

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
National Fuel Gas Distribution Corp.
PECO Energy Company
Peoples Natural Gas Co.
Peoples TWP
Peoples Natural Gas - Equitable Gas Division
Philadelphia Gas Works
Pike County Light & Power
UGI Central Penn Gas, Inc.
UGI Penn Natural Gas, Inc.
UGI Utilities, Inc. - Gas Division
Valley Energy

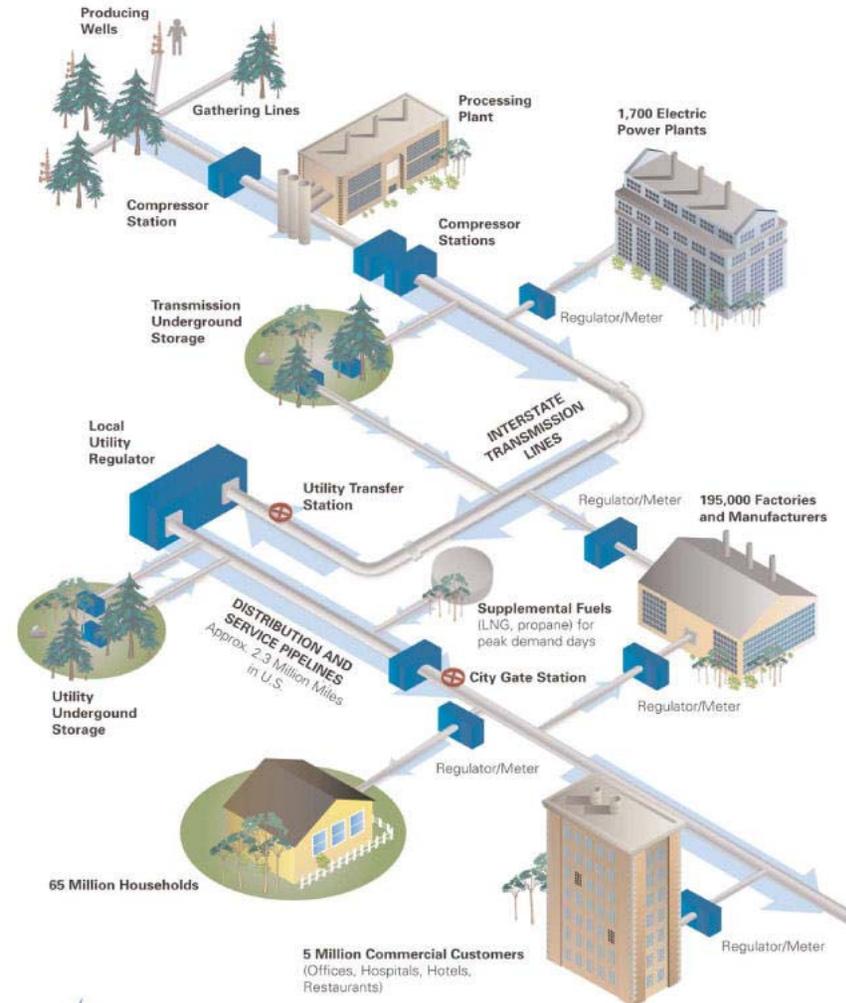
Distributing natural gas to just under three million residential, commercial and industrial customers in Pennsylvania



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

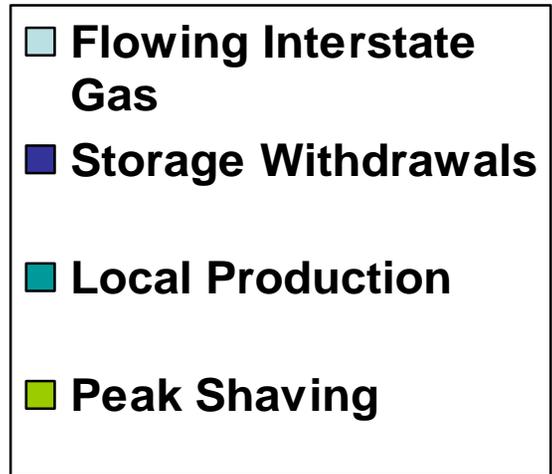
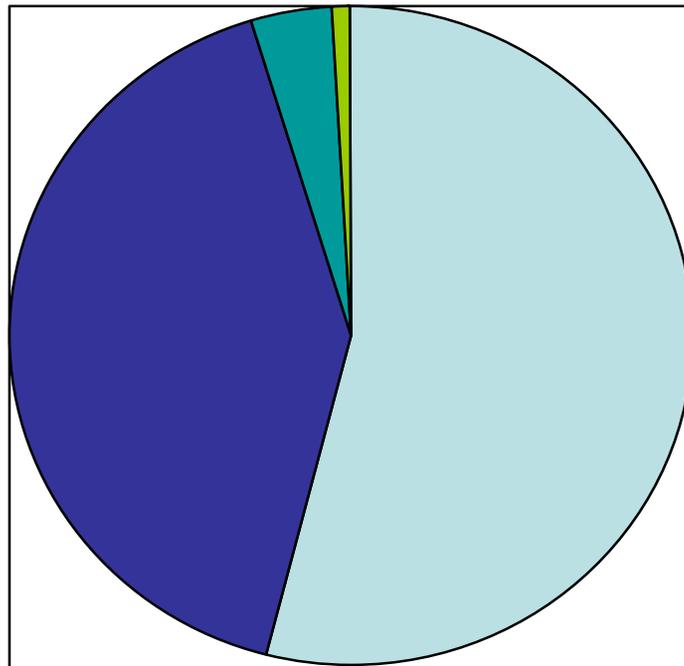
Winter 2016-2017

(all natural gas volumes in billions of cubic feet)

Expected Demand	219.6 Bcf
Expected Supply	
Flowing Interstate Gas	118.3
Storage Withdrawals	91.1
Local Production	8.3
Peak Shaving	1.9
TOTAL	219.6



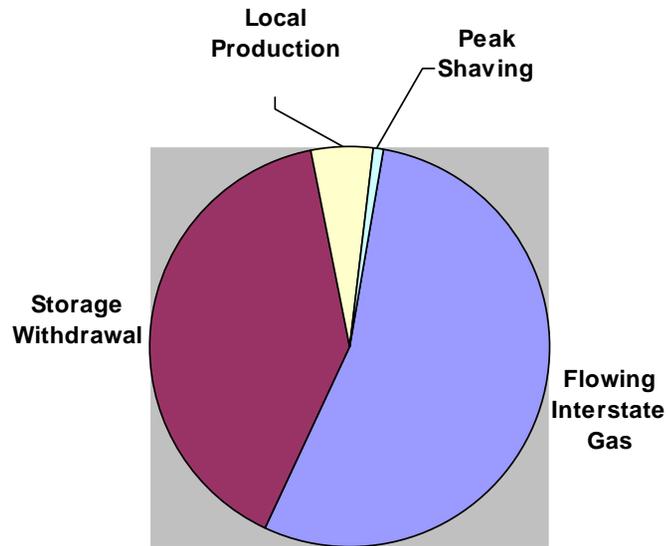
Winter 2016-2017: Supply Sources



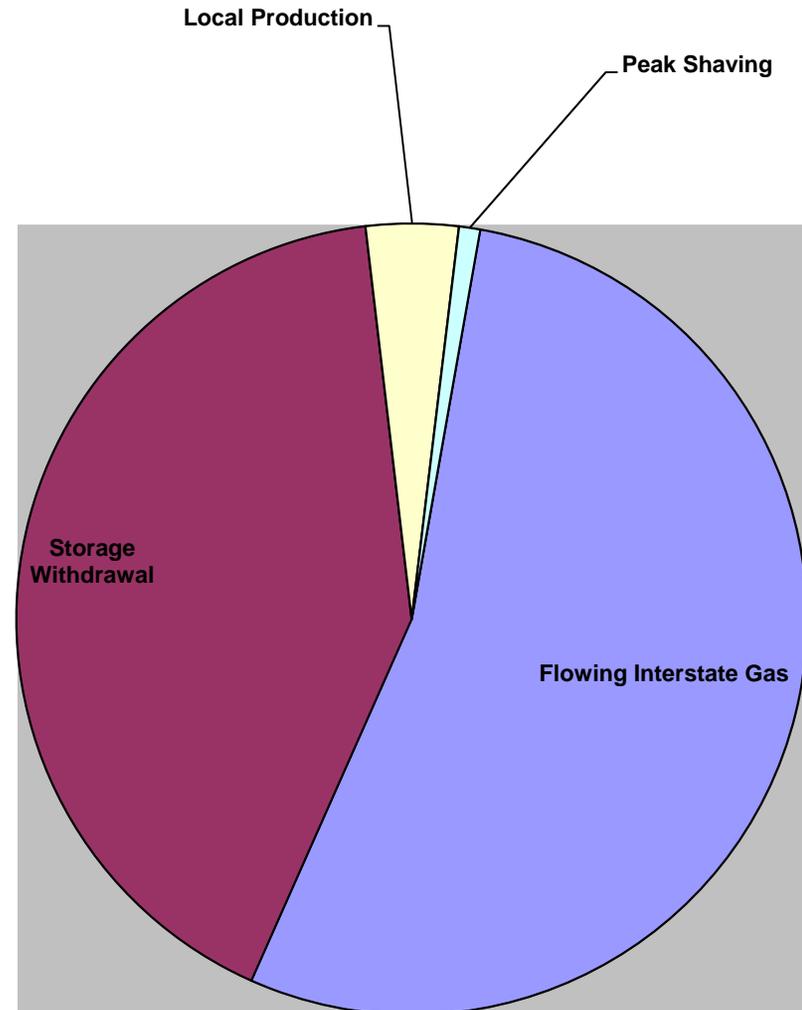
* Note: gas flowing on interstate pipelines can be sourced from Pennsylvania production connected to those interstate pipelines.

Comparison of Forecasts Last Winter and This Winter

Winter 2015-2016:
Supply Sources by Type
219.0 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

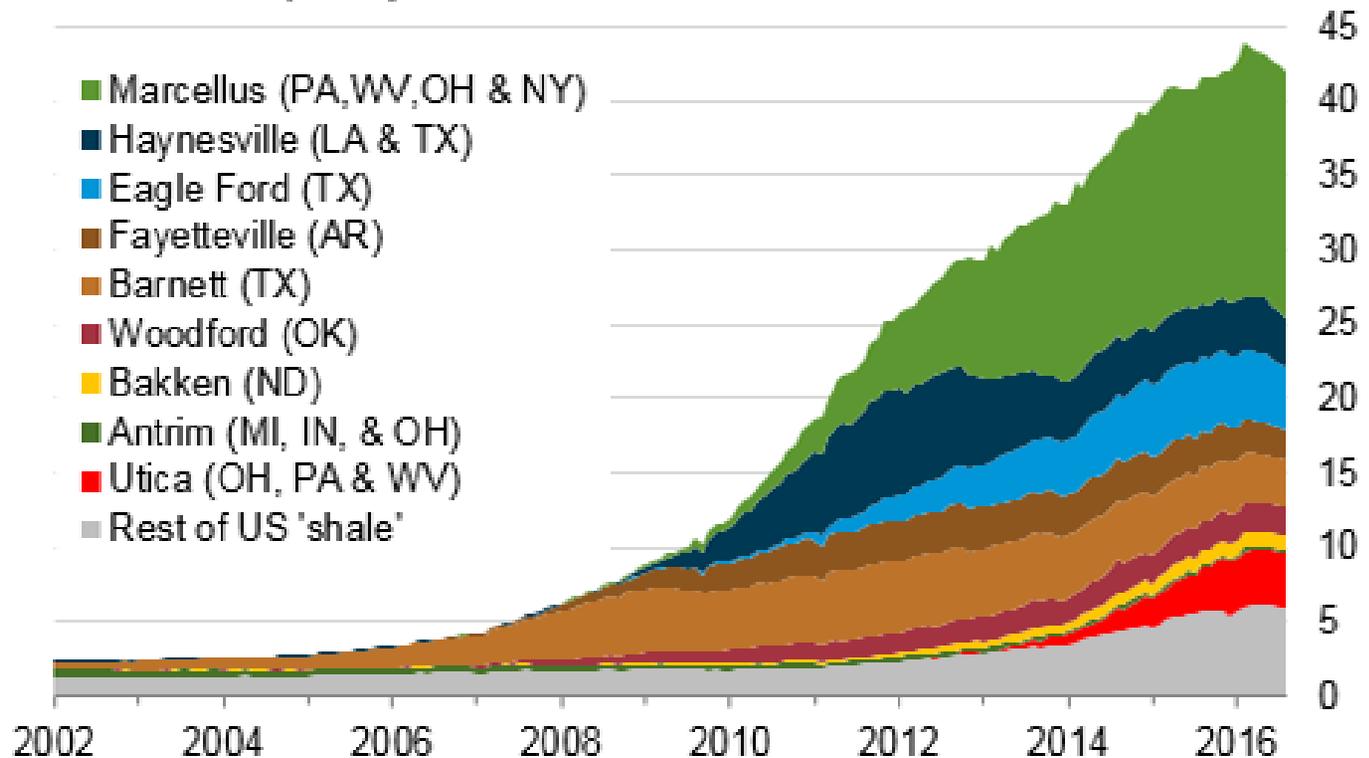
- Record high natural gas production is helping to ensure that adequate supplies of natural gas are available. EIA reports record U.S. natural gas production levels for the fifth consecutive year, as of the end of 2015. Domestic dry natural gas (consumer-grade natural gas) production in 2015 was 4.5% above the 2014 level, or 74.1 billion cubic feet (Bcf) per day. Analysts believe that development of natural gas resources will increase as a result of abundant domestic resources and technology improvements.
- For the third consecutive year, Pennsylvania was the state with the largest total gain in annual dry natural gas production, increasing from 11.56 billion cubic feet (Bcf) per day in 2014 to 13.04 Bcf per day in 2015.
- The combination of two technologies —horizontal drilling and hydraulic fracturing — has made it possible to produce shale gas economically. The United States has experienced a rapid increase in natural gas production from shale resources. 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.
- Domestic gas production in the lower 48 states has averaged 71.6 Bcf per day in September 2016, which is 1.3 Bcf per day less than September 2015. Production decreases can be accounted for by looking at market and pricing developments. EIA expects production to increase in late 2016 and through 2017 in response to forecast price increases and increases in liquefied natural gas (LNG) exports. They forecast natural gas production to rise by 0.6% in 2016 and by 3.0% in 2017.

(US Energy Information Administration (EIA) Natural Gas Annual, released 9/30/16; US EIA Today in Energy, August 22, 2016; American Gas Association (AGA) Natural Gas Market Indicators, 9/29/16 and 8/11/16; US EIA Annual Energy Outlook 2016, released 9/15/16; US EIA Short Term Energy Outlook, August 2016 and release date 9/7/16)



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 2016 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 10/6/16)



System Planning Strategies - Price

- The Henry Hub in southern Louisiana is the best known spot market for natural gas. As of October 5, 2016, the Henry Hub spot price was \$2.86 per MMBtu. Prices in the Northeast trading hub have been below prices at the Henry Hub. The price on 10/5/16 was \$1.07/MMBtu at the Transcontinental Pipeline Zone 6 (New York).
- A hot summer and production declines have put some upward pressure on natural gas prices, although prices remain low enough to support significant natural gas-fired generation. EIA expects natural gas prices to gradually rise and forecast Henry Hub prices to average \$2.42 per million British thermal units (MMBtu) in 2016 and \$2.87/MMBtu in 2017.
- If winter proves relatively mild, prices could fall below where they are today, according to some analysts. Heating degree day data will say much about where the market goes during the winter heating season.

(American Gas Association (AGA) Natural Gas Market Indicators – 19/29/16; US Energy Information Administration (EIA) Short-Term Energy Outlook, released September 7, 2016; US EIA Natural Gas Weekly Update, for week ending 10/5/16, released 10/13/16)



System Planning Strategies - Pipeline Capacity Reliability

- The national pipeline network is comprised of 305,000 miles of interstate and intrastate transmission pipelines and 400 underground natural gas storage facilities. Development of this infrastructure helps meet the needs of the market. Additional pipeline redundancy would be challenging but perhaps should be considered in light of increased gas powered electricity generation.
- 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.
- About 27,800 miles of new natural gas transmission pipeline were placed in service in the U.S. from 1998 to 2011. At least 25 major pipeline projects were completed in the U.S. in 2011, adding a total of about 2,400 miles of pipeline and 13.7 billion cubic feet (Bcf) per day of capacity. In addition to bidirectional pipeline projects, the industry is planning to build transportation capacity to support the growth of natural gas production in the Northeast.
- 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; US EIA, Today in Energy, 12/2/14, 3/25/13, and 2/17/12; US EIA Natural Gas Year-In-Review 2011, released July 2012 and Year-In-Review 2009, released July 2010; US EIA, Major Changes in Natural Gas Transportation Capacity 1998-2008, J. Tobin, Office of Oil & Gas; FERC Summer 2012 Energy Market & Reliability Assessment, 5/17/12; www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline/index.html)



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, 2016 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 are above average. Working gas stockpiles topped 3,000 billion cubic feet (Bcf) during the first week of June which is earlier in the refill season (April 1 to October 31) than ever before. The last time inventories reached this threshold in June was in 2012. When the refill season began on April 1, working gas stocks were 874 Bcf above the five year average.
- Stockpiles at the end of September were at 3,600 Bcf which is 6.5% above the five year average. EIA forecasts natural gas inventories to be 4,042 Bcf at the end of October 2016, which would be a record high level for that time of year.

(American Gas Association (AGA) Natural Gas Market Indicators –9/29/16; US Energy Information Administration (EIA) Short Term Energy Outlook –August 2016; US EIA Natural Gas Weekly Update, for week ending June 22, 2016, released 6/23/16 and for week ending October 5, 2016, released 10/6/16)



Injections into Liquefied Natural Gas (LNG) Facilities

- Two Association members inject into member-owned facilities
- Total volume injected: 4.0 Bcf
- PECO Energy 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, 42.9% 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.

