Gas Pipeline Development in the United States

A Discussion on the Regulatory Framework and Lessons Learned

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Numerous players in every segment of gas value chain

Key players along the North American gas value chain

**UPSTREAM**

**Suppliers** – E&P companies deliver raw production into the gathering and processing facilities.

**Gas Processors** – provide gathering and processing services to deliver pipeline quality gas into interstate pipeline grid.

**MIDSTREAM**

**Pipelines** – common carrier transporters per regulated tariff and contractual terms.

**Storage** – generally provided by interstate pipelines but 3rd party providers exist in interstate and intrastate markets.

**DOWNSTREAM**

**Marketing Companies** – provide marketing and trading services as core profit center or as service to affiliate E&P division.

**Distributors** – provide bundled retail service (residential, commercial, industrial) and wholesale services to industrials and power companies.

Source: IHS Markit

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Plenty of infrastructure in different parts of the gas business

North American gas infrastructure

- Natural Gas from Wells on Land
- Gas Storage Facility
- Natural Gas from Offshore Drilling Platform
- LNG Storage and Processing Facility
- Liquified Natural Gas (LNG) Offloaded from or Loaded to Overseas Tankers
- Gas Processing and Treatment Plant
- Gathering Lines
- Compressor Station
- Natural Gas Transmission Lines
- City Gate
- Local Gas Distribution System

Direct Served Customers
- Electric Power Generating Station
- Large Industrial
- Smaller Manufacturing
- Commercial
- Residential
- Natural Gas Powered Vehicles

Source: IHS Markit
Common misconceptions about the North American gas market

- Local market versus Integrated continental market
- Long-term fixed-price or oil-indexed take-or-pay contracts versus Flexible spot contracts
- Pricing on cost versus Pricing on supply/demand

Cost only provides a loose sense of direction for prices in the long run
Gas prices are determined by supply/demand fundamentals

Transaction volume breakdown by pricing mechanism

- Daily index
- Monthly index
- Fixed pricing next day delivery
- Fixed pricing next month delivery
- NYMEX trigger
- Physical basis

Note: Breakdown of FERC from 552 Reportable volumes for calendar year 2012, 123.9 Tcf or 339.4 Bcf per day.
Source: IHS Markit, FERC

Gas is priced by trades

- Gas prices are set in real time by a combination of short-term fundamentals, expectations and market psychology.
- The market is liquid, supported by numerous players and universal access of pipeline service.
- But the liquidity is geographically diffuse because of transmission constraints.
Massive pipeline system supports the spot market and interregional gas flow

- The interstate pipelines in aggregate operate more than 300,000 miles (480,000 km) of pipeline.
- The huge increase in production from the Marcellus play in the Appalachian Basin has greatly affected pipeline flows.
- Between 2011 and 2015 the largest increases in flows were North to South. The largest declines in flows were from South to North.
Gas market reform occurred at a time when transmission pipeline network matured.

### U.S. gas transmission pipeline mileage


Source: IHS Markit, U.S. Department of Transportation

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Gradually policies over three decades enabled gas market liberalization and unbundled pipeline service

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<tbody>
<tr>
<td><strong>Natural Gas Policy Act of 1978</strong></td>
<td><strong>FERC Order 380</strong></td>
<td><strong>FERC Order 436</strong></td>
<td><strong>FERC Order 636</strong></td>
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<td>Heavily regulated in all aspects of the value chain</td>
<td>Removal of wellhead price controls</td>
<td>Removal of take-or-pay (“minimal bill”) obligation</td>
<td>Partial transmission capacity open access</td>
<td>Full sales and transportation unbundling</td>
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<td>Supply shortages in the 1970s created crises and raised political concerns</td>
<td>FERC* oversight of inter- &amp; intra-state trade</td>
<td>Gas producer competition facilitated</td>
<td>Start of transportation function separation</td>
<td>Non-discriminatory transportation services</td>
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*FERC = Federal Energy Regulatory Commission
Pipeline transmission service is separated from commodity delivery, and regulated by government in an effective and transparent manner

**Transmission pipeline service**

- Transportation services: firm (FT), interruptible (IT), and no-notice
- Park and Loan service (PAL)
- Balancing service
- Storage service

**Transmission pipeline regulation**

- Regulated by the Federal Energy Regulatory Commission (FERC)
- Provides a catalog of transportation-related services pursuant to the approved Terms and Conditions and rates specified in their tariff
- Does not take title to the gas commodity but provide transportation, balancing, storage, and park and loan services
Cost-based mechanism is mainstream for setting transmission tariffs

**FERC sets and approves just and reasonable rates**

- **Cost-of-service ratemaking**
- **Selective discounting**
- **Market-based rates**
- **Negotiated rates**

**Rate Base \times \text{Overall Rate of Return} = \text{Return}**

\[
\text{Return} + \text{Operation & Maintenance Expenses} + \text{Administrative & General Expenses} + \text{Depreciation Expense} + \text{Non-Income Taxes} + \text{Income Taxes} - \text{Revenue Credits} = \text{Total Cost-of-Service}
\]

- FERC Order 636 requires that pipeline rates be designed according to the **straight fixed-variable methodology**.
- Rate structures may be further adjusted to reflect any costs related to the distance gas is transported.
The pipeline pricing system also allows for scarcity pricing (in a secondary market) based on market demand to create incentives for pipeline investment.

The relationship between basis and pipeline load factor

- Pipeline capacity transacts in an active secondary market.
- Prices for pipeline capacity reflect – but are not necessarily tied to – basis OR basis reflect the price of pipeline capacity in the secondary market.
- Basis is often set based on short run variable cost but may reflect constraints and risk of supply scarcity.

Source: IHS Markit
Most gas storage facilities are also regulated

- 385 underground gas storage fields throughout the US Lower 48, with a total of 4,658 Bcf (132 Bcm) of design working capacity—80% in depleted reservoirs, 10% in aquifers, and 10% in salt caverns.

- FERC regulates the rates charged for the storage services of interstate pipeline companies.

- Transmission supporting operations—costs are classified and allocated in the same manner as transmission costs.

- Separately contracted storage services—fixed costs are divided equally between “Deliverability” and “Capacity” classifications while all variable costs are classified as “Injection/Withdrawal” costs.

- Market-based rates may also be approved if the applicant can demonstrate that it has no market power.
Lessons learned

Numerous players in every part of the value chain help ensure that no single player can sway the market.

Developed pipeline network paved the way for market reform and midstream liberalization.

Open and transparent third-party access to infrastructure is a prerequisite for competition in upstream and downstream.

Deregulation could lead to high prices as well as high volatility, but adequate storage and pipeline capacity serve as an important tool to optimize seasonality in gas supply.