

Virtual Pipelines for Natural Gas Service IDEA Annual Conference & Trade Show 2016



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Introduction to the Virtual Pipeline

▣ Introduction to the Virtual Pipeline

- ▣ What is Compressed Natural Gas?
- ▣ The Technology
 - Compression
 - Delivery
 - Decompression
 - Send Out

▣ CNG Applications

- ▣ Heat and Power Applications
- ▣ Gas Utility Service
- ▣ Fleet Fueling
- ▣ Typical Cost of Service

▣ CNG Case Studies

- ▣ University Campus Solutions

Why use a “Virtual Pipeline”?

Virtual Pipelines provide natural gas to locations that have limited or no access to pipeline gas.

Pipeline gas is replaced with a fleet of trucks and trailers to deliver a continuous supply of natural gas to large consumers

- Systems monitor pressure, flow and temperature in real-time to provide a continuous supply to the customer

Three primary applications

- 1. CNG for Industrial and Commercial** heat and power demand, displacing traditional oil and propane, as well as solid fuels like biomass and coal
- 2. CNG for Utilities** that seek to
 - Increase baseload ahead of capacity upgrades
 - Peaking gas supply
 - Gas supply during scheduled or emergency repair
- 3. CNG for off-pipeline fleet fueling** and transportation companies

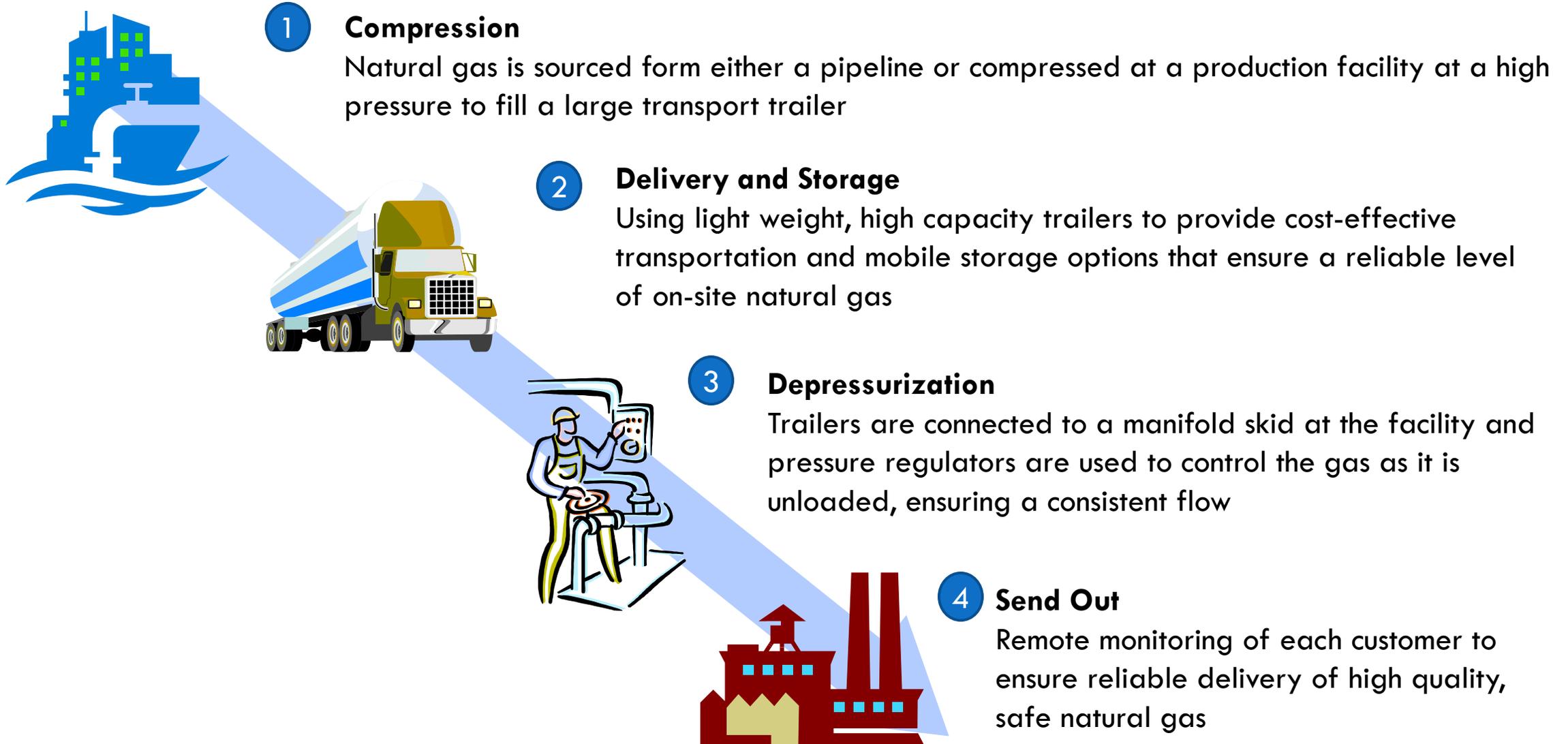


What is CNG? Compressed Natural Gas.

- **CNG is natural gas loaded into storage tanks for transportation and delivery**
 - Same basic concept as a scuba tank
- **We use a “drop and swap” model to provide a constant stream of gas to customers**
 - Full trailers are dispatched to site
 - Once connected, an empty trailer on site is disconnected and “swapped”
 - The empty trailer is returned to the station to be refilled and sent out again.
- **Strategic terminal locations close to the customers, goal is to create a low-cost and highly reliable delivery model to supply natural gas to regions without a pipeline.**



CNG systems represent a utility-grade reliable natural gas supply solution.



1 Compression

Terminals are located on interstate transmission lines



■ Interstate pipelines enable offer uninterruptible service at a lower cost

- Guaranteed firm capacity with no curtailment
- Compressors sized to fill individual CNG trailers in under 1 hour
- Capacity to support multiple truck-loading stations
- Staffed 24x7 by a dispatch manager and truck filling attendant



2 Delivery and Storage High-capacity CNG trailers

- **CNG uses a “Drop and Swap” delivery model**

- Transport trailers are used for both delivery and on-site storage
- 4 carbon tubes reduce trailer weight for better fuel efficiency and lower trucking expenses



3 Decompression

Equipment meets regulatory standards for utility service.

- ❑ Pre-assembled in a single container for rapid installation on-site
- ❑ Supported by 24x7 remote monitoring and logistics center owned and operated by XNG
- ❑ Fully-redundant flowpath design supports easy maintenance and 99.9% uptime availability



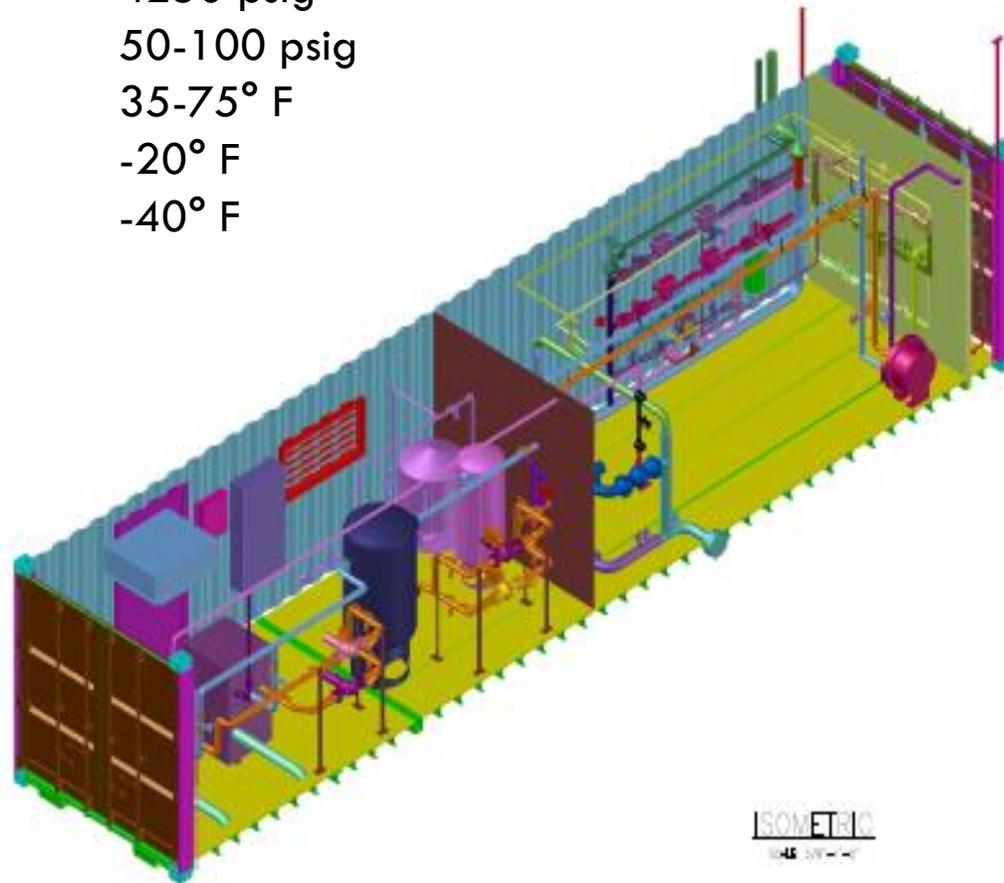
NYSEG Facility (New York State Electric and Gas) in Mechanicville, NY

3 Decompression System Overview

Design Flow Rate	up to 150 MSCFH
Turndown:	10:1 Min
Design Pressure	4250 psig
Discharge Pressure	50-100 psig
Discharge Temperature	35-75° F
Minimum Ambient Temp.	-20° F
Minimum Process Temp.	-40° F

Code Compliance

NFPA 52
NFPA 70 (NEC)
ASME B31.3



Dual-Flow System

- ✓ Approved by NY PSC for utility applications
- ✓ 24/7 remote monitoring
- ✓ 100% redundant flowpaths
- ✓ Designed to automatically change flow patterns and bypass affected area
- ✓ 50% of system can be shut down and system retains 100% flow rate

4 Send Out Actual Installation



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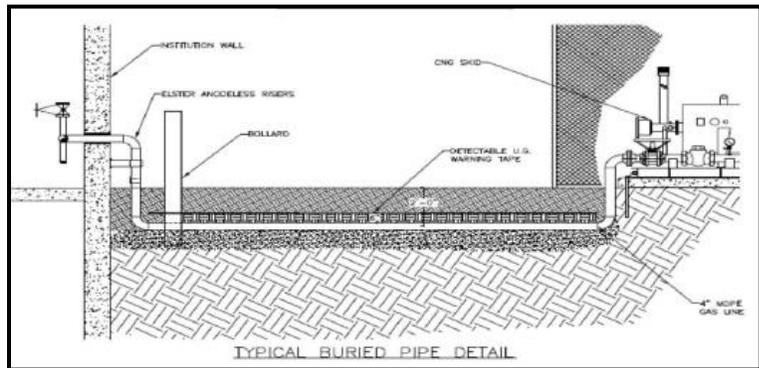
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1. Heat and Power Applications

- 1. Boiler Conversion.** Existing systems are modified to burn natural gas, or new equipment is installed. Once gas is available, any heat or power application is a potential candidate for conversion.



- 3. CNG Equipment Installation.** Decompression system includes integrated PLC for on-site and remote management, metering and all utility interconnections.



- 2. Piping and Site Work.** A simple reinforced parking area is required for the trailers and decompression equipment, and piping (typically HDPE) connects the site to the gas train inside the plant.



2. Gas Utility Service

▣ Gas supply for LDCs that require:

- ▣ Ability to increase baseload ahead of capacity upgrades
- ▣ Peaking gas supply
- ▣ Gas supply during scheduled or emergency repairs or pressure testing and inspection.



▣ Examples of CNG in Utility Service

- ▣ Peaking solution using a permanent CNG injection system in New York
- ▣ Mobile solution equipment for CNG injection in Florida
- ▣ Temporary repair support for community service in New York
- ▣ Permanent baseload gas supply (target commission Q1 2017) for community service in New York

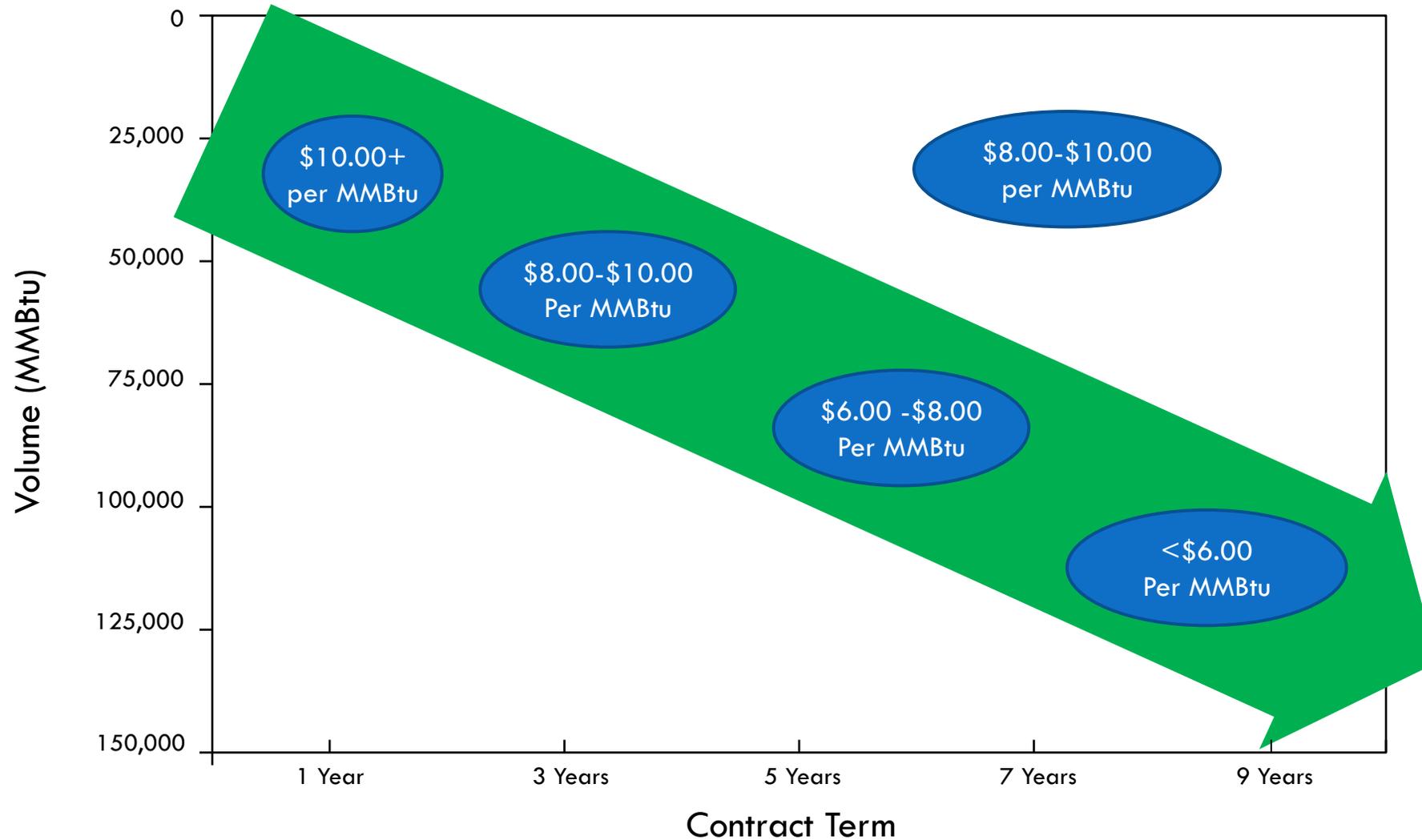
3. CNG for Transportation

- ❑ **Fueling Solution for Off-Pipeline Truck Fleets**
- ❑ **Fleets typically rely on a single fueling station at a central location on a pipeline**
- ❑ **Mobile CNG trailer technology changes that model by enabling fleets in off-pipeline locations**
 - ❑ Can provide a central location at the customer site off the pipeline AND
 - ❑ Can also set up fueling at supplier truck depots at locations up to 200 miles away



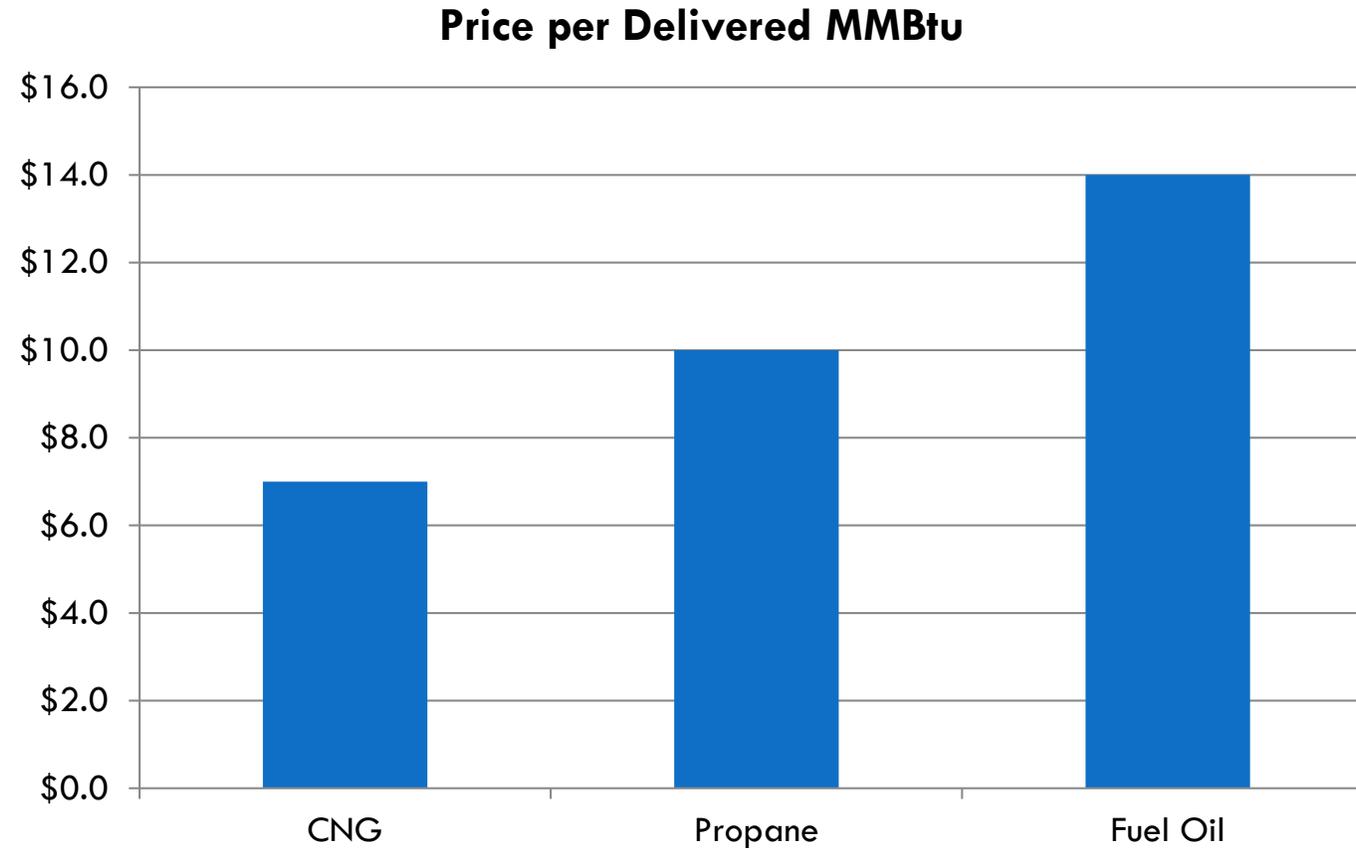
CNG Pricing

Longer Commitments to Greater Volumes Can Drive Lower Pricing



CNG Pricing

25-50% Cost Savings versus Traditional Heating Fuels



Contract Terms

Typical Provisions	
Volume	Customer elects a minimum annual fuel volume commitment
Term	Contracts are between 5 and 10 years
Commodity Gas Pricing	<ul style="list-style-type: none">• Defaults to regional pipeline gas index• Customers pay only for the gas they use -- just like a pipeline• Customers options include locking in 100% of commodity costs to floating and purchasing on a daily basis or any combination
XNG Service Pricing	<ul style="list-style-type: none">• Fixed pricing for term of contract• Delivery includes all decompression equipment and maintenance• Billed as a metered volume charge based on how much gas a customer uses.
Alternative Fuel Commitment	XNG credits the difference between price of any alternative fuel used if service is disrupted for any reason

Safety Is Our Highest Priority

- ▣ **We operate with total focus and commitment to the safety of our employees, our customer employees, and everyone in the communities where we work.**
 - ▣ Support for complete Hazard Operations review
 - ▣ Training for employees and all community first responders
 - ▣ Complete customer documentation for operational safety and maintenance
 - ▣ Integrated Emergency Response Plan for each customer site.

- ▣ **Every customer must comply with all applicable Federal, State, and local laws, rules, and regulations.**
 - ▣ NFPA 52
 - ▣ All OSHA Safety regulations with regards to construction and operations
 - ▣ Any state or city code or local ordinance that may be applied to each project.

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■ CNG Case Study

- Industrial Manufacturing with Fleet Fueling

Case Studies

University Campus Solutions



Institution	Plymouth State University	The University of Maine at Machias
XNG Solution	Fuel Conversion at Central Boiler Plant	Campus-wide gas distribution piping to new boilers in each building
Project Challenges	Location within 100' of Student Dorms led to extensive collaboration with State of New Hampshire to meet and exceed regulatory setbacks and safety equipment.	Older campus required significant upgrades to existing distributed boilers to meet code during the upgrade
Campus Benefits	Converted from bunker fuel enabled the campus to realize 30%+ reduction in carbon emissions	All managed under a single contract during the summer months prior to class starting in the fall
Cost Savings	Greater than 30% versus bunker fuel	Greater than 35% versus heating oil

Questions?

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