



PENNSYLVANIA NATURAL GAS OUTLOOK REPORT

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Section 1 - Exposition

I. Introduction

The Public Utility Code requires natural gas distribution companies (NGDCs) to file annual financial reports with the Pennsylvania Public Utility Commission (PUC).¹ These Reports detail financial and accounting data, including revenues and expenses. NGDCs also are required to file annual resource planning reports (ARPR) with the PUC.² NGDCs with sales of 8 billion cubic feet (Bcf) of gas per year or more must file these reports, which include the past year's historical data, program changes and the next three-year forecast of demand requirements.³

This report has been prepared using information filed by the NGDCs, including the information in the reports noted above, as well as the U.S. Energy Information Administration (EIA) and other sources. The most recent available data is reported, although much of the EIA production and reserves data has a one-year lag for reporting. With the uncertainty of the unconventional gas supplies, EIA has not presented proven reserves information since 2009.

¹ 52 Pa. Code § 59.48.

² 52 Pa. Code § 59.81.

³ The NGDCs in PA with sales of 8 Bcf or more include Philadelphia Gas Works (PGW), PECO Energy Company (PECO), Columbia Gas of PA (Columbia), Peoples Natural Gas Company (Peoples), UGI, and National Fuel Gas Distribution Company (NFG).

II. Executive Summary

The PUC's Bureau of Technical Utility Services has prepared this report to summarize the 2020 financial and supply and demand data for the Pennsylvania NGDCs. This report also presents several topics of interest regarding the Pennsylvania natural gas industry. National trends in the natural gas industry are affected by trends and events in Pennsylvania. Therefore, macroeconomic and industry data for the entire U.S. are included in this report.

National Summary

The national natural gas storage inventory peak for the 12 months prior to this winter heating season⁴ was 3.9 trillion cubic feet (Tcf). This was 0.2 Tcf higher than the peak from the prior injection season. Domestic dry natural gas production in the U.S. averaged 91.7 billion cubic feet per day (Bcfd) in 2020, which was a decrease of 1.2% from 2019.⁵ Domestic consumption in 2020 was 83.5 Bcfd, which is a decrease of 1.8 Bcfd from 2019. Henry Hub spot prices averaged \$2.03 per million British thermal units (MMBtus) in 2020, which is a decrease of 20.7% from \$2.56 in 2019.⁶ So far, 2021 has shown a sharp reversal in the downward pricing trend, with an average price of \$3.69. Additionally, an analysis of Henry Hub natural gas futures contracts in comparison to Henry Hub spot prices⁷ shows an expected increase in prices in 2022; producing a national average price of \$4.37/MMBtu for 2022.⁸

⁴ 2020-2021 heating season.

⁵ EIA, *EIA Natural Gas Gross Withdrawals and Production*, available at <http://www.eia.gov>.

⁶ Henry Hub is a distribution hub in Louisiana. The price at this delivery point is frequently used by industry and trading markets as a benchmark for natural gas prices.

⁷ CME Group, available at <http://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>.

⁸ EIA, *EIA Short Term Energy Outlook*, available at <http://www.eia.gov>.

Pennsylvania Summary

There are nearly 3.1 million natural gas customers in Pennsylvania, with about 2.8 million residential customers.⁹ There are 26 regulated natural gas utility companies in Pennsylvania, and 6 of these are major distribution companies with gross revenues greater than \$40 million per year.¹⁰ Pennsylvania's natural gas infrastructure includes intrastate pipelines, interstate pipelines, landfill gas pipeline projects, propane facilities and liquefied natural gas (LNG) facilities. Infrastructure needs are being met by expansion and replacement of existing pipelines, with new pipelines and compressor stations being constructed.

As of Oct. 15, 2021, 29,580 unconventional drilling permit applications have been filed with the Pennsylvania Department of Environmental Protection (560 new applications YTD 2021).¹¹ Of those 29,580 applications, 13,190 unconventional wells have been drilled.¹² As of Oct. 15, 2021, there were 17 rotary rigs active in Pennsylvania, a 15% decrease in of the number of active rigs a year ago. Rotary rigs are a piece or set of equipment, usually mobile, that is used to provide the rotational force needed to drill a borehole. The rotary rig count is an indicator of how many rigs are in service and the demand for drilling equipment.¹³ The EIA estimates that there were 68,929 producing shale and conventional gas wells in Pennsylvania in 2020, which is a 1.7% decrease from 2019.¹⁴

Financial statistics taken from the Gas Annual Reports of the NGDCs are presented in Section VII, in time series fashion from 2010 through 2020. Sections V through VII present broad category financial data for several categories, including revenue, expenses, plant in service,

⁹ EIA, *EIA Number of Natural Gas Consumers*, available at <http://www.eia.gov>.

¹⁰ \$40 million in gross revenue is the threshold over which an NGDC files under 66 Pa. C.S. § 1307(f) to recover natural gas costs.

¹¹ A conventional gas well is typically shallower than an unconventional well, and drills into a pocket or reservoir of gas. Such wells generally rely on the natural pressure to extract the gas once the well is drilled. An unconventional well uses more sophisticated means to extract gas from underground deposits, typically by hydraulic fracturing of shale structures (fracking). These unconventional wells also tend to require drilling to much greater depths than conventional wells.

¹² See *PA DEP Well Permit Workload Report*, available at <http://www.dep.pa.gov/DataandTools/Reports/Oil%20and%20Gas%20reports/Pages/default.aspx>.

¹³ Baker Hughes, rotary rig count, available at <http://www.bakerhughes.com/rig-count>.

¹⁴ EIA, *Number of Producing Gas Wells*, available at <http://www.eia.gov>.

depreciation, maintenance, and gas costs. Data on the number of customers, reserves, wellhead prices, Pennsylvania production and average consumption is also provided.

The following are a few of the notable statistics contained in this report:

- Total natural gas consumption in Pennsylvania has increased from 706.2 Bcf in 1997 to 1,714 Bcf in 2020.
- Pennsylvania gas production reached 7.1 Tcf in 2020, up from only 121 Bcf (0.12 Tcf) in 1997, and up 3.6% from 2019.
- Gas deliveries for Pennsylvania electric generation have increased markedly from 3% of total deliveries in 1997, to 58% in 2020, or 20 Bcf in 1997 as compared to 826 Bcf in 2020.¹⁵ This has accelerated dramatically in recent years, with an increase of 22.8% year over year, from 675 Bcf in 2019 to 826 Bcf in 2020.

¹⁵ EIA, *Natural Gas Consumption by End Use*, available at <http://www.eia.gov>.

III. Pennsylvania Natural Gas Infrastructure

Pipelines

Twenty interstate natural gas pipelines exist in the Northeast Region, which includes Connecticut, Delaware, Massachusetts, Maine, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Virginia and West Virginia. These interstate pipelines deliver to several intrastate pipelines and more than 50 local distribution companies (LDCs). They also deliver to natural gas-fired electric generating facilities and large industrial customers. The pipelines in Pennsylvania have access to natural gas production from the South and Midwest, from the Rocky Mountains via the Rockies Express Pipeline, from Canada, and from the Marcellus and Utica Shales that span large portions of Pennsylvania, Ohio, and West Virginia.¹⁶

Marcellus shale production in the northeast U.S. has risen from 0.5 Bcfd in January 2010 to 34.8 Bcfd in October 2021. Despite this vast increase in production, many portions of eastern Pennsylvania and New England are still subject to higher priced gas, as well as dramatic spikes in price during cold snaps in the winter heating season. These price differences are mostly caused by a lack of pipeline capacity to transport supply to the markets with demand. There are 3.2 Bcfd of pipeline projects that have been, or are scheduled to be, placed in service in the Northeast region in 2021. A further 3.5 Bcfd of projects are scheduled to be placed in service in 2021, as shown in Tables 1 and 2 below, respectively. The additional pipelines are intended to remove some of the above-mentioned constraints and may assist in stabilizing regional prices by moving the increased Marcellus Shale gas production to market or linking other sources of gas to the Northeast region.¹⁷

¹⁶ EIA, Natural Gas Pipelines in the Northeast Region, *About U.S. Natural Gas Pipelines*, available at <http://www.eia.gov>.

¹⁷ EIA, *EIA Marcellus Region Drilling Productivity Report*, available at <http://www.eia.gov>.

Table 1: Proposed Pipeline Infrastructure for 2021 In-Service in the Northeast Region^{18 19}

Project Name	Pipeline Operator Name	State(s)	Additional Capacity (MMcf/d)
261 Upgrade Projects	Tennessee Gas Pipeline Co	MA,CT	72
Adelphia Gateway Project	Adelphia	PA	250
Appalachia to Market Project	Texas Eastern Transmission	PA	18
Atlantic Bridge Project Phase 2	Algonquin Gas Transmission	NJ,NY,CT,RI,MA	93
Bailey East Mine Panel 11J Project	Texas Eastern Transmission	WV	0
Bernville Compression Station Project	Texas Eastern Transmission	PA	0
Del-Mar Energy Pathway Project	Eastern Shore Natural Gas	MD,DE	14
FM 100 Project	National Fuel Gas Supply Corp	PA	330
Greater Philadelphia Expansion	Texas Eastern Transmission	PA	475
Greene Interconnect Project	Mountain Valley Pipeline, LLC	WV	0
Leidy North Project	Dominion Energy Transmission Co	PA,NY	10
Leidy South Project	Transcontinental Gas Pipeline	PA,MD,DE	580
Line SM-116 Forced Relocation Project	TC Energy	WV	0
Long Ridge Lateral	Equitrans Midstream Corporation	OH	0
Marshall County Mine Panels 19E and 20E Projects	Texas Eastern Transmission	WV	0
Middlesex Expansion Project	Texas Eastern Transmission	NJ	264
PennEast Pipeline Phase 1 ²⁰	PennEast Pipeline Co	PA	1,107
TriState Corridor Pipeline Project	Equitrans Midstream Corporation	PA,WV	140
West Loop Project	Dominion Energy Transmission Co	PA, OH	150

¹⁸ EIA, EIA Natural Gas Pipeline Projects, available at <http://www.eia.gov>.

¹⁹ Some projects providing 0 MMcf/d additional capacity are designed to meet new regulations, or to provide additional flexibility in deliverability to underserved or new areas of consumption.

²⁰ As of the date of this report, the final determination of whether this pipeline would be constructed had not yet been determined.

Table 2: Proposed Pipeline Infrastructure for 2022 In-Service in the Northeast Region^{21 22}

Project Name	Pipeline Operator Name	State(s)	Additional Capacity (MMcf/d)
Central Corridor Pipeline Extension	Duke Energy Ohio	OH	1
Mid-Atlantic Chiller Project	Eastern Gas Transmission and Storage	PA, VA	25
Mountain Valley Pipeline	Mountain Valley Pipeline, LLC	WV,VA	2,000
Supply Header Project	Dominion Energy Transmission Co	PA,WV	1,500
Yorktown Meter Station Upgrade	Algonquin Gas Transmission	NY	21

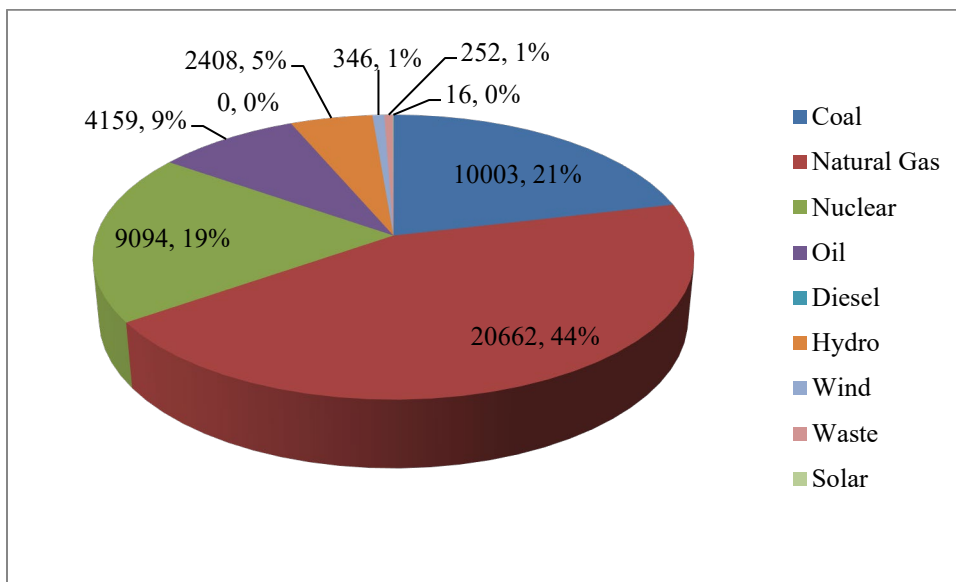
²¹ EIA, EIA Natural Gas Pipeline Projects, available at <http://www.eia.gov>

²² Some projects providing 0 MMcf/d additional capacity are designed to meet new regulations, or to provide additional flexibility in deliverability to underserved or new areas of consumption.

IV. Natural Gas Generation and End Uses in Pennsylvania

By the end of 2020, Pennsylvania had 20,662 megawatts (MWs) of natural gas fired electric generation installed capacity, as shown by comparison to other capacity fuel sources in Chart 1, below.²³ These facilities constitute 46.2% of Pennsylvania’s generating capacity, up from 41.6% the prior year, making natural gas the largest portion of Pennsylvania’s generation mix for the third year in a row. The change in the share of natural gas capacity was predominantly caused by a 2,087 MW increase in natural gas capacity, while most other capacity sources remained relatively unchanged.²⁴ Chart 2, below, shows the percentage of generation capacity by fuel source over time, from 2010 through 2020. Chart 2 also shows that natural gas has been steadily increasing as a share of the total capacity in PA, firmly overtaking coal in 2018, and further increasing its dominance in Pennsylvania through 2020.

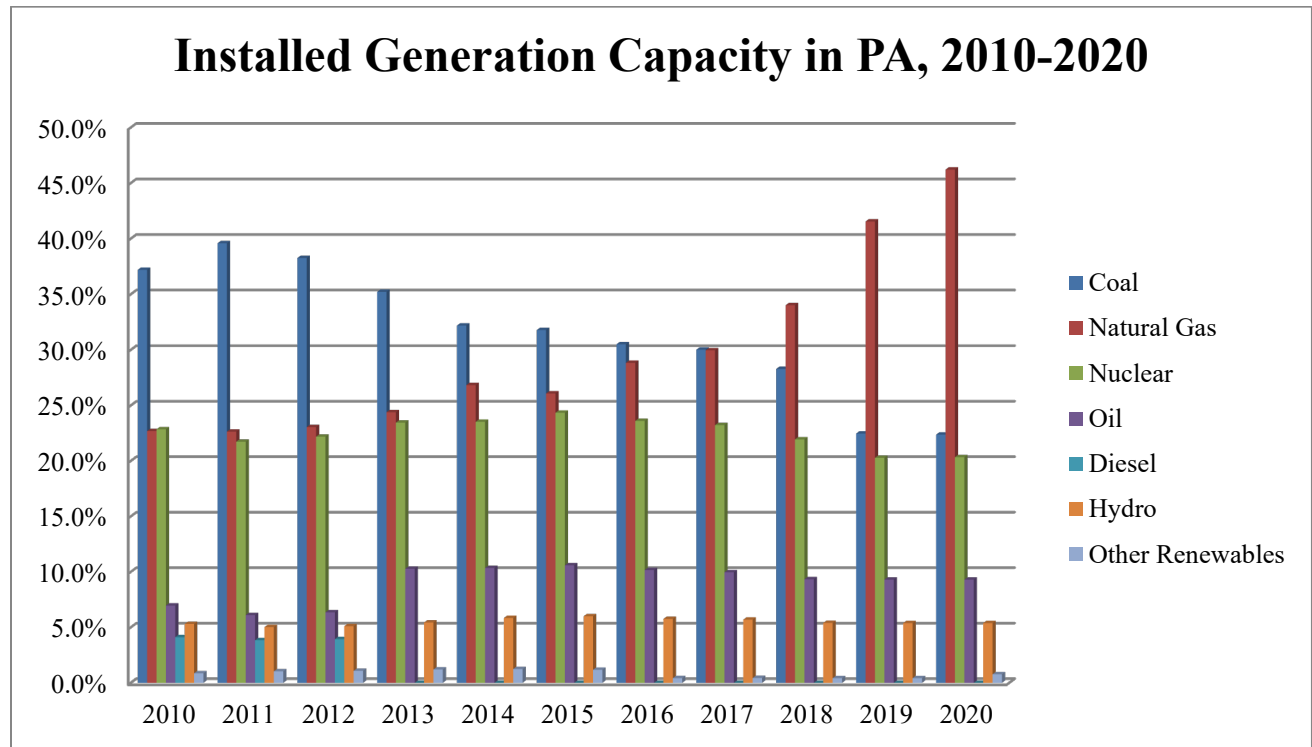
Chart 1: Capacity in Pennsylvania by Fuel Type at Year End 2020 (MW)



²³ Data from PJM’s 2020 PA State Report

²⁴ While a relatively small portion of Pennsylvania’s total capacity, wind saw a substantial increase of 158 MW, an increase of 84% from 2019.

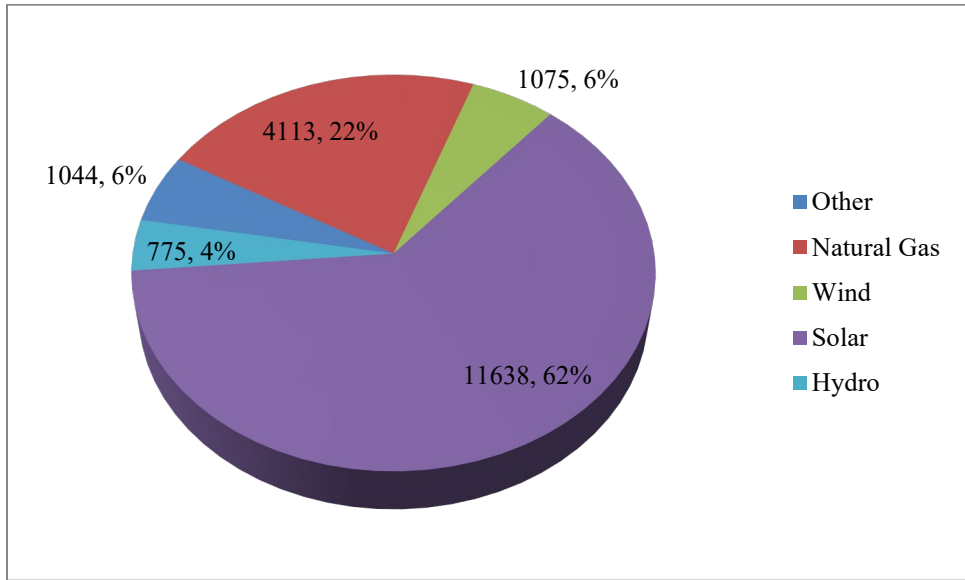
Chart 2: Installed Generation Capacity in PA, 2010-2020



Charts 3 and 4, below, summarize the PJM queue for new electric generation capacity for Pennsylvania as of Dec. 31, 2020. The queue includes 4,113 MW of proposed new natural gas fired capacity, making up 22% of the PJM queue for Pennsylvania, representing a reduction from 2019, when natural gas made up 42% of the total queue. This is due predominantly to a substantial increase in solar resource in the PJM queue this year. However, PJM treats intermittent energy sources, such as solar, wind, and storage facilities differently than other generation sources when bidding into PJM’s capacity market. These facilities are assigned an Unforced Capacity value (UCAP) by PJM, which is a fraction of the Installed Capacity (ICAP), or nameplate value for the facility. For wind resources, UCAP is roughly 15% of ICAP on average, and for solar resources it is roughly 50% of ICAP. With this in mind, Chart 4 shows the PJM queue with UCAP values for the appropriate resources in the queue. In Chart 4, we can see

that natural gas takes up 32% of the PJM queue for Pennsylvania.^{25 26} As mentioned above, of note this year is the dramatic increase in Solar projects in the queue, taking up 62% of the ICAP total, substantially higher than natural gas. Typically, about 25% of the projects in PJM’s queue are actually built.²⁷

Chart 3: Queued Capacity (ICAP) in Pennsylvania by Fuel Type (MW)

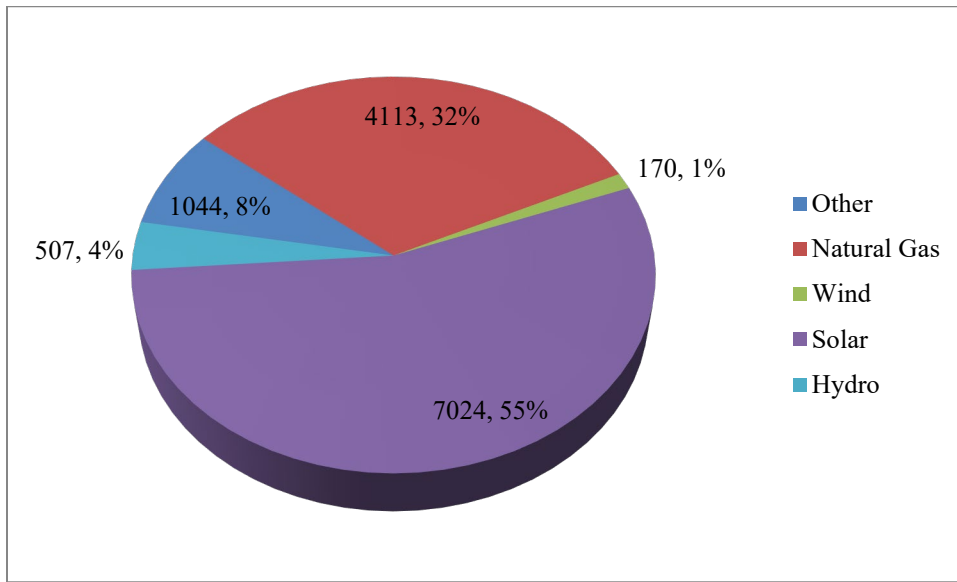


²⁵ PJM Pennsylvania State Report 2020

²⁶ The largest component of the “Other” fuel types based is Storage (988 MW), followed by Nuclear (44 MW).

²⁷ PJM, *PJM Regional Transmission Expansion Plan Report*, available at <http://www.pjm.com>.

Chart 4: Queued Capacity (UCAP) in Pennsylvania by Fuel Type (MW)



Charts 5 and 6, below, compare the gas consumed in Pennsylvania for electric generation compared to other end-uses in 1997 and 2020, respectively. As depicted, the fraction of natural gas usage for electric generation has dramatically increased. Reasons for this increase include: greater supply of natural gas and the resultant lower cost for natural gas; the advancement of efficient natural gas fueled electric generation technology; and retirements of older coal-fired and nuclear power plants. As the composition of the generating fleet changes to more gas-fired units, pressure will continue to increase on the natural gas industry to augment production and transportation capacity.

Chart 5: Natural Gas Consumption in Pennsylvania by End Use 1997²⁸

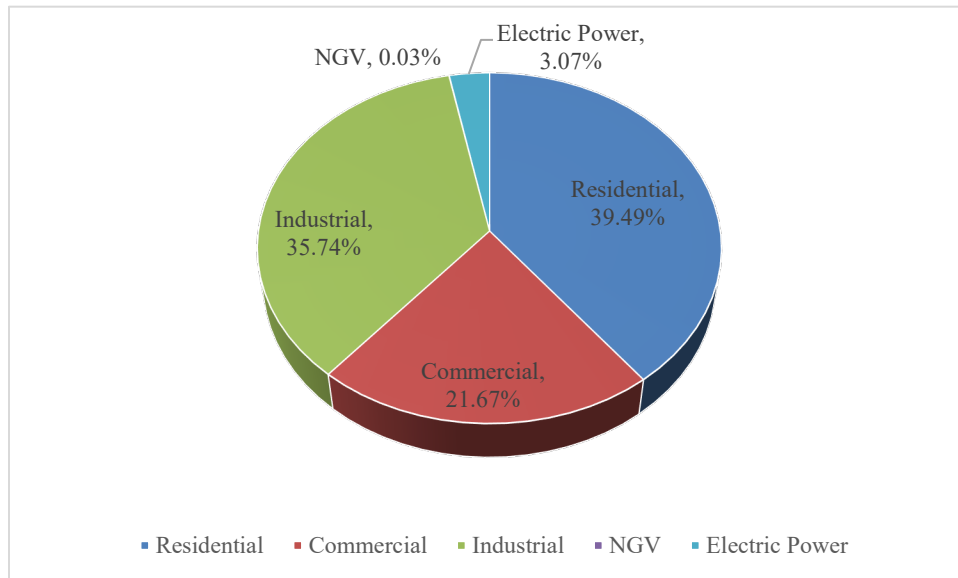
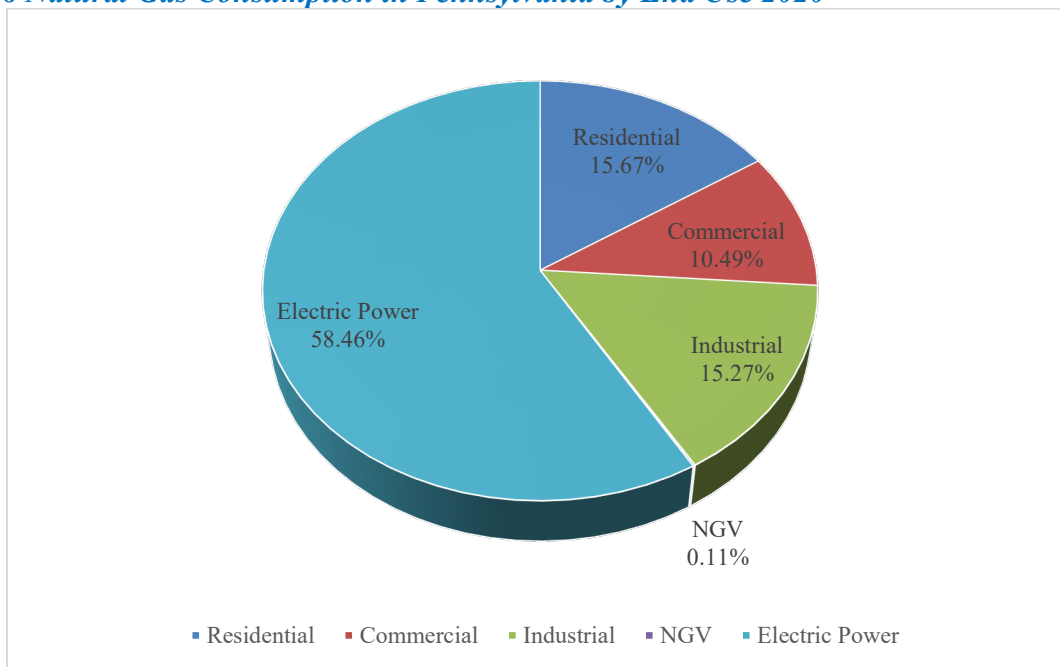


Chart 6 Natural Gas Consumption in Pennsylvania by End Use 2020

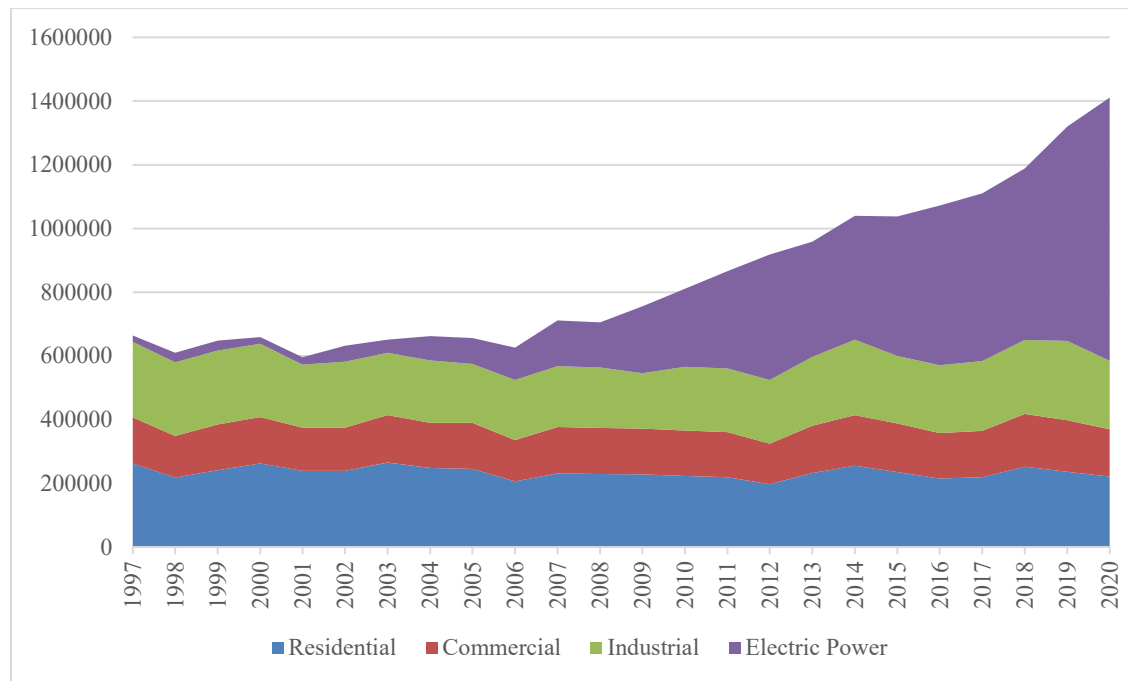


The dramatic shift in the use of natural gas from primarily residential, commercial, and industrial uses to electric power generation has been occurring steadily over the period from 1997 through

²⁸ NGV = Natural Gas Vehicles

2020, with a marked acceleration beginning in 2008 as Marcellus Shale production ramped up, as seen in Figure 1, below. Notably, natural gas usage for electric generation increased over 128% from 2013 to 2020, rising 463 Bcf, while total usage increased only 453 Bcf over the same period.²⁹ Gas usage for all other end uses generally increased over this period, although residential and commercial usage saw a slight drop in 2020, likely due to the drop in demand during the COVID-19 pandemic. Regardless of the slight drop in 2020 for residential and commercial consumption, the increase in gas usage appears to be overwhelmingly driven by its increased use as a fuel for electric power generation. Electric consumption was up dramatically year over year, with a 22.8% increase in 2020 as compared to 2019.³⁰

Figure 1: Natural Gas Deliveries in Pennsylvania by End Use 1997-2020



²⁹ Usage for NGVs actually increased over this time period, but since the amount going to this sector is so small, it is negligible for the purposes of the analysis in this section. NGV usage went from 312 MMcf to 1595 MMcf, an increase of 411% from 2013-2020.

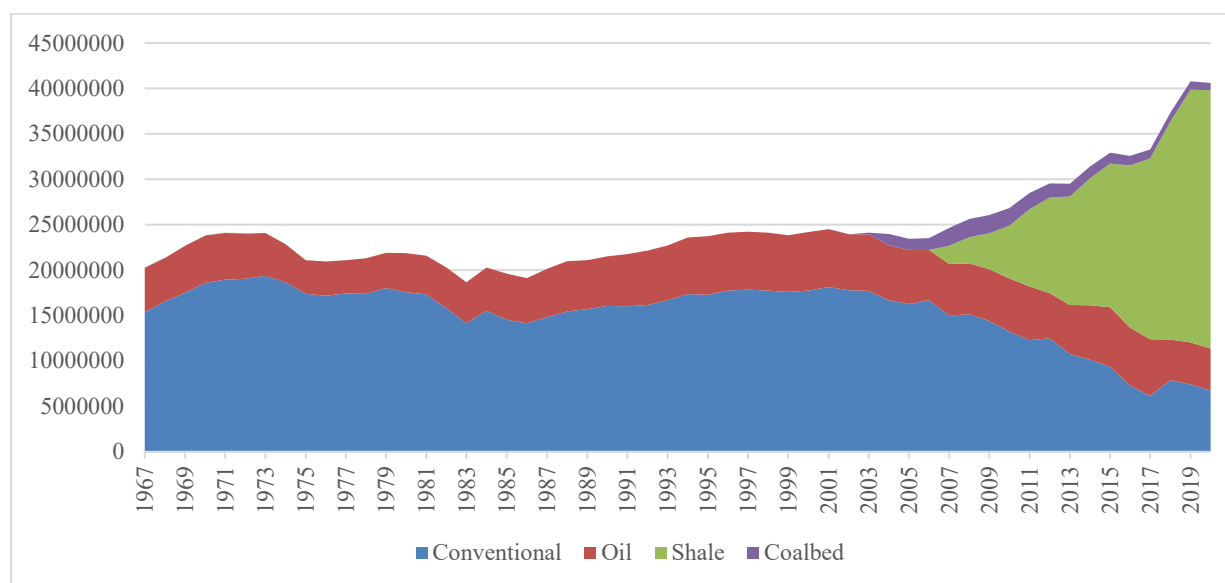
³⁰ PUC *Electric Power Outlook Report*, August 2021

V. Natural Gas Production, Consumption, Reserves, and Prices

United States

Total U.S. withdrawals of natural gas were 40.6 Tcf in 2020, of which, gross withdrawals of unconventional shale gas were 28.4 Tcf.³¹ As shown in Figure 2 below, this is the eighth consecutive year in which unconventional shale gas withdrawals outpaced conventional gas wells in the U.S. This trend is accelerating, with the spread between shale and conventional gas production increasing from 1.2 Tcf in 2013 to 21.7 Tcf in 2020. Total US withdrawals of natural gas decreased very slightly by 0.2 Tcf in 2020, a 0.5% decrease from 2019.

Figure 2: US Gross Natural Gas Withdrawals (MMcf), 1967-2020



The national storage inventory peak for the prior heating season was 3.9 Tcf and was reached in November 2020. This is up from the peak from the prior injection season of 3.7 Tcf in November 2019. Dry natural gas production in the U.S. averaged 91.7 Bcfd in 2020. This was a decrease of 1.2% from 2019. Over the past decade, U.S. domestic dry natural gas production has

³¹ EIA, *EIA Natural Gas Summary*, available at <http://www.eia.gov>.

increased an average of 5.7% per annum.³² Domestic natural gas consumption was 83.5 Bcfd in 2020, down from 85.3 Bcfd from 2019.³³ Henry Hub spot prices averaged \$2.03 in 2020, a decrease of 20.7% from \$2.56/MMBtu in 2019.

An analysis of Henry Hub natural gas futures contracts in comparison to Henry Hub spot prices³⁴ shows an expected increase in price over the coming year. 2021 has averaged \$3.69/MMBtu so far, while the average projected price is \$4.37/MMBtu for 2022.³⁵ Figure 3, below, shows the futures prices for Henry Hub through May 2023 delivery dates. Although the Henry Hub price is frequently used as a benchmark for the “price” of natural gas, there are significant differences in price at delivery points based on geography. For example, the Dominion South Hub is located in southwestern Pennsylvania, which is in the middle of the Marcellus and Utica Shale plays. Based on past spot prices, Henry Hub prices are generally higher, with an average basis spread of \$0.30/MMBtu to \$0.80/MMBtu.³⁶ Although it is purely speculative, if this pricing trend were to continue going forward, we could expect lower pricing in 2022 at the Dominion South Hub compared to Henry Hub.

³² EIA, *Natural Gas Gross Withdrawals and Production*, available at <http://www.eia.gov>.

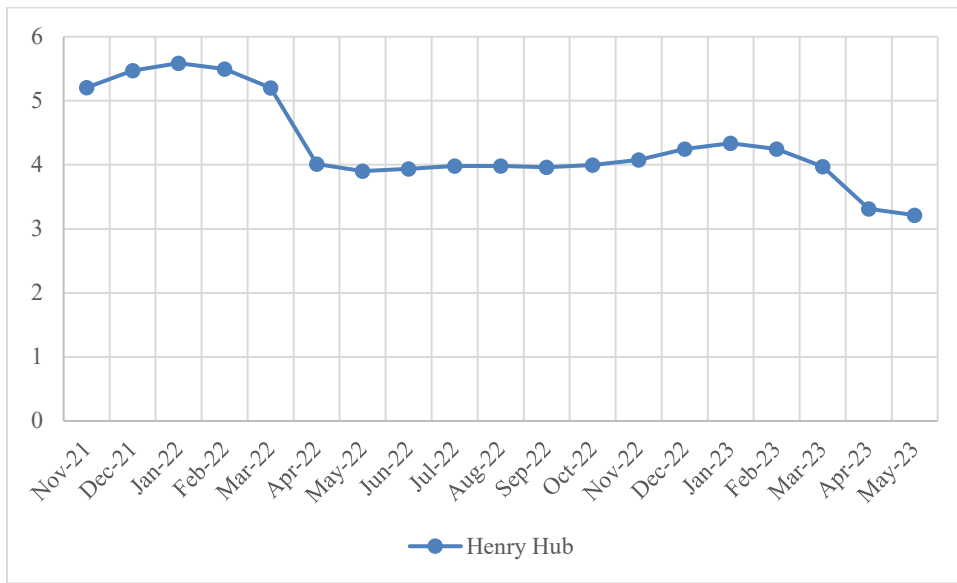
³³ EIA, *Natural Gas Consumption by End Use*, available at <http://www.eia.gov>.

³⁴ CME Group, available at <http://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>.

³⁵ EIA, *EIA Short Term Energy Outlook*, available at <http://www.eia.gov>.

³⁶ CME Group, available at <http://www.cmegroup.com/trading/energy/natural-gas/natural-gas.html>.

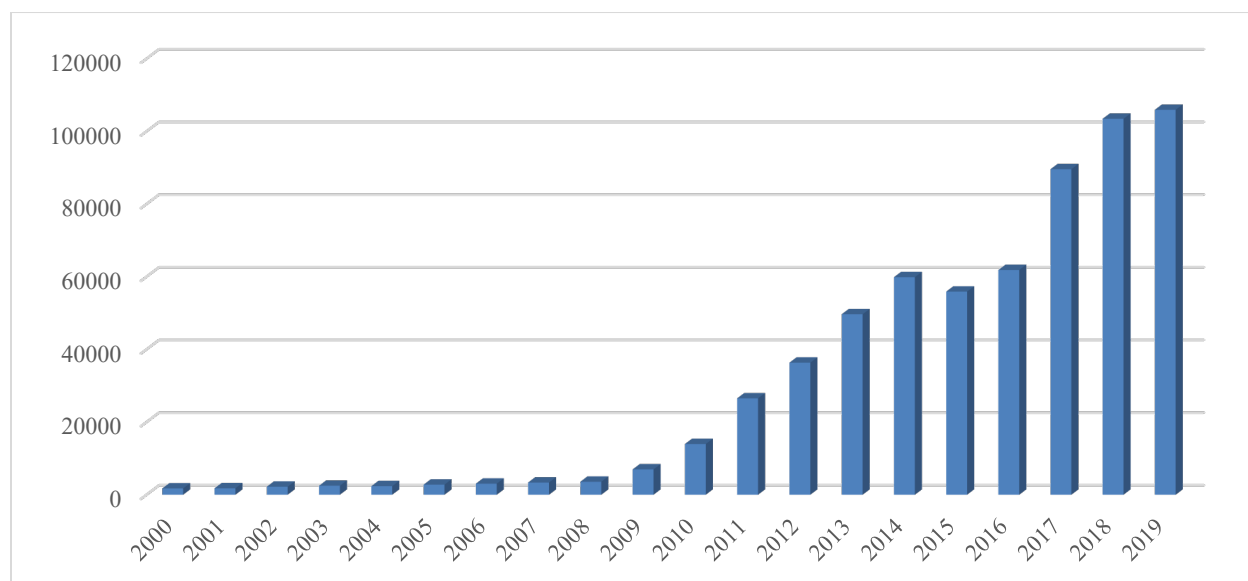
Figure 3: Henry Hub Futures Prices (\$/MMBtu)



Pennsylvania

This section presents Pennsylvania specific data. The data includes sales by NGDCs, deliveries by NGDCs for competitive suppliers and production of natural gas in Pennsylvania. Dry proved reserves for Pennsylvania as of Dec. 31, 2019, were 105.9 Tcf, an increase of 2.4% from 2018. Pennsylvania's dry proved reserves since 2000 can be seen in Figure 4, below.

Figure 4: Pennsylvania's Dry Proved Reserves (Bcf), 2000-2019³⁷



The EIA estimates that there were 68,929 producing natural gas wells in Pennsylvania in 2020.³⁸ As of Oct. 15, 2021, 29,580 unconventional drilling permit applications had been filed with the Pennsylvania Department of Environmental Protection. Of those applications, 13,190 unconventional wells have been drilled.³⁹ As of Oct. 15, 2021, there were 17 rotary rigs active in Pennsylvania, a 15% decrease from the number of active rigs a year ago. Rotary rigs are a piece or set of equipment, usually mobile, that is used to provide the rotational force needed to drill a borehole. The rotary rig count is an indicator of how many rigs are in service and the

³⁷ 2020 Data was not yet available.

³⁸ EIA, *Natural Gas Annual*, available at <http://www.eia.gov>.

³⁹ Pennsylvania Department of Environmental Protection Well Permit Workload Report, available at http://www.portal.state.pa.us/portal/server.pt/community/oil_and_gas_reports/20297.

demand for drilling equipment.⁴⁰ Table 4, below, illustrates that Pennsylvania’s production in 2020 greatly exceeded its deliveries to consumers in the state, by more than a factor of 4 in 2020.

Table 4 Historical Pennsylvania Deliveries, Transportation and Production (Bcf)⁴¹

Year	Gas Delivered to Consumers	Delivered for the Account of Others (Transport)	PA Gross Gas Production
1997	706.2	261.2	80.0
1998	644.0	273.4	130.3
1999	688.7	293.5	174.7
2000	702.8	292.0	150.0
2001	634.8	254.2	130.9
2002	675.6	270.6	157.8
2003	690.0	264.3	159.8
2004	696.2	258.2	197.2
2005	691.6	246.8	168.5
2006	659.8	247.3	176.0
2007	752.4	259.1	182.3
2008	749.9	260.6	198.3
2009	809.7	253.3	273.9
2010	879.4	283.2	572.9
2011	965.7	287.6	1310.6
2012	1038.0	293.5	2256.7
2013	1121.7	331.4	3259.0
2014	1244.4	362.7	4257.7
2015	1255.6	332.5	4813.0
2016	1301.0	326.3	5210.2
2017	1350.2	335.2	5453.6
2018	1460.5	365.8	6264.8
2019	1618.0	382.1	6896.8
2020	1714.4	341.9	7148.3

⁴⁰ Baker Hughes, rotary rig count, available at <http://www.bakerhughes.com/rig-count>.

⁴¹ EIA, <http://www.eia.gov>.

Natural Gas Liquids (NGLs) and the Natural Gas Market

At this time, a significant amount of NGLs are still simply sold directly into the natural gas system, owing to a lack of supply transportation to other markets, i.e., manufacturing, retail sales, etc. With natural gas prices still relatively low, this adds to the downward pressure on NGL prices. However, over the past several years, the pricing for NGLs has begun to rise, as Mariner East I came online for ethane service, and some energy companies have begun transporting additional quantities of NGLs through other means, such as rail and road transportation.⁴² These transportation options have allowed more NGLs to be sold to higher priced markets, such as manufacturing. Also, the price of natural gas has risen somewhat over the previous three years, boosting the price received for NGLs sold back into the natural gas pipelines.

As additional new pipelines are placed in service, it is possible that a substantial shift in the relationship between NGL supplies and the natural gas market could develop. Currently, there is a substantial, though unmeasured, volume of NGLs within the natural gas system, both in Pennsylvania and throughout the U.S. This causes variation in the heat content of natural gas being delivered to consumers. Heat content is a measure of the amount of energy derived from a given quantity of gas when it is combusted, usually measured in Btu. For example, pure methane, the primary component of natural gas, has a heat content of 1,010 Btu/ft³.⁴³ Ethane, the most common NGL to be produced from natural gas wells by volume, has a much higher heat content of 1,783 Btu/ft³. Other potential impurities in natural gas, such as carbon monoxide, have much lower heat content.⁴⁴

It is possible for the heat content of the mixture that is delivered to a customer to have a heat content either higher or lower than that of pure methane, depending on the amounts of these various impurities within a given sample of natural gas. If it is higher, an estimate can be made of the amount of NGLs present in the gas. To prepare estimates of the amount of NGLs in gas produced in Pennsylvania, two assumptions have been made:

⁴² <https://www.reuters.com/article/us-range-resources-npls-mariner-east/range-finds-alternatives-to-ship-npls-due-penn-mariner-east-shutdown-idUSKCN1J42EK>

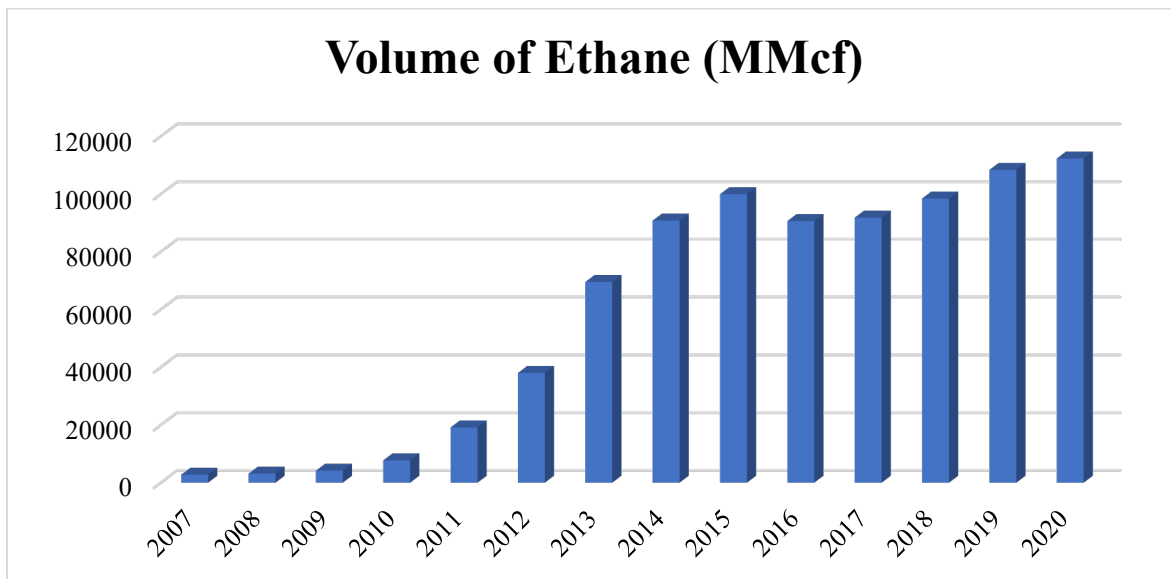
⁴³ In the natural gas industry, the heat content of natural gas is often approximated to be 1,000 Btu/ft³.

⁴⁴ Carbon monoxide has a heat content of 323 Btu/ft³.

1. The heat content of gas consumed in Pennsylvania is the same as the heat content of the gas being produced in Pennsylvania. This assumption is necessary since EIA only provides data on the heat content of gas consumed.
2. The only NGL in the gas is ethane, and there are no other low-heat content impurities in the gas. This is done for simplicity. While there may be other impurities, including a small quantity of larger hydrocarbons, i.e., propane, butane, etc., ethane is used to try to derive an estimate of the overall amount of NGLs in the natural gas.

Using these assumptions, Figure 6, below, shows the theoretical quantity of ethane produced and fed into the natural gas system by Pennsylvania producers. These estimates were determined using the average heat content of natural gas delivered in Pennsylvania, combined with the gross production of natural gas in Pennsylvania.⁴⁵ Using the assumptions, above, it then follows that any additional heat content above 1,010 Btu/ft³ of methane is derived purely from ethane, and the exact quantity of ethane injected into the natural gas system can be determined.

Figure 6: Hypothetical Volume of Ethane Injected into the Natural Gas System by Pennsylvania Producers (MMcf)



⁴⁵ EIA, *Heat Content of Natural Gas Delivered to Consumers*, and *Natural Gas Gross Withdrawals*, both available at <http://www.eia.gov>.

Projects such as the Mariner East II may help to relieve this oversupply of NGLs, once the delays are overcome and the pipeline can come fully into service.⁴⁶ Mariner East II is expected to come into full service in 2021, in addition to the Mariner East 2X pipeline.⁴⁷ This should stabilize or raise the prices for these commodities. In 2020, this could have meant that an estimated 112 million cubic feet (MMcf) of NGLs currently being fed into the natural gas system would have been redirected, possibly causing the prices of both NGLs and natural gas to rise, creating incentive for additional production in Pennsylvania.

Figure 7, below, shows Pennsylvania deliveries of natural gas for competitive suppliers, often called transportation gas, as a percentage of total gas delivered. In 2020, 20% of the total natural gas delivered was for competitive suppliers in Pennsylvania. In 2020, the percentages of gas delivered for competitive suppliers by customer class were as follows:⁴⁸

Residential: 14.0%

Commercial: 65.9%

Industrial: 99.0%

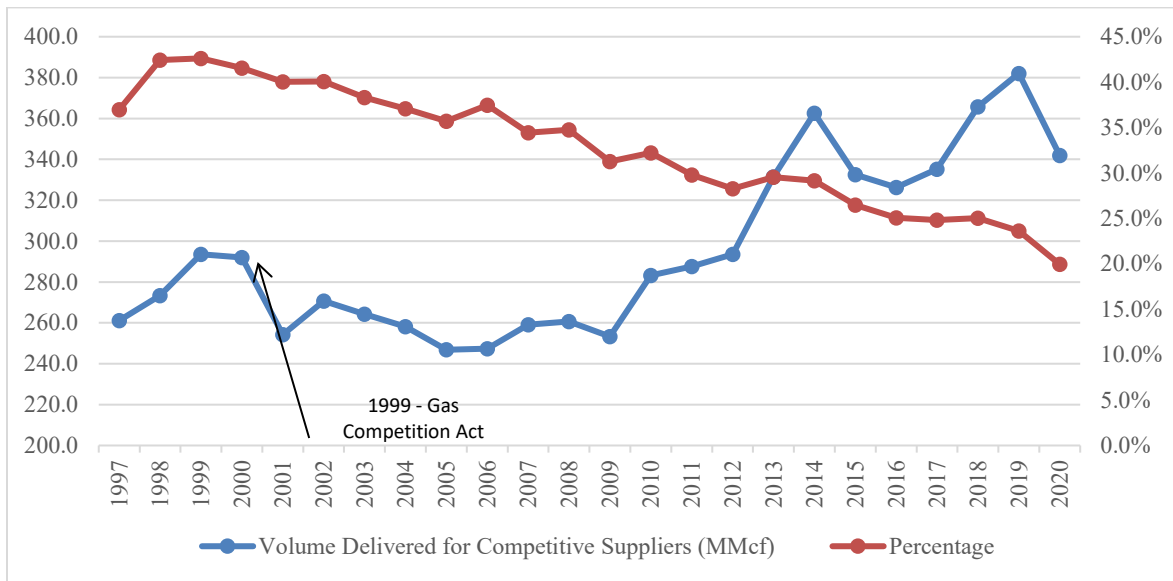
⁴⁶ <https://stateimpact.npr.org/pennsylvania/tag/mariner-east-2/>

⁴⁷ <https://marinerpipelinefacts.com/>

⁴⁸ Natural Gas Delivered on Account of Others.

https://www.eia.gov/dnav/ng/ng_cons_acct_a_EPG0_VRT_mmc_f_a.htm.

Figure 7: Natural Gas Delivered for Competitive Suppliers by Pennsylvania NGDCs ^{49 50}



Since 2009, total transportation gas had been generally trending upward, despite the drop in 2020. While the total amount of transportation gas has been increasing, the percentage of transportation gas has been declining, as overall usage in other delivery sectors has increased dramatically.

⁴⁹ Natural Gas Delivered on Account of Others, https://www.eia.gov/dnav/ng/ng_cons_acct_a_EPG0_VRT_mmcf_a.htm

⁵⁰ The Natural Gas Choice and Competition Act was signed into law on June 22, 1999.

VI. Natural Gas Distribution Company (NGDC) Statistical Data

Customer Data

The information in Tables 5 and 6, below, is derived from data contained in the Gas Annual Reports and the ARPRs submitted to the Commission by those Pennsylvania NGDCs with greater than 8 Bcf of annual sales. The charts and data analysis in this section are derived from the raw data in these two tables.

Table 5: 2020 Customer Statistical Data

<i>Company</i>	<i>Number of Residential Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Commercial Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Industrial Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Transportation Customers</i>	<i>Average per customer usage (MCF)</i>
Columbia	322,930	80	25,355	288	71	2,465	92,295	423
Peoples	491,218	82	33,163	238	93	2,903	111,742	579
Peoples Gas	58,332	81	3,822	322	1	0	956	12,416
NFG	174,203	92	11,289	258	176	1,494	27,598	893
PECO	492,298	82	44,460	457	16	1,500	713	36,129
PGW	464,940	68	21,707	323	476	838	25,217	1,230
UGI	521,665	75	49,774	289	675	1,121	102,968	2,470

Table 6: 2019 Customer Statistical Data⁵¹

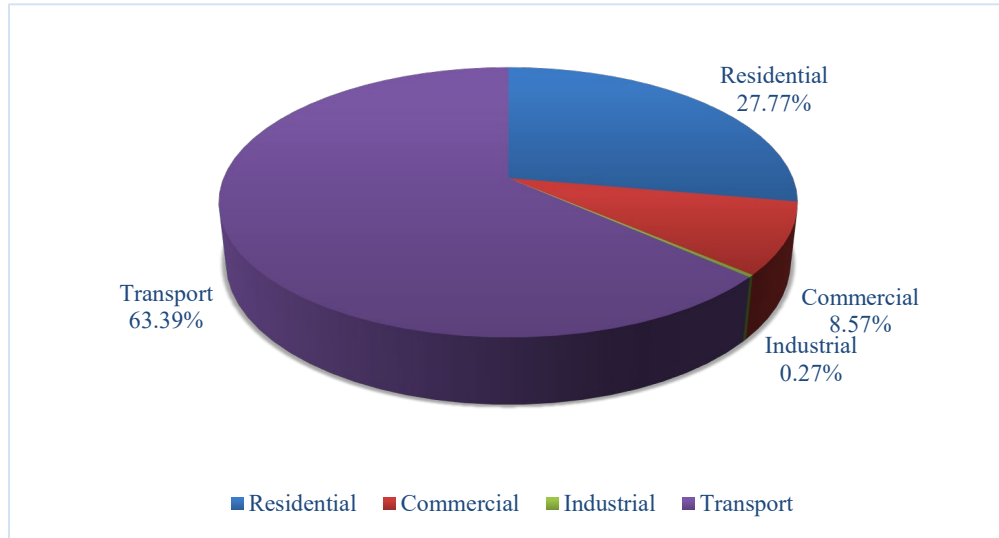
<i>Company</i>	<i>Number of Residential Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Commercial Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Industrial Customers</i>	<i>Average per customer usage (MCF)</i>	<i>Number of Transportation Customers</i>	<i>Average per customer usage (MCF)</i>
Columbia	337,268	81	24,782	350	62	3,323	74,483	575
Peoples	476,863	90	32,647	257	90	2,844	122,511	576
Peoples Gas	57,717	86	3,864	369	0	0	1,057	13,493
NFG	170,729	100	11,189	293	168	1,405	29,869	956
PECO	487,337	82	44,360	538	16	1,750	730	35,373
PGW	467,732	74	21,824	363	484	1,050	18,416	1,824
UGI	512,116	85	49,001	330	673	1,171	102,604	2,360

Chart 7, below, provides a breakdown of gas usage by customer class among Pennsylvania’s major NGDCs (those with more than 8 Bcf in sales per year). 63.4% of all sales volume was from transportation customers, up from 61.8% the previous year. These are typically larger customers that procure their own natural gas supply, and the utility delivers the natural gas to

⁵¹ The tracking of customer classes and natural gas usage are not necessarily done within one tracking system. Some customers may be classed in a certain category, but depending on their usage for the year, may end up assigned to a different rate class. This can create the appearance of a customer class with 0 Mcf of usage, when in actuality they had simply been shifted to a different rate class that year and are accounted for under a different category.

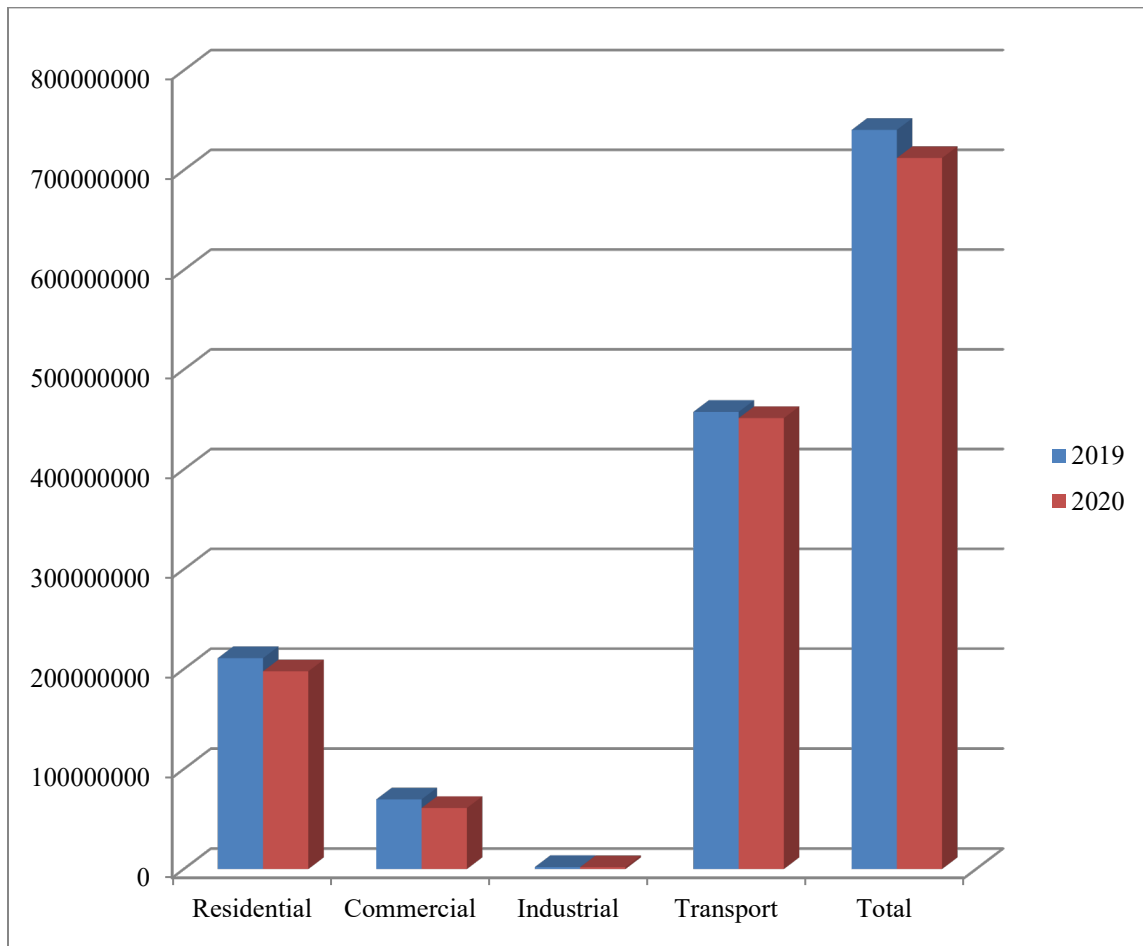
them. Transportation also includes residential and commercial customers that utilize an alternate natural gas supplier (NGS).

Chart 7: 2020 Pennsylvania Gas Usage by Customer Class within Major NGDCs



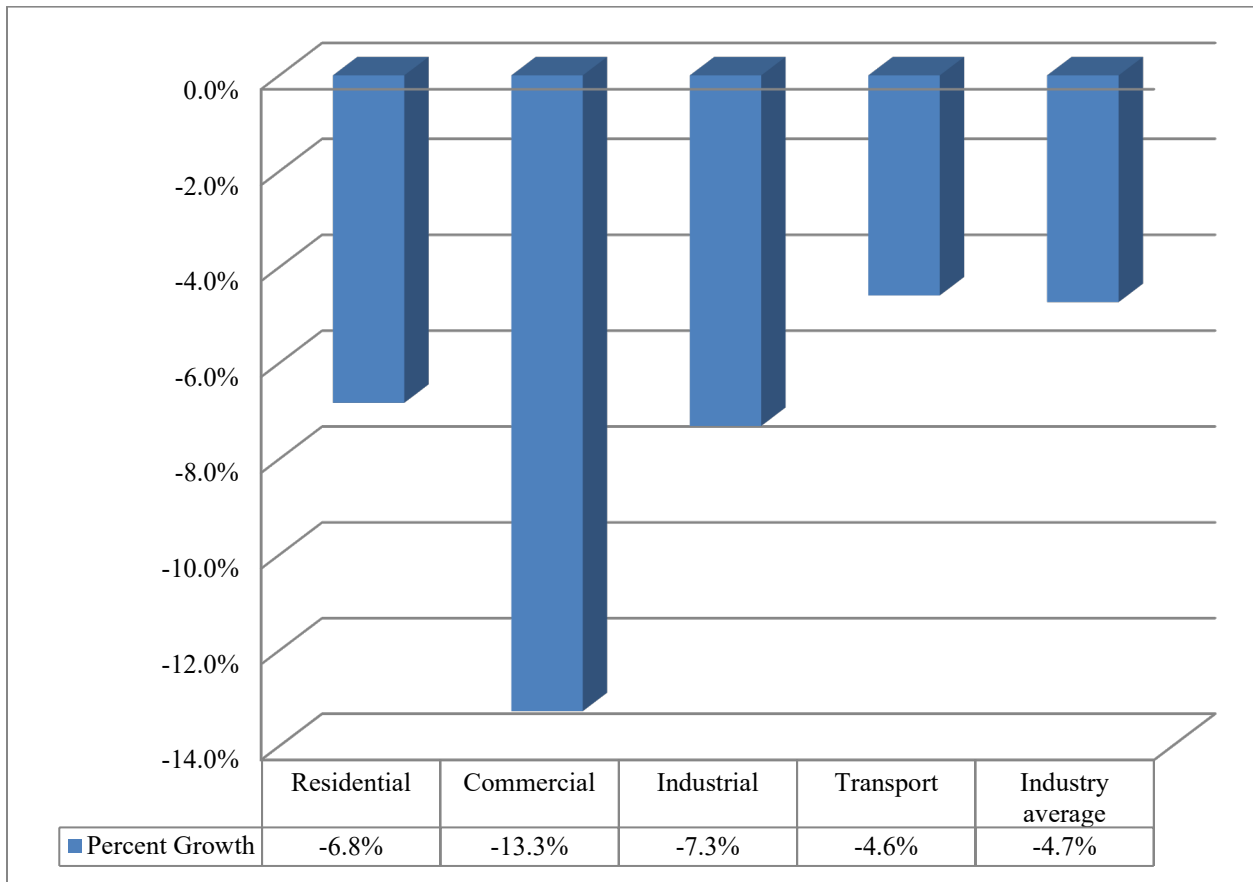
As seen in Figure 8, below, natural gas usage in 2020 was lower for all customer classes in Pennsylvania, when compared to 2019.

Figure 8: Pennsylvania Gas Usage by Customer Class within Major NGDCs: 2019-2020



In total, gas usage fell by 3.8% between 2019 and 2020, while the number of customers rose by 1.0%. This decline in usage was across all customer classes, with the highest decline being from the commercial class, possibly due to the COVID-19 pandemic causing a number of businesses to curtail hours, or close down altogether for portions of 2020. The rise in the number of customers was seen across all customer classes as well, with the highest being transportation, which saw a 3.4% increase in the number of customers.

Figure 9: Change in Average Customer Usage for Major NGDCs by Customer Class: 2019-2020



VII. Pennsylvania Natural Gas Distribution Company Gas Supply and Demand Balance

The following tables and charts provide natural gas supply and demand data for Pennsylvania's NGDCs. The NGDCs provided the supply and demand data for the 2020 delivery year. The data is presented for 2020 on an annual basis as well as for peak day. Peak day is non-coincident data such that demand for a specific customer class is not necessarily at the same time as the system peak. Data is derived from the ARPRs.⁵²

⁵² Some large users bypass the local distribution companies, buy gas at the wellhead or from suppliers, and receive the gas directly from the interstate pipelines. Gas-fired electric generation stations are usually bypass customers, and most of their gas consumption is not included in the PUC reports.

Table 7: 2020 Annual Gas Supply and Demand for Major Gas Utilities (MMcf)

	UGI	PGW	Columbia	NFG	PECO	Peoples	Peoples Gas
Gas Supply:							
Supply Contracts	83,250	41,469	26,058	15,693	40,608	28,469	3,088
Spot Purchases	14,899	9,109	7,102	3,693	18,612	23,443	3,849
Storage Withdrawal	0	0	0	0	0	0	0
LNG	0	1,141	0	0	0	0	0
Subtotal Gas Supply	98,149	51,719	33,160	19,386	59,220	51,912	6,937
Transportation	254,378	31,927	42,833	24,643	24,533	67,339	12,104
TOTAL GAS SUPPLY	352,527	83,646	75,993	44,029	83,753	119,251	19,041
Requirements:							
Firm Requirements	56,315	39,937	33,160	19,386	59,208	54,504	7,170
Liquefaction	0	1,733	0	0	0	0	0
Interruptible Requirements	0	664	0	0	12	0	0
Storage Injections	0	9,384	0	0	0	0	0
Subtotal Firm & Interruptible	56,315	51,718	33,160	19,386	59,220	54,504	7,170
Transportation	254,378	31,927	42,833	24,643	24,533	64,747	11,870
Load Deductions	(41,834)	0	0	0	0	0	0
TOTAL GAS REQUIREMENTS	352,527	83,645	75,993	44,029	83,753	119,251	19,040
Surplus(Deficiency)	0	1	0	0	0	0	1

Chart 8: Pennsylvania Gas Utility Annual Supply 2020

**Pennsylvania Gas Supply for Major Utilities in
2020**
Percentages out of a total of 829,476 MMcf

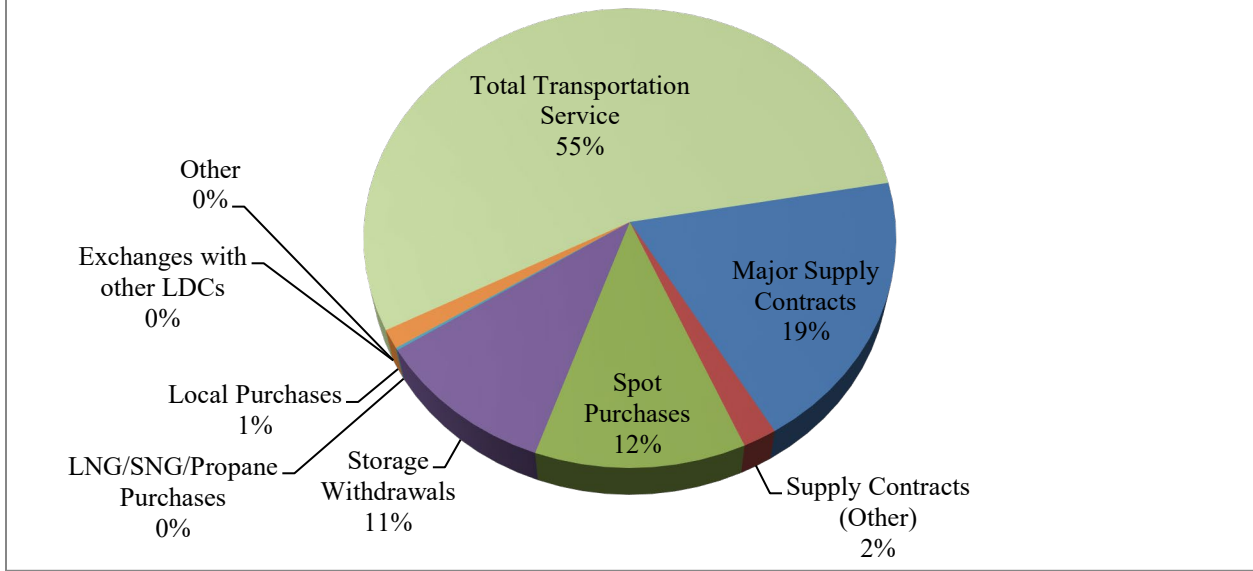
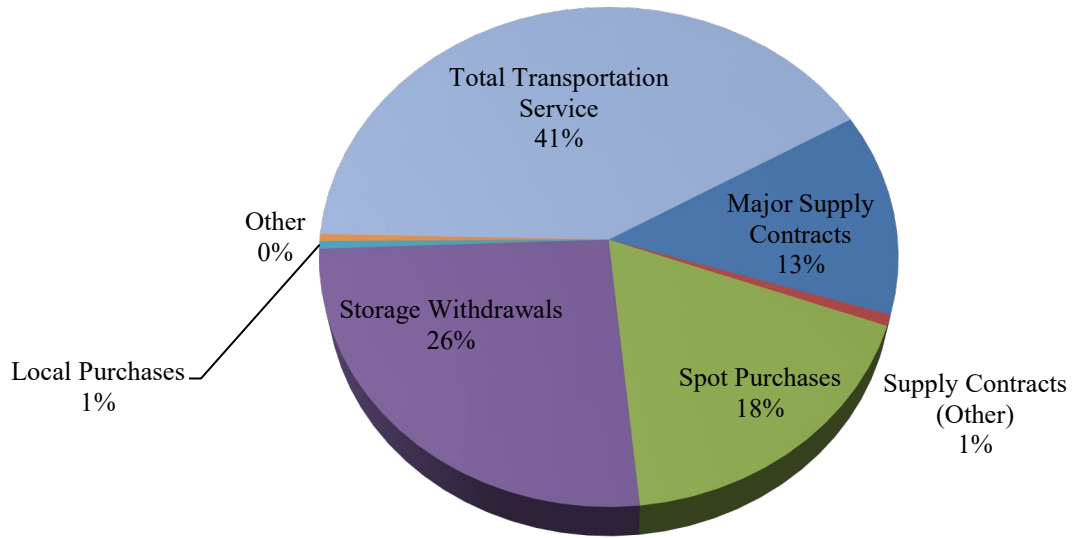


Table 8: 2020 Peak Day Gas Supply and Demand Balance for Major Gas Utilities (MMcf)

	UGI	PGW	Columbia	NFG	PECO	Peoples	Peoples Gas
Gas Supply:							
Supply Contracts	192	152	296	166	355	341	68
Spot Purchases	684	166	0	0	118	133	0
Storage Withdrawal	0	0	0	0	0	0	0
LNG	0	36	0	0	0	0	0
Subtotal Gas Supply	876	354	296	166	473	474	68
Transportation	931	151	215	133	149	359	43
TOTAL GAS SUPPLY	1,807	505	512	299	622	833	111
Requirements:							
Firm Requirements	573	353	296	166	557	454	64
Liquefaction Interruptible Requirements	0	0	0	0	0	0	0
Storage Injections	0	0	0	0	0	0	0
Subtotal Firm & Interruptible	573	353	296	166	557	454	64
Transportation	930	151	215	133	65	379	48
Load Deductions	(305)	0	0	0	0	0	0
TOTAL GAS REQUIREMENTS	1,808	504	512	299	622	833	112
Surplus(Deficiency)	(1)	1	0	0	0	0	(1)

Chart 9: Pennsylvania Peak Day Supply 2020

**Pennsylvania Gas Peak Day Supply
for Major Utilities in 2020
Percentages out of a total of 4,795 MMcf**



Section 3 – Financial Data

VIII. Natural Gas Distribution Company Financial Statistics

Data Set

This section presents selected NGDC financial data taken from the Gas Annual Reports of the major NGDCs for an eleven-year period from 2010 through 2020.⁵³

The data in Tables 9 through 13 includes operating revenues and expenses, net operating income, gross plant in service, administrative and general expense, maintenance expense, depreciation expense and total gas cost, and average cost of gas purchased by the NGDC.

⁵³ Note: UGI Central Penn Gas was purchased from PPL Gas Utilities in 2007. UGI Penn Natural Gas was purchased from PG Energy in 2006. Equitable Gas Company merged with Peoples Natural Gas in 2013-2014, becoming Peoples Natural Gas Company, which has since merged with Peoples Gas Company. For ease of comparison in the tables, the data for Peoples includes combined data for Peoples, Equitable, and Peoples Gas during the years when they were still separate companies. UGI now reports as a combined company, so for ease of comparison, totals across the 3 companies in prior years have also been combined.

Table 9: Operating Revenue and Operating Expense

OPERATING REVENUE (\$ Million)							
	Columbia	NFG	PECO	Peoples	UGI	PGW	Total
2010	559.2	255.5	686.8	836.3	1,058.0	749.2	4,145.0
2011	504.8	248.1	613.0	768.5	989.2	705.1	3,828.6
2012	406.3	215.9	545.4	681.6	784.7	642.6	3,276.4
2013	512.3	235.5	600.8	827.7	855.8	688.2	3,720.3
2014	563.3	248.3	646.8	946.1	973.9	746.6	4,125.0
2015	536.2	196.9	546.5	802.0	853.7	621.5	3,556.7
2016	493.9	175.0	463.4	667.1	739.7	629.0	3,168.1
2017	552.6	204.6	495.3	766.7	868.1	635.0	3,522.3
2018	590.2	215.3	569.8	820.0	1,002.0	697.2	3,894.4
2019	602.4	206.9	611.4	818.0	965.5	703.4	3,907.5
2020	555.3	189.2	515.1	722.6	908.1	608.1	3,498.4
OPERATING EXPENSE (\$ Million)							
	Columbia	NFG	PECO	Peoples	UGI	PGW	Total
2010	495.7	220.4	599.8	707.1	939.3	655.3	3,617.6
2011	444.6	200.8	406.7	595.5	755.9	523.6	2,927.2
2012	337.6	176.9	350.2	485.9	549.2	473.3	2,373.1
2013	416.1	187.9	484.8	571.0	592.5	491.2	2,743.5
2014	478.5	209.0	525.7	797.0	841.8	627.3	3,479.3
2015	445.2	165.0	430.5	660.0	731.2	564.9	2,996.8
2016	400.2	143.3	340.1	538.6	609.5	520.7	2,552.3
2017	467.1	177.0	367.7	643.2	713.5	540.0	2,908.4
2018	450.2	187.1	421.8	667.2	837.9	563.3	3,127.5
2019	466.8	175.1	457.7	645.4	780.2	552.5	3,077.7
2020	427.2	163.9	379.0	535.3	741.7	468.9	2,716.0

Table 10: Net Operating Income and Administration & General Expense

NET OPERATING INCOME (\$ Million)								
	Columbia	NFG	PECO	Peoples	UGI	PGW		Total
2010	63.5	35.1	87.0	98.3	118.7	26.5		429.1
2011	35.9	35.5	115.7	84.0	139.1	30.8		440.9
2012	45.2	27.9	106.3	110.7	135.3	32.7		458.3
2013	70.3	37.6	116.1	90.2	164.5	56.5		535.2
2014	97.0	45.8	121.0	165.3	182.9	67.7		679.8
2015	100.4	35.8	115.9	140.3	161.2	5.8		559.5
2016	66.8	24.0	123.2	84.2	109.7	63.3		471.3
2017	85.8	20.2	127.6	86.1	136.0	56.1		511.8
2018	105.8	21.8	148.0	104.5	127.2	97.7		605.0
2019	97.0	27.4	153.7	115.7	135.9	124.1		653.8
2020	86.6	20.9	136.2	137.3	119.5	105.0		605.4
ADMINISTRATION & GENERAL EXPENSE (\$ Million)								
	Columbia	NFG	PECO	Peoples	UGI	PGW		Total
2010	53.4	27.1	29.4	73.2	75.3	120.3		378.7
2011	56.2	29.4	29.0	90.1	69.7	108.5		383.0
2012	47.4	28.9	32.7	80.5	61.4	124.1		375.0
2013	53.0	31.2	28.0	93.7	75.7	107.9		389.4
2014	58.9	27.7	27.4	75.3	79.8	110.9		380.0
2015	62.3	27.9	30.2	79.6	85.8	152.9		438.8
2016	70.5	24.5	31.3	63.2	72.8	168.3		430.7
2017	91.5	28.2	33.2	59.9	85.4	148.5		446.7
2018	64.8	30.3	33.8	60.6	91.0	133.0		413.4
2019	74.2	26.0	31.1	59.3	96.8	120.8		408.2
2020	84.6	30.7	31.2	56.1	110.4	89.5		402.3

Table 11: Maintenance Expense and Depreciation Expense

MAINTENANCE EXPENSE (\$ Million)								
	Columbia	NFG	PECO	Peoples	UGI	PGW		Total
2010	14.1	4.0	23.7	41.7	22.9	25.7		132.1
2011	13.9	3.9	21.5	40.3	26.4	31.7		137.7
2012	14.4	3.3	20.8	41.4	27.5	29.8		137.2
2013	15.5	5.6	27.0	45.2	28.0	33.6		154.9
2014	18.3	6.1	26.8	47.6	31.9	40.5		171.2
2015	22.0	6.4	32.4	47.6	34.3	38.5		181.1
2016	23.6	5.9	29.5	42.5	30.8	41.0		173.4
2017	25.8	6.1	29.9	42.7	33.2	42.5		180.3
2018	22.3	6.4	28.7	48.7	38.4	45.8		190.3
2019	23.8	6.8	30.2	51.7	41.7	46.5		200.8
2020	25.7	6.8	33.6	53.8	23.7	45.7		189.2
DEPRECIATION EXPENSE (\$ Million)								
	Columbia	NFG	PECO	Peoples	UGI	PGW		Total
2010	22.5	11.1	32.7	47.5	47.0	39.0		199.8
2011	25.0	11.3	33.5	51.5	45.8	39.6		206.7
2012	14.4	11.4	35.1	53.8	46.5	40.1		201.3
2013	33.4	11.4	36.7	55.1	49.2	41.5		227.3
2014	37.7	11.5	39.2	53.6	52.5	41.7		236.1
2015	42.1	12.0	42.0	53.3	56.8	44.6		250.8
2016	47.5	12.9	43.1	56.0	60.7	46.7		267.0
2017	52.0	14.2	47.2	59.9	66.9	48.6		288.9
2018	55.6	14.4	51.8	64.5	74.6	60.5		321.4
2019	65.7	14.4	56.4	69.6	86.7	68.2		361.0
2020	72.3	15.0	59.7	76.4	100.9	65.0		389.2

Table 12: Total Gas Costs and Average Cost of Gas Purchased

TOTAL GAS COSTS (\$ Million)							
	Columbia	NFG	PECO	Peoples	UGI	PGW	Total
2010	328.7	95.1	381.3	442.9	622.3	321.7	2,192.0
2011	332.2	96.6	314.5	420.0	596.4	303.8	2,063.5
2012	152.8	69.4	239.1	251.1	391.5	220.8	1,324.6
2013	265.3	79.3	275.5	342.5	467.0	258.9	1,688.5
2014	259.1	91.3	320.3	397.6	545.6	295.1	1,909.0
2015	182.6	44.5	189.2	311.8	361.1	196.8	1,286.0
2016	114.7	22.5	174.1	213.7	307.1	149.8	981.8
2017	176.4	54.3	190.9	307.3	401.7	187.9	1,318.5
2018	184.2	62.5	297.1	350.8	507.8	203.5	1,605.9
2019	157.4	57.9	209.6	322.8	451.8	191.7	1,391.2
2020	120.9	37.1	163.3	236.7	484.8	144.3	1,187.1
AVERAGE COST OF GAS PURCHASED (\$/MCF)							
	Columbia	NFG	PECO	Peoples	UGI	PGW	Ave.
2010	7.04	5.43	6.85	7.30	9.76	6.31	7.12
2011	7.51	4.72	6.18	5.29	6.47	5.74	5.99
2012	4.79	3.37	5.47	5.25	6.16	4.98	5.00
2013	5.75	3.81	5.51	4.20	4.74	5.29	4.88
2014	6.25	4.07	6.15	4.60	5.29	5.78	5.36
2015	4.90	2.10	4.09	5.44	6.29	4.17	4.50
2016	3.56	1.21	3.97	4.11	4.34	3.33	3.42
2017	5.22	2.85	4.39	3.06	4.02	4.28	3.97
2018	4.43	2.93	6.11	4.71	4.55	4.31	4.51
2019	4.30	2.82	4.53	4.78	5.64	4.17	4.37
2020	3.60	1.90	4.11	3.93	5.79	3.44	3.80

Table 13: Gross Utility Plant in Service

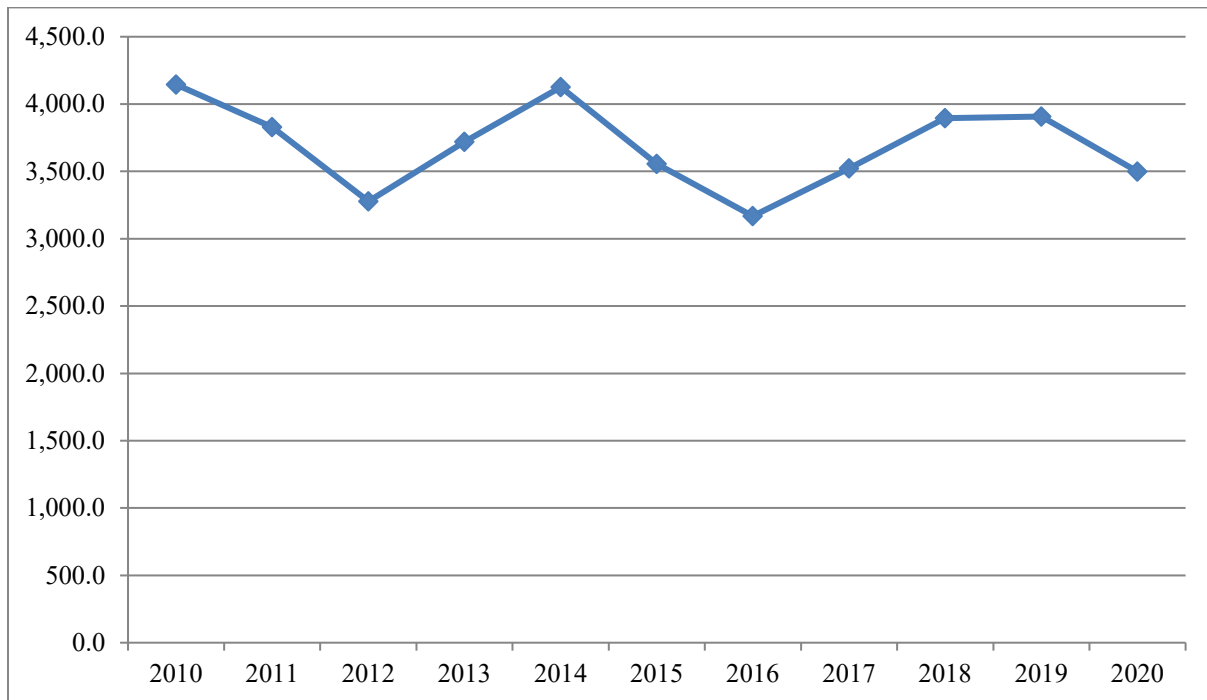
GROSS UTILITY PLANT IN SERVICE (\$ Million)							
	Columbia	NFG	PECO	Peoples	UGI	PGW	Total
2010	981.9	478.9	1,698.5	2,157.0	2,110.2	1,531.0	8,957.5
2011	1,073.6	491.5	1,792.9	2,277.7	2,033.4	1,555.1	9,224.2
2012	1,198.2	501.4	1,859.5	2,392.7	2,137.4	1,575.8	9,665.0
2013	1,335.7	511.7	1,932.4	2,350.6	2,262.9	1,596.6	9,989.9
2014	1,500.5	527.2	2,071.4	2,469.8	2,418.9	1,646.7	10,634.5
2015	1,660.1	542.5	2,205.4	2,589.7	2,581.9	1,685.2	11,264.7
2016	1,860.1	577.8	2,260.4	2,697.5	2,945.3	1,741.5	12,082.6
2017	2,074.1	594.5	2,503.6	2,892.3	3,035.8	1,793.6	12,893.9
2018	2,330.6	611.8	2,694.0	3,110.5	3,329.1	1,905.1	13,981.0
2019	2,568.9	637.9	2,899.1	3,357.7	3,681.6	2,038.5	15,183.7
2020	2,851.1	662.2	3,098.4	3,592.3	4,004.8	2,172.1	16,380.9

IX. Industry Trends

Many indicators of the financial status of the gas utilities in Pennsylvania are very closely correlated with current prices of natural gas. The single largest expense for NGDCs is the procurement of natural gas and the largest source of revenue is the sale of natural gas.⁵⁴

Therefore, as gas prices have remained low in recent years, so too have the sales revenues of the NGDCs. Figures 10 through 12, below, illustrate this correlation with very similar patterns for Operating Revenues, Operating Expenses, and the Average Cost of Gas Purchased for the major NGDCs since 2010.

Figure 10: Total Operating Revenue for All Major NGDCs (Millions of \$)



⁵⁴ Pennsylvania natural gas utilities do not derive any net earnings or profits from natural gas commodity prices. The cost of procuring natural gas for customers is purely a pass-through cost. NGDCs only earn a profit on the delivery of the commodity to customers.

Figure 11: Total Operating Expenses for All Major NGDCs (Millions of \$)

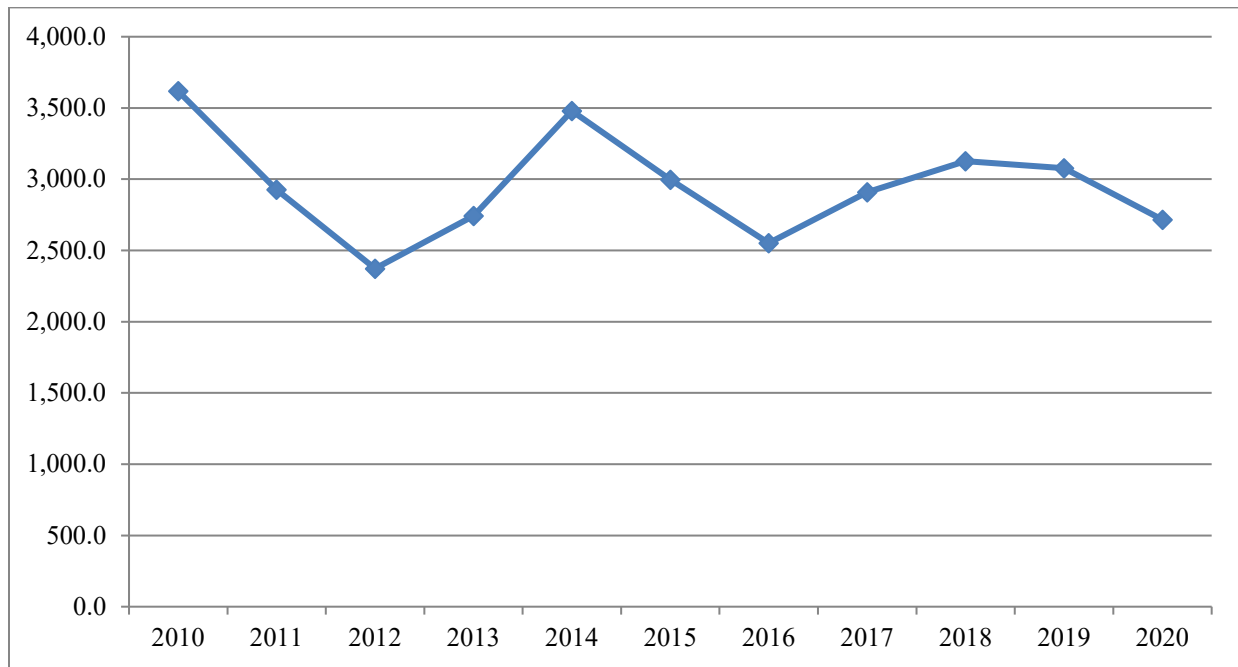
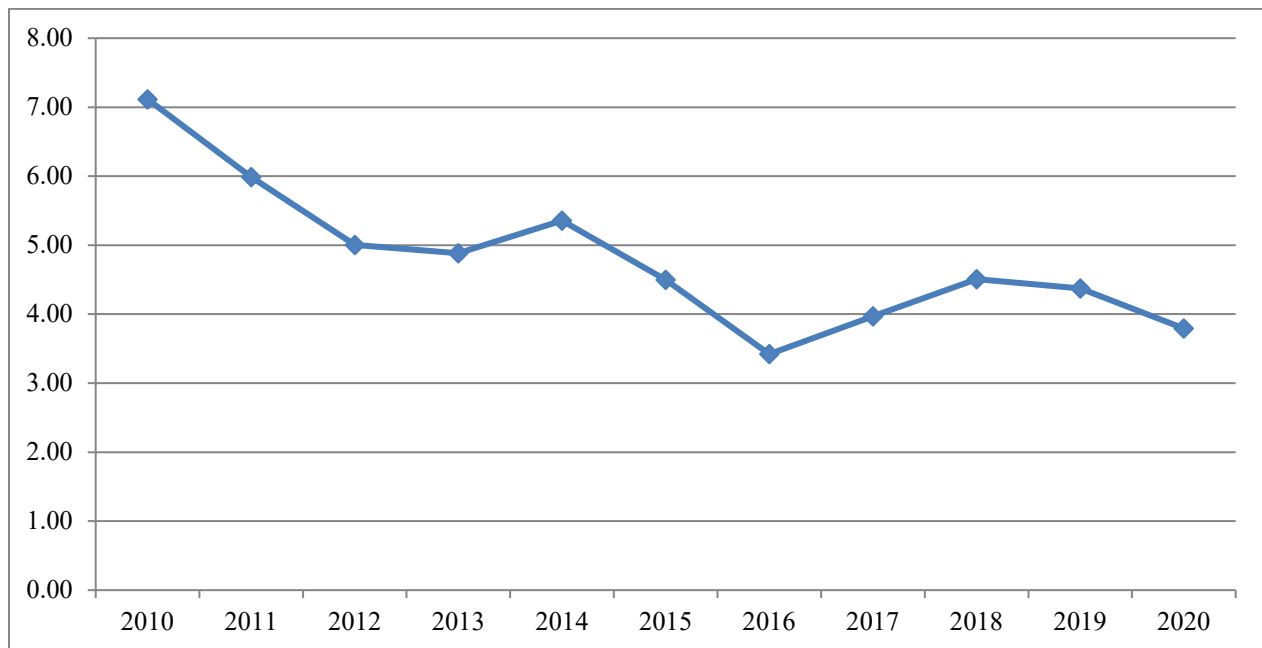


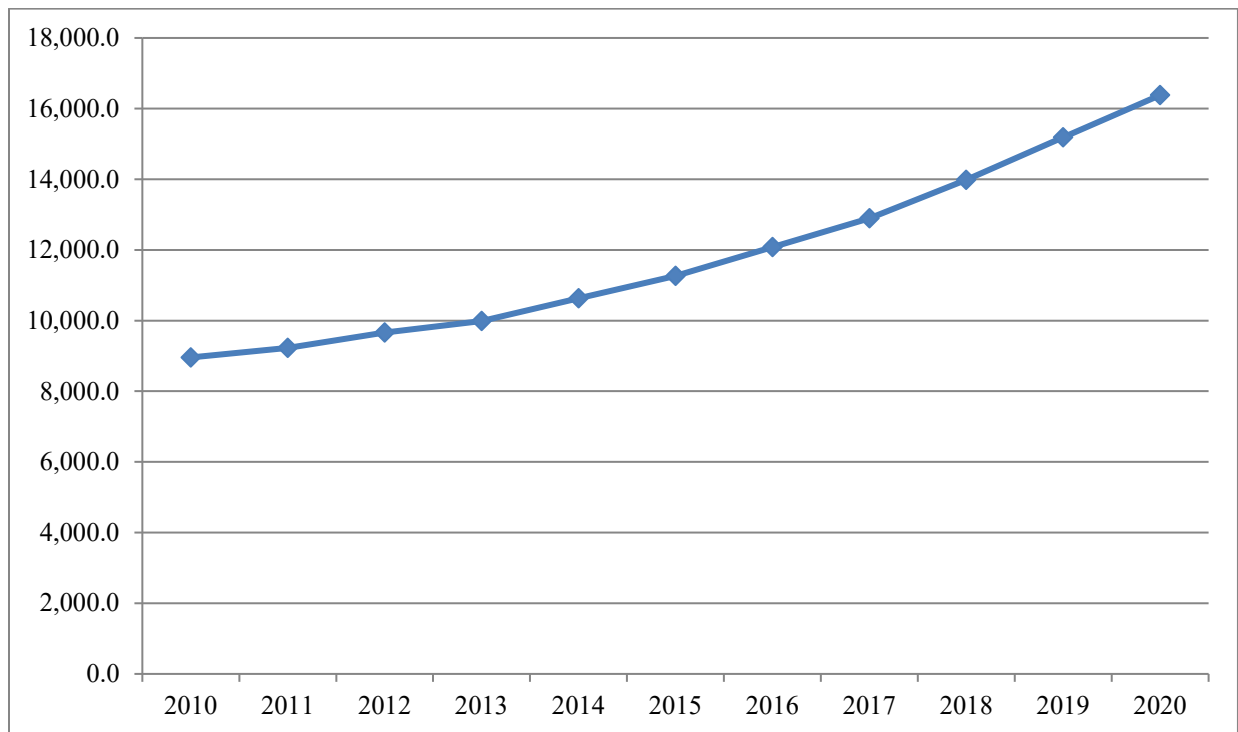
Figure 12: Average Cost of Gas Purchased for All Major NGDCs (\$/Mcf)



Over the past decade, NGDCs have been steadily investing in their infrastructure. Much of the increase in infrastructure spending was spurred by the implementation of Commission-approved Long-Term Infrastructure Improvement Plans (LTIIPs) and their corresponding Distribution

System Improvement Charge (DSIC) mechanisms for most of the major NGDCs.⁵⁵ Figure 13, below, shows that the major NGDCs have added approximately \$548 million per year to their total utility plant in service. This equates to a cumulative increase of 82.9% in plant in service for the total industry since 2010. Figure 14, below, shows that while all NGDCs have increased plant in service since 2010, Columbia has the fastest rate of increase, more than doubling its total plant in service with a 190% increase since 2010. NFG has the slowest rate of increase at 38.3% since 2010.⁵⁶

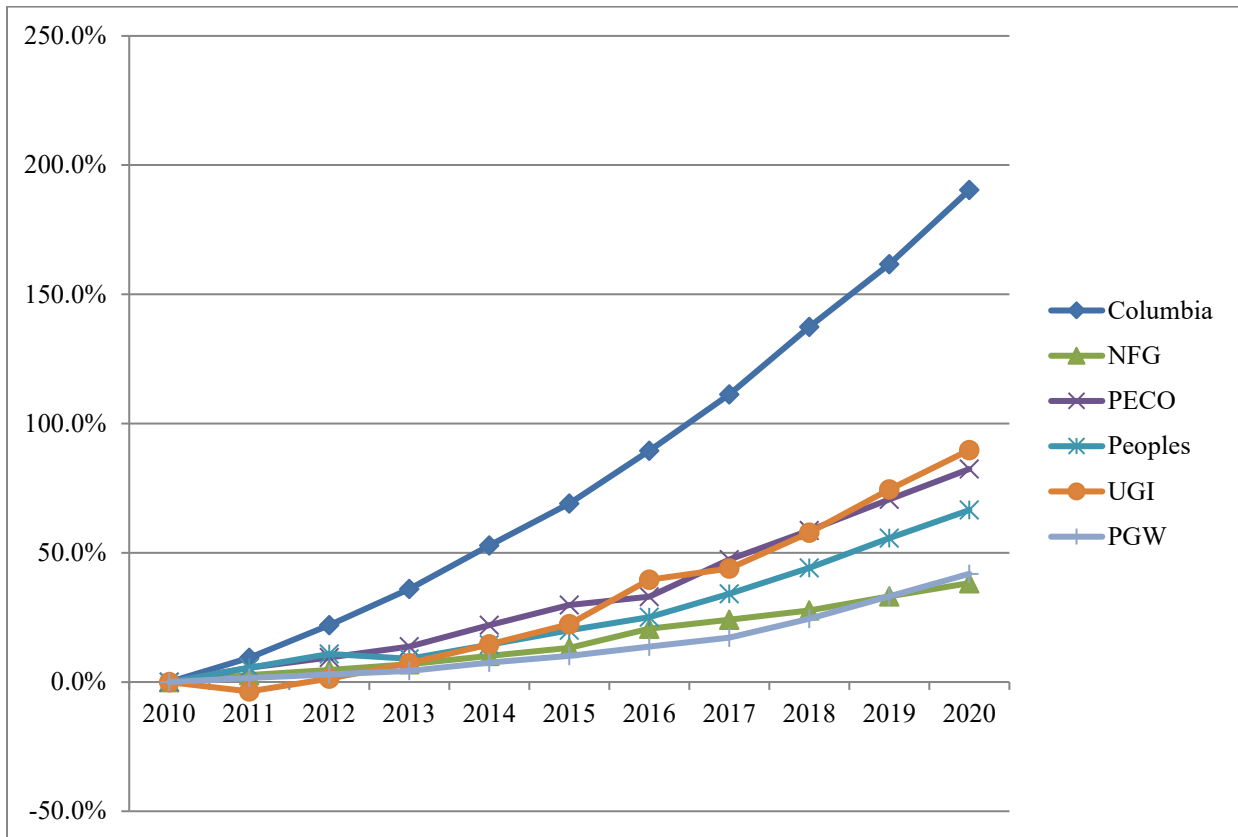
Figure 13: Total Utility Plant in Service for All Major NGDCs (Millions of \$)



⁵⁵ Final Implementation Order entered May 23, 2014 at Docket No. L-2012-2317274.

⁵⁶ All of the other major NGDCs besides PGW and Columbia have had an increase of roughly 60-80% since 2010. The only other notable exception is NFG, with an increase of only 38.3%. NFG is also the only major NGDC without a Commission-approved LTIP in Pennsylvania.

Figure 14: Cumulative Percentage Increase in Utility Plant in Service for All Major NGDCs (base year 2010)



Section 4 - Conclusion

X. Summary

Natural gas production and production have both continued to increase in Pennsylvania in 2020. This is despite the national reduction in both production and consumption in 2020, likely due to the COVID-19 pandemic. Natural gas prices have begun to rise, and it appears they will continue to rise through 2022, possibly due to the reduced demand that may be a result of the COVID-19 pandemic. This is increasingly significant, as natural gas has become the largest portion of Pennsylvania's electric power generation, and it seems likely that its share of the electric generation portfolio will continue to increase.

A notable industry trend is the marked increase in natural gas usage in the electric power generation sector. The share of natural gas being allocated to electric power generation has been rapidly increasing year over year in the US as a whole, but specifically in Pennsylvania. In Pennsylvania, electric power generation now accounts for more than half of all natural gas deliveries to consumers, and appears to be continuing to increase through 2021. In fact, despite the fact that all other sectors in Pennsylvania saw a decline in consumption in 2020, the dramatic increase in usage for electric generation is what caused the overall increase in usage in Pennsylvania in 2020.

In general, it appears that the natural gas industry in Pennsylvania is robust and working to relieve some lack of adequate transportation capacity, both for natural gas and for natural gas liquids. Natural gas utilities in Pennsylvania are making significant investments in their infrastructure, to ensure that they will be prepared to meet any increased demand in the future, providing the residents and businesses of the Commonwealth with safe and reliable natural gas service.

Acronyms

ARPR	= Annual Resource Planning Report
Bcf	= Billion cubic feet
Bcfd	= Billion cubic feet per day
EIA	= Energy Information Administration
GSC	= Gas Supply Cost
LDC	= Local Distribution Company
LNG	= Liquefied Natural Gas
Mcf	= Thousand cubic feet
MMBtu	= Million British Thermal Units
MMcf	= Million cubic feet
MW	= Megawatt
NGDC	= Natural Gas Distribution Company
NGL	= Natural Gas Liquids
NGS	= Natural Gas Supplier
NYMEX	= New York Mercantile Exchange
PUC	= Public Utility Commission
Tcf	= Trillion cubic feet



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