Pennsylvania Summer Reliability

PENELEC

A. Reliability Enhancement Programs

Pennsylvania Electric Company ("Penelec" or "Company") remains committed to providing safe and reliable electric service to its customers and employs various programs to strengthen the durability and flexibility of the electric system. The Company has put into place plans, which are described in various filings, to further support reliability performance. These include a Corrective Action Plan,[1] Reliability Plan,[2] Worst Performing Circuit Plan,[3] and the Long-Term Infrastructure Improvement Plan ("LTIIP").[4] Components of these plans are described below.

To reduce tree related outages, Penelec performs cycle-based tree trimming which removes selected incompatible trees within the clearing zone corridor, removes certain defective limbs that are overhanging primary conductors, controls selected incompatible brush, and removes off right-of-way priority trees.[5] Penelec performed tree trimming on 3,792 miles (which includes the removal of 131,290 priority trees) in 2017 and plans to trim approximately 3,636 miles in 2018. A study conducted by Penelec Engineering in 2017 determined that twenty-three of Penelec's circuits, or 8% of the total mileage, accounted for 24% of total outages over the past five years. As a result of the study, Penelec reduced the trimming cycle for six circuits to every three years, and every four years for an additional seventeen circuits. Beginning in 2018, Penelec will concentrate its efforts on those circuits by accelerating the trimming of approximately 665 miles. In addition, Penelec continues the proactive removal of Ash trees that have been deemed a threat by the Emerald Ash Borer, and in 2017 approximately 44,000 Ash trees were removed.

Penelec proactively replaces porcelain cutouts with a more robust version constructed from polymer which is likely to reduce the number of recloser and circuit breaker lockouts and other equipment damage. Penelec replaced porcelain cutouts on eighty circuits in 2017 and plans to replace cutouts on an additional fifty-seven circuits by the end of 2018.

Targeted circuit rehabilitation is being performed in zones one and two,[6] focusing on circuits having a high rate of equipment and line failure and animal-caused outages. Equipment that may be replaced includes crossarms, capacitors, insulators, lightning arresters and connectors. Penelec completed the rehabilitation of twelve circuits in 2017 and plans to complete rehabilitation on an additional twenty-one circuits in 2018.

[1] In December 2014, Penelec submitted a CAP designed to improve overall reliability and achieve benchmark performance in all three indices by year-end 2018.

[2] On March 30, 2015, the Commission issued an order directing, Pennsylvania Electric Company to prepare and file a revised implementation plan relating to specific topics addressed in the report issued by the Commission's Bureau of Audits on February 12, 2015. *Implementation Plan for the Focused Management Audit of Pennsylvania Electric Company,* Docket No D-2013-2365992,

[3] See Footnote 2.

[4] On October 19, 2015, pursuant to Section 1352 of the Pennsylvania Public Utility Code, 52 Pa. Code §§ 121.1 et seq. and the Commission's final order in Implementation of Act 11 of 2012, Pennsylvania Electric Company filed their petition for approval of its LTIIP at Docket No. P-2015-2508936. On February 11, 2016 the Commission approved the plan.

[5] Trees located off the right-of-way that are either dead, diseased, declining, structurally compromised, severely leaning or significantly encroaching onto the right-of-way.

[6] Zone one is defined as the portion of the circuit from the substation breaker to the first protective device. Zone two is defined as the three-phase conductor and devices after the first protective device.

Supervisory control and data acquisition ("SCADA") controlled devices are being installed at locations on both the distribution and 34.5 kV systems which allow for remote operation to restore service to customers when an outage occurs. Remote switching eliminates the need to dispatch crews to manually operate the switches. The result is fewer customers affected and reduced outage durations. Twenty-one SCADA controlled switches were installed in 2017, and the Company plans to install an additional twenty-five switches in 2018.

To reduce the scope of outages, fuse protection and coordination recommendations on the 34.5 kV system will be constructed and implemented based on full circuit coordination studies. Penelec implemented fuse protection coordination and recommendations on six circuits in 2017 and plans to address an additional five circuits in 2018.

Brown porcelain cap and pin style insulators that are prone to failure, as well as switch insulators and arresters, are being replaced. Penelec replaced fifteen insulators in 2017 and plans to replace an additional thirty insulators in 2018.

Circuit ties and loops continue to be built between radial sections of circuits. When ties and loops are available, circuits can be switched during outages to enable faster service restoration. Penelec installed one circuit tie and loop in 2017 and plans to install at least one additional tie and loop in 2018.

Advanced protective devices such as electronically controlled reclosers and switches with modernized communication are being installed to allow for additional protection coordination. Two advanced protective devices were installed in 2017, and eighteen are planned for installation in 2018.

Penelec has identified a brand of circuit breaker that fails to operate properly causing unreliable breaker operations during line outages. As a result, these select circuit breakers at 34.5 kV substations are being replaced. Sixteen breakers were replaced in 2017, and Penelec plans to replace at least forty breakers in 2018.

Reliability improvements are being performed on clusters of customers that experience frequent or repeated outages. The customer service improvement program is designed to reduce the frequency of outages at the customer level and is often initiated from customer complaints. In addition to enhancing system performance, the program is a means to reduce the frequency of outages at the customer level that might not otherwise be addressed when targeting overall system metrics. Thirty-one projects were completed in 2017, and thirty projects are planned for 2018.

B. Preventative Maintenance Programs

In accordance with 52 Pa. Code § 57.198, every two years Penelec files a Biennial Inspection, Maintenance, Repair and Replacement Plan[7] for approval by the Commission.

[7] Pursuant to 52 Pa. Code § 57.198, every two years an electric distribution company shall file, and receive approval from the Commission of, a biennial plan for the periodic inspection, maintenance, repair and replacement of its facilities. On March 4, 2016 Paul Diskin, Director, Technical Utility Services, issued a letter approving the Companies' biennial inspection, maintenance, repair, and replacement plan effective January 1, 2017 through December 31, 2018. Further, on September 29, 2017 Penelec submitted the plan effective January 1, 2019 through December 31, 2020.

This Biennial Plan is designed to reduce the risk of outages on the Company's system and form the basis for the Company's inspection and maintenance objectives. The Biennial Plan includes programs to conduct vegetation management, pole inspections, distribution overhead line inspections, distribution transformer inspections, recloser inspections and substation inspections.

These well-established maintenance programs ensure the existing system will continue to operate in a safe and reliable manner and serve to identify any potential system issues so they can be proactively addressed.

C. Capacity Planning

Due to ongoing system enhancements and the hard work of employees and contractors, Penelec is able to reliably serve its customers. The primary driver of customer demand this summer is again expected to be warm temperatures across the region.

Penelec does not foresee significant concerns with system delivery capacity during the upcoming summer based on its performance during last summer's peak. Ongoing facility enhancements designed to improve reliability, load-bearing upgrades, and customers' adoption of energy efficiency and conservation opportunities are being viewed as additional opportunities to ensure the reliability and capacity availability of the system.

D. 2017/2018 Storm Update and Lessons Learned

In calendar year 2017, Penelec experienced two major events. During any weather event, safety remains the number one priority.

On May 1-6, 2017, 95,607 customers were impacted when severe thunderstorms with wind gusts of sixty to seventy miles per hour for over a twenty-four hour period moved through the Penelec service territory. In addition, the National Weather Service confirmed two tornados in Clarion County in the Penelec service territory. Restoration efforts were hindered by heavy rains and high winds, and falling trees were a safety concern due to the persistent high winds.

On July 23-25, 2017, 1,111 customers in Bradford and Wyoming Counties were impacted by a severe thunderstorm that produced nearly five inches of rain in a three-hour period, causing extensive flooding. The floodwaters reached five feet in some areas which made roads and bridges impassable causing delays in the restoration efforts.

Throughout restoration efforts, working safely and efficiently is the main objective. Regional conference calls are held for preparation and logistics planning. Effective planning allows for the precise deployment of crews, supplies, and equipment. Employees are also staggered around the clock to maximize productivity.

After each significant storm event, Penelec leadership conducts post-storm review meetings to identify and disseminate lessons learned which are used to improve the emergency response plan.

E. 2017 Summer Readiness

Capacitor Inspections – By June 1, 2018, Penelec will have inspected all line capacitor banks and completed all necessary repairs or replacements to ensure at least 98% availability.

Substation – By June 1, 2018, Penelec will have inspected all substation capacitor banks and completed necessary repairs or replacements to ensure minimum 98% available reactive support. In addition, a review of spare equipment will have been completed. Spare equipment includes voltage regulators and substation cooling items such as transformer fans.

By July 1, 2018, Penelec will have cleaned and inspected all transformer cooling systems. Cleaning removes the accumulation of Cottonwood seedlings that are released each May and June. In addition, fans and pumps are inspected and their functionality verified during the cleaning process.

Capacity Additions:

- **Lewistown #3 230/115 kV Transformer Replacement** – The #3 230/115 kV transformer was replaced with a higher capacity transformer. This equipment is already in service.
- **Homer City – Shelocta – Keystone 230 kV Terminal Upgrade** – This project upgraded terminal equipment at the Keystone substation on the Homer City/Shelocta terminal. This equipment is already in service.
- **Hollidaysburg – HCR Tap 46 kV Terminal Upgrade** – This project upgraded terminal equipment at the Hollidaysburg substation on the HCR tap terminal. This equipment is already in service.
- **EH1 Tap – Hollidaysburg 46 kV Relay Upgrade** – This project upgraded the bus conductor and relay equipment at Hollidaysburg substation on the EH1 tap terminal. This equipment is already in service.
- **Jackson Road #1 115/46 kV Transformer** – This project will replace the #1 115/46 kV transformer with a higher capacity transformer. The project is expected to be completed by June 1, 2018.
- **Altoona – Collinsville 46 kV Terminal Upgrades** – This project will upgrade relay equipment at Altoona and Collinsville substations on the AG, G and F lines. The projects are expected to be completed by June 1, 2018.
- **Ashville – Sankertown Tap 46 kV Line Rebuild** – This project will rebuild the Ashville – Sankertown tap 46 kV line with higher capacity conductor. The project is expected to be completed by June 1, 2018.
- **Lewis Run – Pierce Brook 230 kV Line** – This project will construct a 230 kV line between the Lewis Run and Pierce Brook substations utilizing existing 115 kV right-of-way from Lewis Run – Farmers Valley. The project is expected to be completed by June 1, 2018.
- **Huntingdon – C Tap 46 kV Terminal Upgrade** – This project will upgrade terminal equipment at the Huntingdon substation on the C tap terminal. This project is expected to be completed by June 1, 2018.

- **Huntingdon – Raystown 46 kV Terminal Upgrade** – This project will upgrade relay equipment at Raystown substation and relay equipment and bus conductor at Huntingdon substation. This project is expected to be completed by June 1, 2018.
- **Raystown – Smithfield 46 kV Terminal Upgrade** – This project will upgrade relay equipment at Raystown on the Smithfield terminal. This project is expected to be completed by June 1, 2018.
- **East Towanda – South Troy 115 kV Line Rebuild** – This project will rebuild the East Towanda – Tennessee Gas – South Troy line, upgrade terminal equipment at East Towanda and install a new switch at South Troy. This project is expected to be completed by June 1, 2018.
- **East Sayre – East Towanda 115 kV Terminal Upgrade** – This project will upgrade relay equipment at East Sayre and East Towanda substations. This project is expected to be completed by June 1, 2018.

Transmission Preparedness – An annual transmission readiness review is conducted with the transmission operations department to discuss the capability and reliability of the system for the summer. The detailed review did not reveal any significant issues for the summer of 2018. Based on the system conditions modeled, the Penelec transmission system is expected to sufficiently support the forecasted peak summer loading.

Two aerial patrols are conducted annually by Penelec to inspect transmission facilities. The purpose of routine patrols is to ensure the integrity of in-service transmission lines to maintain safe and reliable service. The first aerial patrol has been completed and the second will be completed by year end.

Additionally, PJM Interconnection LLC (“PJM”) has operational procedures identified to effectively control and mitigate contingency outage conditions on the transmission system. Penelec has operational procedures to implement any PJM required actions and to mitigate contingency conditions on the lower voltage systems (<100kV).

Emergency Exercise – As part of the FirstEnergy Utilities (“FEU”) Emergency Preparedness program, Penelec completed an emergency exercise on April 10, 2018. The exercise facilitated the testing and validation of key emergency response roles, systems and processes. The primary objective of the exercise was to ensure a complete understanding of the restoration process by all participants through exposure to a variety of real-world scenarios and decision-making challenges that could be experienced during actual restoration events.

Event Preparedness – FirstEnergy’s in-house meteorologists use highly sophisticated, proprietary data and forecasting models specifically designed to provide actionable intelligence. When predicted weather meets specific criteria, planning and preparation work is immediately initiated, often days before forecasted impact.

As part of the preparation efforts, Penelec’s executive leadership and operations managers implement the emergency restoration process. Based on available data, resource needs are evaluated and requests are submitted to the FEU Emergency Operations Center. These requests can include, but are not limited to: line resources (both internal to FirstEnergy and external), hazard responders, damage assessors, public protectors,

vegetation crews, and equipment and material needs. Depending on the predicted magnitude of the event, pre-identified staging areas can be quickly activated to prepare for the efficient deployment of crews and equipment.

Refresher Training – All employees with emergency response roles receive appropriate refresher training at specified intervals to ensure they are immediately deployable when an event impacts the system. Expectations for employees to complete appropriate training and verify all equipment and personal protective equipment are available and in proper working order are communicated each year during emergency exercises and verified by Penelec management.

Staffing – Penelec is appropriately staffed for the 2018 summer storm season. Penelec performs an annual staffing analysis that accounts for attrition, including retirements, to determine the proper staffing levels of craft workers. Penelec then enrolls students in the Power Systems Institute ("PSI") based on the results of the analysis. PSI is a unique, two-year program that combines classroom learning with hands-on training. Penelec hired twenty-five line worker graduates and six substation electrician graduates in 2018. The objective of the PSI program is to proactively hire a diverse group of individuals that will fulfill the line work and substation electrician staffing needs for Penelec. The following colleges have partnered with Penelec to support these line worker and substation electrician development:

- Pennsylvania Highlands Community College (for Line and Substation students)
- Porreco College of Edinboro University (for Line students)

For larger scale events, Penelec is able to supplement its own resources by accessing FirstEnergy's portfolio of operating companies that includes the additional three companies located within Pennsylvania, as well as an additional six operating companies in other jurisdictions. The consistency in standards and work practices employed across all ten of these operating companies enables streamlined resource sharing in a way that promotes both safety and efficiency.

FirstEnergy, for itself and its affiliated operating companies, including Penelec, is a member of the following Regional Mutual Assistance Groups ("RMAGs") and can call upon them to request additional resources when needed:

- Great Lakes Mutual Assistance Group
- North Atlantic Mutual Assistance Group
- Southeastern Electrical Exchange

A National Response Event can be activated by Edison Electric Institute member utilities when multiple RMAGs cannot adequately support the resource requirements of the requesting utilities. In addition to working with RMAG organizations, FirstEnergy works with non-RMAG utility companies and contractors to secure resources.

F. Storm Response

Outage Restoration Strategy – Penelec begins preparing for potential outages long before severe weather hits. When inclement weather is forecasted, Penelec plans are activated to ensure an adequate number of crews are prepared to tackle the damage. Part of this preparation includes running a model that estimates the impact of an impending weather threat and calculates the expected number of customers impacted. This output, along with historical storm experience, is used to estimate the impact of the weather event so that properly scaled preparations can be made.

Information obtained through various tools and resources is critical to determine the type, number and location of resources needed to assure prompt restoration of service. Line personnel, damage assessors and hazard responders are integral resources in providing initial and ongoing assessments of the damage in the field. Line personnel are equipped with mobile data terminals ("MDTs") in their vehicles and will enter damage information directly into the MDT. This information is immediately available for viewing in the Outage Management System ("OMS"). The OMS is the central collection point for all relevant information concerning damage reports, assessment and configuration of the electric distribution system. During emergencies that meet triggering criteria, the circuit quarantine process is used for rapid assessment and repair of heavily damaged circuits. Additionally, there are two apps that employees can use on mobile devices to automatically enter damage information into the Company's OMS.

In response to power outages and other systems emergencies, FirstEnergy maintains a copy of its Emergency Plan for Service Restoration which provides the guidelines for all common processes and procedures for conducting emergency preparedness, response and service restoration. Further, Penelec is in the process of incorporating Incident Command System principles into its emergency response organization to adhere to the principles and high-level structure of the National Incident Management System as appropriate in an electric utility environment.

Communications and Outreach – External Affairs managers establish communications with emergency management agencies, local officials, county commissioners, and legislators and their offices in advance of and throughout a storm to keep them apprised of preparation and planning efforts. Communications representatives also contact the media to enlist their help in encouraging customers to prepare for the likely storm events and provide information on who to call if they lose power. Proactive email alerts and phone messages are initiated to key stakeholders alerting them of the potential for extended power outages. These efforts and face-to-face outreach are closely aligned with the Company's service restoration efforts. The Company also provides safety messages via newspapers, radio, and online banner ads.

Penelec customers can stay abreast of restoration progress through a variety of means. A customer can access the Storm Restoration Process page of the Company's website to learn about the damage assessment and repair prioritization processes as well as the importance of customer calls and outage reporting during the restoration process. Customers can access the 24/7 Power Center outage map that provides county-by-county information. Through this site users can obtain the number of customers served and the

number of customers out of power at the county level as well as estimated time of restoration ("ETR") information. In addition, the 24/7 Power Center outage map shows the status of crews restoring service, and informs customers when crews have been dispatched, when they are working on a repair and when additional crews or equipment are needed to complete restoration work.

Penelec's mobile website and mobile app allow customers to report outages and connect to the 24/7 Power Center outage map which has been optimized for mobile devices. From the mobile site, customers can view personalized outage status for an outage they have reported. The mobile website and app, as well as the full Penelec website, also allow customers to register for outage-related alerts via text messages and/or email. These platforms also provide instructions to use two-way text messaging, an interactive option for customers to report outages and obtain outage updates.

Furthermore, Penelec uses Twitter and Facebook to share additional safety reminders, ETRs, updates on restoration efforts, explanations of the restoration process and information about the arrival of additional crews, water and ice locations, and links to other resources such as shelters.

In addition, Interactive Voice Response ("IVR") messaging is used to communicate restoration information to customers. Messaging is also relayed to customers who have called Penelec regarding their individual outage. Live agent customer service representatives are available and have the same information at their disposal.

For extended power outages, Communications issues regular news releases and media advisories over both traditional media channels and social media to update customers on the status of power restoration efforts, as well as provide realistic ETRs so customers can plan accordingly. Communications proactively issues safety messaging ranging from avoiding downed wires to properly hooking up and operating generators. The Company also has plans in place to provide free water and ice to customers without service. Once locations have been determined, this information is communicated to customers via the IVR, press releases, social media and the website.

Outage Restoration and Storm Response Best Practices – Penelec continues to review each storm event, and many of the practices adopted as mentioned above stemmed from sharing best practices with other utilities, a practice that continues today.