Topics

Gas distribution system
- Pipelines
- Storage facilities
  - Depleted reservoirs (fields)
  - Salt caverns
  - Depleted aquifers
- Market centers

Liquid distribution system
- Transportation – pipeline, rail, truck, barge
- Storage
Gas distribution system
Overview of U.S. Natural Gas Distribution System
Distribution of Gas Line Diameters (2009)

United States

- 30 in. (760 mm) - 81%
- 22–30 in. (560–760 mm) - 15%
- 4–10 in. (100–250 mm) - 0.3%
- 12–20 in. (300–510 mm) - 3.5%

International

- 30 in. (760 mm) - 87%
- 22–30 in. (560–760 mm) - 9.4%
- 4–10 in. (100–250 mm) - 0.9%
- 12–20 in. (300–510 mm) - 2.5%

- Depleted fields: 81%
- Aquifers: 16%
- Salt caverns: 3%
Underground Gas Storage

Figure 1. Types of underground natural gas storage facilities

https://www.eia.gov/naturalgas/storage/basics/

A Salt caverns
B Mines
C Aquifers
D Depleted reservoirs
E Hard-rock caverns

Source: PB-KBB, inc., enhanced by EIA.

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Underground Gas Storage


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Underground Gas Storage

Where Natural Gas Underground Storage Fields are Located
Type of Storage and Total Field Capacity, July 2014

Type of Storage
- Depleted Fields
- Salt Formations
- Depleted Aquifers

Total Field Capacity
(Billion Cubic Feet)
- Less than 14.5
- 14.5 to 37.8
- 37.8 to 73
- 73 to 122
- Greater than 122

NOTE: that the map includes both active and inactive fields.

Underground Salt Caverns

Solution Mining

https://barryonenergy.wordpress.com/2012/06/10/natural-gas-storage-is-not-as-boring-as-you-as-think/

Table 1. Administrative Profile of Operational Natural Gas Market Centers in the United States and Canada, 2008

<table>
<thead>
<tr>
<th>Region/State/Province</th>
<th>Market Center</th>
<th>Administrator</th>
<th>On Line Customer Service System</th>
<th>Type of Infrastructure</th>
<th>Type of Operation</th>
<th>Year Started</th>
<th>Associated Processing Plant</th>
<th>Associated Storage Sites Names</th>
<th>Type of Storage Fields</th>
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<tr>
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</table>

N/A = Not applicable, Inter = Interruptible, WG = working gas. See Table 2 and Figure 2 for additional data.
Source: Energy Information Administration, Office of Oil and Gas, Natural Gas Division, Natural Gas Hubs Database, December 2008.

https://www.eia.gov/naturalgas/archive/ngmarketcenter.pdf

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U.S. Market Hubs

https://www.eia.gov/state/maps.php retrieved April 26, 2018
U.S. Market Hubs & Pipelines

https://www.eia.gov/state/maps.php retrieved April 26, 2018
Liquid distribution system
Liquid distribution system

Options for transporting liquids similar to options for gases

- Pipeline
  - Dedicated pipeline,
  - Batching with other liquids in a petroleum pipeline
- Rail
- Truck
- Marine (barge)

Feasibility of methods depend upon:

- Product specifications, especially with respect to water and sulfur requirements
- Existing infrastructure
- Volatility
- Rate of product produced
- Distance between plant and customer
- Geographic location
Liquid distribution system issues

Mixed NGLs
- Can be very large volume & can justify dedicated pipeline to dedicated fractionation site

E/P mixtures
- High vapor pressures necessitate dedicated pipelines

Butanes
- Relatively small volumes so no dedicated pipelines
- Truck or rail to hub

Natural gasoline
- Small volumes, typically stored & sent via truck to refinery

LPGs
- Dedicated pipelines have been built for Propane HD-5
- Odorized with methyl mercaptan

http://www.thermacon.com/gallery/
Summary
Summary

Large volume storage may be underground

- Salt caverns
- Depleted reservoirs

System for transportation depend on volumes to be moved

- Gas, NGL, & LPG through dedicated pipelines
- Small volumes via rail & trucks