Gas and Crude Oil Production Outlook

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By John Powell
Office of Petroleum, Natural Gas, and Biofuels Analysis
EIA mission: independent statistics and analysis

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- EIA collects, analyzes, and disseminates independent and impartial energy information to promote sound policymaking, efficient markets, and public understanding of energy and its interaction with the economy and the environment
- EIA is the Nation's premier source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. Government
- EIA does not propose or advocate any policy positions
EIA produces data series, analyses, and energy projections

- **Weekly, monthly, and annual data**
  - Displays U.S. and regional production, stocks, blender inputs, imports, and exports

- **Real-time analyses**
  - Digests important developments in Today in Energy, This Week in Petroleum, Issues & Trends, Country Analysis Briefs

- **Short-Term Energy Outlook (STEO)**
  - Forecasts U.S. supplies, demands, imports, stocks, and prices of energy with a horizon of 12 to 24 months

- **Annual Energy Outlook (AEO)**
  - Presents 25- to 30-year projection and analysis of U.S. energy supply, demand, and prices

- **International Energy Outlook (IEO)**
  - Assesses international energy production and consumption
EIA Drilling Productivity Report: Seven key plays account for nearly all recent growth in oil and natural gas production

Drilling Productivity Report (DPR) represents a step change in analyzing production metrics

• Prior to the shale revolution
  – Drillers targeted either oil or natural gas formations
  – Production was relatively stable over a long period from each well
  – Simple rig count was sufficient to monitor and forecast production

• Drilling in tight formations, the “shale revolution”
  – New applications of technology: Horizontal drilling and hydraulic fracturing
  – Pad drilling: Multiple wells per rig from one surface location
  – High initial production rates driven by better technology
  – Steep production declines
  – Formations yielding both oil and natural gas
  – Regional differences contrast rig and well productivity
U.S. shale gas production was 36.4 Bcf/d in August 2014, approximately 52% of total U.S. dry production

Shale gas production (dry)
Billion cubic feet per day

Dry shale gas production as a percent of total dry natural gas production

Sources: EIA Natural Gas Monthly data through November, STEO through July 2014 and Drilling Info.
U.S. tight oil production from selected plays has increased to nearly 50% of total U.S. oil production

Tight oil production
million barrels of oil per day

Tight oil production as a percent of total oil production

Rest of U.S. Oil Production
Eagle Ford (TX)
Bakken (MT & ND)
Spraberry (TX & NM Permian)
Bonespring (TX & NM Permian)
Wolfcamp (TX & NM Permian)
Delaware (TX & NM Permian)
Yeso-Glorieta (TX & NM Permian)
Niobrara-Codell (CO, WY)
Haynesville
Utica (OH, PA & WV)
Marcellus
Woodford (OK)
Granite Wash (OK & TX)
Austin Chalk (LA & TX)
Monterey (CA)

Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through July 2014 and represent EIA's official tight oil estimates, but are not survey data. State abbreviations indicate primary state(s).
EIA forecast that U.S. crude oil production will grow from an average of 7.4 million b/d in 2013 to 9.5 million b/d in 2015

Source: EIA, Short-Term Energy Outlook, May 2014
Roughly 96% of the growth in production between 2011 and 2013 consisted of sweet grades with API gravity of 40 or above.

U.S. crude oil production by type
million barrels of oil per day

Source: EIA, DrillingInfo, Colorado DNR, Texas RRC. http://www.eia.gov/analysis/petroleum/crudetypes/
More than 60% of EIA’s production growth forecast for 2014 and 2015 consists of sweet grades with API gravity of 40+. 

Annual change in U.S. crude oil production by type

<table>
<thead>
<tr>
<th>Year</th>
<th>API 50+</th>
<th>API 45-50</th>
<th>API 40-45</th>
<th>API 40-50 sweet</th>
<th>API 35-40 sweet</th>
<th>API 35-40 sour</th>
<th>API 27-35 med-sour</th>
<th>API 27-35 sour</th>
<th>California</th>
<th>API &lt;27 sweet</th>
<th>API &lt;27 sour</th>
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Source: EIA, DrillingInfo, Colorado DNR, Texas RRC.
Eagle Ford is driving growth of Gulf Coast API 40-50 production

Gulf Coast crude oil production by crude type

- Million barrels of oil per day
- Forecast

Source: EIA, DrillingInfo, Texas RRC.

- The Eagle Ford formation becomes deeper moving from northwest to southeast, creating an oil window, a wet gas window, and a dry gas window

- Since 2010, producers in the Eagle Ford have moved steadily towards areas with more liquids, as prices have continued to favor oil over natural gas
Crude quality varies widely within counties and across the Eagle Ford region.
Bakken crude dominates the Northern Great Plains crude quality

Crude oil production by well start date
million barrels of oil per day

Forecast

Source: EIA, DrillingInfo

Annual distribution of N. Great Plains production
percent

Forecast

- Although additional API gravity data were not available for the Bakken, industry reports indicate that most Bakken wells produce relatively uniform quality crude oil between 38 and 44 degrees API gravity, and narrowly centered on 41 degrees API gravity.
Changes in resource assumptions between the reference and high resource case lead to a 76% increase in oil production rates.

Source: EIA, Annual Energy Outlook 2014 and August 2014 Short-Term Energy Outlook
U.S. dependence on imported liquids is declining, particularly in the near term

U.S. liquid fuels
million barrels per day

**Consumption**

**Net imports**

**Domestic supply**

Source: EIA, Annual Energy Outlook 2014
U.S. import share of liquid fuels declines sharply because of increased production of tight oil and greater fuel efficiency

U.S. liquid fuels supply
million barrels per day

Note: “Other” includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels
Source: EIA, Annual Energy Outlook 2014
U.S. becomes a net exporter of natural gas in the near future

U.S. dry natural gas
trillion cubic feet per year

Source: EIA, Annual Energy Outlook 2014

John Powell, COQA/CCQTA Joint Meeting, October 30-31, San Francisco
Shale gas leads U.S. production growth

U.S. dry natural gas production
trillion cubic feet

History 2012 Projections


0 5 10 15 20 25 30 35 40

Shale gas
Tight gas
Associated with oil
Coalbed methane
Non-associated offshore
Non-associated onshore
Alaska

Source: EIA, Annual Energy Outlook 2014
Results from EIA’s International Energy Outlook 2014 (IEO2014) Reference case

• World petroleum and other liquid fuels use increases by 38% between 2010 and 2040, all in the non-OECD

• Developing Asia (including China and India) and the Middle East account for 85% of the increase

• Increased demand requires 33 million b/d of additional liquid fuels supplies to reach 110 million b/d by 2040
  – OPEC crude and lease condensate increases by 14 MMbbl/d
  – Non-OPEC crude and lease condensate increases by 10 MMbbl/d

• Other liquid supplies (from NGPL, biofuels, CTL, GTL, and refinery gain) grow in importance, supplying 17% of total liquids production by 2040
China’s use of liquid fuels exceeds the United States by 2035

liquid fuels consumption in China and the United States, Reference case
million barrels per day

Supply composition changes more than demand across cases

liquids consumption and production in three price cases, 2040 million barrels per day

The shale revolution, starting in North America, is changing where crude oil and natural gas are produced.

Source: United States basins from EIA and U.S. Geological Survey, other basins from ARI based on data from various published studies
North America leads the world in tight oil production in 2012

Source: U.S. Energy Information Administration, LCI Energy Insight, Canada National Energy Board, and Thane Gustafson’s Wheel of Fortune: The Battle for Oil and Power in Russia
North America leads the world in shale gas production in 2012

shale gas production
billion cubic feet per day

Source: U.S. Energy Information Administration; LCI Energy Insight; Canada National Energy Board; Facts Global Energy

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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

For more information


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

Annual Energy Outlook | www.eia.gov/aeo

International Energy Outlook | www.eia.gov/ieo

Monthly Energy Review | www.eia.gov/mer

State Energy Portal | www.eia.gov/state

Today in Energy | www.eia.gov/todayinenergy