

PECO
2014 Summer Readiness Overview
May 23, 2014

Summer is here and PECO is ready. PECO bases its readiness on its reliability enhancement programs, preventative maintenance programs and capacity planning. These ongoing system enhancement projects contributed to the company's record-breaking electric and natural gas reliability performance in 2013 with customers experiencing the fewest number of outages in the company's history, surpassing previous records set in 2012.

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 nearly 450 three-phase reclosers in automated loop schemes in the Bucksmont, Delchester and Philadelphia Regions during the last five years, bringing the total to 1,571 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 to increased recloser installations, PECO continues storm hardening activities via infrastructure improvements and enhanced vegetation management. PECO has installed more than 15 miles of tree resilient Hendrix wire in areas impacted by high incidences of vegetation outages and removed more than 900 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). As of May 18, 2014, we have deployed 1,236,272 new electric meters throughout our service territory. Our target is substantially complete AMI meter deployment by the end of 2014.

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B. Preventative Maintenance Programs

PECO routinely performs numerous preventative maintenance programs, including vegetation management, substation inspections, pole inspections, distribution overhead line inspections (including automatic splice connections), and recloser inspections. In addition, PECO inspects distribution capacitors, regulators and transformers. Preventative 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 on transmission lines on a five-year cycle, to protect the transmission and distribution systems from vegetation-related interruptions.

As part of PECO's overhead line inspections and a broader Circuit Patrol & Thermography Program, PECO inspects automatic splice connections, among other things. Through this biennial program, PECO performs thermography (or infrared imaging) and visual inspection of the solid portion of overhead circuits. Visual and thermographic inspections of overhead 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 27 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.

D. 2013/2014 Storm Update and Lessons Learned

2013 was a light year for PECO relative to the number and impact of severe storms. As stated above, PECO had record-breaking electric and natural gas reliability performance with customers experiencing the fewest number of outages in the company's history, surpassing previous records set in 2012. That calm weather pattern ended in February 2014, when three significant events impacted the PECO service territory. Most notable was the February ice storm (Nika), which occurred from February 5-11. The impact of this storm was primarily focused on PECO's service territory, resulting in more than 750,000 customer outages.

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The table below provides comparisons between three recent significant storms at PECO:

Comparative Data for Recent Major Storms			
	2011	2012	2014
	Irene	Sandy	Ice Storm
Color Code	B10	B10	R2 Y8
Duration	7 days	9 days	7 days
Storm Size	Extreme	Extreme	Extreme
Customers	511,102	845,703	723,681
Primary Outages	1,844	4,540	4,062
Secondary Outages	269	967	1,339
CAIDI	925	1633	1,661
Staffing-Additional	1,567	3,772	5183
Cross Arms	1,509	2,875	2,559
Fuses	11,001	16,522	14,554
Poles	316	750	520
Transformers	278	398	307
Wire& Cable-miles	90	141	100
Police, Fire & Wire down	+3,300	+2,600	+3,885
Road Closed	+100	305	884
Media Interviews	+500	+770	+500

In many ways, the February 2014 ice storm was even more damaging than Hurricane Sandy. While Hurricane Sandy was by far PECO’s largest storm in terms of customer outages, the ice storm resulted in 528 more primary outage events, 372 more secondary outage events, almost *three times* the number of road closure events and nearly 50% more Police/Fire/Wire-down reports.

Despite the level of devastation experienced, PECO was able to respond quickly and effectively, restoring all customers in the same timeframe as Hurricane Irene from 2011 (7 days). This was accomplished in large part due to the support of the two Regional Mutual Assistance Groups (the North Atlantic Electric Exchange and South East Electric Exchange). Through these two groups, PECO was able to quickly obtain an extraordinary number of supplemental resources, far more than for any previous event. Because of the localized impact of the storm on PECO’s service territory, additional crews from neighboring utilities were able to be released to PECO throughout the duration of the event, as those utilities completed work on their systems.

After every major storm event, PECO conducts a formal “lessons learned” review to evaluate the elements of our planning and response efforts and determine what worked well and what could be improved. As part of this comprehensive review, PECO works with customers and other stakeholders, including municipal and county officials, as well as elected officials. After Hurricane Sandy, PECO helped initiate an industry-wide,

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PUC-sponsored, Best Practices assessment of Pennsylvania utilities. This extensive collaborative effort continues today, and will be further utilized as the result of the ice storm.

Unlike Hurricane Sandy, there was no multi-day opportunity for pre-event mobilization and staging of supplemental resources. Despite this constraint, PECO's standing storm restoration plans, and the availability of both local and more distant mutual assistance resources, allowed for a quick and effective response.

Lessons learned from previous extreme weather events were implemented such as multiple staging areas for receiving and dispatching supplemental resources, processes to address road closures and suspension of providing Estimated Times of Restoration (ETRs) early in the event to allow time for damage assessment prior to estimating the duration of outages across the system.

The extent of the damage caused by the ice storm stretched many of the processes utilized to respond to storms far beyond any prior event. As a result, many of these processes are being reviewed and revised to better address similar events in the future.

In particular, the road closure process initially implemented during Hurricane Irene in response to about 100 road closure events and revised during Hurricane Sandy to better address a volume of over 300 road closure events, will be enhanced again to reflect process improvements made in the course of responding to nearly 900 events experienced during the ice storm. Automated road closure reports, additional support personnel and centralized internal and external contact lists are now being implemented to better respond and communicate status.

Another lesson learned implemented after Hurricane Sandy executed during the ice storm was the suspension of ETRs and the establishment of a "Global" ETR. The utility Best Practices Group highlighted a potential opportunity to improve the accuracy and communication of ETRs and better manage customer expectations during large events, such as Hurricanes Sandy and Irene. This ETR strategy was implemented for the ice storm and generated further improvement opportunities to refine the messaging. For instance, when customers received the global ETR many reacted negatively, interpreting it as their "true ETR" and not the system-wide "worst case ETR" as intended. PECO is implementing a focus-group approach with numerous customer interviews to better understand how best to communicate various types of ETRs through the evolution of a storm. Follow up with the utility Best Practices Group is also anticipated to better understand the detailed practices of the other Pennsylvania utilities in this area.

The metrics developed after Hurricane Sandy to identify customers with multiple ETRs indicated a relatively small number of customers (in comparison to the total customers affected) received several ETRs. However, feedback from customers and stakeholders during outreach events indicated a level of dissatisfaction due to multiple ETRs for some customers.

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While multiple ETRs cannot be avoided entirely due to “nested” outages (multiple damaged areas on the same circuit), which cannot be readily identified until personnel are able to complete a thorough walk-down of every damaged circuit, measuring the number of ETRs provided for an outage may identify opportunities for improvement in our communications with customers.

PECO has upgraded the information available on our website to show the number of outages within a municipality, to help municipal officials obtain information to communicate with local residents. PECO is also working to provide additional granularity on its website for outages within the City of Philadelphia.

PECO successfully utilized social media (Twitter and Facebook) to keep customers, government leaders and key stakeholders informed about restoration efforts and provide important customer safety information during the Ice Storm. This included proactive posts, as well as reactive posts responding to customer questions related to safety and emergencies. This marked PECO’s first use of these channels in response to a large scale emergency. During the storm, Facebook likes increased by 1,485 and Twitter followers increased by 2,355. These social media channels were also leveraged as a customer safety tool to capture photos and additional details about downed wires and other damaged equipment. The availability of social media provided a valuable tool to communicate directly with our customers in real-time and also provided additional details on the extent of damage in local areas.

A more tactical process improvement was to develop a more effective way to communicate outage information, locations and circuit configurations to restoration crews. Historically done by utilizing distribution of “hard copy” paperwork, the company has developed the ability to email this information to restoration crews that have the capability to receive electronic copies. This new ability was utilized to a great extent during the ice storm. Crews that were able to receive this information electronically all responded favorably to the new system, although not all supplemental crews have the ability to receive electronic information. It is anticipated that more utilities and contractors will be utilizing this technology in the future.

PECO continues to find ways to expedite vehicle permits for interstate travel for emergency restoration purposes (such as for mutual assistance crews and the like). Declarations of Emergency and waivers help tremendously in this area, and PECO will continue to work with the All-Hazards Consortium, government officials and others to further expedite the process during future events.

Recently, regarding the ice storm, the PUC issued its Summary Report of Ourage Information and PEMA issued its After Action Review Report, which contained recommendations for the industry and for PECO specifically. PECO is committed to addressing these recommendations as part of the company’s ongoing goal of improving its storm readiness and outage response.

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E. PECO's 2014 Summer Readiness

PECO has completed 33 projects this year that are essential to ensure safe and reliable service 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 1.6 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 2014 summer readiness. Some of our major projects include the following:

- **Upper Providence PDM Installation - \$10M**
This multi-year project was started in 2010 to increase capacity for projected load growth in the area. A new 220/34kV substation transformer and associated equipment were installed along with two new 34kV distribution circuits with automatic reclosing and sectionalizing capabilities to increase reliability in the area.
- **Newtown Square 136 new circuit - \$1.5M**
This project addressed capacity and reliability issues in the area. This project included a new substation breaker at the Newtown Square substation as well as a build out of two miles of new distribution cable, poles and associated equipment.
- **Emilie 815, Waneeta 85 and 425 circuit breaker upgrades - \$1.2M**
This project included upgrades to two 230kV circuit breakers at the Waneeta substation and one 230kV circuit breaker at the Emilie substation to increase the transmission capacity and electric reliability for the surrounding areas.

b. Supplemental Vegetation Management Preventative Maintenance Activities

PECO's Vegetation Management department schedules a backshift of tree crews during the summer months (i.e., 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,

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distribution corrective maintenance work is identified before June 1 each year for circuits that qualify for mid-cycle and 34-kV 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; training for PECO Smart A/C Saver events; 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 drills, covering the entire PECO storm organization, were conducted on May 12 and 20, 2014. PUC representatives were invited to observe the drills. PECO will coordinate with county emergency response directors on the development of road closure response drills utilizing enhanced procedures identified during the 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, electronic work packages and a "substation-based" restoration methodology utilized to focus on concentrated areas of devastation (a methodology utilized in several locations during the ice storm).

e. Transmission and Substation Preparedness

PECO's transmission and substation preparedness include 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; verification of spare equipment availability including mobile transformers and portable units; completion of the Summer Operations Task Force Summer Study with PJM Interconnection (the regional transmission planner); and communication to control room staff of the findings of the Reliability First Corporation (RFC) Summer Resource and Summer Transmission Assessments.

f. Transmission Planning

Transmission Planning, in collaboration with PJM Interconnection, conducted look-ahead planning studies in 2013 for 2018 and update the results in subsequent years prior to 2018. All required transmission needs for the PECO system to meet the reliability

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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 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 with Hurricane Sandy, PECO initiates pre-event planning and preparations days before the events. For an event such as the 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, PECO's sister utilities (Commonwealth Edison and Baltimore Gas and Electric), as well as resources through mutual assistance organizations in which PECO is a member: the North Atlantic Mutual Assistance Group (a new organization formed in the fall of 2013 through the merger of three Regional Mutual Assistance groups, MAMA, NYMAG and NEMAG) and the Southeast Electric Exchange (SEE).

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. Additionally, PECO conducts outreach 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 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

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remaining primary outage event list, and dispatches repair crews in descending order of the number of affected customers, simultaneously prioritizing “critical care 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 care 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 spread 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.

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 Central, 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 and restoration numbers by county and township; and PECO Smart Mobile On-the-Go an application that allows customers to report an outage, check their service status, and pay their bill using a mobile device.

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In more severe outage events like the February 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 and 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 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 inform stakeholders. Following PA PUC Utility Best Practices work, PECO's Twitter and Facebook accounts were launched in 2013. During the Ice Storm, PECO used these channels to provide proactive information, including emergency contact information, outage reporting procedures, restoration updates and important safety information. The platforms were updated every two to four hours – and more often when additional information became available. In addition, PECO responded to public and private customer inquiries on social media regarding emergencies. In total, PECO issued 94 Facebook and 141 Twitter posts, not including those messages that were posted in response to individual customers. During the storm, Facebook likes increased by 1,485 and Twitter followers increased by 2,355.

PECO also maintains close contact with elected and regulatory officials through personal outreach and regular follow-up communication. For example, during the ice storm, PECO was in continuous contact with the PUC Commissioners and key staff through daily statewide conference calls, ad hoc outreach, several PUC visits to the storm center and service territory, as well as daily routine reporting on storm status. In addition, calls were made to each state legislator 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 also 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.