

Pennsylvania Public Utility Commission

Annual Winter Reliability Assessment

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Introduction

The **Energy Association of Pennsylvania** represents the interests of its

Member Natural Gas Distribution Companies:

Columbia Gas of Pennsylvania
Leatherstocking Gas Company
National Fuel Gas Distribution Corp.
PECO
Peoples Natural Gas Company LLC
Peoples Gas Company (formerly Peoples TWP)
Philadelphia Gas Works
Pike County Light & Power Company
UGI Central Penn Gas
UGI Penn Natural Gas
UGI Utilities - Gas Division
Valley Energy

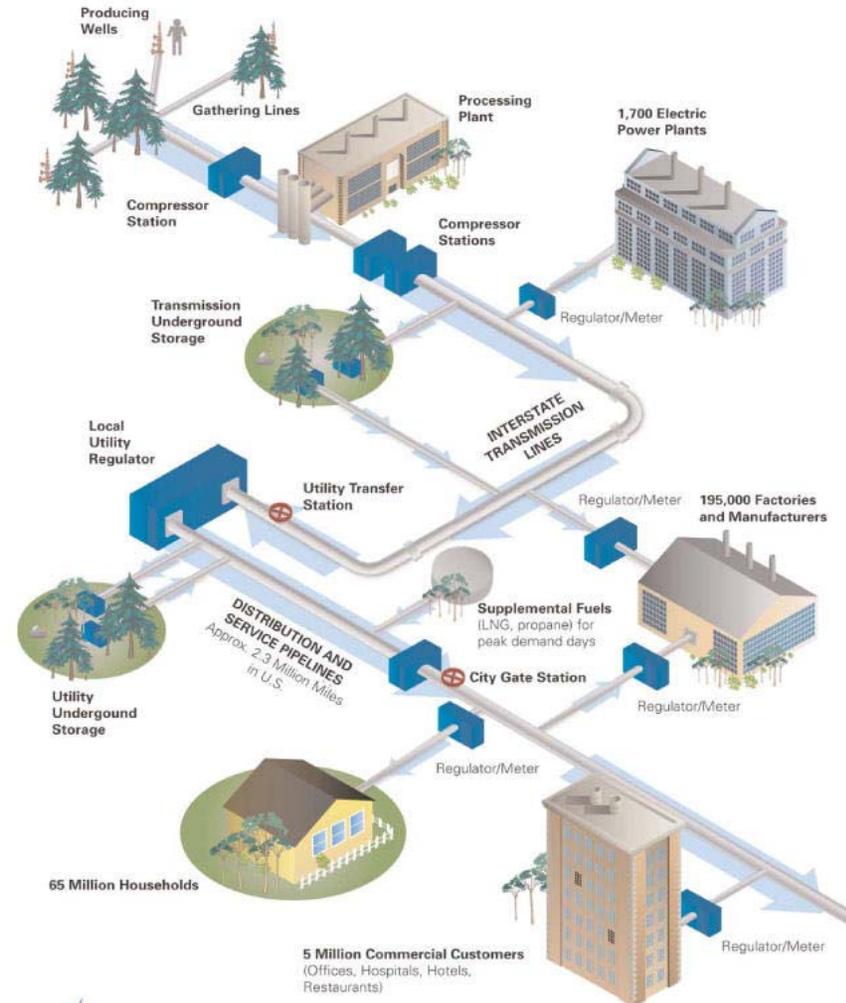
Distributing natural gas to just under three million residential, commercial and industrial customers in Pennsylvania



Introduction - How Gas is Delivered

- Extracted from wells and moved from collection point into gathering system for sale into the wholesale market
 - Includes processing facility where natural gas is purified and useful by-products such as propane and butane are removed
- Moved into transmission system using compressors
 - counteracts friction that is created when gas is moved through steel pipe
- Transported by midstream companies to utility's delivery point ("city gate") or to upstream storage
 - Pressure reduced
 - Odorant added
- Moved into utility's distribution pipeline and delivered through individual service lines to customer
 - pressure further reduced for delivery

NATURAL GAS DELIVERY SYSTEM



Supply and Demand

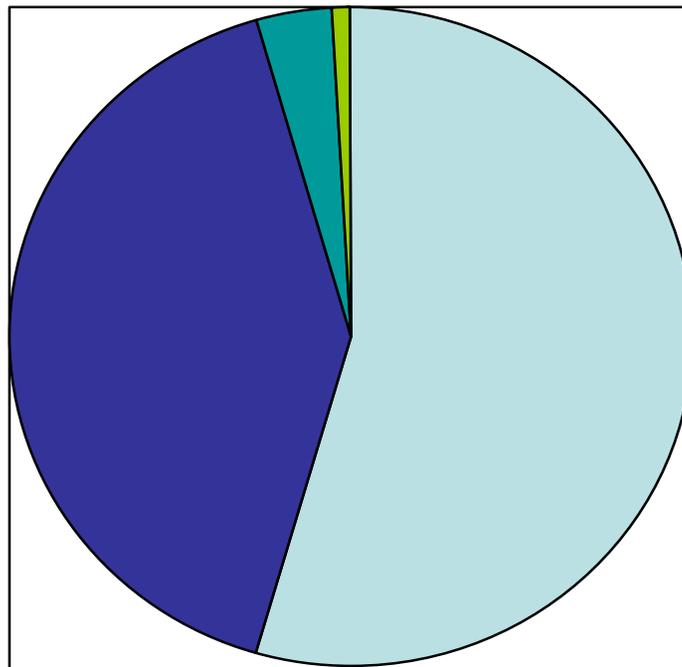
Winter 2017-2018

(all natural gas volumes in billions of cubic feet)

Expected Demand	224.1 Bcf
Expected Supply	
Flowing Interstate Gas	122.1
Storage Withdrawals	92.3
Local Production	7.8
Peak Shaving	1.9
TOTAL	224.1



Winter 2017-2018: Supply Sources



- Flowing Interstate Gas
- Storage Withdrawals
- Local Production
- Peak Shaving

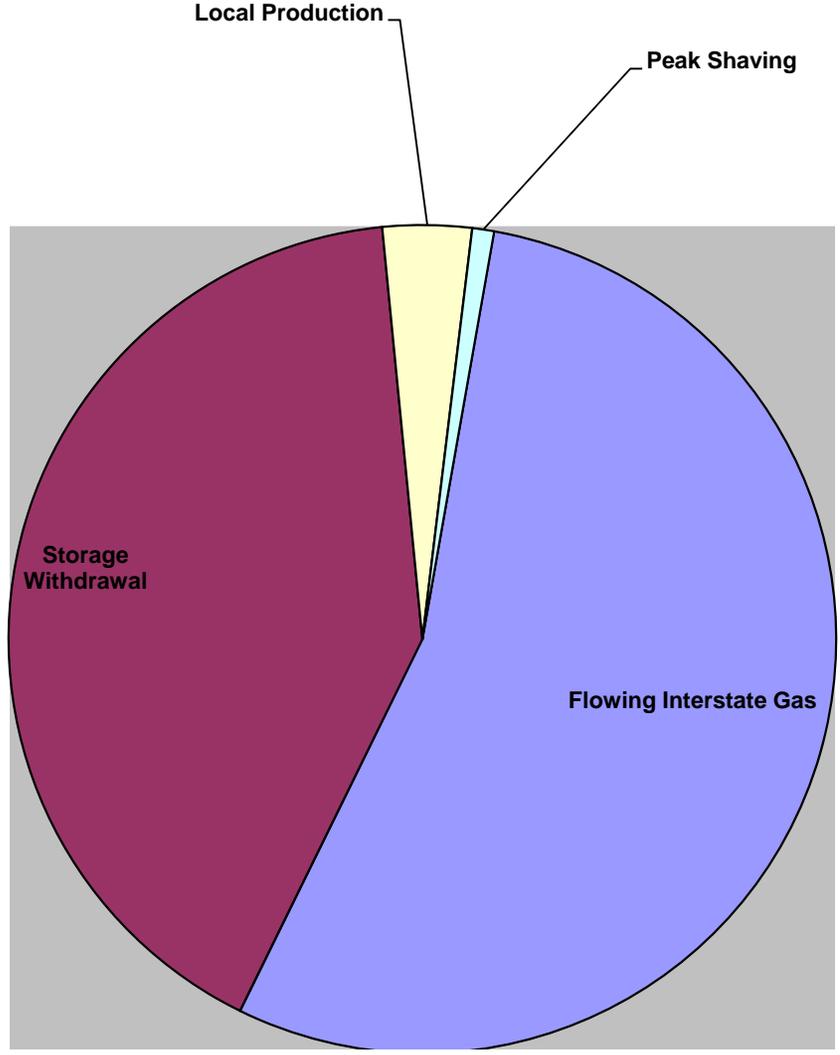
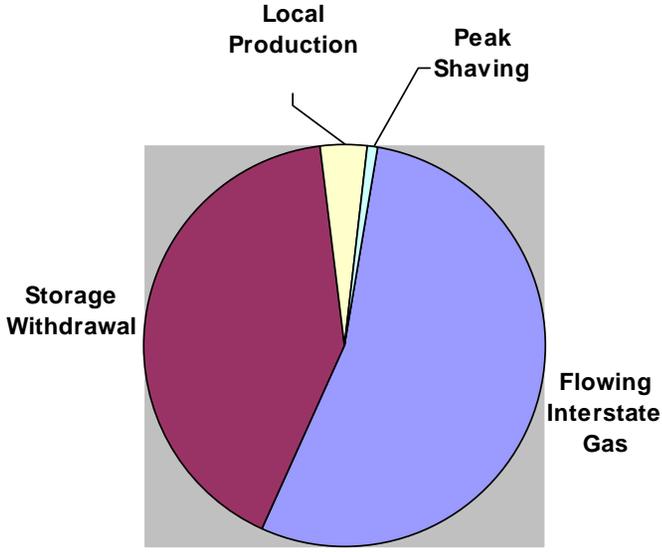


* Note: gas flowing on interstate pipelines can be sourced from Pennsylvania production connected to those interstate pipelines.

Comparison of Forecasts Last Winter and This Winter

Winter 2017-2018:
Supply Sources by Type
224.1 Bcf

Winter 2016-2017:
Supply Sources by Type
219.6 Bcf



System Planning Strategies

Objective: To identify supply resources (including upstream transportation and storage capacity) that will be necessary to preserve service reliability at anticipated levels of firm demand



System Planning Strategies

Capacity and Supply Assets: NGDCs commit to capacity and supply assets as necessary to meet firm customer needs, including operational swings. Commitments may include a reserve, but do not include service to interruptible customers. These assets include:

- Pipeline deliveries per firm transportation agreements
- Underground storage withdrawals (on-system, off-system)
- Pennsylvania local production (where available)
- Peak shaving facilities



System Planning Strategies - Production

- High natural gas production is helping to ensure that adequate supplies of natural gas are available. The U.S. lower 48 dry natural gas (consumer-grade natural gas) production reached 73.84 Bcf on September 5, 2017, passing the prior daily record set in February 2016. This record was surpassed on September 20, 2017 which posted 74.6 Bcf. States driving this increase are Pennsylvania and Ohio.
- For the fourth consecutive year, Pennsylvania was the state with the largest total gain in annual dry natural gas production, increasing from 13.04 billion cubic feet (Bcf) per day in 2015 to 14.33 Bcf per day in 2016.
- The United States has experienced a rapid increase in natural gas production from the robust influx of shale resources. The combination of two technologies —horizontal drilling and hydraulic fracturing — has made it possible to produce shale gas economically. Based on EIA projections, U.S. shale gas production is expected to reach 79 Bcf per day in 2040. Improvements in drilling technology and more efficient hydraulic fracturing techniques have allowed, and are likely to continue to allow, the expansion of shale gas production. Such advances will allow producers to recover greater volumes from a single well.
- With new takeaway infrastructure capacity out of the Marcellus/Utica shale plays coming online through the end of 2017 and into 2018, the possibility for new record levels of gas production in the coming months may be likely. According to EIA, natural gas production in 2018 is forecast to be 4.9 Bcf per day higher than the 2017 level.

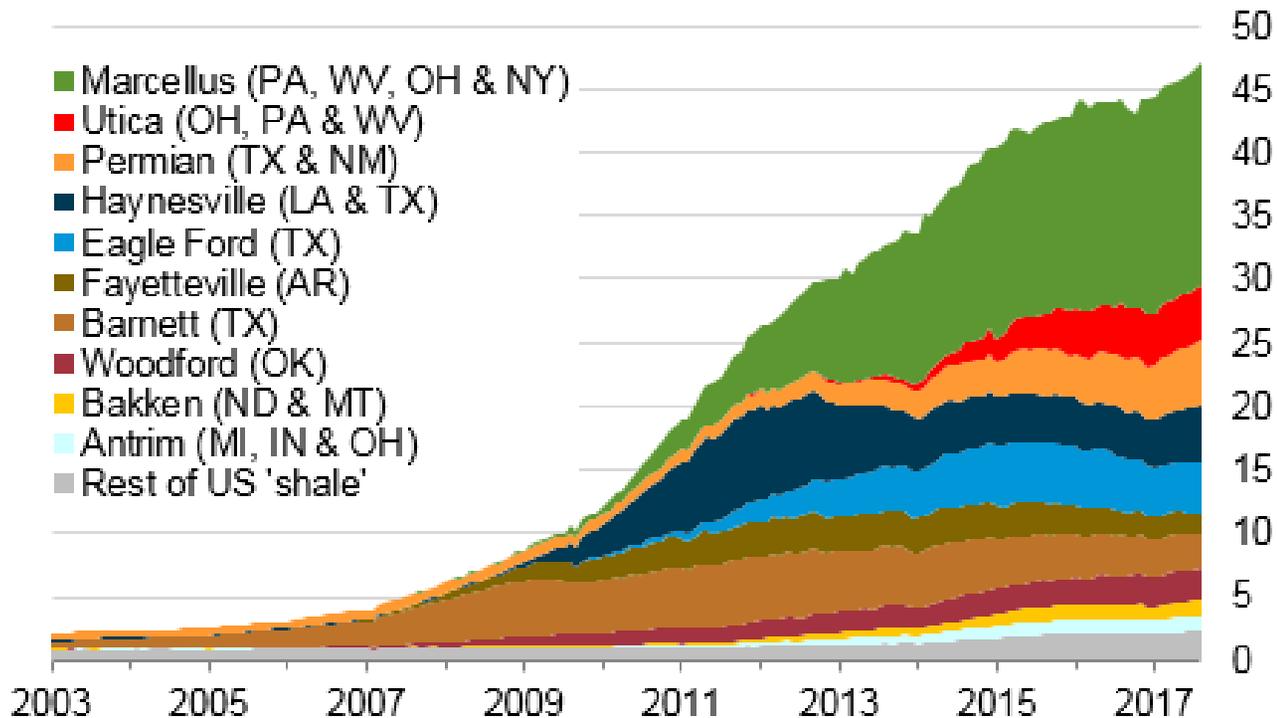
(US Energy Information Administration (EIA) Natural Gas Annual, released 9/29/17; American Gas Association (AGA) Natural Gas Market Indicators, 9/29/17, 9/14/17; US EIA Annual Energy Outlook 2016, released 9/15/16; US EIA Short Term Energy Outlook, release date 10/11/17)



System Planning Strategies - Production

Monthly dry shale gas production

billion cubic feet per day



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through August 2017 and represent EIA's official shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).



(US Energy Information Administration (EIA) Natural Gas Weekly Update, released 10/12/17)

System Planning Strategies - Price

- Serving as a national benchmark, the Henry Hub in southern Louisiana is the best known spot market for natural gas. As of October 4, 2017, the Henry Hub spot price was \$2.81 per MMBtu (million British thermal units)
- With regard to natural gas spot prices at Northeast regional trading hubs, the price on 10/4/17 was \$2.78/MMBtu at the Transcontinental Pipeline Zone 6 (New York).
- The Henry Hub natural gas spot price is forecast to rise from an annual average of \$3.03/MMBtu in 2017 to \$3.19/MMBtu in 2018. According to EIA's *Winter Fuels Outlook*, higher forecast prices reflect higher expected use of natural gas across all consuming sectors and higher expected natural gas exports. The increase in consumption includes a reflection of forecast heating degree days that are 13% higher this winter compared with last winter, noting that last winter was significantly warmer than normal.

(US Energy Information Administration (EIA) Short-Term Energy Outlook, released October 11, 2017; US EIA Winter Fuels Outlook October 2017; US EIA Natural Gas Weekly Update, released 10/5/17)



System Planning Strategies - Pipeline Capacity Reliability

- Development of the national pipeline network infrastructure, comprised of interstate and intrastate transmission pipelines and underground natural gas storage facilities, helps meet the needs of the market and reach new customers within the U.S. and abroad.
- More than one-third of the pipeline projects since 2008 addressed a growing need for additional natural gas pipeline capacity to support transportation of new natural gas production to regional markets. According to the Federal Energy Regulatory Commission (FERC), access to new production and added natural gas transportation capacity has contributed to breaking down long standing price differences between market hubs and has helped to reduce bottlenecks significantly.
- The pipeline infrastructure in the Northeastern US has not kept pace with soaring natural gas production. In addition to bidirectional pipeline projects, the industry is working to build transportation capacity to support this production growth. Pipeline expansion projects are helping to alleviate a supply glut in the region. EIA reports that last year 11 interstate pipeline projects were completed in the Northeastern US, which added slightly over 4 Bcf per day of capacity.
- According to FERC's State of the Markets Report - 2015, approximately 49 Bcf per day of capacity is proposed or planned to come online by 2018 to transport natural gas to markets.

(Federal Energy Regulatory Commission (FERC) State of the Markets Report 2015, released March 17, 2016; FERC Summer 2012 Energy Market & Reliability Assessment, 5/17/12; www.stateimpact.npr.org/pennsylvania/2017/08/17/as-pipelines-alleviate-natural-gas-glut-prices-rise-for-producers-in-northeast/)



Ability to contract for interstate pipeline capacity

- Firm capacity assets are used to transport supplies and manage storage to serve firm customers and operationally balance system requirements
- Members routinely review the interstate capacity market to try to obtain the optimum portfolio of assets to meet their needs
- The temperature sensitive loads of residential and human needs customers require dedicated, firm gas supply assets, including interstate transportation and storage services: There is no substitute
- Members do not report difficulty contracting for firm interstate capacity **when it is available**



Storage Management

- Inventories must be maintained at the levels necessary to fulfill obligations per planning criteria. Aggregate projected storage levels on Nov. 1, 2017 are sufficient to meet anticipated winter demand
- Warmer than normal weather affects storage utilization, given the need to meet minimum turnover requirements for the integrity of fields and to comply with pipeline tariff provisions



Storage Management

- Where contractually and operationally permissible, an NGDC may leave gas in storage if projected replacement costs exceed current prices, or an NGDC may use storage in lieu of firm transportation if replacement costs are favorable
- Storage inventory is managed to prevent deliverability from being reduced before potential design day occurrence, and to prevent firm markets from going un-served for some part of the remainder of the season
- Working natural gas is the volume of gas in a reservoir that is available for withdrawal. Nationally, natural gas working inventories were 1.2% higher than the five year average for the week ending September 15, 2017. Less volumes of gas were injected on average this summer compared with prior years. According to EIA, working gas stockpiles will total 3,842 Bcf, if net injections into working gas match the five year average for the remainder of the April 1 to October 31 refill season.

(American Gas Association (AGA) Natural Gas Market Indicators –9/14/17, 9/29/17; US Energy Information Administration (EIA) Short Term Energy Outlook –August 2016; US EIA Today in Energy – 9/29/17; US EIA Natural Gas Weekly Update, released 10/5/17, released 10/12/17)



Injections into Liquefied Natural Gas (LNG) Facilities

- Two Association members own on-system liquefied natural gas (LNG) facilities, which provide a source of wintertime deliverability
- These facilities are also used to mitigate exposure to price volatility, especially during peak periods
- Total volume injected: 5.0 Bcf
- PECO anticipates using LNG to meet 1% of winter day requirements, PGW anticipates using LNG to meet 2% of winter requirements
- Management of LNG facilities is primarily a matter of preparedness



Gas Price Volatility: Hedging

- Based on a weighted average of the members, 50.8% of this winter's supplies are hedged
- Supplies are considered hedged if they are
 - Already purchased and in storage
 - If they are contracted for delivery under:
 - Fixed-price contracts
 - Forward-priced contracts
 - Price caps



Conclusion: Supply

- Members are well prepared to accommodate the conditions forecasted in their winter season planning design.
- Underground storage and peak shaving inventories will be adequate to handle design conditions.

Thank you.

