Maintaining Adequate Infrastructure in the Natural Gas and Electric Industries

Institute for Regulatory Policy Studies
Illinois State University

Jeff Wright, Deputy Director
Office of Energy Projects
Federal Energy Regulatory Commission
Springfield, Illinois
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United States Demand Overview

Alaska
- 2007: 1.3 Bcf/d
- 2017: 1.3 Bcf/d
- 2030: 1.6 Bcf/d

Rockies
- 2007: 2.5 Bcf/d
- 2017: 3.1 Bcf/d
- 2030: 3.4 Bcf/d

Midcontinent
- 2007: 14.5 Bcf/d
- 2017: 15.6 Bcf/d
- 2030: 17.4 Bcf/d

California
- 2007: 6.2 Bcf/d
- 2017: 5.4 Bcf/d
- 2030: 5.0 Bcf/d

Gulf Coast
- 2007: 17.0 Bcf/d
- 2017: 20.0 Bcf/d
- 2030: 22.0 Bcf/d

Northwest
- 2007: 1.8 Bcf/d
- 2017: 2.2 Bcf/d
- 2030: 2.6 Bcf/d

Florida
- 2007: 2.8 Bcf/d
- 2017: 4.5 Bcf/d
- 2030: 5.0 Bcf/d

New England
- 2007: 2.4 Bcf/d
- 2017: 2.3 Bcf/d
- 2030: 2.0 Bcf/d

East Coast
- 2007: 10.7 Bcf/d
- 2017: 13.8 Bcf/d
- 2030: 13.5 Bcf/d

Source: EEA January Compass Report
The largest increase in natural gas usage is projected to be the electric power sector.
Gas-fired generation has dominated recent U.S. expansion of generation capacity

Over 300,150 MW of new generation capacity has come online since 1997; 91% of which is natural gas fired.

Electric generation from gas fired plants is 22 percent of the total in 2007, increased from 9 percent in 1997.

Gas – Pivotal Fuel for Electric Generation

- Coal is plentiful in North America; but carbon output brings uncertainty – CCS issues
- Renewables increasing; but still a small percentage of generation mix – Transmission is the problem
- Nuclear approval process and construction time is extensive – Estimates vary but minimum of ten years
- Gas-fired generation has smallest “carbon footprint” of fossil fuels; lowest capital cost
More Than Just Production and Canadian Imports Are Needed

Source: EIA, EEA, FERC

- **NET PIPELINE IMPORTS**: 85% in 2008
- **LNG IMPORTS**: 17% in 2008
- **ALASKAN GAS**: 7% in 2008
- **LOWER 48 PRODUCTION**: 71% in 2008
United States Supply Overview

**Alaska Production for Lower 48**
- 2007: 0.0 Bcf/d
- 2017: 0.0 Bcf/d
- 2030: 4.4 Bcf/d

**Western Canadian Sedimentary Basin Production**
- 2007: 16.0 Bcf/d
- 2017: 13.5 Bcf/d
- 2030: 7.5 Bcf/d

**U.S. Based LNG**
- 2007: 2.1 Bcf/d
- 2017: 8.9 Bcf/d
- 2030: 12.7 Bcf/d

**Canadian Net Exports to U.S.**
- 2007: 8.4 Bcf/d
- 2017: 6.6 Bcf/d
- 2030: 3.2 Bcf/d

**Canaport**
- 2007: 0.0 Bcf/d
- 2017: 0.6 Bcf/d
- 2030: 0.8 Bcf/d

**Costa Azul**
- 2007: 0.0 Bcf/d
- 2017: 1.2 Bcf/d
- 2030: 1.4 Bcf/d

**Lower 48 U.S. Production**
- 2007: 51.4 Bcf/d
- 2017: 53.4 Bcf/d
- 2030: 50.3 Bcf/d

**Canadian Pipeline Exports to U.S.**
- 2007: 51.4 Bcf/d
- 2017: 53.4 Bcf/d
- 2030: 50.3 Bcf/d

**Canadian LNG Exports to U.S.**
- 2007: 0.0 Bcf/d
- 2017: 0.6 Bcf/d
- 2030: 0.8 Bcf/d

**Mexican LNG Exports to U.S.**
- 2007: 0.0 Bcf/d
- 2017: 1.2 Bcf/d
- 2030: 1.4 Bcf/d

**U.S. Based LNG**
- 2007: 2.1 Bcf/d
- 2017: 8.9 Bcf/d
- 2030: 12.7 Bcf/d

Source: EIA Annual Energy Outlook 2007; EEA January Compass Report; and NEB's Canada's Energy Future
Future U.S. Gas Sources

- ALASKA
- ROCKIES SUPPLY
- MEXICAN LNG
- CANADIAN LNG
- SHALE SUPPLY
- LNG

Future U.S. Gas Sources
In the United States, there are over 213,000 miles of interstate natural gas transmission pipeline.

### Major Pipeline Projects Certificated (MMcf/d)

**January 2005 to March 2008**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Capacity (MMcf/d)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. TransColorado</td>
<td>(300, 250)</td>
</tr>
<tr>
<td>2. Rendezvous</td>
<td>(300)</td>
</tr>
<tr>
<td>3. WIC</td>
<td>(350, 556, 330)</td>
</tr>
<tr>
<td>4. Entrega (EnCana)</td>
<td>(1,500)</td>
</tr>
<tr>
<td>5. Questar</td>
<td>(102, 175)</td>
</tr>
<tr>
<td>6. Northwest</td>
<td>(450)</td>
</tr>
<tr>
<td>7. Questar Overthrust</td>
<td>(550, 750)</td>
</tr>
<tr>
<td>8. CIG</td>
<td>(899)</td>
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**Total Capacity:**

- **12.6 BCF/D** Total
- **903 Miles**

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<td>8. CIG</td>
<td>(899)</td>
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</table>

**Total Capacity:**

- **53.72 BCF/d** Total
- **5,115 Miles**
## Purpose of Pipeline Construction Varies Over Time

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity (Bcf/day)</th>
<th>Miles of Pipe</th>
<th>Compression (HP)</th>
<th>Cost (Bil $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2.2</td>
<td>1,102.8</td>
<td>151,096</td>
<td>0.8</td>
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<td>2001</td>
<td>8.8</td>
<td>2,700.3</td>
<td>870,767</td>
<td>4.4</td>
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<tr>
<td>2002</td>
<td>5.8</td>
<td>1,590.0</td>
<td>560,064</td>
<td>3.1</td>
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<tr>
<td>2003</td>
<td>1.7</td>
<td>352.4</td>
<td>221,545</td>
<td>1.0</td>
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<td>2004</td>
<td>8.1</td>
<td>619.3</td>
<td>83,538</td>
<td>1.2</td>
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<td>2005</td>
<td>14.3</td>
<td>785.1</td>
<td>123,036</td>
<td>1.9</td>
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<tr>
<td>2006</td>
<td>14.2</td>
<td>1,363.6</td>
<td>329,657</td>
<td>4.2</td>
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<tr>
<td>2007</td>
<td>23.2</td>
<td>2,772.7</td>
<td>849,110</td>
<td>8.1</td>
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<tr>
<td>2008</td>
<td>2.1</td>
<td>194.4</td>
<td>30,900</td>
<td>0.4</td>
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<tr>
<td>Total</td>
<td>80.4</td>
<td>11,480.6</td>
<td>3,219,713</td>
<td>25.1</td>
</tr>
</tbody>
</table>
Major Pipeline Projects Pending (MMcf/d)

April 2008

15.63 BCF/D Total
2,240 Miles
Major Pipeline Projects Pre-Filing (MMcf/d)
April 2008

10.93 BCF/D Total
2,073 Miles

Oregon Pipeline
(Oregon LNG)
(1,500)

Palomar Project
(Palomar Gas)
(700)

Yuma Lateral
(North Baja)
(81)

White River Hub
(Questar)
(2,645)

Arkoma Connector
(MarkWest Pioneer)
(350)

South East Supply Header
(360)

South System Expansion
(Southern)
(370)

Phase VIII
(Florida Gas)
(800)

Northern Lights 09-10
(Northern Natural)
(135)

Hub Line Expansion
(Algonquin)
(1,145)

Phase V Expansion
(Maritimes)
(200)

10.93 BCF/D Total
2,073 Miles
Major Pipeline Projects On The Horizon (MMcf/d)
April 2008

- Alaska (4,500)
- Paso Norte Pipeline Project (380)
- Greasewood Lateral (Northwest) (200)
- Piceance Lateral Expansion (WIC) (230)
- Eastern & Western Flow Path (Questar) (2,000)
- White River Lateral (Questar) (810)
- Pathfinder (TransCanada) (1,200)
- Bison Pipeline (Northern Border) (400)
- Blue Bridge (Williams) (500)
- Sunstone Pipeline (Williams) (1,200)
- Sundance Trail (Northwest) (150)
- Bronco Pipeline (Spectra) (1,000)
- Kern River (500)

- Panhandle Eastern (750)
- Kinder Morgan (360)
- Kinder Morgan (170)
- Northern Natural (82)
- Hub III (Dominion) (570)
- Williston Basin (20)
- REX East Exp. (1,000)
- Texas Eastern (150)
- Trunkline (650)
- Seminole (80)

- A/G Line Expansion (Natural) (139)
- Transcontinental (Mobile Bay) (700)
- Transcontinental (Pascagoula Exp) (467)
- Transcontinental (85 North Expansion) (250)
- Mobil Bay South (Williams) (700)
- Enogex Pipeline (Southern Star) (100)
- Gulfstream (750)
- Greenway Expansion (East Tennessee) (450)
- Centerville Expansion (Columbia Gulf) (235)
- Worsham-Steed (Falcon Gas) (150)
- Gulf Coast Connector (NGS) (2,000)
- 800 Line Expansion (Tennessee) (400)
- Henry Hub Expansion (Trunkline) (600)
- Houston Market (KM Interstate) (400)
- Highland Trails (Southern Star) (1,000)
- Henry Hub (Columbia Gulf) (200)
- Eagle Hub Project (Lehman) (2,000)
- Shenzi Lateral (Enbridge) (100)

- Northeast Expansion (NFG) (500)
- MetroExpress (Iroquois) (300)
- Northeast Express (Rockies) (1,500)
- Tennessee (1,100)
- New Penn (Nisource) (500)
- Texas Eastern (325)
- Rockies Connector (Williams) (688)
- East-West Connector (NFG) (750)

33.21 BCF/D Total
5,473 Miles

May 1, 2008
Federal Energy Regulatory Commission
All Storage Projects
(Capacity in Bcf)

Certificated Since 1/1/05
Currently Pending
Pre-Filing
On The Horizon
North American LNG Terminals

Potentially In Service by 2010

As of April 14, 2008

**U.S.**
1. Everett, MA : 1.035 Bcf/d (SUEZ LNG - DOMAC)
2. Cove Point, MD : 1.0 Bcf/d (Dominion - Cove Point LNG)
3. Elba Island, GA : 1.2 Bcf/d (El Paso - Southern LNG)
4. Lake Charles, LA : 2.1 Bcf/d (Southern Union - Trunkline LNG)
5. Gulf of Mexico: 0.5 Bcf/d, (Gulf Gateway Energy Bridge - Excelerate Energy)
6. Offshore Boston, MA: 0.8 Bcf/d (Northeast Gateway - Excelerate Energy)
7. Hackberry, LA: 1.8 Bcf/d (Cameron LNG - Sempra Energy)
8. Freeport, TX: 1.5 Bcf/d, (Cheniere/Freeport LNG Dev.)
9. Sabine, LA: 2.6 Bcf/d (Sabine Pass Cheniere LNG)
10. Sabine, TX: 2.0 Bcf/d (Golden Pass - ExxonMobil)
11. Cove Point, MD : 0.8 Bcf/d (Dominion - Expansion)*
12. Sabine, LA: 1.4 Bcf/d (Sabine Pass Cheniere LNG – Expansion)

**Canada**
13. St. John, NB: 1.0 Bcf/d, (Canaport – Irving Oil)

**Mexico**
14. Altamira, Tamulipas: 0.7 Bcf/d, (Shell/Total/Mitsui)
15. Baja California, MX: 1.0 Bcf/d, (Costa Azul - Sempra)

* Expansion of an existing facility
Since January 1, 2000, numerous interstate gas transmission lines have been built.

37.35 Bcf/d Total
8,958 Miles

1. Islander East (285)
2. Iroquois (100,200)
3. Columbia (135)
4. Transcontinental (130)
5. Transcontinental (100)
6. Maritimes (418)
7. Tennessee (500)
8. Tennessee (136)
9. Texas Eastern (900)
10. Algonquin (325)
11. CIG (85,133,105)
12. TransColorado (250)
13. WIC (120,675,350,556)
14. Entrega (1,500)
15. Rockies Express West (1,800)

May 1, 2008
Federal Energy Regulatory Commission
Since January 1, 2000, 18 interstate electric transmission lines have been built totaling 917 miles.

Transmission Projects

1. Clarksville, OK - Chamber Springs Rd, AR
2. Caldwell, ID - Ontario, OR
3. Paddock, ID - Ontario, OR
4. Freeport, TN - Horn Lake, MS
5. Cross Sound Cable
6. Brownlee, ID - Oxbow, OR
7. Rathdrum, ID - Beacon, WA
8. Lamar, CO - Holcomb, KS
9. Spurlock, KY - Stuart/Zimmer, OH
10. Fentress, VA - Shawboro, NC
11. Wempton, IL - Paddock, WI
12. Jacksons Ferry, VA - Wyoming, WV
13. Gladstone, NM - Walsenburg, CO
14. Neptune Project
15. Palmers Corner, MD - Potomac Rvr PP
16. Marion, SC - Whiteville, NC
17. Benewah, ID - Shawnee, WA
18. Arrowhead, MN - Weston, WI

Sources: NERC Summer and Winter Assessments, WECC Existing Generation and Significant Additions and Changes to System Facilities Reports and FERC’s Transmission Database
**FERC and Transmission**

- **Section 1221 - Siting of Interstate Electric Transmission Facilities**
  - New Section 216 of the FPA
  - FERC given authority to site interstate transmission after attempting to site at state level
    - Must be in corridors designated by DOE
    - Must render decision within 12 months of filing date
  - DOE delegated lead agency authority to FERC
  - MOU signed with DOE and seven other federal agencies to coordinate processing.
  - Order No. 689 issued by FERC on November 16, 2006
  - Final rule provides direction for filing an application
    - Pre-filing process
    - Application process
Final Observations

- Traditional gas supplies – domestic and Canadian imports are declining
- LNG could be a solution – if it is allowed
- There is some pipeline expansion expected to get the Rockies gas to the Northeast
- It would appear that expansion of the existing long lines from the Southeast to the Northeast will be necessary to get new sources to market
- Power generation will be increasingly dependent upon gas-fired generation
- Will need more activity on the electric transmission side to get the energy where it is needed.