EIA's Global Energy Outlook

For

The Institute of Energy Economics, Japan

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By

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International Energy Outlook: key findings in the 2016 Reference case

- 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.

International Energy Outlook: key findings in the 2016 Reference case (continued)

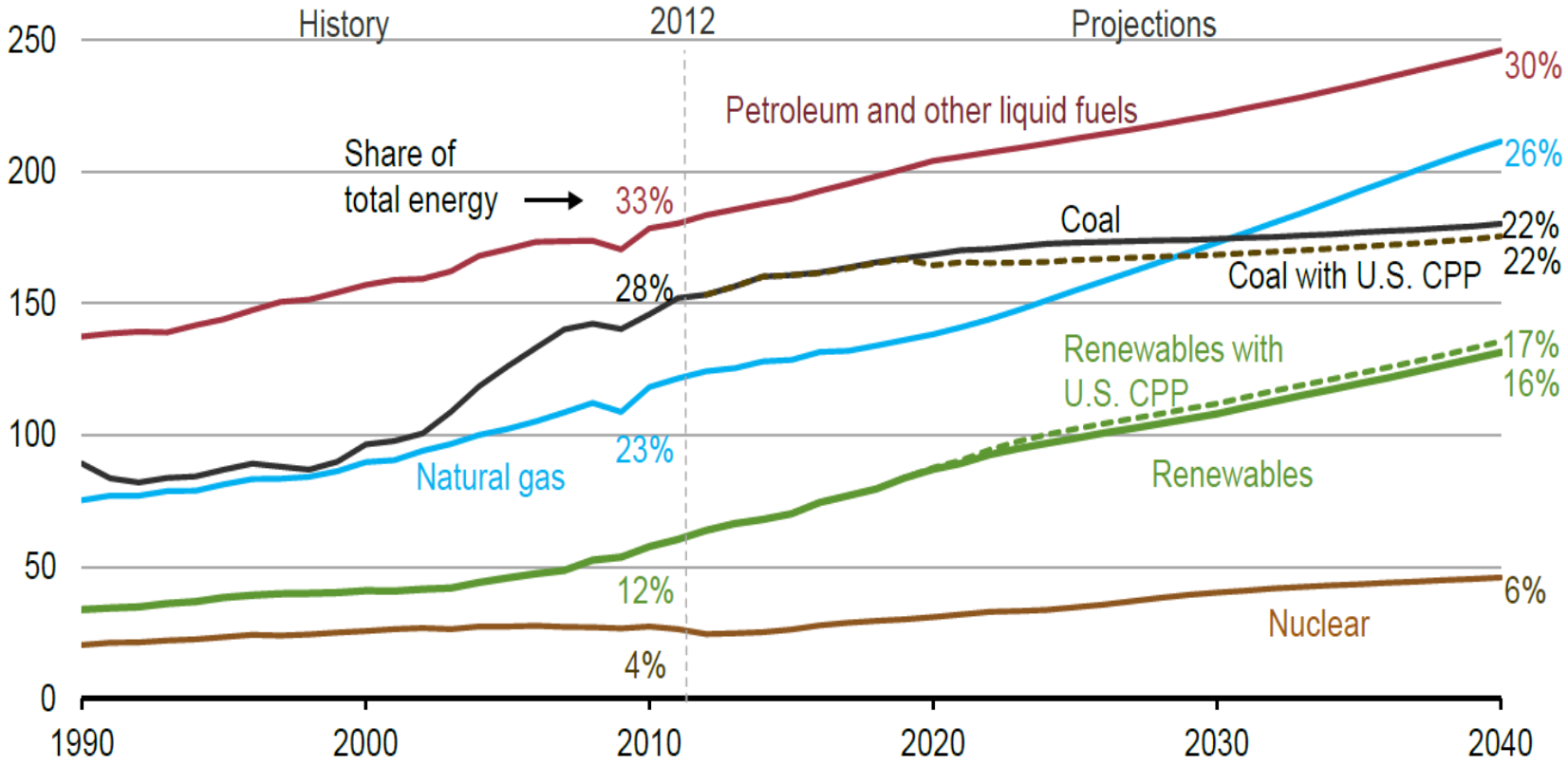
- Among the fossil fuels, natural gas grows the fastest. Coal use plateaus in the mid-term as China shifts from energy-intensive industries to services and worldwide policies to limit coal use intensify. By 2030, natural gas surpasses coal as the world's second largest energy source.

- 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

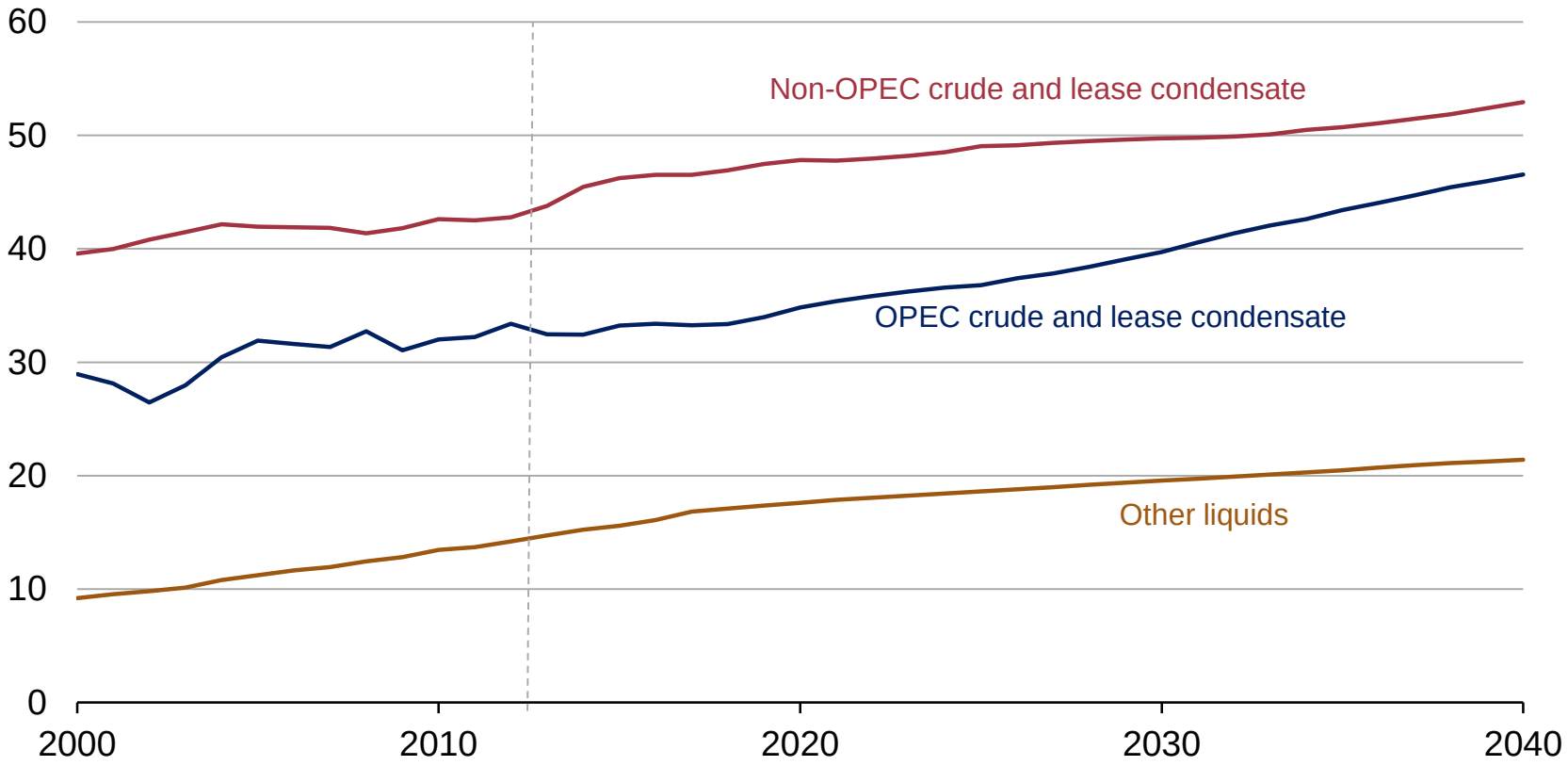


Source: EIA, International Energy Outlook 2016 and EIA, Analysis of the Impacts of the Clean Power Plan (May 2015)

Liquid fuels supplies from both OPEC and non-OPEC producers increase through 2040

world production of petroleum and other liquid fuels

million barrels per day

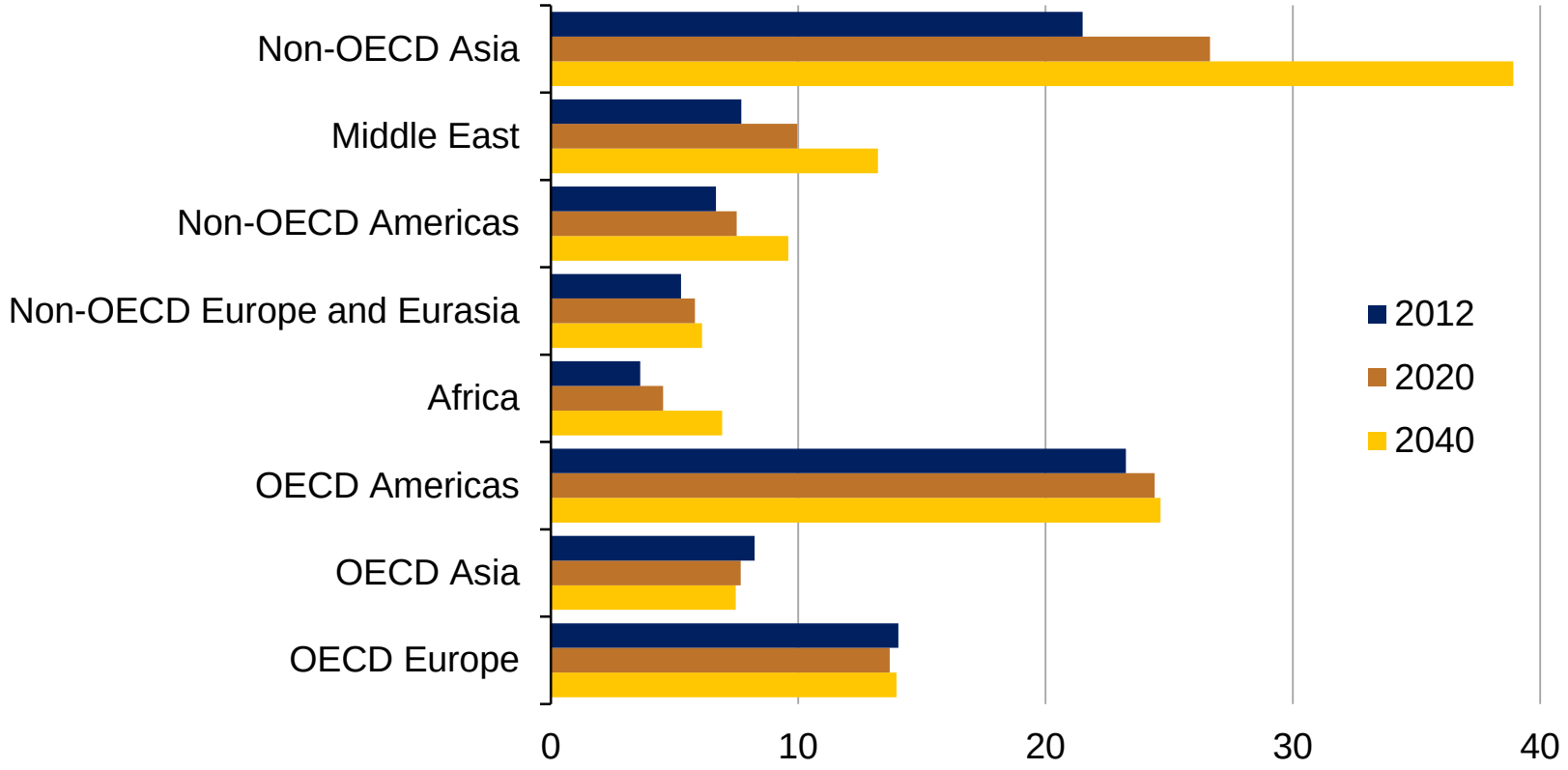


Source: EIA, International Energy Outlook 2016

Most of the growth in world oil consumption occurs in the non-OECD regions — especially Asia

world petroleum and other liquid fuels consumption

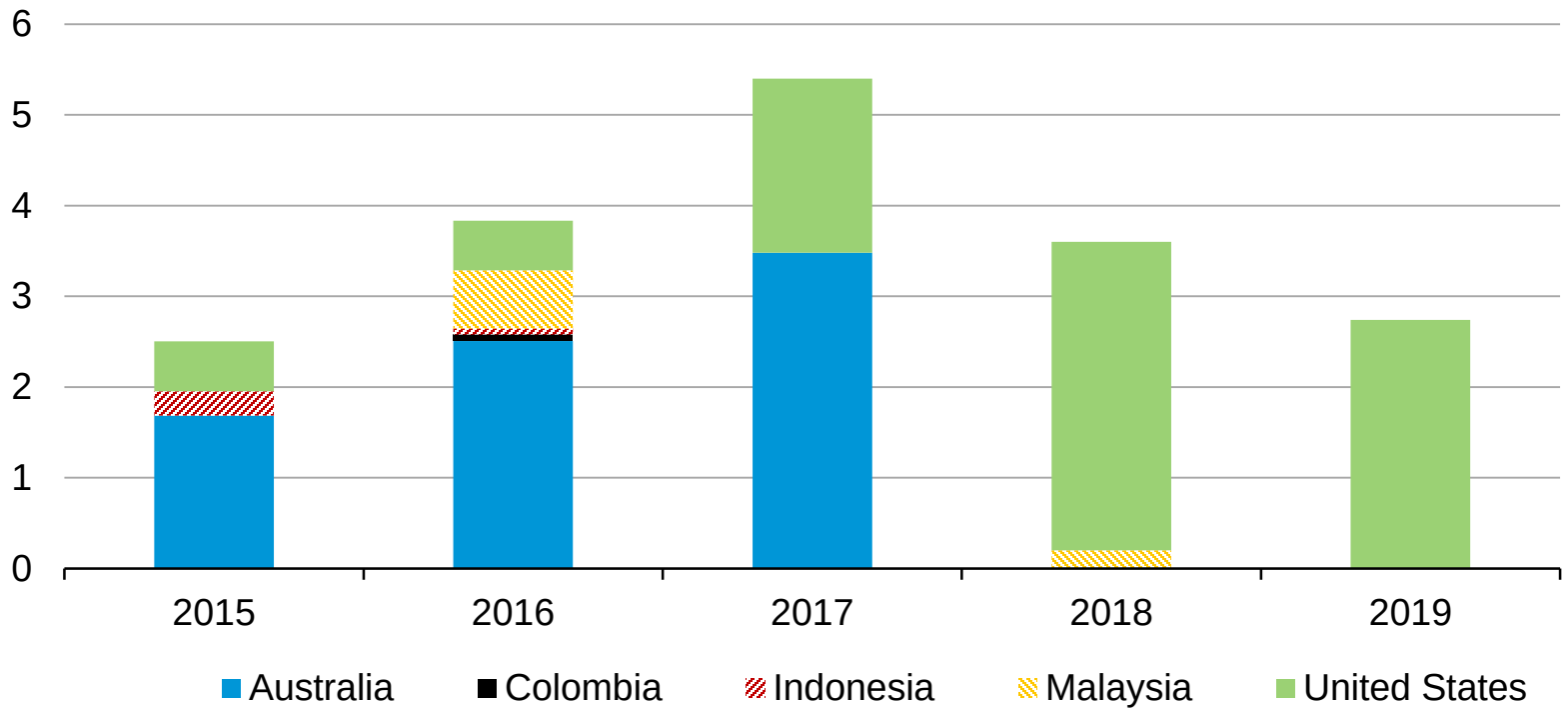
million barrels per day



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

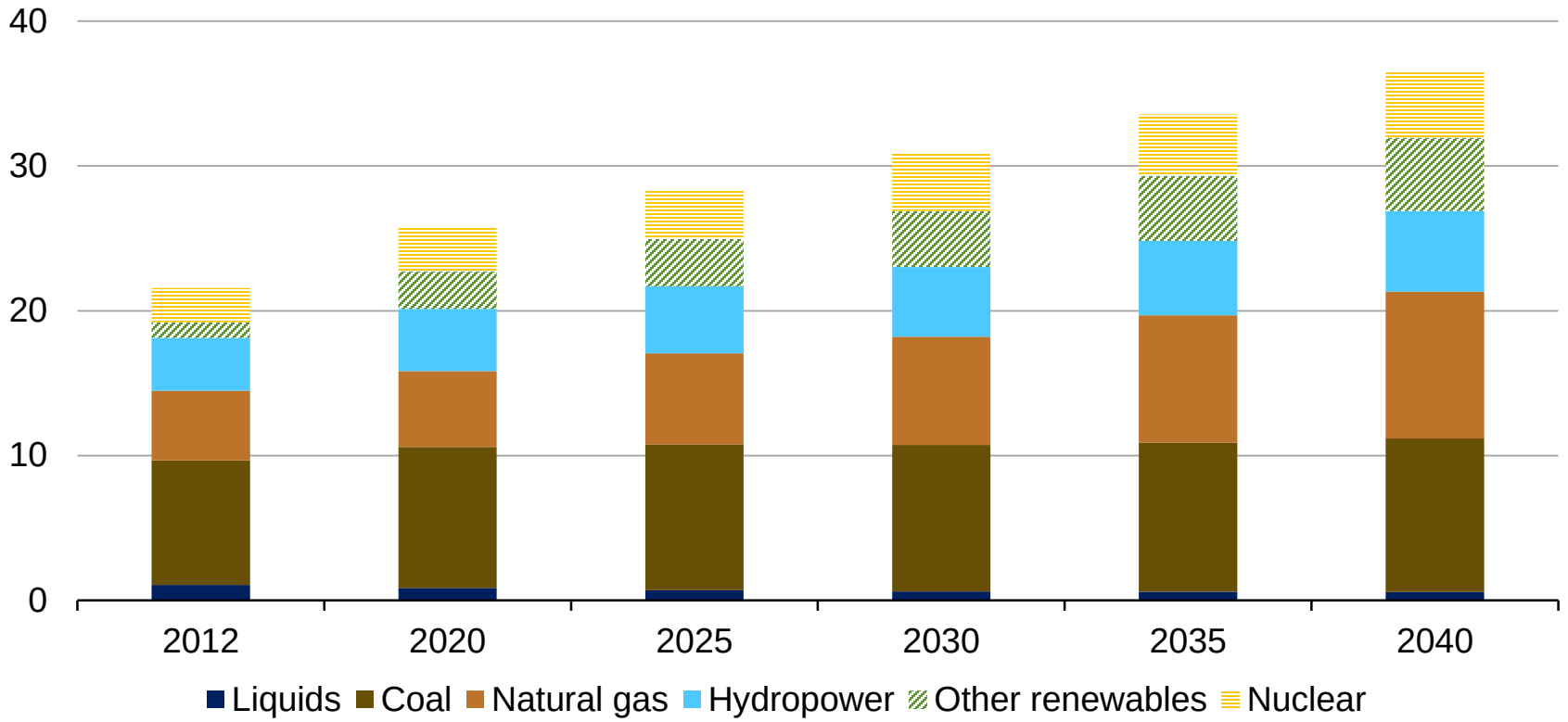


Note: Capacity additions in 2015-19 include projects currently under construction, and represent nameplate capacity, not adjusted for ramp-up
Source: U.S. Energy Information Administration estimates based on trade press

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

world net electricity generation by source

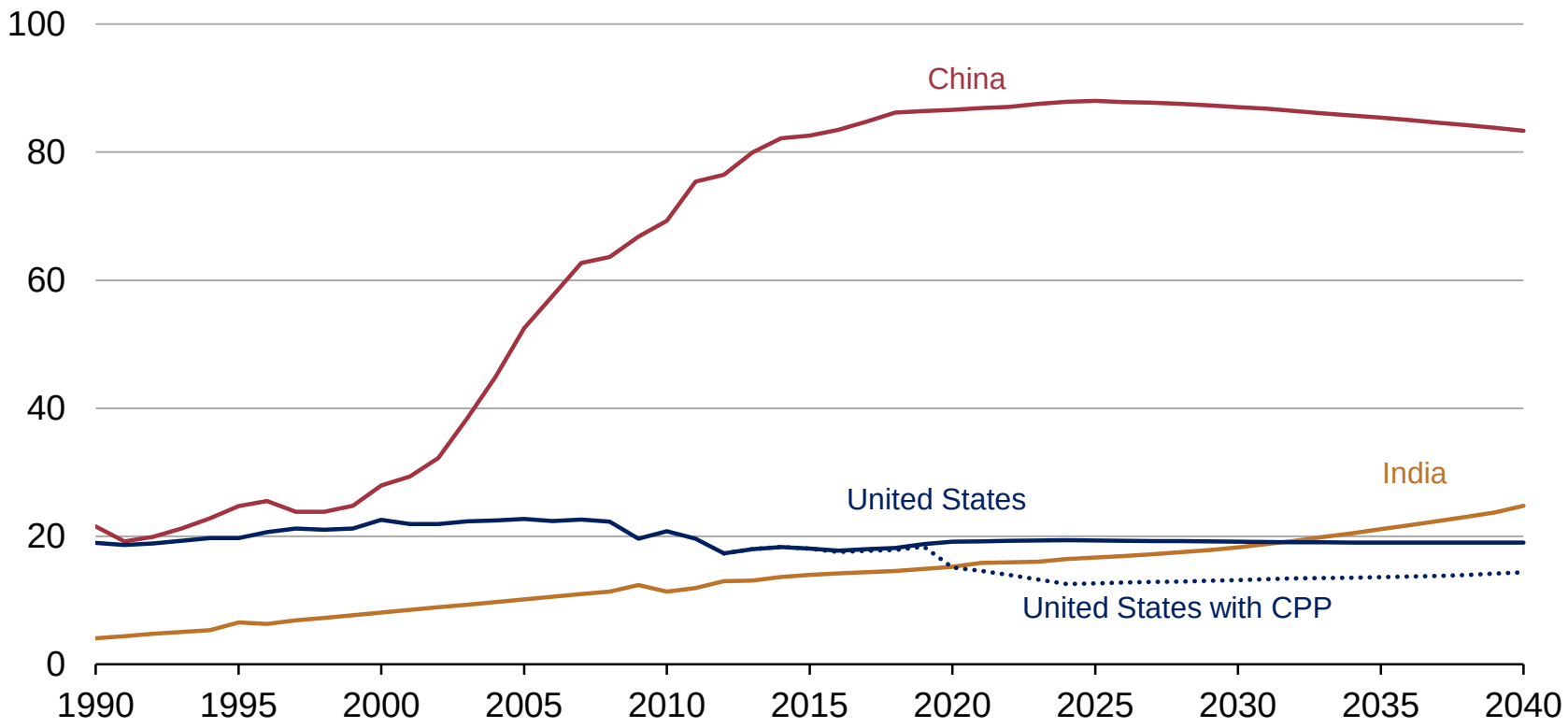
trillion kilowatthours



Source: EIA, International Energy Outlook 2016

Of the world's three largest coal consumers, only India is projected to continue to increase throughout the projection

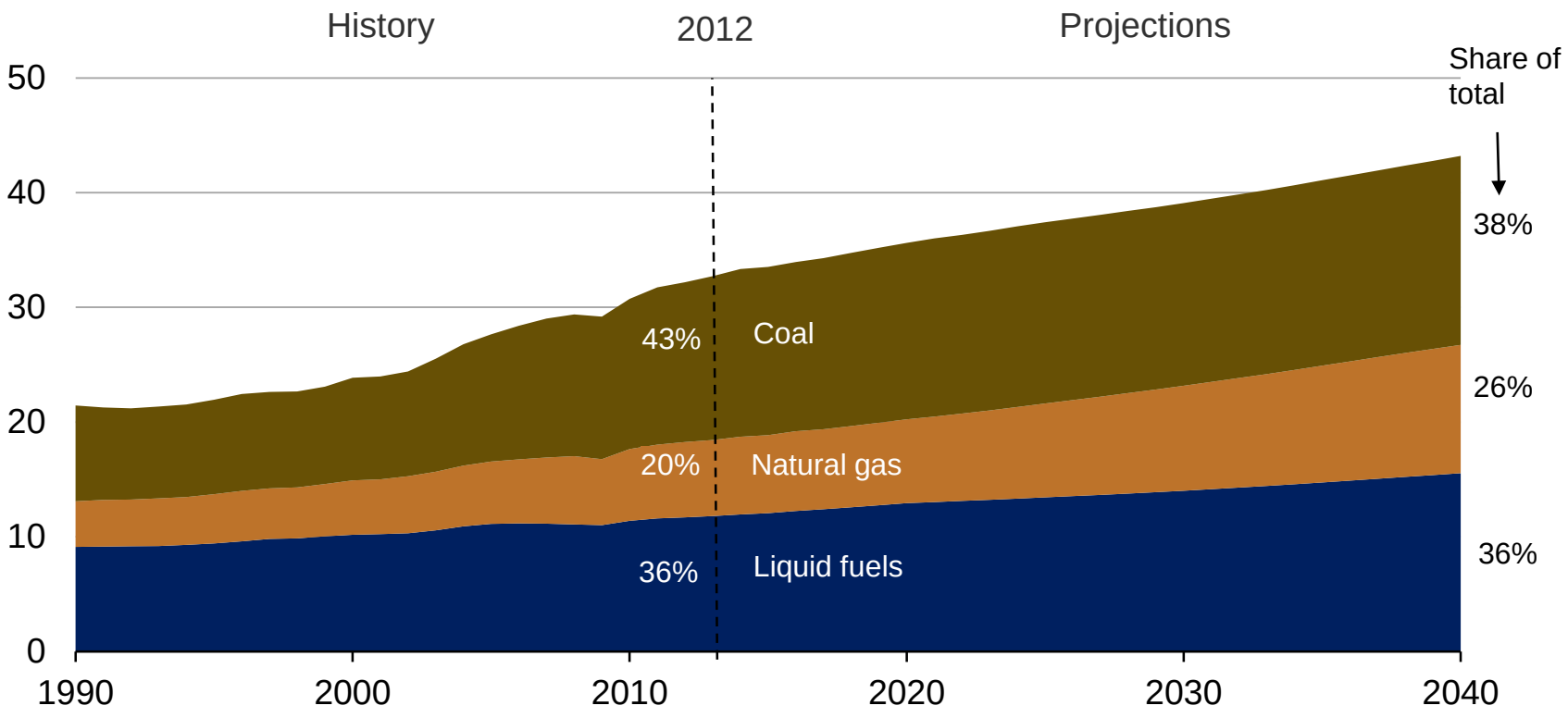
coal consumption in the US, China, and India
quadrillion Btu



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

Coal remains the world's largest source of energy-related CO2 emissions, but by 2040 its share declines to 38%

world energy-related carbon dioxide emissions
billion metric tons



Source: EIA, International Energy Outlook 2016

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.
- Electricity demand growth slows while non-power sector generation increases, dampening the need for central power station generation.
- 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.

U.S. Energy Outlook: key takeaways from AEO2016 (continued)

- Net exports of liquefied natural gas range between 3.5 Tcfand 10.6 Tcfin 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
- EPA's Clean Power Plan (CPP) requires states to reduce carbon dioxide emissions from existing fossil generators:
  - Details of the CPP implementation strategies selected by the states affect the overall generation mix, as well as consumer prices
  - CPP effects on coal production vary across regions

U.S. Energy Outlook: key takeaways from AEO2016 (continued)

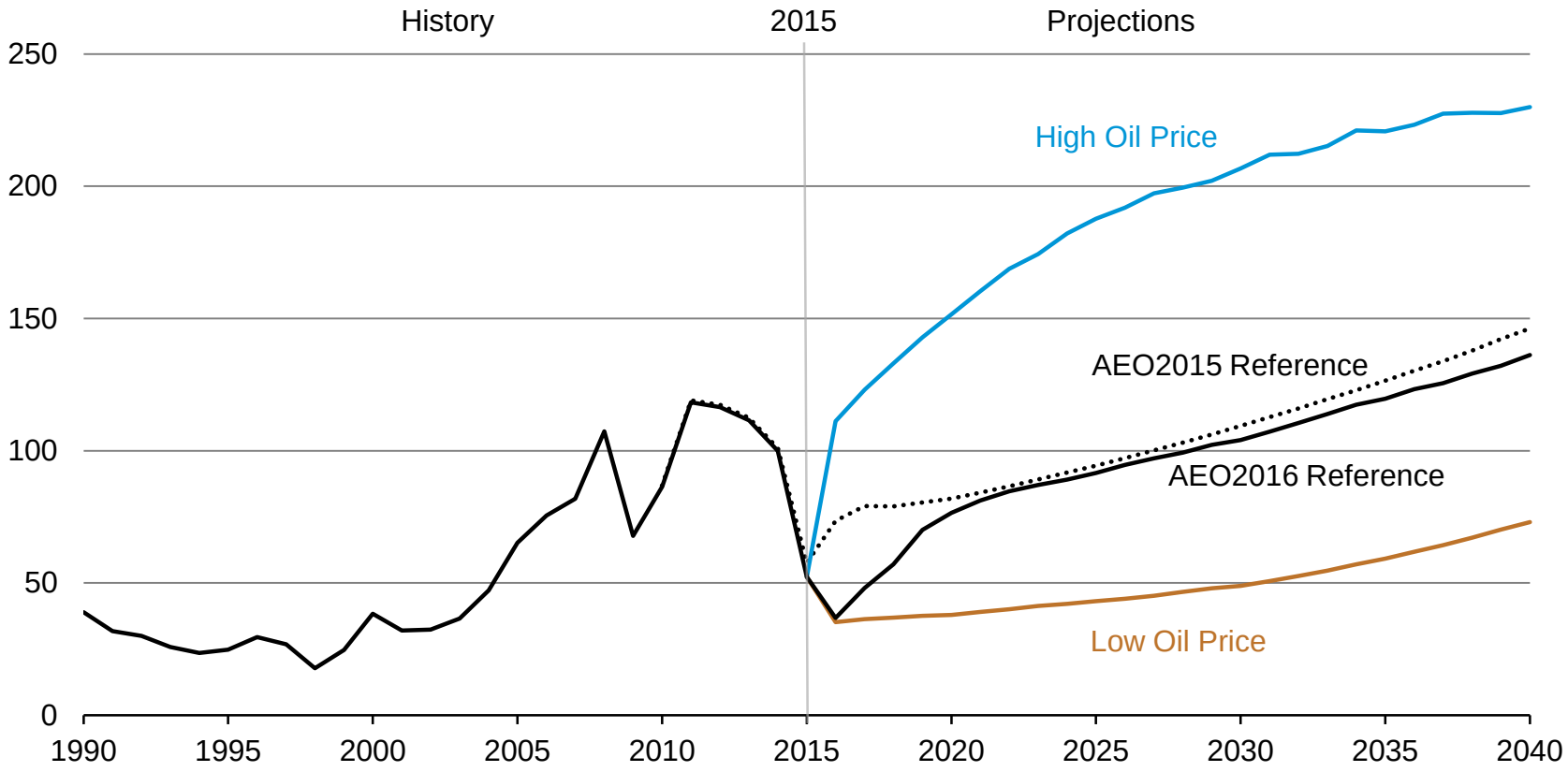
  - CPP, along with renewable tax credit extension and lower natural gas prices, contributes to a shift in the generation mix, with increases in generation from natural gas and renewables and reduced coal generation
  - Even if the CPP is not implemented, key factors combine to support a transition from coal to natural gas as the predominant fuel for electric generation

- Extending or expanding existing laws and regulations, including efficiency policies for appliances and vehicles, the CPP, and EPA's proposed Phase 2 standards for medium- and heavy-duty trucks results lower energy consumption and CO2 emissions than projected in the Reference case

Near-term crude oil price scenario is lower in AEO2016

Brent crude oil spot price

2015 dollars per barrel

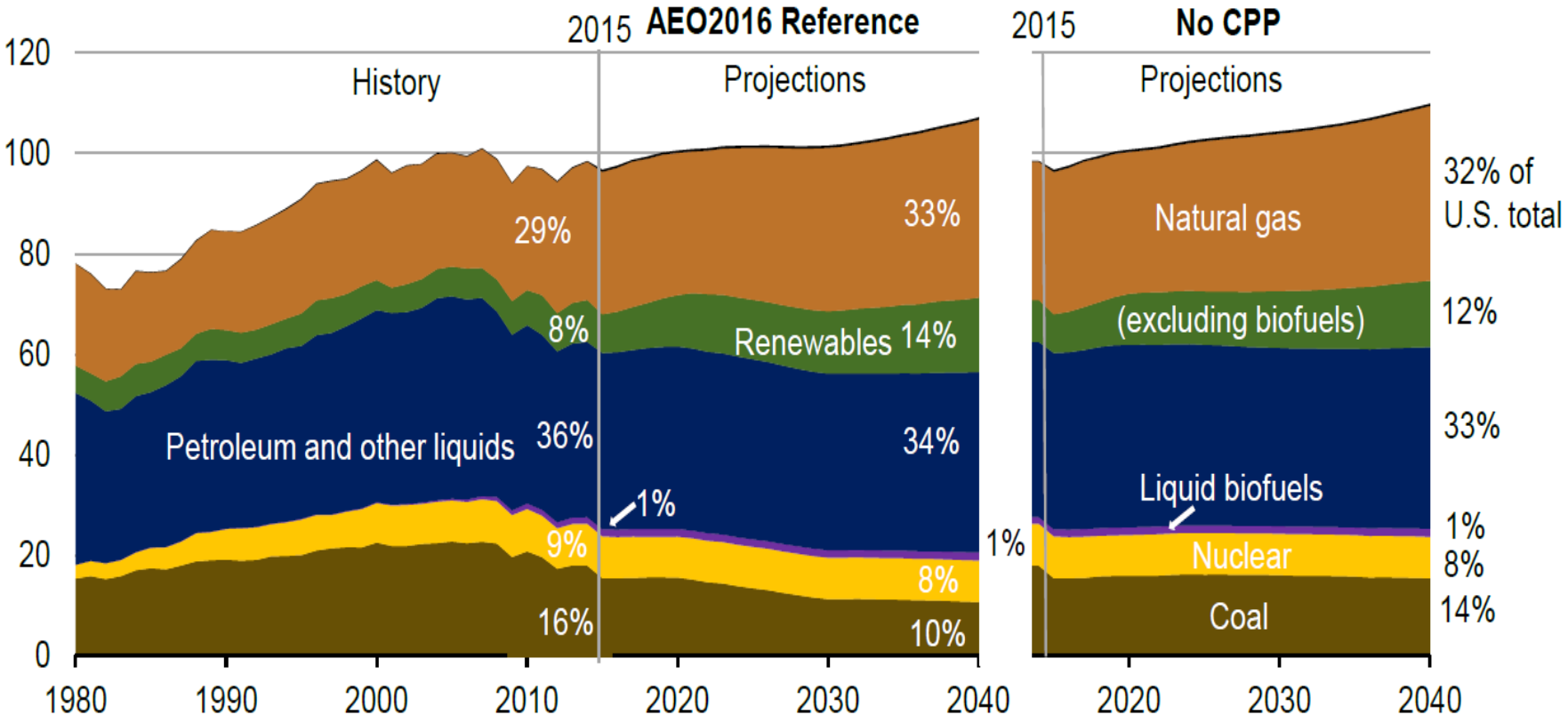


Source: EIA, Annual Energy Outlook 2016 Reference case and Annual Energy Outlook 2015 Reference case

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

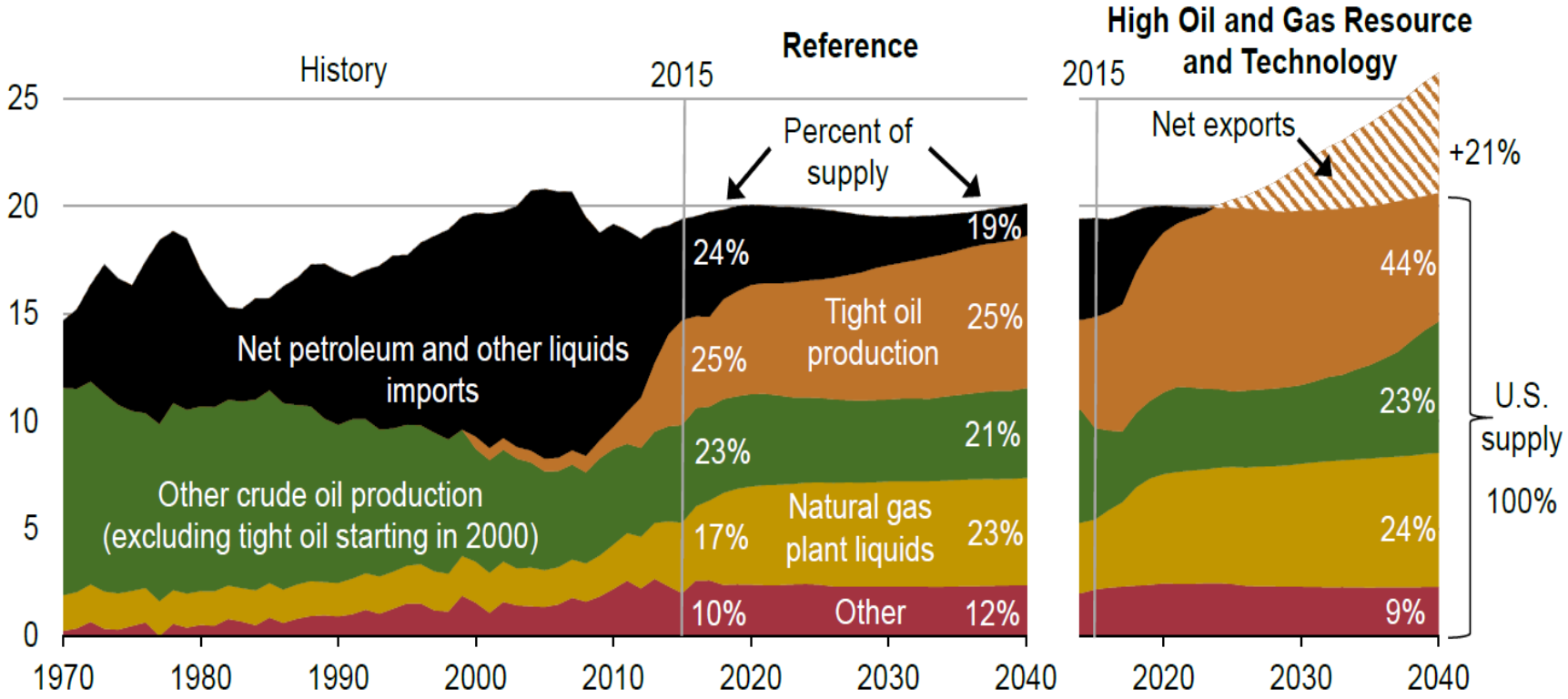
quadrillion Btu



Source: EIA, Annual Energy Outlook 2016

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

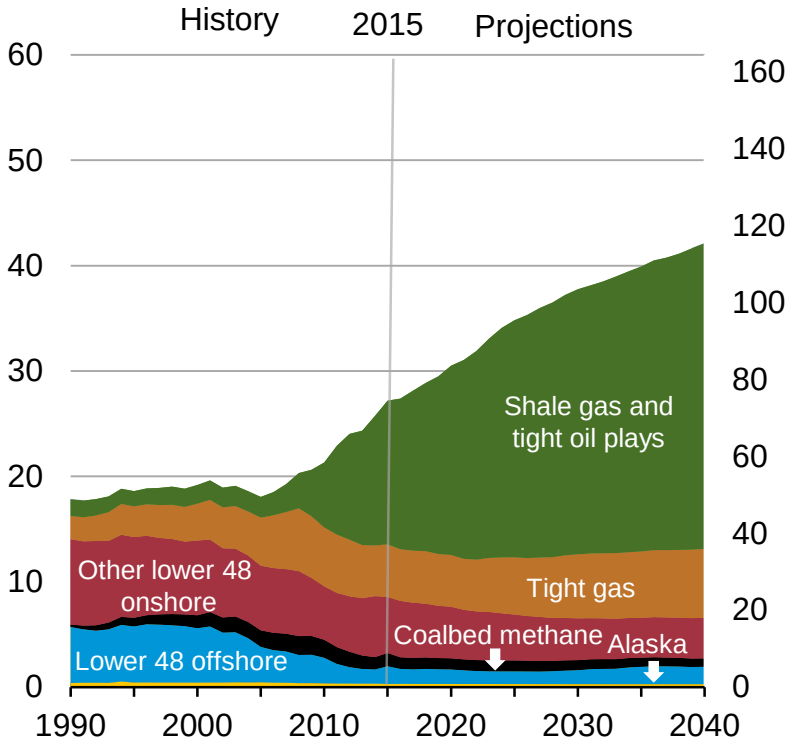
U.S. liquid fuels supply
million barrels per day



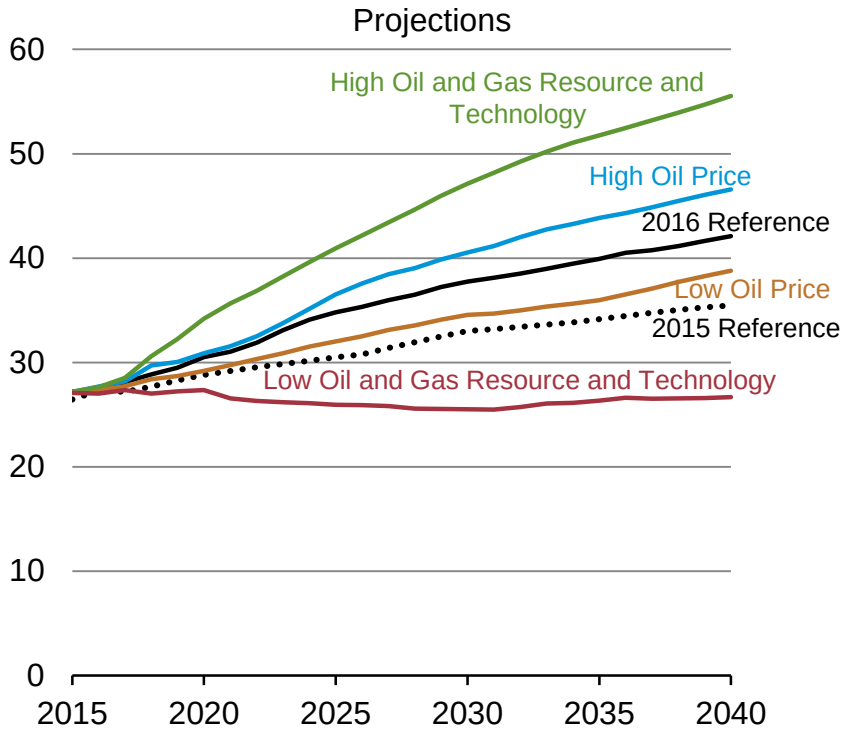
Note: "Other" includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels
Source: EIA, Annual Energy Outlook 2016

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



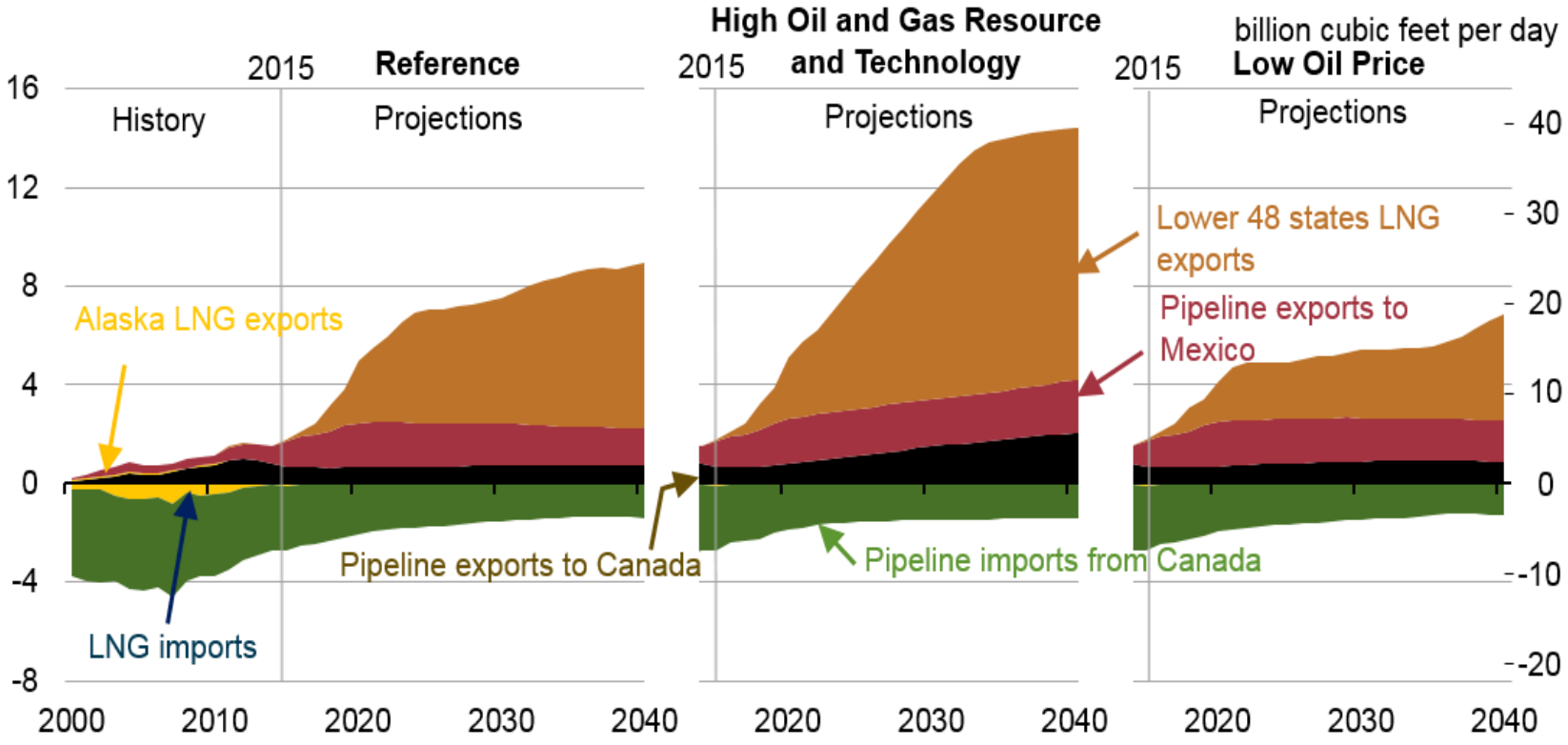
U.S. dry natural gas production
trillion cubic feet



Source: EIA, Annual Energy Outlook 2016

Projected U.S. natural gas exports reflect the spread between domestic natural gas prices and world energy prices

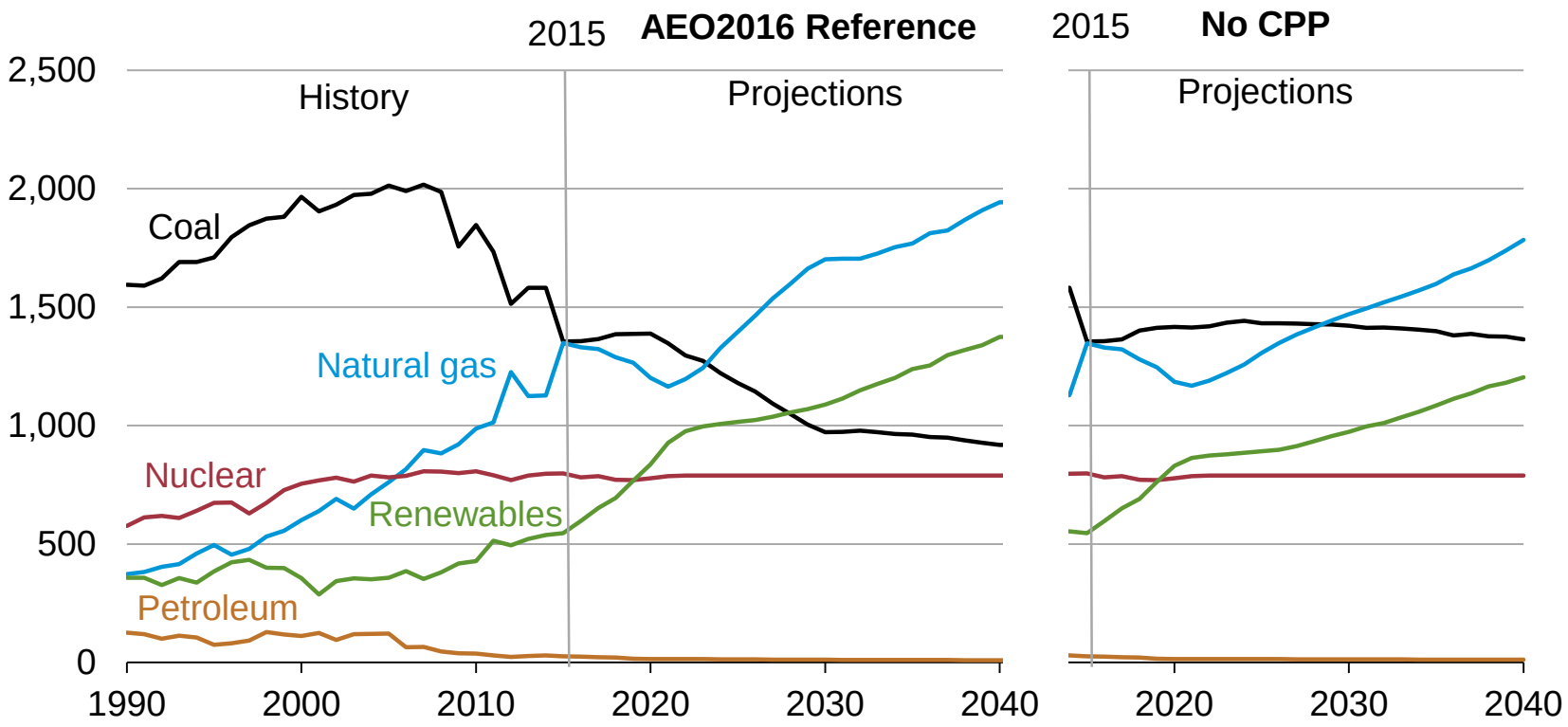
U.S. natural gas imports and exports
trillion cubic feet



Source: EIA, Annual Energy Outlook 2016

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

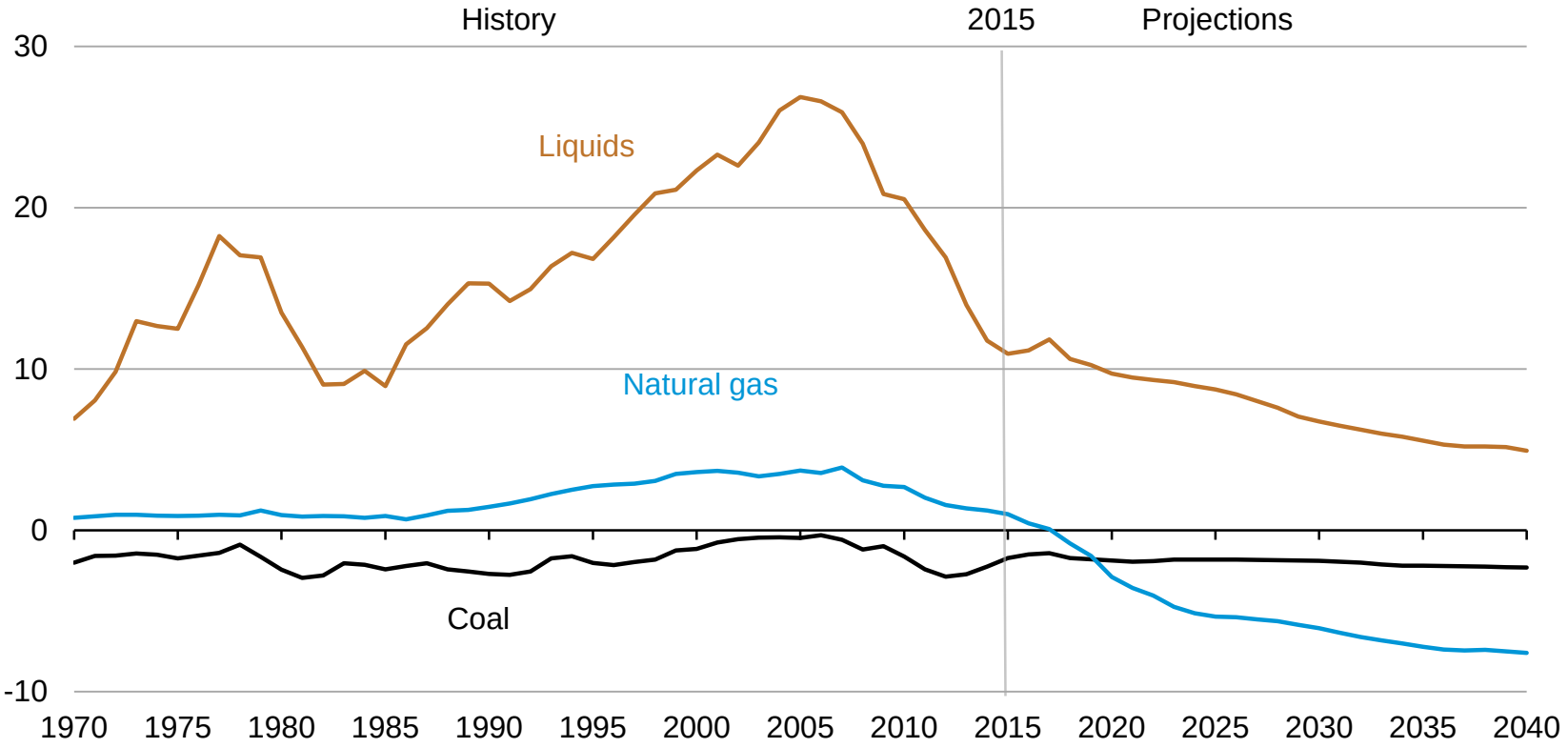


Source: EIA, Annual Energy Outlook 2016

U.S. net energy imports trend downward, reflecting increased oil and natural gas production coupled with slowly growing or falling demand

U.S. net imports

quadrillion Btu



Source: EIA, Annual Energy Outlook 2016

For more information

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

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

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