EIA's Energy Outlook 2016

for
University of Tulsa
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by
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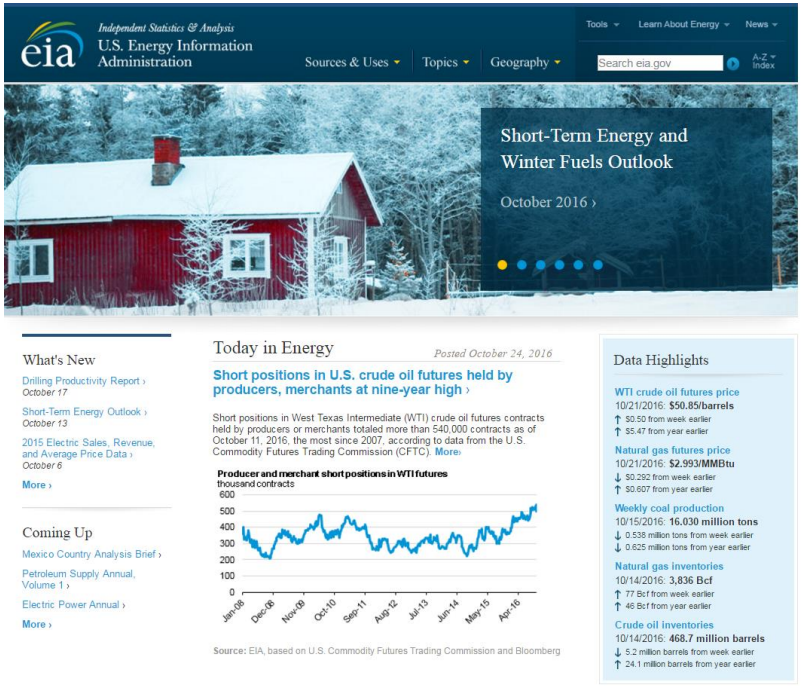
Independent Statistics & Analysis

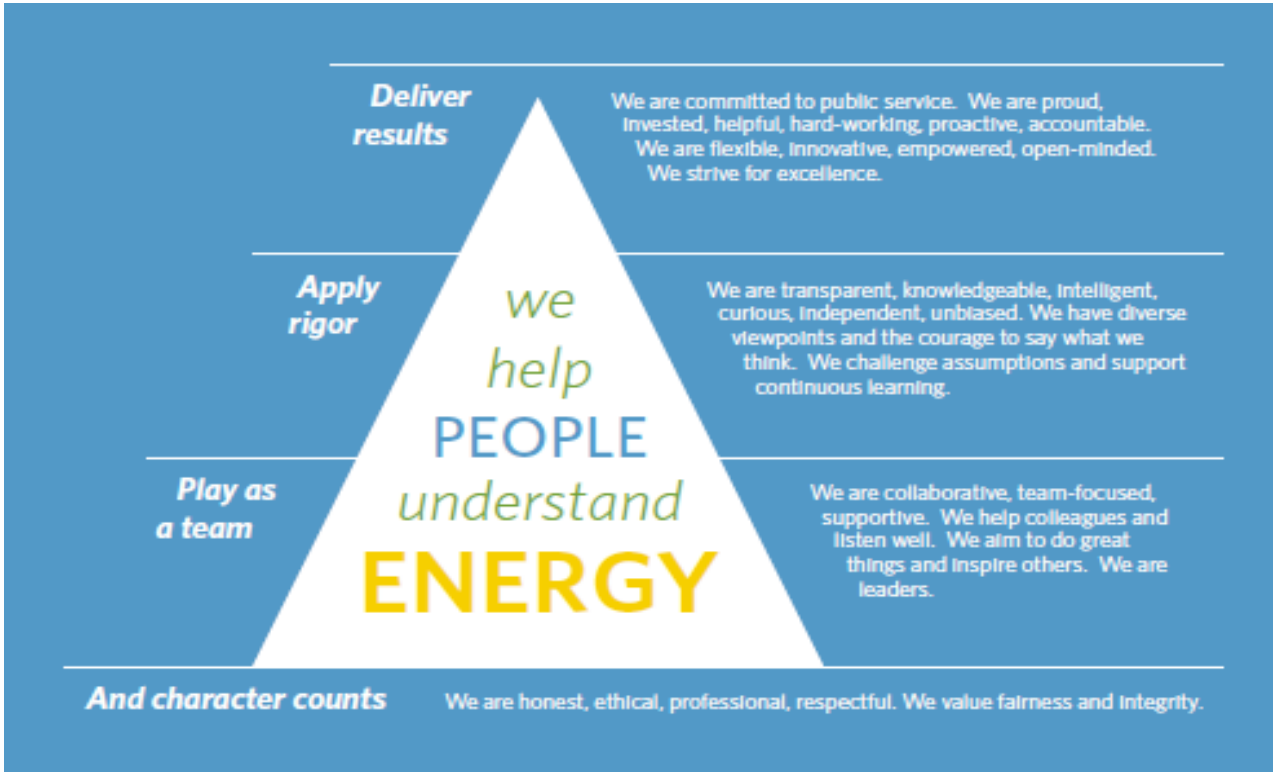
U.S. Energy Information Administration

Mission: 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 official source of energy information and, by law, its data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government.



Our core values and vision



Principles and practices for federal statistical agencies

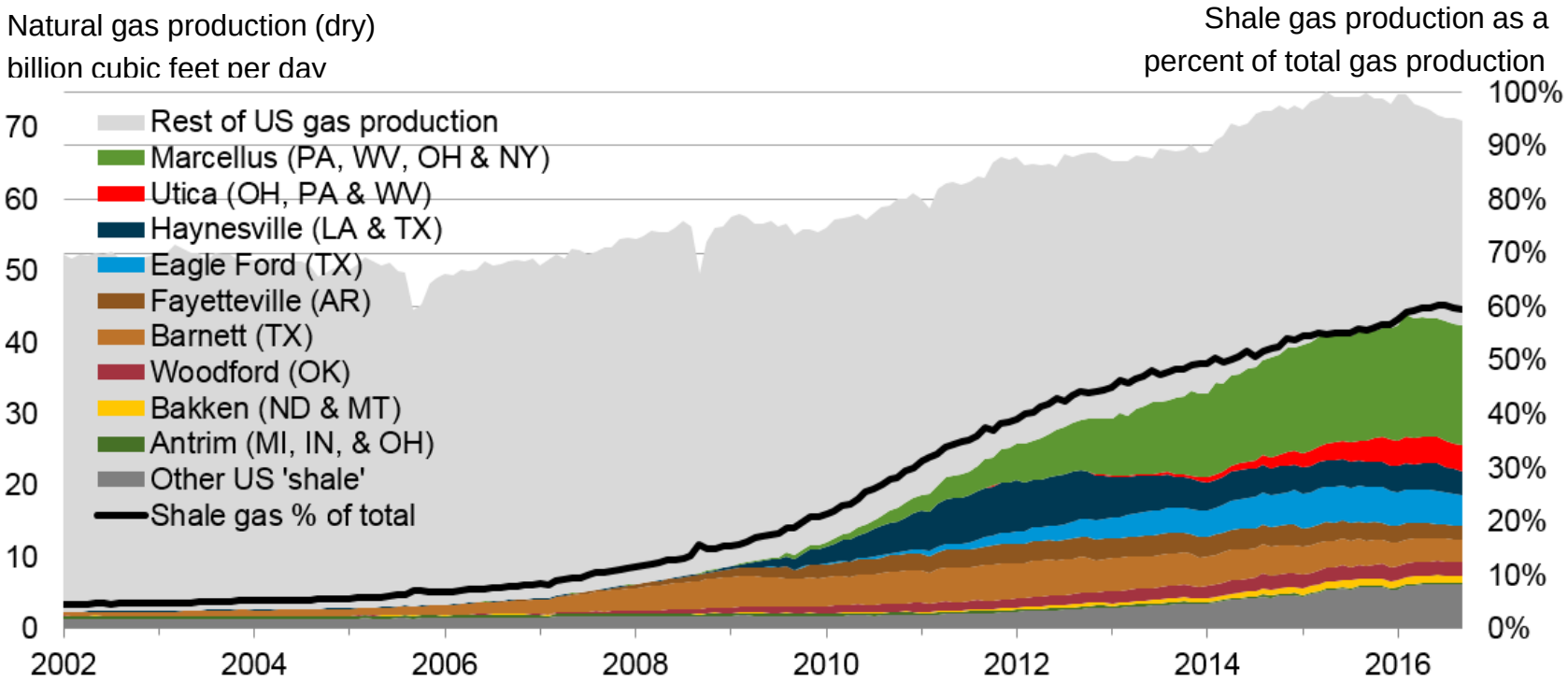
Key Principles
Relevance to policy issues
Credibility among data users
Trust among data providers
Independence from influences that undermine impartiality

Key Practices
Clearly defined and well-accepted mission
Necessary authority to protect independence
Continual development of more useful data
Openness about sources and limitations of the data provided
Wide dissemination of data
Cooperation with data users
Respect for the privacy and autonomy of data providers
Protection of the confidentiality of data providers' information
Commitment to quality and professional standards of practice
Active research program
Professional advancement of staff
Strong internal and external evaluation program
Coordination and collaboration with other statistical agencies

Source: Committee on National Statistics

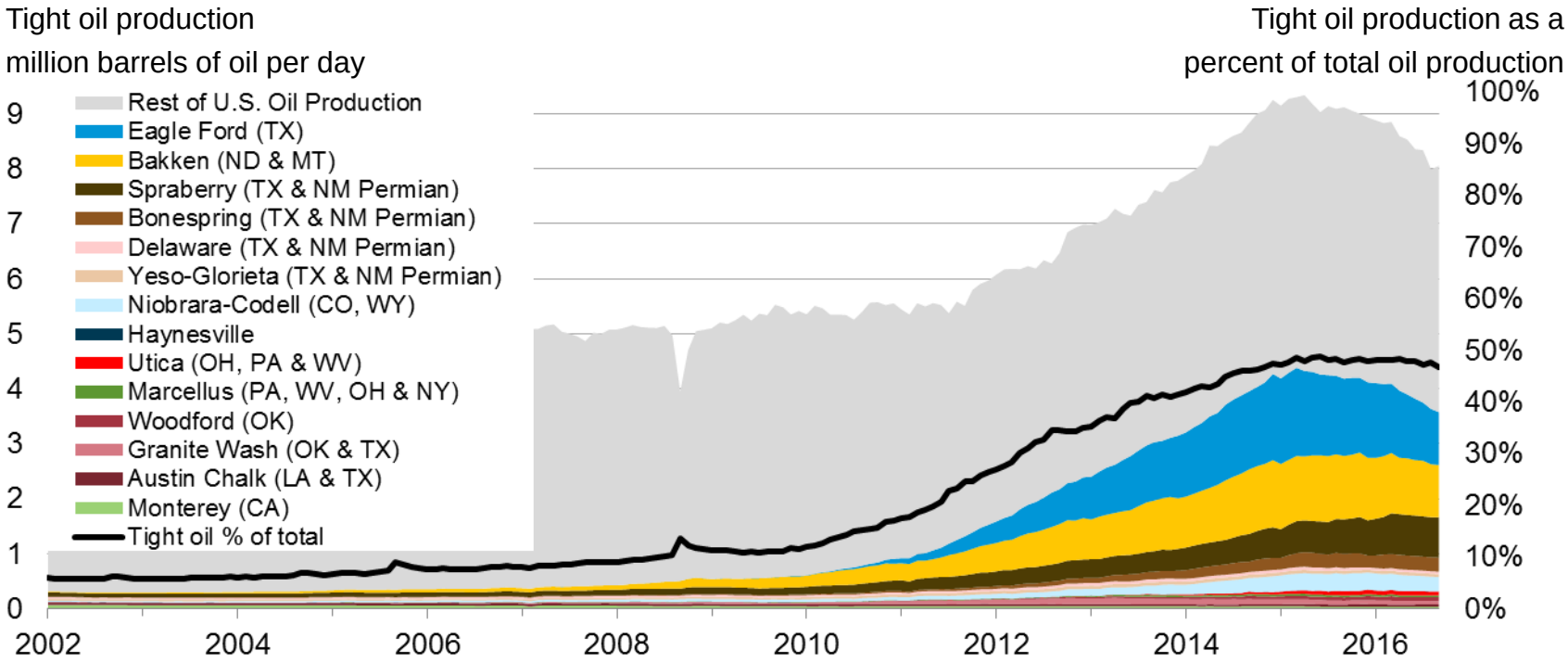
U.S. short term oil and natural gas outlook

Estimated U.S. shale gas production was 42.4 Bcf/d in September 2016 about 60% of total U.S. dry production (71.1 Bcf/d)



Sources: EIA Natural Gas Monthly, STEO through September 2016 and DrillingInfo.

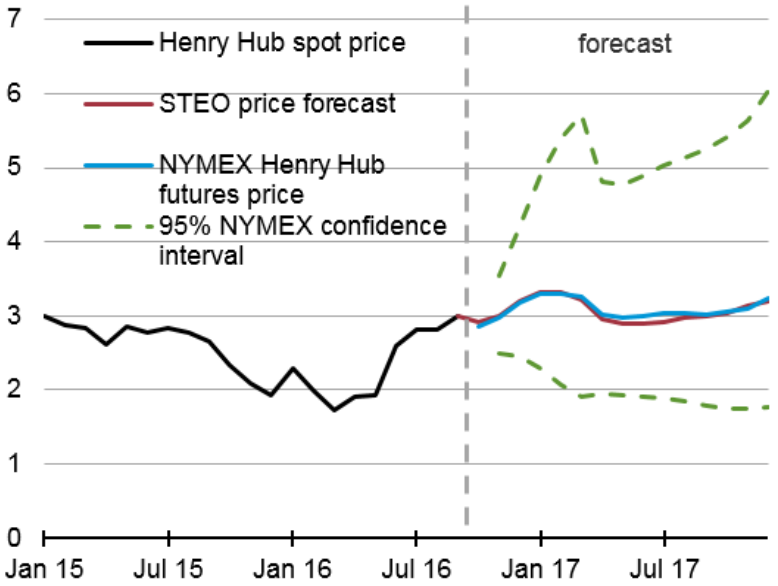
Estimated U.S. tight oil production was 3.9 MMbbl/d in September 2016 about 47% of total U.S. oil production (8.4 MMbbl/d)



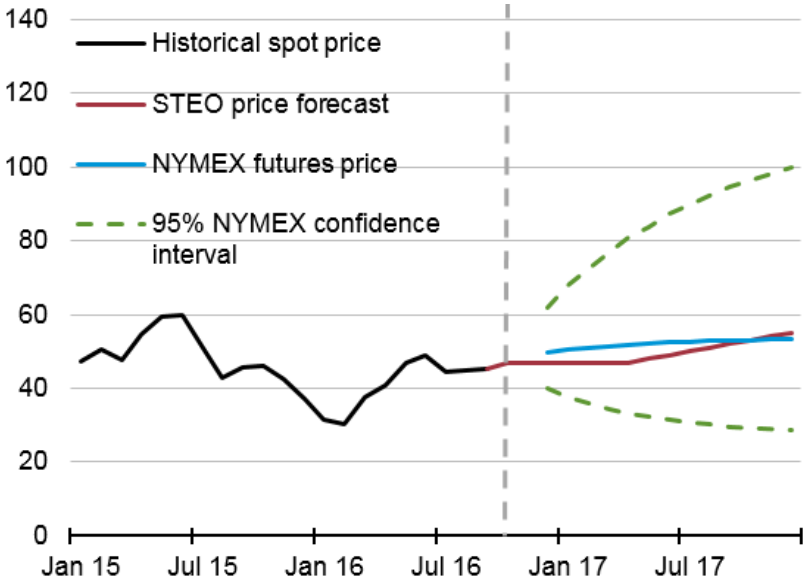
Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through September 2016 and represent EIA's official tight oil estimates, but are not survey data. State abbreviations indicate primary state(s).

EIA forecasts Henry Hub spot prices to average $3.15/MMBtu this winter. West Texas intermediate crude oil spot price to average $47/b this winter.

Henry Hub natural gas price
dollars per million Btu



West Texas intermediate (WTI) crude oil price
dollars per barrel



Note: Confidence interval derived from options market information for the 5 trading days ending October 6, 2016 Intervals not calculated for months with sparse trading in near-the-money options contracts.

Source: EIA Short-Term Energy Outlook, October 2016, and CME Group.

U.S. Energy Outlook

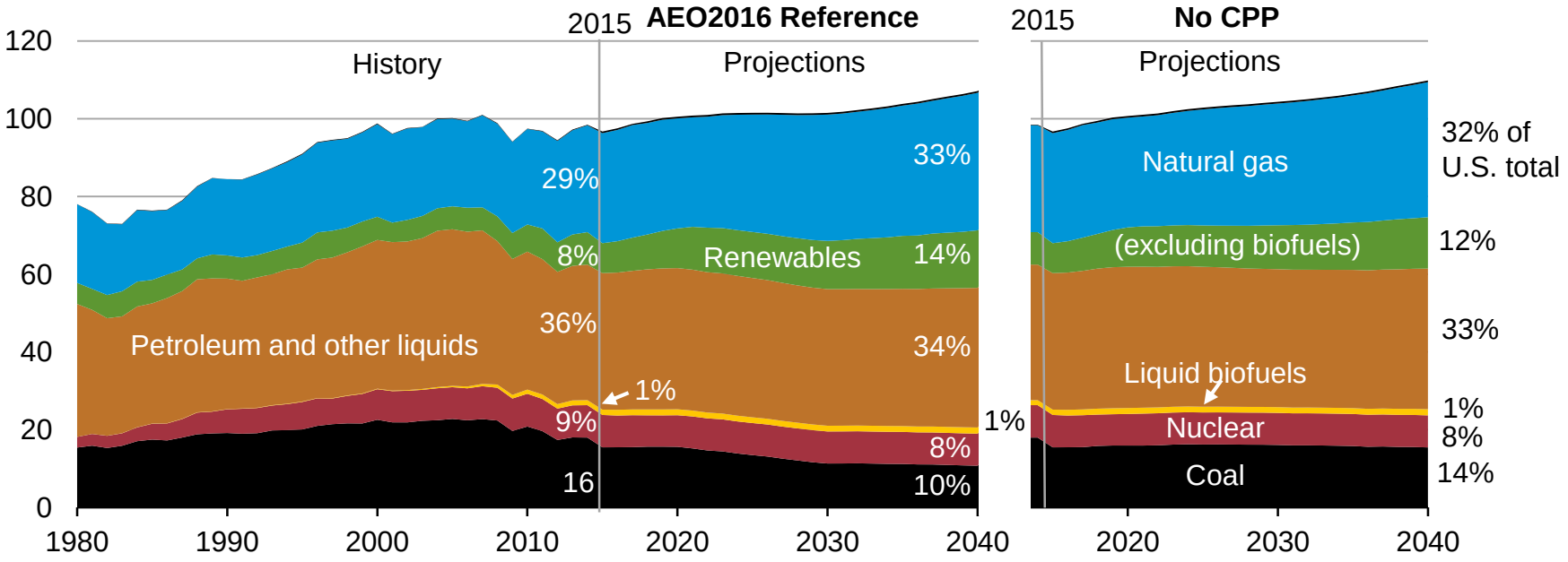
Key takeaways from AEO2016

- Energy use per dollar of Gross Domestic Product declines through 2040 allowing for economic growth without upward pressure on energy consumption and related emissions
- Market forces drive up oil prices throughout the projection and U.S. production increases in response
- Natural gas production increases despite relatively low and stable natural gas prices
- Technological improvements are key drivers of U.S. oil and gas production
- Net exports of liquefied natural gas range between 3.5 Tcf and 10.6 Tcf in 2040 depending on relative prices in foreign markets
- EPA's proposed medium and heavy-duty vehicle Phase 2 standards would increase fuel economy, resulting in 18% lower diesel consumption in 2040 compared with the Reference case

Reductions in energy intensity largely offset impact of gross domestic product (GDP) growth, leading to slow projected growth in energy use

U.S. primary energy consumption

quadrillion Btu

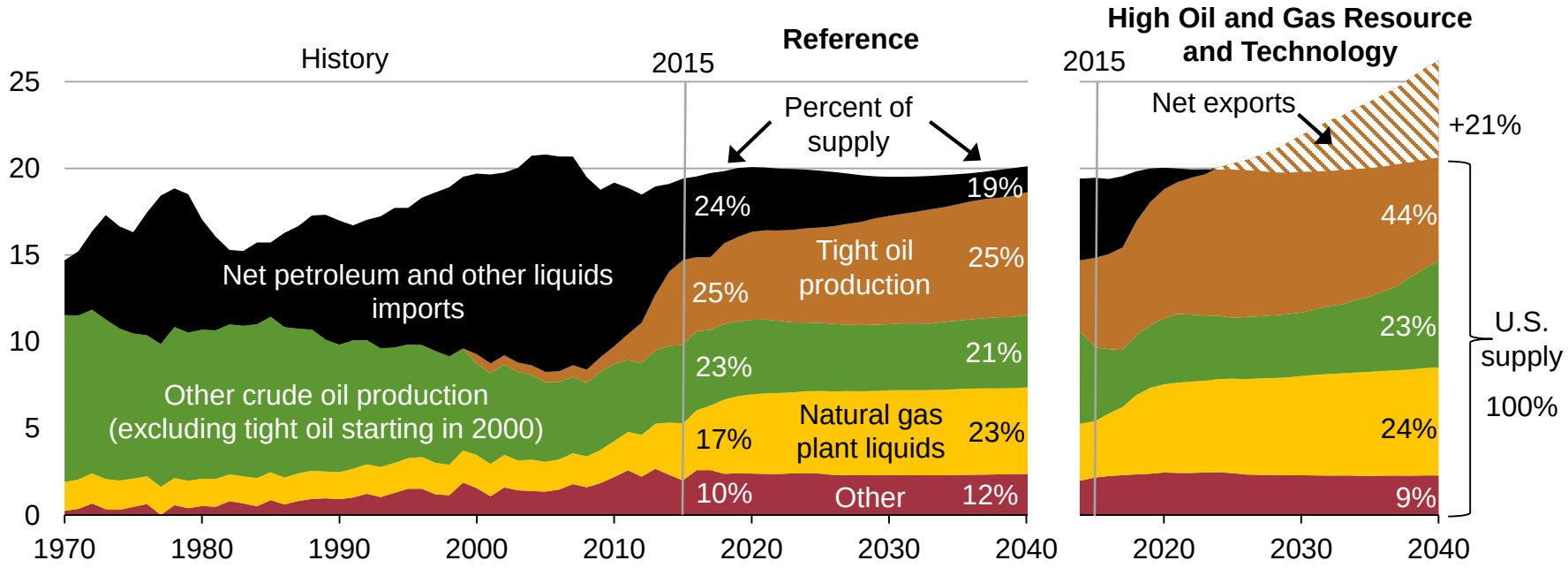


Source: EIA, Annual Energy Outlook 2016

Combination of increased tight oil production and higher fuel efficiency drives projected decline in oil imports

U.S. liquid fuels supply

million barrels per day



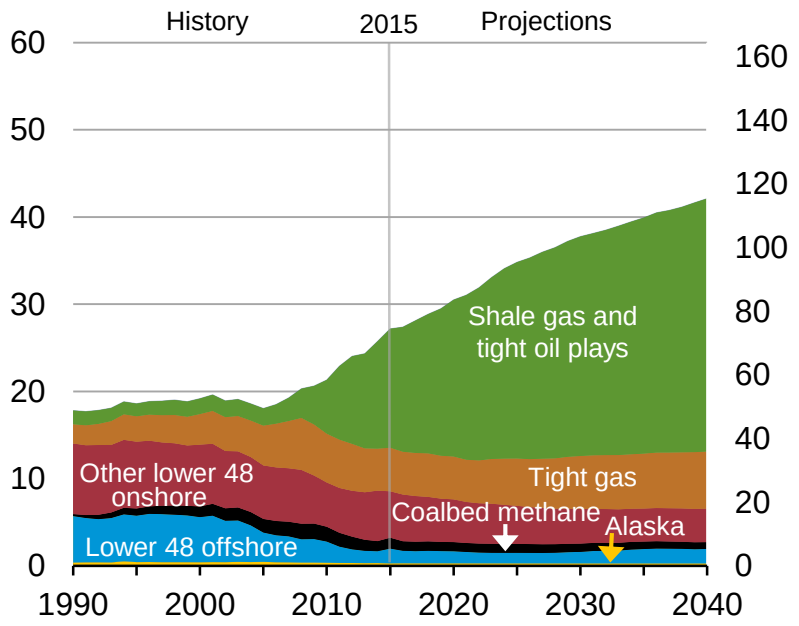
Note: "Other" includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels

Source: EIA, Annual Energy Outlook 2016

U.S. natural gas production dominated by shale resources; alternative price and resource /technology assumptions could be quite different

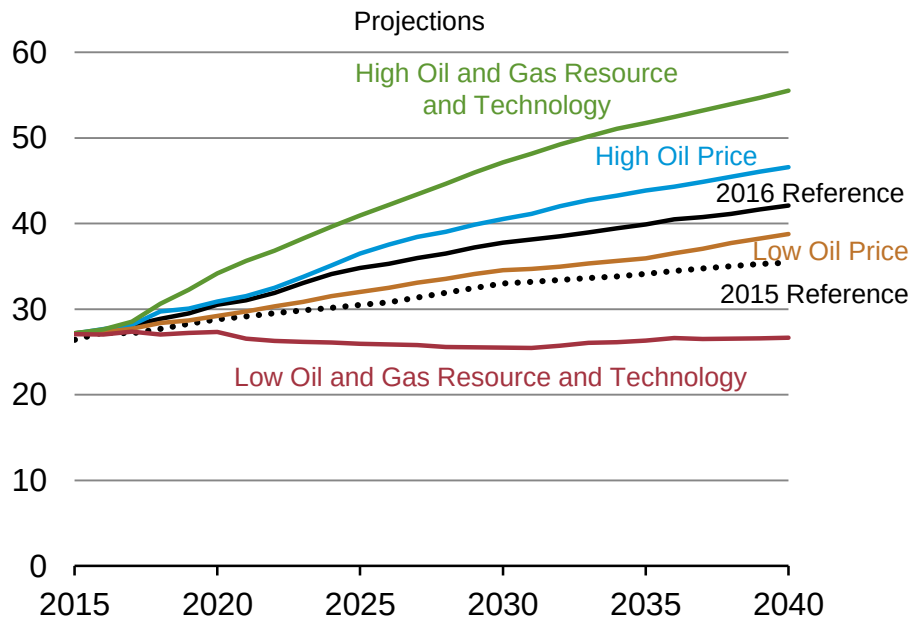
U.S. dry natural gas production

trillion cubic feet billion cubic feet per day



U.S. dry natural gas production

trillion cubic feet



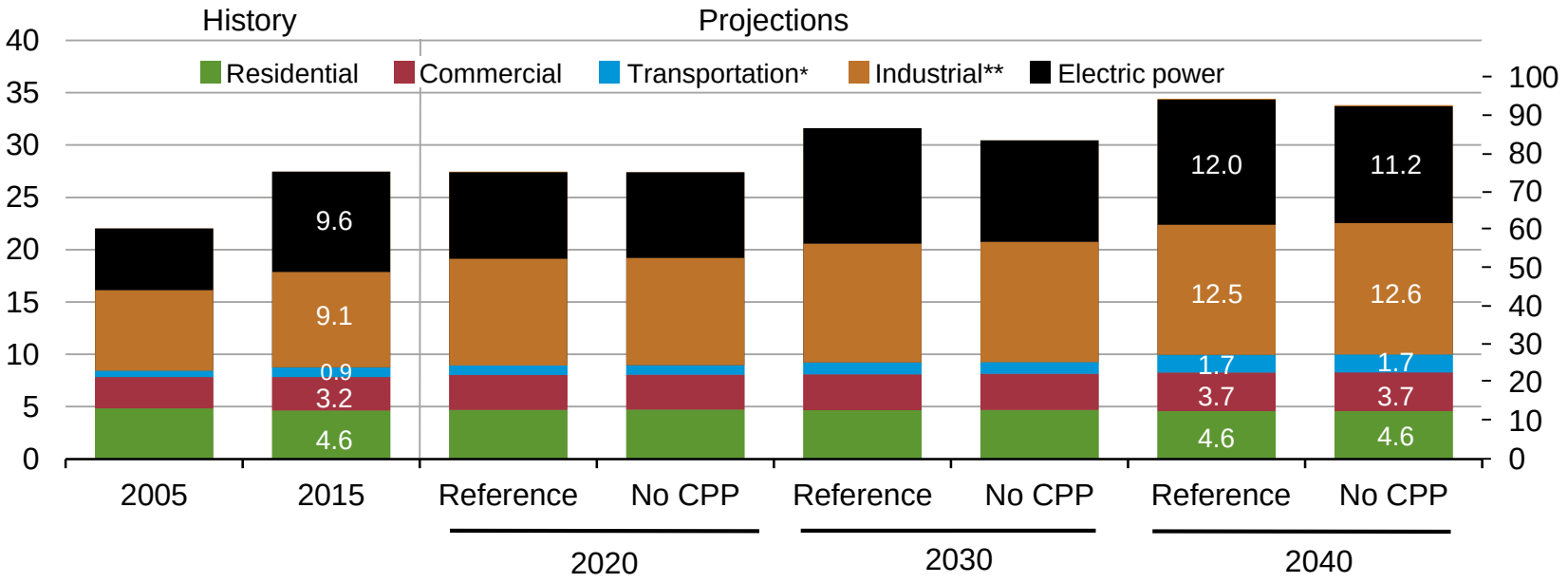
Source: EIA, Annual Energy Outlook 2016

Natural gas consumption growth is led by electricity generation and industrial uses; natural gas use rises in all sectors except residential

U.S. dry gas consumption

trillion cubic feet

billion cubic feet per day



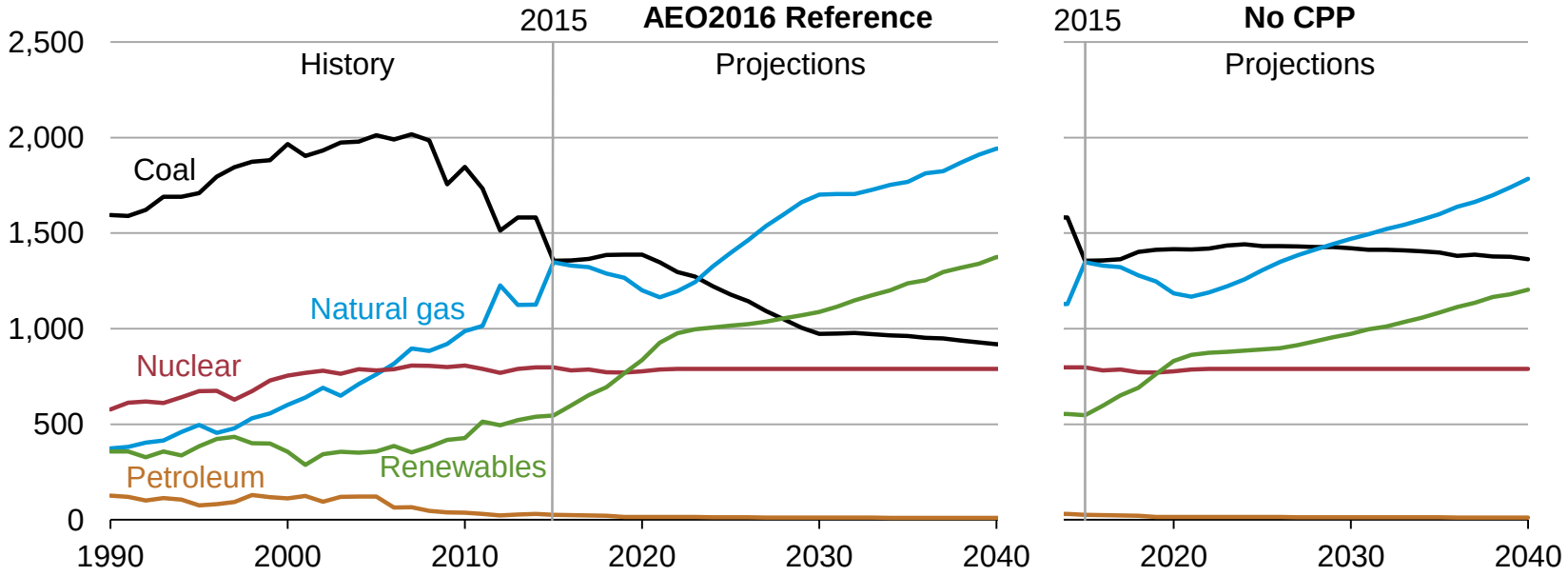
Source: EIA, Annual Energy Outlook 2016

**Includes pipeline fuel*

***Includes combined heat-and-power and lease, plant, and export liquefaction fuel*

Both natural gas and renewable generation surpass coal by 2030 in the Reference case, but only natural gas does so in the No CPP case

net electricity generation
billion kilowatthours

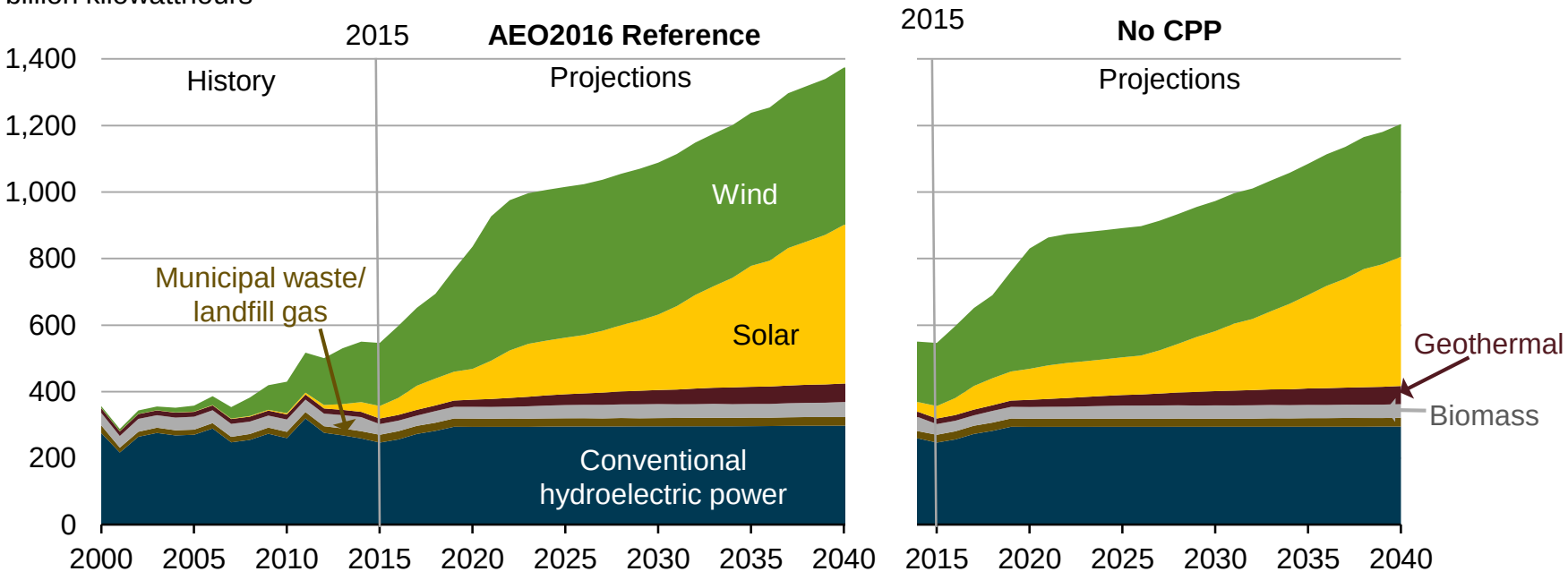


Source: EIA, Annual Energy Outlook 2016

Changing tax and cost assumptions contribute to stronger solar growth, with the CPP providing a boost to renewables

renewable electricity generation by fuel type

billion kilowatthours



Source: EIA, Annual Energy Outlook 2016

International Energy Outlook

Key findings in EIA's long-term global outlook (IEO 2016)

- World energy consumption increases from 549 quadrillion Btu in 2012 to 629 quadrillion Btu in 2020 and then to 815 quadrillion Btu in 2040, a 48% increase (1.4%/year). Non-OECD Asia (including China and India) account for more than half of the increase.

- The industrial sector continues to account for the largest share of delivered energy consumption; the world industrial sector still consumes over half of global delivered energy in 2040.

- Renewable energy is the world's fastest-growing energy source, increasing by 2.6%/year; nuclear energy grows by 2.3%/year, from 4% of the global total in 2012 to 6% in 2040.

- Fossil fuels continue to supply more than three-fourths of world energy use in 2040.

Key findings in EIA's IEO 2016 (continued)

- Among the fossil fuels, natural gas grows the fastest. Coal use plateaus in the mid-term as China shifts from energy-intensive industries to services and worldwide policies to limit coal use intensify. By 2030, natural gas surpasses coal as the world's second largest energy source.

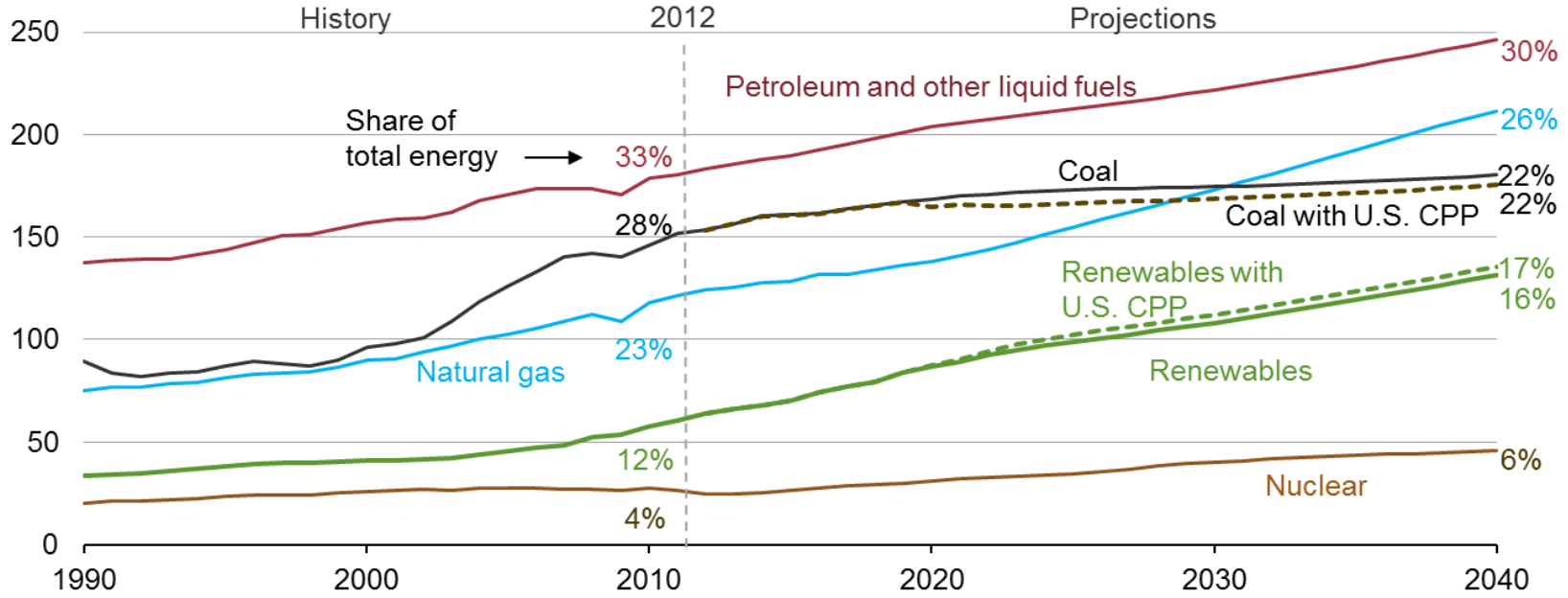
- In 2012, coal provided 40% of the world's total net electricity generation. By 2040, coal, natural gas, and renewable energy sources provide roughly equal shares (28-29%) of world generation.

- With current policies and regulations, worldwide energy-related carbon dioxide emissions rise from about 32 billion metric tons in 2012 to 36 billion metric tons in 2020 and then to 43 billion metric tons in 2040, a 34% increase.

Global energy shares: renewables grow fastest, coal use plateaus, natural gas surpasses coal by 2030, and oil maintains its leading share

world energy consumption

quadrillion Btu

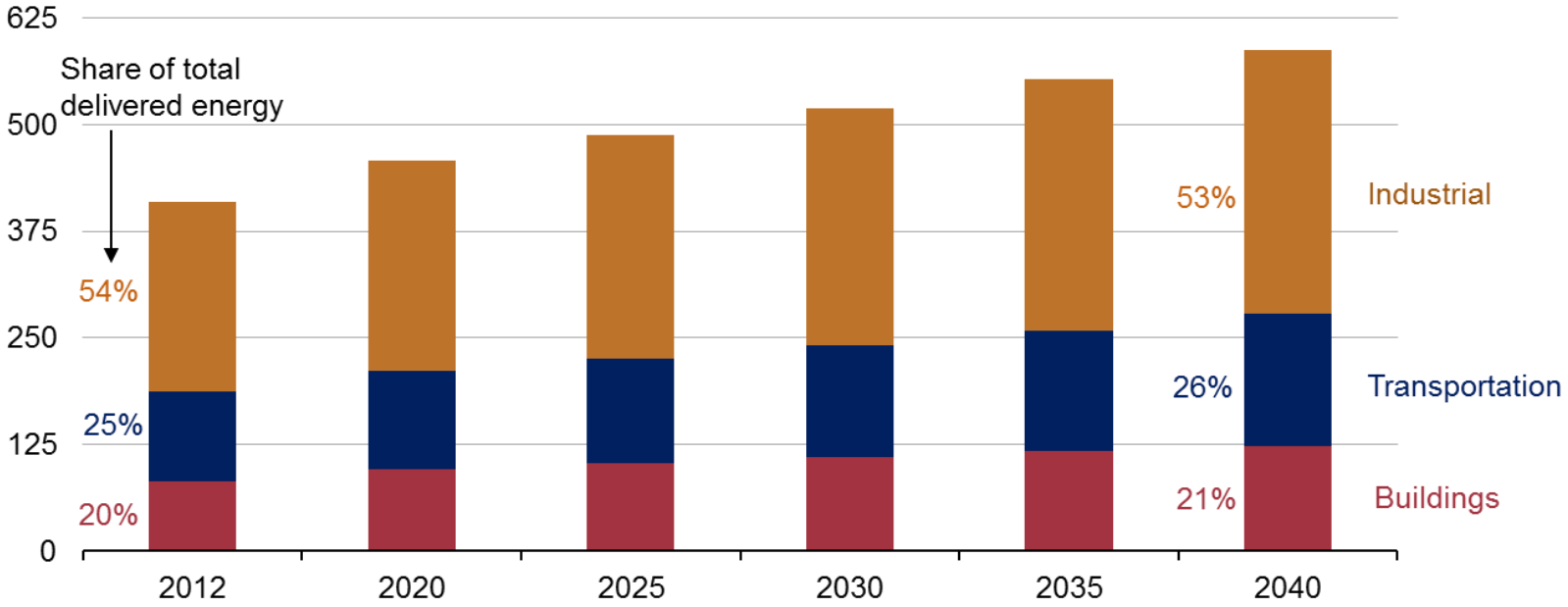


Source: EIA, International Energy Outlook 2016 and EIA, Analysis of the Impacts of the Clean Power Plan (May 2015)

As total world energy consumption grows, shares by end-use sector remain relatively unchanged

world delivered energy consumption by end-use sector

quadrillion Btu

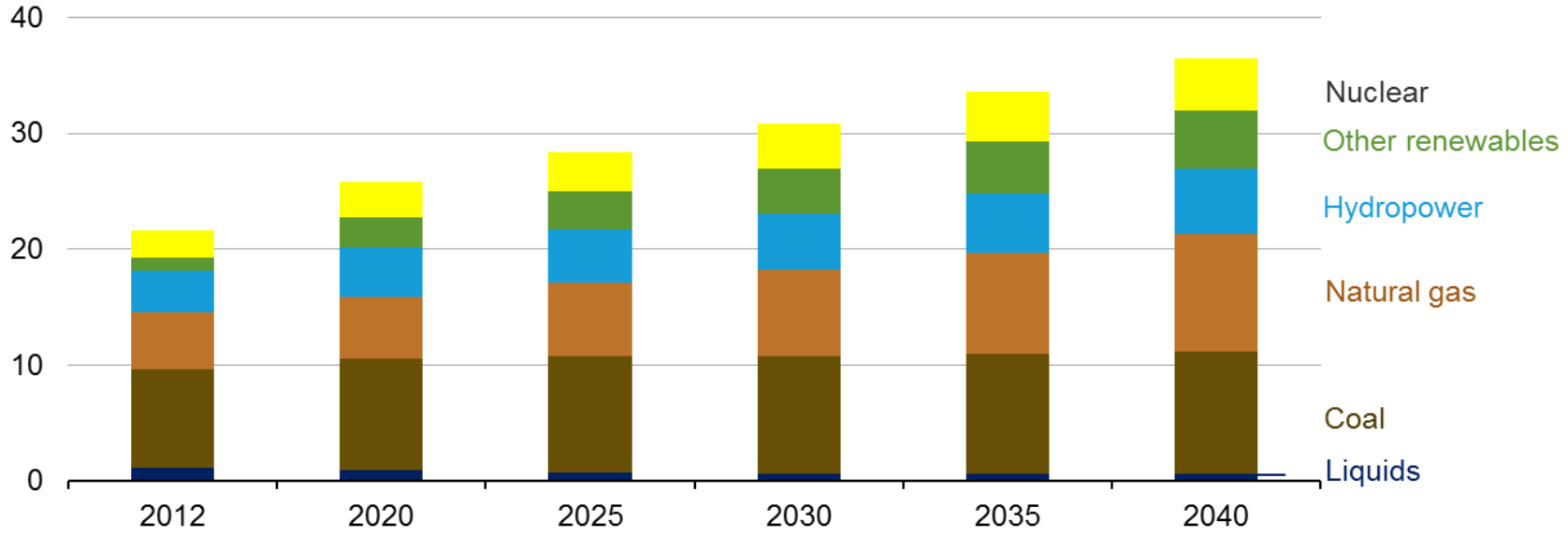


Source: EIA, International Energy Outlook 2016

Renewables, natural gas, and coal all contribute roughly the same amount of global net electricity generation in 2040

world net electricity generation by source

trillion kilowatthours

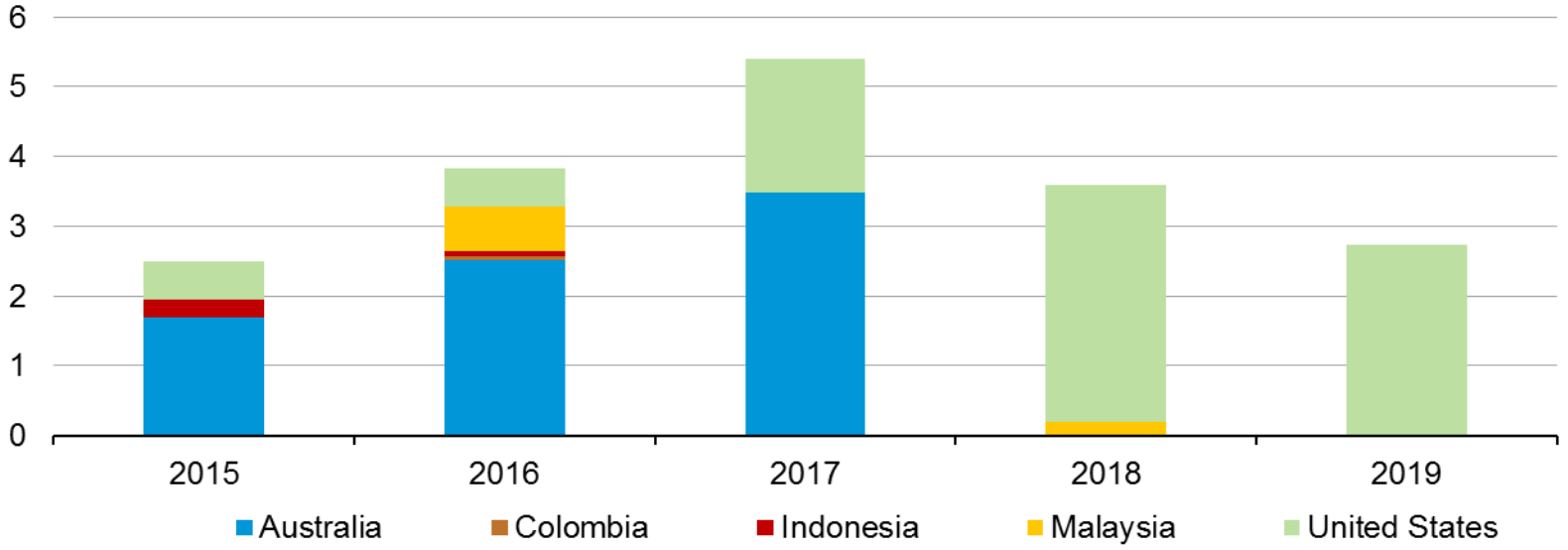


Source: EIA, International Energy Outlook 2016

Liquefaction capacity additions over the 2015-19 time period will increase global capacity by over 30%

LNG capacity additions

billion cubic feet per day



Note: Capacity additions in 2015-19 include projects currently under construction, and represent nameplate capacity, not adjusted for ramp-up

Source: U.S. Energy Information Administration estimates based on trade press

For more information

U.S. Energy Information Administration home page | www.eia.gov

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

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