



EXECUTIVE SUMMARY

The exponential growth of data centers necessitates innovative and reliable energy solutions. UGI Energy Services (UGIES), with its robust midstream natural gas pipeline assets in Pennsylvania, presents a viable opportunity for data centers to secure cost-effective and sustainable energy sources. This white paper explores the feasibility of leveraging UGIES’s pipeline infrastructure to generate electricity for data centers, ensuring reliability, efficiency, and sustainability.

INTRODUCTION

As data centers continue to proliferate, their energy consumption is becoming a critical issue. Traditional energy sources, such as coal and nuclear power, face regulatory and sustainability challenges. Natural gas, with its lower carbon footprint and abundant domestic supply, serves as an attractive alternative. UGIES’s extensive natural gas pipeline network and extensive experience designing, constructing, operating, and maintaining those networks and related energy infrastructure throughout Pennsylvania provides an excellent foundation and resource to integrate reliable natural gas-powered electricity generation most suitable for critical applications including data centers.

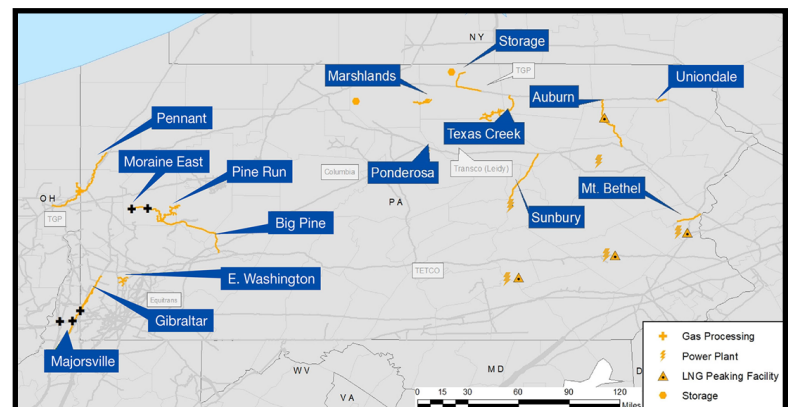
OVERVIEW OF UGI ENERGY SERVICES’ PIPELINE INFRASTRUCTURE

30 years of providing natural gas solutions in the NE United States including:

- Partnerships with interstate pipelines
- Midstream capacity access including storage, gathering, and transport
- Midstream assets including 1.9 BCF of LNG storage
- Multiple LNG facilities within trucking distance owned and operated by UGIES

UGIES has constructed, owns, and operates a comprehensive network of midstream assets (including traditional pipelines) that provides reliable and scalable natural gas transportation. Key features include:

- **Extensive Pipeline Network:** A vast and interconnected system ensuring steady gas flow to key locations.
- **Strategic Connectivity:** Direct access to Marcellus Shale production and key demand centers.
- **Compression & Pressure Management:** Advanced compressor stations that optimize gas flow for efficient delivery.
- **Interconnections with Power Generation Facilities:** Seamless integration with existing and potential gas-fired power plants near data center hubs.



These assets provide a stable and scalable foundation for energy-intensive industries such as data centers.

ENERGY DEMAND IN DATA CENTERS

Data centers require high levels of continuous, reliable power due to:

- **24/7 Operations:** Uptime is critical, requiring dependable energy sources.
- **High Power Density:** Massive energy demand per square foot.
- **Cooling Requirements:** Additional energy needed for temperature control.

Natural gas-fired power generation provides an attractive solution to meet these demands due to its reliability and cost-efficiency.

To provide a more detailed comparison, here's a chart illustrating the average natural gas prices in the Marcellus Shale region versus other key regions in the United States over the past year:

REGION	AVERAGE PRICE (MMBTU)
Marcellus Shale (PA)	\$2.50
Henry Hub (Louisiana)	\$3.00
Permian Basin (Texas)	\$2.80
Haynesville Shale (Louisiana/Texas)	\$2.90

Note: The prices to the left are illustrative and based on historical data trends. Actual prices can fluctuate based on market conditions.

It's important to note that while the Marcellus region often experiences lower natural gas prices due to its abundant supply, infrastructure constraints can lead to price volatility. However, UGI Energy Services midstream assets alleviate these issues and narrow the price gap between the Marcellus region and other parts of the country.

FEASIBILITY OF USING UGIES'S PIPELINE NETWORK FOR POWER GENERATION

By leveraging UGIES's pipeline infrastructure, data centers can access:

- **Onsite or Near-Site Power Generation:** Establishing gas-fired power plants near data center locations to minimize transmission losses.
- **Direct Pipeline Access:** Secure and consistent supply of natural gas from UGIES's network, ensuring uninterrupted power generation.
- **Microgrid Implementation:** Enhancing energy security with localized power generation tailored to data center needs.
- **Combined Heat and Power (CHP) Systems:** Improving energy efficiency by utilizing waste heat for cooling.
- **Energy Redundancy Systems**

Indicative Lead Time Details of indicative pricing and lead times are provided as best effort, high-level analysis.

To provide more accurate information, UGIES would need to perform engineering and analysis under contract.

Indicative Lead Time = 60 Months Included in Lead time

- Engineering Study
- Design Finalization
- Most Permitting* - FERC, EPA, Pennsylvania, Municipalities and/or County, PHMSA, DEP, etc.
- Construction
- Operations Ramp Up
- Interstate Pipeline negotiations
- Possible, unforeseen delays

Indicative Capital Cost = \$225M - \$400M

- Included in Indicative Cost
- Engineering Study
- Design Finalization (based on generalized energy/process flow system)
- Permitting – FERC, EPA, Pennsylvania, Municipalities and/or County, etc.

Construction of LNG storage, vaporization, and pipeline tie-in; CNG storage, compression, and tie-in; pipelines, and pipeline tap(s); metering and monitoring equipment; etc. (final design based on specific customer energy profile and standards).

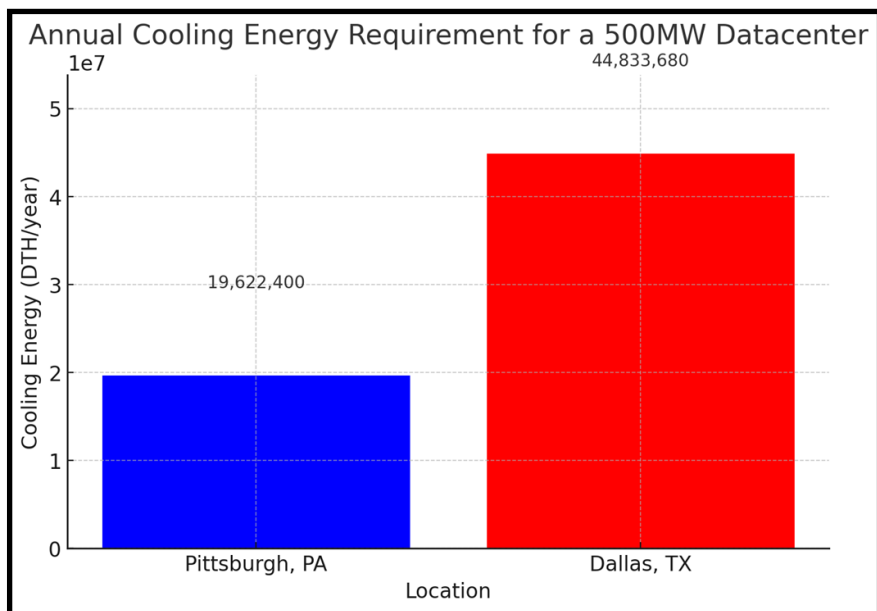
- Operations Ramp Up
- Land Acquisition
- Possible, unforeseen cost drivers like policies that add or remove incentives, standards, or regulations; volatility in cost of materials or labor; issues in land acquisition; geological issues like rock or fault lines; etc.

NOT Included in Indicative Capital Cost:

- Natural gas service
- Operations once the LNG plant is live

ENVIRONMENTAL AND ECONOMIC BENEFITS

- **Lower Carbon Footprint:** Compared to coal, natural gas reduces greenhouse gas emissions.
- **Cost Stability:** UGIES’s pipeline network ensures consistent and competitive natural gas pricing.
- **Grid Independence:** Reduces reliance on traditional power grids, enhancing operational resilience.



A 500 MW datacenter in Texas would require about 2,878 more DTH per hour for cooling than the same datacenter in Pennsylvania, assuming similar cooling infrastructure and efficiencies. Over a year, that's ~25.2 million additional DTH or approximately \$70,500,000 (assuming continuous operation).

CONCLUSION & NEXT STEPS

Integrating UGIES’s pipeline assets into data center energy strategies presents a viable, sustainable, and cost-effective solution. Stakeholders, including data center operators, energy providers, and policymakers, should collaborate to develop pilot projects and long-term strategies to harness this opportunity.



Industry leaders should explore partnerships with UGIES to implement natural gas-powered solutions tailored to data center needs. Future discussions should focus on regulatory considerations, infrastructure investment, and technological advancements to optimize energy usage.

MIDSTREAM ASSETS

SUNBURY PIPELINE

Snyder, Union, Northumberland, Montour, and Lycoming Counties, PA, Natural Gas Pipeline

- 35 mile, 20-inch pipeline
- FERC Regulated
- Capacity of 200,000 Dth/day
- Supplies fuel to the Hummel Station Power Facility in Shamokin Dam, PA
- Interconnected with Kinder Morgan's Marc 1 pipeline, Transco's Leidy Line, and UGI Utilities

MT. BETHEL PIPELINE

Northampton County, PA | Natural Gas Pipeline

- 12.5 mile, 12-inch pipeline
- FERC regulated
- Capacity of 72,000 Dth/day
- Interconnected with Transco's Leidy Line and UGI Utilities

UNIONDALE PIPELINE

Susquehanna County, PA | Natural Gas Pipeline

- 6 mile, 12-inch high-pressure gathering pipeline
- Capacity of 100,000 Dth/day
- Interconnected with Williams Field Services and UGI Utilities

AUBURN GATHERING SYSTEM

Susquehanna, Wyoming and Luzerne Counties, PA | Natural Gas Gathering System

- 46 miles of 12-inch, 20-inch and 24-inch pipeline
- 4 compressor stations totaling 32,000hp
- Capacity of 635,000 Dth/day
- Interconnected with local production, the Tennessee Gas Pipeline, Transco Leidy Line, and UGI Utilities

BIG PINE GATHERING SYSTEM

Butler, Armstrong, Indiana, and Westmoreland Counties, PA | Natural Gas Gathering System

- 67 miles of 20-inch and 24-inch pipeline
- 4,000hp of compression
- Capacity of 425,000 Dth/day
- Customers include XTO Energy, Penn Energy Resources, Range Resources, and Snyder Brothers
- Interconnected with BHE GT&S Pipeline (formerly Dominion Transmission) and Texas Eastern Transmission

Gibraltar Gathering System

Washington and Greene Counties, PA | Natural Gas Gathering System

- 25 miles of 36-inch pipeline
- 10,000hp of compression
- Capacity of 1,000,000 Dth/day
- Interconnected with Columbia Gas Transmission's Leach Express Pipeline and Texas Eastern Transmission

MAJORSVILLE GATHERING SYSTEM

Washington and Greene Counties, PA, and Marshall County, WV | Natural Gas Gathering System

- Majorsville pipelines: 24 miles of 16-inch and 20-inch pipeline
- Capacity of 300,000 Dth/day
- Interconnected with MarkWest Majorsville Processing Plant, Texas Eastern Transmission, and Columbia Gas Transmission

EAST WASHINGTON GATHERING SYSTEM

Washington County, PA | Natural Gas Gathering System

- 16 miles of 8-inch, 12-inch, 16-inch, and 20-inch pipeline
- Capacity of 300,000 Dth/day
- Gathering service provided for Range Resources
- Interconnected with Columbia Gas Transmission and Equitrans

PENNANT MIDSTREAM™ GATHERING AND PROCESSING SYSTEM

Western PA and Eastern Ohio | Natural Gas Gathering, Processing, Natural Gas Liquids Transportation System

- Wet gas gathering from production facilities in third-party locations, including in Mercer and Lawrence Counties, PA, and Mahoning County, OH
- Dry gas gathering from production facilities in third-party locations, including in Columbiana County, OH
- Provides processing of natural gas and removes natural gas liquids from natural gas at the Hickory Bend Gas Processing Plant near New Middletown, OH (Capacity: 240,000 Dth/day)
- Interconnected with the Tennessee Gas Pipeline
- Transportation of natural gas liquids, utilizing a 36-mile pipeline to Kensington Processing Plant

MORAIN EAST GATHERING SYSTEM

Butler County, PA | Natural Gas Gathering System

- 47.5 miles of rich gas gathering and over 130,000 Mcf/day of compression capacity (20,000 horsepower)
- Interconnected with MPLX's Bluestone Processing Plant, which delivers into BHE GT&S Pipeline (formerly Dominion Transmission) and UGI's Big Pine Gathering System

TEXAS CREEK GATHERING SYSTEM

Bradford, Tioga, and Lycoming Counties, PA | Natural Gas Gathering System

- 63 miles of 8-inch, 12-inch, and 16-inch pipeline
- 7 compressor stations totaling 14,000hp.
- 290,000 Dth/day of day capacity
- Interconnected with the Tennessee Gas Pipeline and Energy Transfer

MIDSTREAM ASSETS

MARSHLANDS GATHERING SYSTEM

Tioga and Potter Counties, PA | Natural Gas Gathering System

- 26 miles of 4-inch, 8-inch, and 10-inch pipeline
- 3 compressor stations totaling 3,000hp
- 70,000 Dth/day of day capacity
- Interconnected with BHE GT&S Pipeline (formerly Dominion Transmission)

PONDEROSA GATHERING SYSTEM

Clinton County, PA | Natural Gas Gathering System

- 4.6 miles of pipeline
- Interconnected with the Transco Leidy Line

PINE RUN MIDSTREAM (49% OWNERSHIP)

Butler and Armstrong Counties, PA, Natural Gas Gathering System

- Partnership with Stonehenge Energy
- 47.5 miles of dry gas gathering and over 350,000 Mcf/day of compression capacity (over 40,000 horsepower)
- Interconnected with BHE GT&S Pipeline (formerly Dominion Transmission) and UGI's Big Pine Gathering System

UGI STORAGE COMPANY

Tioga, Potter, and Cameron Counties, PA, Natural Gas Storage and Pipelines

- FERC regulated.
- Approximately 15 Bcf of 60-day and 100-day storage service
- Access to Tennessee Pipeline, BHE GT&S Pipeline, and Transco Leidy Line