Annual Energy Outlook 2015

AEO2015 Rollout Presentation
Center for Strategic and International Studies
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by
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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
  - Strong growth in domestic production of crude oil from tight formations through 2020 and limited growth in domestic demand after 2020 leads to a decline in net petroleum and other liquids imports
  - The United States transitions from being a net importer of natural gas to a net exporter by 2017 in all cases
- 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
CO₂ emissions are sensitive to the influence of future economic growth and energy price trends on energy consumption.
CO₂ 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
New AEO table browser

- Signature product redeveloped for EIA’s state-of-the-art table browser experience
- Compares up to 6 cases from AEO
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.

U.S. crude oil production (million barrels per day)

- History
- 2013
- Reference
- 2013
- High Oil and Gas Resource
- 2013
- Low Oil Price

U.S. maximum production level of 9.6 million barrels per day in 1970

- Tight oil
- Lower 48 offshore
- Other lower 48 onshore
- Alaska

Source: EIA, Annual Energy Outlook 2015
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

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

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 liquids imports provide a declining share of U.S. liquid fuels supply in most AEO2015 cases; in two cases the nation becomes a net exporter.

Net crude oil and petroleum product imports as a percentage of total U.S. supply

Source: EIA, Annual Energy Outlook 2015

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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 in 2013 dollars per million Btu.

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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</tbody>
</table>

Source: EIA, Annual Energy Outlook 2015 Reference case

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

**Includes pipeline fuel
Growth in manufacturing output and use of natural gas reflect high natural gas supply and low prices, particularly in near term.

Source: EIA, Annual Energy Outlook 2015 Reference case
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

Source: EIA, Annual Energy Outlook 2015, April 14, 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)

History

Structural Change in Economy - Higher prices - Standards - Improved efficiency

Projections

<table>
<thead>
<tr>
<th>Period</th>
<th>Average Growth</th>
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<tbody>
<tr>
<td></td>
<td>Electricity use</td>
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<tr>
<td>1950s</td>
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<td>2013-2040</td>
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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.

电力净发电量
万亿千瓦时

| 年份 | 煤炭 | 可再生能源 | 天然气 | 核电 | 其他液体和石油 
|------|------|-----------|-------|------|---------
| 1990 | 19%  | 19%       | 53%   | 1%   | 4%      
| 2013 | 13%  | 39%       | 27%   | 1%   | 1%      
| 2025 | 16%  | 38%       | 27%   | 1%   | 1%      
| 2040 | 18%  | 34%       | 31%   | 1%   | 1%      

来源：EIA, 年度能源展望 2015 参考方案
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

ELECTRICITY
U.S. ELECTRIC SYSTEM OPERATING DATA

11.078299999999999
U.S. Demand (over 48 states)
Thousand megawatthours
Jan 8, 2015 EST | last hour, 6:00-6:59 AM EST

Regional hourly electricity demand: thousand megawatthours

Annual Energy Outlook 2015, April 14, 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
• 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.