Outlook for North American Natural Gas

For
LDC Natural Gas Forum
November 11, 2014 | Toronto, Ontario, Canada

By
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U.S. Energy Information Administration
The Americas are the second largest region in natural gas reserves and resources

regional natural gas reserves and resources, 2012

trillion cubic feet

The Americas hold an abundance of shale gas resources, undeveloped except in the U.S. and Canada

Americas natural gas reserves and resources, 2012

trillion cubic feet

Americas natural gas production is pulling away from other regions

dry natural gas production by region
trillion cubic feet

Source: EIA, International Energy Statistics
Total dry natural gas production in the Americas is outpacing consumption, largely driven by U.S. shale gas production.

Source: EIA, International Energy Statistics
These seven regions accounted for 95% of U.S. oil production growth and all U.S. natural gas production growth from 2011-2013

Source: EIA, Drilling Productivity Report
The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources.

**U.S. tight oil production**
- Million barrels of oil per day
- Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through August 2014 and represent EIA’s official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

**U.S. dry shale gas production**
- Billion cubic feet per day

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**Sources:** EIA derived from state administrative data collected by DrillingInfo Inc. Data are through August 2014 and represent EIA’s official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).
U.S. shale gas leads growth in total gas production through 2040, when production exceeds 100 billion cubic feet per day

Source: EIA, Annual Energy Outlook 2014, Reference case
Natural gas consumption growth is driven by electric power, industrial, and transportation use

U.S. dry gas consumption
trillion cubic feet

<table>
<thead>
<tr>
<th>Year</th>
<th>Electric Power</th>
<th>Industrial*</th>
<th>Transportation**</th>
<th>Commercial</th>
<th>Residential</th>
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</thead>
<tbody>
<tr>
<td>2005</td>
<td>2.9</td>
<td>4.2</td>
<td>0.7</td>
<td>2.9</td>
<td>4.2</td>
</tr>
<tr>
<td>2012</td>
<td>8.5</td>
<td>9.1</td>
<td>0.7</td>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>2020</td>
<td>11.0</td>
<td>11.2</td>
<td>1.7</td>
<td>3.6</td>
<td>4.1</td>
</tr>
<tr>
<td>2025</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2030</td>
<td></td>
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<tr>
<td>2035</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Source: EIA, Annual Energy Outlook 2014, Reference case

*Includes combined heat-and-power and lease and plant fuel
**Includes pipeline fuel
U.S. becomes a net exporter of natural gas in the near future

Source: EIA, Annual Energy Outlook 2014 Reference case
Projected U.S. natural gas trade depends on assumptions regarding resources and future technology advances.

Reference case
trillion cubic feet per year

High Oil and Gas Resource case
trillion cubic feet per year

-4

-2

0

2

4

6

8

2010 2015 2020 2025

Source: EIA, Annual Energy Outlook 2014, Reference case and High Oil and Gas Resource case

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Currently, most of the US exports are via pipeline, but liquefied natural gas export projects have been proposed.

**Proposed non-FTA LNG export facilities as of March 2014**

Potential export-oriented natural gas liquefaction facilities

- **Canada**
  - Kitimat: 0.7 Bcf/d proposed
  - Corpus Christi: 2.1 Bcf/d
  - Gulf Coast: 2.8 Bcf/d

- **Mexico**
  - Mexico City: 2.5 Bcf/d
  - Laredo: 2.3 Bcf/d

- **Kitimat**
  - 2.0 Bcf/d potential

- **Gulf Coast**
  - 2.8 Bcf/d

- **Jordon Cove**
  - 1.2 Bcf/d

- **Cove Point**
  - 1.0 Bcf/d

- **Gulf LNG Liquefaction Company**
  - 1.5 Bcf/d

- **EOS FLNG**
  - 1.6 Bcf/d

- **Barca FLNG**
  - 1.6 Bcf/d

- **CE FLNG**
  - 1.07 Bcf/d

- **Cove Point**
  - 1.0 Bcf/d

- **Elba Island**
  - 0.5 Bcf/d

- **Lavaca Bay, TX**
  - 1.38 Bcf/d

- **Ingleside, TX**
  - 1.09 Bcf/d

- **Texas Golden Pass**
  - 2.6 Bcf/d

- **Venture Global**
  - 0.7 Bcf/d

- **Cameron**
  - 1.7 Bcf/d

- **Lake Charles**
  - 2.0 Bcf/d

- **Sabine Pass**
  - 2.2 Bcf/d approved
  - 0.9 Bcf/d proposed

- **Main Pass Energy Hub**
  - 3.2 Bcf/d

- **Golden Pass**
  - 2.6 Bcf/d

- **Magnolia**
  - 1.08 Bcf/d

- **Delfin**
  - 1.8 Bcf/d

- **Cove Point**
  - 1.0 Bcf/d

- **Cove Point**
  - 1.0 Bcf/d

- **Douglas Island**
  - 0.25 Bcf/d

- **Prince Rupert Island**
  - 1.0 Bcf/d

- **Kitimat**
  - 2.0 Bcf/d potential

Source: U.S. Energy Information Administration based on information from the Department of Energy (DOE), Office of Fossil Energy and the Canada’s National Energy Board. Note: Capacity estimated from larger of FTA or non FTA capacity proposals.
Most liquefaction projects are in North America and will increase the region’s total capacity 8-fold by 2019.

### Liquefaction (bcf/d)

<table>
<thead>
<tr>
<th>Country</th>
<th>Operating</th>
<th>Construction</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peru</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trinidad and Tobago</td>
<td>2.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>1.2</td>
<td>13.1</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>3.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2.6</strong></td>
<td><strong>1.3</strong></td>
<td><strong>16.8</strong></td>
</tr>
</tbody>
</table>

### Regasification (bcf/d)

<table>
<thead>
<tr>
<th>Country</th>
<th>Operating</th>
<th>Construction</th>
<th>Engineering</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>0.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>1.2</td>
<td>0.8</td>
<td></td>
</tr>
<tr>
<td>Canada</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chile</td>
<td>0.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>2.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Puerto Rico</td>
<td>0.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>10.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16.8</strong></td>
<td><strong>0.8</strong></td>
<td><strong>0</strong></td>
</tr>
</tbody>
</table>

Source: IHS EDIN  
Note: Displays larger import/export facilities only.
Currently, the Panama Canal can accommodate only 9% of the world’s LNG carrier fleet; after the expansion, it will be able to accommodate 88% of currently active carriers

- The Panama Canal and the Trans-Panama Pipeline are not currently used for significant volumes of petroleum trade and no LNG trade

- The Panama Canal expansion project will open the canal route to Aframax tankers and 80% of the current global LNG carrier fleet, resulting in increased regional petroleum and LNG trade

- By 2019, liquefaction capacity in the Americas is expected to increase eight-fold, with most of the projects in the United States

- EIA anticipates increased LNG trade between countries in the Americas, but traffic from the Americas to Asia (the largest LNG import market) through the Panama Canal will also increase
Shale gas in eastern Canada

• Of the four shale plays in Eastern Canada, two have been assessed by ARI
  – Utica in Quebec has 31.1 Tcf of technically recoverable resources
  – Horton Bluff in Nova Scotia has 3.4 Tcf of technically recoverable resources

• These shale resource volumes are not included in NEB’s 2013 estimates

• Quebec enacted a hydraulic fracturing moratorium in 2012 pending further research

• New Brunswick permits hydraulic fracturing, but has imposed strict rules surrounding it

• Nova Scotia, similar to Quebec, will not permit hydraulic fracturing until the completion of a review, due mid-2014

Source: Advanced Resources International, “Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States”
LNG export projects in eastern Canada

<table>
<thead>
<tr>
<th></th>
<th>Goldboro LNG Terminal</th>
<th>H-Energy LNG Terminal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned year in service</td>
<td>2019</td>
<td>2020</td>
</tr>
<tr>
<td>Liquefaction capacity</td>
<td>1.3 Bcf/d</td>
<td>0.6 Bcf/d</td>
</tr>
<tr>
<td>Storage capacity</td>
<td>14.6 Bcf</td>
<td>N/A</td>
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<tr>
<td>Contract</td>
<td>20 year supply deal with E. On AG</td>
<td>N/A</td>
</tr>
<tr>
<td>Supply sources</td>
<td>Marcellus, eastern Canada</td>
<td>N/A</td>
</tr>
<tr>
<td>NEB approval</td>
<td>Under review</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: Company websites
Resources in eastern Canada are modest compared with the Canada national total

Canada marketable resources in trillion cubic feet as of 12/31/12

<table>
<thead>
<tr>
<th>Region</th>
<th>Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario and Quebec</td>
<td>8</td>
</tr>
<tr>
<td>West coast</td>
<td>17</td>
</tr>
<tr>
<td>East coast</td>
<td>91</td>
</tr>
<tr>
<td>Northern Canada</td>
<td>116</td>
</tr>
<tr>
<td>WCSB*</td>
<td>861</td>
</tr>
</tbody>
</table>

Note: WCSB stands for Western Canada Sedimentary Basin. All Territories are included under Northern Canada.
Key Takeaways from Updated EIA Study of added LNG exports

**Prices:** Projected average natural gas prices at the producer level average 4% to 11% above the Reference case projection across export scenarios over 2015-40, while residential natural gas prices in the export scenarios average 2% to 5% above their base projection.

**Natural gas production:** With the exception of one baseline/scenario pairing, higher natural gas production satisfies 60% to 80% of the increase in natural gas demand from LNG exports over 2015-40.

**Natural gas consumption:** The electric power sector accounts for most of the decrease in delivered natural gas. The electric generation mix shifts towards other generation sources, including coal and renewables, with some decrease in total generation as electricity prices rise.

**CO₂ emissions:** Higher coal use leads to higher carbon dioxide output.

**Expenditures:** On average, from 2015 to 2040, natural gas bills paid by end-use consumers in the residential, commercial and industrial sectors combined increase 1% to 8% across pairings of export scenarios and baselines. Increases in electricity bills paid by end-use customers range from 0% to 3%.

**Economic gains:** Changes in the level of GDP relative to baseline range from 0.05% to 0.17% and generally increase with the amount of added LNG exports required to fulfill an export scenario; EIA’s NEMS model may understate the economic benefits.
Areas of uncertainty in the outlook

• Oil and natural gas prices

• China’s energy demand growth; particularly in transportation

• Increasing global trade of natural gas and hydrocarbon gas liquids in addition to oil

• Global development of tight oil and shale gas resources

• Policy decisions on crude oil exports and pipeline permits

• Impact of geopolitical tensions on energy supply

• Constraints on CO₂
For more information


Annual Energy Outlook | www.eia.gov/aeo

Short-Term Energy Outlook | www.eia.gov/steo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

Today in Energy | www.eia.gov/todayinenergy

State Energy Portal | www.eia.gov/state

Drilling Productivity Report | www.eia.gov/petroleum/drilling/
Supplemental Slides
A larger share of new wells produce both oil and natural gas

Share of new wells by production type

Note: 2014 figure represents averages from January to September 2014
Source: EIA based on DrillingInfo
Resource and technology assumptions have major implications for projected U.S. crude oil production beyond the next few years.

**Reference case**

- Million barrels per day

**High Oil and Gas Resource case**

- Million barrels per day

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Source: EIA, Annual Energy Outlook 2014; Short Term Energy Outlook, October 2014

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Most significant contributors to non-OPEC crude and lease condensate production: Canada, Brazil, U.S., Kazakhstan, Russia

non-OPEC crude and lease condensate production, Reference case
million barrels per day

In the Americas, recent gains in oil production are concentrated in countries with open investment structures.

Crude oil production by select Americas country:

- Million barrels per day

Source: EIA, International Energy Statistics

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Tight oil production will spread to nations outside of the United States and Canada over the projection.

Tight oil production, Reference case
million barrels per day