

PECO
2015 Summer Readiness Overview
May 28, 2015

Summer is just around the corner and PECO is ready. PECO 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 at least five percent of the system's worst performing circuits on an annual basis. The company takes steps to improve reliability by installing reclosers for distribution automation, identifying and repairing problems via 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 digging and repair work.

Through Distribution Automation, PECO installed more than 500 three-phase reclosers in automated loop schemes in Bucks, Chester, Delaware, Montgomery and Philadelphia and York counties during the last five years, bringing the total to 1,653 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 via infrastructure improvements and enhanced vegetation management. PECO has installed more than 17 miles of tree resilient Hendrix wire in areas impacted by high incidences of vegetation-related outages and removed more than 840 hazardous trees to enhance system performance and mitigate service interruptions.

PECO's ongoing advanced grid investments 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 distribution system real-time management (DMS). In addition, PECO implemented an expanded version of Advanced Metering Outage System (AMOS), which provides the ability to create, analyze and escalate customer outage events. As part of PECO's meter upgrade project, AMOS has been enhanced 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 18, 2015, more than 1.65 million new electric meters and nearly 300,000 natural gas AMI modules have been installed across the PECO service territory. The meter upgrade project is expected to complete by the end of 2015.

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PECO filed a Long Term Infrastructure Improvement Plan (LTIIIP) known as “System 2020” on March 27, 2015. The plan, as filed, proposes to make additional capital investments to construct reliability-related improvements during the period of 2016 through 2020. These investments are in three key areas: storm hardening and resiliency measures; accelerated cable replacements; and the acceleration of a plan to eliminate Building Substations and upgrade the distribution facilities supplied by those substations.

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 been completed 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 problems and restore service to customers. PECO ensures that the maintenance of its equipment will meet the reliability needs of its customers.

C. Capacity Planning

As part of PECO’s distribution capacity planning for this year, all circuits were analyzed with data from the previous summer. During this review, PECO identified 29 projects that were designed and completed to address capacity planning needs. Peak load and possible under-frequency conditions were assessed leading to updates to the load shed database and lists of locations to block automatic load transfers. Projects are designed to increase the transmission and distribution capacity and to increase reliability in the identified areas. Additionally, training was performed so that employees can take peak day readings at substations where there are no automated load readings.

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D. 2014/2015 Storm Update and Lessons Learned

In 2014, PECO experienced one of the most severe storm years in the company's history.¹ For the first time ever, PECO responded to three storms affecting more than 10 percent of its customers within a single calendar year.

The February 2014 Ice Storm (February 5-12) resulted in about 715,000 customer outages, second in our history only to Hurricane Sandy in terms of the number of customers impacted. The storm's impact was largely focused on PECO's service territory and resulted in the largest mobilization of external storm resources in company history. Supplemental resources were brought in from local contractors, PECO's sister utilities BGE and ComEd, and two Mutual Assistance Groups (Southeast Electric Exchange (SEE) and North Atlantic Mutual Assistance (NAMA)). Crews from New England, the Midwest and Southeastern states, as well as from Quebec and Nova Scotia, all assisted in the response.

As a result of all the efforts responding to the 2014 February Ice Storm, PECO received the 2014 Emergency Response Award from the Edison Electric Institute (EEI).

In July, the PECO service territory was impacted again by two thunderstorm events. On July 3, a storm impacted about 180,000 customers. Almost immediately after finishing restoration work associated with that storm, another severe thunderstorm struck on July 8, impacting more than 230,000 customers. PECO again activated its local contractors, sister utilities and the Mutual Assistance process to bring in supplemental resources to expedite the company's response to these storms.

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 lessons learned, including:

- Utilizing multiple staging areas to efficiently receive and dispatch supplemental resources.
- Enhanced processes to address road closures and communications with county Emergency Operations Centers.
- Construction of auxiliary crew dispatch facilities.
- Creation of a system to send work packages to crews electronically via email.
- Development of group email boxes to improve internal communications during storms.
- Improvements to our storm ETR development and communications.

¹ In PECO's 2014 Summer Readiness Report, submitted to the Public Utility Commission on May 23, 2014, the company discussed the 2014 February Ice Storm in much greater detail and therefore have provided a more high level summary in this report.

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- Development of a “base camp” strategy to address the risk of hotel availability constraints.
- Changes to our Emergency Response Organization staffing.

Since Hurricane Sandy, PECO has been an active participant in sharing storm response lessons learned with other Pennsylvania utilities through the PUC Best Practices Working Group. This ongoing effort is a great opportunity for utilities to share improvements and learn from each other.

PECO is in the process of enhancing the company’s outage map, which will provide additional information regarding outages and estimated restoration times. As part of the update, PECO will enhance the county municipal list to segment Philadelphia County by zip code. These enhancements are expected to be implemented during the summer of 2015.

E. PECO’s 2015 Summer Readiness

PECO has completed 29 projects this year to ensure safe and reliable service to customers to keep their homes and businesses cool during the summer months. This work included the installation of substation equipment upgrades, and new transmission wires and poles. PECO also has completed projects to increase neighborhood electric supply, inspected circuits and equipment, and completed additional jobs to ensure reliable service for the company’s approximately 1.7 million electric customers this summer.

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 2015 summer readiness. Some of our major projects include the following:

- **New Master Distribution Substation - \$30M**
This new 230-13kV distribution substation was built adjacent to the existing Master transmission substation to increase capacity for projected load growth in the area. Two new 230/13kV substation transformers, new switchgear building and associated equipment were installed along with five new 13kV distribution circuits with automatic reclosing and sectionalizing capabilities to increase reliability in the area.
- **Plymouth 183 New Circuit - \$1.1M**
This project addressed capacity and reliability issues in the area and included the addition of a new 13kV circuit breaker at the Plymouth Substation, as well as a

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build-out of two miles of new underground and aerial distribution cable, poles and associated equipment.

- **New Middletown 230-34kV Transformer - \$10.5M**
This project installed a new 230-34kV transformer and associated equipment and reconfigured an existing network line to increase capacity in Delaware County. New reclosers were installed to provide automatic reclosing and sectionalizing capabilities to increase reliability in the area.

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 annual drills, including the entire PECO Emergency Response Organization, were conducted on May 12 and 19, 2015. PUC representatives were invited to observe these drills. In addition, two exercises were conducted in June 2014 with the county EOCs, which focused on road closure response. The exercise utilized the enhanced procedures, reporting and communications improvements identified during the February 2014 Ice Storm.

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. All emergency response teams participated in the drills prior to storm season. The drill 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. Additional separate drills for specific events were conducted, including blackout restart, substation physical security, electronic work packages, a "substation-based" restoration methodology utilized to focus on concentrated areas of devastation, and integration of sister-utility crews.

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e. Transmission and Substation Preparedness

PECO's transmission and substation preparedness includes the following: review of summer readiness procedures with substation inspectors; 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.

f. Transmission Planning

Transmission Planning, in collaboration with PJM Interconnection, conducted look-ahead planning studies in 2014 for 2019 and updated the results for the years prior to 2019. 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 Hurricane Sandy, PECO initiates pre-event planning and preparations days before an event. For an event such as the February 2014 Ice Storm, 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 and PECO's sister utilities (BGE and ComEd), as well as resources through mutual assistance organizations in which PECO is a member: the North Atlantic Mutual Assistance Group (NAMAG) and the Southeast Electric Exchange (SEE). PECO is currently serving as the chair of NAMAG, leading that organization.

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

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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.

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 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

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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 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 outage map, which provides outage numbers by county and township; and PECO Smart Mobile On-the-Go, the company's mobile-enhanced website that allows customers to report an outage, check their service status, and pay their bill using a mobile device.

In more severe outage events like the February 2014 Ice Storm, 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. For instance, during the February 2014 Ice Storm, the team conducted more than 500 media interviews with local, national and international media.

In addition to traditional media, the company uses social media to provide customers and stakeholders with 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

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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.

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.