



North American Midstream Infrastructure through 2035: Capitalizing on Our Energy Abundance

Midstream infrastructure – mainline pipelines, laterals, processing plants, gathering lines, compression and storage – is essential to bringing domestic natural gas, natural gas liquids and oil production to households, businesses, industrial customers, refineries and electric power generators. The benefits of the shale revolution that have transformed the North American energy landscape can only be realized by constructing new midstream infrastructure.

The INGAA Foundation Inc. has sponsored reports forecasting midstream infrastructure for the past 20 years. The objective of these reports has been to inform industry, policymakers and stakeholders about the new dynamics of North America’s energy markets and the need for pipelines. This report was cosponsored by America’s Natural Gas Alliance.

Total Midstream Capital Expenditures to Exceed \$640 Billion

The 2014 study, conducted by ICF International, forecasts more than \$640 billion in total capital expenditures, or nearly \$30 billion per year, from natural gas, natural gas liquids (NGL) and oil midstream activity from 2014 to 2035.

Study results are driven by projected increases in U.S. and Canadian crude oil and natural gas supply, as well as North American market growth, particularly in the power, industrial and exports sectors.

The Base Case study assumes the U.S. population will grow at 1 percent per year and the U.S. Gross Domestic Product will increase 2.8 percent in 2014 and 2.6 percent from 2015 onward. Industrial production growth is assumed at 2.3 percent per year, and that weather conditions are consistent with the average weather of the past 20 years.

Total Infrastructure Expenditures

| (Billions of Real Dollars) | 2014-2035 (2012\$) | Average Annual (2012\$) |
|--|--------------------|-------------------------|
| New Oil & Gas Lease Equipment | \$219.5 | \$10.0 |
| New or Expanded Gas and Liquids Mainline Capacity | \$188.8 | \$8.6 |
| New Oil and Gas Gathering Lines | \$71.80 | \$3.3 |
| New Laterals | \$48.9 | \$2.2 |
| LNG Export Facilities | \$43.7 | \$2.0 |
| Processing Plants | \$27.4 | \$1.2 |
| NGL Fractionation Plants | \$21.1 | \$1.0 |
| Other (Underground Gas Storage, Crude Oil Storage and NGL Export Facilities) | 19.7 | \$0.9 |
| Total | \$640.9 | \$29.1 |

\$313 Billion of Natural Gas Midstream Investment Required

The study finds that, in 2012 dollars, the United States and Canada will require annual average natural gas midstream investment of \$14.2 billion per year, or \$313.1 billion through 2035.

The report projects real natural gas prices that rise from \$4 to average between \$6 and \$7 per MMBtu through 2035. Gas consumption is projected to increase at a rate of 1.2 percent per year to meet growing power and industrial demand. LNG exports further boost domestic gas demand.

The report forecasts some 43 Bcfd of new gas transmission capability. This consists of over 800 miles per year of new gas transmission mainline and 14,000 miles per year of new gas gathering line. An additional 800 miles per year of new laterals to/from power plants, processing plants and storage fields also will be required.

Natural Gas Capital Expenditures

| (Billions of Real Dollars) | 2014-2035 (2012\$) | Average Annual (2012\$) |
|--|--------------------|-------------------------|
| Gas Transmission Mainline Pipe | \$87.2 | \$4.0 |
| Laterals to/from Power Plants, Gas Storage and Processing Plants | \$45.2 | \$2.1 |
| Gathering Line (pipe only) | \$35.6 | \$1.6 |
| Gas Gathering Line Compression | \$23.5 | \$1.1 |
| Gas Lease Equipment | \$26.9 | \$1.2 |
| Gas Pipeline & Storage Compression | \$11.6 | \$0.5 |
| Gas Storage Fields | \$12.0 | \$0.5 |
| Gas Processing Capacity | \$27.4 | \$1.2 |
| LNG Export Facilities | \$43.7 | \$2.0 |
| Total Capital Expenditures | \$313.1 | \$14.2 |



NGLs will need \$56 Billion of Investment

NGL infrastructure will require capital investment of \$2.6 billion per year, or \$56 billion total, through 2035. The report finds that almost 700 miles per year of new NGL transmission line and about 30,000 horsepower per year of additional pumping will be needed.

Approximately 3.3 million Bbl/d of new NGL fractionation capacity and just over 1.4 million Bbl/d of new NGL export capacity also will be required through 2035.

Crude Oil to Require \$12.4 Billion per Year

Crude oil infrastructure will require \$12.4 billion per year, or \$271.8 billion total of capital investment, through 2035. More than 10 million Bbl/d of new oil transmission capacity will be needed, requiring over 730 miles per year of new oil transmission line.

In addition, 7,800 miles per year of new oil gathering line will be required through 2035.

Midstream Expenditures to Create 432,000 Jobs per Year

The projected midstream energy infrastructure investment of nearly \$641 billion will yield an annual average of roughly 432,000 jobs across the U.S. and Canada through 2035. This investment will create an estimated \$588 billion in labor income, with salaries averaging \$61,800 across all impacted industries.

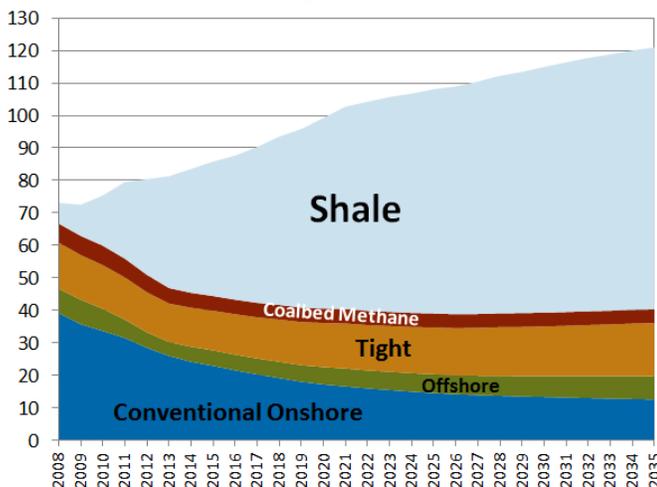
Natural gas, NGL and oil midstream investment will contribute \$885 billion in value added to the U.S. and Canadian economy and \$302 billion in combined tax revenue.

U.S. & Canada: Economic Impacts for Reference Case, 2014-2035

| Impact Type | Employment (Jobs per Year) | Annual Wages and Benefits (2012\$ Per Job) | Labor Income (Billions of 2012\$) | Value Added (Billions of 2012\$) | State/Provincial and Local Tax Revenues (Billions of 2012\$) | Federal Tax Revenues (Billions of 2012\$) |
|--------------|----------------------------|--|-----------------------------------|----------------------------------|--|---|
| Direct | 144,026 | \$75,259 | \$238.5 | \$290.7 | | |
| Indirect | 117,298 | \$64,070 | \$165.3 | \$265.6 | | |
| Induced | 171,158 | \$48,844 | \$183.9 | \$328.8 | | |
| Total | 432,482 | \$61,770 | \$587.7 | \$885.2 | \$146.3 | \$156.2 |

Shale Development Drives Production

U.S. and Canadian Natural Gas Production (Average Annual Bcfd)



U.S. and Canadian natural gas production is projected to grow from an average of 83 Bcfd in 2014, to an average of over 120 Bcfd in 2035, adequate to meet projected gas market needs through 2035. Unconventional natural gas supplies account for all of the incremental supply and will comprise approximately two-thirds of the total gas supply mix by 2035.

Like gas production, petroleum liquids production is projected to grow in the foreseeable future. U.S. and Canadian crude oil and condensate production will grow from a recent level of roughly 10 million Bbl/d to roughly 17 million Bbl/d in 2035. Over half of the growth is from unconventional (tight) oil supplies that include production from the Bakken, Niobrara, Eagle Ford and Cline plays.