

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

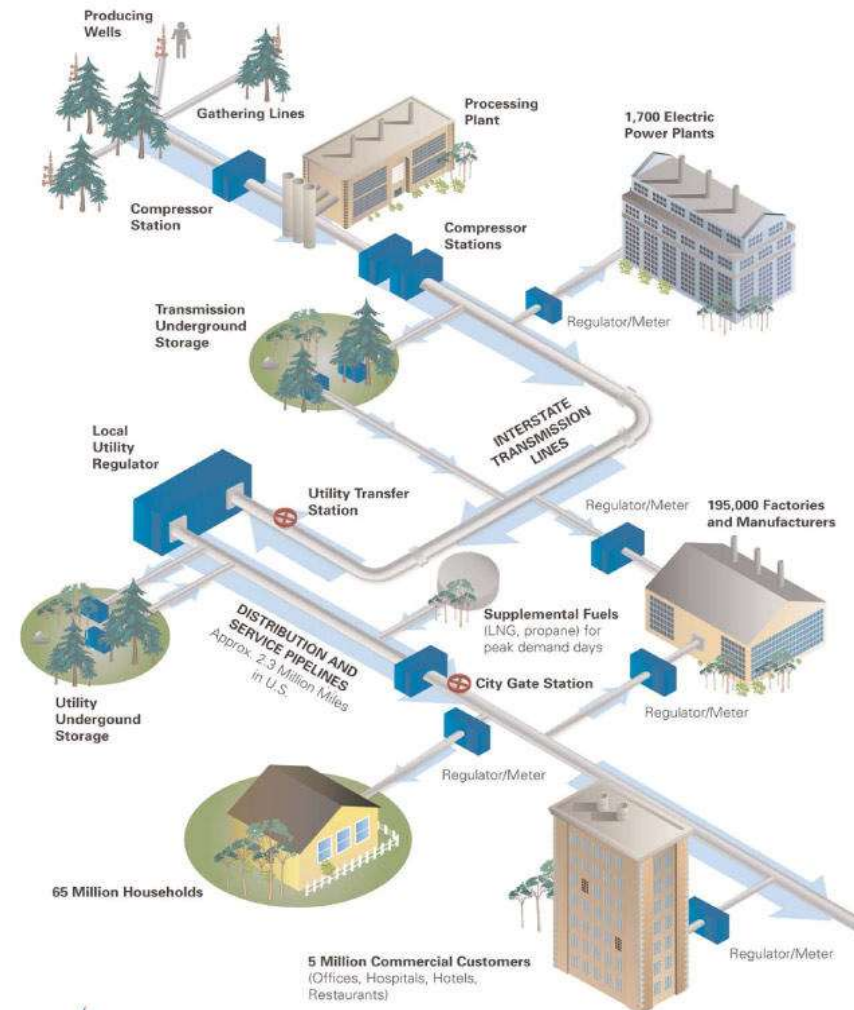
Distributing natural gas to over three million residential, commercial and industrial customers in Pennsylvania



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

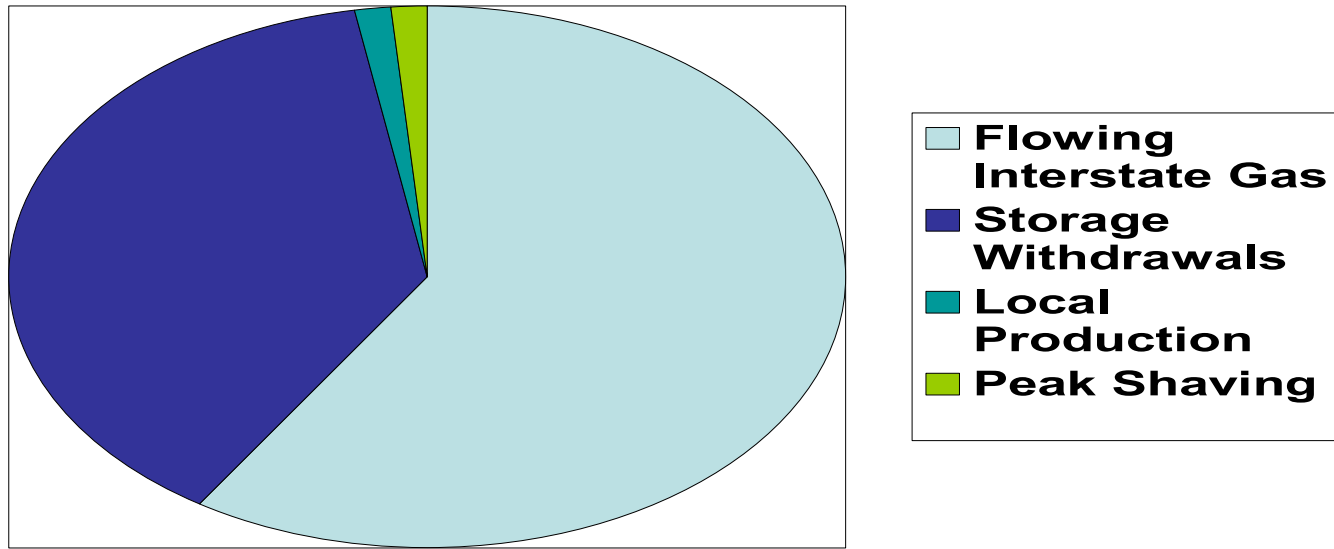
Winter 2021-2022

(all natural gas volumes in billions of cubic feet)

Expected Demand	230.6 Bcf
Expected Supply	
Flowing Interstate Gas	136.3
Storage Withdrawals	88.1
Local Production	3.3
Peak Shaving	2.9
TOTAL	230.6

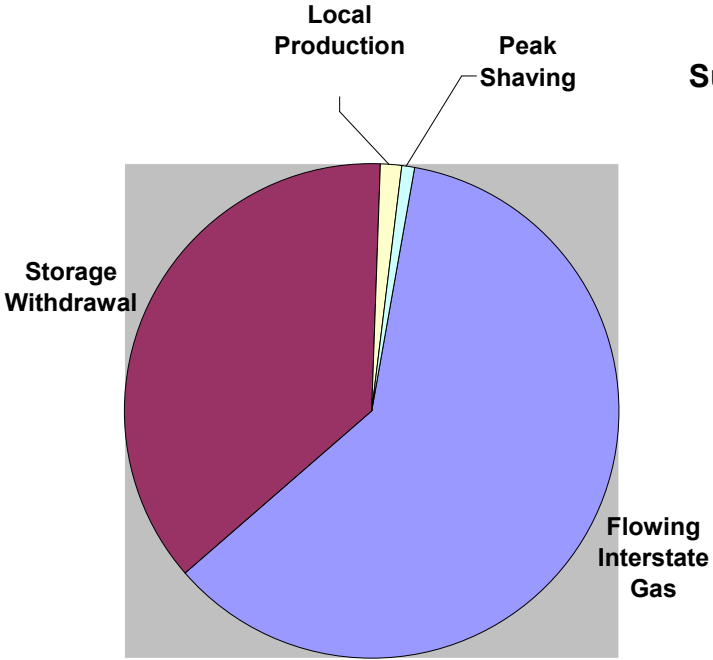


Winter 2021-2022: Supply Sources



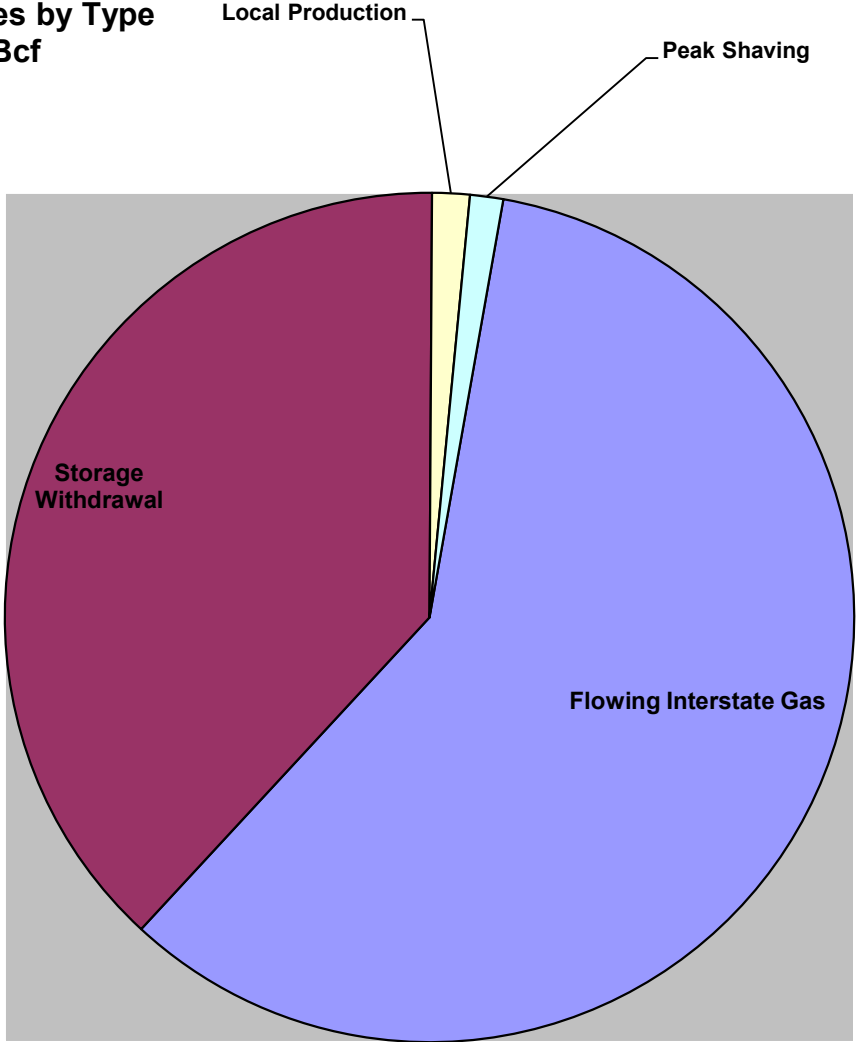
* Note: gas flowing on interstate pipelines can be sourced from Pennsylvania production connected to those interstate pipelines.

Comparison of Forecasts Last Winter and This Winter



**Winter 2020-2021:
Supply Sources by Type
224.7 Bcf**

**Winter 2021-2022:
Supply Sources by Type
230.6 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

- According to the year end 2018 Potential Gas Committee's (PGC) natural gas resources assessment, the U.S. possesses a total mean technically recoverable resource base of 3,374 trillion cubic feet (Tcf) which is the highest resource evaluation in the Committee's 54 year history. The increase resulted, in part, from reassessments of shale gas resources in the Atlantic and Mid-Continent areas. The record gas resources assessed by the PGC, in addition to record reserves and record production reported by the US Energy Information Administration (EIA), display a picture of strong supply of natural gas in the U.S. for many years to come.
- The EIA estimates that U.S. dry natural gas (consumer-grade natural gas) production averaged 93.3 billion cubic feet (Bcf) per day during the third quarter of 2021 – up from 91.6 Bcf/d in the first half of 2021. Production in the forecast rises to an average of 94.0 Bcf/d during the winter, and averages 96.4 Bcf/d during 2022, driven by natural gas and crude oil prices, which EIA expects to remain at levels that will support enough drilling to sustain production growth.
- Dry natural gas production from shale formations in the Appalachian Basin that spans Pennsylvania, West Virginia, and Ohio has been growing since 2008, and monthly production has recently set new record highs. Production in the region reached 32.5 billion cubic feet per day (Bcf/d) in December 2020, and it averaged 31.9 Bcf/d during the first half of 2021, the highest average for a six-month period since production began in 2008. The Appalachian Basin contains two shale formations, Marcellus and Utica, which accounted for 34% of all U.S. dry natural gas production in the first half of 2021. On its own, the Appalachian Basin would have been the third-largest natural gas producer in the world the first half of 2021, behind Russia and the rest of the United States.
- Production has increased in part because of new drilling techniques. The combination of two technologies — horizontal drilling and hydraulic fracturing — has made it possible to produce shale gas economically. 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. Advances, such as longer well laterals, allow producers to recover greater volumes from a single well.

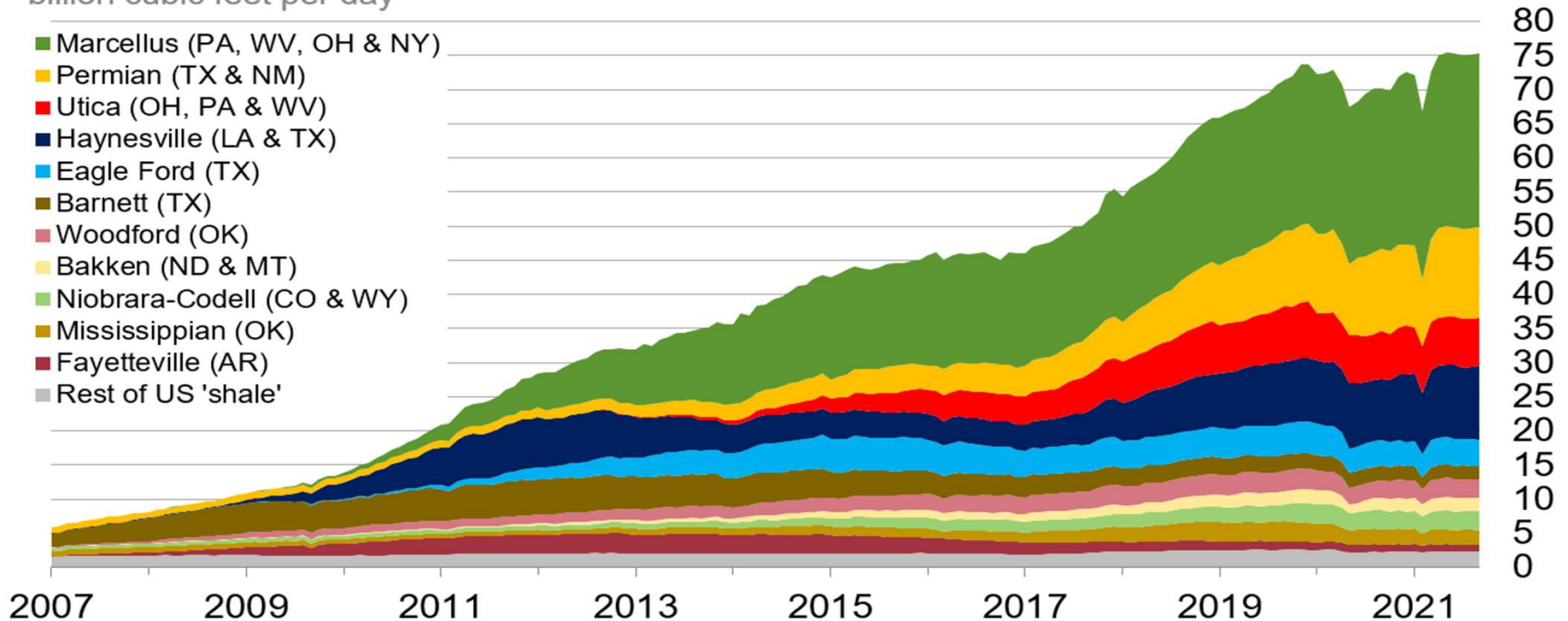
(<https://www.iea.org/reports/world-energy-outlook-2020#>; US Energy Information Administration (EIA) *Today in Energy*, release date 9/1/21; US EIA *Short-Term Energy Outlook*, release date 10/13/21.; American Gas Association (AGA) *Natural Gas Market Indicators*, 10/1/21; *Potential Supply of Natural Gas in the United States*, Report of the Potential Gas Committee, released 12/31/18, www.potentialgas.org)



System Planning Strategies - Production

Monthly dry shale gas production

billion cubic feet per day



Source: Graph by the U.S. Energy Information Administration (EIA) based on state administrative data collected by Enverus. Data are through September 2021 and represent EIA's official tight gas estimates, but are not survey data. State abbreviations indicate primary state(s).

Note: Improvements to play identification methods have altered production volumes of between various plays.



(US Energy Information Administration (EIA) - <https://www.eia.gov/naturalgas/weekly> - 10/21/21

System Planning Strategies - Price

- Serving as a national benchmark, the Henry Hub in southern Louisiana is the best known spot market for natural gas. In September, this spot price averaged \$5.16 per MMBtu (million British thermal units). As of October 20, 2021, the Henry Hub spot price was \$4.79 per MMBtu. With regard to natural gas spot prices at Northeast regional trading hubs, the price on 10/20/21 was \$4.15/MMBtu at the Transcontinental Pipeline Zone 6 (New York).
- According to the US Energy Information Administration (EIA), Henry Hub natural gas spot prices are forecast to average \$5.80 MMBtu in fourth quarter 2021 and are likely to remain elevated through the winter. The rising prices in recent months reflect U.S. natural gas inventory levels that are below the five year average and continuing demand for natural gas for power generation use at relatively high prices.
- Current pricing trends reflects a tighter market as production growth in the short term has lagged increases in natural gas demand, principally as flows for export have increased. Noting that U.S exports of liquified natural gas (LNG) are on track to establish a record high this year, EIA expects Henry Hub prices will decrease in the second quarter of 2022, as growth in domestic natural gas production outpaces growth in U.S. LNG exports. According to EIA, the Henry Hub spot price will average \$4.01 MMBtu in 2022.
- EIA forecasts that average household expenditures for all major home heating fuels will increase significantly this winter primarily because of higher expected fuel costs, as well as more consumption of energy due to a colder winter. The high prices follow changes to energy supply and demand patterns in response to the COVID-19 pandemic. Based on forecasts from the National Oceanic and Atmospheric Administration (NOAA), EIA's forecast assumes a slightly colder winter than last year in most of the United States and more similar to the average winter of the previous 10 years. EIA forecasts residential natural gas prices to be 27% higher than last winter.

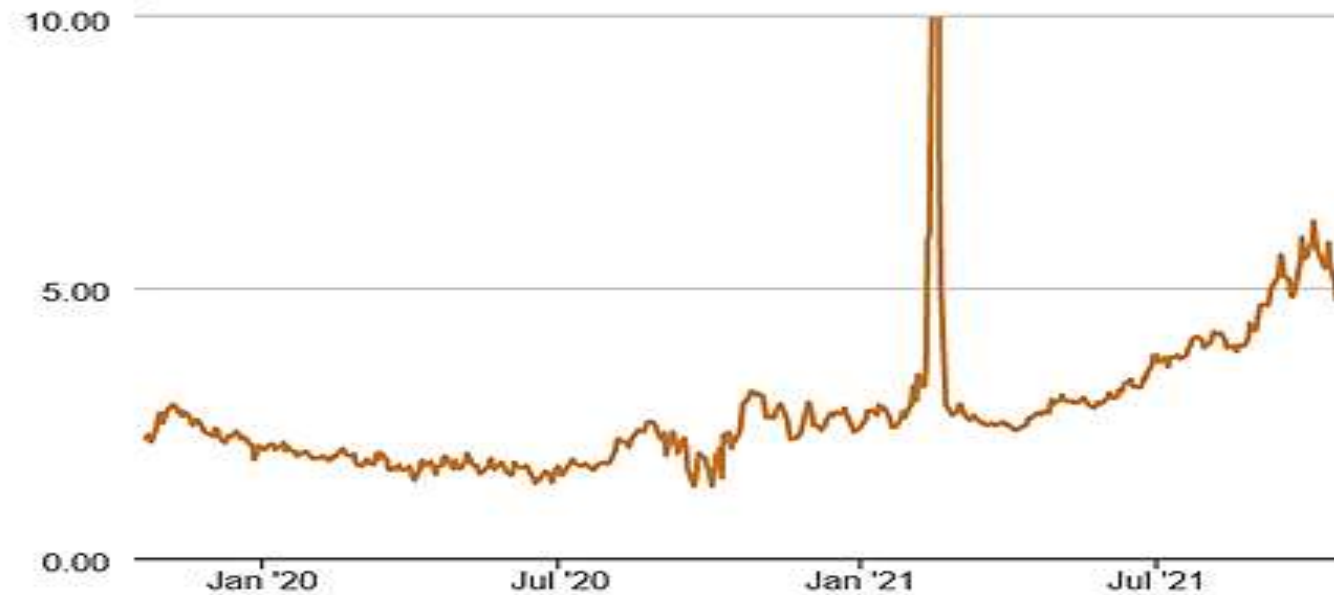
(US Energy Information Administration (EIA) Short-Term Energy Outlook, released October 13, 2021; US EIA Natural Gas Weekly Update, released 10/14/21 and 10/21/21; TODAY IN ENERGY -10/14/21; US EIA Winter Fuels Outlook – October 2021; AGA Natural Gas Market Indicators -10/1/21)



System Planning Strategies - Price

Natural gas spot prices (Henry Hub)

dollars per million British thermal units



Source: Graph by the U.S. Energy Information Administration (EIA), based on data from Natural Gas Intelligence

Note: Henry Hub prices reported for February 16 and 17, 2021, exceeded the published range, averaging \$16.96/MMBtu and \$23.61/MMBtu, respectively.



(US Energy Information Administration (EIA) - <https://www.eia.gov/naturalgas/weekly> - 10/21/21

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.
- Pipeline projects address 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.
- Growth in pipeline takeaway capacity allows natural gas produced in the Appalachian Basin to reach other demand markets, especially in the Midwest. From 2008 to 2020, total pipeline takeaway capacity from the Northeast increased from 4.5 Bcf/d to 24.5 Bcf/d, alleviating some congestion and supporting higher wholesale natural gas prices in the region. Most of the increase in takeaway capacity happened between 2014 and 2020, when pipeline capacity increased by 16.5 Bcf/d. Pipeline takeaway capacity from Appalachia to Canada and to the Southeast has also increased.

(US EIA Today in Energy, released 9/1/21; www.stateimpact.npr.org/pennsylvania/2017/08/17/as-pipelines-alleviate-natural-gas-glut-prices-rise-for-producers-in-northeast/; Federal Energy Regulatory Commission (FERC) State of the Markets Report, released 3/17/16; FERC Summer 2012 Energy Market & Reliability Assessment, 5/17/12)



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, 2021 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.
- U.S. natural gas inventories are forecasted by EIA to be at 3.5 trillion cubic feet (Tcf) by the end of the typical underground storage injection season (April through October), 5% less than the five year average for this time of year.
- Storage inventories, while below the five-year average, continue a strong refill pace, especially in the Northeast market served by natural gas utilities. Injections were slow this summer, largely as a result of more electricity consumption in June due to hot weather, and increased exports even as domestic natural gas production remained flat.
- The US natural gas market prepares to enter the winter heating season with a portfolio of natural gas supplies that includes strong natural gas production, imports, and growing storage inventories. It appears the gas market is well-positioned in terms of supply as we head into the winter.

(American Gas Association (AGA) Natural Gas Market Indicators –10/1/21; US Energy Information Administration (EIA) Short Term Energy Outlook, released 10/13/21; US EIA Weekly Natural Gas Storage Report, released 10/21/21; US EIA Natural Gas Weekly Update, released 10/21/21)



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 3% 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, 48% 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.

