Electric Power Outlook for Pennsylvania 2018-2023

August 2019

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ELECTRIC POWER OUTLOOK FOR PENNSYLVANIA 2018–2023

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Executive Summary

Introduction

Section 524(a) of the Public Utility Code (Code) requires jurisdictional electric distribution companies (EDCs) to submit to the Pennsylvania Public Utility Commission (PUC or Commission) information concerning plans and projections for meeting future customer demand.[1] The PUC's regulations set forth the form and content of such information, which is to be filed on or before May 1 of each year.[2] Section 524(b) of the Code requires the Commission to prepare an annual report summarizing and discussing the data provided, on or before Sept. 1. This report is to be submitted to the General Assembly, the Governor, the Office of Consumer Advocate and each affected public utility.[3]

Since the enactment of the *Electricity Generation Customer Choice and Competition Act*,[4] the Commission's regulations have been modified to reflect the competitive market. Thus, projections of generating capability and overall system reliability have been obtained from regional assessments.

Any comments or conclusions contained in this report do not necessarily reflect the views or opinions of the Commission or individual Commissioners. Although issued by the Commission, this report is not to be considered or construed as approval or acceptance by the Commission of any of the plans, assumptions, or calculations made by the EDCs or regional reliability entities and reflected in the information submitted.

Overview

This report concludes that sufficient generation, transmission and distribution capacity exists to reasonably meet the needs of Pennsylvania's electricity consumers for the foreseeable future.

Regional generation adequacy and reserve margins of the mid-Atlantic will be satisfied through 2028, provided planned generation and transmission projects will be forthcoming in a timely manner. The North American Electric Reliability Corporation (NERC) provided a reliability assessment of the Regional Transmission Organization (RTO), which is PJM Interconnection, LLC (PJM), and concluded that PJM will meet its reserve margin requirements.

In 2019, the PJM reserve margin requirement is 16.0 percent with an actual available reserve of 28.2 percent as compared to a reserve margin requirement of 16.1 percent and available reserve of 27.7 percent in 2018.[5] NERC also projects PJM will have enough generation capacity to meet its reserve margin requirements through 2028.[6]

Pennsylvania's aggregate electrical energy usage (residential, commercial, industrial, sales for resale, and other) in 2018 was 148,333 gigawatt hours (GWh) as compared to 142,740 GWh in 2017; 145,022 GWh in 2016; and 146,229 GWh in 2015. Year-over-year electric usage increased 3.92 percent.

Over the next 5 years, total Pennsylvania electric energy usage is projected to decrease at an average annual rate of 0.18 percent. This includes a 0.28 percent decrease in average annual residential usage, a 0.43 percent decrease in average annual commercial usage, and a 0.14 percent increase in average annual industrial usage.

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[1] *See* 66 Pa. C.S. § 524(a).
[2] *See* 52 Pa. Code §§ 57.141—57.154.
[3] *See* 66 Pa.C.S. § 524(b).
[4] 66 Pa.C.S. §§ 2801—2812.
[5] http://www.puc.state.pa.us/Electric/pdf/Reliability/Summer_Reliability_2019-PJM.pdf.
[6] https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2018_12202018.pdf.

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Section 1 – Regional Electric Outlook

Purpose

The *Electric Power Outlook for Pennsylvania 2018-2023* discusses the current and future electric power supply and demand situation for the 11 investor-owned jurisdictional electric distribution companies (EDCs) operating in the state and the entities responsible for maintaining the reliability of the bulk electric supply system within the region that encompasses the state.

Pursuant to Title 66, Pennsylvania Consolidated Statutes, Section 524(b), the PUC annually submits this report to the General Assembly, the Governor, the Office of Consumer Advocate and affected public utilities. It also is posted on the Commission's website.[7]

The information contained in this report includes highlights of the past year, as well as EDCs' projections of energy demand and peak load for 2019-2023. The state's seven largest EDCs[8] represent 99 percent of both jurisdictional electricity customers and electrical energy consumption in Pennsylvania. Accordingly, information regarding the other four smallest EDCs contained in this report is limited. The report also provides a regional perspective with statistical information on the projected resources and aggregate peak loads for the region that impacts Pennsylvania.

As permitted under Section 2809(e) of the Public Utility Code, the Commission has adopted revised regulations, reducing from 20 years to five years the reporting requirements and the reporting horizon for energy demand, connected peak load, and number of customers. Because Pennsylvania has a competitive retail electric market, certain information is no longer required to be reported. This includes information regarding generation facilities such as capital investments, energy costs, new facilities, and expansion of existing facilities.

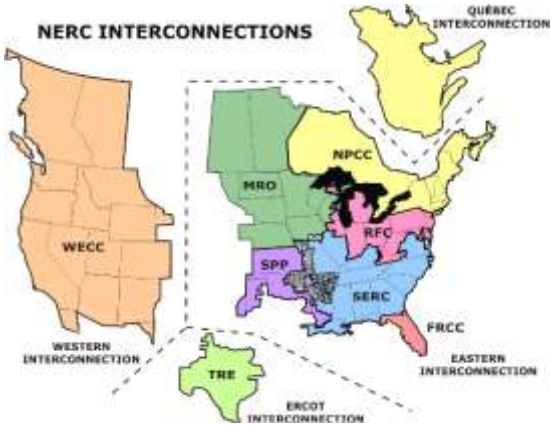
Data for the report is submitted annually by EDCs, pursuant to the Commission's regulations.[9] Additionally, the Commission relies on reports and analyses of regional entities, including the ReliabilityFirst Corporation (RFC) and PJM, to obtain a more complete assessment of the current and future status of the electric power supply within the region. Sources also include data submitted by regional reliability councils to the North American Electric Reliability Corporation (NERC), which is subsequently forwarded to the U.S. Energy Information Administration (EIA).

[7] Report is available at http://www.puc.pa.gov/utility_industry/electricity/electric_reports.aspx.
[8] Those EDCs with at least 100,000 customers.
[9] *See* 52 Pa. Code §§ 57.141—57.154.

Regional Reliability Organizations

In Pennsylvania, all major EDCs are interconnected with neighboring systems extending beyond state boundaries. These systems are organized into regional reliability councils responsible for ensuring the reliability of the bulk electric system.

North American Electric Reliability Corporation



The North American Electric Reliability Corporation (NERC) has been granted legal authority by the Federal Energy Regulatory Commission (FERC) to enforce reliability standards and to mandate compliance with those standards. NERC oversees the reliability of the bulk power system that provides electricity to 334 million people, has a total demand of over 830 gigawatts (GW), has approximately 211,000 miles of high-voltage transmission lines (230,000 volts and greater), and represents more than $1 trillion worth of assets.

NERC's members operate in 8 regional reliability entities. Members include investor-owned utilities, federal and provincial entities, rural electric cooperatives, state/municipal and provincial utilities, independent power producers, independent system operators, merchant electricity generators, power marketers and end-use electricity customers. The membership accounts for virtually all the electricity supplied in the United States, Canada, and a portion of Baja California Norte, Mexico. The regional entity operating in Pennsylvania is ReliabilityFirst Corporation (RFC).

NERC establishes criteria, standards and requirements for its members and all control areas. All control areas must operate in a seamless and stable condition to prevent uncontrolled system separations and cascading outages caused by any single transient event.

NERC Reliability Assessment

The *2018 Long-Term Reliability Assessment*[10] is NERC's independent review of the 10-year reliability outlook for the North American bulk power system (BPS) while identifying trends, emerging issues, and potential risk. Also reported is insight on resource adequacy and operating reliability, as well as an overview of projected electricity demand growth for individual assessments areas. NERC also provides specific review of the PJM Regional Transmission Organization (RTO).

In the 2018 assessment, NERC highlighted several key findings and recommendations regarding issues that are emerging and have the potential to increase risks to reliability.

The electricity sector is undergoing significant and rapid change, presenting new challenges and opportunities for reliability. With appropriate insight, careful planning, and continued support, the electricity sector will continue to navigate the associated challenges in a manner that maintains reliability and resilience. As NERC has identified in recent assessments, retirements of conventional generation and the rapid addition of variable resources in some areas, primarily wind and solar, are altering the operating characteristics of the grid in some areas. A significant influx of natural gas generation raises new questions about how disruptions on the pipeline system can impact the electric system reliability. Risks and corresponding mitigations may be unique to each area, and industry stakeholders and policymakers should respond with policies and plans to address these emerging issues. NERC noted that the 2018 assessment served as a comprehensive, reliability-focused perspective on the 10-year outlook for the North American BPS and identified potential risks to inform industry planners and operators, regulators, and policy makers. Based on data and information collected for this assessment, NERC has identified the following 5 key findings:

NERC Key Findings

- The ERCOT, MRO-MISO, and NPCC-Ontario regional reliability entities are projected to be below the Reference Margin Level; probabilistic assessments of future conditions can highlight additional reliability challenges:
    - Anticipated Reserve Margins in ERCOT are projected below the Reference Margin Level for the entire first five-year period, but additional Tier 2 resources may be advanced to preserve reliability.
    - MISO and NPCC-Ontario are projected to have Anticipated Reserve Margin shortfalls beginning in 2023, but additional Tier 2 resources may be advanced to preserve reliability.

[10] *See* NERC, *2018 Long-Term Reliability Assessment*, Dec. 2018, available at https://www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_LTRA_2018_12202018.pdf.

- Probabilistic evaluations identify resource adequacy risks during nonpeak conditions in WECC-CAMX, starting in 2020 and increasing by 2022. While planning reserve margins are adequate for the peak hour in California, loss-of-load studies that evaluate all hours of the year have started to indicate greater risk of a supply deficit.

- Reliance on natural gas generation increases in some areas with continuing resource mix changes, and fuel assurance mechanisms are being developed:

  - The FRCC, ERCOT, and WECC-CA-MX assessment areas are projecting natural gas generation to contribute greater than 60 percent of on-peak capacity. Natural gas generation provides important flexibility attributes that are essential for managing wind and solar variability.

  - A total of 41 GW of Tier 1 natural gas generation capacity is planned through 2028.

  - Fuel assurance mechanisms offer important reliability benefits, particularly in areas with high levels of natural-gas-fired generation and constrained natural gas transportation. NERC noted that fuel assurance mechanisms come in many forms and have existed for decades within integrated resource planning processes. In market areas, evolving rules and mechanisms continue to target better performance as well as increasing overall fuel assurance by increasing firm pipeline transportation and maintaining back-up oil inventories for gas-fired generation.

- Frequency response is expected to remain adequate through 2022:

  - Eastern and Western Interconnection dynamic stability analysis shows that the projected generation mix sufficiently supports frequency after simulated disturbances despite reductions in inertia.

  - Operational procedures in ERCOT are in place to limit the reliability risk resulting from degraded inertia.

- Increasing solar and wind resources requires more flexible capacity to support ramp requirements:

  - As more solar and wind generation is added, additional flexible resources are needed to offset these resources' variability—such as supporting solar down ramps when the sun goes down and complementing wind pattern changes.

  - With continued rapid growth of distributed solar, the California Independent System Operator's (CAISO) three-hour ramping needs have reached 14,777 MW, exceeding earlier projections and reinforcing the need to access more flexible resources. By 2022, this need increases to 17,000.

- Changing ramping requirements induced by increasing amounts of wind is largely managed with improved forecasting. Ramp forecasts allow ERCOT operators to curtail wind production and/or reconfigure the system in response to large changes in wind output.

- Over 30 GW of new distributed solar photovoltaic is expected by the end of 2023 and it will impact system planning, forecasting, and modeling needs:

  - California is projected to have over 18 GW of distributed solar photovoltaic (PV) by 2023, which is nearly 40 percent of its projected peak demand for the same period. New Jersey, Massachusetts, and New York are projected to each have between 3.5 and 4 GW of distributed solar PV by 2023.

  - Increasing installations of distributed energy resources (DERs) modify how distribution and transmission systems interact with each other. Transmission planners and operators may not have complete visibility and control of these resources, but as growth becomes considerable, their contributions must be considered in system planning, forecasting, and modeling.

NERC Recommendations

Based on the identified key findings, NERC formulated the following recommendations:

- Enhance NERC's Reliability Assessment Process: In addition to its capacity supply assessment, NERC's Reliability Assessment Subcommittee should lead the electric industry in developing a common approach and identify metrics to assess energy adequacy. As identified in the 2018 assessment, the changing resource mix can alter the energy and availability characteristics of the generation fleet. Additional analysis is needed to determine energy sufficiency, particularly during off-peak periods and where energy-limited resources are most prominent.

- Develop Guidelines to Assess Fuel Limitations and Disruption Scenarios: Given the increased reliance on natural gas generation, NERC noted that system planners should identify potential system vulnerabilities that could occur under extreme, but realistic, contingencies and under various future supply portfolios. In addition, NERC's Planning Committee should leverage industry experience and develop a reliability guideline that establishes a common framework for assessing fuel disruptions of various types. The industry-developed assessments can then be used to address potential regulatory needs or establish market mechanisms to better promote fuel assurance.

- Improve Interconnection Frequency Response Modeling: NERC noted that the analysis in this 2018 assessment represents the first-ever, forward-looking interconnection- wide assessment for both the Eastern and Western Interconnections. The analysis highlights several areas for improvement that include the following: improving the generation dispatch to better reflect low-inertia conditions; identifying locational constraints, particularly in the Western Interconnection; and valid representation of DERs in load models. NERC noted that it should continue working with the Eastern, Western, and Texas

interconnection study groups to develop improved frequency response base case and scenario assessments.

- Ensure System Studies Incorporate DERs: In areas with expected growth in DERs, system planners should determine data gathering strategies to ensure the aggregate technical specifications of generation connected to local distribution grids are known to the transmission operator. This data collection is needed to ensure accurate and valid system planning models, load forecasting, coordinated system protection, and real-time situation awareness. In areas with large or emerging DER penetration, future system studies should properly account for DERs in order to accurately represent the system's behavior.

- Flexible Ramping Resources Needed to Offset Variable Energy Production: Presently, ramping capacity concerns are largely confined to California. However, as solar generation continues to increase in California and elsewhere across North America, system planners should ensure adequate flexible ramping capacity, including large-scale energy storage.

ReliabilityFirst Corporation

ReliabilityFirst Corporation (RFC), headquartered in Fairlawn, Ohio, is one of 8 NERC regional entities serving North America, and is the regional reliability entity for Pennsylvania. Its service territory consists of more than 72 million people in a 238,000 square-mile area covering New Jersey, Delaware, Pennsylvania, Maryland, District of Columbia, West Virginia, Ohio, Indiana; and parts of Michigan, Wisconsin, Illinois, Kentucky, Tennessee, and Virginia. Its membership includes load-serving entities (LSEs)[11], RTOs, suppliers and transmission companies.

The RFC controls reliability standards and enforcement by entering into delegation agreements with regional entities to ensure adequate generating capacity and transmission. Program areas include Compliance monitoring, enforcement, entity development, event analysis and situational awareness, regulation and certification, reliability assessment and performance analysis, risk analysis and mitigation, and standards.

ReliabilityFirst is committed to sharing their expertise, and leveraging the expertise of their entities, to advance industry practices surrounding risk identification, mitigation, and prevention. The ReliabilityFirst Knowledge Center website is used to share educational materials on key topics related to reliability, security, and resiliency.

ReliabilityFirst's Committees and Subcommittees provide input and advice on reliability related issues and activities. They also provide valuable forums for members to discuss and learn about current and emerging technical issues and risks associated with the reliability and security of the Bulk Power System. The following committees and subcommittees are active in RF: CIP Low Impact Focus Group, Critical Infrastructure Protection Committee, Reliability Committee, Generator Subcommittee, Protection Subcommittee, Special Protection System (SPS) Review Team, Transmission Performance Subcommittee, and Standards Committee.

[11] A Load Serving Entity (LSE) is any entity (or the duly designated agent of such an entity), including a load aggregator or power marketer that (a) serves end-users within the PJM Control Area, and (b) is granted the authority or has an obligation pursuant to state or local law, regulation or franchise to sell electric energy to end-users located within the PJM Control Area (definition from *PJM.com* glossary).

In 2018, cyber security remained an area of focus for both ReliabilityFirst and the industry. The industry is taking these issues seriously, with entities self-reporting 93 percent of all noncompliance.[12]

Regional Transmission Organizations

The 2 RTOs within the RFC footprint are PJM Interconnection, LLC (PJM) and Midcontinent Independent System Operator, Inc. (MISO).

PJM Interconnection

PJM is a regional transmission organization that ensures the reliability of the largest centrally dispatched control area in North America, covering 369,089 square miles. PJM coordinates the operation of 180,086 megawatts (MW) of generating capacity with 165,492 MW of available peak demand and more than 84,236 miles of transmission lines.[13] The PJM RTO coordinates the movement of electricity for over 65 million people through all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM manages a sophisticated regional planning process for generation and transmission expansion to ensure the continued reliability of the electric system. PJM is responsible for maintaining the integrity of the regional power grid and for managing changes and additions to the grid to accommodate deactivating and new generating plants, substations, and transmission lines. In addition, PJM analyzes and forecasts future electricity needs of the region. Its planning process ensures that the electric system growth is efficient and takes place in an orderly fashion. PJM supports market innovation through its active support for demand response markets for energy, capacity and ancillary services, and helps ensure that appropriate infrastructure and operational capabilities are in place to support newly installed renewable energy and other generation facilities. PJM's mission can be described as below:[14]

- Acts as a neutral, independent party, PJM operates a competitive wholesale electricity market and manages the high-voltage electricity grid to ensure reliability for more than 65 million people.

- PJM's long-term regional planning process provides a broad, interstate perspective that identifies the most effective and cost-efficient improvements to the grid to ensure reliability and economic benefits on a system wide basis.

- An independent Board oversees PJM's activities. Effective governance and a collaborative stakeholder process help PJM achieve its vision: "To be the electric industry leader – today

[12] https://rfirst.org/about/publicreports/Public%20Reports/2018%20Annual%20Report.pdf.
[13] *See* PJM, *Summer 2019 PJM Reliability Assessment*, available at http://www.puc.pa.gov/Electric/pdf/Reliability/Summer_Reliability_2019-PJM.pdf.
[14] http://www.pjm.com/about-pjm/who-we-are.aspx.

and tomorrow – in reliable operations, efficient wholesale markets, and infrastructure development."

PJM coordinates the continuous buying, selling and delivery of wholesale electricity through open and competitive spot markets. PJM balances the needs of suppliers, wholesale customers and other market participants, and continuously monitors market behavior in tandem with the Monitoring Analytics LLC, the PJM RTO Market Monitoring Unit.

PJM membership in 2018 was 1,018 members.[15] In 2018, the PJM market amount billed increased to $49.8 billion as compared to $41.17 billion in 2017, and $39 billion in 2016. PJM's 2018 transmission volumes were 806.5 terawatt hours (TWhs) as compared to 807 TWhs in 2017; 792.3 TWhs for 2016, and 793 TWhs for 2015.

PJM's annual net energy load for growth is expected to average 0.4 percent over the next 10 years and 0.4 percent over the next 15 years.[16] PJM received deactivation notifications throughout 2018, totaling 10,882 MW as compared to 4,800 MV in 2017, 5,605 MW in 2016, 1,626 MW in 2015, 4,291 MW in 2014, 7,745 MW in 2013, and 14,444 MW in 2012. To replace retiring generators, there are over 17,797 MW of new generating resources under construction as of Dec. 31, 2018, with an additional 53,762 MW actively under study.[17]

Cold-fired generators are facing deactivation due to several factors, including old age of the unit, with many more than 40 years old; the cost of operation; environmental public policy, particularly emissions standards; state mandates for renewable energy; and low natural gas prices. Some generator owners are transitioning their fleets to become cleaner and leaner to meet emission standards and to improve the planet.

PJM Bulk Power System Status – Winter Performance[18]

Overall Performance

PJM noted the electrical grid provided reliable service through the 2018–2019 winter even with some extreme temperatures and high electricity demand.

The 2018–19 winter provided insights into grid operation, market trends and the security of fuel supplies for the 13 states and District of Columbia that make up PJM's service area. PJM saw the following:

- Electricity was supplied by a diverse set of resources, including natural gas, coal, nuclear and renewables.

[15] *See* PJM, *PJM 2018 Annual Report*, available at https://www.pjm.com/-/media/about-pjm/newsroom/annual-reports/2018-annual-report.ashx?la=en.

[16] *See* PJM, *PJM Load Forecast Report January 2019*, available at https://pjm.com/-/media/library/reports-notices/load-forecast/2019-load-report.ashx?la=en.

[17] *See* PJM, *PJM 2018 Regional Transmission Expansion Plan Report*, Book 2, available at http://www.pjm.com/-/media/library/reports-notices/2018-rtep/2018-rtep-book-2.ashx?la=en.

[18] *https://www.pjm.com/-/media/about-pjm/newsroom/2019-releases/20190318-reliability-fuel-supply-strong-in-pjm-during-2018-2019-winter.ash*.

- Generator performance continued to improve, with forced outages down from previous cold weather periods.

- A break in a major natural gas pipeline occurred during winter peak operations, but did not pose a significant impact to generation.

- PJM asserted that pricing in PJM's reserve market during stressed conditions showed that valuable energy reserves, while adequate during these periods, were not appropriately compensated in the market, which supports the movement for price reforms.

- Wind generation in PJM reached its all-time peak of 7,808 MW on Jan. 9, 2019.

During the short but intense cold snap that impacted PJM's footprint between Jan. 28 and Jan. 31, 2019, forced outages were slightly higher than normal winter operations, which is typical for extreme cold periods. PJM noted that overall generator performance was good, and continued to show marked improvement over the polar vortex winter of 2013–14.

During cold weather on Jan. 30 and Jan. 31, 2019, PJM observed forced generation outages of 8.6 percent and 10.6 percent, respectively. Last winter (2017–18), the extended cold snap produced forced outages of 12 percent. During the (2013-14) polar vortex winter, PJM faced forced generation outages of up to 22 percent.

Generator Performance

PJM noted that the output of the diverse generation fleet this winter was much-like last year's cold snap, with a significant increase in the percentage of natural gas, and a decrease in the percentage of coal-fired generation.

There were a total of 21,359 MW[19] of forced outages during the winter peak on January 31, 2019, with 2,930 MW, or 14 percent, resulting from natural gas supply outages, as compared to a total of 23,751 MW of forced outages during the winter peak on January 7, 2018, with 5,913 MW, or 25 percent, resulting from natural gas supply outages. At the polar vortex winter peak on Jan. 7, 2014, there was 40,200 MW of forced outages, with approximately 9,300 MW, or 23 percent, resulting from natural gas supply outages.

PJM Pennsylvania State Infrastructure

The Pennsylvania electric power outlook generally reflects the projections of RFC, which are based on forecasts of PJM and MISO. PJM evaluates regional data concerning the current and future condition of the bulk power system because it is planned on a regional rather than a state basis. While the aggregate load for the state's consumers can be determined, the availability and mix of electrical generation units cannot be predicted, since the complexities of weather, generation availability, and fuel prices will be the primary driving forces.

[19] https://www.pjm.com/-/media/committees-groups/committees/oc/20190305/20190305-oc-cold-weather-ops-january-28-31-info-only.ashx.

An RTO such as PJM has the primary responsibility to coordinate and plan future upgrades and expansion of the regional transmission system. PJM noted that a key part of the planning process is to evaluate existing generation deactivation, new generation interconnection, and merchant transmission interconnection requests. Although transmission planning is performed on a regional basis, most upgrades and expansion in Pennsylvania are planned to support the local delivery system and new generating facilities.

LSEs acquire capacity resources as follows: entering bilateral agreements; participating in the PJM-operated capacity market; owning generation; and/or pursuing load management options. The PJM generator interconnection process ensures new capacity resources satisfy LSE requirements to reliably meet their obligations.

All new generation that anticipates interconnecting and operating in parallel with the PJM transmission grid and participating in the PJM capacity and/or energy markets must submit an interconnection request to PJM for technical evaluation and approval. A summary of key information related to generation capacity and usage for the PJM RTO area and information specific to Pennsylvania is provided in Appendices B and C of this report.

PJM Pennsylvania State Infrastructure Summary:

- Existing Capacity: Natural gas represents approximately 34.0 percent of the total installed capacity in Pennsylvania while coal represents 28.3 percent and nuclear represents 21.9 percent. In PJM the PJM RTO area, natural gas and coal are at 40.2 and 30.7 percent of total installed capacity, respectively.

- Interconnection Requests: Natural gas represents approximately 85.3 percent of new interconnection requests in Pennsylvania, or 11,467 MW.

- Deactivations: 76.1 MW of capacity deactivated within Pennsylvania in 2018. An additional 4,391.5 MW of capacity gave a notification of deactivation in 2018.

- Regional Transmission Expansion Plan (RTEP) 2018: Pennsylvania RTEP 2018 projects total more than $949 million in investment.[20] Approximately 66.1 percent of that total represent supplemental projects.[21] These investment figures only represent RTEP projects that cost at least $5 million. A listing of all RTEP projects over $10 million, as well as those specific to Pennsylvania, may be found in PJM's RTEP.[22] The status of individual PJM Board-approved baseline and network RTEP projects, as well as that of Transmission Owner Supplemental Projects, is available on the PJM website.[23]

[20] *See* PJM, *PJM Pennsylvania State Report 2018*, available at http://www.pjm.com/-/media/library/reports-notices/state-specific-reports/2018/2018-pennsylvania-state-infrastructure-report.ashx?la=en.

[21] Supplemental projects, known at one time as Transmission Owner initiated projects, are not required for compliance with system reliability, operational performance or market efficiency economic criteria, as determined by PJM. PJM reviews these projects to ensure they do not introduce other reliability criteria violations. While not subject to PJM Board approval, they are included in PJM's RTEP models. *See* the *PJM 2018 Regional Transmission Expansion Plan* at https://www.pjm.com/-/media/library/reports-notices/2018-rtep/2018-rtep-book-1.ashx?la=en.

[22] *Id.*, Pennsylvania-specific information begins on page 179.

[23] https://www.pjm.com/planning/rtep-upgrades-status.aspx.

- Load Forecast: Pennsylvania load growth is nearly flat, between -0.1 and 0.8 percent per year over the next 10 years. This aligns with PJM RTO load growth projections.

- 2021-22 Capacity Market: Pennsylvania cleared 328 MW more Demand Response and Energy Efficient resources than in the prior auction.

- Calendar Year 2018 Market Performance: Except for the cold snap in early 2018, Pennsylvania's average locational marginal prices were consistently at or below PJM average LMPs for the year. Nuclear resources represented 40 percent of generation used in Pennsylvania while natural gas and coal averaged 29.6 percent and 20.7 percent, respectively. Pennsylvania exports 24 percent of the energy produced in the state.

- Emissions: 2018 carbon dioxide, nitrogen oxides, and sulfur dioxide emissions are all slightly down from 2017.

- The existing generating capacity in Pennsylvania totals 44,660 MW in 2018 as compared to 42,257 MW in 2017; and 45,700 MW in 2016 and 42,628 MW in 2015.[24]

Section 2 – Pennsylvania Electric Outlook

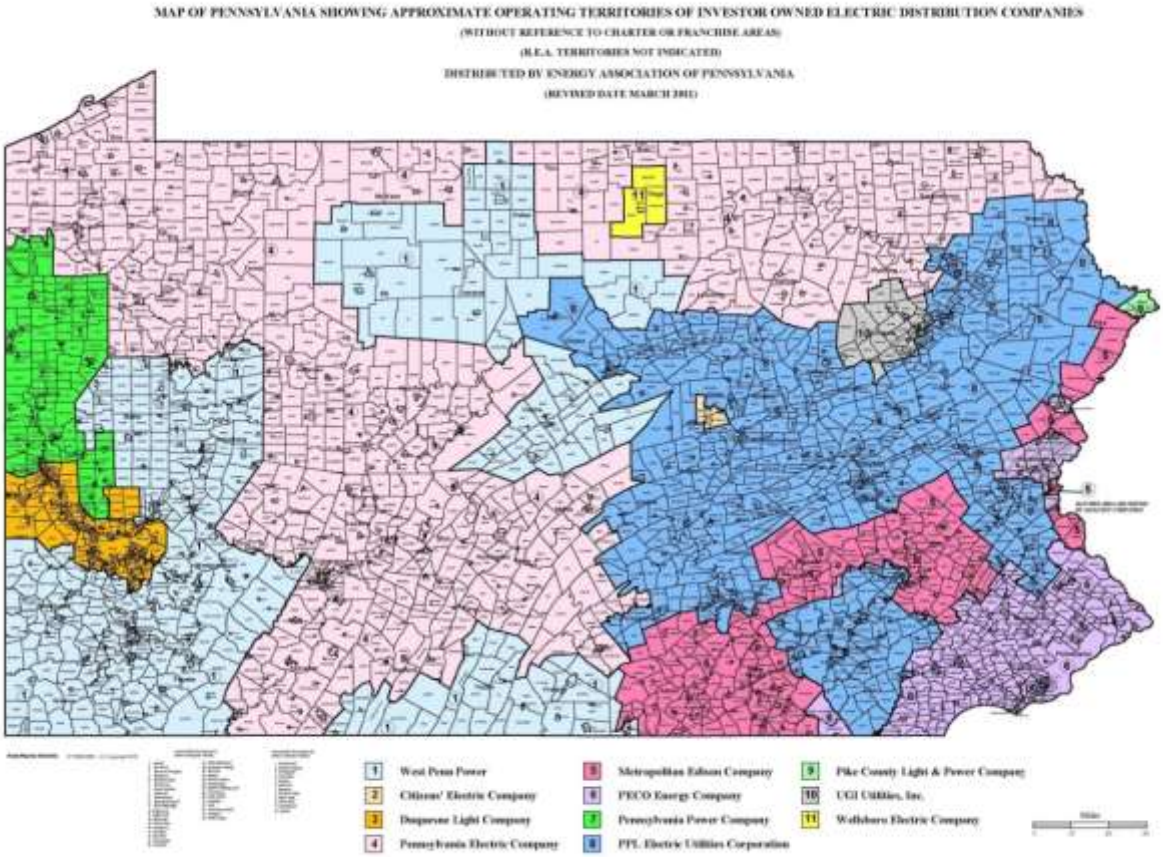
Electric Distribution Companies

Eleven EDCs currently serve the electricity needs of most Pennsylvania's homes, businesses and industries. Cooperatives and municipal systems provide service to several rural and urban areas. The 11 jurisdictional EDCs are:

- Citizens' Electric Company
- Duquesne Light Company
- Metropolitan Edison Company (FirstEnergy)
- Pennsylvania Electric Company (FirstEnergy)
- Pennsylvania Power Company (FirstEnergy)
- PPL Electric Utilities Corporation
- PECO Energy Company (Exelon)
- Pike County Light & Power Company
- UGI Utilities Inc. – Electric Division
- Wellsboro Electric Company
- West Penn Power Company (FirstEnergy)

[24] *See* PJM, *PJM Pennsylvania State Report 2018*, available at http://www.pjm.com/-/media/library/reports-notices/state-specific-reports/2018/2018-pennsylvania-state-infrastructure-report.ashx?la=en.

Figure 1 Map of EDC Service Territories



Each LSE is responsible to make provisions for adequate generating resources to serve its customers. The local EDC or a Commission approved alternative default service provider (DSP)[25] must acquire electricity, pursuant to a Commission approved competitive procurement process, for customers who:

1. Contract with a competitive Electric Generation Supplier (EGS). Contracting with an EGS allows customers to choose an electric provider in the competitive retail market. The Commission provides a website that provides a one source comparison of EGS electric offers and allows electric customer to directly link into an EGS website to switch electric services.[26]

   or,

2. Stay with the local EDC or Commission approved DSP. Under current law, the default electric generation prices are required to be based upon a "prudent mix" procurement strategy that will produce the least cost to customers over time.[27]

[25] 66 Pa. C.S. § 2803
[26] http://www.papowerswitch.com.
[27] *See id.* § 2807(e)(3).

Alternative Energy Portfolio Standards

The PUC continues to implement procedures and guidelines necessary to carry out the requirements of the Alternative Energy Portfolio Standards Act (AEPS) of 2004 (Act 213).[28] Act 213 requires that an annually increasing percentage of electricity sold to Pennsylvania retail customers be derived from alternative energy resources. The amount of electricity to be supplied by alternative resources increases to a total of 18 percent by 2021. In 2008, the Commission adopted regulations pertaining to the AEPS obligations of EDCs and EGSs.[29] AEPS resources must be located within PJM.

Alternative energy resources are categorized as Tier I and Tier II resources. Tier I resources include solar, wind, low-impact hydropower, geothermal, biologically derived methane gas, fuel cells, biomass (including electricity generated in Pennsylvania utilizing by-products of the pulping process and wood manufacturing process, including bark, wood chips, sawdust and lignins in spent pulping liquors)[30] and coal mine methane. Tier II resources include waste coal, demand side management, distributed generation, large-scale hydropower, by-products of wood pulping and wood manufacturing, municipal solid waste, and integrated combined coal gasification technology.

Act 213 requires that by 2021, 8 percent of the electricity sold in each EDC service territory will be derived from Tier I resources, including solar. Energy derived from Tier II resources is to increase to 10 percent. Act 213 sets forth a 15-year schedule for complying with its mandates, as shown in Table 1. Since Jan. 1, 2011, all EDCs and EGSs have been required to comply.

Table 1 Alternative Energy Portfolio Standards

Year	Period	Tier I (incl. Solar)	Tier II	Solar PV
1	June 1, 2006, through May 31, 2007	1.50%	4.20%	0.0013%
2	June 1, 2007, through May 31, 2008	1.50%	4.20%	0.0030%
3	June 1, 2008, through May 31, 2009	2.00%	4.20%	0.0063%
4	June 1, 2009, through May 31, 2010	2.50%	4.20%	0.0120%
5	June 1, 2010, through May 31, 2011	3.00%	6.20%	0.0203%
6	June 1, 2011, through May 31, 2012	3.50%	6.20%	0.0325%
7	June 1, 2012, through May 31, 2013	4.00%	6.20%	0.0510%
8	June 1, 2013, through May 31, 2014	4.50%	6.20%	0.0840%
9	June 1, 2014, through May 31, 2015	5.00%	6.20%	0.1440%
10	June 1, 2015, through May 31, 2016	5.50%	8.20%	0.2500%
11	June 1, 2016, through May 31, 2017	6.00%	8.20%	0.2933%
12	June 1, 2017, through May 31, 2018	6.50%	8.20%	0.3400%
13	June 1, 2018, through May 31, 2019	7.00%	8.20%	0.3900%
14	June 1, 2019, through May 31, 2020	7.50%	8.20%	0.4433%
15	June 1, 2020, through May 31, 2021	8.00%	10.00%	0.5000%

To meet the requirements of Act 213, EDCs and EGSs acquire alternative energy credits (AECs) in quantities commensurate with the required tier percentage and the electricity sold to retail customers. AECs are separate from the electricity that is sold to customers. An AEC represents one megawatt hour (MWh) of qualified alternative electric generation or conservation, whether self-generated,

[28] Alternative Energy Portfolio Standards Act, effective Feb. 28, 2005; 73 P.S. §§ 1648.1—1648.8.
[29] *See* Docket No. L-00060180; 52 Pa. Code §§ 75.61-75.70.
[30] *See* 66 Pa.C.S. § 2814(b).

purchased along with the electric commodity, or purchased separately through a tradable instrument.[31]

AECs are earned when a qualified facility generates 1,000 kilowatt-hours (kWh) of electricity through either estimated or actual metered production. An AEC is a tradable certificate that represents all the renewable energy benefits of electricity generated from a facility. An AEC can be sold or traded separately from the power. AECs are generally purchased by EDCs and EGSs in order to meet the percentages required under AEPS for any given year. AECs can be traded multiple times until they are retired for compliance purposes. An AEC can only be retired once and may not be used to satisfy any other obligations, whether voluntarily or mandated by a renewable energy portfolio standard in another state.

The Pennsylvania AEC program administrator verifies that EGSs and EDCs are complying with the minimum requirements of Act 213. PJM EIS' Generation Attribute Tracking System (GATS) is the alternative energy credit registry used to track alternative energy credit creation and transfer among qualified alternative energy systems. GATS is used by EDCs and EGSs to verify compliance with the requirements of Act 213.

Under Act 213, the Commission adopted regulations promoting onsite generation by customer-generators using renewable resources and eliminated previously existing barriers to net metering.[32] The regulations also provide for required metering capabilities and a compensation mechanism that reimburses customer-generators for surplus energy supplied to the electric grid.[33] Act 35 of 2007 amended Act 213. One aspect of Act 35 altered the reconciliation mechanism used to compensate resellers for surplus energy supplied through net metering.[34]

The Commission also adopted regulations that govern interconnection for customer-generators. The regulations strive to eliminate barriers which may have previously existed regarding interconnection, while ensuring that interconnection by customer-generators will not pose unnecessary risks to the Commonwealth's electric distribution systems.[35]

On Oct. 27, 2016, the Commission adopted regulations to revise and update existing regulations to comply with Act 129 of 2008, and Act 35 of 2007 and to clarify certain issues of law, administrative procedure and policy.[36] On April 19, 2018, the Commission adopted a Final Implementation Order to provide the Commission's interpretation and implementation of Section 11.1 of Act 40 of 2017[37]. Effective Oct. 30, 2017, Act 40 contained a section that further amended Act 213 by establishing geographical limits on solar photovoltaic (solar PV) systems that qualify for the solar PV share requirements of the AEPS.

[31] *See* 52 Pa. Code §§ 75.61—75.70.
[32] Net metering measures the difference between the electricity supplied by an electric utility or EGS and the electricity generated by a customer-generator when any portion of the electricity generated by the alternative energy generating system is used to offset part or all of the customer-generator's requirements for electricity. *See* 52 Pa. Code § 75.12.
[33] *See* Docket No. L-00050174; 52 Pa. Code §§ 75.11-75.15.
[34] *Id.*
[35] *See* Docket No. L-00050175; 52 Pa. Code §§ 75.21-75.40.
[36] *See* Docket No. L-2014-2404361; 52 Pa. Code §§ 75.1-75.72.
[37] *See* Docket No. M-2017-2631527

As of May 31, 2019, Pennsylvania had certified 28,043[38] alternate energy facilities, of which 21,518 are located within the state.

For additional information on Alternative Energy in Pennsylvania, please visit the Commission's website (http://www.puc.pa.gov/consumer_info/electricity/alternative_energy.aspx).

Energy Efficiency and Conservation (Act 129)

Act 129 of 2008[39] required the 7 Pennsylvania EDCs[40] with at least 100,000 customers[41] to establish an energy efficiency and conservation (EE&C) plan. The Act is being implemented in phases; Phases I and II are now complete. Phase III of Act 129, the current 5-year phase, began on June 1, 2016, and will end on May 31, 2021.

The Commission directed the State Wide Evaluator (SWE) to perform a Demand Response (DR) Potential Study using residential direct load control and commercial and industrial load curtailment models provided by the Commission.[42] This study was to provide the Commission with the information necessary to determine whether Act 129 Phase III peak demand reduction programs would be cost-effective. The SWE submitted its final version of the DR Potential Study to the Commission on Feb. 25, 2015.[43]

The SWE also performed an Energy Efficiency (EE) Potential Study to determine the cost-effective consumption reduction potential in Pennsylvania.[44] The SWE submitted its final EE Potential Study to the Commission on February 25, 2015.[45] Following a review of the SWE's EE and DR Potential Studies, the Commission found that additional consumption and peak demand reduction targets were cost-effective.[46] On June 11, 2015, the Commission adopted a Final Implementation Order prescribing targets for a Phase III of the Act 129 EE&C Program.[47] Phase III began on June 1, 2016, and will end on May 31, 2021. The EDCs' consumption[48] and peak demand reduction[49] requirements are provided in Table 1 below. While the EDCs must implement energy efficiency programs all five

[38] http://pennaeps.com/app7/publiccontroller.
[39] Act 129 of 2008, effective November 14, 2008; 66 Pa. C.S. §§2806.1-2806.2.
[40] The 7 EDCs with Act 129 Energy Efficiency and Conservation obligations are Duquesne Light Company; Metropolitan Edison Company; PECO Energy Company; Pennsylvania Electric Company; Pennsylvania Power Company; PPL Electric Utilities Corporation and West Penn Power Company.
[41] *See* 66 Pa. C.S. § 2806.1.
[42] *See* Energy Efficiency and Conservation Program Final Order, Docket No. M-2012-2289411, entered February 20, 2014.
[43] *See* Demand Response Potential for Pennsylvania – Final Report, submitted by GDS Associates, Inc., et al., February 25, 2015 (hereinafter DR Potential Study).
[44] *See* Proposal to Pennsylvania Public Utility Commission – Statewide Evaluator RFP, submitted by GDS Associates, Inc., et. al., January 11, 2013.
[45] *See* Energy Efficiency Potential for Pennsylvania – Final Report, submitted by GDS Associates, Inc., et. al., February 2015 (hereinafter EE Potential Study).
[46] *See* Energy Efficiency and Conservation Program Implementation Order, Docket No. M-2014-2424864, entered June 19, 2015, at 10-12.
[47] *Id.* at 14-15.
[48] *Id.* at 57.
[49] *Id.* at 35.

years of Phase III, the Commission required demand response programs only during the last 4 years of the Phase, recognizing the time necessary to develop and implement such programs.[50]

Additionally, using the design and budgetary allocation information provided by the Commission, the SWE found no cost-effective demand response potential in the Penelec service territory and, therefore, the Commission did not prescribe a peak demand reduction requirement for Penelec.

Table 1 - Phase III Electric Consumption and Peak Demand Reduction Targets

EDC	Phase III Five-Year Electric Consumption Reduction Targets (MWh)	Phase III Four-Year Peak Demand Reduction Targets – Average Annual Potential Savings (MW)
Duquesne	440,916	42
Met-Ed	599,352	49
PECO	1,962,659	161
Penelec	566,168	0
Penn Power	157,371	17
PPL	1,443,035	92
West Penn	540,986	64

The Commission requires that all EDCs file semiannual, preliminary annual and final annual reports, which provide the reported savings for that program year. The EDCs just recently filed their preliminary annual reports for the third year of Phase III (Program Year 10).[51] The SWE monitors and verifies data collection, quality assurance and the results of each EDCs EE&C Plan. Table 2, below, summarizes unverified Phase III electric consumption savings reported by the EDCs, through Program Year 10, and the SWE verified electric consumption and peak demand savings through Program Year 9.

[50] *Id.* at 35.

[51] *See* EDCs Preliminary Annual Reports for Program Year 10, available at: http://www.puc.pa.gov/filing_resources/issues_laws_regulations/act_129_information/electric_distribution_company_act_129_reporting_requirements.aspx.

Table 2 - Phase III Electric Consumption and Peak Demand Savings since June 1, 2016

EDC	Phase III – PY8 and PY9 Verified Electric Consumption Savings (MWh)	% of Verified Phase III Target	Phase III to date Unverified Electric Consumption Savings (MWh)	Phase III – PY 9 Verified Peak Demand Savings (MW)
Duquesne	271,235	62	359,390	59.1
Met-Ed	347,022	58	513,451	46.0
PECO	600,840	31	1,044,677	149.4
Penelec	336,782	59	507,867	0 *
Penn Power	108,350	69	161,159	33.5
PPL	740,165	51	1,157,029	126.7
West Penn	347,368	64	489,405	81.9

* The Commission did not prescribe a peak demand reduction requirement for Penelec.
PY 8: June 1, 2016 – May 31, 2017
PY 9: June 1, 2017 – May 31, 2018
PY 10: June 1, 2018 – May 31, 2019

It appears that all EDCs are on their way to meet their 5-year electric consumption and peak demand reduction requirements. Final annual reports for Program Year 10 are due to the Commission by Nov.15, 2019.

In its planning for a potential Phase IV, the Commission directed the SWE to perform electric baseline studies to establish baseline energy use and building characteristics for the residential, commercial and industrial sectors. The SWE submitted the final residential and non-residential baseline studies to the Commission on Feb. 12, 2019.[52]

Further, the Commission directed the SWE to perform an energy efficiency potential study to inform the Commission of the energy savings potential remaining in the EDCs service territories. This data will be used to assist the Commission to determine energy efficiency and conservation consumption reduction targets for a potential Phase IV. In addition, the Commission tasked the SWE to conduct a demand response potential study to determine if cost-effective peak demand reduction potential remains in the EDCs service territories for the next phase of Act 129.

Phase IV, if implemented by the Commission, would begin June 1, 2021, and end on May 31, 2026.

[52] *See* 2018 Pennsylvania Residential and Non-Residential Baseline Studies, Docket No. M-2019-3006866, submitted by NMR Group, Inc., February 2019.

Statewide Review of Electrical Energy Usage

As shown on Tables 3 and 4 below, Pennsylvania's Total electrical consumption energy usage (residential, commercial, industrial, sales for resale, and other) in 2018, was 148,334 gigawatt hours (GWh) as compared to 142,732 GWh in 2017, which is a year-over-year increase of 3.92 percent in electric usage. All categories of users saw an increase in usage in 2018, which may be attributed to Pennsylvania's expanding economy. Pennsylvania's gross domestic product (GDP) for 2018 saw a 4.8 percent increase over 2017[53] and Pennsylvania tax revenues for fiscal-year 2018 exceeded estimates by 2.8 percent.[54]

Also, in 2018, the total number of electrical customers were 5,814,037 as compared to 5,782,124 in 2017, which is a year-over-year increase of 31,913 customers or 0.55 percent. In 2016 the year-over-year customer increase was 30,333 or 0.53 percent.

Table 3 PA EDC customers served, energy usage, and peak load (2018)

Company	Total Customers Served	Residential (MWh)	Commercial (MWh)	Industrial (MWh)	Other (MWh)	Sales For Resale (MWh)	Total Consumption (MWh)	System Losses (MWh)	Company Use (MWh)	Net Energy For Load (MWh)	Peak Load (MW)
Duquesne	599,716	4,257,666	6,218,237	2,623,317	54,303	24,526	13,178,049	838,099	31,367	14,047,515.00	2,795
Met-Ed	571,563	5,739,983	2,971,617	5,685,009	28,021	549,748	14,974,378	1,179,905	0	16,154,283.00	3,026
Penelec	587,330	4,424,065	3,609,790	5,797,151	36,188	2,732,970	16,600,164	1,352,741	0	17,952,905.00	2,993
Penn Power	166,670	1,712,880	1,355,828	1,825,637	3,290	176,192	5,073,827	244,362	0	5,318,189.00	950
PPL	1,440,505	14,810,769	14,104,756	8,143,618	311,824	0	37,370,967	2,694,977	59,262	40,125,206.00	7,729
PECO	1,640,278	14,004,677	8,176,582	15,516,391	767,339	3,484	38,468,473	2,080,970	33,861	40,583,304.00	8,608
West Penn	727,408	7,357,622	4,499,678	8,667,371	25,633	748,023	21,298,327	1,323,018	0	22,621,345.00	3,879
UGI	62,309	571,067	320,494	114,671	2,687	109	1,009,028	80,760	1,403	1,091,191.00	215
Citizens'	7,057	90,568	31,359	55,546	533	0	178,006	4,140	171	182,317.00	45
Pike County	4,768	30,698	45,278	0	385	0	76,361	0	26	76,387.00	18
Wellsboro	6,433	44,775	32,920	28,120	238	108	106,161	7,019	213	113,393.00	20
Total	**5,814,037**	**53,044,770**	**41,366,539**	**48,456,831**	**1,230,441**	**4,235,160**	**148,333,741**	**9,805,991**	**126,303**	**158,266,035.00**	**30,278**
% of Total		35.76%	27.89%	32.67%	0.83%	2.86%	100%				
2018 VS 2017	0.55%	7.95%	1.83%	1.45%	3.85%	5.32%	3.92%	13.32%	29.09%	4.48%	3.68%

Table 4 PA EDC customers served, energy usage, and peak load (2017)

Company	Total Customers Served	Residential (MWh)	Commercial (MWh)	Industrial (MWh)	Other (MWh)	Sales For Resale (MWh)	Total Consumption (MWh)	System Losses (MWh)	Company Use (MWh)	Net Energy For Load (MWh)	Peak Load (MW)
Duquesne	594,785	3,876,119	6,111,717	2,632,037	53,063	0	12,672,936	0	0	12,672,936	2,682
Met-Ed	568,797	5,350,518	2,885,830	5,511,678	28,567	520,101	14,296,694	1,120,513	0	15,417,207	2,897
Penelec	587,361	4,152,733	3,529,397	5,791,727	37,280	2,542,574	16,053,711	1,360,883	0	17,414,594	2,910
Penn Power	165,705	1,590,587	1,302,207	1,737,658	3,471	240,764	4,874,687	198,678	0	5,073,365	926
PPL	1,432,366	13,649,551	14,037,007	8,097,915	211,470	0	35,995,943	2,596,017	59,855	38,651,815	7,468
PECO	1,626,898	13,023,608	7,968,328	15,424,996	811,758	4,967	37,233,657	2,032,029	36,088	39,301,774	8,141
West Penn	725,891	6,816,601	4,364,001	8,371,394	33,832	712,697	20,298,525	1,255,004	0	21,553,529	3,879
UGI	62,197	525,732	313,812	112,762	4,239	110	956,655	72,466	1,402	1,030,523	215
Citizens'	7,035	81,630	29,979	54,097	576	0	166,282	9,820	163	176,265	47
Pike County	4,768	30,965	46,899	0	379	0	78,243	0	116	78,359	16
Wellsboro	6,321	42,426	32,221	30,050	232	107	105,036	7,726	220	112,982	23
Total	**5,782,124**	**49,140,470**	**40,621,398**	**47,764,314**	**1,184,867**	**4,021,320**	**142,732,369**	**8,653,136**	**97,844**	**151,483,349**	**29,204**
% of Total		34.43%	28.46%	33.46%	0.83%	2.82%	100%				

[53] https://fred.stlouisfed.org/series/PANGSP.

[54] http://www.ifo.state.pa.us/getfile.cfm?file=/Resources/Documents/MTR-2019-06.pdf.

As shown on Table 5, below, the total average annual aggregate 5-year energy usage growth projection for the residential, commercial, and industrial classes is projected to decrease 0.18 percent per year. This includes an average residential growth rate decrease of 0.28 percent, a commercial growth rate decrease of 0.43 percent, and an industrial growth rate increase of 0.14 percent for the entire 5-year projected period.

Table 5 Average Aggregate 5-year Electrical Energy Projection

Energy Usage Projection (GWh)				
Year	Residential	Commercial	Industrial	Total
2019	50,337	40,582	47,929	138,848
2020	50,051	40,313	47,730	138,094
2021	49,866	40,123	47,913	137,902
2022	49,788	40,006	48,115	137,909
2023	49,773	39,893	48,206	137,872
average annual growth (%)	-0.28	-0.43	0.14	-0.18

Figure 2 below represents, in Gigawatt-hours, the Pennsylvania historic usage for residential, commercial, and industrial retail from 1972 through 2018 and forecasted Gigawatt-hours usage from 2018 through 2022.

Figure 2 Pennsylvania retail energy usage and 5-year forecast (GWh)

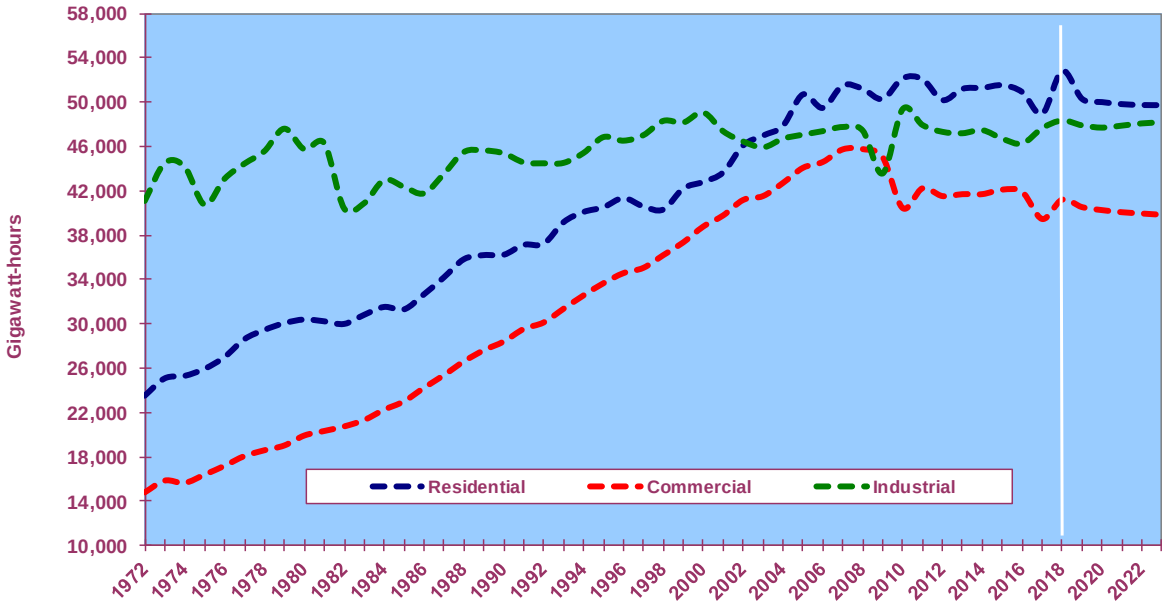


Figure 3, below, shows average residential usage and nominal cost from 1940 to 2018. Between 1970 and 2010, average residential yearly usage in Pennsylvania increased 1.4 percent each year, while average yearly cost increased 4.1 percent each year during this period.

During the last 10 years, average residential yearly usage increased 0.05 percent each year, while average yearly cost increased 0.8 percent a year.

In 2018, the average Pennsylvania customer used 10.43 MWh as compared to 9.70 MWh in 2017. In 2018, the average Pennsylvania customer paid 11.25 cents per kWh as compared to 11.48 cents in 2017.

Figure 3 Average residential nominal cost (cents/kWh) and usage (MWh/year)

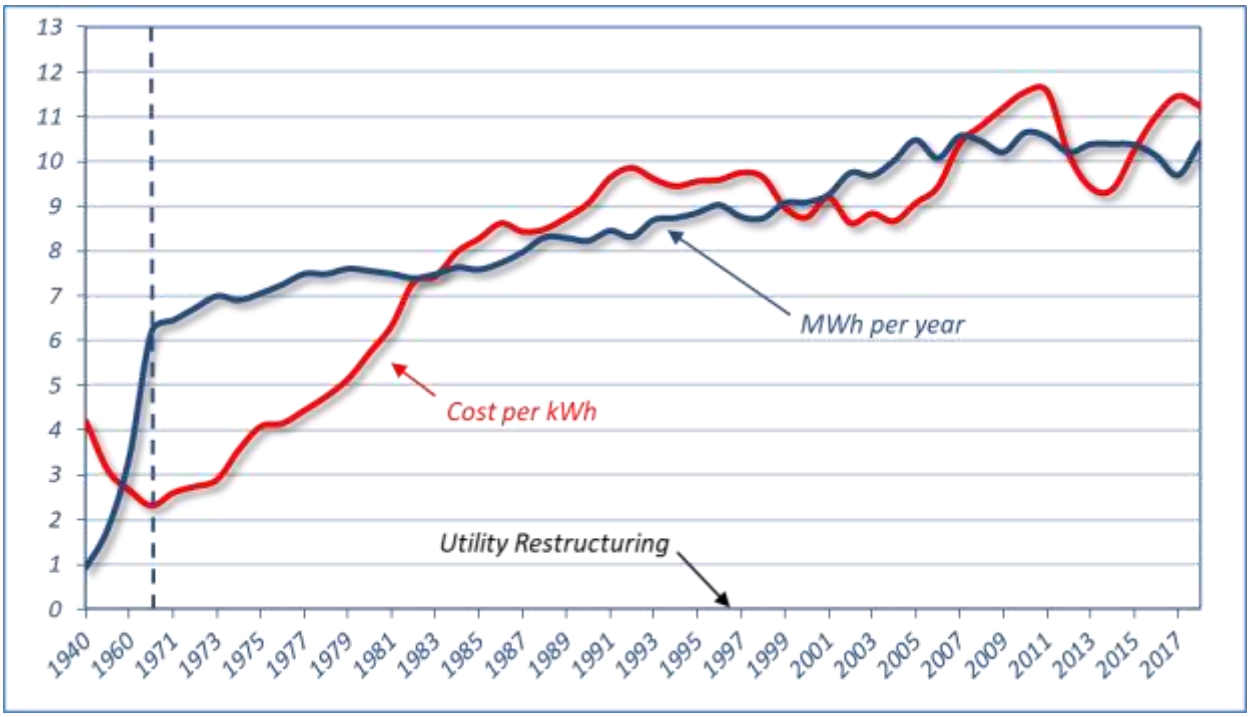


Figure 4, below, shows Pennsylvania's aggregate non-coincidental peak load demand from 2009 through 2018 and the associated 5-year projections estimated during the last 3 years.

Figure 4 Pennsylvania aggregate non-coincidental peak load (MW)

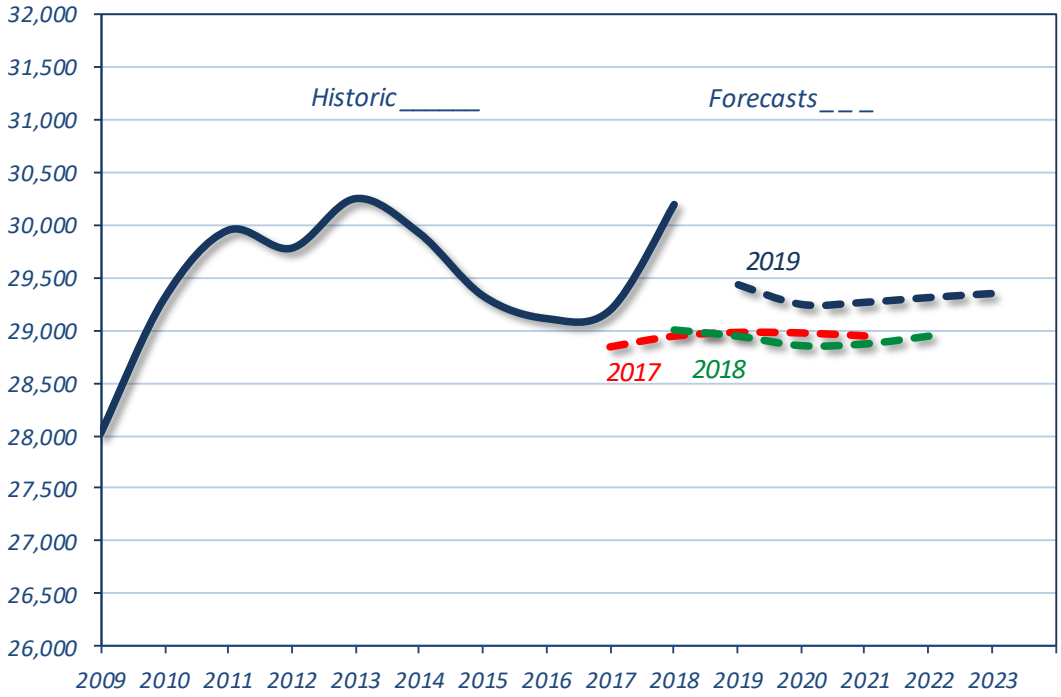
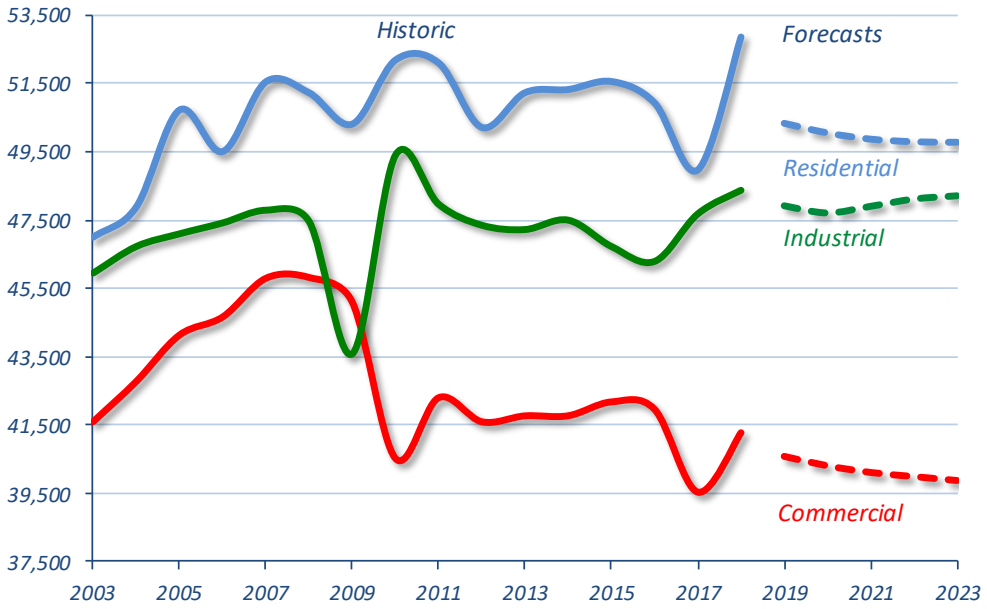


Figure 5, below, shows Pennsylvania's aggregate energy demand from 2003 through 2018 and the associated 5-year projections.

Figure 5 Pennsylvania aggregate energy demand (GWh)

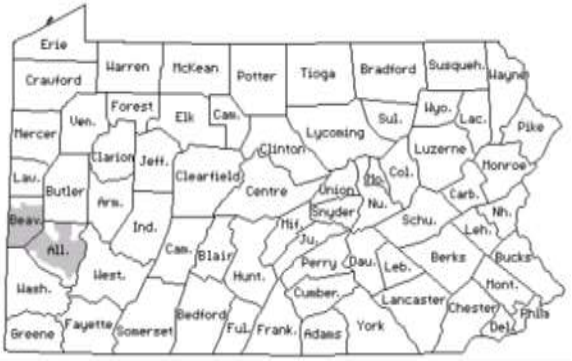


Summary of Data for the Seven Largest EDCs

Individual EDC forecasts are more specific to customers and geographical areas. Each EDC bases its forecasts on financial forecasts of its choosing. The EDC's forecasts are more specific for each territory than the PJM forecast, which is a broader forecast that includes Pennsylvania EDC territories.

The following section provides historic and projected energy usage and peak load demand statistics, for Pennsylvania's seven largest EDCs.

Duquesne Light Company (Duquesne)



Duquesne provides electric service to about 599,716 customers in the City of Pittsburgh and portions of Allegheny and Beaver counties in Southwestern Pennsylvania. Duquesne's 2018 energy usage total was 13,178 GWh as compared to 12,673 GWh in 2017, 13,173 GWh in 2016, and 13,504 GWh in 2015. Year-over-year (YOY) energy usage increased 4.0 percent. Duquesne's total usage mix consisted of residential (30.6 percent), commercial (48.2 percent), industrial (20.8 percent), and sales for resale (less than 0.2 percent).

Over the next five years, total energy usage is projected to decrease at an average annual rate of 1.2 percent. This includes a residential usage average annual decrease in of 2.2 percent, commercial usage decrease of 1.4 percent, and industrial usage increase by 0.5 percent. See Figure 6.

Duquesne's highest **summer** peak load of 2,795 MW occurred on Sept. 5, 2018. This represents a YOY increase of 4.4 percent from the previous year's peak of 2,682 MW. The 5-year peak load forecast is projected to increase by an average of 0.5 percent per year. See Figure 7.

Refer to Appendix A, Tables A01-A04 for Duquesne's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 6 Duquesne energy usage (GWh)

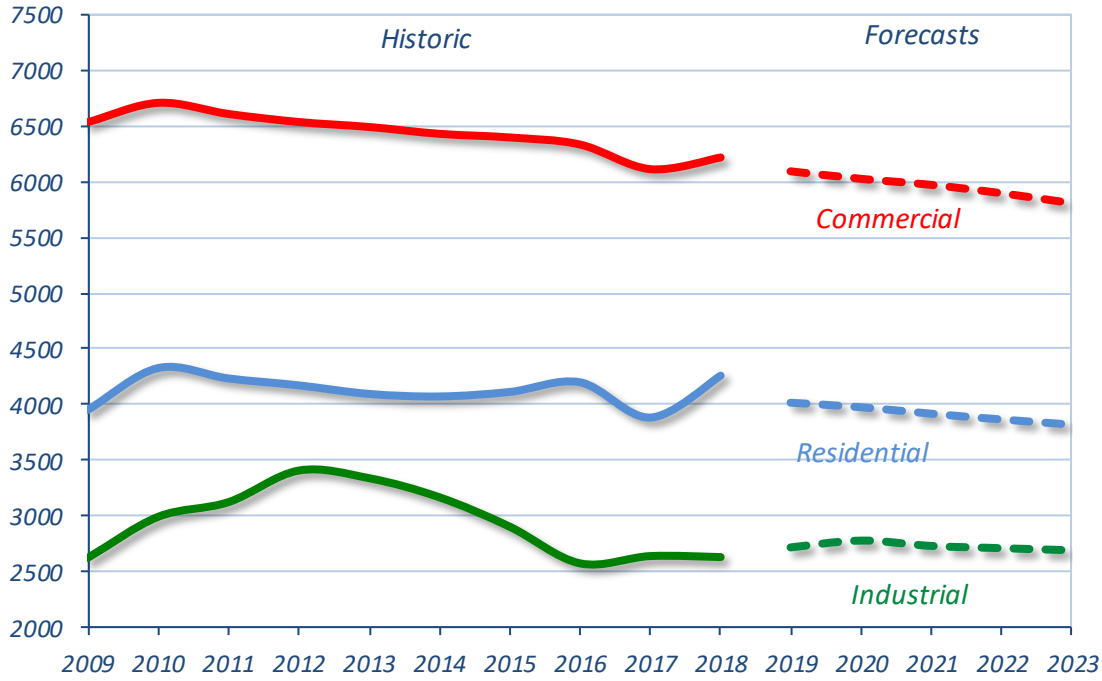
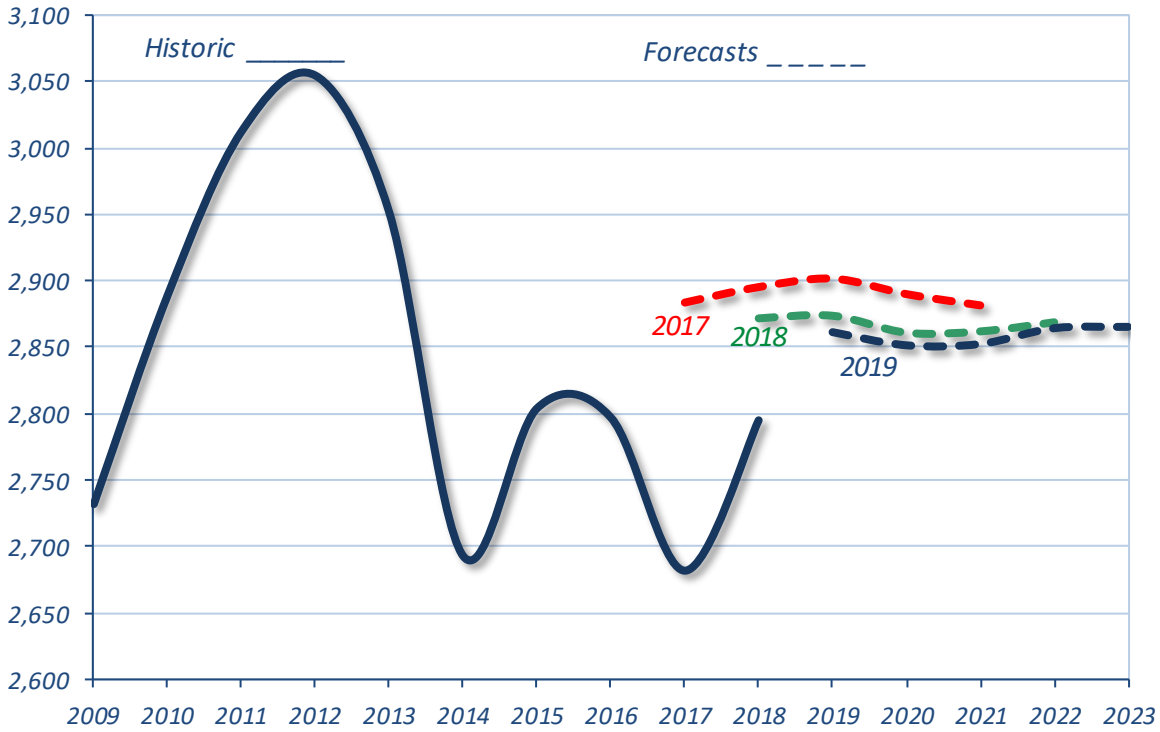


Figure 7 Duquesne peak load (MW)



Metropolitan Edison Company (Met-Ed)

Met-Ed provides electric service to about 571,563 customers in all or portions of 14 counties in Eastern and Southcentral Pennsylvania. Met-Ed's 2018 energy usage total was 14,974 GWh as compared to 14,297 GWh in 2017, 14,441 GWh in 2016, and 14,388 GWh in 2015. Year-over-year (YOY) energy usage increased 4.7 percent. Met-Ed's total usage mix consisted of residential (38.3 percent), commercial (19.8 percent), industrial (38.0 percent), and sales for resale (3.7 percent).

Over the next five years, total energy usage is projected to decrease at an average annual rate of 1.0 percent. This includes a residential usage average annual decrease in of 1.9 percent, commercial usage decrease of 0.6 percent, and industrial usage increase by 0.1 percent. See Figure 8.

Met-Ed's highest **summer** peak load of 3,026 MW occurred on Aug.29, 2018. This represents a YOY increase of 4.5 percent from the previous year's peak of 2,897 MW. The 5-year peak load forecast is projected to decrease by an average of 1.0 percent per year. See Figure 9.

Refer to Appendix A, Tables A05-A08 for Met-Ed's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 8 Met-Ed energy usage (GWh)

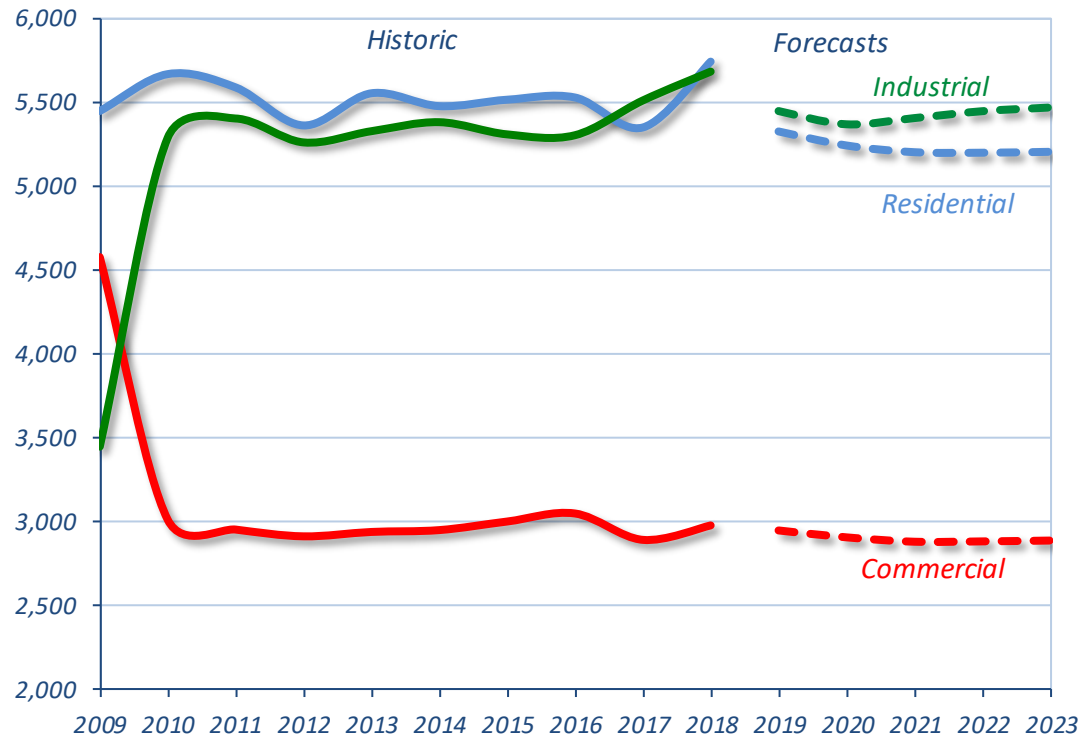
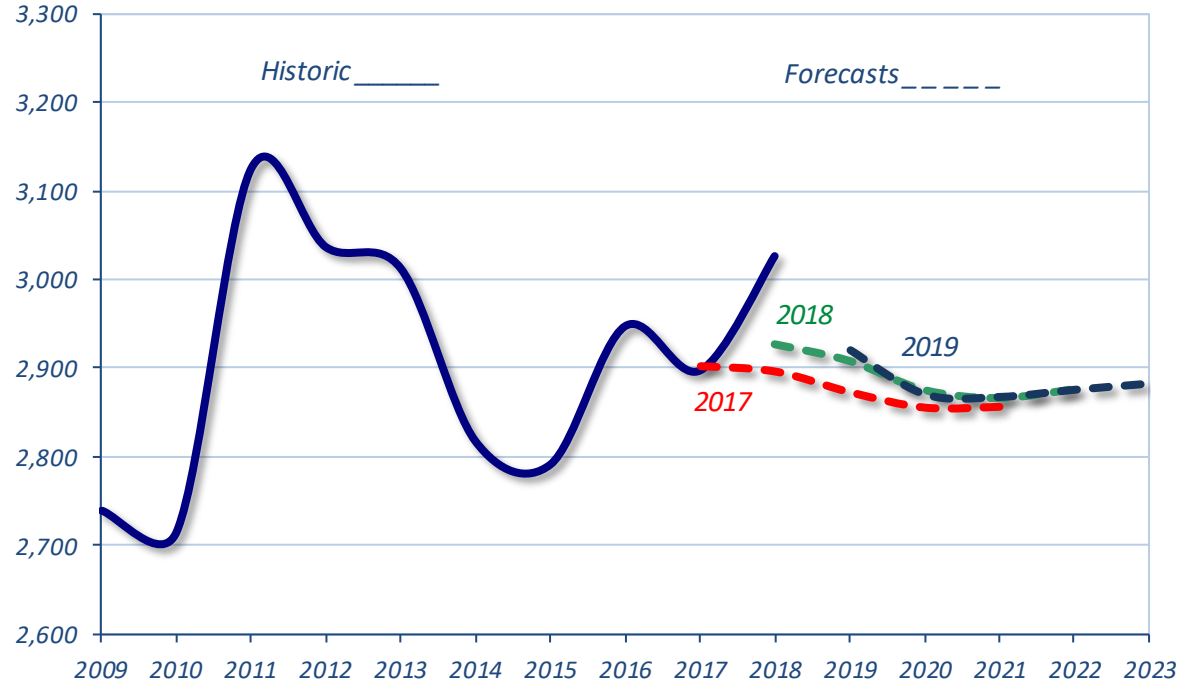
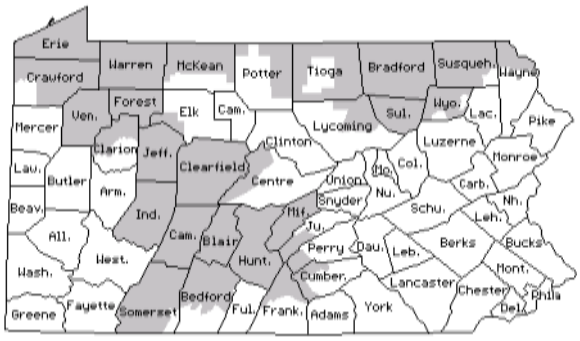


Figure 9 Met-Ed peak load (MW)



Pennsylvania Electric Company (Penelec)

Penelec provides electric service to about 587,330 customers in all or portions of 29 counties in Western and Northern Pennsylvania. Penelec's 2018 energy usage total was 16,600 GWh compared to was 16,054 GWh in 2017, 16,245 GWh in 2016, and 16,117 GWh in 2015. Year-over-year (YOY) energy usage decreased 3.4 percent. Penelec's total usage mix consisted of residential (26.7 percent), commercial (21.7 percent), industrial (34.9 percent), and sales for resale (16.5 percent).



Over the next five years, total energy usage is projected to decrease at an average annual rate of 0.7 percent. This includes a residential usage average annual decrease in of 1.5 percent, commercial usage decrease of 1.2 percent, and industrial usage increase by 0.2 percent. See Figure 10.

Penelec's highest **winter** peak load of 3,020 MW occurred on Jan. 30, 2019. This represents a YOY increase of 1.0 percent from the previous year's peak of 2,910 MW. The 5-year peak load forecast is projected to decrease by an average of 1.4 percent per year. See Figure 11.

Refer to Appendix A, Tables A09-A12 for Penelec's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 10 Penelec energy usage (GWh)

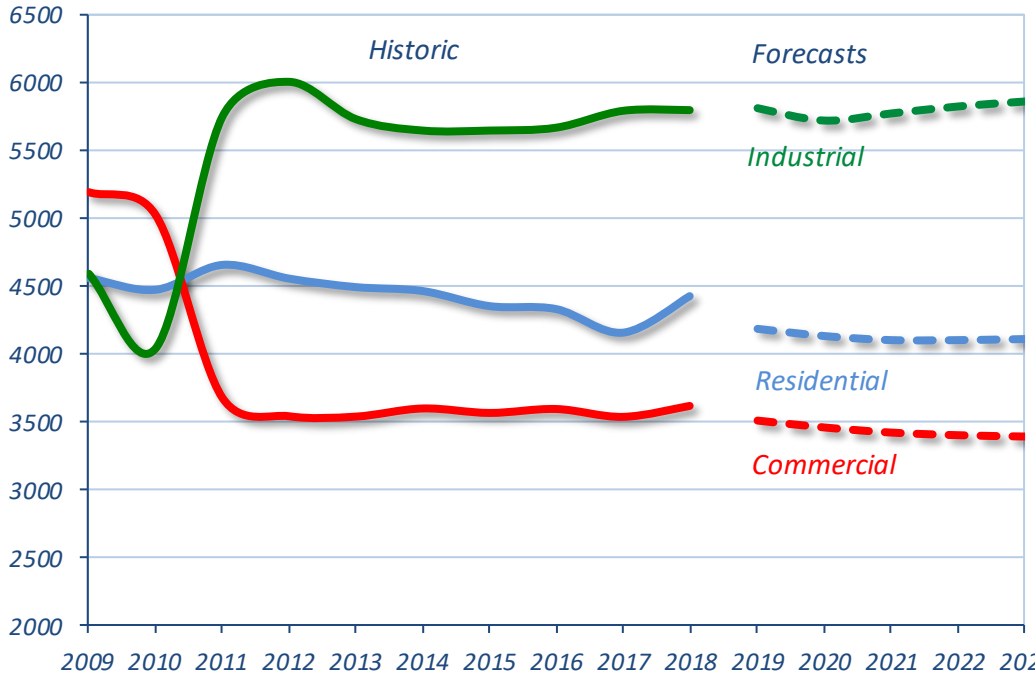
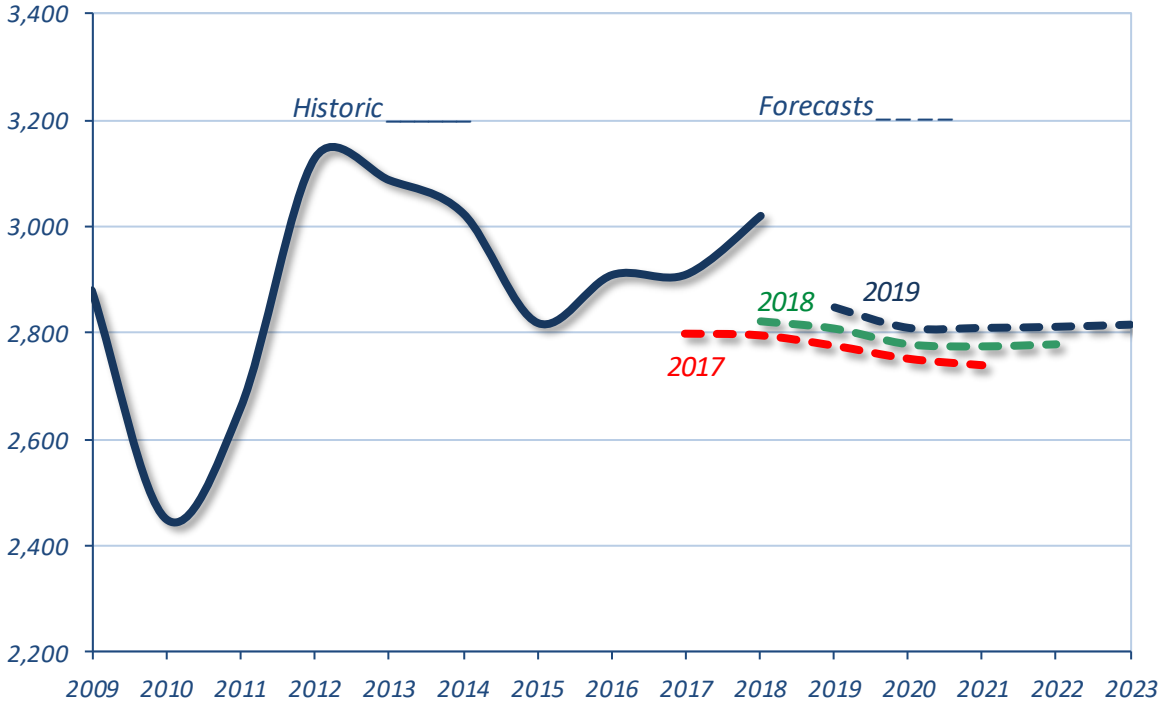
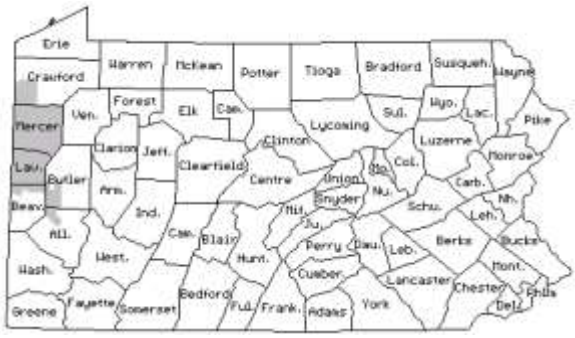


Figure 11 Penelec peak load (MW)



Pennsylvania Power Company (Penn Power)



Penn Power provides electric service to about 166,670 customers in all or portions of six counties in Western Pennsylvania. Penn Power's 2018 energy usage total was 5,074 GWh as compared to 4,875 GWh in 2017, 4,861 GWh in 2016, and 4,756 GWh in 2015. Year-over-year (YOY) energy usage increased 4.1 percent. Penn Power's total usage mix consisted of residential (33.8 percent), commercial (26.7 percent), industrial (36.0 percent), and sales for resale (3.5 percent).

Over the next five years, total energy usage is projected to decrease at an average annual rate of 0.8 percent. This includes a residential usage average annual decrease of 1.2 percent, commercial usage decrease of 2.1 percent, and industrial usage increase by 0.4 percent. See Figure 12.

Penn Power's highest **summer** peak load of 950 MW occurred on Sept. 5, 2018. This represents a YOY increase of 2.6 percent from the previous year's peak of 926 MW. The 5-year peak load forecast is projected to increase by an average of 0.5 percent per year. See Figure 13.

Refer to Appendix A, Tables A13-A16 for Penn Power's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 12 Penn Power energy usage (GWh)

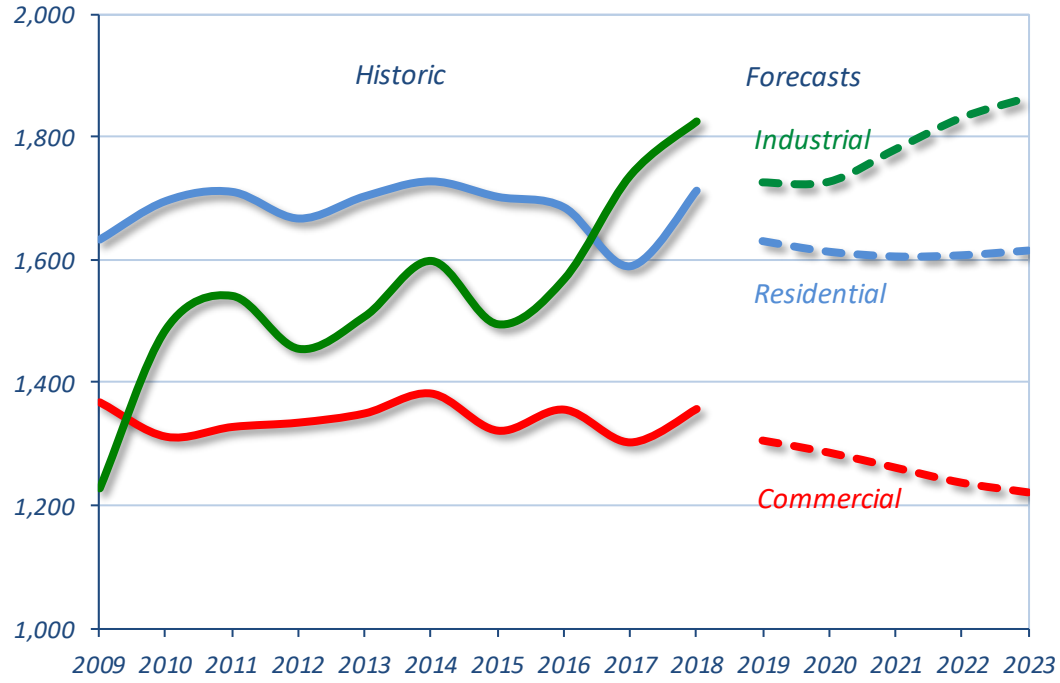
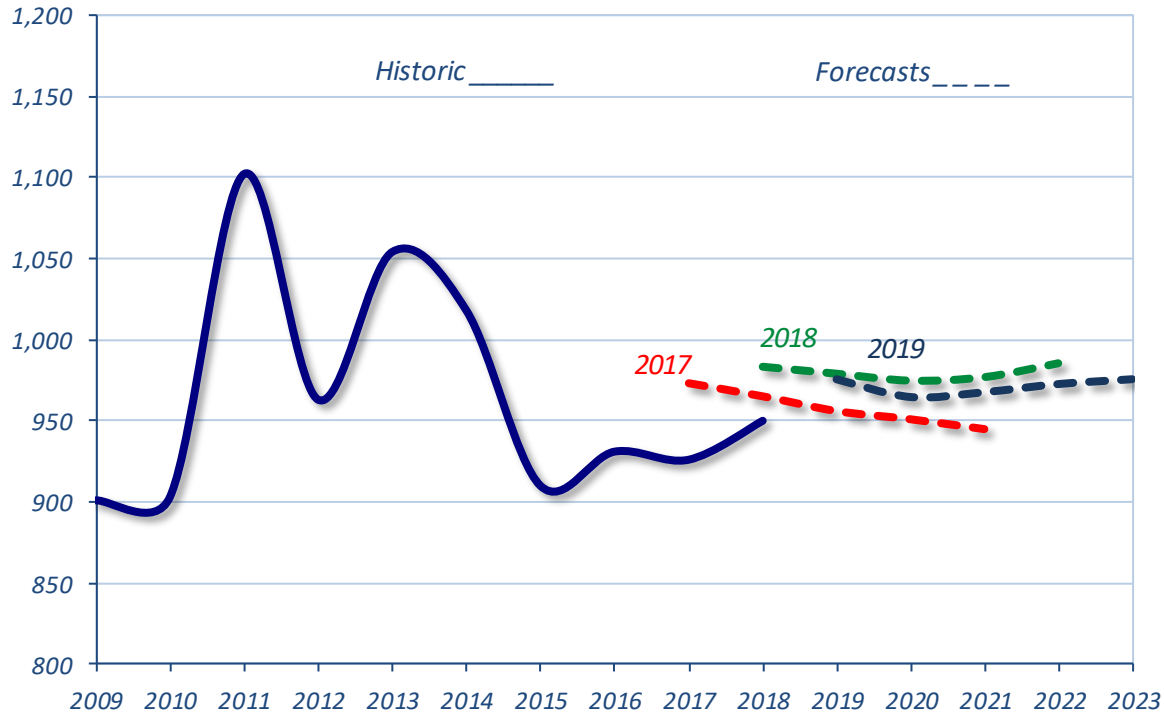
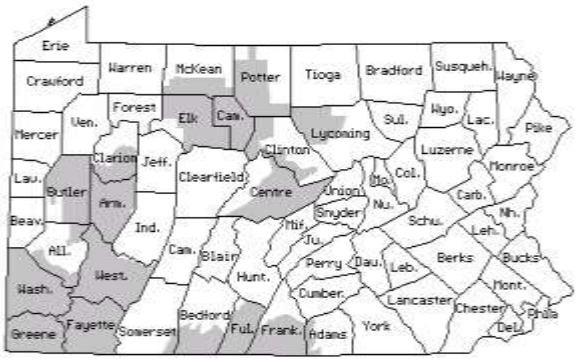


Figure 13 Penn Power peak load (MW)



West Penn Power Company (West Penn)



West Penn provides electric service to 724,408 customers in all or portions of 24 counties in Western, North and South-Central Pennsylvania. West Penn's 2018 energy usage total was 21,298 GWh as compared to 20,299 GWh in 2017, 20,702 GWh in 2016, and 20,798 GWh in 2015. Year-over-year (YOY) energy usage increased 4.9 percent. West Penn's total usage mix consisted of residential (34.5 percent), commercial (21.1 percent), industrial (40.7 percent), and sales for resale (3.5 percent).

Over the next five years, total energy usage is projected to decrease at an average annual rate of 0.3 percent. This includes a residential usage average annual decrease in of 0.2 percent, commercial usage decrease of 0.8 percent, and industrial usage increase by 1.3 percent. See Figure 14.

West Penn's highest **winter** peak load of 4,012 MW occurred on Jan.30, 2019. This represents a YOY increase of 1.0 percent from the previous year's peak of 3,879 MW. The 5-year peak load forecast is projected to decrease by an average of 1.6 percent per year. See Figure 15.

Refer to Appendix A, Tables A25-A28 for West Penn's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 14 West Penn energy usage (GWh)

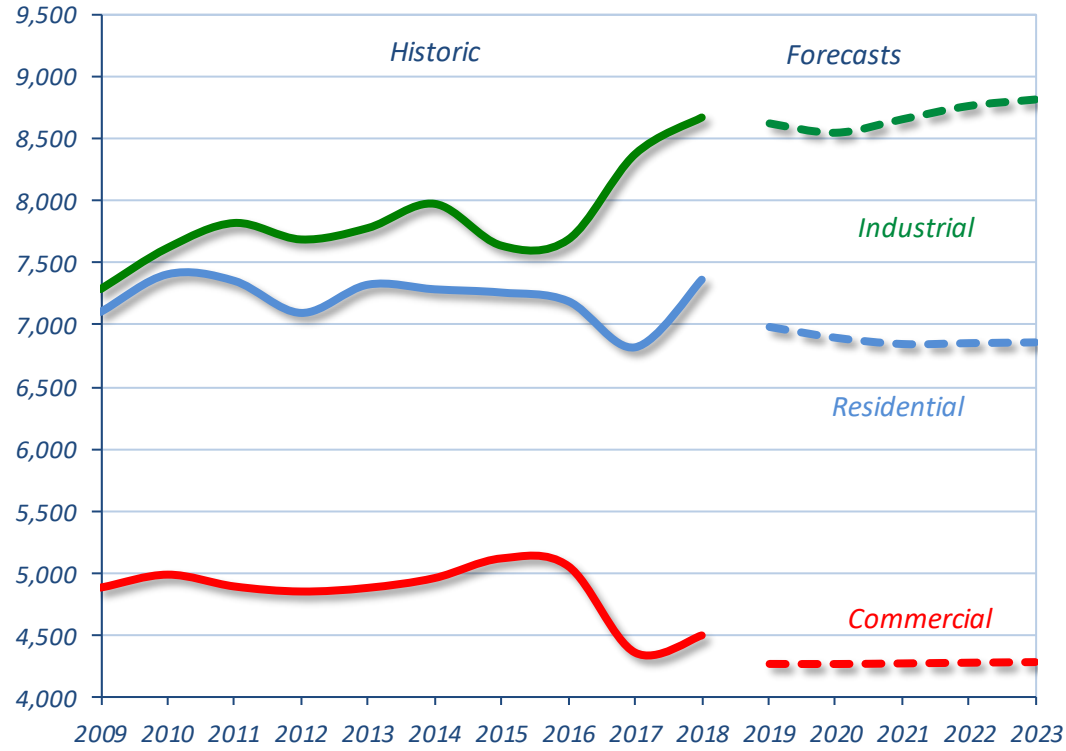
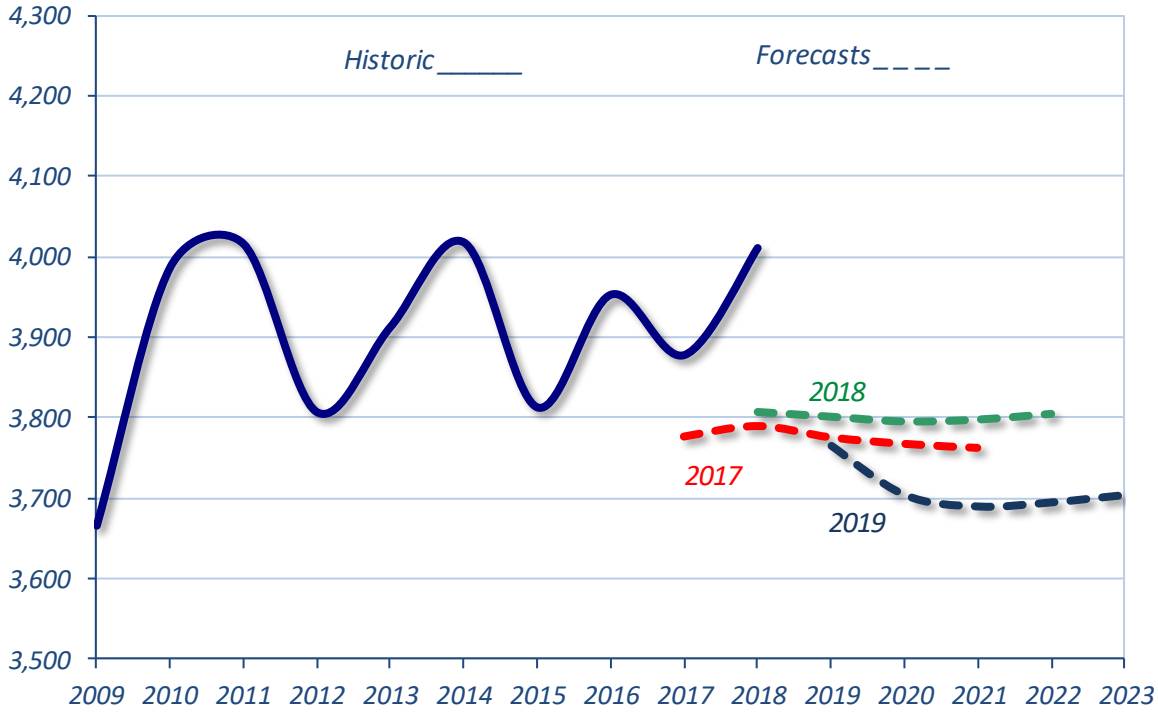
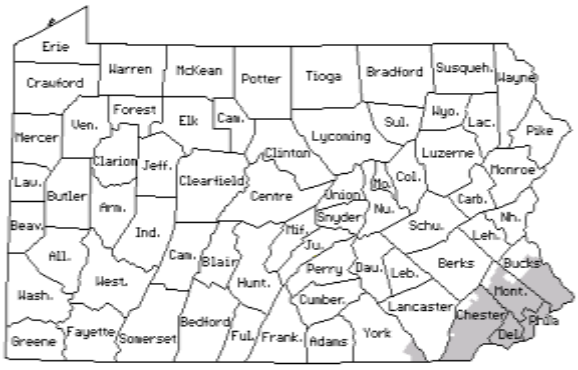


Figure 15 West Penn peak load (MW)



PECO Energy Company (PECO)

PECO is the largest electric utility in Pennsylvania, providing service to about 1,640,278 customers in the City of Philadelphia and all or portions of 6 counties in Southeastern Pennsylvania. PECO's 2018 energy usage total was 38,468 GWh as compared to 37,234 GWh in 2017, 37,940 GWh in 2016, and 38,125 GWh in 2015. Year-over-year (YOY) energy usage increased 3.3 percent. PECO's total usage mix consisted of residential (36.4 percent), commercial (21.3 percent), industrial (40.3 percent), and sales for resale (less than 1 percent).



Over the next five years, total energy usage is projected to decrease at an average annual rate of 0.2 percent. This includes a residential usage average annual decrease of 0.3 percent, commercial usage change of 0 percent, and industrial usage decrease by 0.1 percent. See Figure 16.

PECO's highest **summer** peak load of 8,608 MW occurred on Sept.6, 2018. This represents a YOY increase of 0.6 percent from the previous year's peak of 8,141 MW. The 5-year peak load forecast is projected to increase by an average of 0.1 percent per year. See Figure 17.

Refer to Appendix A, Tables A21-A24 for PECO's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 16 PECO energy usage (GWh)

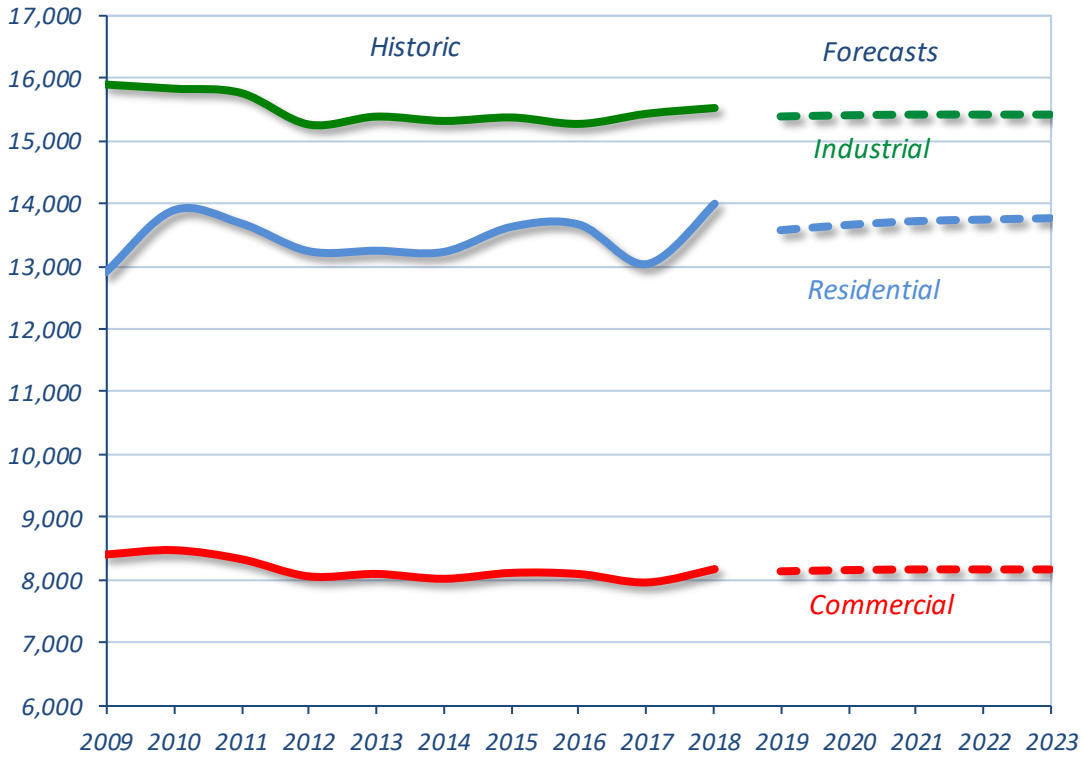
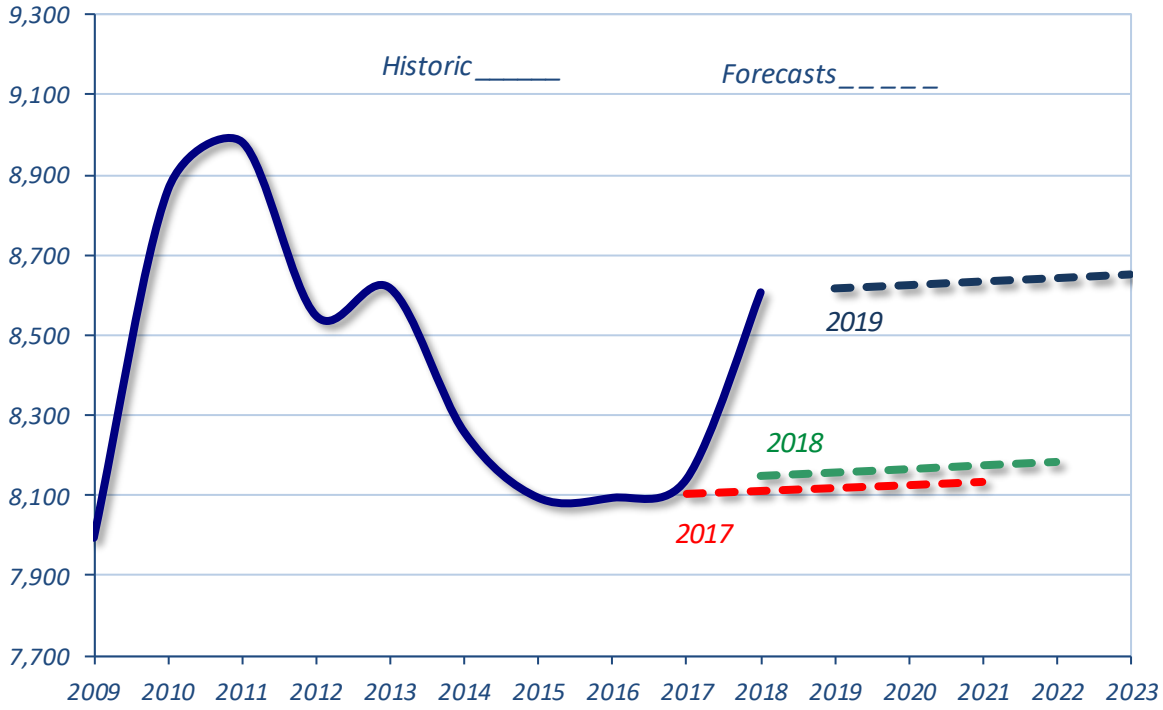
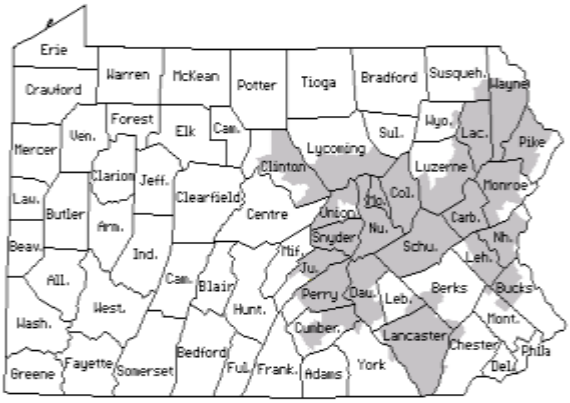


Figure 17 PECO Energy Company peak load (MW)



PPL Electric Utilities Corporation (PPL)



PPL provides service to about 1,440,505 customers over a 10,000-square-mile area in all or portions of 29 counties in Central Eastern Pennsylvania. PPL's 2018 energy usage total was 37,371 GWh as compared to 35,996 GWh in 2017, 36,311 GWh in 2016, and 37,222 GWh in 2015. Year-over-year (YOY) energy usage increased 3.8 percent. PPL's total usage mix consisted of residential (39.6 percent), commercial (37.7 percent), industrial (21.8 percent), and other (0.8 percent).

Over the next five years, total energy usage is projected to decrease at an average annual rate of 0.8 percent. This includes a residential usage average annual decrease 1.4 percent, commercial usage decrease of 0.4 percent, and industrial usage decrease by 0.4 percent. See Figure 18.

PPL's highest **winter** peak load of 7,729 MW occurred on Jan. 31, 2019. This represents a YOY increase of 3.5 percent from the previous year's peak of 7,468 MW. The 5-year peak load forecast is projected to decrease by an average of 1.2 percent per year. See Figure 19.

Refer to Appendix A, Tables A17-A20 for PPL's forecasts of peak load and residential, commercial and industrial energy demand, filed with the Commission in years 2009 through 2018.

Figure 18 PPL Electric Utilities Corporation energy usage (GWh)

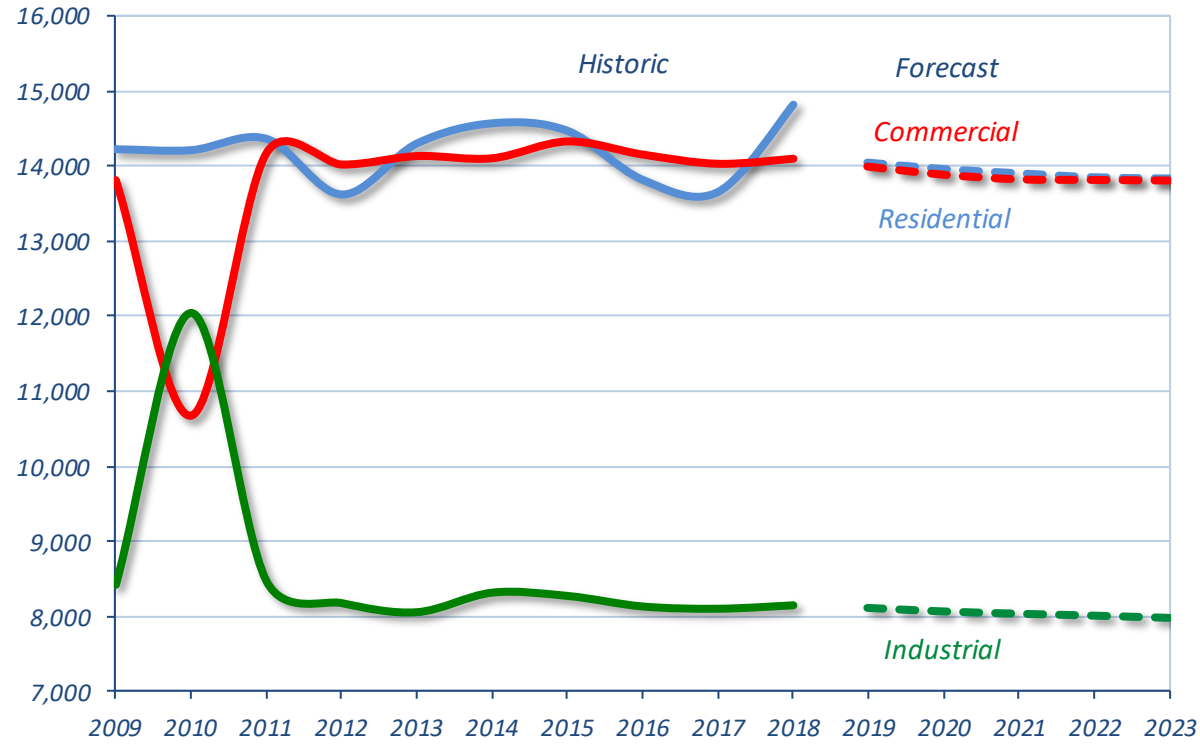
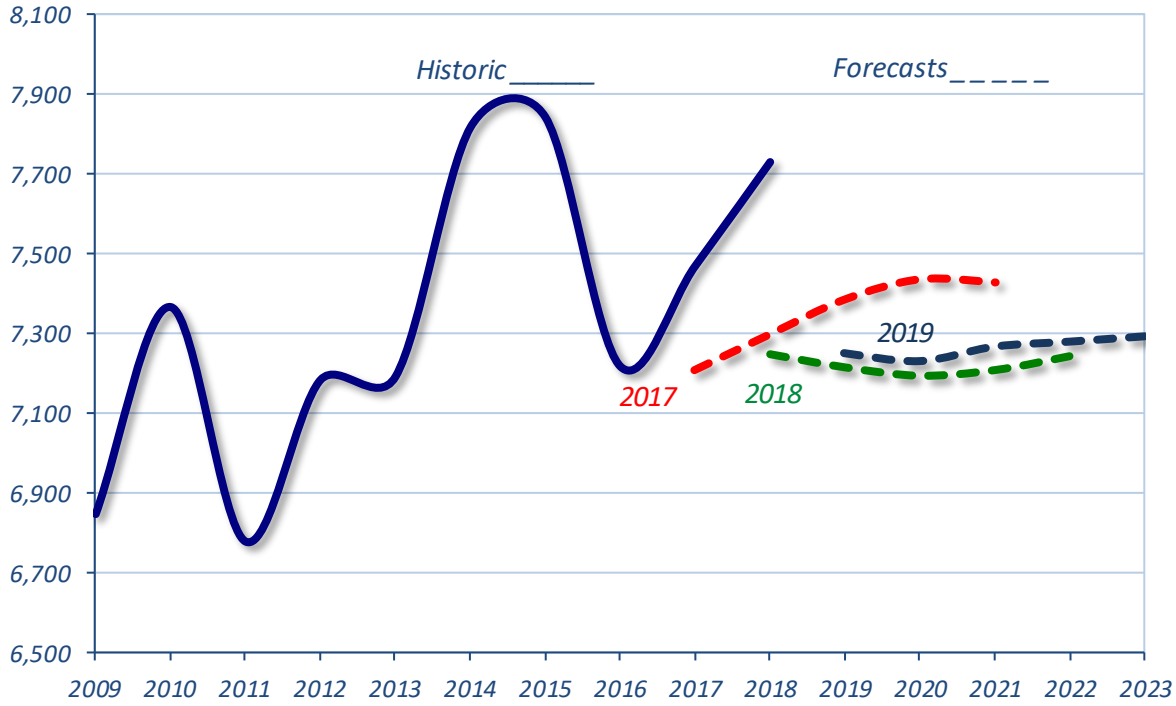
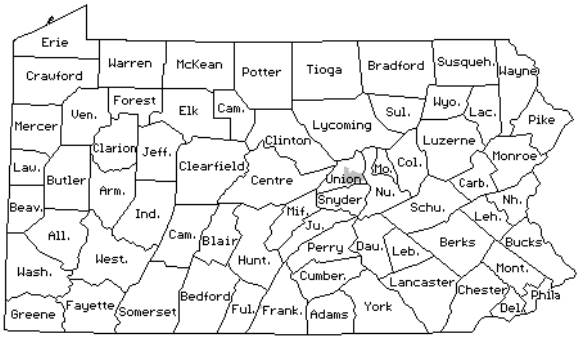


Figure 19 PPL Electric Utilities Corporation peak load (MW)



Summary of Data for the Four Smallest EDCs

Citizens' Electric Company (Citizens')

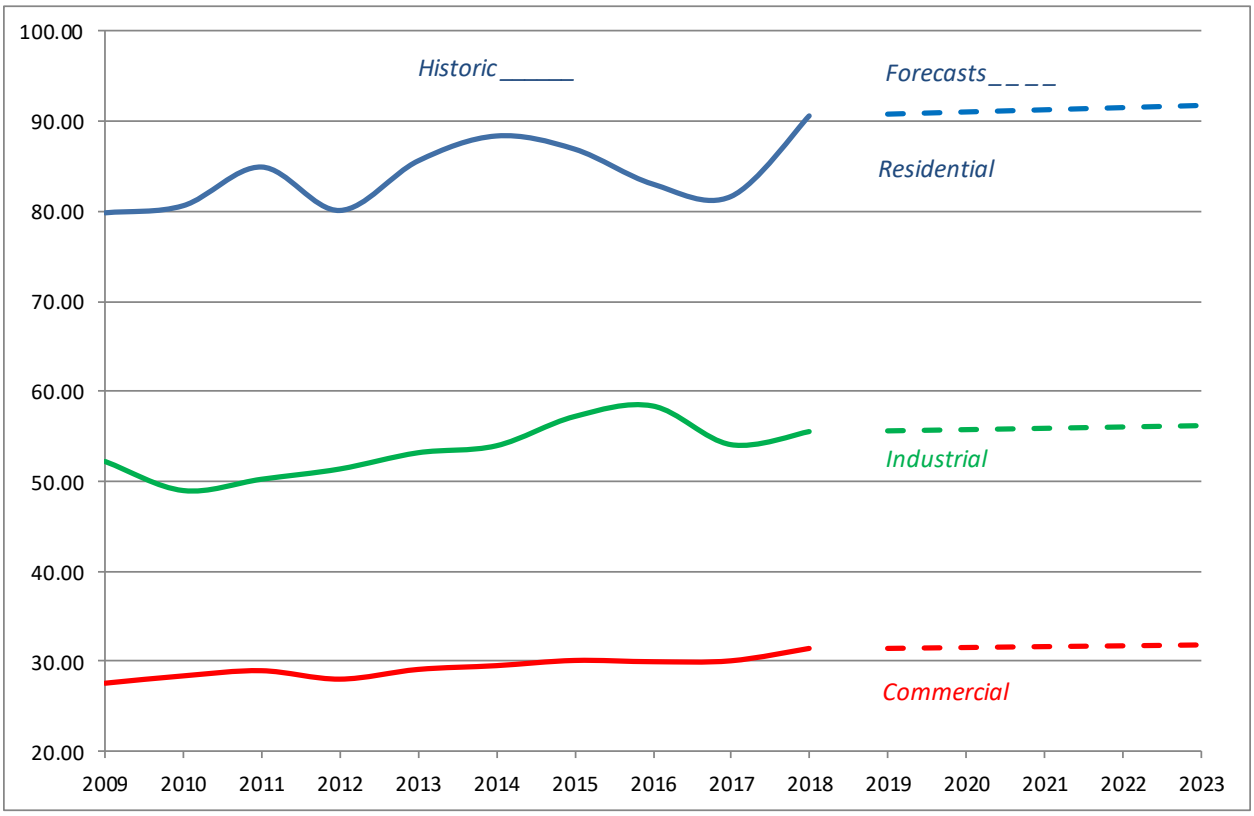


Citizens' provides service to about 7,057 customers in Union County, Pennsylvania. Citizens' 2018 energy usage total was 178 GWh as compared to 166 GWh, 172 GWh in 2016, and 175 GWh in 2015. Year-over-year (YOY) energy usage increased 7.1 percent. Citizens' total usage mix consisted of residential (50.9 percent), commercial (17.6 percent), industrial (31.2 percent), and other (<1 percent).

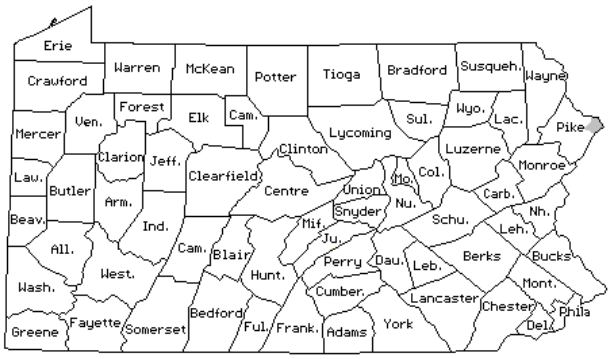
Over the next five years, total energy usage is projected to increase at an average annual rate of 0.2 percent. This includes a residential usage average annual increase 0.3 percent, commercial usage increase of 0.2 percent, and industrial usage increase by 0.2 percent. See Figure 20.

Citizens' highest **winter** peak load of 44.8 MW occurred on Jan. 31, 2019. This represents a YOY decrease of 9.5 percent from the previous year's peak of 47.1 MW. The 5-year peak load forecast is projected to decrease by an average of 0.1 percent per year.

Figure 20 Citizens' energy usage (GWh)



Pike County Light & Power Company (Pike)

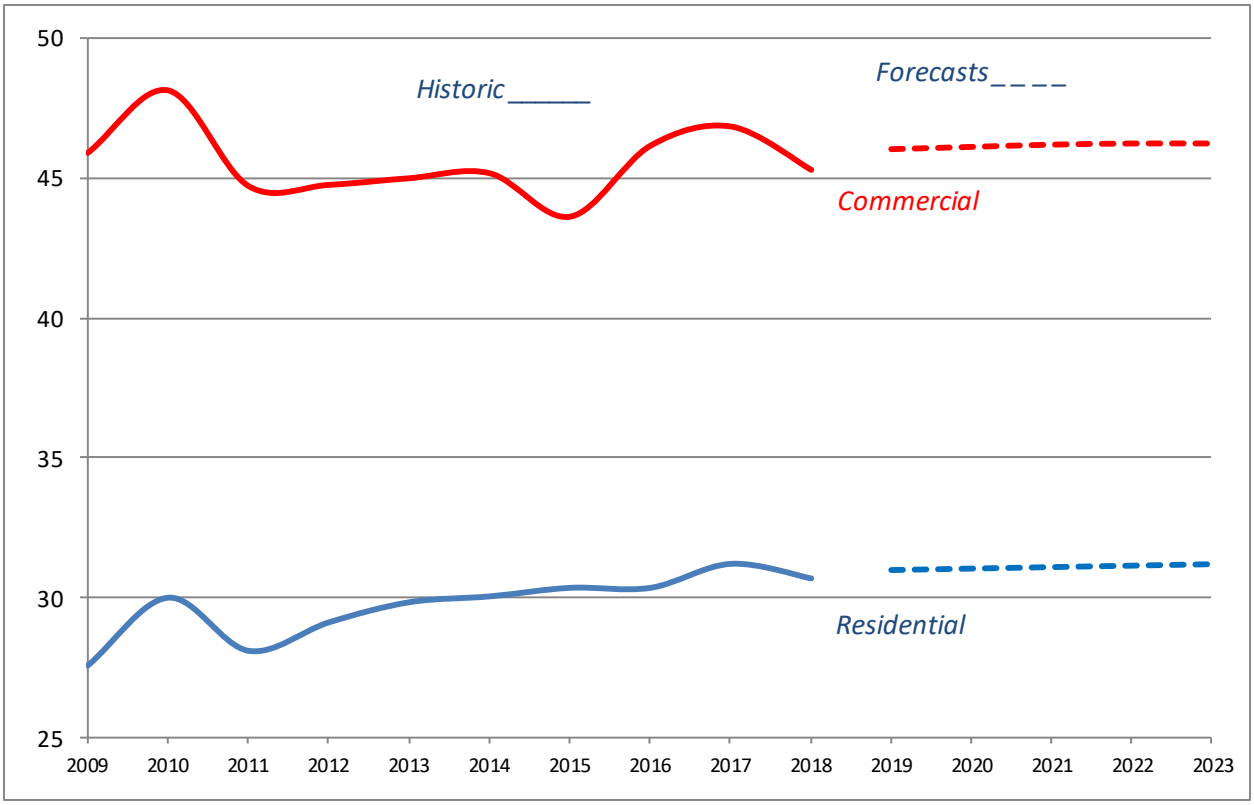


Pike provides service to about 4,768 customers in Eastern Pike County, Northeastern Pennsylvania. Pike's 2018 energy usage total was 76 GWh as compared to 78 GWh in 2017, 78 GWh in 2016, and 76 GWh in 2015. Year-over-year (YOY) energy usage decreased by 2.6%. Pike's total usage mix consisted of residential (40 percent), commercial (60 percent). Pike has no industrial customers or sales for resale.

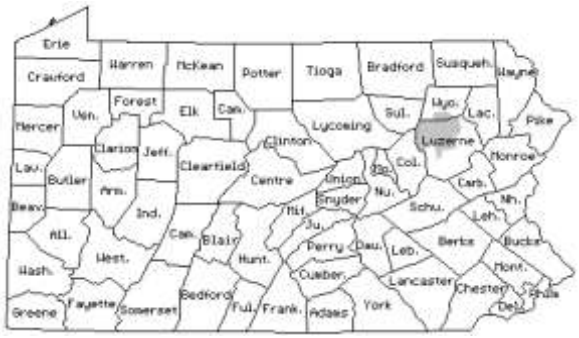
Over the next five years, total energy usage is projected to increase at an average annual rate of 0.4 percent. This includes a residential usage average annual increase of 0.3 percent, and a commercial usage increase of 0.4 percent. See Figure 21.

Pike highest **summer** peak load of 17.80 MW occurred on July 3, 2018. This represents a YOY increase of 10.4 percent from the previous year's peak of 16.12 MW. The 5-year peak load forecast is projected to increase by an average of 0.5 percent per year.

Figure 21 Pike County Light & Power energy usage (GWh)



UGI Utilities Inc.—Electric Division (UGI)

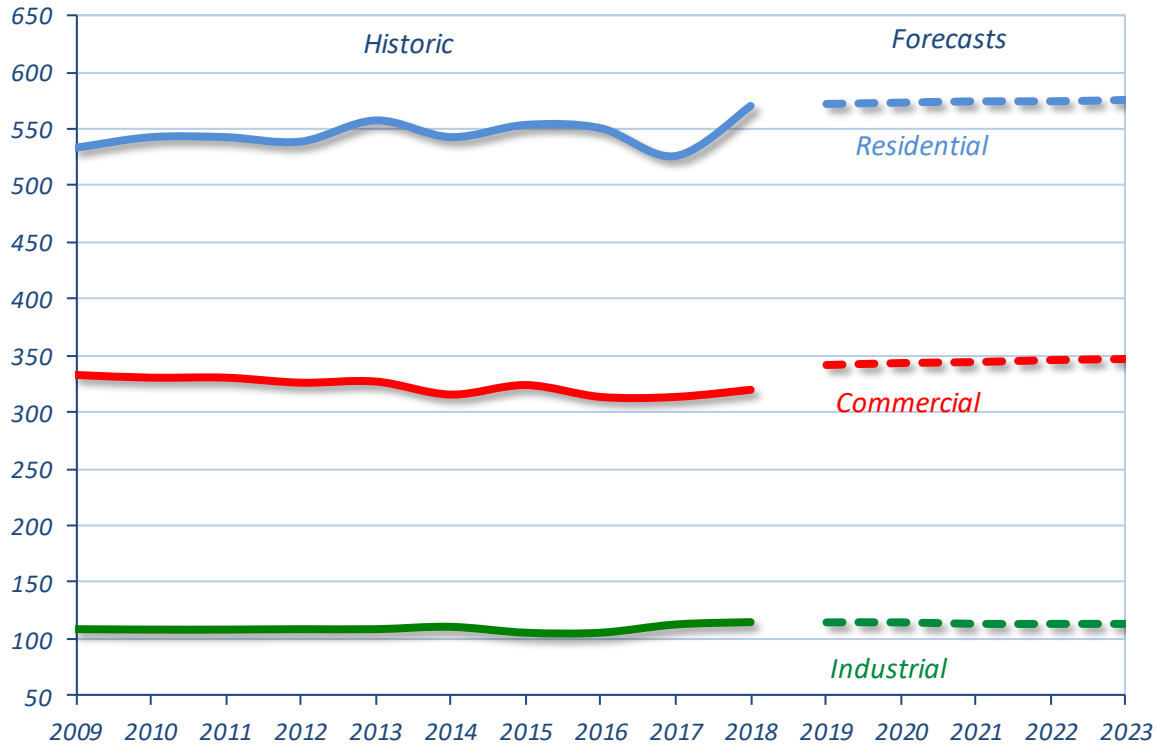


Utility provides electric service to about 62,309 customers in Northwestern Luzerne and Southern Wyoming counties in Pennsylvania. UGI 2018 energy usage total was 1,009 GWh as compared to 957 GWh in 2017, 977 GWh in 2016, and 990 GWh in 2015. Year-over-year (YOY) energy usage increased 5.5 percent. UGI's total usage mix consisted of residential (56.6 percent), commercial (31.8 percent), industrial (11.4 percent), and sales for resale (<1 percent).

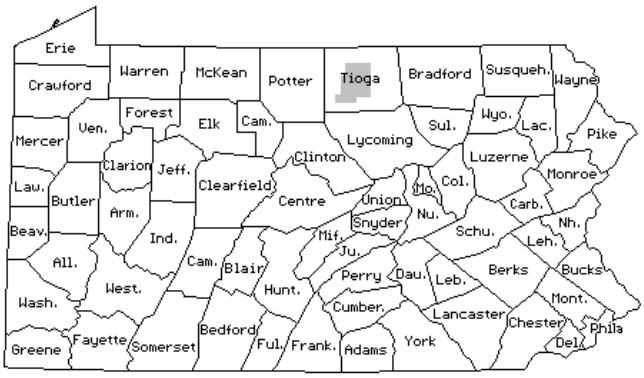
Over the next five years, total energy usage is projected to increase at an average annual rate of 0.6 percent. This includes a residential usage average annual increase 0.1 percent, commercial usage increase of 1.6 percent, and industrial usage decrease by 0.4 percent. See Figure 22.

UGI highest **winter** peak load of 215 MW occurred on Jan.30, 2019. This represents a YOY change of 0 percent from the previous year's peak of 215 MW. The 5-year peak load forecast is projected to decrease an average of 0.6 percent per year.

Figure 22 UGI Utilities Inc. energy usage (GWh)



Wellsboro Electric Company (Wellsboro)



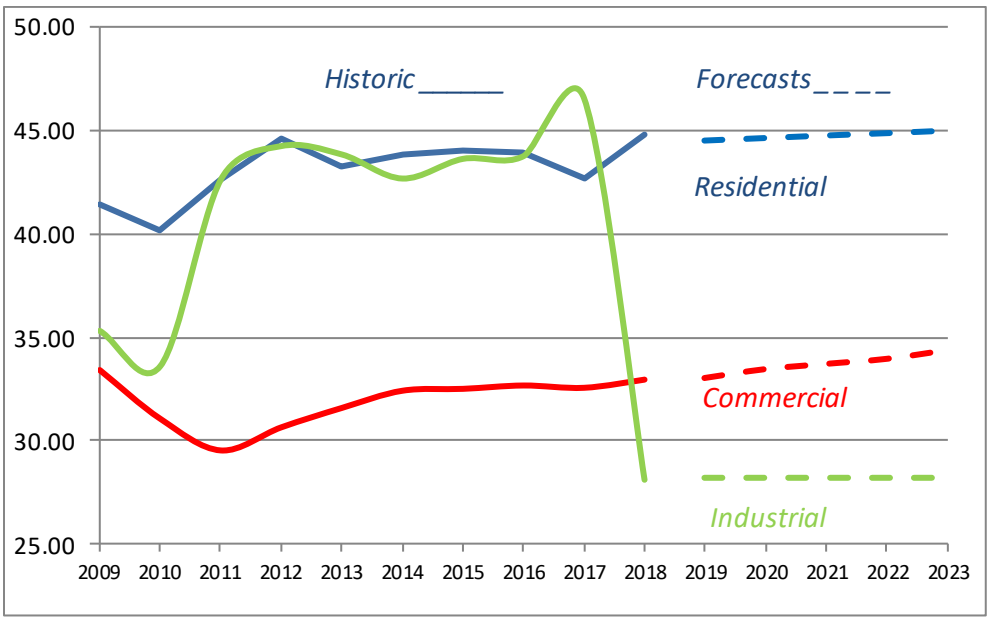
Wellsboro provides electric service to about 6,433 customers in Tioga County, North Central Pennsylvania. Wellsboro 2018 energy usage total was 106 GWh as compared to 105 GWh in 2017, 122 GWh in 2016, and 121 GWh in 2015. Year-over-year (YOY) energy usage increased 1 percent. Wellsboro total usage mix consisted of residential (42.2 percent), commercial (31.0 percent), industrial (26.5 percent).

Over the next five years, total energy usage is projected to increase at an average annual rate of 0.4 percent. This includes a residential usage average annual increase 0.1 percent, commercial usage increase of 0.9 percent, and industrial usage changes by 0 percent. See Figure 23.

Note: the dramatic drop in Industrial usage in 2017 is due to two large industrial customers leaving region in 2017.

Wellsboro's highest **summer** peak load of 20 MW occurred on Aug. 28, 2018. This represents a YOY decrease of 13 percent from the previous year's peak of 23 MW. The 5-year peak load forecast is projected to remain static over the next 5 years.

Figure 23 Wellsboro Electric Company energy usage (GWh)



Appendix A – Data Tables

The following tables provide actual and projected peak load as well as residential, commercial and industrial energy demand by EDC. The 5-year projections are filed each year by the large EDCs. Actual values are provided for years 2009 through 2018 and values are listed in the second column labeled "Actual." The lower-right-most-column in the body of the table is the latest 5-year projection for years 2019 through 2023.

Table A01 Duquesne Light Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirments (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	2732	2862										
2010	2889	2836	2854									
2011	3012	2857	2863	2944								
2012	3054	2850	2860	3000	2935							
2013	2951	2890	2917	3053	2980	2966						
2014	2693		2960	3088	3045	3021	2997					
2015	2804			3125	3102	3083	3056	2969				
2016	2797				3132	3135	3094	3005	2893			
2017	2682					3167	3118	3026	2918	2884		
2018	2795						3143	3042	2938	2895	2872	
2019								3056	2950	2901	2874	2862
2020									2942	2890	2861	2852
2021										2882	2862	2853
2022											2869	2865
2023												2866

Table A02 Duquesne Light Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	3946	4177										
2010	4327	4188	4117									
2011	4232	4181	4184	4213								
2012	4169	4171	4267	4275	4350							
2013	4091	4197	4352	4332	4436	4246						
2014	4068		4448	4402	4509	4260	4217					
2015	4109			4474	4579	4265	4230	4176				
2016	4197				4676	4284	4266	4202	4081			
2017	3876					4306	4266	4184	4068	4004		
2018	4258						4272	4172	4067	3987	3949	
2019								4164	4053	3955	3915	4011
2020									4012	3908	3856	3971
2021										3863	3797	3913
2022											3747	3862
2023												3816

Table A03 Duquesne Light Company
Actual and Projected Commercial Energy Demand (GWh)

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	6537	6648										
2010	6712	6627	6428									
2011	6612	6583	6501	6681								
2012	6539	6533	6585	6782	6682							
2013	6494	6527	6666	6854	6749	6642						
2014	6432		6742	6957	6842	6640	6600					
2015	6399			7056	6929	6640	6621	6494				
2016	6335				7017	6645	6648	6503	6371			
2017	6112					6641	6643	6472	6327	6261		
2018	6218						6654	6455	6299	6232	6072	
2019								6430	6254	6187	6024	6098
2020									6210	6151	5980	6029
2021										6082	5905	5973
2022											5833	5896
2023												5804

Table A04 Duquesne Light Company
Actual and Projected Industrial Energy Demand (GWh)

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	2616	3002										
2010	2987	2933	2440									
2011	3120	2851	2407	2865								
2012	3406	2777	2395	2846	3185							
2013	3337	2726	2385	2815	3226	3501						
2014	3164		2359	2770	3252	3035	2787					
2015	2898			2724	3272	3032	2778	2909				
2016	2566				3289	3031	2762	2896	2890			
2017	2632					3031	2734	2873	2852	2665		
2018	2623						2711	2851	2837	2658	2675	
2019								2826	2819	2640	2656	2719
2020									2803	2638	2650	2783
2021										2618	2627	2733
2022											2605	2712
2023												2692

Table A05 Metropolitan Edison Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirements (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	2739	2829										
2010	2715	2932	2687									
2011	3125	3017	2640	2869								
2012	3036	3085	2630	2775	2911							
2013	3012	3158	2668	2815	2928	2881						
2014	2817		2731	2872	2962	2887	2958					
2015	2791			2952	2995	2898	2965	2975				
2016	2947				3028	2910	2974	2979	2987			
2017	2897					2932	2996	2985	2995	2901		
2018	3026						3017	2987	2997	2895	2926	
2019								2986	2996	2872	2907	2921
2020									2995	2855	2874	2871
2021										2856	2865	2868
2022											2875	2876
2023												2883

Table A06 Metropolitan Edison Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	5448	5771										
2010	5666	5836	5587									
2011	5588	5969	5552	5424								
2012	5363	6109	5577	5226	5201							
2013	5553	6232	5682	5386	5184	5297						
2014	5477		5799	5547	5183	5159	5354					
2015	5515			5650	5212	5042	5421	5533				
2016	5528				5210	4979	5438	5378	5190			
2017	5351					4993	5457	5392	5042	5316		
2018	5740						5476	5382	4925	5242	5347	
2019								5351	4840	5154	5265	5318
2020									4760	5083	5201	5239
2021										5044	5166	5201
2022											5172	5198
2023												5203

Table A07 Metropolitan Edison Company
Actual and Projected Commercial Energy Demand (GWh)*

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	4568	4853										
2010	3006	5020	4671									
2011	2947	5152	4706	2955								
2012	2907	5291	4783	2959	2871							
2013	2933	5421	4887	3019	2909	2900						
2014	2944		4963	3090	2948	2930	2914					
2015	2995			3158	2997	2937	2931	2983				
2016	3043				2995	2940	2964	2929	2919			
2017	2886					2956	2984	2938	2923	2953		
2018	2972						2989	2938	2927	2948	2952	
2019								2923	2925	2941	2948	2940
2020									2921	2935	2924	2899
2021										2925	2904	2873
2022											2912	2875
2023												2880

* The 2010 actual and 2011 forecast are based on a reclassification of the commercial and industrial classes.

Table A08 Metropolitan Edison Company
Actual and Projected Industrial Energy Demand (GWh)*

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	3439	3620										
2010	5288	3842	3538									
2011	5404	4035	3497	5443								
2012	5261	4047	3528	5545	5434							
2013	5328	4048	3731	5589	5652	5411						
2014	5382		4021	5610	5765	5521	5322					
2015	5309			5625	5851	5561	5381	5413				
2016	5304				5847	5587	5456	5472	5350			
2017	5512					5612	5508	5507	5372	5360		
2018	5685						5524	5523	5467	5428	5449	
2019								5532	5474	5408	5443	5451
2020									5467	5397	5396	5372
2021										5458	5388	5409
2022											5419	5450
2023												5472

* The 2010 actual and 2011 forecast are based on a reclassification of the commercial and industrial classes.

Table A09 Pennsylvania Electric Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirements (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	2880	2637										
2010	2451	2674	2603									
2011	2659	2711	2630	2465								
2012	3128	2750	2661	2452	2515							
2013	3087	2789	2688	2458	2544	2938						
2014	3024		2715	2496	2579	2942	2927					
2015	2819			2531	2625	2987	2935	2888				
2016	2909				2662	3039	2946	2896	2890			
2017	2910					3081	2962	2904	2898	2797		
2018	3020						2968	2904	2906	2794	2823	
2019								2902	2907	2775	2809	2849
2020									2907	2751	2779	2811
2021										2739	2775	2811
2022											2779	2813
2023												2817

Table A10 Pennsylvania Electric Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	4558	4533										
2010	4471	4598	4611									
2011	4656	4662	4614	4569								
2012	4554	4727	4662	4489	4460							
2013	4491	4793	4721	4443	4304	4257						
2014	4462		4776	4442	4387	4164	4469					
2015	4350			4486	4539	4145	4513	4491				
2016	4328				4653	4157	4525	4373	4145			
2017	4153					4156	4554	4393	4011	4248		
2018	4424						4583	4394	3923	4229	4238	
2019								4377	3856	4181	4157	4187
2020									3791	4133	4090	4134
2021										4112	4056	4104
2022											4057	4104
2023												4112

Table A11 Pennsylvania Electric Company
Actual and Projected Commercial Energy Demand (GWh)*

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	5186	5122										
2010	5019	5199	5159									
2011	3671	5277	5213	5196								
2012	3534	5356	5265	5215	3562							
2013	3531	5436	5320	5257	3526	3512						
2014	3591		5364	5343	3593	3535	3553					
2015	3558			5424	3650	3510	3552	3649				
2016	3587				3698	3503	3582	3582	3539			
2017	3529					3503	3604	3614	3545	3483		
2018	3610						3608	3619	3551	3454	3525	
2019								3607	3553	3426	3516	3506
2020									3552	3392	3499	3459
2021										3352	3473	3424
2022											3472	3406
2023												3397

* The 2010 actual and 2011 forecast are based on a reclassification of the commercial and industrial classes.

Table A12 Pennsylvania Electric Company
Actual and Projected Industrial Energy Demand (GWh)*

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	4594	4881										
2010	4044	4954	4203									
2011	5748	4983	4538	4126								
2012	6005	5013	4859	4222	6026							
2013	5731	5043	4889	4370	6175	5883						
2014	5647		4922	4607	6266	5993	5696					
2015	5647			4674	6304	6062	5808	5747				
2016	5668				6325	6133	5867	5822	5723			
2017	5792					6130	5894	5931	5746	5602		
2018	5797						5896	6017	5721	5617	5822	
2019								5998	5675	5602	5832	5807
2020									5623	5569	5757	5720
2021										5548	5751	5770
2022											5790	5819
2023												5854

* The 2010 actual and 2011 forecast are based on a reclassification of the commercial and industrial classes.

Table A13 Pennsylvania Power Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirements (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	901	984										
2010	903	941	896									
2011	1102	963	890	944								
2012	963	981	899	947	1010							
2013	1054	995	930	983	1001	929						
2014	1018		977	1002	1003	930	867					
2015	910			1010	1006	953	873	931				
2016	931				1010	969	880	940	992			
2017	926					980	885	947	999	973		
2018	950						889	949	1003	965	983	
2019								949	1004	956	979	976
2020									1006	951	975	965
2021										945	977	968
2022											985	973
2023												976

Table A14 Pennsylvania Power Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	1634	1780										
2010	1696	1761	1701									
2011	1711	1806	1708	1664								
2012	1668	1860	1721	1624	1590							
2013	1704	1904	1714	1638	1588	1645						
2014	1728		1739	1664	1582	1627	1677					
2015	1703			1684	1589	1619	1685	1752				
2016	1686				1588	1625	1691	1689	1597			
2017	1591					1649	1699	1703	1563	1651		
2018	1713						1705	1713	1545	1632	1640	
2019								1714	1532	1609	1617	1630
2020									1520	1593	1604	1612
2021										1584	1595	1604
2022											1598	1606
2023												1614

Table A15 Pennsylvania Power Company
Actual and Projected Commercial Energy Demand (GWh)

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	1367	1401										
2010	1311	1394	1428									
2011	1327	1424	1408	1300								
2012	1334	1491	1449	1267	1291							
2013	1349	1535	1500	1272	1297	1337						
2014	1381		1535	1277	1314	1347	1345					
2015	1321			1278	1335	1358	1322	1180				
2016	1355				1334	1365	1326	1048	1311			
2017	1302					1374	1332	1049	1315	1345		
2018	1356						1332	1047	1319	1330	1317	
2019								1040	1321	1314	1312	1307
2020									1321	1302	1303	1287
2021										1289	1295	1262
2022											1293	1237
2023												1221

Table A16 Pennsylvania Power Company
Actual and Projected Industrial Energy Demand (GWh)

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	1229	1347										
2010	1488	1517	1226									
2011	1542	1687	1214	1527								
2012	1456	1694	1238	1652	1513							
2013	1509	1700	1370	1705	1483	1473						
2014	1599		1596	1725	1486	1518	1596					
2015	1496			1738	1490	1519	1743	1847				
2016	1569				1490	1488	1739	2079	1637			
2017	1738					1485	1729	2202	1696	1513		
2018	1826						1731	2256	1742	1476	1702	
2019								2278	1775	1465	1713	1727
2020									1790	1467	1726	1728
2021										1460	1757	1781
2022											1794	1833
2023												1866

Table A21 PECO Energy Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirements (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	7994	8956										
2010	8864	9091	8114									
2011	8984	9227	8236	8786								
2012	8549	9365	8359	8770	8926							
2013	8618	9506	8485	8842	8956	8529						
2014	8258		8612	8916	8987	8580	8627					
2015	8094			8991	9018	8631	8635	8259				
2016	8094				9049	8683	8644	8267	8102			
2017	8141					8735	8653	8275	8110	8102		
2018	8608						8661	8284	8118	8110	8149	
2019								8292	8126	8118	8157	8617
2020									8135	8126	8165	8625
2021										8135	8174	8634
2022											8182	8642
2023												8651

Table A22 PECO Energy Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	12893	13583										
2010	13896	13855	13151									
2011	13686	14132	13414	13912								
2012	13233	14415	13683	14037	13669							
2013	13241	14703	13956	14317	13806	13392						
2014	13222		14235	14604	13944	14463	13343					
2015	13630			14896	14083	14608	13346	13288				
2016	13664				14224	14754	13349	13355	13366			
2017	13024					14902	13351	13422	13341	13436		
2018	14005						13354	13489	13352	13423	13266	
2019								13556	13354	13404	13240	13581
2020									13360	13428	13182	13661
2021										13346	13104	13718
2022											13009	13741
2023												13762

Table A23 PECO Energy Company
Actual and Projected Commercial Energy Demand (GWh)

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	8404	8874										
2010	8472	9052	8572									
2011	8332	9233	8744	8589								
2012	8063	9417	8918	8705	8360							
2013	8101	9606	9097	8879	8443	7821						
2014	8025		9279	9057	8528	7790	7858					
2015	8118			9238	8613	7868	7936	8021				
2016	8099				8699	7947	8015	8017	8044			
2017	7968					8026	8096	8013	8020	8132		
2018	8177						8177	8009	8016	8073	7992	
2019								8005	8018	8063	8043	8143
2020									8019	8046	8049	8156
2021										7995	8038	8163
2022											8042	8163
2023												8163

Table A24 PECO Energy Company
Actual and Projected Industrial Energy Demand (GWh)

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	15889	16864										
2010	15824	17202	16207									
2011	15755	17546	16531	15991								
2012	15253	17897	16861	16153	15755							
2013	15379	18254	17199	16476	15912	15481						
2014	15310		17543	16806	16071	15714	15609					
2015	15365			17142	16232	15949	15844	15302				
2016	15263				16394	16188	16081	15294	15547			
2017	15425					16431	16322	15287	15515	15016		
2018	15516						16567	15279	15513	15364	15421	
2019								15271	15517	15320	15293	15385
2020									15529	15356	15306	15415
2021										15355	15247	15431
2022											15217	15431
2023												15431

Table A25 West Penn Power Company
Actual and Projected Peak Load (MW)

		Projected Peak Load Requirements (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	3667	3910										
2010	3988	3990	3788									
2011	4017	4032	3755	3757								
2012	3808	4084	3771	3754	3758							
2013	3914	4120	3809	3786	3771	3784						
2014	4019		3951	3879	3840	3846	4075					
2015	3814			3928	3903	3908	3945	3793				
2016	3954				3964	3980	4012	3842	3793			
2017	3879					4015	4065	3927	3840	3776		
2018	4012						4077	4020	3886	3789	3806	
2019								4031	3916	3775	3801	3764
2020									3917	3767	3796	3704
2021										3762	3798	3690
2022											3804	3695
2023												3704

Table A26 West Penn Power Company
Actual and Projected Residential Energy Demand (GWh)

		Projected Residential Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	7101	7206										
2010	7401	7264	7147									
2011	7349	7233	7104	7139								
2012	7092	7248	7085	7122	7121							
2013	7318	7102	6952	7047	7149	7146						
2014	7281		7008	7073	7188	7282	7311					
2015	7255			7148	7231	7369	7302	7383				
2016	7186				7281	7431	7303	7157	6775			
2017	6817					7493	7319	7244	6634	6892		
2018	7358						7335	7298	6548	6834	6931	
2019								7303	6473	6752	6906	6988
2020									6407	6660	6819	6901
2021										6614	6756	6851
2022											6756	6858
2023												6864

Table A27 West Penn Power Company
Actual and Projected Commercial Energy Demand (GWh)

		Projected Commercial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	4880	5048										
2010	4983	5160	4966									
2011	4889	5275	4987	4909								
2012	4849	5353	5059	4931	4819							
2013	4878	5450	5169	4979	4930	4845						
2014	4956		5307	5091	5083	4909	4860					
2015	5112			5229	5229	4946	4897	4996				
2016	5051				5343	4979	4932	4957	4900			
2017	4364					5047	4962	5015	4915	4995		
2018	4500						4962	5029	4941	4953	4285	
2019								5006	4952	4918	4246	4261
2020									4954	4884	4208	4260
2021										4857	4184	4266
2022											4184	4273
2023												4279

Table A28 West Penn Power Company
Actual and Projected Industrial Energy Demand (GWh)

		Projected Industrial Energy Demand (Year Forecast Was Filed)										
Year	Actual	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
2009	7286	8440										
2010	7617	8711	7612									
2011	7818	8906	7740	7833								
2012	7685	9093	7936	8025	8029							
2013	7777	9246	8105	8146	8172	8087						
2014	7972		8214	8264	8334	8303	7947					
2015	7635			8346	8487	8542	8161	8053				
2016	7684				8608	8786	8331	8492	8287			
2017	8371					8878	8466	8903	8641	7947		
2018	8667						8495	9321	8798	8072	8785	
2019								9700	8847	8114	8873	8617
2020									8852	8179	8865	8540
2021										8199	8920	8651
2022											8920	8760
2023												8813

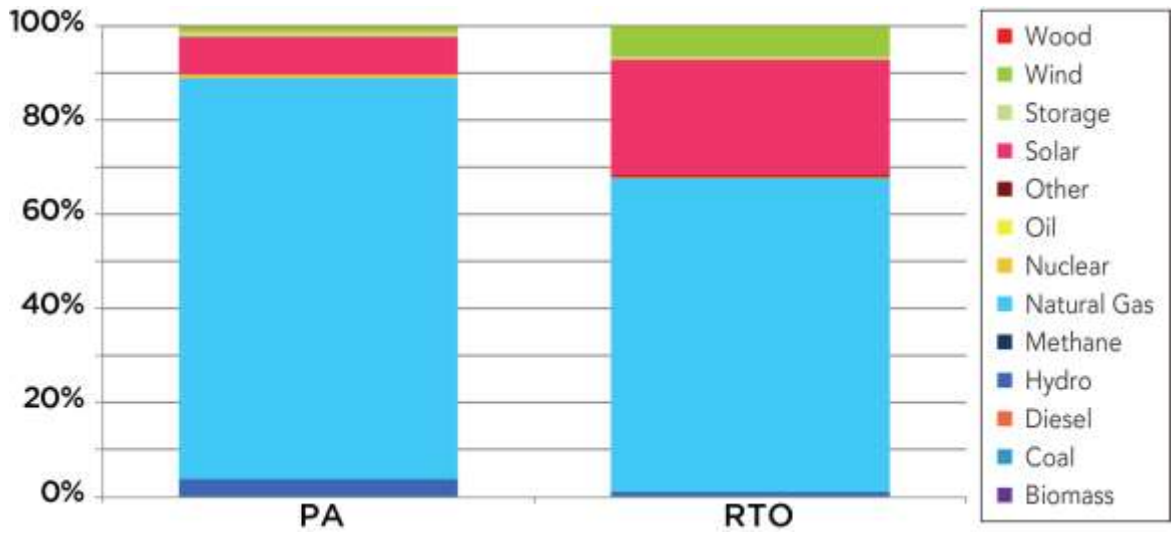
Appendix B – Plant Additions and Upgrades

Table B-1, Chart B-1, and Chart B-2 detail PJM interconnection requests for new generating resources located in Pennsylvania.[55] Currently Pennsylvania has 6,600 MW under construction as compared to 9,636 MW in 2017; 7,142 MW in 2016; 8,202 MW in 2015; 4,629 MW in 2014; and 2,134 MW in 2013. Table B-2 details the generation deactivations for Pennsylvania from January 1, through December 31, 2018.

Table B-1, New Generation Queue for Pennsylvania – Interconnection Requests (Dec 31, 2018)

	Complete				In Queue						Grand Total	
	In Service		Withdrawn		Active		Suspended		Under Construction			
	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW	No. of Projects	Capacity, MW
Non-Renewable	124	18,792.0	313	104,070.0	40	3,876.0	10	1,371.0	25	6,462.0	512	134,576.0
Coal	17	229.0	28	14,354.6	0	0.0	0	0.0	0	0.0	45	14,583.6
Diesel	3	33.3	12	51.5	0	0.0	0	0.0	1	4.1	16	88.9
Natural Gas	78	15,612.3	227	86,077.7	26	3,682.2	10	1,371.4	21	6,413.5	362	113,157.1
Nuclear	15	2,581.8	8	1,681.0	4	50.0	0	0.0	1	44.0	28	4,356.8
Oil	3	9.4	9	1,307.0	0	0.0	0	0.0	0	0.0	12	1,316.4
Other	3	326.5	6	344.0	0	0.0	0	0.0	0	0.0	9	670.5
Storage	5	0.1	23	262.1	10	143.8	0	0.0	2	0.0	40	406.0
Renewable	82	897.0	281	3,065.0	42	1,548.0	6	58.0	16	140.0	427	5,708.0
Biomass	3	31.4	4	36.5	0	0.0	0	0.0	0	0.0	7	67.9
Hydro	12	480.8	15	188.6	2	500.0	0	0.0	0	0.0	29	1,169.4
Methane	27	135.7	37	201.3		0.0	0	0.0	0	0.0	64	337.0
Solar	3	6.8	95	940.1	37	1,009.7	3	16.3	8	54.7	146	2,027.6
Wind	37	242.5	130	1,698.7	3	38.5	2	25.7	8	85.0	180	2,090.4
Wood	0	0.0	0	0.0.0	0	0.0	1	16.0	0	0.0	1	16.0
Grand Total	206	19,689.6	594	107,143.1	82	5,424.3	16	1,429.4	41	6,601.3	939	140,287.6

Chart B-1, Pennsylvania/PJM New Generation – Fuel as % of Projects in Queue (Dec 31, 2018)



[55] http://www.pjm.com/-/media/library/reports-notices/state-specific-reports/2017/2017-pennsylvania-state-infrastructure-report.ashx?la=en.

Chart B-2, Pennsylvania New Generation Queue –Total MW Capacity by Fuel (Dec 31, 2018)

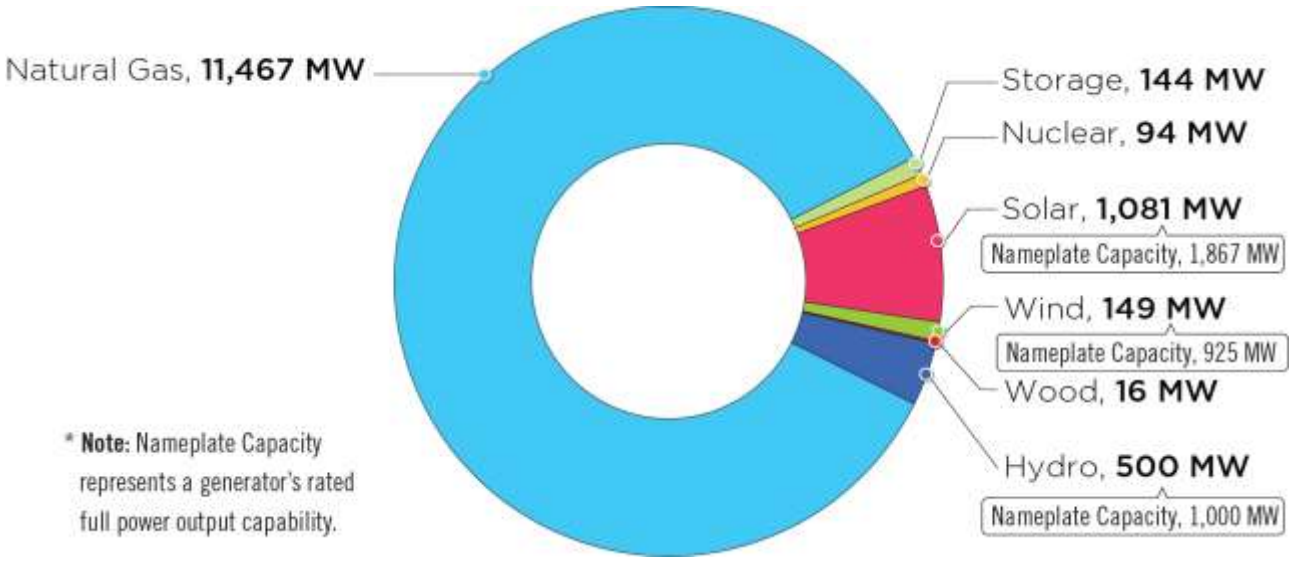
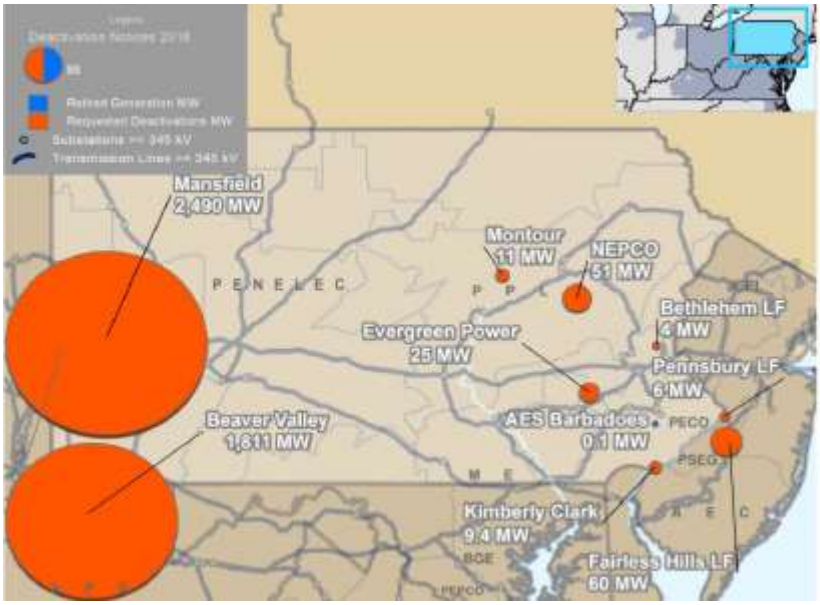


Table B-2, 2017 Pennsylvania Actual Generation Deactivations and Deactivation Notifications Received in 2018



Unit	Capacity (MW)	TO Zone	Age (Years)	Projected/Actual Deactivation Date
Beaver Valley 1	909.0	DLCO	42	5/31/2021
Beaver Valley 2	902.0	DLCO	31	10/31/2021
Northeastern Power NEPCO	51.0	PPL	29	10/24/2018
Fairless Hills Unit A	30.0	PECO	22	6/1/2020
Fairless Hills Unit B	30.0	PECO	22	6/1/2020
Evergreen	25.0	METED	8	5/1/2018
Montour ATG	11.4	PPL	45	2/16/2019
Kimberly Clark	9.4	PECO	32	6/1/2019
Bethlehem	3.7	PPL	10	6/1/2020
Pennsbury 1	3.0	PECO	22	6/1/2020
Pennsbury 2	3.0	PECO	22	6/1/2020
Barbados Battery	0.1	PECO	10	7/29/2018
Mansfield 1	830	ATSI	42	2/5/2019
Mansfield 2	830	ATSI	41	2/5/2019
Mansfield 3	830	ATSI	38	6/1/2021

In 2018, there were 76.1 MW of Pennsylvania generation retirements as compared to 14 MW in 2017, and 177 MW in 2016. PJM received 12 new Pennsylvania Deactivation Notices in 2018, totaling 4,391.5 MW, with projected deactivation dates as shown in Table B-2.

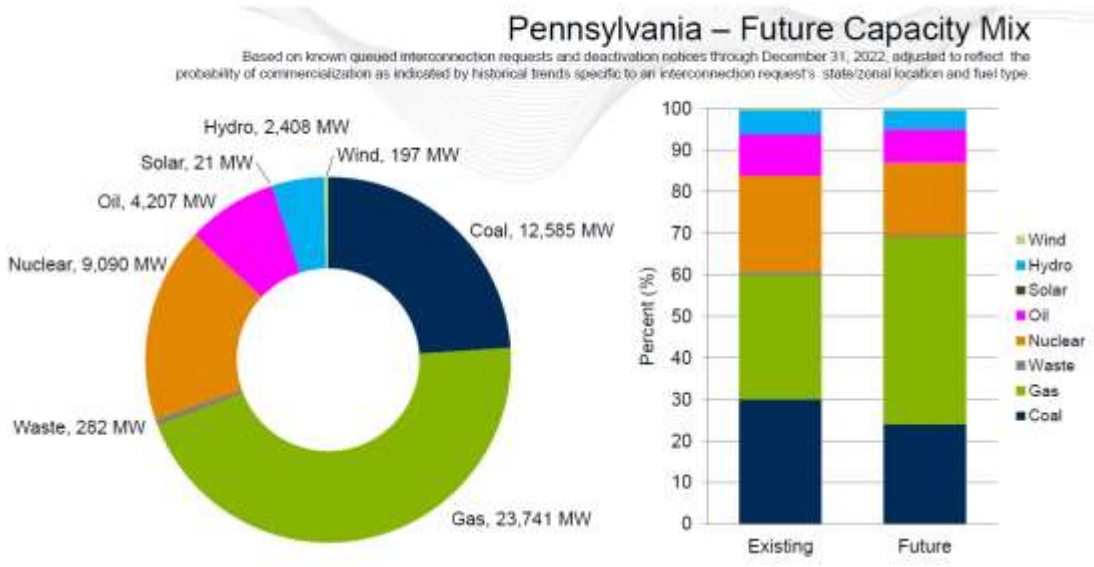
Appendix C – Pennsylvania Generation Capability/Facilities

Table C-1, represents the 2018/2017/2016/2015/2014 PJM region installed electrical capacity percentage and actual generation percentage by energy source.[56] Chart C-1, represents future projected Pennsylvania capacity percentage by energy source from 2014 through 2022. Chart C-2, represents the 2018 and 2017 Pennsylvania installed capacity percentage by energy source. Chart C-3, represents the 2018 and 2017 Pennsylvania actual generation percentage by energy source. Table C-2 represents existing generating facilities by County located in Pennsylvania.[57]

Table C-1 PJM Region Electrical Power Supply Mix

PJM Region Electricity Supply Mix 2018/2017/2016/2015/2014 (percent)										
Energy Source	Capacity					Generation				
	2018	2017	2016	2015	2014	2018	2017	2016	2015	2014
Coal	32.7	35.4	36.5	37.5	39.7	28.6	31.8	33.9	36.6	43.3
Nuclear	17.6	18	18.1	18.6	17.9	34.2	35.6	34.4	35.5	34.4
Natural Gas	40.2	36.8	35.7	34	30.7	30.9	27.1	26.7	23.4	17.8
Hydro,Wind, & Other	6.1	6	6	6	5.7	5.9	5.7	4.7	4.4	4.4
Oil	3.4	3.6	3.7	3.9	6	0.4	0.3	0.3	0.1	0.1

Chart C-1 future projected Pennsylvania capacity percentage by energy source through 2022

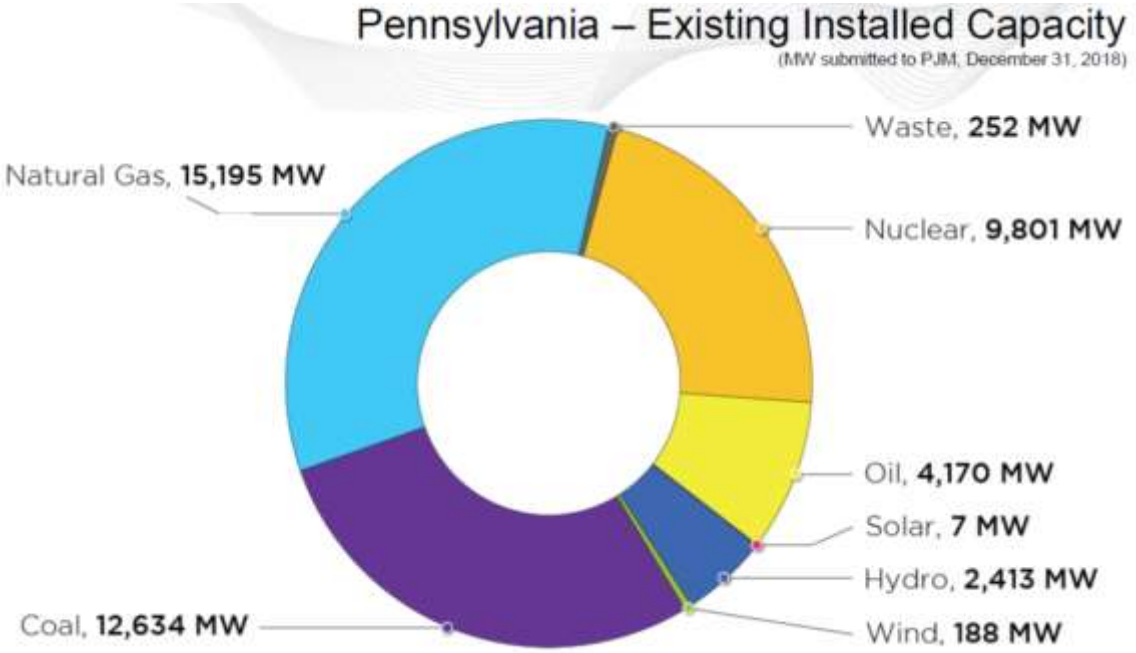


[56] *State of the Market Report for PJM*, Volume II, Sections 3 & 5 reporting years 2018, 2017, 2016, 2015, and 2014; available at www.monitoringanalytics.com.

[57] Data reported to SNL and received by PUC staff.

Chart C-2 Electrical Power Capacity Mix

2018 Pennsylvania Installed Capacity



2017 Pennsylvania Installed Capacity

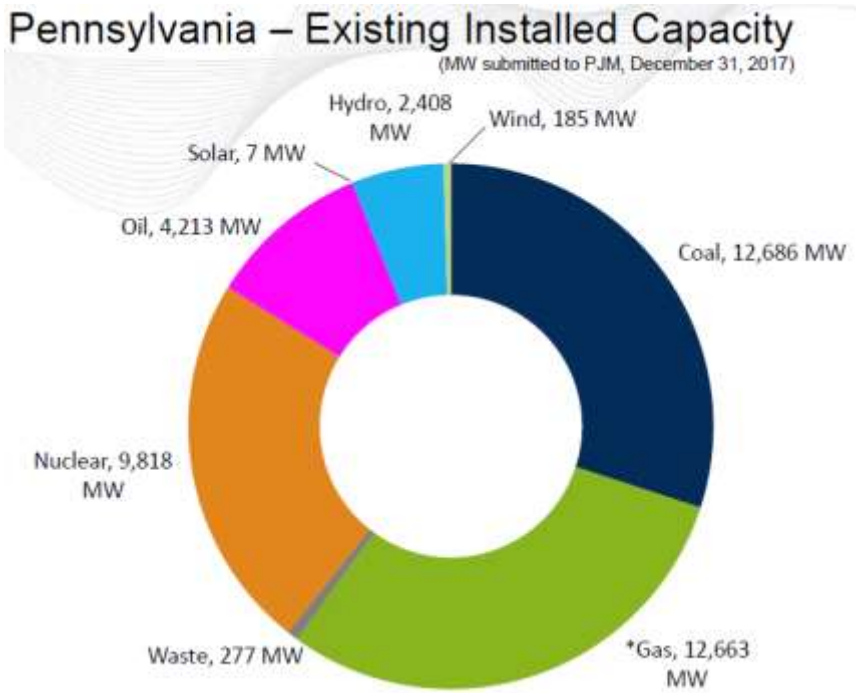
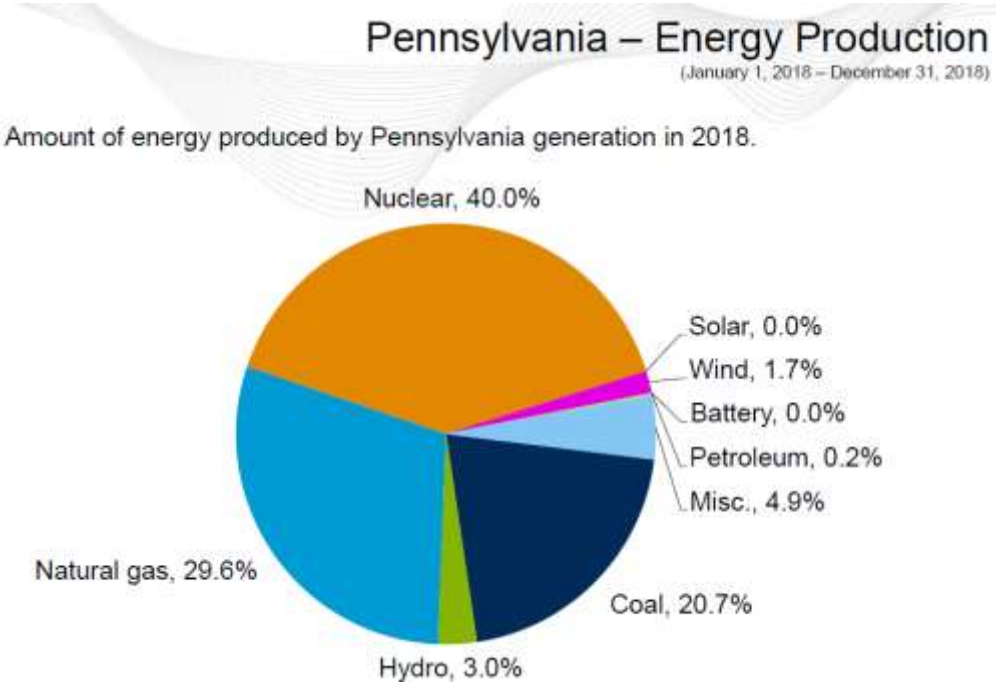


Chart C-3 Pennsylvania Electrical Power Generation Mix

2018 Actual Generation Production



2017 Actual Generation Production

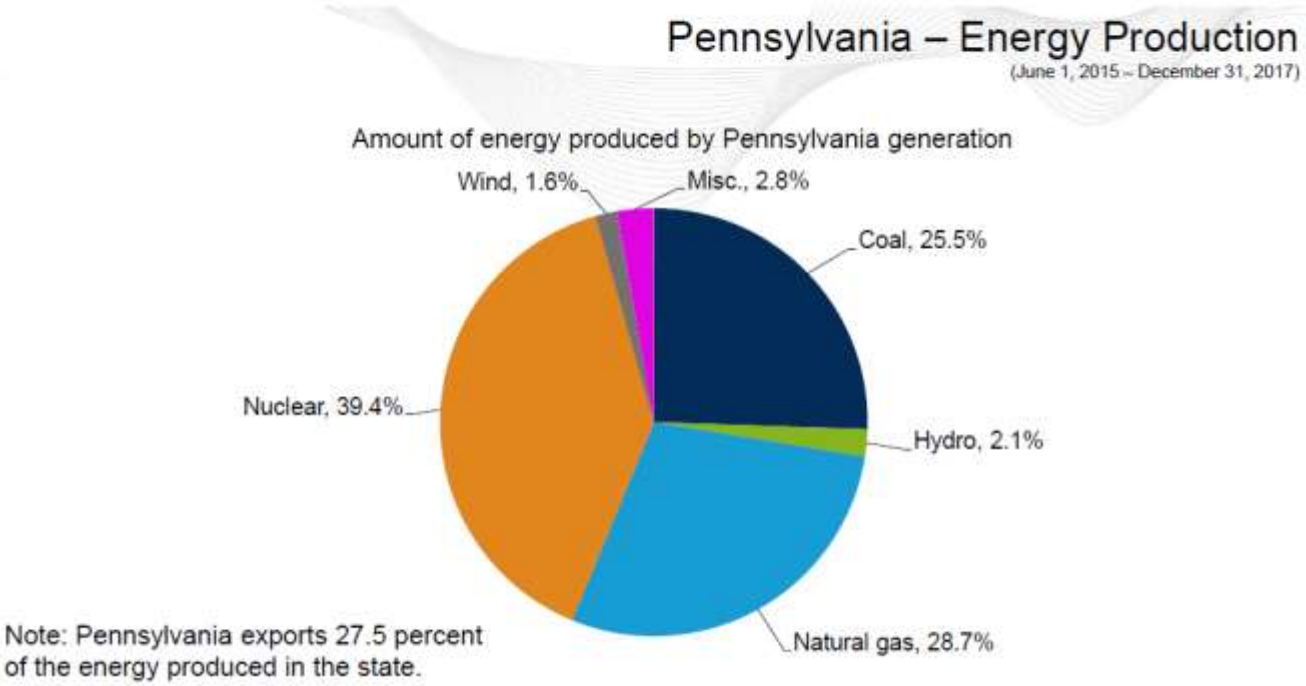


Table C-2 Electric Generating Facilities in Pennsylvania

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Adams	Gettysburg Energy & Nutrient Recovery Facility	EnergyWorks BioPower, Inc	EnergyWorks BioPower, Inc	3	2013	5	Steam Turbine
	Hamilton	NRG REMA , LLC	GenOn Holdings, Inc.	24	1971	47	Gas Turbine
	Hunterstown	NRG REMA , LLC	GenOn Holdings, Inc.	75	1971	47	Gas Turbine
	Hunterstown CC	Platinum Equity Advisors, LLC	Platinum Equity, LLC	810	2003	15	Combined Cycle
	Orrtanna	NRG REMA , LLC	GenOn Holdings, Inc.	26	1971	47	Gas Turbine
Allegheny	Allegheny Energy 3, 4 and 5 (Springdale)	Aspen Generating, LLC	LS Power Group	550	2003	15	Combined Cycle
	Allegheny Energy Units 1 and 2 (Springdale)	Aspen Generating, LLC	LS Power Group	88	1999	19	Gas Turbine
	Brunot Island	NRG Power Midwest LP.	GenOn Holdings, Inc.	15	1972	46	Gas Turbine
	Brunot Island CC	NRG Power Midwest LP.	GenOn Holdings, Inc.	269	1973	45	Combined Cycle
	Cheswick	NRG Power Midwest LP.	GenOn Holdings, Inc.	565	1970	48	Steam Turbine
	Clairton Works	United States Steel Corporation	United States Steel Corporation	26	1955	63	Steam Turbine
	Mon Valley Works	United States Steel Corporation	United States Steel Corporation	68	1943	75	Steam Turbine
	PPG Monroeville Chemicals Center	PPG Monroeville Chemicals Center	PPG Industries, Incorporated	1	1998	20	Internal Combustion
	PPG Place	PPG Industries, Incorporated	PPG Industries, Incorporated	2	1990	28	Internal Combustion
Armstrong	Allegheny 5	Multi-Owned	Multi-Owned	10	1988	30	Hydraulic Turbine
	Allegheny 6	Multi-Owned	Multi-Owned	12	1988	30	Hydraulic Turbine
	Allegheny 8 (Torrent Hydro)	Multi-Owned	Multi-Owned	14	1990	28	Hydraulic Turbine
	Allegheny 9 (Torrent Hydro)	Multi-Owned	Multi-Owned	18	1990	28	Hydraulic Turbine
	Armstrong County	LS Power Development, LLC	LS Power Group	676	2002	16	Gas Turbine
	Keystone	Multi-Owned	Multi-Owned	1700	1967	51	Steam Turbine
	Keystone IC	Multi-Owned	Multi-Owned	11	1968	50	Internal Combustion
	Mahoning Creek	Multi-Owned	Multi-Owned	7	2013	5	Hydraulic Turbine
Beaver	Beaver Solar	Eaton Corporation	Eaton Corporation plc	1	2012	6	Solar
	Beaver Valley	FirstEnergy Nuclear Generation, LLC	FirstEnergy Corp.	1872	1976	42	Nuclear
	Beaver Valley Patterson Dam	Multi-Owned	Multi-Owned	1	1982	36	Hydraulic Turbine
	Bruce Mansfield	FirstEnergy Generation, LLC	FirstEnergy Corp.	2490	1976	42	Steam Turbine
	Townsend Hydro	Beaver Falls Municipal Authority	Beaver Falls Municipal Authority	4	1987	31	Hydraulic Turbine
Berks	Altairnano PJM Li-ion Battery Storage Project	AES Energy Storage, LLC	AES Corporation	1	2009	9	Other
	Birdsboro Combined Cycle Plant	Multi-Owned	Multi-Owned	NA	2019	-1	Combined Cycle
	Morgantown Generating Station	Granger Electric Co	Granger Electric Co	2	2016	2	Internal Combustion
	Morgantown Solar Park	Hankin Group	Hankin Group	2	2011	7	Solar
	Ontelaunee Energy Center	Dynegy Power, LLC	Vistra Energy Corp.	624	2002	16	Combined Cycle
	Pioneer Crossing Landfill	Fortistar LLC	Fortistar LLC	8	2008	10	Internal Combustion
	Temple Solar Arrays Project	UGI Energy Services, Inc.	UGI Corporation	2	2011	7	Solar
	Titus CT	NRG REMA , LLC	GenOn Holdings, Inc.	35	1967	51	Gas Turbine
Blair	Allegheny Ridge Wind Farm	Leeward Renewable Energy, LLC	OMERS Administration Corporation	80	2007	11	Wind Turbine
	Chestnut Flats Windfarm	EDF Renewables Inc.	EDF Group	38	2011	7	Wind Turbine
	Juniata Locomotive Shop GT Project	Norfolk Southern Corporation	Norfolk Southern Corporation	2	2015	3	Gas Turbine
	North Allegheny Wind	Duke Energy Renewables, Inc.	Duke Energy Corporation	70	2009	9	Wind Turbine
	Sandy Ridge Wind Farm	Algonquin Power Fund (America) Inc.	Algonquin Power & Utilities Corp.	48	2012	6	Wind Turbine
Bradford	Alpaca Gas Project	IMG Midstream LLC	COFRA Holding AG	21	2017	1	Internal Combustion
	Beaver Dam Gas Project	IMG Midstream LLC	COFRA Holding AG	21	2016	2	Internal Combustion
	Milan Gas Project	IMG Midstream LLC	COFRA Holding AG	21	2017	1	Internal Combustion
	Northern Tier Landfill	Talen Renewable Energy	Energy Power Partners, LLC	2	2009	9	Internal Combustion
	Panda Liberty Generating Station (Moxie Liberty)	Multi-Owned	Multi-Owned	850	2016	2	Combined Cycle

Table C-2 Electric Generating Facilities in Pennsylvania (cont'd)

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Bucks	Croydon	Exelon Generation Company, LLC	Exelon Corporation	512	1974	44	Gas Turbine
	Exelon-Conergy Solar Energy Center	Conergy Ag	Kawa Capital Management, Inc.	2	2008	10	Solar
	Fairless Hills Steam Generating Station	Exelon Generation Company, LLC	Exelon Corporation	60	1996	22	Steam Turbine
	Fairless Works Energy Center	Starwood Energy Group Global, LLC	Starwood Energy Group Global, LLC	1320	2004	14	Combined Cycle
	Falls	Exelon Generation Company, LLC	Exelon Corporation	60	1970	48	Gas Turbine
	Pennsbury Generating Station	Exelon Generation Company, LLC	Exelon Corporation	5	1996	22	Gas Turbine
	Tullytown Landfill Gas Facility	WM Renewable Energy, LLC	Waste Management, Inc.	2	2013	5	Internal Combustion
	Wheelabrator Falls	Wheelabrator Technologies Holdings Inc.	Macquarie Group Ltd.	44	1994	24	Steam Turbine
Cambria	Cambria Cogeneration	Multi-Owned	Multi-Owned	88	1991	27	Steam Turbine
	Colver Power Project	Multi-Owned	Multi-Owned	110	1995	23	Steam Turbine
	Ebensburg Power Company	Revloc Reclamation Service, Inc.	Generation Holdings, LP	50	1991	27	Steam Turbine
	Highland North Wind Farm	BlackRock, Inc.	BlackRock, Inc.	75	2012	6	Wind Turbine
	Highland Wind Project	BlackRock, Inc.	BlackRock, Inc.	63	2009	9	Wind Turbine
	Patton Wind Farm	BlackRock, Inc.	BlackRock, Inc.	30	2012	6	Wind Turbine
Carbon	PA Solar Park Project	Consolidated Edison Development, Inc.	Consolidated Edison, Inc.	10	2012	6	Solar
	Panther Creek	Multi-Owned	Multi-Owned	83	1992	26	Steam Turbine
Centre	East Campus Plant	Pennsylvania State University	Pennsylvania State University	8	2011	7	Gas Turbine
	University Park Solar Project	SS Pa II PSU LLC	SS Pa II PSU LLC	2	2018	0	Solar
	West Campus Plant	Pennsylvania State University	Pennsylvania State University	5	1938	80	Steam Turbine
Chester	Andromeda One A Biomass Plant	Behrens Energy Agriculture & Robotics	Behrens Energy Agriculture & Robotics	4	2016	2	Internal Combustion
	Aqua Ingrams Mill Solar	Aqua Pennsylvania, Inc.	Aqua America Inc.	1	2009	9	Solar
	Longwood Gardens Solar Plant	Ecogy Pennsylvania Systems, Llc	Ecogy Pennsylvania Systems, Llc	1	2010	8	Solar
	Marlboro Mushrooms Solar Field	Marlborough Mushrooms	Marlborough Mushrooms	1	2011	7	Solar
	Pickering Solar	Aqua America Inc.	Aqua America Inc.	1	2012	6	Solar
	SECCRA Community Landfill	Southeastern Chester County Refuse Authority	Southeastern Chester County Refuse Authority	3	2007	11	Internal Combustion
Clarion	Piney	Multi-Owned	Multi-Owned	33	1924	94	Hydraulic Turbine
Clearfield	Shawville	NRG REMA , LLC	GenOn Holdings, Inc.	588	1954	64	Steam Turbine
	Shawville IC	NRG REMA , LLC	GenOn Holdings, Inc.	6	1960	58	Internal Combustion
Clinton	Lock Haven	Talen Energy Supply, LLC	Riverstone Holdings LLC	15	1969	49	Gas Turbine
Cumberland	Carlisle Area School District	Carlisle Area School District	Carlisle Area School District	1	2010	8	Solar
	Knouse Foods Solar Plant	Knouse Foods Cooperative Inc	Knouse Foods Cooperative Inc	3	2010	8	Solar
	Mountain	NRG REMA , LLC	GenOn Holdings, Inc.	50	1972	46	Gas Turbine
	PPG Industries Works 6 IC Facility	PPG Industries, Incorporated	PPG Industries, Incorporated	5	1972	46	Internal Combustion
	Shippensburg (Cumberland County) Landfill	Talen Renewable Energy	Energy Power Partners, LLC	6	2009	9	Internal Combustion
	West Shore	Talen Energy Supply, LLC	Riverstone Holdings LLC	31	1969	49	Gas Turbine
Dauphin	Harrisburg	Talen Energy Supply, LLC	Riverstone Holdings LLC	44	1967	51	Gas Turbine
	Paxton Creek Cogeneration	Multi-Owned	Multi-Owned	12	1986	32	Internal Combustion
	Susquehanna Resource Management Complex	Lancaster County Solid Waste Mgmt Authority	Lancaster County Solid Waste Mqmt Authority	22	1986	32	Steam Turbine
	Three Mile Island	Exelon Generation Company, LLC	Exelon Corporation	829	1974	44	Nuclear
Delaware	Chester	Exelon Generation Company, LLC	Exelon Corporation	54	1969	49	Gas Turbine
	Chester Operations	Kimberly-Clark Corp.	Kimberly-Clark Corp.	67	1986	32	Steam Turbine
	Delaware County Resource Recovery Facility	Covanta Energy Corporation	Covanta Holding Corporation	80	1991	27	Steam Turbine
	Eddystone 3-4	Exelon Generation Company, LLC	Exelon Corporation	760	1974	44	Steam Turbine
	Eddystone CT	Exelon Generation Company, LLC	Exelon Corporation	76	1967	51	Gas Turbine
	Liberty Electric Power	EquiPower Resources Corp.	Vistra Energy Corp.	562	2002	16	Combined Cycle
	Marcus Hook	Multi-Owned	Multi-Owned	847	2004	14	Combined Cycle
	Marcus Hook Cogeneration	Multi-Owned	Multi-Owned	50	1987	31	Gas Turbine

Table C-2 Electric Generating Facilities in Pennsylvania (cont'd)

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Elk	Johnsonburg Mill	Domtar Paper Company, LLC	Domtar Corp.	49	1993	25	Steam Turbine
Erie	Erie Coke Corporation	Erie Coke Corporation	Erie Coke Corporation	1	1953	65	Steam Turbine
	Lakeview Gas Recovery	WM Renewable Energy, LLC	Waste Management, Inc.	6	1997	21	Internal Combustion
Fayette	Allegheny Energy Units 8 and 9 (Gans Plant)	Aspen Generating, LLC	LS Power Group	88	2000	18	Gas Turbine
	Fayette Energy Facility	Vistra Energy Corp.	Vistra Energy Corp.	705	2003	15	Combined Cycle
	Mill Run Wind Farm	GlidePath Power Solutions LLC	Quinbrook Infrastructure Partners Pty Ltd.	15	2001	17	Wind Turbine
	South Chestnut Wind Project	Multi-Owned	Multi-Owned	50	2012	6	Wind Turbine
Franklin	Allegheny Energy Units 12 & 13 (Chambersburg)	Aspen Generating, LLC	LS Power Group	88	2001	17	Gas Turbine
	Falling Spring	Chambersburg Borough of	Chambersburg Borough of	7	1967	51	Internal Combustion
	IESI Blue Ridge Landfill	Talen Renewable Energy	Energy Power Partners, LLC	6	2013	5	Internal Combustion
	Mountain View Landfill	Multi-Owned	Multi-Owned	14	2003	15	Internal Combustion
	Orchard Park	Chambersburg Borough of	Chambersburg Borough of	23	2003	15	Internal Combustion
Huntingdon	Warrior Ridge Hydroelectric	American Hydro Power Co.	American Hydro Power Co.	3	1985	33	Hydraulic Turbine
	Wm F Matson Generating Station	Allegheny Electric Cooperative, Inc.	Allegheny Electric Cooperative, Inc.	22	1988	30	Hydraulic Turbine
Indiana	Conemaugh	Multi-Owned	Multi-Owned	1700	1970	48	Steam Turbine
	Conemaugh IC	Multi-Owned	Multi-Owned	11	1970	48	Internal Combustion
	Homer City	Multi-Owned	Multi-Owned	1895	1969	49	Steam Turbine
	Indiana University of Pennsylvania	Indiana University Of Pennsylvania	Indiana University Of Pennsylvania	24	1988	30	Internal Combustion
	Seward Waste Coal	Seward Generation, LLC	Robindale Energy Services, Inc.	521	2004	14	Steam Turbine
Lackawanna	Archbald Cogeneration	PEI Power Corporation	Energy Transfer LP	20	1988	30	Steam Turbine
	Archbald Power Station	PEI Power Corporation	Energy Transfer LP	59	2001	17	Gas Turbine
	Keystone Landfill	Keystone Recovery Inc.	Keystone Recovery Inc.	6	1995	23	Internal Combustion
	Lackawanna Energy Center	Multi-Owned	Multi-Owned	674	2018	0	Combined Cycle
Lancaster	Dart Container Corp Cogen	Dart Container Corporation	Dart Container Corporation	10	2012	6	Gas Turbine
	Elizabethtown Solar	Community Energy Solar LLC	Community Energy, Inc.	2	2016	2	Solar
	Frey Farm Landfill	Talen Renewable Energy	Energy Power Partners, LLC	2	2006	12	Internal Combustion
	Holtwood Hydroelectric Plant	Multi-Owned	Multi-Owned	249	1910	108	Hydraulic Turbine
	Honey Brook Generating Station (Granger)	Granger Energy of Honey Brook, L.L.C.	Granger Electric Co	3	2006	12	Internal Combustion
	Keystone Solar Project	Multi-Owned	Multi-Owned	5	2012	6	Solar
	Lancaster County Resource Recovery	Lancaster County Solid Waste Mgmt Authority	Lancaster County Solid Waste Mgmt Authority	32	1991	27	Steam Turbine
	Martin Limestone Solar Array Plant	Sunstream Energy Llc	Sunstream Energy Llc	1	2012	6	Solar
	Muddy Run Pumped Storage Facility	Exelon Generation Company, LLC	Exelon Corporation	1070	1967	51	Pumped Storage
	PA4 Solar Farm	Alchemy Renewable Energy	Alchemy Renewable Energy	NA	2019	-1	Solar
	Safe Harbor	Multi-Owned	Multi-Owned	418	1931	87	Hydraulic Turbine
	TPE Pennsylvania Solar 1	Alchemy Renewable Energy	Alchemy Renewable Energy	NA	2019	-1	Solar
	Turkey Point Wind Project (Frey Farm Wind)	Talen Renewable Energy	Energy Power Partners, LLC	3	2011	7	Wind Turbine
	Zook Generating Station (L&S Sweetners)	Granger Electric Co	Granger Electric Co	3	2013	5	Internal Combustion
Lawrence	New Castle	NRG Power Midwest LP.	GenOn Holdings, Inc.	320	1939	79	Steam Turbine
	New Castle IC	NRG Power Midwest LP.	GenOn Holdings, Inc.	5	1968	50	Internal Combustion
Lebanon	Fort Indiantown Gap Solar Project (FTIG)	Standard Solar, Inc.	Énergir, L.P.	NA	2019	-1	Solar
	Greater Lebanon Refuse Authority Landfill	Talen Renewable Energy	Energy Power Partners, LLC	3	2007	11	Internal Combustion
	PPL Ironwood	Helix Generation, LLC	LS Power Group	775	2001	17	Combined Cycle
Lehigh	Air Products Solar (Trexlertown Solar)	Air Products Energy Enterprises, L.P.	Air Products and Chemicals, Inc.	2	2011	7	Solar
	Allentown	Talen Energy Supply, LLC	Riverstone Holdings LLC	62	1967	51	Gas Turbine

Table C-2 Electric Generating Facilities in Pennsylvania (cont'd)

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Luzerne	AE Hunlock 4	UGI Development Company	UGI Corporation	45	2000	18	Gas Turbine
	Harwood	Talen Energy Supply, LLC	Riverstone Holdings LLC	30	1967	51	Gas Turbine
	Hazle Township Flywheel Energy Storage	Convergent Energy and Power LP	Energy Capital Partners LLC	20	2013	5	Other
	Hazleton Cogeneration	Starwood Energy Group Global, LLC	Starwood Energy Group Global, LLC	151	1989	29	Gas Turbine
	Hunlock Repowering	UGI Development Company	UGI Corporation	130	2011	7	Combined Cycle
	Jenkins	Talen Energy Supply, LLC	Riverstone Holdings LLC	31	1969	49	Gas Turbine
	MATS Wind	Electric City Wind Power Corporation	Electric City Wind Power Corporation	1	2008	10	Wind Turbine
	Moxie Freedom Generating Plant	Multi-Owned	Multi-Owned	1050	2018	0	Combined Cycle
	Romark PA Solar	Romark Logistics Of Pa, Inc.	Romark Logistics Of Pa, Inc.	2	2011	7	Solar
	Susquehanna Nuclear	Multi-Owned	Multi-Owned	2620	1983	35	Nuclear
	Wind Park Bear Creek Project	Multi-Owned	Multi-Owned	24	2006	12	Wind Turbine
Lycoming	Allenwood (PPLRE Lycoming County Landfill Project)	Talen Renewable Energy	Energy Power Partners, LLC	3	2012	6	Internal Combustion
	Laurel Hill	Duke Energy Renewables, Inc.	Duke Energy Corporation	69	2012	6	Wind Turbine
	Lycoming County Landfill Project (PPL Renewable)	Talen Renewable Energy	Energy Power Partners, LLC	3	2012	6	Internal Combustion
	Patriot Power Generation Plant (Moxie Patriot)	Multi-Owned	Multi-Owned	850	2016	2	Combined Cycle
	Williamsport	Talen Energy Supply, LLC	Riverstone Holdings LLC	29	1967	51	Gas Turbine
Mercer	General Electric Company	General Electric Company	General Electric Company	4	1984	34	Internal Combustion
Monroe	Pocono Raceway Solar Project	Pocono International Raceway Inc.	Pocono International Raceway Inc.	3	2010	8	Solar
	Shawnee CT	NRG REMA , LLC	GenOn Holdings, Inc.	24	1972	46	Gas Turbine
Montgomery	500 Virginia Solar	500 Virginia Solar, Lp	500 Virginia Solar, Lp	1	2011	7	Solar
	Barbadoes Energy Storage Unit	AES Energy Storage, LLC	AES Corporation	2	2013	5	Other
	Conshohocken -Solar	Sun Power Electric	Conservation Services Group, Inc.	0	1999	19	Solar
	Covanta Plymouth (Montenay Montgomery)	Covanta Plymouth Renewable Energy L.P.	Covanta Holding Corporation	28	1991	27	Steam Turbine
	Hill at Whitemarsh	Talen Renewable Energy	Energy Power Partners, LLC	2	2007	11	Internal Combustion
	IKEA Conshohocken Rooftop PV System	IKEA Energy US LLC	Stichting INGKA Foundation	1	2012	6	Solar
	Limerick	Exelon Generation Company, LLC	Exelon Corporation	2386	1986	32	Nuclear
	Merck-Upper Gwynedd Solar Array	Merck & Co., Inc.	Merck & Co., Inc.	2	2011	7	Solar
	Moser	Exelon Generation Company, LLC	Exelon Corporation	60	1970	48	Gas Turbine
	Spring House IC Plant	Janssen Pharmaceuticals, Inc.	Johnson & Johnson	4	2013	5	Internal Combustion
	West Point Facility	Merck & Co., Inc.	Merck & Co., Inc.	66	1989	29	Gas Turbine
	West Point Facility IC	Merck & Co., Inc.	Merck & Co., Inc.	17	1972	46	Internal Combustion
Montour	Montour	Talen Generation LLC	Talen Energy Corporation	1549	1971	47	Steam Turbine
Northampton	Bethlehem CC	Multi-Owned	Multi-Owned	1134	2003	15	Combined Cycle
	Bethlehem Landfill	Multi-Owned	Multi-Owned	5	2008	10	Gas Turbine
	Crayola Solar Park	Multi-Owned	Multi-Owned	3	2010	8	Solar
	Glendon Plant	Talen Renewable Energy	Energy Power Partners, LLC	3	2011	7	Internal Combustion
	Green Knight Energy Center	Waste Management, Inc.	Waste Management, Inc.	9	2001	17	Gas Turbine
	Lower Mount Bethel	Talen Energy Corporation	Riverstone Holdings LLC	628	2004	14	Combined Cycle
	Martins Creek 3 and 4	Talen Generation LLC	Talen Energy Corporation	1730	1975	43	Steam Turbine
	Martins Creek CT	Talen Generation LLC	Talen Energy Corporation	79	1971	47	Gas Turbine
	Northampton	Multi-Owned	Multi-Owned	112	1995	23	Steam Turbine
	Portland CT	NRG REMA , LLC	GenOn Holdings, Inc.	191	1967	51	Gas Turbine
Northumberland	Mount Carmel Cogeneration	Mt Carmel Co-Gen, Inc.	Private investors-Ken & Connie Pollock	43	1990	28	Steam Turbine

Table C-2 Electric Generating Facilities in Pennsylvania (cont'd)

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Philadelphia	Delaware CT	Exelon Generation Company, LLC	Exelon Corporation	74	1969	49	Gas Turbine
	Grays Ferry Cogeneration	Grays Ferry Cogeneration Partnership	Veolia Environnement S.A.	171	1997	21	Combined Cycle
	Lincoln Financial Field Solar Plant	Clearway Renew LLC	Global Infrastructure Partners	3	2013	5	Solar
	Navy Yard Natural Gas Plant	PIDC Local Development Corporation	PIDC Local Development Corporation	8	2018	0	Internal Combustion
	Newman & Company Inc.	Newman & Co Inc	Newman & Co Inc	2	1964	54	Steam Turbine
	Philadelphia Refinery	Multi-Owned	Multi-Owned	20	1952	66	Steam Turbine
	PWD Northeast WPCP Biogas Cogen	Philadelphia Water Department	Philadelphia Water Department	6	2013	5	Internal Combustion
	Richmond CT	Exelon Generation Company, LLC	Exelon Corporation	132	1973	45	Gas Turbine
	Schuylkill CT	Exelon Generation Company, LLC	Exelon Corporation	38	1969	49	Gas Turbine
	Southwark	Exelon Generation Company, LLC	Exelon Corporation	72	1967	51	Gas Turbine
	Temple SEGF Cogen Plant	Temple University	Temple University	16	1993	25	Internal Combustion
Pike	Wallenpaupack	Multi-Owned	Multi-Owned	44	1926	92	Hydraulic Turbine
Schuylkill	Broad Mountain Landfill Facility	UGI Development Company	UGI Corporation	10	2009	9	Gas Turbine
	Fishbach	Talen Energy Supply, LLC	Riverstone Holdings LLC	36	1969	49	Gas Turbine
	John B Rich Memorial Power Station	Multi-Owned	Multi-Owned	80	1988	30	Steam Turbine
	Locust Ridge II	Multi-Owned	Multi-Owned	102	2009	9	Wind Turbine
	Locust Ridge Wind Farm	Multi-Owned	Multi-Owned	26	2007	11	Wind Turbine
	Masser Farms Realty Solar	Masser Farms Realty, Ltd.	Masser Farms Realty, Ltd.	1	2011	7	Solar
	Pine Grove Landfill	Multi-Owned	Multi-Owned	5	2008	10	Internal Combustion
	St. Nicholas Cogeneration	Schuylkill Energy Resources Inc	Schuylkill Energy Resources Inc	86	1990	28	Steam Turbine
	Westwood Generating Station	Multi-Owned	Multi-Owned	30	1987	31	Steam Turbine
	Wheelabrator Frackville Cogeneration Facility	Wheelabrator Technologies Holdings Inc.	Macquarie Group Ltd.	43	1988	30	Steam Turbine
Snyder	Panda Hummel Station (Sunbury Repower CC)	Multi-Owned	Multi-Owned	1124	2018	0	Combined Cycle
	Sunbury CT	Corona Power, LLC	Corona Power, LLC	36	1971	47	Gas Turbine
	Sunbury IC	Corona Power, LLC	Corona Power, LLC	5	1967	51	Internal Combustion
	Susquehanna University Solar Project	WGL Energy Systems, Inc.	AltaGas Ltd.	3	2018	0	Solar
Somerset	Casselman Wind	Multi-Owned	Multi-Owned	35	2007	11	Wind Turbine
	Forward WindPower LLC	Multi-Owned	Multi-Owned	29	2008	10	Wind Turbine
	Glades Pike Cogeneration Plant (CT)	State Correctional Institution (Laurel Highlands)	State Correctional Institution (Laurel Highlands)	3	2011	7	Gas Turbine
	Glades Pike Cogeneration Plant IC	State Correctional Institution (Laurel Highlands)	State Correctional Institution (Laurel Highlands)	3	2011	7	Internal Combustion
	Green Mountain Battery Storage System	NextEra Energy Resources LLC	NextEra Energy, Inc.	10	2016	2	Other
	Lookout WindPower LLC	Multi-Owned	Multi-Owned	38	2008	10	Wind Turbine
	Meyersdale Wind Project	GlidePath Power Solutions LLC	Quinbrook Infrastructure Partners Pty Ltd.	30	2003	15	Wind Turbine
	Ringer Hill Wind Farm	Multi-Owned	Multi-Owned	38	2016	2	Wind Turbine
	Somerset Wind Project	GlidePath Power Solutions LLC	Quinbrook Infrastructure Partners Pty Ltd.	9	2001	17	Wind Turbine
	Stony Creek Wind Farm	Multi-Owned	Multi-Owned	53	2009	9	Wind Turbine
	Twin Ridges Wind Farm	BlackRock, Inc.	BlackRock, Inc.	139	2012	6	Wind Turbine
	Yough Hydro Power	D/R Hydro Company	D/R Hydro Company	12	1989	29	Hydraulic Turbine
Susquehanna	Roundtop	IMG Midstream LLC	COFRA Holding AG	21	2015	3	Internal Combustion
Tioga	Armenia Mountain Wind	ALLETE Clean Energy, Inc.	ALLETE, Inc.	101	2009	9	Wind Turbine
	Blossburg	NRG REMA , LLC	GenOn Holdings, Inc.	24	1971	47	Gas Turbine
Union	Bucknell University	Bucknell University	Bucknell University	7	1991	27	Combined Cycle
Venango	Handsome Lake Energy	Constellation Power, Inc.	Exelon Corporation	268	2001	17	Gas Turbine
	Scrubgrass	Multi-Owned	Multi-Owned	88	1993	25	Steam Turbine

Table C-2 Electric Generating Facilities in Pennsylvania (cont'd)

County	Plant	Owner	Ultimate Parent	Operating Capacity (MW)	Year First Unit in Service	Age	Technology Type
Warren	Kinzua Pumped Storage Project (Seneca)	Harbor Hydro Holdings, LLC	LS Power Group	513	1970	48	Pumped Storage
	Warren CT	NRG REMA , LLC	GenOn Holdings, Inc.	57	1972	46	Gas Turbine
Washington	Arden Landfill	WM Renewable Energy, LLC	Waste Management, Inc.	5	2009	9	Internal Combustion
Wayne	Waymart Wind Farm	GlidePath Power Solutions LLC	Quinbrook Infrastructure Partners Pty Ltd.	65	2003	15	Wind Turbine
Westmoreland	Conemaugh Hydroelectric	Multi-Owned	Multi-Owned	15	1989	29	Hydraulic Turbine
	Tenaska Westmoreland Generating Station	Multi-Owned	Multi-Owned	940	2018	0	Combined Cycle
Wyoming	Mehoopany	The Procter & Gamble Company	The Procter & Gamble Company	2	1984	34	Steam Turbine
	Mehoopany CT	The Procter & Gamble Company	The Procter & Gamble Company	123	1985	33	Gas Turbine
	Mehoopany Wind	Multi-Owned	Multi-Owned	143	2012	6	Wind Turbine
York	Brunner Island	Talen Generation LLC	Talen Energy Corporation	1460	1961	57	Steam Turbine
	Brunner Island IC	Talen Generation LLC	Riverstone Holdings LLC	7	1967	51	Internal Combustion
	P.H. Glatfelter Company - Pennsylvania	P H Glatfelter Co	P H Glatfelter Co	85	1948	70	Steam Turbine
	Peach Bottom	Multi-Owned	Multi-Owned	2627	1974	44	Nuclear
	Tolna	NRG REMA , LLC	GenOn Holdings, Inc.	50	1972	46	Gas Turbine
	Turnkey Project - GlaxoSmith	GlaxoSmithKline	GlaxoSmithKline	2	2010	8	Solar
	York 2 Energy Center	Multi-Owned	Multi-Owned	NA	2019	-1	Combined Cycle
	York Cogeneration	Sapphire Power Generation Holdings LLC	Riverstone Holdings LLC	47	1989	29	Combined Cycle
	York County Resource Recovery Center	York County Solid W & R Authority	York County Solid W & R Authority	30	1989	29	Steam Turbine
	York Energy Center (Delta Power Project)	Multi-Owned	Multi-Owned	545	2011	7	Combined Cycle
	York Haven	Multi-Owned	Multi-Owned	19	1905	113	Hydraulic Turbine

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