permits;
- The District authorizes the necessary street closures, work hours, etc. for construction operations;
- The District ensures, with Pepco, that financing mechanisms and performance requirements are in place to achieve timely funding and recovery of Pepco's program costs;



- Financing and cost recovery mechanisms include a potential securitization and an undergrounding cost recovery mechanism providing return on and of Company investments;
- The District and Pepco implement an ongoing public information and stakeholder communication program to provide reliable and timely information on planning and progress; and
- District assists Pepco with economic development initiatives and coordination between utility projects to gain efficiencies in construction of multiple activities.



EXISTING CONDITIONS

Description of Existing Facilities

The existing electric distribution system within the District of Columbia contains a mix of overhead and underground facilities. The green portions identified on Figure 1 to the left represent overhead power lines and the red portions represent underground power lines. It is also important to note that a significant portion of the electric grid is already constructed underground. For example, some key facts are as follows:

- 4,070 miles of distribution lines;
 - 1,430 miles of overhead lines; and
 - 2,640 miles of underground lines;
- 102,000 citizens connected to overhead lines;
- 155,000 citizens connected to underground lines;
- 40,000 citizens supplied by underground lines are attached to lines that also contain some portion of overhead lines; and
- Majority of high voltage lines that supply the substations are already constructed underground.

There are solid arguments for both underground and overhead electric distribution systems. In general, overhead systems are less costly to install, are longer lasting, and easier to maintain, since problems are easily found and repaired. Underground systems, while more costly to install and maintain, are less susceptible to environmental damage from storms, vegetation and other environmental disturbances. Making the proper choices between overhead and underground facilities requires balancing cost and reliability while evaluating the impact of severe weather on the electric system.

The cost difference between the two options is significant. A rough estimate of the cost to install overhead distribution feeders is \$100,000 to \$200,000 per mile, depending on the specific conditions of that individual feeder. This compares to a cost of between \$2 million to \$5 million to underground that same feeder.

The existing electric distribution system within the District of Columbia distributes electricity at 4kV⁵ and 13 kV voltage levels from transmission and sub-transmission

⁵ kV is the designation that is equal to 1,000 volts, i.e. 4kV is equal to 4,000 volts.

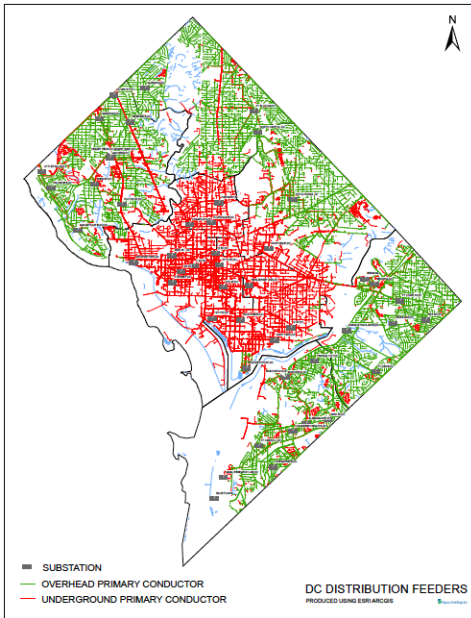


Figure 1 – Underground and Overhead System in Washington, DC

The majority of the underground system is located in the central business district (CBD) and the areas immediately surrounding the CBD, as shown in Figure 1. Overhead supply areas power lines are shown in green, while underground supply areas are shown in red. This high use of underground was mandated from the very beginning of electrification of the District of Columbia and continues today within the central business district and new load growth areas outside of the central business district.



substation supply lines located in the District of Columbia, Maryland and Virginia. Transmission (per the FERC definition) is provided at the 230kV, 138kV and 115kV levels, while sub-transmission is provided at 69kV and 34 kV levels. All transmission and sub-transmission lines within the District of Columbia are underground, except for a short section of 115 kV located on a railroad right-of-way located in Northeast DC, and about seven miles of 34kV circuits supplying one 13 kV distribution substation.⁶ There are several small 4kV substations that are supplied from the 13 kV distribution system, many of which are planned to be retired over the coming years. Undergrounding of these 13 kV supply lines would be evaluated as part of the 13 kV undergrounding program.

System Configuration

System design typically consists of distribution circuits having multiple interconnections with other circuits through the use of switches or other automated devices which can be remotely controlled. This design provides the ability to transfer or move customers from one circuit to another to allow work to be performed on lines without interrupting service. In addition, this design also helps ensure that fewer customers on the system will experience a sustained outage in the event of a problem on the system and faster restoration when an outage does occur. As a result, the overall system is more reliable.

The typical electric system is made up of various components that, when operated together, provide the capacity to deliver power across the entire electric system. Each component is designed to operate at a voltage level that achieves safe and efficient operation of the system. Figure 2 below is a depiction of the electric system.

The Task Force focused on the distribution lines that originate at the substations across the District. These lines consist of the main line, which extends from the substation to the residential and commercial communities. Extending from the main line are lateral connections that provide power to the local transformers, which channel service to the customer. The transformers reduce the voltage level in order to supply the services that are connected directly to each customer. These connections extend the secondary cables from the transformer to the individual service cables that feed each customer's internal electric service equipment.

⁶ These 34kV lines are scheduled to be retired and replaced with new underground lines in 2016 when a new substation is built in northwest Washington.

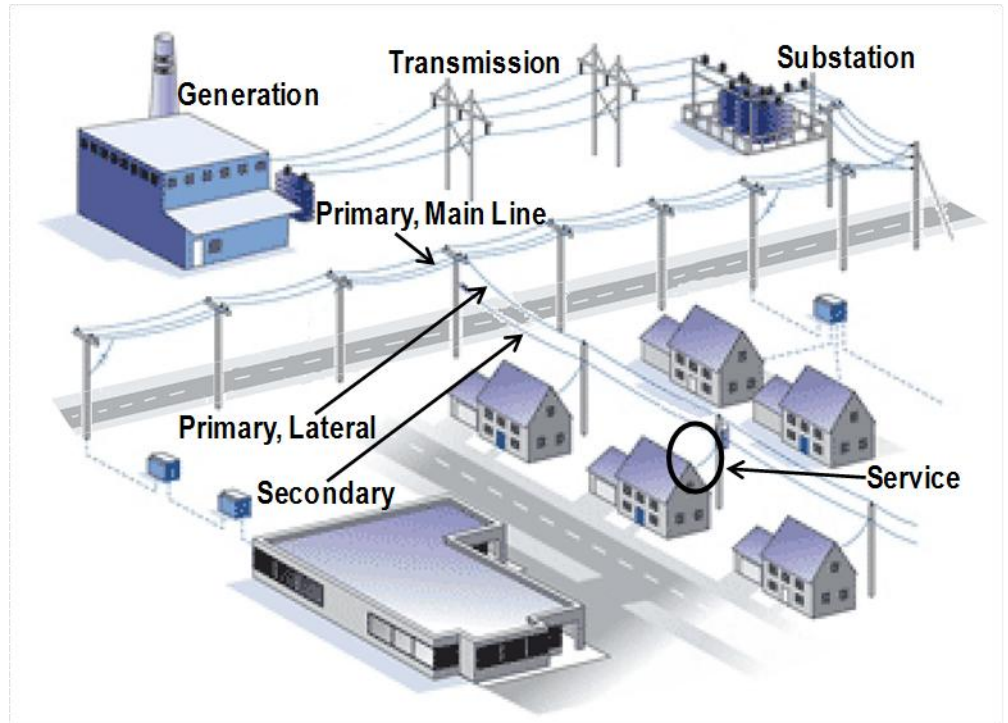


Figure 2 – Overview of Portions of Electric System

There are three types of distribution system electrical connectivity – radial, radial loop, and network design – relevant to an assessment of Pepco’s distribution system. Radial design typically consists of circuits having no interconnections with other circuits. Overhead laterals are typically constructed in this manner. A fault anywhere on the lateral interrupts power to customers beyond the protective device or fuse. Service cannot be restored until the cause of the outage is located and repaired. With overhead construction, damage is visible and easily repaired relative to underground construction, and service interruptions are usually limited in duration. Radial Loop connectivity typically consists of circuits with an interconnection to other circuits as shown below in Figure 3.



CABLE SCHEMATIC - TYPICAL 13,000 VOLT RADIAL LOOP SYSTEM

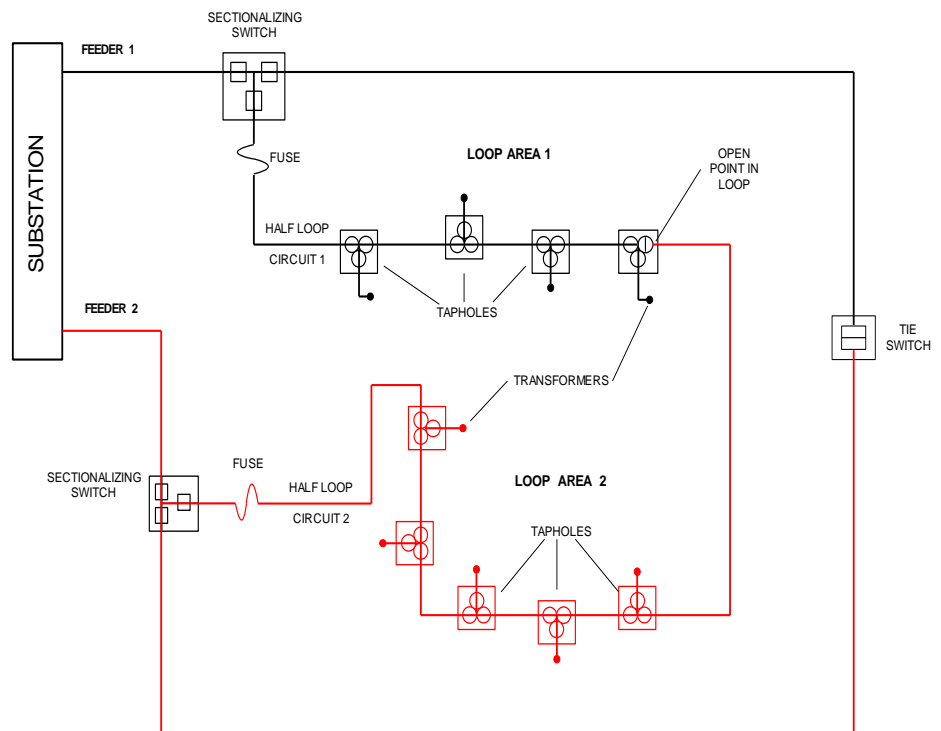


Figure 3 – Loop Cable Schematic

An open point divides the loop into two radial supplies under normal operating conditions. A fault interrupts power to all customers beyond the protective device, as in a radial overhead lateral. However, sectionalizing devices or switches enable the isolation of failed components, and the open interconnection device enables the resumption of supply to consumers not directly involved in a component failure. Underground laterals are usually constructed in this manner. Since the outage cause is difficult to locate and time consuming to repair, relative to overhead, this design allows for the cable fault to be isolated and all customers' service be restored, while the repair work is performed on the failed section of cable.

Because of the cost and complexity of a network type of design, widespread use has generally been limited to downtown urban centers within the District of Columbia. On a very small scale, network design has been used in other dense business districts and in areas where specific consumers paid the additional incremental costs. Figure 4 shows a typical network configuration and the more complex arrangement than a standard



Network connectivity, as illustrated in Figure 4, typically consists of low voltage secondary circuits interconnected between many different transformers so that no consumers will normally experience a service interruption when a high voltage distribution circuit is out of service. Electrical protection and power flow control is difficult and expensive relative to radial or looped design. More sophisticated equipment is required, resulting in additional initial cost and increased maintenance.

looped system. A network system is designed to serve high-density areas with high-energy needs. It also is designed to include redundant circuits so that any one feeder or transformer can be out of service with no loss of load.

Generation and Distribution Connectivity with Other Jurisdictions

Until recently, there were three electric generation facilities directly serving the District of Columbia. These were: Benning, Buzzard Point and Potomac River generating stations. The first two – Benning and Buzzard Point – were retired in May 2012. The last one – Potomac River – was retired in October 2012. As a result of these generation retirements, the District is now totally dependent on the electric transmission system to deliver energy from remote generation facilities.

The reliability of the transmission system in the District is robust. In fact, no customer outages from major weather events have occurred as a result of any transmission system outages. One of the main reasons for this is that nearly all of the major transmission and substation supply lines within the District are located underground. Pepco's overall transmission zone delivers power for 100 percent of the District's peak load. It also delivers power for about 40 percent of the neighboring state of Maryland. Due to the existing high level of reliability at the transmission level, no additional analysis of the transmission system was performed. However, because of the District's critical dependence on the reliability of the transmission system, the Task Force supports the continued compliance with current robust planning criteria followed by Pepco and PJM.⁷ In addition, continued operation of this system in compliance with all NERC⁸ planning criteria is required to ensure that the robustness of the system be maintained.

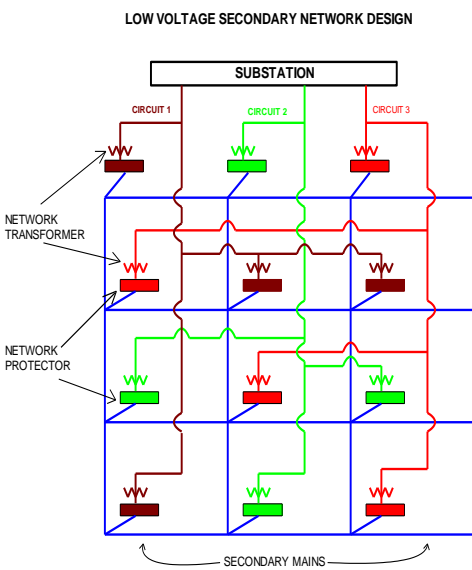


Figure 4 - Network Connectivity

Electric System Statistics

To provide a clearer picture of the electric distribution system in the District of Columbia, a number of statistics are provided below. These statistics cover the following:

- Substations (transmission and distribution);
- Circuit miles; and
- Customers.

The table below provides substation statistics in the District of Columbia:

⁷ PJM is the regional operating and planning authority that is responsible for the operation of the transmission system.
⁸ NERC is the organization responsible for establishing the reliability standards for the bulk electric transmission system.



Substation Type	Underground Supplied	Overhead Supplied	Total
Distribution	36	15	51
Transmission	7	0	7
Total	43	15	58

Table 4 – Substation Statistics in DC

The next table provides details on the number of circuit miles in the District:

Circuit Type	Underground	Overhead	Total
Primary (4kV & 13kV)	1,699 miles (72%)	645 miles (28%)	2,344 miles
Secondary (120V/240V)	937 miles (54%)	788 miles (46%)	1,725 miles
Total	2,636 miles (65%)	1,433 miles (35%)	4,069 miles

Table 5 – Circuit Miles in DC

The third table provides customer statistics, specifically the number of customers supplied from feeders that are greater than 85% overhead, 100% underground or mixed overhead and underground construction:

Customers By Feeder	4kV	13kV	Total	% of Total
Greater than 85% Overhead	27,742	28,495	56,237	22%
100% Underground	10,168	104,964	115,132	45%
Mixed Overhead & Underground	10,008	75,048	85,056	33%
Total	47,918	208,507	256,425	100%

Table 6 – Customers By Feeder in DC

The fourth table provides further customer statistics regarding the number served by overhead versus underground service:

Customers By Service	Total	% of Total
Overhead	101,737	40%
Underground	154,908	60%
Total	256,745	100%

Table 7 – Customers Served By Overhead vs. Underground



Reliability Performance of Existing Systems

The electric system in the District of Columbia has significant portions located underground and data supports that reliability is typically higher in the underground portions of the system. The two pie charts below help illustrate this fact.

The pie chart on the left shows the percentage of feeders by each underground category. The categories are divided into:

- 100% underground;
- 99%-75% underground;
- 74%-50% underground;
- 49%-25% underground; and
- 24%-0% underground.

The chart shows that 17% of the feeders in the District are 24%-0% underground. In other words, they are “majority overhead” feeders (75% to 100% overhead). Nearly one-third (30.1%) of customers in the District are served by these feeders that are 75% to 100% overhead.

The pie chart on the right then shows the percentage of customers affected by outages. Not surprisingly, a large percentage of the customer outages (43.3%) are located on the 17% of feeders that are primarily overhead feeders.

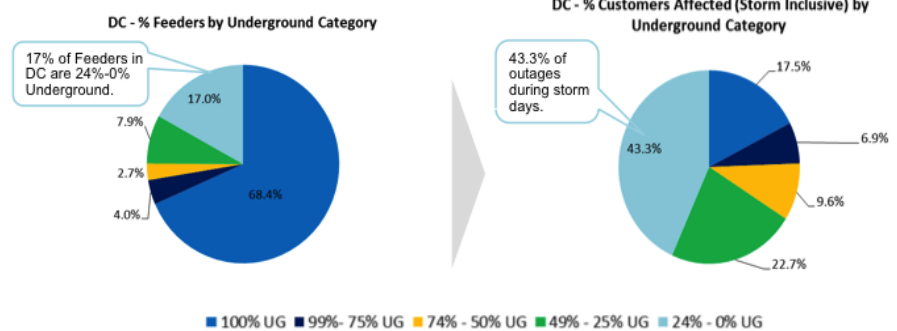


Figure 5 – UG Feeder Categories and Outages

In conclusion, a relatively small percentage of feeders (17%), serving nearly one-third of District customers are responsible for 43.3% of customer outages.



Restoration of Service Priorities

In the event of severe weather that damages the electric system, Pepco prioritizes its service restoration activities. This is so the utility can repair the equipment that will restore the largest numbers of customers first, or address situations that may pose a safety risk. Generally, the power restoration process is as follows:

1. Downed live wires or potentially life-threatening situations and public health and safety facilities (hospitals, fire stations, etc.) without power;
2. Transmission lines serving tens of thousands of customers;
3. Substation supply lines serving thousands of customers;
4. Main distribution lines serving one to two thousand customers;
5. Secondary lines serving neighborhoods; and
6. Service lines to individual homes and businesses.

A graphic illustrating the power restoration process is featured on the next page in Figure 6. During an outage, several of the steps in the restoration process will be addressed simultaneously to help restore electric service as quickly as possible.

During major outages, Pepco maintains close coordination with Homeland Security and Emergency Management Agency (HSEMA). When requested, utilities will provide a representative to be stationed at HSEMA to increase the coordination between agencies and to expedite emergency restoration and response to critical facilities.

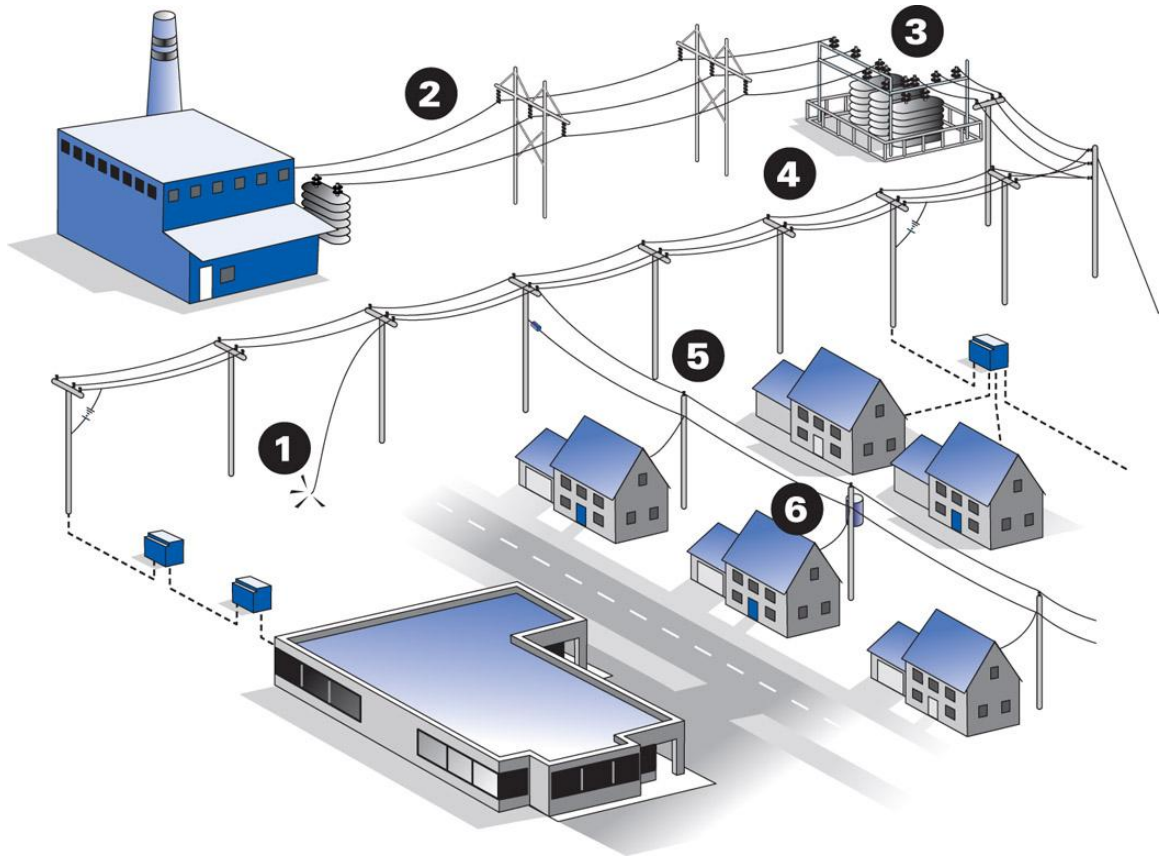


Figure 6 – The Power Restoration Process

By following this power restoration process, Pepco is able to restore power to the largest number of customers in the safest and fastest way possible.



Some of the positive measures that have been playing a key role in the District include:

- *Electric Quality of Service Standards;*
- *Major Service Outage Restoration Plan;*
- *Council of the District of Columbia Legislative Order on AMI; and*
- *Reliability Enhancement Plan.*

ACTIONS TO MITIGATE ELECTRIC SYSTEM OUTAGE IMPACTS, INCLUDING REGULATORY AND LEGISLATIVE

It is important to note that the District of Columbia and related stakeholders have already taken important steps to improve the reliability of electric service. A number of initiatives have been launched that have already resulted in improvements to reliability and the delivery of safe electricity for residents. These initiatives are complementary to the goals of the undergrounding Task Force.

Electric Quality of Service Standards

The Electric Quality of Service Standards (EQSS) were established through the Public Service Commission Notice of Final Rulemaking, dated February 29, 2008. The EQSS serves to institute standards and requirements for ensuring that electric utility distributors and electricity suppliers operating in the District of Columbia meet an adequate level of quality and reliability in their electricity service. The EQSS, which form a part of the “Customer Service and Reliability Standards,” adopted in Commission Order No. 13565 on April 27, 2005, were implemented after the Public Service Commission received significant input and recommendations from the Office of the People’s Counsel (OPC), Pepco and other stakeholders.

With these approved regulations, Pepco is required to report all major and non-major electric service outages and manhole events to the Public Service Commission and OPC. Pepco is also required to report incidents that result in the loss of human life, personal injury requiring hospitalization, or service disruption directly or indirectly arising from, or connected with its maintenance and operation of the electric system. Further, Pepco is also required to comply with established Customer Service and Reliability Standards. In 2013, and extending through 2020, these include completing the restoration of non-major outages within 24 hours following the onset of the outage. Also, beginning January 2013, Pepco is required to meet predefined benchmark levels for SAIDI and SAIFI.⁹ The results for 2012 were such that Pepco exceeded the required level of performance for 2012.

⁹ SAIDI – System Average Interruption Duration Index. This is the average duration of an outage. Mathematically equal to the sum of customer interruption hours divided by total number of customers served. SAIFI – System Average Interruption Frequency Index. This is, on average, how frequently outages occur. Mathematically equal to the sum of number of customer interruptions divided by total number of customers served.



Pepco files quarterly EQSS reports. These filings began with the initial quarterly submission on October 10, 2008 and Pepco continues to file these updates. All reports are posted on the Public Service Commission's website. In addition, Pepco participates in a working group that was established by the Public Service Commission entitled the Productivity Improvement Working Group. Pepco meets quarterly with representatives from the Public Service Commission and OPC to discuss topics relevant to Pepco's operations, performance and reliability of the electric distribution system. The EQSS is one of several positive steps that have been taken to improve electric system reliability in the District.

Major Service Outage Restoration Plan

Another positive step that has been taken involves the development of formal plans to prepare for major service outages. Pepco filed a Major Service Outage Restoration Plan with the Public Service Commission pursuant to the Commission's Notice of Final Rulemaking, dated July 27, 2012. On November 6, 2012, Pepco filed its plan which included procedures/processes for encountering both forecasted and unexpected events that could impact Pepco's electric distribution system.

Pepco's emergency response plan is designed to address events such as customer outages, network facilities interruptions, preparation for a potential event, or an event that requires an immediate response.

Once a major service outage occurs, the objective for Pepco is to safely respond and restore electric service as quickly as possible. Throughout the power restoration process, Pepco works to keep all relevant stakeholders informed of the status of restoration activities. It is important for Pepco to communicate the status of preparations and response strategies internally to employees and externally to its customers and government agencies. Pepco has assigned incident response roles for each of its employees. In addition, Pepco is a member of associations and Regional Mutual Assistance Groups that provide supplemental resources from companies and utilities external to Pepco during major events. Pepco consistently monitors and trains employees in order to be prepared to analyze, direct, perform and complete emergency response activities. Safety, Communications, Contingency Planning, Finances, Technologies, Training and Regulatory Compliance are all addressed as part of its preparation and response.



Council of the District of Columbia Legislative Order on AMI

In June 2009, the Council of the District of Columbia passed the Advanced Metering Infrastructure and Cost Recovery Act of 2009. This Legislation authorized Pepco to implement AMI for all District of Columbia customers provided the Commission determined that Pepco had obtained sufficient federal funding for AMI under the American Recovery and Reinvestment Act of 2009 (ARRA). Subsequently, in December 2009, the Public Service Commission determined that Pepco in fact had received sufficient ARRA funding. As a result, Pepco began installing smart meters for District customers.

Smart meters are helping to improve reliability in the District of Columbia. The new meters have a “last gasp” function that sends an electronic message to Pepco when a meter goes out of service. This message includes the precise location of the outage. In addition, Pepco has the capability to “ping” the new meters so it can tell whether that location has restored power or is continuing to experience an outage. This is especially important if no one is home to report a loss of power.

In compliance with Public Service Commission directives set forth in Formal Case No. 1056, Pepco files weekly notices informing the Commission of the general location for which AMI meter installs occur. In addition, Pepco files monthly area and route reports for installations and monthly identification of obstacles and/or customer concerns reports, respectively. As of the “Third Quarter 2012 Build Metrics Report,” Pepco has installed 264,547 functioning AMI meters within the District.

Reliability Enhancement Plan

Another positive step that has already been taken is Pepco's creation of a Reliability Enhancement Plan (REP). On September 30, 2010, Pepco filed its REP with the Public Service Commission and included a six-point plan that both advances work on existing programs and initiates new activities to improve reliability. These programs are intended to substantially improve the reliability of the distribution system across the District of Columbia by reducing both the frequency and duration of outages for customers. The total cost of the work completed between 2011-2015 is estimated to be in excess of a quarter billion dollars and increases Pepco's expenditures by \$90 million over that same time period.



The table below outlines the key components of the REP.

Program	Goal
Vegetation Management	Performing on a 2-year growth cycle (Pepco DC), removal of danger trees and limbs (Enhanced Integrated Vegetation Management).
Feeder Improvement	Focusing on improving the distribution assets that are least performing to drastically reduce outage events.
Distribution Automation	Using innovative and proven technologies such as advanced switches for automatic fault isolation and restoration together with AMI to monitor and optimize the performance of the distribution system and review service quality.
Load Growth	Meeting the need for load growth and system enhancement to maintain the required reliability and capability to move load under contingency conditions (DA and Emergency Conditions).
Cable Replacement and Enhancement	Accelerating treatment and/or replacement of cable and related joints/elbows/splices that are reaching “end of life” before they fail.
Selective Undergrounding	Undergrounding selected portions of the main lines as a pilot to improve reliability and reduce customer impact in areas where reliability cannot be enhanced with other appropriate measures.

Table 8 – REP Programs and Goals

The REP is a dynamic plan – it will continue to be updated as necessary and as results demonstrate effectiveness of the work performed.

The pie chart below provides a breakdown of the 5-year distribution budget for Pepco in the District of Columbia over the period 2013-2017.

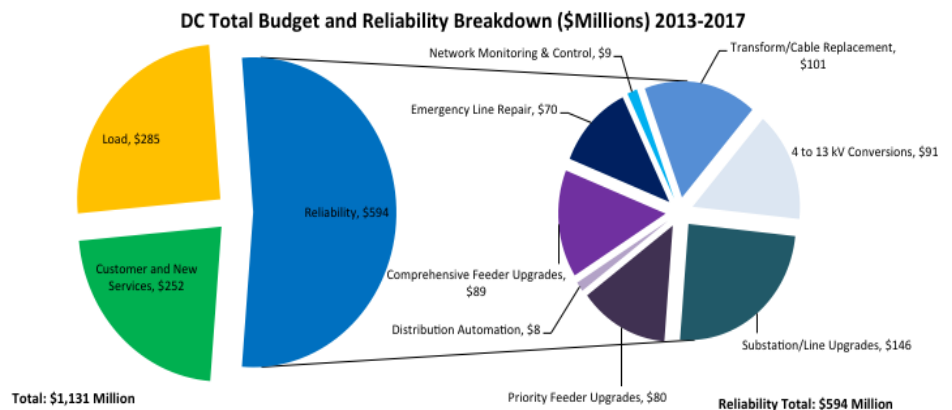


Figure 7 – DC Total and Reliability Budget (2013-2017)



The total rate base for the District of Columbia is \$1.16 billion. Reliability expenditures were \$238 million over the past five years and will increase to \$594 million in the next five years. Load expenditures were \$140 million over the past five years and will increase to \$285 million in the next five years. This represents a significant financial obligation and commitment of resources directed at improving the reliability of electric service for District residences. The recommendations of the Task Force will represent an additional commitment above these expenditures and will provide even greater improvement to the overall reliability of the electric system across the District of Columbia during major storm events.

The REP has already made a difference in the District. Both the frequency and duration of power outages have been reduced on distribution feeders that have undergone REP-related work. These improvements are reflected in the reliability indices. Both the system average interruption frequency index (SAIFI) and system average interruption duration index (SAIDI) have improved since the inception of the REP. This work has resulted in Pepco being able to exceed the level of reliability performance as required by the Electric Quality of Service Standard for 2012. This improvement is shown in the two charts below.

In the first chart (Figure 8), the SAIDI indices are shown for the following:

- Pepco All (both DC and Maryland);
- DC All (all feeders in DC); and
- DC REP 2011 (REP feeders in DC).

The chart shows a marked improvement for the DC REP feeders (seen in the heavier green line in the chart).

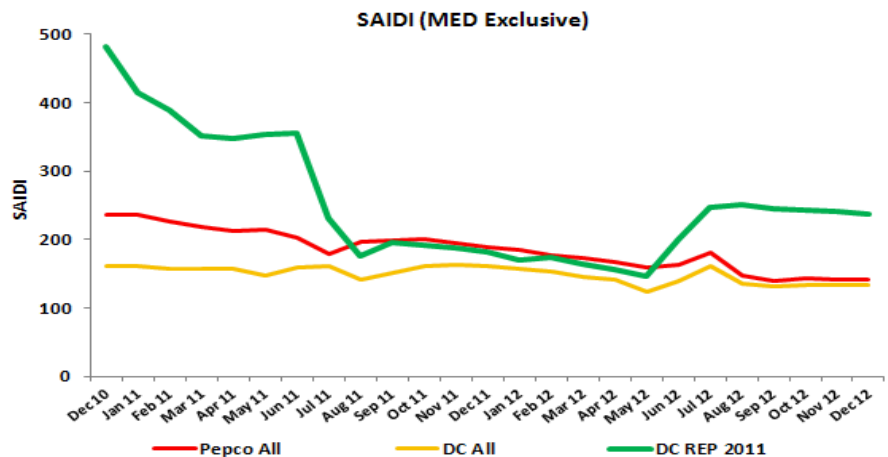




Figure 8 – SAIDI for Pepco, DC and DC REP Feeders

In the second chart (Figure 9), the same elements are shown for the SAIFI index. Again, the clear trend demonstrates an improvement – in this case, the frequency of outages for DC REP feeders is falling in the District.

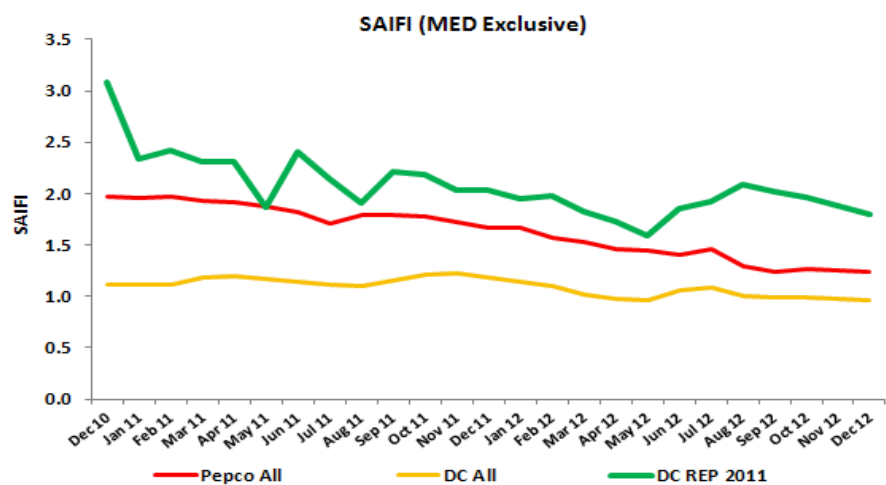


Figure 9 – SAIFI for Pepco, DC and DC REP Feeders

Six-Points of REP and Results Achieved through October 2012

1. Trimming Trees

Reliability Work

District of Columbia Progress to Date

Many of Pepco's recent outages are a direct result of trees falling on power lines. Pepco is aggressively trimming trees along public rights of way to obtain increased clearance between the overhead electric wires and existing trees. Pepco also will work with District of Columbia communities and homeowners to remove potentially hazardous trees that fall outside of the company's right of way area.

Pepco trimmed trees along 57 miles of power lines in the District of Columbia during October, bringing the yearly total to 305 miles. The annual target will be to trim 310 miles in the District by the end of the year. Enhanced vegetation management techniques have been implemented including the increased removal of trees that pose a significant risk to the reliability of the electric system.

2. Improving Priority Feeders

Reliability Work

District of Columbia Progress to Date

A feeder is an electric power line that typically

In October, work continued in the Adams



distributes power to 1,100 customers within a specific geographic area. Each year, across the District of Columbia, Pepco selects and identifies corrective actions for feeders that are performing poorly as required by EQSS. As part of the Reliability Enhancement Plan, Pepco has expanded this program to include additional feeders.

Morgan, Howard University, Georgetown, and Manor Park areas. Pepco is planning to complete 16 projects during 2012.

3. Preparing for System Growth

Reliability Work

District of Columbia Progress to Date

Similar to upgrading electric service to a customer's home to accommodate new appliances and electronic devices, Pepco is continuing to add new substations, upgrade power lines and is installing additional circuits to accommodate new customers and support increased energy use by existing customers.

There are 21 projects slated for implementation during 2012, encompassing every Ward in the District of Columbia. During October, Pepco completed a project in the Anacostia area. Work started on a project in the Tenleytown area. Pepco continued work on projects in the areas of Anacostia, Brightwood Park, Congress Heights, Douglas, Georgetown and Van Ness. Pepco plans to fully complete 15 projects during 2012. Completion on five additional projects will carry over into 2013.

4. Installing Advanced Technologies

Reliability Work

District of Columbia Progress to Date

Pepco is installing advanced control systems that allow the electric system to identify problems and perform switching automatically. The technology will automatically isolate failed pieces of equipment and restore customers not directly impacted by the failed equipment within minutes of the failure.

There are eight projects slated for completion during 2012 in the Chevy Chase, Foxhall, Tenleytown, Palisades and Van Ness areas as well as the Brookland and Manor Park areas.

5. Improving Additional Feeders

Reliability Work

District of Columbia Progress to Date

This program supplements the priority feeder program and focuses on addressing equipment,

In October, work was completed in the Palisades area. Also, during October, work



<p>vegetation, weather and animal-related issues that negatively impact reliability performance. As part of the Reliability Enhancement Plan, Pepco has expanded this program and identified additional feeders for corrective actions above what is required by EQSS.</p>	<p>continued in the areas of Adams Morgan, Brookland, Capitol Hill, Cleveland Park, Isherwood, Penn Branch and Texas Avenue. Work has started on a project in the Michigan Park area. Pepco has 10 projects slated for completion in 2012. Work on five additional projects will carry over into 2013.</p>
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6. Selective Undergrounding

Reliability Work	District of Columbia Progress to Date
<p>In areas where traditional modifications on the overhead system have not produced the desired results, Pepco will selectively replace a selected portion of the overhead system with an underground system.</p>	<p>Pepco has completed engineering design and permitting for portions of two feeders in the District of Columbia. Pepco will not begin work in this area until it revises the methodology for selecting feeders in accordance with direction from the Public Service Commission.</p>

Table 9 – 6 Points of REP and Results Achieved

Blue Ribbon Task Force Formed

Another recent effort was the establishment of a Task Force aimed at improving reliability. Pepco requested the formation of this Task Force to solicit feedback from District of Columbia customers regarding the reliability of the company’s electric service, the methods used to communicate with customers and the process the company uses to restore power in the wake of outages. Pepco hired Claude Bailey of Venable LLP to assemble the Task Force comprised of citizens representing various communities, industries, and interests in the District of Columbia.

Seven town hall meetings and one virtual town hall meeting were hosted to solicit customer feedback. Two of these meetings focused on Pepco’s ability to provide reliable service to federal agencies and to the special needs of commercial and residential real estate management customers.

The Task Force solicited customer feedback and delivered the “Washington, DC Blue Ribbon Task Force on Pepco Service Reliability” final report on February 23, 2012, containing the Task Force’s recommendations. Pepco has used the recommendations contained in the report as a tool to help guide the company’s efforts to improve both reliability and customer relations.





ECONOMIC DEVELOPMENT

On November 14, 2012, the Mayor issued an extensive and detailed five year Economic Development Strategy for the District of Columbia. This plan contains *“the visions, goals and initiatives that will transform the District by creating 100,000 new jobs and generating \$1 billion in new tax revenue to support city services over the next five years.”*

The Mayor's Five-Year Economic Development Strategy was the product of a collaborative effort among the public and private sectors and local universities. Participants interviewed hundreds of thought leaders in different sectors to generate ideas for growing the economy in the District, creating jobs and increasing tax revenues. The interviews, along with sector research, contributed data and insights were then transformed into strategic initiatives. The initiatives were analyzed using an economic model to determine priority.

The result of this process was the establishment of six bold visions for the District:

1. Most business-friendly economy in the nation;
2. Largest technology center on the East Coast;
3. Nation's destination of choice;
4. End of retail leakage;
5. Best-in-class global medical center; and
6. Top North American destination for foreign investors, businesses and tourists.

These six visions are to be carried out using a “sector-led approach” focused on seven different sectors. The seven sectors evaluated for growth opportunities during this period were:

1. Federal Government and Contractors;
2. Professional Services;
3. Higher Education & Health Care;
4. Hospitality;
5. Technology;
6. Retail; and
7. Real Estate & Construction.

Five of these sectors can have a greater chance of being successful if there is a strong and reliable utility infrastructure to support growth and the ultimate day-to-day operations once new development is operational. These sectors include Professional Services, Technology, Hospitality, Retail and Real Estate and Construction. Simply put, new businesses are not likely to move to the District without a secure and reliable utility infrastructure that is able to withstand significant weather events.



Role of Utilities to Support Economic Development

Another source of economic growth is the increased capital spending of utilities to improve reliability. This includes the current programs that use significant numbers of local contracting firms to construct new facilities and support the larger workforces required to operate the systems once built. In total, Pepco plans to spend over \$1.1 billion within the District during the next five years, much of that with local contracting firms. A multi-year program to place utility lines underground could result in nearly an additional \$1 billion of construction work across the city. This level of sustained construction will provide a base for local District-based firms to increase staffing, purchase additional equipment and drive economic development in addition to the growth proposed by the Mayor. Together, these programs are expected to create new jobs for District residents and increase the tax base for the city.

Because of the dependency on economic growth and the success of the long term strategic plan, the establishment of a utility sector in future economic development plans would be beneficial and complement the work performed in evaluating the development within other established sectors.



ALTERNATIVES TO UNDERGROUNDING

Selective Undergrounding of Portions of a Circuit

The Public Service Commission has initiated a process to develop criteria for when Pepco will underground short sections of a feeder to improve the overall reliability of a feeder as a whole. This process has not been addressed by this Task Force and will continue to be administered by the Commission as an acceptable reliability enhancement method.

Selective undergrounding, as it relates to the work of this Task Force, involves the identification and selection of the most appropriate sections of a feeder to be undergrounded as a means of producing the greatest reliability improvement return for its cost. This process is discussed in greater detail in the Pepco Undergrounding Study and involves the ranking of feeders using multiple criteria such as cost, customer benefits and potential reliability improvement. Once a feeder is selected for undergrounding, the next step is to determine which portion of the feeder will be undergrounded. This evaluation will establish if all or any portion of the high voltage lines will be undergrounded and if any of the low voltage secondary lines are to be undergrounded, too. Each of these decisions will impact the cost of the work, the time required to complete it and the impact it will ultimately have on the community.

The results of this analysis demonstrate that there is a wide variation in the cost as well as the benefits of undergrounding different portions of the overhead distribution system. Based on the study performed by Pepco, the following table shows a summary of costs and benefits if the entire overhead distribution system is undergrounded. This reliability improvement will be shared across all of the overhead feeders; therefore, it is reasonable to anticipate the same level of improvement for the feeders proposed as part of this plan even though all overhead feeders are not being considered for undergrounding. The positive impact on the frequency and duration of outages is represented by the percentage reduction seen in each of the undergrounding scenarios.

Table 10 is a summary of these costs and benefits if the respective scenario were applied to the entire electric system relative to both overhead and underground outages.



District of Columbia (All Outages Percent of total)	Cost (\$Billions)	Customer Frequency	Customer Duration
1. UG main line w/OH secondary	\$1.93	32%	31%
2. UG laterals w/UG secondary	\$3.30	26%	37%
3. UG main line and laterals w/OH secondary	\$3.00	56%	62%
4. UG main line and laterals w/UG secondary	\$5.11	58%	67%
5. UG laterals w/OH secondary	\$1.33	24%	31%

Table 10 – Results for All Outages as a Percentage of All Outages

Table 11 is a summary of these costs and benefits relative to all overhead outages only:

District of Columbia (All Outages Percent of overhead)	Cost (\$Billions)	Customer Frequency (SAIFI)	Customer Duration (SAIDI)
1. UG main line w/OH secondary	\$1.93	56%	45%
2. UG laterals w/UG secondary	\$3.30	44%	55%
3. UG main line and laterals w/OH secondary	\$3.00	97%	92%
4. UG main line and laterals w/UG secondary	\$5.11	100%	100%
5. UG laterals w/OH secondary	\$1.33	42%	47%

Table 11 – Results for All Outages as a Percentage of Overhead Outages

The cost and benefits shown in tables 10 and 11 are reflective of the entire overhead system. The costs to comply with the recommendations of the Task Force are less due to undergrounding approximately 30% of the overhead feeders. e. The benefits in reliability performance will apply across all of the undergrounded feeders just as if the entire overhead system was to be undergrounded. Even though the entire overhead system will not be undergrounded, it is reasonable to anticipate that the reliability improvement on the feeders undergrounded will be the same as identified in the tables above.



Vegetation Management

Extensive vegetation management can be an alternative to undergrounding power lines. By trimming trees and creating clear spaces around the power lines, trees or tree branches cannot fall on lines. That means fewer outages and less damaged infrastructure.

Parties Responsible for Vegetation Management in the District

Vegetation management within the District of Columbia is the responsibility of different parties depending on the location of the tree itself. There are four primary stakeholders who are responsible for vegetation management:

- District Department of Transportation (DDOT) and its Urban Forestry Administration (UFA);
- Owners of private property;
- United States Park Service on federal lands; and
- Pepco.

The graphic below provides further detail on how responsibility for vegetation management and trees can vary depending on the specific tree's location.

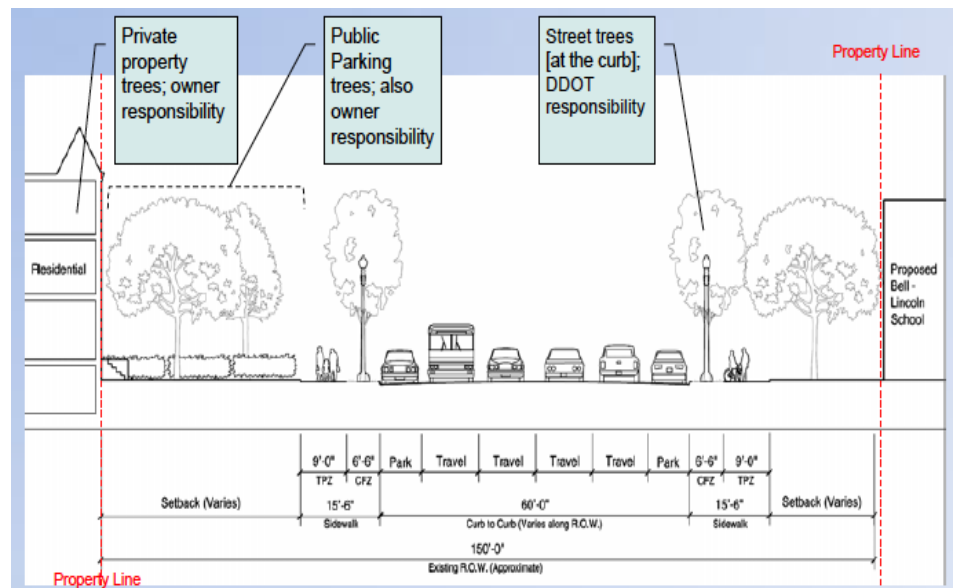


Figure 10 – Public vs. Private Responsibility for Trees



The UFA's mandate is to protect and promote the interests of trees in the District. UFA staff and contractors perform the following forestry activities: pruning, planting and removal.

- *Pruning* – street trees are on a five year inspection cycle, and pruning is planned as soon as possible, based on identified need;
- *Planting* – DDOT/UFA plants 4,000+ street trees each year. The planting season extends from November to May; and
- *Removal* – this is completed as needed, based on funding. Removals may arise from any of the following: UFA's proactive evaluation of tree health, resident service requests, storm-related damage, and Pepco's request for reliability.

Private citizens also play a key role in vegetation management as they are responsible for maintaining their own trees. Pepco is restricted from trimming trees without the tree owner's consent, whether that owner is the District, Park Service or private property owner.

Pepco also plays a key role in vegetation management within the District. Public Service Commission Order No. 13431, approved by the Commission on November 19, 2004, established a Tree Trimming Working Group to create a vegetation management process and a plan for the program. The working group sought to balance the need for reliable electric service, sound arboricultural practices and preservation of the aesthetic value of the District's trees. Multiple stakeholders – including representatives from the Office of the People's Counsel, Pepco, the District Departments of Public Works and Transportation, and the Commission – took part in the working group.

As a result of the working group, on March 17, 2005, Pepco filed its Vegetation Management Plan. The plan had five key components:

1. *Routine Scheduled Pruning* – Routine scheduled pruning is designed to remove an amount of growth typical for a two-year period and the amount can vary depending on the health, location and species of the tree. Routine pruning is performed under a blanket permit from the UFA. Pepco provides the UFA with a list of work it has scheduled and the UFA provides any written objections to the schedule within two weeks. Any non-objectionable scheduled pruning continues as planned;
2. *Storm Hardening or Removal of Trees* – Storm hardening refers to additional tree pruning, beyond that performed under routine scheduled pruning on circuits that have been identified as susceptible to damage during storms. Storm



hardening or Enhanced Vegetation Management focuses on the removal of overhanging limbs and adding clearance alongside wires so the circuit can withstand higher winds without contact between the tree and lines. Unlike routine pruning, storm hardening must be approved by the UFA – with possible input from the relevant ANC – prior to any work starting;

3. *Topping Trees for Removal* – Dead, diseased or hazardous trees located directly beneath or in close proximity to distribution wires and identified by the UFA for removal are topped by Pepco so that the tree can be removed without violating approach standards. The UFA provides Pepco with a list of trees to be topped for removal while Pepco develops a schedule for completing the work. Alternatively, Pepco may de-energize the lines prior to tree removal work by the DDOT and therefore negate the need for the tree to be topped. Pepco closely coordinates scheduling of any line de-energizing with the UFA to minimize the impact on customers;
4. *Private Tree Removal* – Privately-owned trees identified for removal by homeowners that are in the vicinity of distribution wires will be topped so that they may be removed without violating OSHA approach standards. Alternatively, provisions may be made to de-energize the wires until the tree is removed. The UFA provides no oversight of trees on private property unless the tree to be topped or removed is a Special Tree as defined in the Urban Forest Preservation Act of 2002; and
5. *Emergency Maintenance Pruning* - Pepco will remove trees and limbs that fall or become entangled within wires during storm events. Pepco will notify the DDOT when an emergency occurs and emergency work is performed.

History of Vegetation Management in the District

There are a number of historical tree preservation regulations in the District of Columbia, and these regulations have contributed to a significant number of tree-related outages. Vegetation management best practices emphasize the prevention of tree-to-wire contact. Stakeholders, including Pepco, the UFA and private citizens are doing their best to work within the restrictions of these historical regulations.

Some key historical statutes, policies and regulations include:

- **1892:** *Act for the Preservation of the Public Peace and the Protection of Property within the District of Columbia*



- "...unlawful for any person willfully to top, cut down, remove, girdle, break, wound, destroy, or in any manner injure... any tree not owned by that person."
- **1960:** *Trees in Public Space Washington, DC Manual*
 - "Utility lines must be cleared by the use of directional clearance methods only – topping and drop crotching are prohibited..." (note: this is in conflict with today's vegetation management best practices which recommend "topping" or "dropping" of leads in order to directionally prune growth away from power lines); and
 - Compliance with this requirement may require relocating the wires as opposed to maintaining directional clearance, which means the removal of portions of the tree too close to wires so that future growth is directionally away from the wires.
- **2002:** *Urban Forest Preservation Act of 2002*
 - Spelled out punishments (monetary penalties and possible imprisonment) for violation of 1892 Act, also required 20 days written notice prior to performing any vegetation management work.
- **2004:** *Removal and Pruning Policy Directive*
 - Reinforces that Pepco maintains a 2-year growth pruning cycle.

These historical precedents have contributed to the current tree-to-wire conflicts negatively impacting the reliability of electric service in the District and limiting the opportunities to design solutions that reduce the risk of tree-based outages during major storms.

In the context of these historical precedents, the UFA is focusing on improving the tree canopy through various efforts and policies. Some of these are as follows:

1. Tree Canopy Maintenance programs that care for the existing canopy in the District so that it can grow in a healthy manner. It is estimated that 50% of the canopy gain will be seen from canopy growth. The UFA inspects more than 20% of the existing street tree canopy each year using on-staff certified arborists to help ensure trees are in good health, prune thousands of trees, treat trees for diseases such as Dutch elm disease and reduce the paving surrounding street trees;



2. Tree Planting programs are the source of the remaining 50% of the canopy growth. This year, the UFA will plant over 6,400 street trees to fill in open spaces citywide. This is almost double UFA's efforts from previous years;
3. Tree Canopy compensation programs through the permitting process for developers. Existing trees on private property cannot be protected fully since the owner has discretion for tree removal and the law does not allow the UFA to stop any removal. Street trees may be lost due to utility improvements, curb cuts, storm water catch basin installs and other changes to the urban environment. UFA staff provides inspection services through the DDOT permit office. Though this is common practice it is not necessarily preservation nor protection;
4. Canopy Keeper programs that engage citizens and work with citizens to become tree keepers and water newly planted trees citywide. This program has over 1,200 new people every year and has been very successful at the UFA; and
5. Canopy Education programs such as those on the UFA web site, Arbor Day, ANC meetings and other public events allow UFA staff to better inform the citizens about the benefits of trees.

Currently, the UFA has a very strong working relationship with Pepco foresters. This has allowed the UFA and Pepco to work very closely on the pruning of street trees and the construction of Pepco's infrastructure. The two organizations are following industry standards for pruning trees around utilities, and any undergrounding program should seek to ensure this collaborative vegetation management program remains strong. Further, any trenching work should carefully consider the health of the tree root structures and seek to employ techniques to preserve them.

It is anticipated that since any undergrounding work will involve the primary mainline and laterals and not the secondary or individual service drops, approximately 80% of the potential root and tree "conflicts" can likely be avoided with the help of the undergrounding program. This will help prevent harm to the District's lush tree canopy. In addition, with a reduced number of overhead lines, the amount of pruning that will be required in the future will be significantly less in the areas where undergrounding has occurred. In isolated cases, localized conditions may require undergrounding additional infrastructure – such as the secondaries – but this will be undertaken on a case-by-case basis and is not anticipated to occur frequently.



Alternative Generation and Micro Grids

There are other alternatives that, in addition to undergrounding power lines, could improve system reliability. There are three key components that can serve as an alternative option for electric service delivery:

1. Distributed Generation;
2. Energy Storage; and
3. Micro Grids.

These three components complement each other in order to provide an alternative to traditional utility electric service for customers, and, if appropriately integrated into the utility system, may improve reliability and complement other initiatives. Although these concepts were discussed at various Task Force and Committee meetings, they are not the subject of this Task Force and therefore are outside the scope of this group.

Distributed Generation

Distributed Generation refers to smaller resources that generate electricity closer to customers. These Distributed Generation resources may even be located “behind the meter” on customer premises, such as solar panels on the roof of a house. This is a shift from the model whereby electricity is generated at large centralized power plants and delivered over transmission and distribution circuits to customer load. By locating generation closer to customers, costs to transmit power are reduced, technical losses are lessened and reliability may be improved. Often these resources are clean or renewable resources that provide environmental benefits, too.

At the same time, Distributed Generation poses several challenges. Often the output of these distributed resources is insufficient to meet all customer demand, meaning the distribution utility is still required to provide backup service. In addition, these distributed resources are often intermittent renewable resources, meaning they can only produce electricity when the sun is shining (solar resources) or when the wind is blowing (wind resources). In order to fully enable distributed resources and realize their benefits, energy storage technologies and micro grids must be harnessed.

Distributed Generation can be incorporated with various energy storage technologies into a Micro Grid. In this way, the various components work together to provide an alternative generation option for various entities or communities.



Energy Storage

There are a number of emerging energy storage technologies being developed in the electric power sector. Historically, energy storage has been cost-prohibitive and this has stunted its development. Cost has also been a major barrier to the creation of Micro Grids and further use of intermittent Distributed Generation options. More recently, costs have begun to come down as new energy storage technologies are developed.

There are a number of energy storage technologies. Some of the most promising include:

- **Lithium-ion battery storage** – Lithium-ion batteries are popular in devices such as cell phones and other electronics. They also can be used on a larger scale for energy storage applications with Micro Grids and to help balance the intermittency of renewables;
- **Vehicle-to-Grid** – This is a variation on battery storage. Instead of a stationary battery, an electric vehicle may be harnessed as a power source when it is parked. Vehicle-to-Grid is still in the early stages of development but represents a future possibility for energy storage; and
- **Fuel cell energy storage** – These are electrochemical devices that typically use hydrogen as their fuel source and convert this to electricity. There are currently a limited number of fuel cell vehicles on the roads in the US. Fuel cells can also be employed as energy storage devices to be used in a Micro Grid or other similar application.

The benefits of energy storage are significant. Storage technologies are needed to enable the deployment of Micro Grids. Benefits include the ability to provide supplemental power when intermittent resources are not generating electricity, improved reliability, reduced environmental impact and other benefits that will help transition away from centralized generation to a more distributed model.

Costs for many energy storage technologies are still too high to encourage widespread usage. Some industry experts believe costs still need to fall to half of today's levels in order to make energy storage a truly viable solution.

Micro Grids

Micro Grids are locally-connected grids comprised of Distributed Generation resources, energy storage technologies and local customer loads. The ideal scenario is to have a self-sufficient Micro Grid that can operate autonomously. The reality is that most times these Micro Grids must interconnect with traditional distribution grids for power backup and to support outages of local generation equipment.



All of these alternative generation technologies are still in the early stages of development. New technologies and innovations may yet reveal more options for the supply of electricity. The wide scale deployment of these technologies is still years away and cost-prohibitive at present. It is also important to note that these systems will still interface with the electric distribution system to supply energy when the distributed technologies are not available or are providing less energy than is being consumed by the customer. For customers, overall reliability is a combination of distributed resources and the electric grid.



TECHNICAL COMMITTEE

Members of the Technical Committee

The list of members was as follows (in alphabetical order):

- John Adragna, Attorney, Office of the People's Counsel;
- Karen Campbell, Vice President, State Government Affairs, Mid-Atlantic Region, Verizon;
- William Gausman, Sr. Vice President, Strategic Initiatives, Pepco (Committee Lead);
- Herbert Harris, Jr., Ward 7 Appointee, Resident Representative;
- Cary Hinton, Policy Advisor to the Chairman, Public Service Commission;
- Phyllis R. Love, Management and Program Analysis Officer, Office of the City Administrator;
- Kevin Mara, OPC Technical Consultant, Office of the People's Counsel;
- Sandra Mattavous-Frye, People's Counsel, Office of the People's Counsel;
- Khalid Muhammed, Deputy Chief Engineer, DC Department of Transportation;
- Joseph Nwude, Deputy Executive Director for Regulatory Matters, Public Service Commission;
- Steven Price, Division Head, Construction & Field Operations, Washington Gas; and
- Donna Rattley-Washington, Vice President, Government Affairs, Comcast.

The Technical Committee members met on a number of occasions to carry out their work and provide recommendations for undergrounding power lines in the District of Columbia. Presentations were made at each Task Force meeting to provide updates on work performed and to present preliminary recommendations.

Scope of Work for the Technical Committee

The overall scope of work for the Technical Committee was as follows:

- Provide details of the current distribution system (for example: where substations and major distribution line substations are located; where distribution systems are underground and overhead);



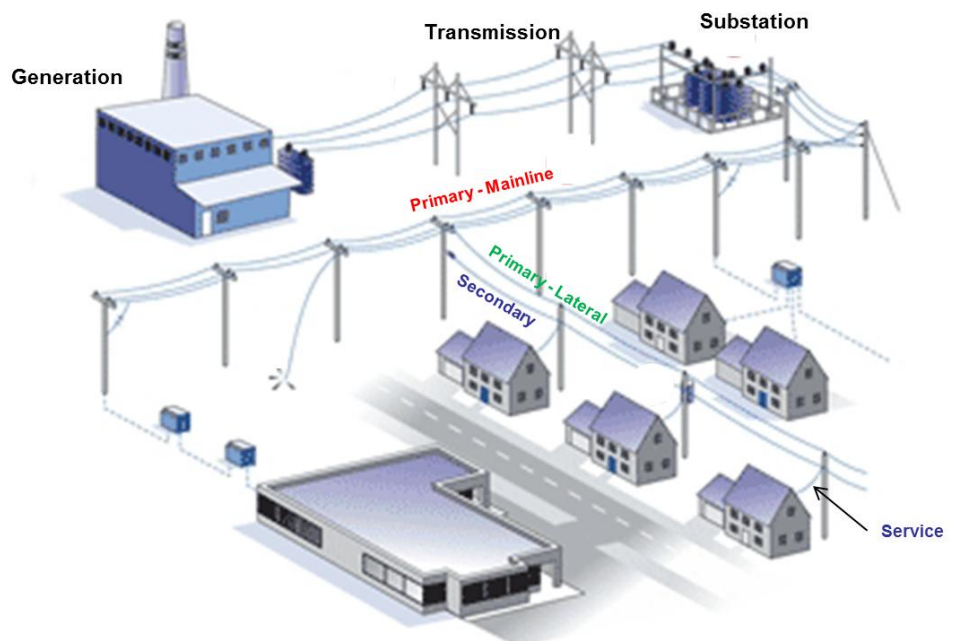
- Examine generation and distribution system connectivity with other jurisdictions; and impact on District planning;
- Define steps needed (and the process) to move lines underground (how undergrounding would happen from a technical standpoint);
- Examine impact of undergrounding on reliability; and
- Identify best options for undergrounding coordination with other utilities and the DDOT.

In order to carry out this scope of work, the Technical Committee members drew upon their diverse backgrounds, consulted with a number of expert stakeholders and completed this written report.

Process of Undergrounding

The process of relocating electric distribution facilities from overhead to underground is complex, cost intensive and requires significant analysis. There are a number of different scenarios for undergrounding depending which part of the power line and associated equipment is placed underground. There is also an analytical process for determining which power lines or portions of the power line to place underground.

Figure 11 – Components of Distribution System





Undergrounding Options

For the District of Columbia, there are fundamentally five different options to explore for the process of undergrounding power lines. They are:

- Scenario 1: Underground the overhead three-phase primary mainlines retaining existing overhead transformers, secondary and service poles and overhead laterals;
- Scenario 2: Underground the primary laterals including secondary and services. Replace overhead pole mounted transformers with pad mount transformers;
- Scenario 3: Underground primary mainline and laterals. Replace overhead pole mounted transformers with pad mount or underground transformers. Leave existing overhead secondary and services;
- Scenario 4: Underground all primary mainline and laterals, transformers, secondary, and services up to the service delivery point; and
- Scenario 5: Underground the primary laterals, retaining existing overhead mainline, secondary and services. Replace overhead pole mounted transformers with pad mount transformers.

Predicted Benefits

Severe weather and storms have increased in intensity and frequency over the past several years, and power outages from adverse weather conditions have become a more common occurrence in the District as well as across all east coast states. The undergrounding of power lines is expected to provide significant benefits in terms of electric service reliability, the reduction in outage frequency and duration and overall public safety. The two tables that follow provide an overview of the anticipated benefits from various undergrounding options when each option is applied to the entire distribution system. These anticipated benefits apply to the approximately 102,000 customers that are now directly supplied power from overhead lines, as well as 40,000 customers that are supplied power from underground lines that are attached to overhead lines.

Cost represents the estimate for undergrounding the entire system for each scenario. However, final strategic recommendations will consider selection of specific feeders



based on reliability performance. The reduction in the duration and frequency of outages once the feeder is undergrounded is defined as SAIDI and SAIFI, respectively. The first table is a summary of the costs and benefits relative to all overhead-related outages only.

District of Columbia (All Outages Percent of overhead)	Cost (\$Billions)	Customer Frequency (SAIFI)	Customer Duration (SAIDI)
1. UG main line w/OH secondary	\$1.93	56%	45%
2. UG laterals w/UG secondary	\$3.30	44%	55%
3. UG main line and laterals w/OH secondary	\$3.00	97%	92%
4. UG main line and laterals w/UG secondary	\$5.11	100%	100%
5. UG laterals w/OH secondary	\$1.33	42%	47%

Table 12 - Results for All Outages as a Percentage of Overhead Outages

The next table compares the same factors for both overhead and underground-related outages.

District of Columbia (All Outages Percent of total)	Cost (\$Billions)	Customer Frequency	Customer Duration
1. UG main line w/OH secondary	\$1.93	32%	31%
2. UG laterals w/UG secondary	\$3.30	26%	37%
3. UG main line and laterals w/OH secondary	\$3.00	56%	62%
4. UG main line and laterals w/UG secondary	\$5.11	58%	67%
5. UG laterals w/OH secondary	\$1.33	24%	31%

Table 13 - Results for All Outages as a Percentage of Total

The general conclusion of this predictability analysis is that there is a range of potential benefits that could realistically be achieved with the different undergrounding options. Of the outages found on overhead power lines, the potential benefits of the five scenarios range from a 42% to 100% reduction in customer frequency of outages for those customers supplied by overhead lines and a 45% to 100% reduction in outage durations. Of the outages found throughout the system, the potential benefits of the five scenarios range from a 24% to 58% reduction in the total frequency of outages and a 31%



to 67% reduction in outage duration for all customers across the entire District, including both overhead and underground supplied customers. Costs for these five scenarios range from \$1.33 billion to \$5.11 billion.

Core Undergrounding Strategy: Scenario 3

The Task Force recommends proceeding with Scenario 3. In this scenario, the primary mainline and laterals will be undergrounded. In addition, the overhead primary wire and equipment as well as the pole-mounted transformers will be removed from the poles. New transformers will be placed on the ground and will be supplied from the underground lines. The existing overhead secondary and service lines will be left in place. This will be the general design to be applied to the vast majority of feeders. In isolated cases, the exact design may vary somewhat depending on conditions on the ground, coordination with other utility or road projects and economic development activities. In these instances, the precise design would be determined on a case-by-case basis.

Scenario 3 is recommended because it will result in the greatest benefits-to-costs ratio compared to the other four options. The cost for Scenario 3, based on the undergrounding of all primary lines and transformers in the District that are not already underground, is estimated to be approximately \$3.0 billion for the entire system. The Task Force recommendation is to underground up to 60 circuits that will improve the reliability of service for nearly 60,000 residents of the District and will cost nearly \$1 billion. The benefits would be significant. Of the outages found on overhead power lines, the Scenario 3 option is anticipated to result in a 97% reduction in the frequency of outages and a 92% reduction in the duration of outages for those customers supplied by overhead lines. Of the outages found throughout the system, Scenario 3 is anticipated to result in a 56% reduction in the total frequency of outages and a 62% reduction in the duration of outages for all customers across the entire District, including both overhead and underground supplied customers.

The cost/benefit rationale for Scenario 3 is based firmly on expected reliability improvements in both the frequency and duration of outages for those customers served from the newly undergrounded power lines. Although not a primary driver, there will also be significant aesthetic benefits for all District residents. The removal of a substantial portion of overhead power lines and equipment will be a significant visual enhancement to the areas where undergrounding is performed.

One solution or template will not necessarily fit all circuits. After a circuit has been selected for undergrounding, an engineering assessment is performed to identify the

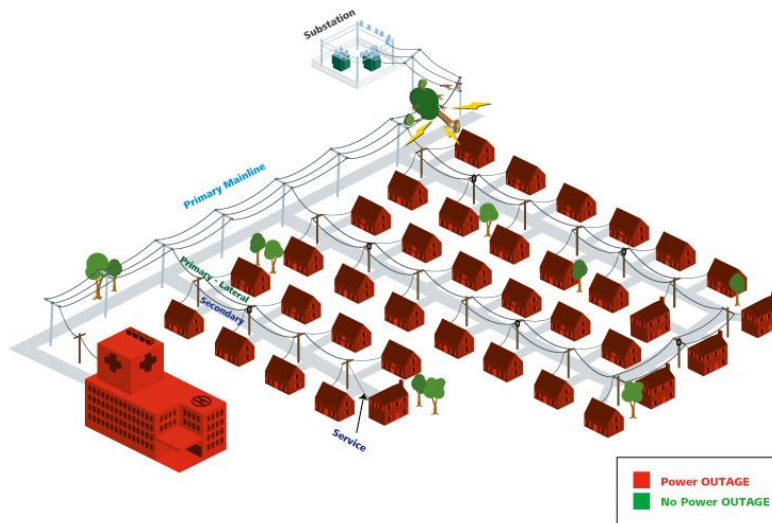


most appropriate portion or portions of the power line to be undergrounded. Part of this engineering assessment will involve identifying where on the power line outages have occurred in the past and what caused those outages. The assessment will then weigh the benefits associated with different undergrounding configurations to reduce these outages. If sections of a feeder are found to have not contributed to outages, then those sections will remain overhead unless there are other economic benefits or operational reasons that justify undergrounding all of the lines.

The benefits expected to be obtained with this method of undergrounding are depicted in the following renderings of the number of customers that would be impacted when an outage occurs. In the current situation, when an outage occurs all customers on the line will lose power and must wait until repairs can be made. Once the lines are placed underground, only the few customers connected to the secondary lines, where the damage occurs, are out of power. This is a significant reduction in the total number of customers without power and allows Pepco to respond faster to make repairs to individual customers' service. In addition to improved reliability, there will be fewer lines and equipment remaining on the poles, thereby reducing the negative visual impact of the overhead lines.



EXISTING OVERHEAD SYSTEM



PROPOSED UNDERGROUND PLAN

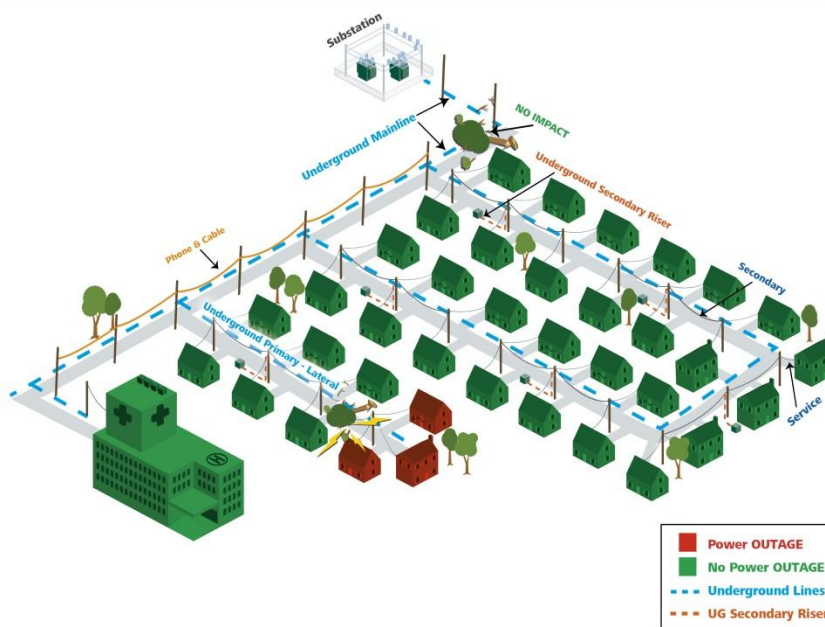


Figure 12 – Existing Overhead System vs. Proposed Underground Plan



The main purpose for undergrounding power lines is to improve the reliability of electric service during severe weather events. However, there are also several other implications of undergrounding that must be taken into consideration. These include the following:

- Undergrounding would be a multi-year project;
- Impacts of construction: noise, traffic and congestion, road closures and restricted parking due to construction;
- Long term road construction can result in reduced business for retail establishments due to limited parking and difficult access;
- Landscape restoration;
- Significant financial impact on the community during construction;
- Possible damage to established areas, shrubbery, flowers, etc.;
- Excavation in close proximity of the roots of trees can pose a risk of damage to the tree; and
- Construction in the roadways can last 6 to 9 months per project.

These and other concerns must be factored into any recommendations regarding selection of feeders and coordination of the undergrounding of power lines.

Communications Lines and Undergrounding

Another important factor to consider is the impact of undergrounding on the communications lines found on the overhead poles. Currently, the power lines are located above the communications lines and therefore provide some measure of protection from vegetation. For example, if a tree falls on the lines, it is typically the power lines that absorb the weight of the tree, shielding in many cases the communications lines found below.

The selected undergrounding option does not recommend the placement of communication lines underground. Therefore, if power lines are placed underground, the communications lines would no longer have the protection from the electric lines above them on the poles. This could have an impact on the reliability of communications providers. During storms, the communication lines may be exposed to increased tree contact when the electric lines are no longer above them serving as a shield from direct tree contact. Communication firms reserve the right to evaluate the reliability benefits for undergrounding by looking at each individual location where Pepco will be undergrounding their lines. However, the increased cost to underground the communication lines could result in up to doubling the cost for the electric lines alone.



Recognizing this cost impact, there may be opportunities where additional conduit lines can be constructed. However, the communication lines would not be moved underground until some future event occurs, such as a new economic development project.

- Verizon estimates that they have over 850 miles of lines within the area being considered for undergrounding. Using the same estimated cost per mile that Pepco developed for its lines, this would result in nearly \$3 billion of investment. This estimate is developed using independent construction of conduit lines, therefore with joint trenching there would be opportunities to reduce this total cost. Likewise, if the District was to construct a portion of the conduit system then the cost to Verizon would be further reduced; and
- Comcast has estimated expenditures of over \$500 million, not including any rental fees for the use of conduits built by other parties.

Selection of Feeders to Underground

In order to select the specific power lines to underground, a six-step process is followed. This process involves the following steps:

1. Ranking of power lines (feeders) by historical reliability and customer minutes of interruptions reduced per dollar spent (SAIFI, SAIDI and CMI/\$);¹⁰
2. Evaluation of other reliability enhancement programs already being performed;
3. Coordination with future economic and infrastructure developments in the feeder area;
4. Coordination with other utilities' and local governments' infrastructure projects;
5. Evaluation of the level of construction being performed at any one time within a Ward; and
6. Consideration of the number of customers served by each feeder.

Ranking of power lines by historical reliability (SAIFI, SAIDI and CMI/\$)

The first step in the selection process for determining which power lines (feeders) to underground involves ranking the feeders. The best method in this step is to rank the

¹⁰ 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.
CMI/\$ - Customer Minutes of Interruption reduced per dollar spend to complete the undergrounding project.



feeders by their historic reliability. This is a quantitatively driven approach for filtering out feeders that may not benefit substantially from undergrounding while identifying feeders that will benefit. The end result is a list of all feeders that are candidates for undergrounding.

There are various options for the ranking process. The most effective is to rank by historical frequency of outages (SAIFI), duration of past outages (SAIDI) and the Customer Minutes of Interruptions (CMI/\$). Ranking by the frequency and duration combination ensures that the selected feeders will achieve the highest overall reliability improvement and the greatest reduction in the minutes of interruption (for every dollar spent on undergrounding).

Once the list of feeders to be considered has been identified, a series of secondary criteria are used to prioritize the feeders by the order in which they will be selected for undergrounding. The secondary criteria comprise value of service, utility coordination with the DDOT, community impact and customer impact. Using this approach, a feeder that results in a high reduction in the duration of outages and the frequency of outages but only serves a few customers would not be selected over a feeder that has similar reliability benefits and costs but serves a larger number of customers.

In addition, once the feeders have been ranked then each feeder will be evaluated to determine if there are portions that do not need to be undergrounded due to other reliability enhancement work that resolved the reliability concerns. This evaluation is part of detailed engineering performed to design the new underground feeder and is completed only after a feeder has been selected for undergrounding. When portions of a selected feeder are identified that will not benefit from undergrounding, the existing lines will remain overhead and the total cost of the program will be reduced. As Pepco or the District performs future work in these areas, undergrounding of these lines will be evaluated at that time.

Sequencing of work helps to ensure that maximum synergies and cost benefits are obtained with other projects being performed within the District and reduces impacts on communities where the work is to be performed. This evaluation will take into consideration reduced construction cost and diminished disruptions that are possible when multiple projects are coordinated and implemented together. This sequencing process will also limit, in most instances, the undergrounding efforts within any Ward to no more than one feeder at a time. When two or more feeders within a Ward have similar reliability benefits to be gained, the priority of work will take into consideration



additional criteria such as the Value of Service (VOS)¹¹ or the economic impact of an outage. The feeder with the highest VOS would generally be worked on first.

The following tables outline the primary and secondary selection criteria that should be used to rank feeders and establish the sequence for performing this work.

Primary Selection Criteria

SAIDI	Selection of feeders that result in the greatest reduction in duration of outages once the feeder is undergrounded.
SAIFI	Selection of feeders that result in the greatest reduction in frequency of outages once the feeder is undergrounded.
Customer Minutes of Interruptions per Cost of Undergrounding	Achieve the greatest reduction in the minutes of interruptions for every dollar spent to underground.

Table 14 – Primary Selection Criteria

¹¹Value of Service - In 2008, the U.S. Department of Energy (DOE) funded a meta-study to estimate outage costs (Value of Service or VOS) for U.S. electricity consumers. Twenty-eight studies, conducted by 10 electric utilities between 1989 and 2005 representing residential and commercial and industrial (C&I) customer groups were included in the analysis. The data was used to estimate customer damage functions expressing customer outage costs as a function of duration.



Secondary Evaluation Criteria

<p>Value of Service</p>	<p>When two or more feeders within a Ward are scheduled for undergrounding, the order or sequence to perform that work can take into consideration the economic benefits of reduced outages – the feeders with the highest economic impact during an outage would be the first to be undergrounded.</p>
<p>Coordination with other District Projects</p>	<p>Coordination of undergrounding projects with major road reconstruction work and other utility projects to achieve cost reduction benefits from reduced paving cost and efficiencies of scale in work being performed.</p>
<p>Community Impact</p>	<p>Major road or utility construction work can have a significant impact on a community and economic impact on businesses. Limiting feeder-undergrounding projects at any one time to no more than one project per Ward can help to reduce this impact.</p>
<p>Customer Impact</p>	<p>Evaluation of customer supplied from each feeder so that the prioritization of work takes into consideration the number of public service facilities (fire and police), health care and customers with special needs for electric service are considered when scheduling the order of feeders to be undergrounded.</p>

Table 15 – Secondary Evaluation Criteria

In summary, the selection of feeders for undergrounding relies on primary and secondary selection criteria. First, the feeders are selected for undergrounding based on quantitative reliability criteria and the reliability benefits to be gained from undergrounding. Second, the sequence of when these feeders will be undergrounded can be determined based on coordination with other construction projects and the impact on a community when multiple projects are being performed at the same time.

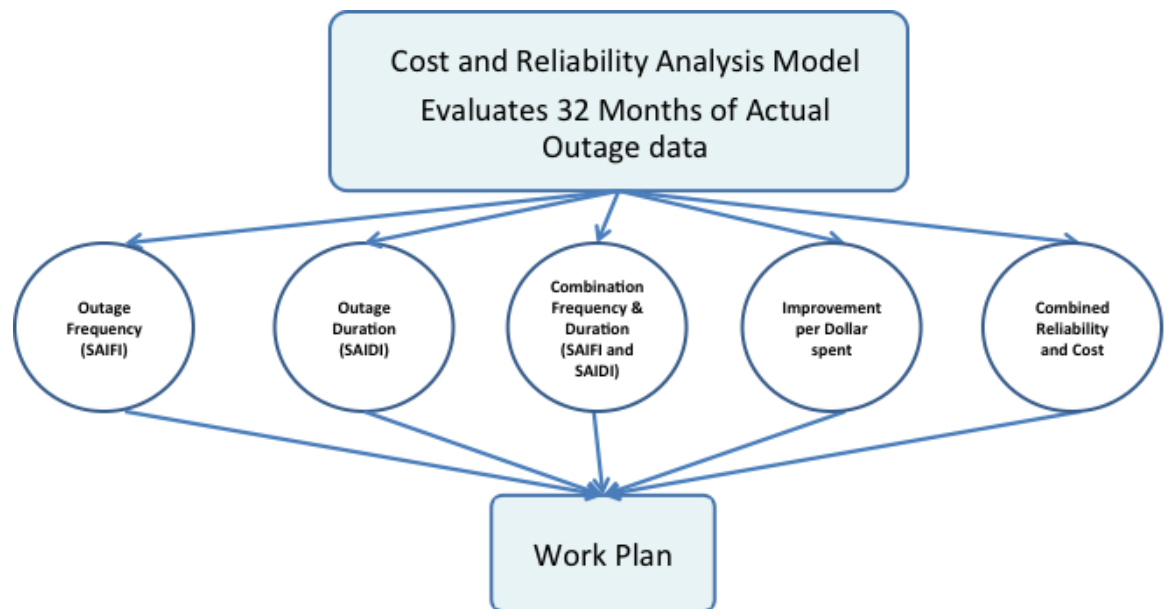


Figure 13 – Feeder Ranking Options

Consider reliability enhancement programs already being performed

Once the quantitative selection step has been taken, it is then important to compare the list of feeders to those feeders that have already benefited from reliability enhancement work. These measures may be effective in improving reliability and therefore undergrounding may not be necessary.

A related issue to consider is ongoing conversion work Pepco has in process in the District. Pepco already has a longer-term 4kV conversion program in place. This program involves converting 4kV circuits to 13kV circuits, both underground and overhead. The underground conversions are not relevant for this analysis as the circuits are already underground facilities. However, the overhead conversions should be considered and incorporated into this analysis.



There are several issues to consider with such planned conversion work and its relationship to potential undergrounding. For example, converting 4kV overhead circuits to 13kV overhead typically results in significant impacts to the tree canopy and also results in circuits more susceptible to tree-related faults. Therefore, these circuits should be considered for potential undergrounding in place of conversion to 13kV overhead facilities. Currently, the 4kV feeders typically have a smaller customer base, are often part of an overhead network configuration and are less prone to tree-related faults due to their lower voltage. As a result, they do not often show up as a high priority to underground. Yet, if converted to 13kV it is likely they would in the future show up as a higher priority to underground, due to some of the issues discussed above, and a significant amount of money will have been spent to perform the overhead conversion. If these feeders are undergrounded, the conversion cost would be saved thereby reducing the total expenditures on that feeder.

Coordination with future economic and infrastructure developments in the feeder area

The refined list of feeders must take another factor into consideration: future economic and infrastructure developments in the area. This includes the schedule of upcoming road construction work and other projects. It is then determined if there is the ability to coordinate the planned infrastructure construction work with the undergrounding projects.

For example, the Task Force has reviewed the Department of Transportation's 2013-2019 Transportation Improvement Program in order to seek out synergies with potential future undergrounding work. Coordination between the two may lead to reduced costs and more efficient future construction projects.

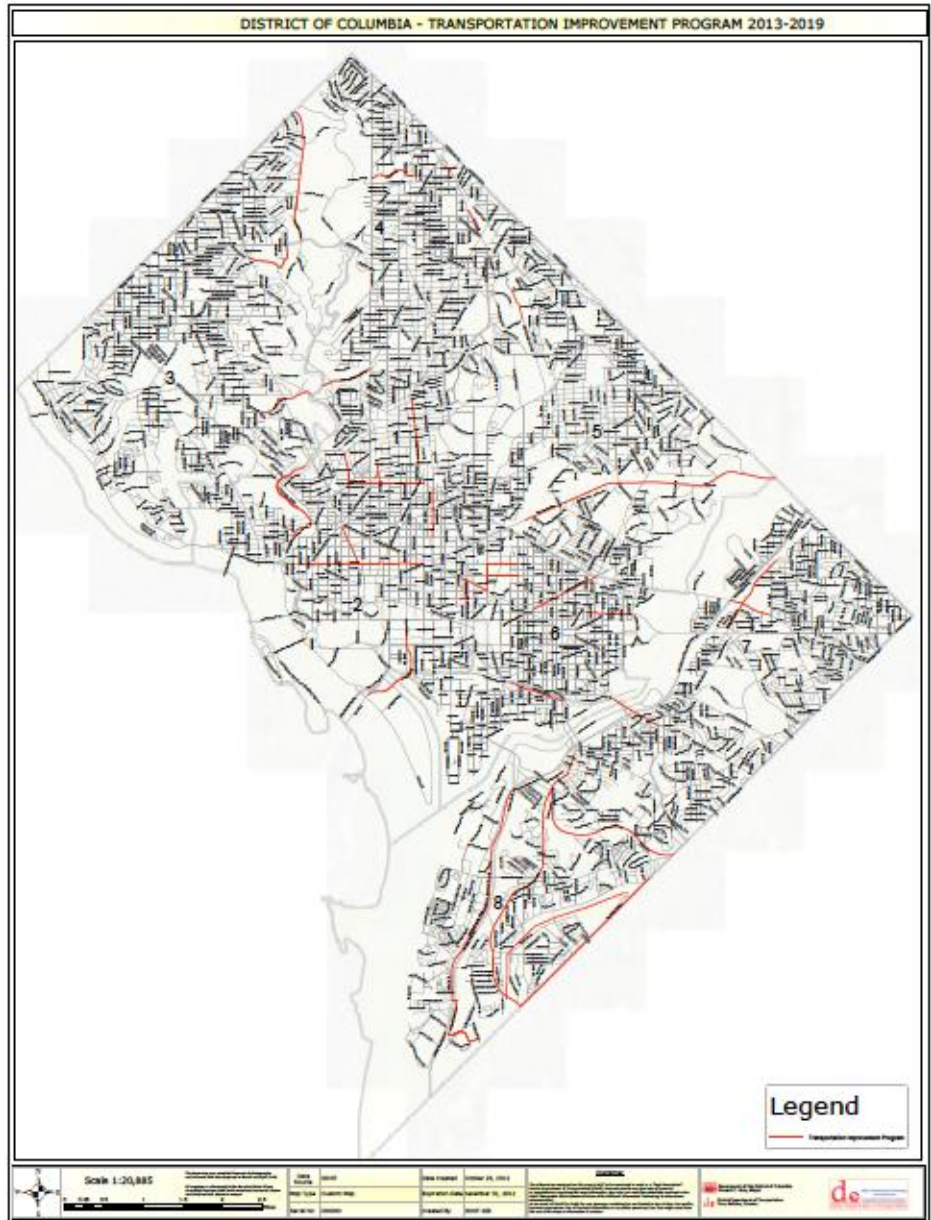


Figure 14 – DDOT's Transportation Improvement Program 2013-2019



Coordination With Other Utilities' and Local Governments' Infrastructure Projects

In this stage, Pepco meets with local government officials to discuss its plans for undergrounding. It is also when permits are applied for and other details managed.

Evaluation of the Level of Construction Being Performed at Any One Time Within a Ward

In addition to the steps above, an evaluation will also be made regarding the level of overall construction activities being performed within a Ward. This is done to ensure there is not too much construction activity occurring at one time and resulting in significant disruptions for Ward residents and businesses. This will limit, in most cases, the undergrounding efforts within any Ward to no more than one feeder at a time.

Consideration of the Number of Customers Served by Each Feeder

The number of customers served by each feeder will also be taken into consideration. In general, those feeders serving a larger number of customers will receive priority over those feeders serving fewer customers.

Schedule

Implementation planning is based on a 7 to 10 year timeline for phased construction of the undergrounding initiative. Conceptually, the first 9 – 10 months will focus on fieldwork assessment, engineering, design, permitting, and resource mobilization, including contracting. Undergrounding construction for the initial group of five feeders (covering approximately 3,000 customers) will be initiated approximately four months after legislative approval is obtained and subject to Public Service Commission approval. This means that field engineering and design will need to begin prior to when all approvals are obtained so that there are no delays in starting construction once legislative and Public Service Commission approvals are in place. The remaining undergrounding is based on a production schedule beginning in 2014, which allows for completion without inordinate construction stress on residents, neighborhoods and businesses. The work planning process will coordinate construction with DDOT projects scheduled for the same timeline, as well as economic development priorities that might influence sequencing and the selection of neighborhoods.



The two graphics below provide a high level schedule for the start-up process, covering six main steps and the approximate time required for each step.

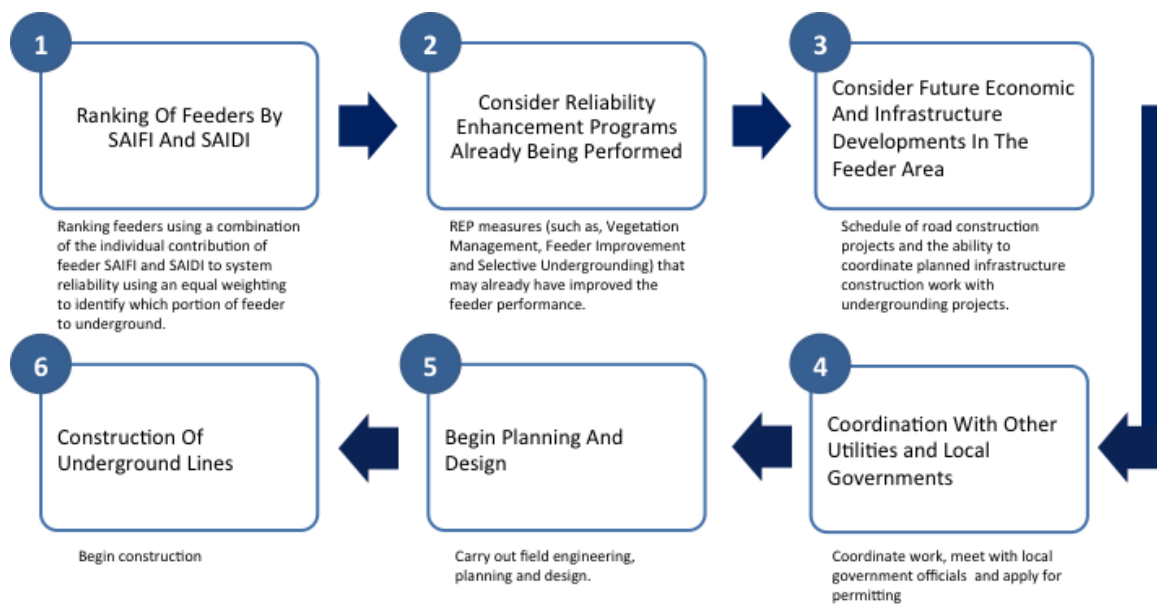


Figure 15 – Ranking and Selection Process



The timeline for the entire process is shown below.

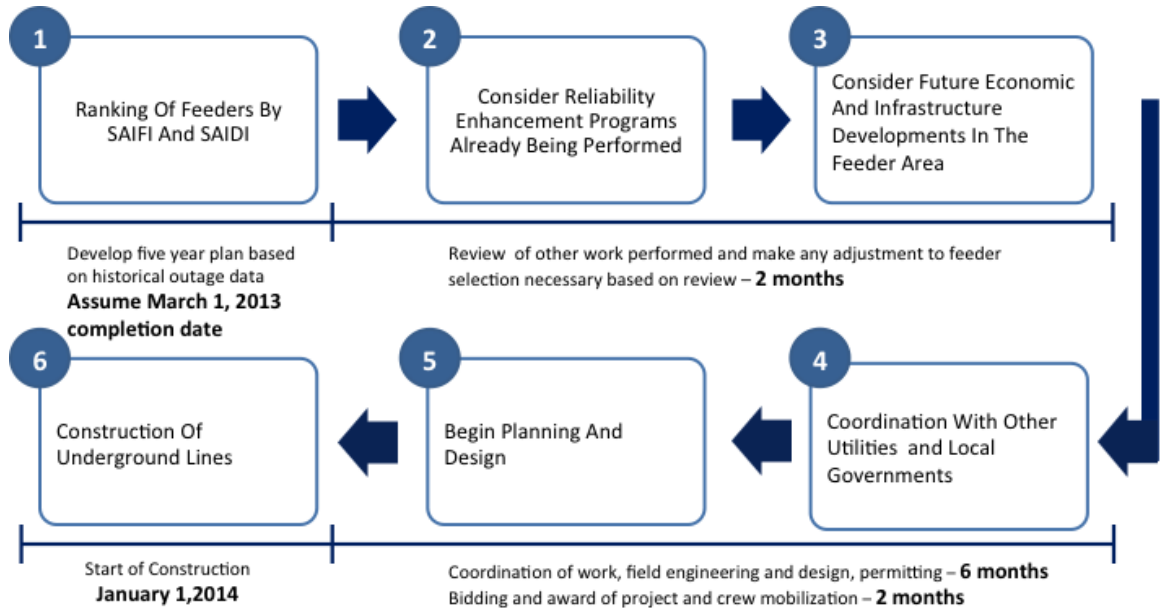


Figure 16 – Timeline for Completion

Economic Benefits

The economy of the District of Columbia benefits from Pepco’s ongoing investment in its electric distribution system. The most obvious benefits are improved reliability, enhanced service and increased access to the electric system that are a direct result of Pepco’s infrastructure investment.

The Mayor’s Power Line Undergrounding Task Force has recommended that further undergrounding of the Pepco distribution system will improve the system’s performance during major storm events. The multi-year implementation plan (approximately 7 to 10 years) will result in sustained employment in the District of Columbia and the potential for job creation as well.

As Pepco invests in distribution related projects, it contributes to employment in the District of Columbia in a variety of ways, including:



- 1) Direct Pepco internal employment in both the field and professional levels across a variety of functions, from running cable to designing projects to maintaining equipment;
- 2) Direct contractor employment, mostly in construction and engineering roles;
- 3) Indirect employment along the regional supply chain that provides materials and services to Pepco and its contractors; and
- 4) Employment throughout the District of Columbia that is supported by spending of income generated by the above three categories of employees.

Methodology for Estimating Employment Contributions

Direct employment within Pepco was estimated for the Undergrounding Program by assuming the labor share of expenditures for a recently completed undergrounding project would be maintained for future projects. The regional allocation of internal employment was based on the regional distribution of Pepco's current employees. Direct contractor employment and all indirect employment were calculated using categorized spending estimates from Pepco and the input-output modeling tool, IMPLAN. IMPLAN is a commonly used tool for estimating supply chain impacts and the regional multipliers that result from income flowing into a region.

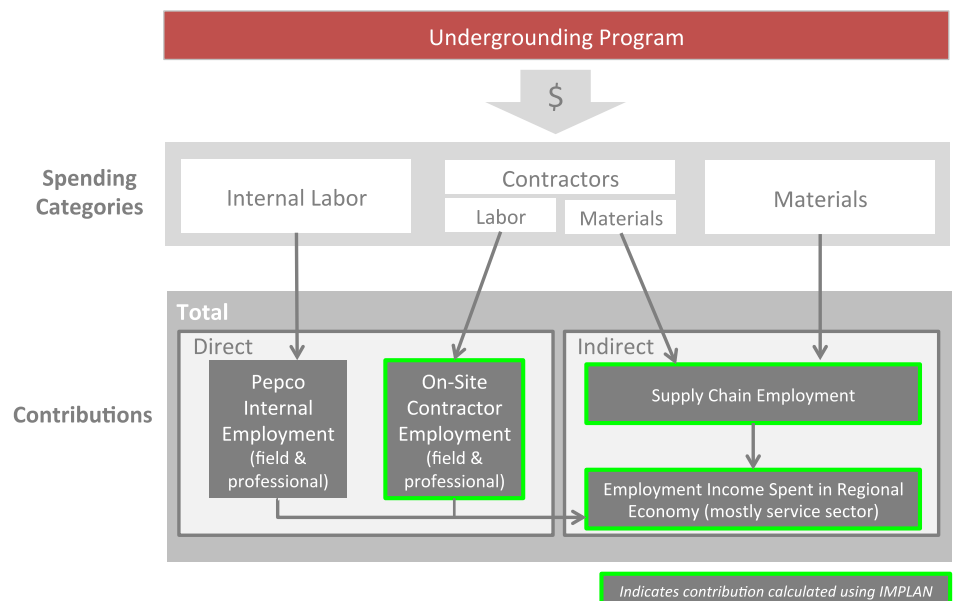


Figure 17 – Methodology for Estimating Employment Contributions



Estimates of the allocation of spending on the Undergrounding Program were based on actual underground construction work of 13 kV networked distribution feeders to supply new federal building construction located within the District of Columbia. The allocation of spending on this work was used as the scalable basis for the construction of new 13 kV distribution feeders in the Undergrounding Program.¹² The sharing between the three main spending categories (internal labor, contractors and materials) is assumed to be similar to the actual spending on the Undergrounding Program. The analysis assumed that contractors will be sourced regionally to the extent possible as indicated by IMPLAN's regional purchase assumptions.

The Undergrounding Program spending profile differs from Pepco's other distribution construction activities in a few key ways:

- 1) Significantly more civil work, such as digging and paving, than what is currently in Pepco's mix of planned projects. Current planned projects consist largely of overhead construction. More civil work leads to more labor per level of investment and a greater need for locally sourced materials;
- 2) Increasing reliance on contractors. The significant expansion assumed in the Undergrounding Program would result in additional reliance on contractors that can provide a more extensive scope of services; and
- 3) More locally sourced contractors. It is assumed that Pepco and the DDOT, through their competitive bid process, will take advantage of the District of Columbia contractor base that is expected to expand with such an increase in construction projects. The extent to which contractors establish a presence in the District of Columbia and hire local workers will determine the accuracy of this assumption.

Table 16 shows the share of spending by category for the Undergrounding Program.

¹² The "Undergrounding" Program is primarily the construction of new underground 13 kV feeder systems. As the new underground system is constructed, the existing overhead feeder (primary) system is removed. Therefore, the use of actual new underground construction data for similar distribution feeders is an appropriate comparison of labor contributions of the Undergrounding Program.



Spending breakdown by category for undergrounding program

Category	% Share
Internal Labor	23.5%
Contractors	53.0%
Materials	23.5%
Total	100%

Table 16 – Spending Breakdown for Undergrounding Program

Given these assumptions about sharing between categories, spending for the Undergrounding Program was allocated to relevant IMPLAN sectors. The IMPLAN model was then used to calculate potential employment, both direct for contractors and indirect for all categories.

Employment Contributions

Table 17 shows the direct and indirect employment contributions that could be possible to be developed from spending on the Undergrounding Program for the District of Columbia economy, and reflects the combined employment impacts of both District funded activity and Pepco funded activity. It includes the potential employment contributions from Undergrounding Programs in both the District of Columbia and Maryland that increase economic activity in the District of Columbia. The Undergrounding Program is based on a fixed spending amount per year, and thus the contributions are assumed to be the same each year.

	Annual	Total (2014-2018)
Direct	800	4,000
Indirect	150	750
Total	950	4,750

Table 17 – Employment Contributions of Undergrounding Program (2014-2018)

The direct employment from the Undergrounding Program is consistently larger than the indirect employment throughout the next five years, which for planning purposes is assumed to be the period of time when the majority of the construction work would be performed. The large number of direct employees relates mostly to contractors working in project engineering and construction. While some indirect employment comes from the local materials supply chain, electrical equipment and cabling generally come from outside the District of Columbia. The direct employment also generates additional indirect employment in the region.



Customer Engagement

Customer engagement, communication and education will be critical to the success of the undergrounding initiative. Well before construction begins, outreach efforts must be launched to educate customers on the undergrounding process, related costs and achievable benefits. The significant construction activity that undergrounding requires can have a substantial impact on District residents. Therefore, it is imperative to clearly communicate what that impact is, how long it will last and how, in the longer term, construction activities will benefit residents.

In partnership with the members of the Undergrounding Task Force and Mayor Gray, the District is undertaking a “game changer” that will place the District of Columbia at the national forefront for grid resiliency. As storms have increased in frequency and severity, the importance of undergrounding the electric system has never been more important.

A project of this scale requires significant investment. This investment will substantially improve the infrastructure, limit the impact storms have on the electric system and stimulate economic growth through job creation. For all of these reasons, communication with citizens early and often – before, during and after construction – is a necessity so they can understand the details and the benefits of the undergrounding plan. The education campaign must be fully integrated and use multiple channels to successfully deliver consistent messaging.

The goal of this customer engagement plan will be to inform and update District utility customers and taxpayers on the Task Force’s undergrounding solution. Among the objectives of the plan will be:

- Explain the causal impact faced by consumers as a result of power outages caused by increasing weather events;
- Explain that inaction to respond to the increasing storm frequency and intensity is not a viable option;
- Explain the unique process the Task Force has undergone to involve itself in what has traditionally been a regulatory function in an effort to develop a common understanding of the costs and benefits;
- Explain the impacts, including financial (cost to customer) and physical (lifestyle) on consumers;
- Explain the benefits that customers not connected to the lines undergrounded will receive from faster restoration if less damage to the electric system is experienced in the future;



- Explain the financing options and limitations available to Pepco and the District government to fund the project; and
- Explain the challenges faced by the utility to incur additional expenses at an accelerated pace without timely recovery by the utility of its investment.

The engagement plan will be targeted at all elected officials, residential and commercial customers and large customers such as hospitals and universities. The impact will go beyond rates to include disruption of streets, business operations, roadway closures and other issues.

In terms of messaging, customer research will help guide the customer education plan to ensure all communications are clear and engaging. For purposes of this plan, the Task Force has developed both first-level and second-level draft messages that can be tested along with others to determine effectiveness. Draft first-level message:

The District of Columbia government, through the work of Mayor Vincent C. Gray's Power Line Undergrounding Task Force, has determined that significant new investment is required to fund improvements to the District's aging electric delivery system in order to reduce extended power outages that are caused primarily by storms. Officials have determined that the most effective and affordable solution is a joint public-private construction and funding program to implement undergrounding in the District of Columbia.

It will not negatively impact the District's budget or debt ceiling as it will be a direct recovery from electric customers in the District.

Draft second-level messaging includes:

- Benefits include, but are not limited to: improved reliability, reduced outages and faster power restoration;
- Information on the process as it relates to residential and commercial interests such as small businesses, hospitals and universities, shopping corridors, disruption of transportation in communities, roadway construction, streetscape coordination, etc.;
- Positive economic impacts such as job creation; and
- Undergrounding, coupled with Pepco's other infrastructure improvements, will provide increased reliability day-to-day as well as during storms.

As part of the overall customer education campaign costs, research and concept testing may be done to determine whom customers will identify with as appropriate messengers for the campaign to help ensure customer engagement and recall of the campaign. While the overall campaign theme and messaging as well as supporting design and graphics will



be informed by customer research, the project will be positioned as a “working together for the common good” initiative.

Impact of Undergrounding on Reliability

There are both pros and cons to undergrounding power lines in the District of Columbia. Some of these pros and cons are highlighted below.

Pros of undergrounding:

- Protection from outages caused by trees, wind, ice, snow, rain, lightning, animals and vehicles;
- Ability to optimize capital spending previously dedicated to reliability improvement efforts to offset the cost of undergrounding;
- Improved aesthetics (if cable and phone lines are also placed underground as well);
- Lower tree-trimming costs;
- Lower storm damage and associated restoration cost;
- Fewer and less lengthy power outages from major storms and the associated lifestyle disruptions and negative economic impact on customers;
- Fewer momentary power interruptions;
- Improved customer relations regarding tree trimming as it relates to outage reduction(s); and
- Future underground construction methods and technology will allow for faster restoration time compared to past design due to greater system interconnection flexibility.

Cons of undergrounding:

- Higher costs than overhead lines for initial construction;
- Underground equipment may not last as long as overhead facilities if exposed to harsh environments;
- Possible tree damage in conversion areas;
- Susceptibility to flooding that could result in outages;
- Generally higher replacement costs than overhead lines; and
- Potentially more time needed to find and fix outages.



Regulatory Process Going Forward

The Task Force's recommendations are found in the next section. These recommendations are focused on a shorter-term horizon while there will be a longer-term ongoing regulatory process. The regulatory process going forward is the focus of this section.

Once the Task Force recommendations are implemented, an ongoing regulatory process will then be followed. This regulatory process will direct the deployment of approximately \$1 billion in capital to underground a larger number of distribution feeders in the District. This investment will be guided by the key lessons learned from the initial 2014-2015 investment of approximately \$200 million to underground approximately five feeders. For example, these key lessons learned will encompass the methodology to rank and select feeders for undergrounding, the communications plan and customer outreach and other procedural items critical to the undergrounding process.

The project plan will be based on spending up to \$200 million per year of capital improvements to underground additional portions of the District's electric system. The recommended plan will aim to underground portions of up to 60 feeders based on analyses of those portions most likely to provide significant reliability benefits from undergrounding. This compares with just 23 feeders that could be placed underground for the same cost over the same period if 100% of all wires were placed underground (not necessarily with a corresponding significant improvement in reliability). Therefore, strategic undergrounding is a more effective use of funds to achieve reliability improvements in the overall system.

The ongoing undergrounding work to be completed by Pepco and the DDOT will be overseen by the Public Service Commission. This oversight would begin immediately in 2014 when initial preparations are made and undergrounding plans developed. Pepco would file a plan regarding how additional feeders would be ranked and selected for undergrounding in the future. The Public Service Commission will initiate a proceeding to review and approve the specifics of the ongoing undergrounding project plan and to formalize the feeder selection process and approve those feeders to be undergrounded over the period covered by the plan.

It is anticipated that Pepco and the DDOT will file a status report informing the Public Service Commission of the status of the current undergrounding projects, the cost for each feeder being undergrounded and any details regarding changes to the original plan



or any new issues uncovered. As part of this annual status report, Pepco would provide updates to its undergrounding plan for the three-year period proposed by the original project plan. In this way, all stakeholders would be aware of the undergrounding plan for a period of three years, as well as areas where undergrounding will occur and other important details.

Technical Committee Recommendations

The Technical Committee was tasked with the responsibility to answer the following key questions:

1. Should the District of Columbia undertake the systematic undergrounding of overhead power lines and, if so;
2. How much of the current overhead distribution system should be placed underground, *i.e.*, all or some portion thereof?

After careful study, the Technical Committee proposes the following list of recommendations.

Recommendation 1: Proceed with 'Scenario 3' and the selective undergrounding of power lines in the District

The undergrounding of overhead power lines could provide District customers substantial benefits in improved reliability and resiliency of the system, *i.e.*, the ability of the electric system to withstand severe weather events. The Technical Committee recommends proceeding with the undergrounding of power lines in the District with a limited scope of activity.

- Underground the primary mainline and lateral portions of the feeder ('Scenario 3'), retaining the secondary lines and communication lines overhead;
- Implement an undergrounding program focused on the top 55 to 60 distribution lines. This would cost approximately \$1.0 billion and would estimate the maximum expenditures in any one year to approximately \$200 million;
- Coordinate where possible with other construction projects in the District to reduce costs and realize synergies;
- Take advantage of joint construction techniques; and
- Devise a strategy for Public Service Commission oversight of the undergrounding program and its implementation.



Recommendation 2: Do Not Proceed with Wholesale Undergrounding

The District should not require the wholesale undergrounding of all overhead distribution facilities in the District, as the cost of such effort would be prohibitive and the gains in terms of improved reliability would not be commensurate with that cost.

Recommendation 3: Follow Pepco Process for Partial Undergrounding

The District should require the partial undergrounding of overhead distribution facilities. Pepco has developed a process that will apply sound engineering criteria in an objective and transparent manner to identify those portions of Pepco's District distribution system where the placement of overhead distribution facilities underground would produce a material improvement in distribution system reliability and resiliency. This process will be used to guide the multi-year undergrounding program as discussed in the Task Force Report and annual updates submitted to the Public Service Commission.

Recommendation 4: Coordinate Undergrounding with Major Construction Projects

It is recommended that the undergrounding process be undertaken in coordination with major construction projects and initiatives of other utilities and District agencies in order to achieve cost savings and to reduce the disruption of daily life and business in the District. This can be achieved by enhancing the Department of Transportation planning process to require that long-term road projects are evaluated to identify the overhead electric distribution facilities that are in close proximity with the roadwork and the historical reliability of those facilities. If an overhead feeder that is impacted by the road project would benefit from undergrounding then this circuit would be advanced to achieve the economic benefits resulting from a coordination of projects. In addition, where major road projects are scheduled to be performed by the District, an evaluation should be performed to determine if there are opportunities for the District to construct the conduit system as part of the local or federal highway project. When the District does construct conduit systems for the utilities, it must be built to the same standards as the utilities construct their own facilities.

Recommendation 5: Take Advantage of Joint Construction Techniques

In areas in which all Pepco overhead distribution facilities are to be placed underground, all lines on such poles should be placed underground utilizing joint construction techniques, e.g., common duct banks with separate utility manholes. To facilitate these



construction techniques a Memorandum of Understanding (MOU) should be filed jointly by the utilities and District government with the Public Service Commission within nine months of this report. This MOU would outline the process to be used to determine the allocation of construction costs for the construction of common facilities between participating utilities. In situations where the District constructs the conduit, the cost for construction would be borne by the District and would reduce the overall expenditures by the utilities.

Recommendation 6: Develop Public Awareness and stakeholder communications plan with budget and engage in extensive consumer education

- Develop and submit a timeline for the consumer education plan implementation. This implementation should be conducted as soon as possible and in advance of the beginning of substantial construction;
- Educate District customers: the Technical and Planning & Research Committees both feel strongly that there must be an extensive effort to educate District consumers in simple terms about:
 - The near- and long-term plans for undergrounding;
 - The benefits to be obtained from undergrounding;
 - The cost of undergrounding, including cost allocation;
 - The process by which distribution facilities will be selected for undergrounding;
 - The implications of undergrounding for District residential and commercial consumers; and
 - Discussion of alternatives to undergrounding and the undergrounding of select sections of circuits.

Recommendation 7: Communications facilities

- Undergrounding of communication lines will only be recommended where complete undergrounding of the electric facilities is also recommended. This recommendation could be driven by economic development objectives or infrastructure improvement projects that may provide further justification for undergrounding of all lines and equipment;
- Joint trenching activities, as applicable, will be used to reduce the cost for all utilities;
- If DDOT determines that it is to construct underground facilities for communication lines, the cost to construct those facilities would be in addition to the funding identified by the proposed legislation and would be funded



totally by DDOT and the communication companies, since no portion of the proposed revenue bonds can be used to fund this work; and

- If communication lines were to be moved underground that would require additional cost recovery authorization for the relevant communication company(s).

Recommendation 8: Integrate a workforce participation strategy into the undergrounding program

- Examine local workforce participation models to identify best practices that encourage and spur District hiring for capital projects. (For example, the District's Workforce Incentive Program takes advantage of financial benefits – 5 percent of the general contractor fee, and 10 percent of subcontractor payroll when resident participation targets are achieved – to help stimulate local hiring); and
- Collaborate with employment and vocational development centers to identify prospects for preparing District residents for new technologies and operation and maintenance opportunities related to electric utility services.

Develop a workforce participation strategy that aids the contractors, government and District residents; and supports the District Government's objective of increasing the participation of its residents on capital projects. Incorporate skill-building and competency development programs as viable.



FINANCE COMMITTEE

Members of the Finance Committee

The list of members was as follows (in alphabetical order):

- Quincy Booth, Chief of Staff, Office of the Deputy Mayor of Public Safety and Justice;
- Matt Brown, Deputy Director, Resource Management, DC Department of Transportation;
- Matthew Frumin, Ward 3 Appointee, Resident Representative;
- Eric Goulet, Director, Office of Budget and Finance;
- Herbert Harris, Jr, Ward 7 Appointee, Resident Representative;
- Cary Hinton, Policy Advisor to the Chairman, Public Service Commission;
- John Howley, ARRA Economist, Public Service Commission;
- Phyllis Love, Management and Program Analysis Officer, Office of the City Administrator;
- Sandra Mattavous-Frye, People's Counsel, Office of the People's Counsel;
- Kevin McGowan, VP Regulatory Affairs, Pepco;
- Donna Rattley-Washington, Vice President, Government Affairs, Comcast; and
- Dr. John Ross, Senior Advisor and Director, Economic Development Finance, Office of the Chief Financial Officer.

Scope of Work for the Finance Committee

The Finance Committee examined several general financing mechanisms that could be used for the nearly \$1 billion underground program, in combination with traditional utility financing:

1. Infrastructure Recovery Surcharge;
2. Third-Party Financing; and
3. Utility Securitization.

In addition, the Committee evaluated a hybrid approach that involved a combination of utility financing, District Government securitization and the leveraging of capital improvement funding.

In considering these alternatives, the Finance Committee recognized:

1. The cost impact to Pepco's customers;
2. The potential for lower cost debt financing; and
3. The business characteristics of Pepco, including its credit ratings.



Infrastructure Recovery Charge

With this financing mechanism, the utility would use a Public Service Commission approved infrastructure recovery charge to finance a pre-approved construction plan as the costs are incurred. This financing mechanism is designed to provide timely recovery of the utility costs as the assets are being re-located underground and providing benefits to the customers; and it does not remove the project prudence review performed by the Commission. The infrastructure recovery charge allocates the cost of the investments similar to the method used to recover costs in a typical utility rate case. The infrastructure recovery charge associated with the investments ends once the utility has fully recovered the costs for relocating lines and facilities underground, including the depreciation costs for stranded lines and equipment and authorized return. At the end of the \$1 billion underground construction program, the utility will request in its next base case filing, that recovery of the remaining costs be moved into rate base and recovered through the traditional rate base process. Special surcharge financing mechanisms are common and used by a wide range of electric utilities providing service in 25 states (including California, Florida, New York, Pennsylvania and Virginia) to facilitate investment and finance projects that benefit millions of electric utility customers, including programs to modernize the distribution system, increase reliability or to replace aging infrastructure.

Third-Party Financing

This financing mechanism is debt-supported contribution in aid of construction (CIAC) that involves long-term debt issued by the City, State or District in which the utility operates and a special tax on electric utility services to support the repayment of the debt. Depending on the depreciation life of the asset involved, the repayment of the third party financing could be longer or shorter than the asset's cost recovery period through the traditional rate base process. The positives of this mechanism are that tax payments could be spread out over a longer time period and the construction period is not tied to the payment period. However, there are also some negatives to this mechanism. The tax payments could be spread over a shorter period of time, impacting customers' combined tax and service rates; the debt generally needs to be reported on the issuer's balance sheet (i.e.: the City, State or District); and issuances have a higher finance cost and require more robust controls to ensure that the proceeds are earmarked



strictly for the undergrounding project. With third party financing, the tax depreciation of the assets, which is a benefit to the utility customers, is usually forgone since the utility is fully reimbursed for the cost of the investment through the CIAC. Thus, the utility's tax implications must be evaluated as part of the economics of the total costs for the underground projects.

Securitization

Utility 'securitization' refers to Laws and Commission Orders needed to set-aside ("secure") a stream of ratepayer fees or surcharges that are dedicated to paying off bonds issued by a separate entity protected from bankruptcy. In many/most models, the separate entity is created as a subsidiary of the utility. With this financing mechanism, the utility serves as the collection agent for the financing costs, which include the repayment of the bond. The Public Service Commission cannot change the Financing Order once it is issued nor can the Legislature amend the authorizing statute. Currently, there are approximately 20 states¹³ that allow for utility securitization.

Securitized assets have typically been used to recover regulatory assets and expenditures that have been made in the past. Securitized assets have not been used to fund future construction programs. Examples of assets that have been recovered through securitizations include stranded costs associated with deregulation, costs associated with the cancellation of nuclear power plant construction projects, losses on power purchase agreements, environmental regulation compliance costs and costs associated with hurricane restoration activities. The terms of securitization bonds have generally ranged in the 5-10 year period, with a few extending out 20 years.

There are pros and cons to this financing approach. The positives include a very low cost of borrowing due to a typical AAA rating on the bonds. However, securitization can be inflexible and can be very time consuming to complete. It requires enabling legislation and a financing order from the Public Service Commission that cannot be changed regardless of any changing circumstances. Also, there is a limit on the amount of securitization that can be borrowed without negatively impacting the issuer's credit ratings. In setting this limit, the rating agencies consider several financial factors including the percent of surcharge to the customer's total bill (under significant stress test scenarios) and the percent of securitized debt to the utility's total debt outstanding and

¹³ http://saberpartners.com/press/articlepages/asr_4_12.html



capital structure. Based on Pepco's discussions with the rating agencies and the investment banks, Pepco has indicated its total capacity to issue securitized debt for the Pepco-DC operations is approximately \$375 million. In addition, the term of the securitization bonds is typically significantly less than the amortization schedule often associated with depreciation of the assets through more traditional ratemaking approaches. Such a difference in the amortization impacts customer rates, and may in fact offset the advantage of utility securitization from a customer rate impact perspective.

A final consideration is that 100% of the cash flow received from the utility customer securitization surcharge must be used to pay down the securitized debt and cannot be used to further reinvest in the electric distribution system. Operating cash flow that Pepco receives today is not restricted and can be used for many purposes including reinvestment back into the electric distribution system. Over the past five years (2008-2012), Pepco has reinvested approximately 90% of its earnings back into the business.

DDOT Capital Improvement Funds

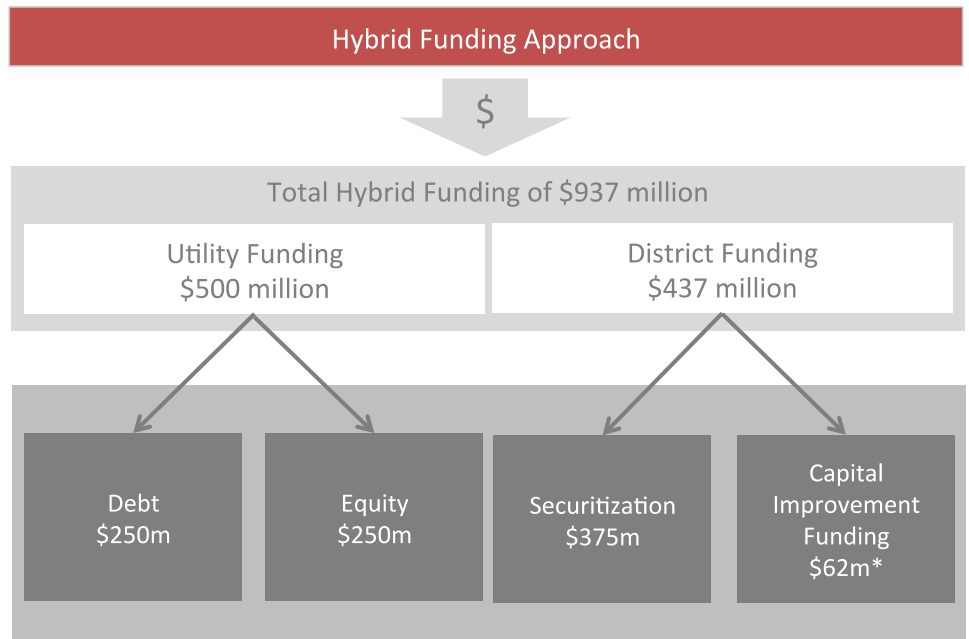
The District is exploring whether local or federal capital improvement funds are available to cover a portion of the underground program. The District is exploring the feasibility of using capital improvement funds to build the underground conduit system at the same time a street is repaired and resurfaced. There is \$62 million in the District's capital improvement budget available by synchronizing the construction of underground conduits and equipment vaults with approved roadwork. This approach will reduce the underground program costs by providing additional funding outside of the utility and will improve coordination between the undergrounding projects and various road projects. Without this coordination of projects, the undergrounding projects could be delayed by an inability to perform construction work in the same general area as other road projects working at the same time.

Hybrid Financing Approach

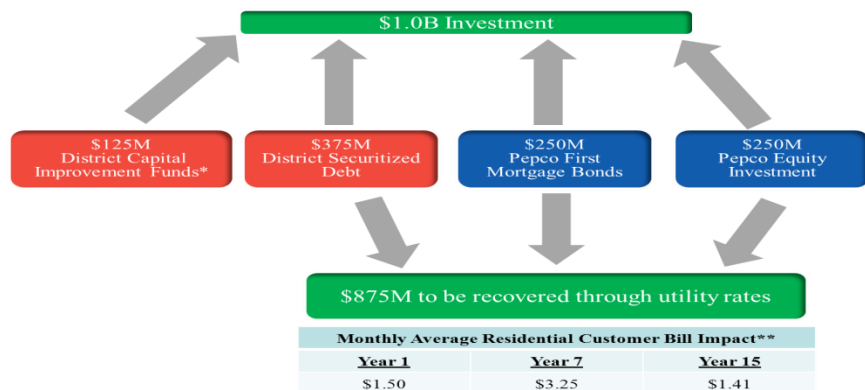
While the infrastructure recovery charge and the utility securitization mechanisms can be used as stand-alone financing sources, depending on project scope and costs, the Task Force has determined that a hybrid financing strategy provides the greatest public benefits at the lowest costs to utility customers. A hybrid financing approach leverages



multiple sources of funding. The hybrid approach involves sourcing funds from a combination of utility financing, securitization bonds and the leveraging of capital improvement funding. The graphic below depicts how this hybrid approach would work for the projects that will be performed jointly by both the DDOT and the utility.



*The \$62 million from DDOT is the level of funding included within the current budget. Additional funding up to a total of \$125 million may be requested in the future if appropriate to complete selected work.



* Subject to budget approval
** Excludes RAD customers

Figure 18 – Hybrid Funding Approach and Rate Impact



The hybrid approach sources funding from the utility and the District. Utility funding would be comprised of both debt and equity financing. District funding would encompass a combination of securitization and capital improvement funding. In order to maximize the capital improvement funding, there will need to be close coordination between the District and Pepco to schedule undergrounding and road improvement projects together. The recovery of the utility's costs will be through a utility projects charge and the District's securitization costs will be through an infrastructure investment charge on customers' electric distribution service bills. The hybrid financing approach and the expectation that the DDOT constructs the electric utility underground infrastructure enables the District to access the low interest rate bonds currently available, in order to finance the DDOT's construction of the conduit infrastructure, and to use existing road funding for a portion of the underground conduit construction costs as part of larger road redevelopment projects.

Other Considerations

The Finance Committee recognizes that the implementation of the proposed hybrid financing methods could take many months to complete. In order to facilitate the initiation of the underground projects as soon as final Public Service Commission approval is granted, the Commission should allow Pepco to establish a regulatory asset to enable recovery of all non-capital costs associated with the underground program. These underground project start-up costs can include such items as development of customer education and communication plans, studies to identify prioritization of feeder selections, preliminary work to review selected feeders for undergrounding and development of the project plan and coordination work between Pepco and DDOT.

In summary the key recommendation of the Finance Committee are:

- The \$937 million shall be funded as follows:
 - Up to \$500 million authorized through a Pepco traditional utility rate surcharge;
 - Up to \$375 million authorized through a utility rate securitization in bonds, through one or more series, issued by the District of Columbia. These revenue bonds are outside the District's debt cap, because electric rates are not part of the General Fund; and
 - \$62 million in savings by synchronizing with approved roadwork.
- The District shall be responsible for work enhancing roads and construction of vaults, conduits, and manholes in coordination with DDOT road improvement projects;



- Ratepayer contributions shall be through regulated distribution rates. This is the most equitable way to distribute the cost and will be allocated among customer classes consistent with cost allocation methods as approved by the Public Service Commission;
- The impact on customer rates will on average be a 3.22% (\$3.25) increase for residential customers in year seven and between 1% and 9.22% for commercial customers. These increases reflect average usage and for commercial customers the individual financial impact will vary between customers; and
- Low-income electricity users (Residential Aid Discount customers) shall be exempted from any undergrounding surcharges.

In addition, the Finance Committee urges the Public Service Commission to consider other recovery methods that would allow the utility to recover its costs on a more timely basis, thus allowing more capacity to accelerate its other reliability related expenditures. Common methods used throughout the industry include trackers as noted above, fully forecasted test periods and terminal rate base.



EMERGENCY RESPONSE COMMITTEE

The list of members was as follows:

- Chris Geldart, Director, DC Homeland Security and Emergency Management Agency, (Committee Chairman);
- Elijah Crawford, Special Assistant, DC Homeland Security and Emergency Management Agency;
- Soumya Dey, Acting Associate Director, DC Department of Transportation;
- Kenneth Glick, Attorney Advisor, Public Service Commission;
- Cary Hinton, Policy Advisor to the Chairman, Public Service Commission;
- Karen Campell, Verizon, Vice President, State Gov. Affairs, Mid Atlantic Region;
- Nathan Palmer, Verizon;
- Karen Sistrunk, Deputy People's Counsel, DC Office of People's Counsel;
- Jennifer Weberski, Assistant People's Counsel, DC Office of People's Counsel;
- Herb Jones, External Affairs Manager, DC Office of People's Counsel;
- Sybil Hammond, DPW, Administrator, Solid Waste Management;
- Herbert Harris, Jr., Ward 7 Appointee, Resident Representative ;
- Matthew Frumin, Ward 3 Appointee, Resident Representative;
- Phyllis Love, , Management & Program Analysis Officer, Office of the City Administrator;
- Jeff Mittler, Director Electric System Operations, Pepco; and
- Pete Pedersen, Manager Emergency Preparedness, Pepco.

The Emergency Response Committee members met on a number of occasions to carry out their work and provide recommendations for operational practices for the prevention of and/or expedited recovery from power outages.

Scope of Work for the Emergency Response Committee

The Emergency Response Committee examined five general recommendations for the prevention of, or improved recovery from, power outages in the District of Columbia:

1. Review debris removal coordination (improve timely assessment of whether a power line is live thereby facilitating District agencies moving forward in debris removal);
2. Review of communication protocols between District leaders and Pepco;
3. Review of resource allocation (manpower);



4. Review of Pepco's community outreach (assisting the District in providing for customers' needs); and
5. Preventative steps other than undergrounding.

The District Response Plan

The District of Columbia Homeland Security and Emergency Management Agency (HSEMA) is the lead organization designated for coordinating emergency disaster response in the Nation's Capital according to the District's comprehensive emergency management plan known as the District Response Plan (DRP).

The DRP developed in accordance with District of Columbia Homeland Security, Risk Reduction and Preparedness Act of 2006 and the Public Emergency Act of 1980, DC Law 3-149, describes the mechanism and structure for the mobilization of District resources and the conduct of activities to address the consequences of any major disaster or emergency. The DRP is all-hazards focused; the concepts apply to any disaster, catastrophe or emergency where the health, safety or welfare of persons in the District is threatened by actual or imminent consequences. These many threats include power failures or outages.

When an incident occurs, such as a power outage that affects more than 100 customers, outages in critical facilities, or there is a potential for extended outages, HSEMA notifies relevant agencies in accordance with its Emergency Response Notification Matrix and works with Pepco to update situational awareness regarding emergency incidents. HSEMA assesses District recovery needs at the outset of the emergency and ensures that relevant damage and emergency information is shared with applicable District agencies and counterparts, including Pepco.

Standard Operating Practices

While the delivery of recovery assistance, including electricity disruption, conforms to the District Response Plan, HSEMA and Pepco have established standard operating practices.

HSEMA maintains a prioritization list, which is regularly updated to identify the event-specific urgency level for critical facilities such as hospitals, nursing homes, fire and police stations, 911 facilities and the water supply system. The listing assigns a priority number



to each critical facility before it is distributed to Pepco's Emergency Preparedness Group. The restoration strategy during a power outage will correspond to the event-specific priorities.

Following the severe storms of 2012, which triggered significant power outages in the District and throughout the region, Pepco's Emergency Preparedness Group and HSEMA established a "priority coding system" with the jurisdictional 911 centers. As a result of this priority coding system, 911 dispatchers and Pepco dispatchers now are able to use the same terminology when describing the threat posed by a downed wire or other life safety issue, and to coordinate an appropriate response. This system is used during both "blue sky" and storm events.

Pepco provides 24-hour liaison support to the HSEMA Emergency Operations Center (EOC), which helps ensure situational awareness. The communication protocol during a disruption of electric service in the District includes regular updates on:

- Customer outages, including estimated restoration times, damage reports, and reassessment of restoration priorities, as applicable;
- Crew numbers, system conditions and general work locations; and
- Downed wires and tree removal (particular those blocking roadways), as coordinated with DDOT through the Urban Forestry Task Force and the Department of Public Works.

Throughout the emergency event, a direct line of communication is maintained between Pepco Emergency Managers and the HSEMA Director to ensure immediate feedback on critical issues. Emergency response practices enable Pepco to serve as an effective conduit for addressing, reviewing/setting priorities, providing timely updates and handling concerns vital to HSEMA and the District of Columbia.

Emergency Preparedness and Storm Restoration Processes

The District, in coordination with Pepco, has well-established emergency preparedness and storm restoration processes in place. There are a number of steps Pepco takes to ensure that the company is prepared to respond as quickly as possible in the event of an emergency, and that it can help ensure the safety of its employees, other first responders and the general public while working to restore electric service as quickly as possible.

Some of the activities Pepco engages in to help prepare for emergency situations include:



- **Plans, training and drills** – These include incident response plans, incident response roles training, drills and exercises and related preparatory activities;
- **Weather monitoring** – Pepco subscribes to two different weather services to ensure it has the best information available regarding future weather events approaching its service territory. The company also reviews information available to the public to complement these weather subscription services. In addition, Pepco has processes in place to share weather and other related information with other utilities and government entities;
- **Business continuity and contingency planning** – In order to help ensure safe and reliable electric service, Pepco has business continuity and contingency plans in place that cover a number of possibilities. These help the company plan and prepare for both known and unknown emergencies; and
- **Mutual assistance** – Pepco is a member of mutual assistance organizations so it can supplement its work force during storms and other emergencies. Other utilities and contractors lend personnel in times of need and Pepco does the same with its personnel.

Restoration

In the event of a power outage affecting a significant number of customers, Pepco initiates its emergency activities. Restoration activities are focused on:

- Public safety;
- Employee safety;
- Restoration of service as quickly as possible; and
- Customer satisfaction.

As part of power restoration efforts, Pepco prioritizes the necessary work to ensure it meets the four focus areas noted above. In general, the prioritization is ranked according to the following criteria:

1. Potentially life-threatening situations;
2. Bulk power system issues (transmission);
3. Sub-transmission system issues (substation supply);
4. Distribution system issues:
 - Critical facilities (nursing homes/assisted living, schools, fire police, etc.);
 - Primary feeders;
 - Vicinities; and
 - Service drops (customer premises).

In this way, Pepco can focus its power restoration activities in the areas where it is most needed and can make the biggest difference.



Another component to restoration activities is customer communication. Pepco seeks to provide its customers with the best information it can regarding the progress of restoration. On a “blue sky” day (e.g. not during a storm event), Pepco generates the “estimated time of restoration” (ETR) from its Outage Management System (OMS). The OMS system generates the ETR based on an analysis of customer calls, the typical repair time for the predicted device in question and other relevant criteria. Crews at the scene may then update this ETR after they arrive and can further assess the problem. Customers can access this restoration information through the use of the Pepco mobile app, the Pepco website to view individual account information or by calling to speak to a customer service representative.

During major events and storms, a different process is followed. No ETR is announced until after damage assessment is completed. Then, a “global ETR” is published with Pepco’s estimates of when it expects the majority of customers to be restored and also when the last customer will be restored. In addition, “tiered ETRs” are provided for larger outage groups and “individual ETRs” are provided for smaller outage groups and individual customer outages.

By following the power restoration process and priorities described above, Pepco can focus on restoring electric services as quickly and efficiently as possible while helping to ensure public and employee safety.

Emergency Response Committee

The Emergency Response Committee reviewed key areas to understand existing systems and processes and identified areas for improvement, as applicable.

Coordination for Debris Removal

There has been a perceived lack of coordination between the District and Pepco for timely assessment of power lines, thereby impeding District agencies from moving forward in debris removal. Pepco representatives outlined a number of steps Pepco takes to help ensure that lines of communication and proper coordination takes place when assessments of power lines are involved. Pepco’s Emergency Preparedness group has established protocols with the Director of HSEMA and the DDOT. HSEMA provides a prioritized list of locations involving downed wires. This list is reviewed by Pepco’s Manager of Emergency Preparedness, who then provides feedback to the HSEMA Director regarding its timeframe for site examination, which helps determine if the



downed lines are electric or communications. Pepco also responds to general reports of downed lines that come directly to the electric company or are received by mechanisms other than the HSEMA prioritized listing.

Pepco has established the “DDOT Task Force” crews that are specifically designated to team up with DC DDOT crews to assist with identification and removal of downed power wires. Given the potential threat to public safety, Pepco must dispatch crews to all reported wire down locations; however, frequently it is determined that the downed lines are telecommunications or cable TV lines – and not electric lines. Since Pepco is not authorized to handle lines owned by the communications companies, the dispatch of crews (when Pepco cannot take removal action) can affect the timely deployment of resources for power restoration. And since there is no color-coding of wires between utilities, the wire intertwining that occurs during the collapse of poles, for instance, makes it difficult to reliably determine ownership until Pepco completes its on-site examination. Essentially, this circumstance increases the workload during the restoration effort and extends Pepco’s response time. Greater coordination and communication between Pepco and communications companies will undoubtedly result in more efficient deployment of resources, which will help Pepco direct more of its resources to expeditious restoration of electricity

Communication Protocols Between District Leaders and Pepco

Pepco’s emergency management organization holds regular meetings with DC agencies responsible for planning and implementing crisis and disaster relief to review coordination and communication protocols, as related to electricity service. In addition, Pepco joins drills and exercises coordinated by HSEMA (e.g. hurricane preparedness) to ensure alignment of practices and build a team approach to planning, response and restoration. Annually, Pepco’s Emergency Management group holds annual joint emergency preparedness drills with members of Fire, Police, Communication, DDOT and Emergency Management personnel from the District of Columbia.

Pepco’s ability to respond to emergencies is strengthened through quarterly participation in Metropolitan Washington Council of Government (MWCOG) meetings where there is strategic discussion on regional planning and coordination for weather cycles and other anticipated events that could lead to disruption of power service. The District’s electric systems connectivity to neighboring jurisdictions makes on-going regional coordination a necessity.



Throughout an emergency event in DC, Pepco is engaged in conference calls with District officials to ensure the effective deployment of resources and to track changes in conditions that warrant adjustment of priorities and emergency response strategies. After an emergency event, Pepco contributes to debriefing – action review – meetings to examine service delivery and performance lessons that can inform response to new events and improve communication protocols between District leaders and Pepco.

Resource Allocation (Manpower)

Concerns about available manpower have been raised during both blue sky and storm restoration events. Pepco's clarification on general staffing levels encompasses both full time employees (FTE's) as well as those of its sustaining contractors.

Pepco retains several utility contract companies full time 24/7, 365 days per year, on property doing both reliability projects and maintenance work. Pepco also reviewed its processes for requesting mutual assistance. Mutual assistance was of great interest to the Committee. Pepco representatives provided a high level view of the mutual assistance process, covering topics such as conference calls, procedures for requesting resources and staging areas. Pepco's mutual assistance program is a multi-state program that allows for the utility to acquire a large number of crews with very limited advanced notice. This process is critical during major storm events since no utility can staff to restore the large number of customers that are impacted by major storms. The additional resources obtained are experienced linemen from utilities and contractors across the region and the country that are knowledgeable of the work required to rebuild the electric system after a storm and come fully equipped to perform the work. The electric utility mutual assistance program is similar to the mutual assistance program that is used to fight large forest fires when firemen are assigned from across the country to support local regions.

Pepco's Community Outreach (Assisting the District in Providing for Customers' Needs)

Pepco representatives reviewed several of Pepco's existing community outreach programs, used during major storm events, with the Emergency Response Committee. Information outlined the Pepco strategy to provide restoration updates to customers and to receive information from customers over multiple media such as, smart phone mobile apps, outbound calling, web pages with outage maps and improved estimated restoration times. The Committee was also provided an overview of the benefits of AMI during outage events and its ability to report both outages and restoration events



without involvement from the customers impacted by the outage. In addition, the group was provided information regarding Pepco's Emergency Medical Equipment Notification Program. The information outlined the program's proactive approach thereby enabling customers to better prepare and implement their own contingency plans in the event of power outages. The Committee also reviewed Pepco's notification of regulatory and government officials and emergency management agencies with regards to efforts to provide those entities with accurate, timely and coordinated communications regarding storm preparations as well as to discuss any special concerns.

Preventative Steps Other Than Undergrounding

The Committee identified two areas with regards to preventative steps to improve reliability and customer satisfaction other than undergrounding of utility lines. The first of these recommendations was for Pepco to continue its current work with the DC HSEMA Director and EOC member. This recommendation requires that all utilities continue to increase communication with HSEMA during major events, increase information sharing, provide proactive notifications as soon as the utility is aware of an event or the possibility of an event, and response to District of Columbia priorities and concerns whenever an issue is identified by any party.

The Committee's second recommendation is for both Comcast and Verizon to commit to providing resources during storm events to assist in addressing wires down issues. Currently Pepco trouble crews are the only utility responding to reports of wires down when many of those wires down reported turn out to be non-Pepco wires. The Committee noted that this requires a significant allocation of resource on Pepco's part and delays its response to other critical or life safety issues. The Committee requested that Comcast and Verizon provide their emergency operations plans to the group and present ideas to address this shortfall in dealing with this important initiative.



Recommendations of Emergency Response Committee

Recommendation 1: Avoid Impediments to Public Safety During Undergrounding Construction

Project planning should delineate the specific coordination between public safety entities including Metropolitan Police, Fire and Emergency Medical Services and HSEMA during the undergrounding process to avoid potential impediments to public safety including coordinating egress/ingress routes, street closures, etc.

Recommendation 2: Overlay Project Planning and Priority Facilities Mapping

HSEMA and Pepco should map priority facilities located within the project plan to ensure necessary precautions are taken to avoid disruption of the electric system during construction, and to identify and rectify potential access constraints. HSEMA has already begun the process of GIS mapping for priority facilities, and it will work with Pepco to incorporate the electrical system.

Recommendation 3: Integrate Communication Sector into District's EOC System

Telecommunications and cable service-providers must be strategically engaged with the District response team to provide reliable information on situational analysis and to achieve unified coordination to restore public safety and communication systems that meet facility prioritization requirements. Currently, only Pepco has joined the District's Emergency Operations Center (EOC), which activates emergency support functions under an incident commander to quickly assess conditions and mobilize and deploy resources to the affected areas. Through the EOC, corporations designate a liaison for direct communication with HSEMA during activation of emergency response.

Telecommunications and cable service-providers should make a commitment to joint response systems to help provide the best consumer service.

Recommendation 4: Establish an EOC Compatible Wire Down Recovery Strategy for Communication Services

Comcast and Verizon must commit to providing resources during storm events to assist in addressing wires down issues, in coordination with HSEMA and Pepco. Currently, Pepco



crews are the only utility responding to reports of wires down when many of the reported wires turn out to be non-Pepco wires. The committee noted that this requires a significant allocation of resources on Pepco's part and delays its response to other critical or life safety issues. Comcast and Verizon will need to share their emergency operations plans with HSEMA and Pepco and work on a collective strategy for effective response to down wires.

Recommendation 5: Mandate Backup Generators for Nursing Home Facilities

When prolonged power outages occur in nursing homes or assisted living facilities, there is a potential that nursing homes will be forced to transfer residents elsewhere if they are without heat or air conditioning for an extended period. Transferring already vulnerable residents requires a significant amount of resources and could strain the District's health system. DC Municipal Regulations 22-B §3235.5 requires nursing homes in the District of Columbia to provide emergency electrical power with an emergency generator when life support systems are used. However, this regulation does not require nursing homes to provide temporary emergency electrical power sources for heating/cooling systems. Nor does it require regular testing of temporary power sources. Therefore, it is recommended that the District's Municipal Regulation be amended to require that licensed nursing home facilities be equipped with an emergency power generator system in working order that is capable of providing power to all internal systems for the safe operation of the facility including heating, ventilation and air conditioning, fire protection, emergency lighting, oxygen delivery systems, ventilators, and any other facilities necessary to sustain life. Additionally, regulations should be developed for the regulation, design, installation, maintenance and periodic testing of the required emergency power generation system.



PLANNING & RESEARCH COMMITTEE

Members of the Planning & Research Committee

The list of members was as follows:

- Terry Bellamy, Director, District Department of Transportation (Committee Chairman);
- The Honorable Betty Ann Kane, Chairman, Public Service Commission;
- Phyllis R. Love, Management and Program Analysis Officer, Office of the City Administrator;
- Daniel Cleverdon, Economist (Technical Advisor), Public Service Commission;
- Cary Hinton, Policy Advisor to the Chairman, Public Service Commission;
- Laurence Daniels, Assistant People's Counsel, DC Office of People's Counsel;
- Laurence Jones, Public Policy Analyst, DC Office of People's Counsel;
- Veronique Marier, Deputy Director, Energy Administration, DC Department of Environment;
- Hussain Karim, Assistant Attorney General, DC Department of Environment;
- Alan Barak, Assistant Attorney General, DC Department of Environment;
- Taresa Lawrence, Associate Director, DC Department of Environment;
- Sosina Tadesse, Energy Program Specialist, DC Department of Environment;
- Khalid Muhammed, Deputy Chief Engineer, DC Department of Transportation;
- Jama Abdi, Electrical Engineer, DC Department of Transportation;
- Matthew Frumin, Ward 3 Appointee, Resident Representative; and
- James Boone, Manager. Sr. Strategic Initiatives, Pepco.

The Planning & Research Committee members met on a number of occasions to carry out their work and provide recommendations for undergrounding power lines in the District of Columbia.

Scope of Work for the Planning & Research Committee

The Planning & Research Committee's charge was as follows:

- Review and summarize the experience of other jurisdictions that have converted to underground wiring, improved storm response, and strengthened overall system reliability;



- Determine which current District plans (e.g. road reconstruction, development projects) should be coordinated with undergrounding; and
- Collect research and studies for Task Force member review.

Experience in Other Jurisdictions

The Planning & Research Committee (“Committee”) reviewed proceedings and assessments on electric utility undergrounding activities of other jurisdictions, which were performed generally in response to major interruptions in electric service as a result of a significant weather event. The jurisdictions included the states of Maryland, New Jersey, North Carolina, Oklahoma, Virginia, and the city of Anaheim. The Committee also discussed the conclusions reached in the Shaw Report prepared for the Public Service Commission. Finally, Pepco prepared an Undergrounding Study, within which it outlines electric distribution line undergrounding assessments conducted by other jurisdictions.¹⁴

The Committee notes that the primary driver for undergrounding existing overhead power lines continues to be for service reliability considerations, not for economic benefits. To date, almost all jurisdictions that have investigated the undergrounding of existing overhead systems have focused on reducing outages during normal conditions and not for storm resiliency and have concluded that the cost of converting all overhead facilitates to underground is prohibitive. Cost estimates for underground construction are approximately ten times the cost of overhead construction. There are also substantial additional costs to connect homes to newly installed underground service which is generally estimated at between \$500 to \$10,000 (or more), in the case of large commercial properties.

Numerous states that have examined this practice found that in normal weather and over the long run, there is sufficient evidence to support the proposition that underground lines suffer fewer outages than overhead lines. The North Carolina Commission concluded that underground systems are more reliable than overhead systems under normal weather conditions, suffering only about half the number of outages of an overhead system.

¹⁴ See Appendix E of Pepco’s Undergrounding Study for Maryland dated November 30, 2012. The Pepco Study outlines reports conducted in 19 jurisdictions and includes underground conversion cost information compiled by the Edison Electric Institute.



Despite the cost of undergrounding, the work group observed that dozens of cities have developed comprehensive plans to bury or relocate utility lines to improve aesthetics. Among these cities a variety of programs are being used to convert existing overhead lines to underground, for instance, special assessment areas, undergrounding districts and state and local initiatives.

The Committee's research found that many utilities adopted general policies associated with reliability. The assessment approach used by many utilities encompasses the following:

- Identify the overhead facilities in each area that repeatedly experience reliability problems based on measures such as the number of outages or number of customer hours out of service;
- Determine whether conversion to underground is a cost effective option for improving the reliability of those facilities;
- Develop a plan for converting those facilities to underground in an orderly and efficient manner, taking into account the outage histories and the impact on service reliability; and
- Determine the impact to the public space and private space and the trees that could be impacted by the improvements.

Establish an Undergrounding Policy

The District undergrounding policy should guide improvement of electric power service delivery during periods of major storm events and define parameters for system upgrades to enhance both system reliability and grid resiliency. The undergrounding policy should include the prioritization of selective electric underground projects, the close coordination of public and private construction projects, and a comprehensive community outreach program.

Prioritize Undergrounding Projects

The Committee believes that electric undergrounding projects should be prioritized based on the potential benefit to reliability, cost of performing the work and ability to coordinate with other work activity, including transportation projects, private development projects and/or non-electric utility work (water, gas, etc.). To assist in prioritizing underground projects, Pepco has developed a model that identifies where



converting existing overhead lines to underground can achieve the largest potential reliability benefit. The model examines primary main lines, lateral lines, secondary lines, as well as services. This approach allows for a detailed focus on areas of the electric system that are vulnerable to electric service interruptions due to overhead electric lines, *e.g.* areas with mature tree growth. The model is discussed in more detail in the Technical Committee section of this report.

Primarily, electric underground projects should be prioritized based on an assessment of the reliability benefit, the number of customers impacted and cost of each project. Prioritization of undergrounding work should also consider, however, the potential synergies resulting from enhanced coordination of public and private work as discussed in more detail below. Also other active strategies that are expected to reduce or prevent interference that damages or erodes reliability.

Coordinate Planned Construction Activities

The Committee advocates for close coordination of public transportation and private development projects and the construction of electric facilities, recognizing the potential cost efficiency of coordinating construction activities. In short, the construction cost for underground electric facilities has the potential to be lower when roadwork is being performed and/or another utility is performing underground work. The reduction in cost would need to be determined on a case-by-case basis and should be factored in the decision-making criteria for prioritizing projects.

The Planning & Research Committee identified plans that could be coordinated with underground activities. This includes evaluation of current projects that could be modified or enhanced to include the undergrounding of overhead lines as recommended by the Task Force. The benefit of evaluating currently approved projects is taking advantage of existing work so that there is no duplication of efforts or construction of new facilities that potentially could be removed if a feeder is undergrounded in the future. In addition, each year DDOT develops a comprehensive transportation improvement plan for the District of Columbia covering a rolling six-year planning horizon. The most recent plan is for fiscal years 2013 through 2018 and it was approved by the National Capital Region Transportation Planning Board on July 18, 2012. The DDOT also has an Envista planning tool that is designed to improve project coordination that may be leveraged to ameliorate the coordination of planning activities. The coordination of transportation construction activities and utility facilities is currently taking place during monthly DDOT meeting, whereby Pepco and other utilities review pending transportation projects and utility construction plans. To help ensure coordination with



undergrounding, these meetings should include electric, telecommunications, gas and water utilities.¹⁵

The Committee is also aware of several large private development projects, such as the redevelopment of the Walter Reed facilities, which may provide a potential opportunity to underground electric lines. These projects should be coordinated in the planning process to assess additional opportunities to underground utilities. The DDOT and the District of Columbia Office of Planning should jointly conduct a review that looks at all major projects to be performed within the District over the next 3 to 5 years. This will identify areas of development and opportunities for coordination of work to reduce construction costs for all parties and limit impacts on the communities. This review should also investigate future parcels of development that might offer an opportunity to incentivize, beyond current standards for new development, commercial customers to locate utilities underground, as well as explore various strategies that were useful in the District's coordination of undergrounding with new major projects. The DDOT should look to leverage its Envista planning tool to coordinate these projects. The results of this review should be shared widely with utilities, developers and other interested parties.

As discussed above in the Technical Committee section, on November 14, 2012, the District of Columbia issued its Sustainable DC Plan for sector-driven economic development. To further enhance this plan, the Committee recommends that strategic targets for the utility sector should be included in future updates. Economic development requires a robust and reliable utility infrastructure that can efficiently support existing capacity and services, as well as future growth. Incorporating the utility strategy also recognizes the national priority for preparedness, given changes in climate patterns and technology, as well as the general need to upgrade aging infrastructure. There is also the possibility to investigate future parcels of development that might offer an opportunity to incentivize commercial customers to go underground.

Implement Communications Plan

A comprehensive communications program is an essential strategy for informing stakeholders – ratepayers, utility consumers, and taxpayers – about the expected benefits of power line undergrounding and engaging the community during project planning and implementation. The District and Pepco will implement a communications program that presents the scope, program design, and impact of undergrounding to build

¹⁵ The Maryland Department of Transportation also generates transportation plans and the coordination of work should be considered across the District of Columbia and state of Maryland boundary, where applicable, to seek cost saving opportunities.



public understanding of the planned electric system improvements. There are three core messages.

- (1) Significant improvement in electric service reliability will be achieved through targeted undergrounding (e.g., most vulnerable circuits), which also offers aesthetic value when overhead lines are reduced.
- (2) Disruption for residents and businesses, during construction, will be minimized when undergrounding improvements are planned with compatible projects (e.g., joint trenching) to avoid overwhelming communities with equipment and traffic pattern changes associated unconnected services.
- (3) The undergrounding strategy combines efficiencies and savings and leverages resources to keep the cost to consumers as low as possible, while implementing a production timeline that will complete reliability improvements within a seven years schedule.

Communications programs for District initiatives commonly comprise activities to achieve awareness and understanding, community outreach, and progressive updates on performance. The public announcement of the undergrounding program can be supplemented with a strategy focused on understanding and awareness that is targeted to residents, neighborhood businesses and other commercial customers. The general scope of this communications strategy is to provide an overview of the project, its goals and timing. While various audience groups may require the same type of information, the level of detail and communication method will often differ. Background materials including fact sheets and frequently asked questions (FAQ) with reliable responses can be created to explain the undergrounding program.

As vulnerable overhead electric wires are diagnosed for prioritized undergrounding, community outreach, in targeted Wards, will be organized to review the current condition of the circuits servicing the area and the specific improvement plans that will reduce outage frequency. The construction schedule and its impact on the standard functioning of the community is another important topic. This forum is also intended to prepare the community for temporary changes that will occur during the construction period. For instance, roadway access and closures, parking restrictions and equipment staging, as applicable, will be carefully discussed with the community. Often a series of community outreach meetings is planned for each target area to reach the widest audience.

Throughout the implementation of the undergrounding program, stakeholders will have access to progress updates. The District generally maintains a website for infrastructure improvement projects with information on project plans and implementation schedules. Sites are periodically updated with information on milestone achievements and/or



necessary work effort adjustments to keep projects on track. Communication planning for many communities includes distribution of flyers with progress updates or notification of key actions that may impact daily activities. The overall objective is to provide timely updates to help communities understand project status and manage service-delivery with transparency.

The Office of the Peoples Counsel (OPC), in its role as consumer advocate, hosts information and education sessions to increase awareness of utility programs and to listen to concerns, in an effort to ensure quality service delivery. With its experience in dissecting programs and services, as well as, their implication for consumers, OPC will be a critical resource for building confidence in the planned undergrounding improvements, and managing expectations.

As a consumer educator, OPC brings a unique capacity to explain the:

- Causal impact faced by consumers as a result of continuing outages in overhead circuits;
- Analysis that identified the most vulnerable overhead circuits and the target areas for undergrounding;
- Impact(s) financial (pocketbook) and physical (lifestyle) on consumers, and
- Benefits -- improved reliability, reduced outages and faster restoration.

A communications program implemented by OPC will give credibility to the programmatic objective of working together for the common good, as achievable through the

OCP has the capacity to implement a multi-year campaign that spans the construction period – encompassing problem identification and technical solution and benefits, project plan and scheduling, and progress reporting. All District communication plans will be coordinated to manage available resources, avoid duplicated efforts and ensure consistent messaging.



Planning & Research Committee Recommendations

Recommendation 1: Establish an Underground Policy

The District should explore the establishment of an undergrounding policy that addresses the transition process from the current paradigm and requirements for activating an undergrounding policy. The undergrounding policy should include the prioritization of selective electric underground projects, the close coordination of public and private construction projects and a comprehensive community outreach program.

Recommendation 2: Prioritization of Work

Electric undergrounding projects should be prioritized based on the potential benefit to reliability, resiliency, cost of performing the work and ability to coordinate with other work activity, including transportation projects, private development projects and/or utility work (water, gas, etc.).

Recommendation 3: Coordinating Construction of Economic Development and Private Projects

Economic development and private projects should be coordinated to the extent possible to minimize costs as well as community impacts during construction. This can be done in conjunction with the road projects coordinated by the DDOT. Annually, DDOT and the District of Columbia Office of Planning jointly should conduct a review that looks at all major projects to be performed within the District over the next 3 to 5 years. This will identify areas of development and opportunities for coordination of work to reduce construction cost for all parties and limit the impact on the communities. It is expected that the DDOT can leverage Envista as the planning tool to coordinate these projects. The results of this review should be shared widely with utilities, developers and other interested parties.

Recommendation 4: Coordinate with Economic Development Strategy for the District of Columbia

On November 14, 2012, the District of Columbia issued its first sustainable sector-driven economic development plan. True economic development is dependent on a robust and reliable utility infrastructure. By incorporating a Utility Sector in future plans, this will further ensure that the utility systems are in place to support the growth across the District.



Recommendation 5: Coordinate the Development of a Comprehensive Communication Plan

Pepco and the District, including OPC, should prepare a comprehensive communication plan to inform, educate and update ratepayers, consumers and other stakeholders about undergrounding program development and implementation. Coordination will be critical to ensure the efficient management of resources and consistent messaging. The communications plan should be prepared for roll-out when the undergrounding strategy is publicly announced as an electric service reliability initiative.



LEGISLATIVE & GOVERNMENT AFFAIRS COMMITTEE

Members of the Legislative & Government Affairs Committee

The list of members was as follows:

- Barry Kreiswirth, Senior Legal Counsel, Office of the City Administrator;
- Rayna Smith, Legislative Counsel, Councilmember Yvette Alexander;
- Talib Abdus-Shahid, Assistant People's Counsel, Office of the People's Counsel;
- Herbert Jones, External Affairs Manager, Office of the People's Counsel;
- Donna Cooper, Vice President, Government Affairs, Pepco;
- Marc Battle, Assistant General Counsel, Pepco;
- Cary Hinton, Policy Advisor to the Chairman, Public Service Commission;
- Arick Sears, Paralegal, Public Service Commission;
- Matthew Frumin, Ward 3 Appointee, Resident Representative;
- Herbert Harris, Jr., Ward 7 Appointee, Resident Representative;
- Reginald Bazile, Special Assistant for Policy and Planning, DC Department of Transportation; and
- Phyllis R. Love, Management and Policy Analysis Officer, Office of the City Administrator.

Scope of Work for the Legislative & Government Affairs Committee

The Legislative & Government Affairs Committee was tasked with two primary activities:

- Determine the legislative and regulatory changes needed to implement undergrounding, or to improve storm response, or system reliability; and
- Draft specific provisions where appropriate.

The Committee carried out its work in evaluating these two focus areas. Three formal reports were presented by members of the Legislative & Government Affairs Committee to the Task Force. The reports covered public space regulations and tree policies; current overhead lines and undergrounding policies, laws, and tariffs, and intergovernmental coordination.



Legislative and Regulatory Changes

The relevant legislative and regulatory changes that may be required include:

- Public Right-of-Way Occupancy Permits;
- Construction Permits;
- Public Inconvenience Fees and Steel Plate Fees;
- Public Space Coordination;
- Vegetation Management – tree management by DDOT and Pepco;
- Current Laws and Policies Regarding the Undergrounding of Power Lines; and
- Enabling Legislation.

Public Space Issues

Permits, Fees, and Other Public Space Management Requirements

The undergrounding of power lines in the District of Columbia will take place largely on public space, which includes both roadways and sidewalks and the green space between property lines and the sidewalk. The implementation of undergrounding, therefore, will need to be carried out in a manner consistent with the District's public space laws and regulations.

Public space is generally regulated by the District Department of Transportation. Title 24 of the District of Columbia Municipal Regulations ("DCMR") sets forth the primary public space regulations, including the key elements of right-of-way ("ROW") occupancy, public space permits, and coordination on major projects.

Public Right-of-Way Occupancy Permit

Pepco, like all District utilities, holds a Public Right-of-Way Occupancy Permit (see 24 DCMR 3302). These permits, issued by the DDOT and renewable every 20 years, grant the utility the basic right to occupy public space with its wires, conduit, and other equipment. There is a rental fee associated with the permit, and it is based on the total linear footage of underground wires and aerial wires installed in public space. For the fourth quarter of 2012, Pepco reported 10.7 million linear feet of underground facilities and 7.0 million linear feet of aerial facilities. Pepco paid \$5.6 million in ROW rental fees for the quarter, which projects to over \$22 million in rental fees on an annual basis. Since the fee varies based on whether the wire is underground or aerial (currently, the rates are \$1.06 per linear foot for underground wires and \$1.59 per linear foot for aerial



wires), undergrounding would generally increase the total ROW rental fee paid by Pepco. This is due to the increased quantity of underground conduit that will be installed and no corresponding reduction of overhead poles. Since the recommendation is to retain the overhead secondary wires, the poles will not be removed and Pepco will continued to be required to pay this fee for all existing overhead lines in addition to the increased payment for more underground facilities.

Construction Permits

To stage construction in the public ROW, Pepco would be required to apply for and obtain two separate types of permits: (1) excavation (“construction”) permits (24 DCMR 3403) and (2) temporary occupancy permits (24 DCMR 225). Construction permits describe the type of work to be performed and are a mechanism for ensuring the quality of the work. Temporary occupancy permits describe when and where construction will take place and are a mechanism for ensuring public safety and avoiding unnecessary disruptions to vehicular and pedestrian flow.

All work conducted in public space requires a permit. However, existing regulations define conditions under which permit fees payable by a utility would be waived (24 DMCR 225.6). No permit fee shall be charged to a utility for the following:

- (a) Work done exclusively for the District to service District owned fixtures;
- (b) Work done exclusively for District buildings and connections to the buildings;
- (c) Changes in existing structures made at the request of, or on order from the Mayor of the District;
- (d) For mains, conduits, or other structures laid or repaired in advance of new paving purely to avoid cuts, therein and as a result of notification to the permittee from the District that paving is contemplated;
- (e) Work done under contract for the District;
- (f) Work done to repair damages caused by construction done by the District or by a contractor for the District; or
- (g) Work done exclusively for agencies of the United States Government.



In order to minimize the permitting burden, the Task Force recommends that Pepco be authorized to submit a bond to DDOT in lieu of a cash deposit for any undergrounding work under the legislation that is subject to a public space permit.

Public Inconvenience Fees and Steel Plate Fees

If a private entity conducts a project in public space for more than 30 days, a public inconvenience fee (“PIF”) is imposed by DDOT (24 DCMR 225.1(c)). PIF fees are calculated based on square feet occupied per day. Within the central business district, the fees comprise \$0.02 per square foot for occupying an alley, \$0.03 per square foot for sidewalks, \$0.04 per square foot for a first travel lane, and \$0.06 per square foot for occupying a second travel lane. Further, the PIF for occupation of the curb lane is assessed at the meter rate. On unmetered streets, the curb lane PIF is \$0.22 per square foot per day. With the exception of the curb lane, PIF rates are 25% lower outside of the central business district and are subject to monthly maximums per block face.

The PIF is intended to balance the need for private construction against the inconvenience such construction imposes on the public. The fee encourages the entity engaging in the construction to minimize both the amount of public space it uses and the amount of time during which the public space is used. To reduce the costs of undergrounding and ensure that the cost to ratepayers is as affordable as possible, the District should consider waiving the PIF for each undergrounding project.

The undergrounding project would also be subject to the steel plate fee (24 DCMR 225.1(p)), which is imposed on private entities performing construction in the public space. Each plate installed in public space requires a permit, and after a five-day grace period each plate is subject to a fee. Steel plate fees are a function of the number of plates used and the amount of time (days) they are deployed in public space. For the winter months (November through March), the per plate fee after the first five days, \$600.00 for the next five days, and \$900.00 for each five day interval thereafter. Steel plate fees are 50% lower during the summer months (April through October). To reduce the costs of undergrounding and ensure that the cost to ratepayers is as affordable as possible, the District should consider waiving the steel plate fee for each undergrounding project.

Other Requirements

In addition to the specific permit requirements, the public space regulations include provisions requiring that work be performed pursuant to DDOT standard specifications



(24 DCMR 3403.7), that the permittee restore the ROW upon completion of excavation (24 DCMR 3404.1), that the restorations be warranted for two years (24 DCMR 3404.8), and that a bond or deposit be provided as a guarantee of performance (24 DCMR 3405.1).

Public Space Coordination

It is critical that all approved power line undergrounding work be coordinated with the District government and other entities that occupy or work within the public space. Presently, the DDOT and major utilities coordinate construction efforts by maintaining a two-year plan that summarizes the location, dates, and type of work planned for each entity. DDOT and the utilities post project information to a web-based mapping tool, Envista. The web-based system automatically alerts the relevant stakeholders when there is a conflict between planned projects or where there is potential for coordination of efforts and cost sharing on projects.

DDOT and its utility partners should recommit to maintaining up-to-date information in the two-year plan in order to maximize opportunities for cost saving and cooperation in the undergrounding of Pepco facilities.

Actions for Consideration

The following actions will help reduce the costs and support efficient implementation of the undergrounding project:

- 1) Adjust and/or waive permit fees for approved power line undergrounding work;
- 2) Implement a streamlined process within the DDOT to issue construction and temporary occupancy permits; and
- 3) Strategically coordinate compatible work efforts in each designated project area to achieve cost efficiency and alleviate construction disruption of neighborhoods. However, ensure that coordination does not unduly delay the ability to execute the undergrounding work within the defined timeframe.



Vegetation Management

Vegetation management will remain an important strategy for preventing power line damage. Rigorous management of tree growth is going to be necessary even with an undergrounding program since circuits designated for conversion from overhead will be implemented in phases. Further, vegetation management is a viable control mechanism in areas where undergrounding is not defined as a priority. While vegetation management is generally performed through coordination between Pepco and the Department of Transportation, the operations are distinct. The goal of DDOT is to maintain or increase the tree canopy across the District of Columbia while the goal for Pepco is to remove tree growth that poses a potential risk to the reliability of the electric system.

DDOT Tree Management

Trees in the public space are managed by the District Department of Transportation (DDOT). Through its Urban Forestry Administration (UFA), DDOT staff and contractors plant, prune, and remove public trees. Currently, street trees are on a five-year inspection cycle. Based on UFA inspections, pruning is planned for the street trees. Generally, pruning decisions and scheduling consider the following:

- (1) Safety of the public and property;
- (2) Overall health of the tree;
- (3) Clearance standards over sidewalks, alleys, and roadways; and
- (4) Special clearance needs of emergency vehicles, sanitation trucks, and other users of public space.

Pruning may also take place as a result of requests from the public that are consistent with the District's tree management standards. For instance, a citizen may identify a tree blocking a directional or way-finding sign and request pruning to guarantee clear sightlines.

As a result of inspection, UFA schedules removal of trees that are dead, dying, or suffering from a disease that will ultimately destroy the tree. UFA also schedules removal of trees that are at risk of toppling. These at-risk situations may arise from accidents, root damage, structural problems or insufficient soil volume.

UFA's mission is to maintain and grow a healthy tree canopy in the District of Columbia. Decision-making on tree pruning and tree removal is generally not influenced by considerations regarding risks to the electric distribution system. However, the District's tree planting strategy does consider existing and planned electric distribution



infrastructure. Each year, DDOT plants more than 4,000 trees during the November to May planting season. The planting strategy conforms to the industry best practice of Right Tree/Right Place. Among other things, this means selecting tree species and planting locations that promote the longest possible life for the tree, which includes avoiding potential conflicts with overhead power lines.

Pepco Vegetation Management Plan

Pepco maintains a separate tree pruning and removal program for both public and private trees. The program, which is referred to as Pepco's Vegetation Management Plan (VMP), was approved by the Public Service Commission ("the Commission") on December 21, 2005. The VMP was developed through a formal working group process that included participants from the Commission, the Office of the People's Counsel, Pepco, and the District's Department of Transportation and Department of Public Works.¹⁶ This working group was charged with establishing a process and plan that balances: (1) the need for reliable service; (2) the desire for sound arboricultural practices; and (3) protection of the aesthetic value of the District's trees.

On October 7, 2009, the Commission requested supplemental information including a continuous improvement plan to achieve improved performance. Pepco filed its Comprehensive Reliability Enhancement Plan, which included an Enhanced Integrated Vegetation Management Plan, on September 30, 2010. This plan complements the original version approved in 2005. Pepco also filed a more detailed Vegetation Management Work Plan on January 18, 2013. Vegetation enhancements are addressed in Section 2.2 of the Plan.¹⁷

Pepco is required to file annual and quarterly status updates on its vegetation management budget and work plan for the District of Columbia, to report progress on identified priorities and milestones. The Company's vegetation management program is a component of the overall vegetation management strategy for the District. The VMP consists of five activities: (1) routine scheduled pruning; (2) storm hardening tree pruning or removal of trees; (3) topping trees for removal; (4) private tree removal; and (5) emergency maintenance pruning. All vegetation management activities must be approved by the UFA. UFA can object to planned work within two weeks of the work plan's submission.

¹⁶ Commission Order No. 13431 (November 19, 2004)

¹⁷http://dcpsc.org/edocket/docketsheets_pdf_FS.asp?caseno=FC766&docketno=2439&flag=D&show_result=Y



Routine Scheduled Pruning: The basic trimming and thinning needed to achieve appropriate clearance between wires and trees is classified as routine scheduled pruning.

Routine scheduled pruning removes the amount of growth that is typical for a two-year period, in accordance with the health, location and species of a tree. This pruning is primarily focused on limbs below and alongside of the electric lines. Removal of limbs above the lines varies, depending on tree species, branch attachment, health of branch, and proximity of electrical facilities. Work schedules are provided by Pepco to UFA with the locations of the targeted trees and an accompanying map. The standards used for scheduled pruning are defined in ANSI A300 (Part 1)-2001: *Tree, Shrub and Other Woody Plant Maintenance-Standard Practices (Pruning)* and its companion best management practices publication, *Utility Pruning of Trees*.

Enhanced Vegetation Management: Enhanced vegetation management refers to additional tree pruning (even within the standard 2 year cycle), on circuits that are identified as susceptible to damage during a possible storm event. This work is focused on removal of overhanging limbs that could fall onto wires and cause outages. Often added clearance is provided alongside the wires so that the circuit can withstand higher winds without contact between the tree and lines.

Topping trees: DDOT submits a list of dead or diseased trees that are in close proximity to electric lines to Pepco for removal coordination. To help ensure the DDOT's safety during its tree removal, Pepco will either top the trees or de-energize the lines.

Private Tree Removal: Pepco coordinates private tree removal directly with the property owner on any identified tree clearance issues. Unless the tree is defined as a special tree under District law, DDOT is not involved in the private tree removal process.

Emergency Maintenance Pruning: Pepco tries to immediately remove trees and limbs that come in direct contact with its wires as a result of a weather event or other obstruction to overhead lines. With emergency work, there is active coordination between DDOT and Pepco.

Actions for Consideration

The following actions are recommended to ensure the implementation of best practices and efficient delivery of vegetation management services for the District.



- 1) UFA should ensure that its review cycle and tree management activities appropriately target areas where trees have negatively impacted the reliability of the electric distribution system;
- 2) UFA and Pepco should work together to ensure that the location and types of trees planted in areas where power lines are overhead are selected so as to minimize the likelihood of interference with the electric distribution system; and
- 3) UFA and Pepco should coordinate vegetation management issues related to power line undergrounding. As part of this process, UFA and Pepco should review the District's tree planting schedule, with locations outlined, to ensure that planned planting will not be adversely impacted by the approved power line undergrounding plan.

Laws and Policies Governing Placement of Power Lines

Overhead Prohibition for the City of Washington (1888)

Since 1888, the construction of overhead power lines within the central core of the District of Columbia has been prohibited. Specifically, section 34-1901.01 of the DC Official Code states that “[t]he Mayor of the District of Columbia shall not permit or authorize any additional telegraph, telephone, electric lighting or other wires to be erected or maintained on or over any of the streets or avenues of the City of Washington.”

This statute effectively banned overhead distribution systems within the City of Washington, as its boundaries existed in 1888. The prohibition, which remains active, covers Georgetown and the area of the District that is between Florida Avenue and the Potomac and Anacostia Rivers, including the central business district, Capitol Hill, Hill East, Dupont Circle, Logan Circle, Shaw, NoMa and Southwest.

New Construction Policy

As defined in Pepco's General Terms and Conditions for Furnishing Electric Service in the District of Columbia, which are approved by the Public Service Commission, new residential construction will have the normal service connection supplied underground and terminate at the corner or along the face of the structure closest to the distribution system.¹⁸ For new service to commercial or industrial customers, the service cable will normally be installed underground unless the construction of underground lines would

¹⁸ See General Terms and Conditions for Providing Service in the District of Columbia, section 10.b.1. http://www.pepco.com/_res/documents/dc_terms.pdf.



serve no aesthetic purpose.¹⁹ In accordance with Pepco's tariff, Pepco does not convert existing overhead electric utility lines to an underground system unless specifically requested by and paid for by a customer, and only if deemed feasible by the Company.²⁰

Legislation Introduced in the Council

Two bills have recently been introduced in the Council which address the undergrounding of power lines.

The first bill, the "Underground Utility Act of 2012,"²¹ would establish an Underground Conversion Assessment Commission that would propose areas in the District where utility undergrounding would occur. (The bill applies to both electricity and communications utilities.) The proposed undergrounding districts would be subject to approval by the Mayor and the Council. After an area is designated an undergrounding districts, utilities would have one year to move their overhead facilities (including all poles and wires) underground. The costs for undergrounding would be paid primarily through an Underground Utility District Trust Fund established by the bill, which would be funded by a 4% assessment imposed on each kilowatt-hour of electricity sold in the District. The bill was referred to the Council's Committee on Government Operations.

The second bill, the "District of Columbia Public Utility Underground Power Lines Act of 2012" would establish a working group consisting of District government officials and Pepco representatives that would be required to develop by December 31, 2012, a plan to bury all power lines in the District. The bill was referred to the Council's Committee on Public Services and Consumer Affairs. Because the Council's legislative period ended without any action by the Committee, this bill is no longer formally before the Council.

Enabling Legislation for Proposed Undergrounding Strategy

The undergrounding of electric power lines will require a significant investment of capital: the costs of undergrounding the facilities recommended by the Task Force are

¹⁹ Id., section 10.b.3.

²⁰ Pepco's "General Terms and Conditions for Furnishing Electric Service in the District of Columbia" ("T&C") contains a more comprehensive discussion regarding the responsibilities to be shared between the utility and a customer when undertaking such work. Pages 32-43 of the T&C contain sections relevant to potential projects of this kind, and can be found online at http://www.pepco.com/_res/documents/dc_terms.pdf

²¹ The bill was originally introduced on July 10, 2012, and was reintroduced on January 8, 2013, because of the commencement of a new Council legislative period.



approximately \$1 billion. Legislation will be necessary to authorize the financing of the costs incurred by both Pepco and DDOT. In addition, the legislation must ensure appropriate oversight of the undergrounding program by the Commission, allow prompt review of undergrounding plans by the Commission and outside parties, and implement various recommendations of the Task Force, such as the waiver of certain fees.

In order to facilitate the financing structure proposed by the Finance Committee, the undergrounding legislation must authorize the issuance of financing orders by the Commission that would impose a separate undergrounding fee to be paid by Pepco's customers to pay debt service on the District's bonds issued to finance DDOT's portion of the undergrounding project.

Specifically, the following provisions should be included:

- (1) Authorization to issue revenue bonds to finance the District's costs of constructing underground conduits, ducts, manholes, vaults and ancillary facilities for electric distribution in the District, and associated roadway restoration; and
- (2) The imposition and annual true-up of a special financing surcharge applicable to Pepco's customers in the District to fund the repayment of bonds issued to finance the construction by the DDOT of underground conduit, vaults, manholes and ancillary facilities to be used in the distribution of electricity in the District.

The legislation should authorize the Public Service Commission to issue irrevocable financing orders which will establish allowable undergrounding costs and impose non-bypassable charges on Pepco customers (other than low-income customers) to support the securitization. Together, the legislation and the financing orders would commit the District of Columbia not to amend the terms of repayment so that the highest bond credit rating and lowest financing costs can be achieved.

In terms of Commission oversight, the legislation should also authorize the Commission to review and approve both Pepco's and DDOT's undergrounding plans and ensure that the reviews are prompt and final.

Specifically, the following provisions should be included:

- (1) Direct Pepco and DDOT to file a triennial plan for the selection and construction of underground electric distribution and ancillary facilities in the District;



- (2) Direct Pepco and DDOT to file progress reports, at least annually, for the construction of underground electric distribution and ancillary facilities as previously approved by the Commission; and
- (3) Authorize the imposition and annual true-up of a special funding surcharge under which Pepco is permitted to recover from its District customers the capital costs and depreciation and other expense directly associated with the relocating and otherwise installing electric distribution and ancillary facilities into underground conduits, duct banks, manholes and vaults.²²

Finally, the legislation should include provisions to authorize or implement other recommendations of the Task Force, including the modification to the right-of-way fee for wires that are undergrounded pursuant to the legislation and to waive the public inconvenience fee and steel plate fee for the first 60 days of each undergrounding project.

²² The underground project cost recovery mechanism will allow Pepco to recover the projected capital costs for undergrounding construction and reduce the financial burden on the company of this large new investment program by allowing Pepco to recover their costs more quickly, rather than waiting until its next base rate case is decided. Traditionally, Pepco files a rate case with the Commission after a project has been completed in order to recover costs that are deemed by the Commission to have been prudently incurred.



Reference Studies

Public Service Commission Study - Shaw Report

Pepco's Undergrounding Study