Energy Outlook 2015

for
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Governors’ Advisors Energy Policy Institute
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by
Howard Gruenspecht, Deputy Administrator
Short-term
Oil prices rise from mid-2015 through mid-2016 in EIA’s forecast—however, the market-implied confidence band is very wide.

Source: EIA, Short-Term Energy Outlook, April 2015
Total U.S. crude production is forecast to decline between 2Q15 and 1Q16; output growth then resumes growth in 2016, reflecting EIA’s price forecast.

U.S. crude oil production growth by area

Cumulative growth compared with 4Q14 (million barrels per day)

Source: EIA, Short-Term Energy Outlook, April 2015
EIA’s latest DPR forecasts May oil production below the April level in the Bakken, Eagle Ford, and Niobrara regions
North American oil production growth slows with lower oil prices but remains the main driver of global production growth.
Gov’t deficits, high reliance on oil revenue, and asset coverage of gov’t spending are indicators of geopolitical stress exposure.

Source: EIA, International Monetary Fund (IMF), individual country investment authorities.
Various events could lead to changes in global supply or demand that could push future crude oil prices higher or lower than the forecast.

### Increase Prices

- Oil demand growth surprises to the upside (economy- or price-driven)
- Key OPEC producers cut output more than expected
- Iraq production is significantly disrupted (ISIL? other discord?)
- Social unrest in oil-dependent countries leads to supply disruptions
- Non-OPEC production slows more than expected

### Decrease Prices

- World economic growth is lower than projected (e.g., China)
- Saudi Arabia keeps production at 9.6-9.7 million bbl/d in 2016
- Reduction in unplanned production outages
- Iranian sanctions are lifted
U.S. gasoline demand is forecast to increase 1.6% percent in 2015 reflecting a combination of factors

year over year quarterly U.S. gasoline demand growth percent change

Source: EIA, Short-Term Energy Outlook, April 2015
Average household energy expenditures fall by 16% in 2015, then increase somewhat in 2016 (based on EIA price forecast)

Sources: 2013 expenditures and income from BLS Consumer Expenditure Survey. The average household in the BLS survey (called a consuming unit) averages 2.5 people and 1.3 income earners. Expenditures for 2014-16 based on average prices from EIA Short-Term Energy Outlook, April 2015
Henry Hub spot prices are expected to average $3.07/million Btu in 2015 and $3.45/million Btu in 2016.

Source: EIA, Short-Term Energy Outlook, April 2015
Natural gas production is expected to increase by 3.8 bcf/day in 2015 and by 1.5 bcf/day in 2016

Source: EIA, Short-Term Energy Outlook, April 2015
Industrial and power sectors drive natural gas consumption growth in the forecast

Natural gas consumption  
billion cubic feet per day  

annual change  
billion cubic feet per day

Source: EIA, Short-Term Energy Outlook, April 2015
Long-term
Key results from *AEO2015*

- In most AEO2015 cases, U.S. net energy imports, including all fuels, decline and ultimately end by 2030 for the first time since the 1950s.

- U.S. energy consumption grows at a modest rate over the projection with reductions in energy intensity resulting from improved technologies and trends driven by existing laws and regulations.

- Renewables provide an increased share of electricity generation, reflecting rising long-term natural gas prices and the high capital costs of new coal and nuclear generation capacity.
Key results from AEO2015 (continued)

• Improved efficiency of energy consumption in end-use sectors and a shift away from more carbon-intensive fuels help to stabilize U.S. energy-related carbon dioxide emissions, which remain below the 2005 level through 2040

• Growth of domestic crude oil and natural gas production varies significantly across regions and cases, leading to shifts in crude oil and natural gas flows between regions, requiring infrastructure adjustments

• The AEO2015 cases generally reflect current policies, including final regulations and the sunset of tax credits under current law; consistent with this approach, EPA’s proposed Clean Power Plan rules for existing fossil-fired electric generating units or the effects of relaxing current limits on crude oil exports are not considered in AEO2015
Overview
Crude oil price projection is lower in the AEO2015 Reference case than in AEO2014, particularly in the near term.

Brent crude oil spot price
2013 dollars per barrel

Reductions in energy intensity largely offset impact of GDP growth, leading to slow projected growth in energy use.

U.S. primary energy consumption
quadrillion Btu

Source: EIA, Annual Energy Outlook 2015 Reference case
U.S. net energy imports continue to decline in the near term, reflecting increased oil and natural gas production coupled with slow demand growth.

Source: EIA, Annual Energy Outlook 2015
CO$_2$ emissions are sensitive to the influence of future economic growth and energy price trends on energy consumption.

**Source:** EIA, Annual Energy Outlook 2015
CO$_2$ emissions per dollar of GDP decline faster than energy use per dollar of GDP with a shift towards lower-carbon fuels

energy and emission intensity index, 2005=1

Source: EIA, Annual Energy Outlook 2015 Reference case
Petroleum and other liquid supply
AEO2015 explores scenarios that encompass a wide range of future crude oil price paths

Brent crude oil spot price
2013 dollars per barrel

Source: EIA, Annual Energy Outlook 2015
U.S. crude oil production rises above previous historical highs before 2020 in all AEO2015 cases, with a range of longer-term outcomes.

Growth of onshore crude oil production varies across supply regions, affecting pipeline and midstream infrastructure needs.

Change between 2013 and 2040 in U.S. lower 48 onshore crude oil production by region, million barrels per day.

Source: EIA, Annual Energy Outlook 2015
Combination of increased tight oil production and higher fuel efficiency drive projected decline in oil imports

U.S. liquid fuels supply
million barrels per day

History

2013

Projections


Net petroleum and other liquids imports

Other crude oil production (excluding tight)

Note: “Other” includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels

Source: EIA, Annual Energy Outlook 2015 Reference case
Net liquid imports provide a declining share of U.S. liquid fuels supply in most AEO2015 cases; in two cases the nation becomes a net exporter.
In the transportation sector, motor gasoline use declines; diesel fuel, jet fuel, and natural gas use all grow.

Source: EIA, Annual Energy Outlook 2015 Reference case

*Includes aviation gasoline, propane, residual fuel oil, lubricants, electricity, and liquid hydrogen.
U.S. net exports of petroleum products vary with the level of domestic oil production given current limits on U.S. crude oil exports.

Source: EIA, Annual Energy Outlook 2015
Natural gas
Future domestic natural gas prices depend on both domestic resource availability and world energy prices.

Average Henry Hub spot prices for natural gas, 2013 dollars per million Btu.

History (2005-2013)

2013

Projections (2015-2040)

- High Oil Price
- Reference
- Low Oil Price
- High Oil and Gas Resource

Source: EIA, Annual Energy Outlook 2015
Shale resources remain the dominant source of U.S. natural gas production growth

U.S. dry natural gas production

trillion cubic feet

Source: EIA, Annual Energy Outlook 2015 Reference case
Natural gas consumption growth is driven by increased use in all sectors except residential

U.S. dry gas consumption trillion cubic feet

<table>
<thead>
<tr>
<th>Year</th>
<th>Residential</th>
<th>Commercial</th>
<th>Transportation**</th>
<th>Electric power</th>
<th>Industrial*</th>
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<td>8.9</td>
<td>8.2</td>
<td>0.9</td>
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<tr>
<td>2013</td>
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<td>8.2</td>
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<tr>
<td>2020</td>
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<td>2025</td>
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<td>8.2</td>
<td>0.9</td>
<td>3.3</td>
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<td>2030</td>
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<tr>
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<td>8.2</td>
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<td>10.9</td>
<td>9.4</td>
<td>1.6</td>
<td>3.6</td>
<td>4.2</td>
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</tbody>
</table>

*Includes combined heat-and-power and lease and plant fuel
**Includes pipeline fuel

Source: EIA, Annual Energy Outlook 2015 Reference case

Energy Outlook 2015, April 16, 2015
Projected U.S. natural gas exports reflect the spread between domestic natural gas prices and world energy prices.

U.S. natural gas imports and exports (trillion cubic feet)

- **LNG imports**
- **Pipeline exports to Canada**
- **Pipeline imports from Canada**
- **Alaska LNG exports**

**History** 2013

- **2000**
- **2010**
- **2020**
- **2030**
- **2040**

**Projections**

- **2013**
- **2020**
- **2030**
- **2040**

**Source:** EIA, Annual Energy Outlook 2015

Energy Outlook 2015, April 16, 2015
Electricity
Growth in electricity use slows, but electricity use still increases by 24% from 2013 to 2040

U.S. electricity use and GDP percent growth (rolling average of 3-year periods)

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Growth</th>
<th>GDP</th>
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<tbody>
<tr>
<td>1950s</td>
<td>9.8</td>
<td>4.2</td>
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<td>1960s</td>
<td>7.3</td>
<td>4.5</td>
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<td>1970s</td>
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<td>2000-2013</td>
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<tr>
<td>2013-2040</td>
<td>0.8</td>
<td>2.4</td>
</tr>
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</table>

Source: EIA, Annual Energy Outlook 2015 Reference case
Over time the electricity mix gradually shifts to lower-carbon options, led by growth in renewables and gas-fired generation.

Source: EIA, Annual Energy Outlook 2015 Reference case
Non-hydro renewable generation grows to double hydropower generation by 2040

renewable electricity generation by fuel type
billion kilowatthours

Source: EIA, Annual Energy Outlook 2015 Reference case
Growth in wind and solar generation meets a significant portion of projected total electric load growth in all AEO2015 cases.

U.S. renewable generation in all sectors by fuel billion kilowatthours

Source: EIA, Annual Energy Outlook 2015
For more information


Annual Energy Outlook | www.eia.gov/forecasts/aeo

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

International Energy Outlook | www.eia.gov/forecasts/ieo

Today In Energy | www.eia.gov/todayinenergy

Monthly Energy Review | www.eia.gov/totalenergy/data/monthly

State Energy Portal | www.eia.gov/state

Drilling Productivity Report | www.eia.gov/petroleum/drilling
Preview of coming attractions
Upcoming: improved international energy web presence

- New data browser to replace IES
- Better map-based navigations and visualizations
- Consolidate CABs/CANs
- Status: dev integration
- Launch: beta in April
Upcoming: EIA-930—hourly survey of electricity balancing authorities

- First near-real time report for EIA
- Dashboard view of the U.S. power grid
- Highly anticipated by EIA customers
- Status: dev largely complete; awaiting OES data to continue
- Launch: TBD

Energy Outlook 2015, April 16, 2015
Upcoming: Final four reports on EIA crude oil exports

Over the next two months, the final four reports will cover:

1) technical options for U.S. refineries to facilitate the processing additional light tight oil

2) implications of increasing light tight oil production for the overall U.S. refining system

3) an update to EIA’s May 29, 2014, report on projections of U.S. crude oil production by API gravity

4) the effects on oil prices, oil production, and oil trade if restrictions on U.S. crude oil exports were removed
Now playing: Crude by rail and EIA-914—data updates

- Both high priority
- Crude by rail due out with PSM, March 30
- Updated 914 expected in June with new data collection
Now playing: New Microsoft Excel add-in for Windows

- Enables spreadsheet users – inside and outside of EIA – to pull recent EIA/FRED data into their existing workbooks
Technology and policy promotes slower growth of transportation energy demand

delivered transportation sector energy consumption
quadrillion Btu

Source: EIA, Annual Energy Outlook 2015
Difference between U.S. natural gas and crude oil prices grows through 2040

energy spot prices
2013 dollars per million Btu

History

2013

Projections

Brent crude oil spot price

Ratio: 5.1

Oil to gas price ratio: 2.6

Henry Hub spot price

Ratio: 3.1

Source: EIA, Annual Energy Outlook 2015 Reference case
Level of net natural gas trade, including LNG exports, depends largely on resource levels and oil prices

U.S. total net natural gas imports

<table>
<thead>
<tr>
<th></th>
<th>History</th>
<th>2013</th>
<th>Projections</th>
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</thead>
<tbody>
<tr>
<td>trillion cubic feet</td>
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</table>

Source: EIA, Annual Energy Outlook 2015
Industrial energy use rises with growth of shale gas supply

Source: EIA, Annual Energy Outlook 2015
Electricity prices increase with rising fuel costs and expenditures for electric transmission and distribution infrastructure.

Average retail electricity prices: 2013 cents per kilowatthour.

Growth in U.S. energy production outstrips consumption leading to a balance in United States energy imports and exports

U.S. energy production and consumption
quadrillion Btu

Source: EIA, Annual Energy Outlook 2015 Reference case