International Energy Outlook

For
Deloitte Oil and Gas Conference
November 18, 2014 | Houston, TX

By
Adam Sieminski, Administrator
U.S. Energy Information Administration
Renewable energy and nuclear power are the fastest growing sources of energy consumption; oil still dominates

world energy consumption by fuel quadrillion Btu

Source: EIA, International Energy Outlook 2013
World energy consumption growth is concentrated in non-OECD countries

World energy consumption, 1990-2040
quadrillion Btu

Source: EIA, International Energy Outlook 2013
Results from the 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 MMbbl/d of additional liquid fuels supplies to reach 119 MMb/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.
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

**Deloitte Oil and Gas Conference**
November 18, 2014
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

Source: EIA, Annual Energy Outlook 2014; Short Term Energy Outlook, November 2014
EIA Reference scenario shows world tight oil production increasing to almost 8 million b/d in 2025

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

U.S. is the largest producer of petroleum and natural gas in the world

Estimated U.S., Russia, and Saudi Arabia petroleum and natural gas production

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petroleum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Energy Information Administration
Note: Petroleum production includes crude oil, natural gas liquids, condensates, refinery processing gain, and other liquids, including biofuels; barrels per day oil equivalent were calculated using a conversion factor of 1 barrel oil equivalent=5.55 million British thermal units (Btu)
U.S. oil production growth helping to offset unplanned outages

estimated unplanned crude oil production outages
million barrels per day

Source: EIA, Short-Term Energy Outlook, November 2014

*monthly production delta versus Jan. 2011 production level
Effect of low oil prices on U.S. shale oil production

Source: Rystad Energy North America Quarterly Shale Report
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

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

2010 2015 2020 2025
-4 -2 0 2 4 6 8

High Oil and Gas Resource case
trillion cubic feet per year

2010 2015 2020 2025
-4 -2 0 2 4 6 8 10 15 20

Source: EIA, Annual Energy Outlook 2014, Reference case and High Oil and Gas Resource case
Most of the growth in production between 2011 and 2015 consists of sweet grades with API gravity of 40 or above.

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

Crude oil and associated liquids contain a wide variety of hydrocarbons

Source: EIA via Harvey Crude Assay Management System
EIA projects declines in carbon dioxide emissions for all sectors except industrial relative to 2005

Source: EIA Annual Energy Outlook 2014
Coal continues to account for the largest share of global energy-related carbon dioxide emissions throughout the projection.

World energy-related carbon dioxide emissions by fuel, billion metric tons:

- **Coal**
- **Natural gas**
- **Liquid fuels**

**Source:** EIA, International Energy Outlook 2013
Areas of uncertainty in the outlook

• Oil 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
• Impact of geopolitical tensions on energy supply
• Constraints on CO₂
EIA natural gas production forecasts were revised up significantly between 2013 and 2014.

Forecasted dry natural gas production (billion cubic feet per day)

Source: EIA Annual Energy Outlook; EIA Monthly Natural Gas Production Report
EIA crude oil production forecasts were also revised up substantially between 2013 and 2014.

Forecasted crude oil production
million barrels per day

Source: EIA Annual Energy Outlook; EIA via state agencies
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/