

PECO
2018 Summer Readiness Overview
May 25, 2018

Summer is just around the corner and PECO is ready. The company bases its readiness on its reliability enhancement programs, preventive maintenance programs and capacity planning. PECO's summer preparedness program is part of the company's ongoing investment in the reliability and safety of the systems serving customers.

A. Reliability Enhancement Programs

PECO has several reliability enhancement programs that significantly contribute to the company's successful performance. Under the Top Priority Circuits Program, PECO analyzes and completes reliability improvements on at least five percent of the system's worst performing circuits on an annual basis. The company takes steps to enhance reliability by installing reclosers for distribution automation, identifying and repairing issues through visual and thermographic inspections, increasing vegetation management activities, installing and upgrading fuses, and replacing cable and other equipment. Selected underground cables were replaced in Philadelphia and the suburban regions to reduce cable-related service interruptions and subsequent excavation and repair work.

Through Distribution Automation, PECO installed more than 500 three-phase reclosers in automated loop schemes in Bucks, Chester, Delaware, Montgomery, Philadelphia and York counties during the last five years, bringing the total to 1,847 reclosers. These reclosers reduce the number of customers affected by outages and automatically restore service to sections of circuits where repairs are not needed.

In addition, PECO continues storm hardening activities through infrastructure improvements and vegetation management work. PECO has installed more than 45 miles of tree-resistant wire in areas impacted by high incidences of vegetation-related outages and removed over 3000 priority trees in 2017 to enhance system performance and reduce service interruptions.

PECO continues advanced grid investments to enhance reliability through microprocessor-based relay upgrades, fiber optic communications among substations, disturbance monitoring equipment across the transmission system, modern computer systems for outage management (OMS), geographic information system (GIS), and upgrades to distribution system real-time management (DMS). In addition, PECO continues to leverage and optimize the Advanced Metering Outage System (AMOS), which provides the ability to create, analyze and escalate customer outage events. As part of PECO's meter upgrade, AMOS has been able to enhance the ability to support outage management of the new AMI meters. The tool provides better visibility of an outage, which can lead to targeted restoration efforts. As of May 2018, more than 1.763 million new electric meters and nearly 536,000 natural gas AMI modules have been installed across the PECO service territory.

PECO

2018 Summer Readiness Overview

PECO's Long-Term Infrastructure Improvement Plan (LTIIP), or "System 2020" plan, was approved by the Pennsylvania Public Utility Commission (PUC) in October of 2015. PECO will spend an additional \$274M through 2020 to install advanced equipment and reinforce the local electric distribution system, making it more weather resistant and less vulnerable to storm damage. These investments are in three key areas: storm hardening and resiliency measures; accelerated cable replacements; and the acceleration of a plan to retire Building Substations and to upgrade the distribution facilities supplied by those substations.

PECO holds regular cross-departmental meetings to coordinate this work with the company's existing electric, natural gas and vegetation management programs. The goal is to minimize the impact of this enhancement work on local communities and to ensure project work plans are communicated to customers and key stakeholders.

B. Preventive Maintenance Programs

PECO routinely performs numerous preventive maintenance programs, including vegetation management, substation inspections, pole inspections, distribution aerial line inspections (including automatic splice connections) and recloser inspections. In addition, PECO inspects distribution capacitors, regulators and transformers. Preventive maintenance programs have met or exceeded PUC Inspection and Maintenance standards every year since the Commission's quarterly reliability reporting began in 2003.

Comprehensive vegetation management programs are completed on distribution circuits and transmission lines on a five-year cycle to protect the transmission and distribution systems from vegetation-related interruptions.

As part of PECO's aerial line inspections and a broader Circuit Patrol & Thermography Program, PECO inspects automatic splice connections and related equipment. Through this biennial program, PECO performs thermography (or infrared imaging) and visual inspection of the solid portion of aerial circuits. Visual and thermographic inspections of aerial distribution lines help us identify potential issues before an outage occurs. In addition, three-phase reclosers are inspected on a regular basis to ensure the distribution automation system is ready to automatically locate and isolate issues and restore service to customers. PECO ensures that the maintenance of its equipment will meet the reliability needs of its customers.

C. Capacity Planning

Each year, as part of PECO's distribution capacity planning process, all distribution substation terminals and circuits are analyzed with data from the previous summer. During this review, PECO identified 12 projects that were designed and completed to address capacity planning needs. Projects were designed to increase the transmission and distribution capacity and to increase reliability in the identified areas. Peak load and possible under-frequency conditions were assessed leading to updates to

PECO
2018 Summer Readiness Overview

the load shed database and lists of locations to block automatic load transfers. PECO is continuing a program initiated in 2017 to install automated load transfer blocking schemes which maximize the amount of time automatic load transfer is available, therefore increasing reliability. Additionally, training was performed so that employees can take peak day readings at substations where there are no automated load readings.

D. 2017/2018 Storm Update and Lessons Learned

The 2017 storm season was relatively quiet from a “major” storm perspective. PECO experienced a single storm event that resulted in over 50,000 sustained customer interruptions; but, overall there were 18 weather events that resulted in some level of storm response over the course of the year. Conversely, thus far for 2018 PECO has experienced a comparable number of weather events with six during same time (Jan. - May); however, in March of this year two storms, Riley and Quinn, were major events significantly impacting customers. Below are the major storm impacts for March 2018:

Date	Affected Customers
3/02/18 (Riley)	603,697
3/07/18 (Quinn)	191,272

After every major storm event, PECO conducts a formal “lessons learned” review to evaluate the elements of our planning and response efforts to determine what worked well and what could be improved. Several initiatives have already been implemented based on recent lessons learned evaluations, including:

- In early 2017, PECO developed the capability to dispatch crews “remotely,” from areas other than our main dispatch areas. This will greatly increase our dispatch effectiveness through increased dispatch efficiency and streamlined communications between field forces and dispatchers. This functionality was installed and tested, but was not needed in an actual storm response in 2017. This capability saw its initial use in March 2018 during the multiple Nor Easters that hit PECO’s territory (Riley and Quinn), and was used to great effect.
- PECO has acquired (3) new Mobile Command Centers, to be able to set up command and control operations and dispatch crews directly from the site of severe areas of damage.
- Implemented a new direct computer interface with Chester County and Delaware County 911 Centers to reduce the number of phone calls needed. PECO has begun working on an interface with Montgomery County. Similar interfaces are being considered by Bucks and Philadelphia Counties, but have not yet been implemented.
- Investigating technology solutions to improve the administration of foreign crews utilized for Mutual Assistance.
- Collected over 200 Lessons Learned items from the Riley-Quinn response, which are currently being evaluated and prioritized for implementation.

PECO 2018 Summer Readiness Overview

- Adding a second Weather Service provider, to compare and contrast forecast accuracy and enhance system damage predictions.

E. PECO's 2018 Summer Readiness

With the potential for severe storms this summer, PECO has been hard at work to ensure safe, reliable, affordable and clean energy and energy services for customers all summer long. The company has invested in new technology and projects to prepare for heat and storms this summer, including upgraded substation equipment, new wires and poles and inspections.

PECO completes hundreds of tasks to prepare for the summer season, including system work, testing and drills. PECO employees across the region are ready to respond to severe summer storms or emergencies if needed. And, as part of the Exelon family of companies, PECO now can draw on resources from sister utilities in Delaware, Maryland, New Jersey, Washington, D.C., and Illinois to restore power quicker after major storms.

PECO also maintains membership in two Regional Mutual Assistance Groups (RMAGs), which provide supplemental storm resources from across much of the USA and Canada for major storm events.

In addition to larger projects, PECO's summer preparedness program includes inspecting and maintaining aerial and underground electrical equipment, substations and other facilities; upgrading, replacing and repairing equipment to meet customer needs; emergency response drills and other training for employees; and maintenance and testing of various computer and support systems.

a. Capacity Additions

PECO completed numerous capacity expansion projects to enhance our 2018 summer readiness. Some of our major projects include the following:

- **Chichester-Linwood:** The newly constructed 2.5 mile 220-43 transmission line between PECO's Linwood and Chichester substations was placed In-Service on April 14, 2017. The project also combined, reconfigured, and increased ratings for the 220-97 Line from Linwood to Post and the 220-39 Line from Post to Chichester. In addition, this project upgraded the Chichester 220 kV Tie Bus with 4000A breakers, 4" SCH 80 Bus, and new relays.
- **Clay 341 to Relieve Daleville:** New Clay-341 was installed on existing spare Clay CB to relieve overloaded Daleville-341 and Daleville-342 lines. 20,000 feet of new conductor and nine new reclosers were installed as part of this project.
- **Lock Substation:** A new 230-34 kV substation was built, including routing the 220-61 Line through a 230 kV ring bus, a 230-34 kV Transformer, one 34 kV bus and two 34 kV distribution circuits. Six new transmission towers were constructed in order to route the 220-61 line from Limerick 230 kV Substation to Lock

PECO
2018 Summer Readiness Overview

Substation, and the 220-99 line from Lock Substation to Cromby Substation. The project also upgraded the 220-61 line relays and breaker fail relays at Limerick 230 kV Substation and installed new OPGW fiber between Limerick and Lock. The new Lock Substation 230 kV ring bus and 230-34 kV transformer were energized on April 20, 2018, and declared electrically complete on May 15, 2018. New 34 kV distribution circuits were energized April 21, 2018 (Lock-341), and May 3, 2018 (Lock-342). The project installed four new reclosers on the new 34 kV distribution circuits and modified/renamed nine existing reclosers. The reclosers are currently being tested and put in-service, with an expected complete date of May 24, 2018.

- **Nottingham Substation Relief:** The project upgraded and converted the existing Nottingham substation from a single transformer/single bus configuration to a duplex substation configuration. The project also rearranged the existing 230 kV transmission lines, creating two new transmission supplies and terminals for 220-01 from Nottingham to PHI's Colora and 220-98 from Clay to Nottingham. The project's Transmission and Substation work was placed in-service on December 8, 2017, and declared electrically complete on February 2, 2018. The project also upgraded 34 kV distribution feeder systems in the street, by installing four new reclosers and modifying eighteen existing reclosers.

b. Supplemental Vegetation Management Preventative Maintenance Activities

PECO's Vegetation Management department schedules a backshift of tree crews during the summer months (June through September). These crews are available to respond to emergency situations in a timely manner during the peak tree growth season. Vegetation Management completes an annual ground patrol of electric transmission lines and completes all identified emergent work before June 1 each year. In addition, distribution corrective maintenance work is identified before June 1 each year for circuits that qualify for mid-cycle and 34kV programs.

c. Employee Preparations/Training

PECO's annual Summer Readiness Program also includes emergency response drills and other training for employees, including, but not limited to: training and summer equipment preparations; employee review of personal protective equipment; inspection of all buildings and substations for summer readiness; and maintenance and testing of various computer and support systems. Extensive scenario-specific drills, exercise the processes utilized by PECO personnel to address storms and other events. The company also continues to work closely with utility counterparts across the country, including sister Exelon utilities, in its efforts to identify and implement best practices emergency preparedness training methods.

PECO
2018 Summer Readiness Overview

d. Event Preparedness

Procedures and checklists are continually enhanced and updated to improve clarity and comprehensiveness. These procedures and checklists are reviewed and utilized during storm drills to ensure understanding and further refine processes. The drills included the following elements: (1) substation fire, with participation by the local fire company at a substation; (2) environmental; (3) security (suspicious package found in substation); (4) load shed; and (5) road closures. In addition, separate drills for specific events were conducted, including: substation physical security, electronic work packages, crew sharing and integration amongst Exelon Utilities, exercising common processes and communications for larger events involving multiple Exelon Utilities, and a “substation-based” restoration methodology utilized to focus on concentrated areas of impact.

e. Transmission and Substation Preparedness

PECO’s transmission and substation preparedness includes the following: completion of summer readiness preventative maintenance; identification and completion of corrective maintenance at critical substations including generating substations; identification and completion of corrective maintenance on transmission lines; annual sump pump maintenance in substations; and verification of spare equipment availability, including mobile transformers and portable units. In 2017, PECO purchased two additional mobile transformers, bringing the total up to four mobile transformers, that can be utilized as spare transformers in the event of equipment failures during extreme weather events. Also, PECO actively participates in the Spare Transformer Equipment Program (STEP), a national utility member group focused on identifying ways to share transformers among participating members in the event it becomes necessary.

f. Transmission Planning

Transmission Planning, in collaboration with PJM Interconnection, conducted look-ahead planning studies in 2017 for 2022 and updated the results for the years prior to 2022. All required transmission needs for the PECO system to meet the reliability standards and criteria of the industry, the region, and the company were identified and constructed as an integral part of PECO’s summer readiness program. These summer critical projects are completed to assure that the load can be reliably served throughout the summer period.

F. Storm Response

a. Storm Preparations

Once a potential storm threat is identified, PECO initiates its pre-event planning and preparations. PECO’s Emergency Preparedness team implements a “graded approach” for crew mobilization as the potential for storm-related damage in the service territory increases. For anticipated significant weather events, such as Hurricanes, PECO

PECO 2018 Summer Readiness Overview

initiates pre-event planning and preparations days before an event. For events with minimal advance warning, the team responds based on pre-established procedures and checklists.

As part of its preparations, PECO identifies the need and secures additional personnel to supplement PECO's resources for restoration and tree trimming. Additional personnel can be obtained through approved local contractors, PECO's sister Exelon Utilities (ACE, BGE, ComEd, DPL, and PEPCO), as well as resources through mutual assistance organizations in which PECO is a member: the North Atlantic Mutual Assistance Group (NAMAG) and the Southeastern Electric Exchange (SEE). PECO is currently serving as the "Chairman Emeritus" of NAMAG.

Another key component of PECO's storm preparedness is communication and outreach. PECO conducts frequent interviews and briefings with the media to discuss storm preparations, planning and customer outage expectations. During significant events, PECO also conducts daily conference calls with elected officials and local governments, state regulatory and elected officials, and municipal and county governments. Particular attention is paid to the county 911 centers and emergency responders to ensure coordinated preparations and PECO employee staffing at 911 centers when appropriate.

Additionally, PECO encourages customers to prepare before severe weather hits. For example, customers are encouraged to visit peco.com/alerts to choose how to receive information, via text, email, or phone, including when power is out in their area, when service is expected to be restored, or when power is restored. Customers are also encouraged to text "ADDOUTAGE" to MYPECO (6973260) to enroll in the company's two-way texting program to report outages and check the status of their outage.

As part of an on-going initiative with the counties in our service territory, PECO continues to work with the county 911 centers that are still considering developing an automated interface with PECO's systems to be able to submit outage tickets directly into our systems. Currently, Delaware and Chester Counties are using such an interface, and Montgomery County is actively considering a similar interface.

b. Outage Restoration Strategy

PECO follows an overall system restoration priority strategy which results in the most effective way to restore service to all customers who are geographically dispersed throughout PECO's service territory.

For all severe weather events, PECO's first step in its restoration strategy is to ensure that the general public and field crews are safe.

PECO's next step for addressing outages is to target restoration to any impacted transmission lines and substations to restore capacity within the affected area. Then any possible switching to re-route power to customers is performed. PECO then evaluates the

PECO

2018 Summer Readiness Overview

remaining primary outage event list, and dispatches repair crews in descending order of the number of affected customers, simultaneously prioritizing “critical customers,” such as police and fire stations, hospitals, nursing homes, public water and sewer facilities, and communication systems. In this manner, repairs are performed that will restore service to the largest number of customers in the least amount of time, while still addressing the “critical customers” as quickly as possible. PECO then restores power to smaller outages within neighborhoods and individual services.

For logistics associated with major storm events, PECO makes extensive use of our existing service centers for staging materials and mutual assistance crews. PECO operates a number of permanent service centers in each county, which include office facilities, as well as materials and supply staging for normal operations. Additional supplies and materials are delivered to the service centers as needed to respond to storm events. This approach allows PECO to disperse crews and materials from numerous sites, which are located throughout the service territory. This arrangement allows the crews and materials to be staged as close as possible to the areas of damage, as opposed to a small number of centralized staging areas that are more prevalent in larger utilities. The relatively small footprint of PECO’s service territory makes this approach effective for most storm responses.

For extreme storms, temporary staging centers are set up at “non-PECO” facilities such as hotels, fire houses and similar facilities. When the number of mutual assistance crews exceeds the capacity of the PECO service centers to manage them effectively, these supplemental facilities are activated. Arrangements and relationships with these non-PECO facilities are made in advance and maintained to ensure availability and concurrence with the facility owners. Materials and supplies are delivered to these facilities for use by the mutual assistance teams, and oversight and control is provided by PECO personnel. Inventories at service center storerooms, our central storeroom and with our key vendors are monitored to ensure adequate stocking level.

PECO has recently developed a new strategy to mitigate the risk of hotel availability constraints by identifying large base camp locations capable of handling a large numbers of crews. This plan would be implemented if hotel availability was limited due to a large event occurring at the same time as the storm (a political convention, for instance). A number of sites have been identified across the service territory, agreements with the property owners are in place, and contracts with vendors to provide temporary lodging, facilities, catering, etc., have been arranged. Materials and supplies would be delivered to these facilities for the crews, and oversight and control is provided by PECO personnel.

c. Communication and Outreach

PECO strongly believes that open, transparent customer communication before, during and after a storm or emergency is critical. The company conducts regular outreach with stakeholders through all available communication channels, including: earned and paid media; direct communication, including our Customer Care Center and automated

PECO 2018 Summer Readiness Overview

phone system, which provides customers with storm and restoration status information and an ETR through an up-front Interactive Voice Response (IVR) message; Storm Center, a dedicated section of PECO's website that provides updates on emergency and restoration information, and a link to the company's new interactive outage map, which provides more information about outages by location.

In 2016, PECO launched a new website, providing anytime, anywhere access for customers. The responsive design of the site optimizes the online experience for customers from any online device – mobile, tablet and desktop. Customers can easily access important account information and customize their online experience, including reporting and checking the status of outages and viewing their energy usage. By visiting peco.com/alerts, customers can choose how they would like to receive information, via text, email or phone, including when power is out in their area, when service is expected to be restored, or when power is restored. And, by texting "ADDOUTAGE" to MYPECO (697326), customers can enroll in our two-way texting program to report outages and check the status of their outage.

In more severe outage events, PECO also makes proactive calls to customers expected to experience the most extended outages to ensure they are aware of the extent of conditions so they can make any necessary plans.

Another important vehicle for communicating with our customers and other stakeholders is the media. During larger storms, PECO conducts numerous interviews with local and regional print, broadcast and radio outlets to provide important outage-related information.

In addition to traditional media, the company uses social media (Facebook, Twitter, YouTube and Flickr) to provide customers and stakeholders with storm preparedness, restoration updates, emergency contact information, outage reporting procedures and important safety information. These channels are updated every two to four hours – and more often when additional information becomes available. In addition, PECO responds to public and private customer inquiries on social media regarding emergencies.

PECO also maintains close contact with elected and regulatory officials through personal outreach and regular follow-up communication. During major storms, PECO stays in continuous contact with PUC Commissioners and key staff through daily statewide conference calls, ad hoc outreach, PUC visits to the storm center and service territory, as well as daily routine reporting on storm status. During significant events, PECO conducts daily conference calls with elected officials and local governments, state regulatory and elected officials, and municipal and county governments. Particular attention is paid to the county 911 centers and emergency responders to ensure coordinated preparations and PECO employee staffing at 911 centers when appropriate.

PECO
2018 Summer Readiness Overview

In addition, calls are made to state legislators in the service territory's Harrisburg and district offices and the district offices of Southeastern Pennsylvania members of Congress.

Outreach also is made to local municipal officials and to the emergency responders in PECO's service territory. PECO utilizes regular email updates and a text alert system for municipalities to provide information about restoration efforts and the number of overall and municipality-specific outages.

Finally, PECO's communications include continuous contact with company employees through regular email and broadcast voicemail updates from the Emergency Response Organization. These messages ensure that employees are fully aware of the extent of the storm and the restoration process, as well as providing a continual channel to emphasize employee safety.