

What does the future fuels market look like and how do biofuels fit?



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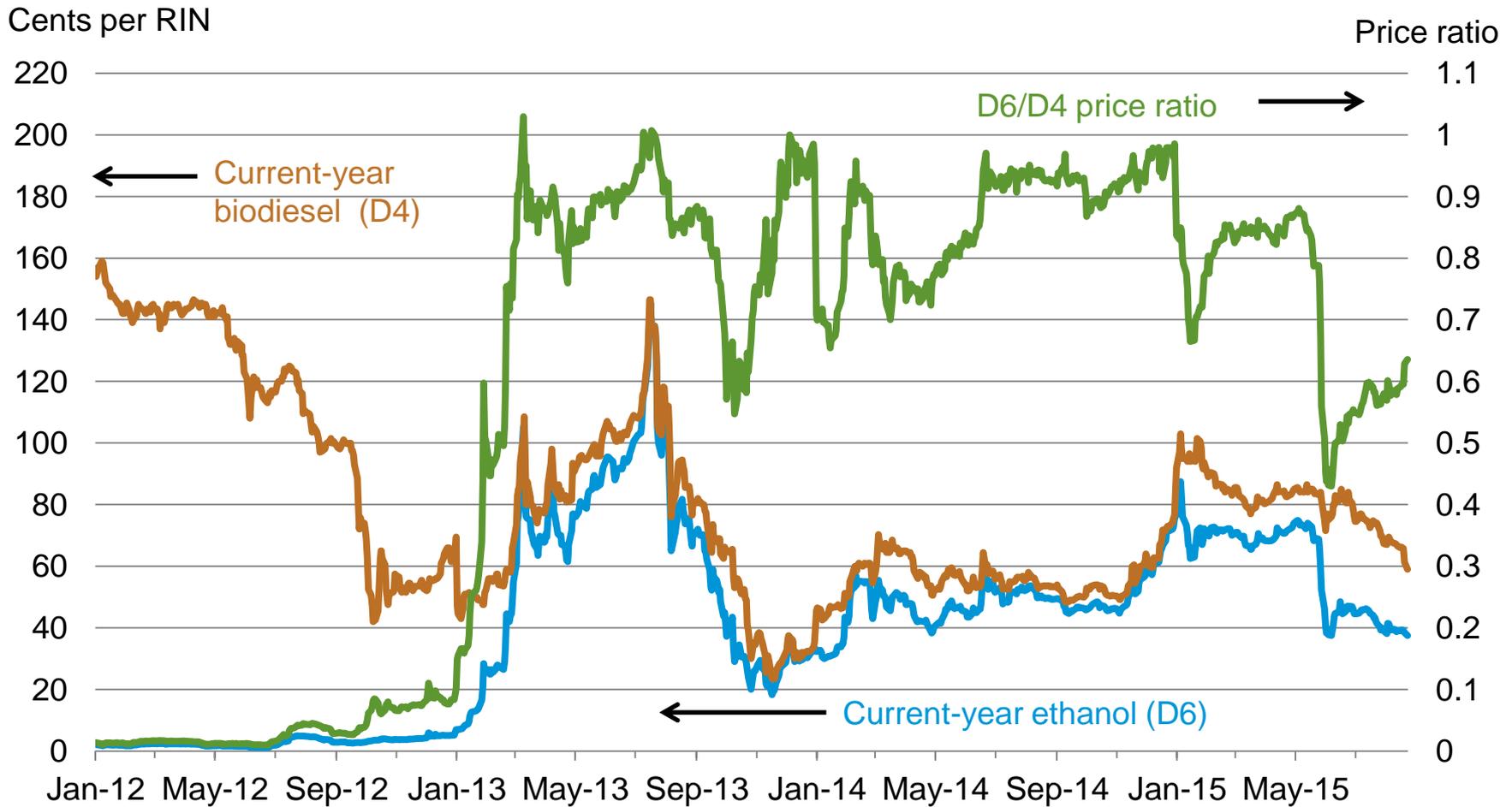
Outline of presentation

- Identify some ways in which biomass competes with other energy sources
 - Renewable technologies don't just compete with conventional fuels, they also compete with each other
- Quantify the competition between ethanol, biodiesel, and conventional fuels over the last 3 years
 - Ethanol, biodiesel, and RIN prices
- Discuss results from EIA Annual Energy Outlook 2015

The interplay between biofuels and conventional fuels

- Ethanol (corn) and biodiesel (soybean) compete for land.
 - Corn oil extraction for biodiesel production does not offset
 - Greater use of cover crops can expand the supply of biomass, reduce erosion
- Cellulosic liquid fuels
 - Stover-based process complement corn ethanol: collocation of production, additional revenue to corn farmers, possible yield benefits
 - Firing cellulosic biomass to provide energy to grain-based processes may be less expensive route to advanced biofuels than cellulosic liquids
 - Best GHG impact is obtained by displacing coal from electricity generation, instead of displacing oil in transportation
- Renewable natural gas
 - Competes directly with fossil natural gas
 - Competes indirectly with diesel for transportation applications
 - Competes indirectly with wind, solar, and direct firing of biomass for renewable electricity production
 - Renewable natural gas and biomass can be stored

Ethanol RINs dropped on the announcement of EPA's RFS proposal. But the market is still pricing in a binding RFS.

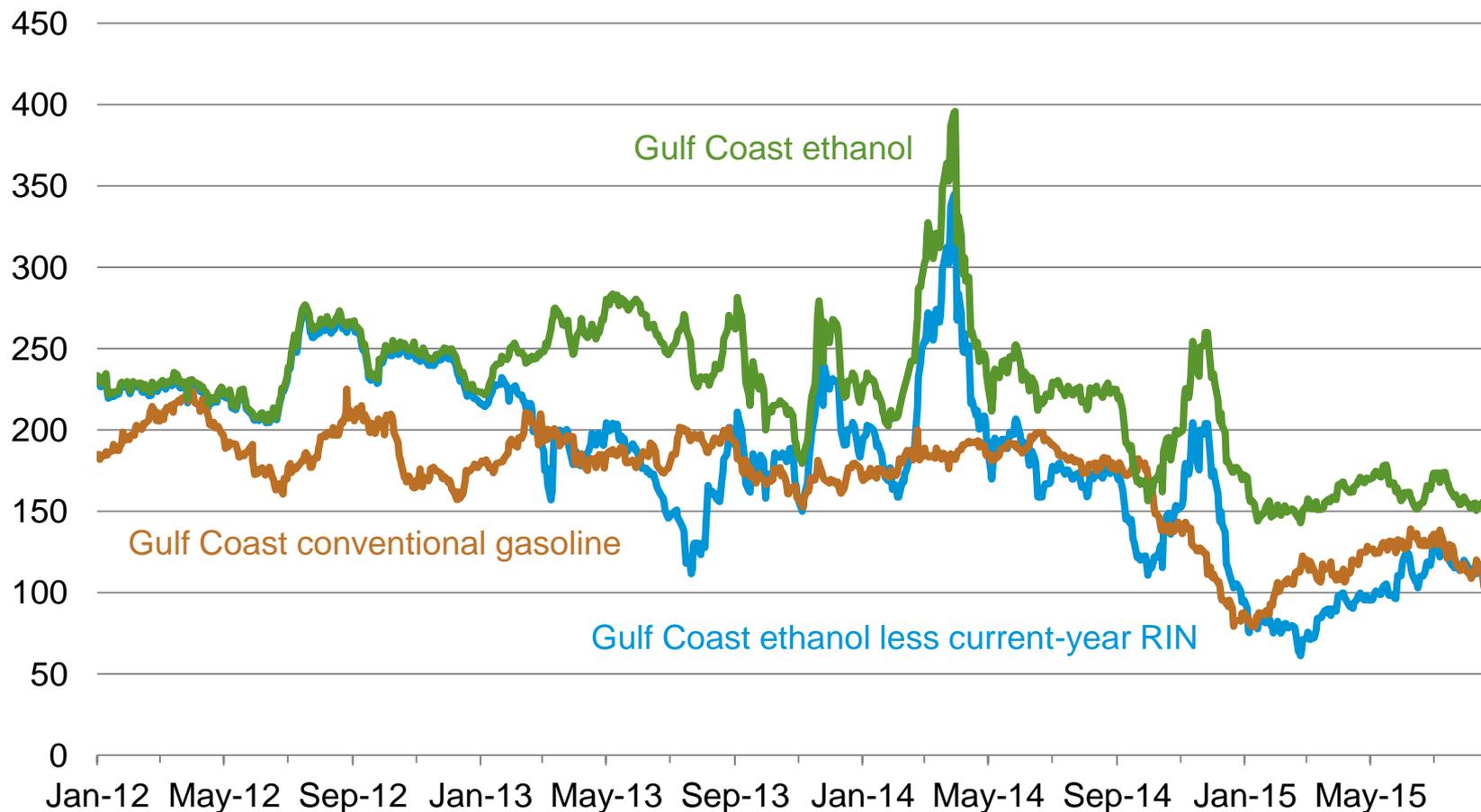


Note: One RIN represents the energy equivalent of one gallon of ethanol

Source: Oil Price Information Service

Ethanol with the RIN value was below gasoline on an energy basis on the Gulf Coast from mid-January through July 2015.

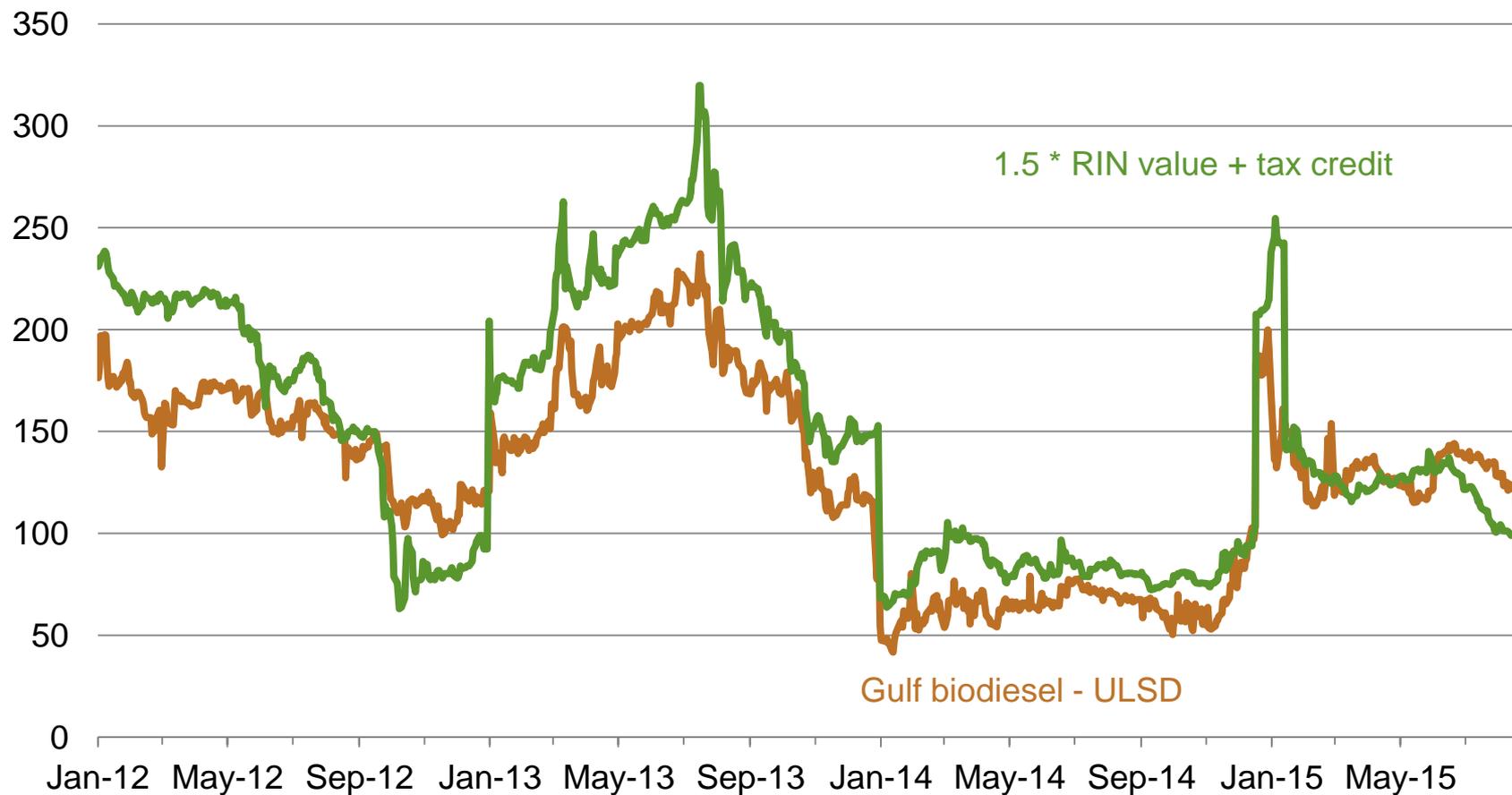
cents per ethanol gallon equivalent



Source: Oil Price Information Service

The combination of the biodiesel RIN and tax credit has typically exceeded the spread between biodiesel and diesel fuel. Since June 2015, however, the RIN value has been lower than the spread.

Cents per gallon



Source: Oil Price Information Service, Thomson Reuters

Key results from *AEO2015*

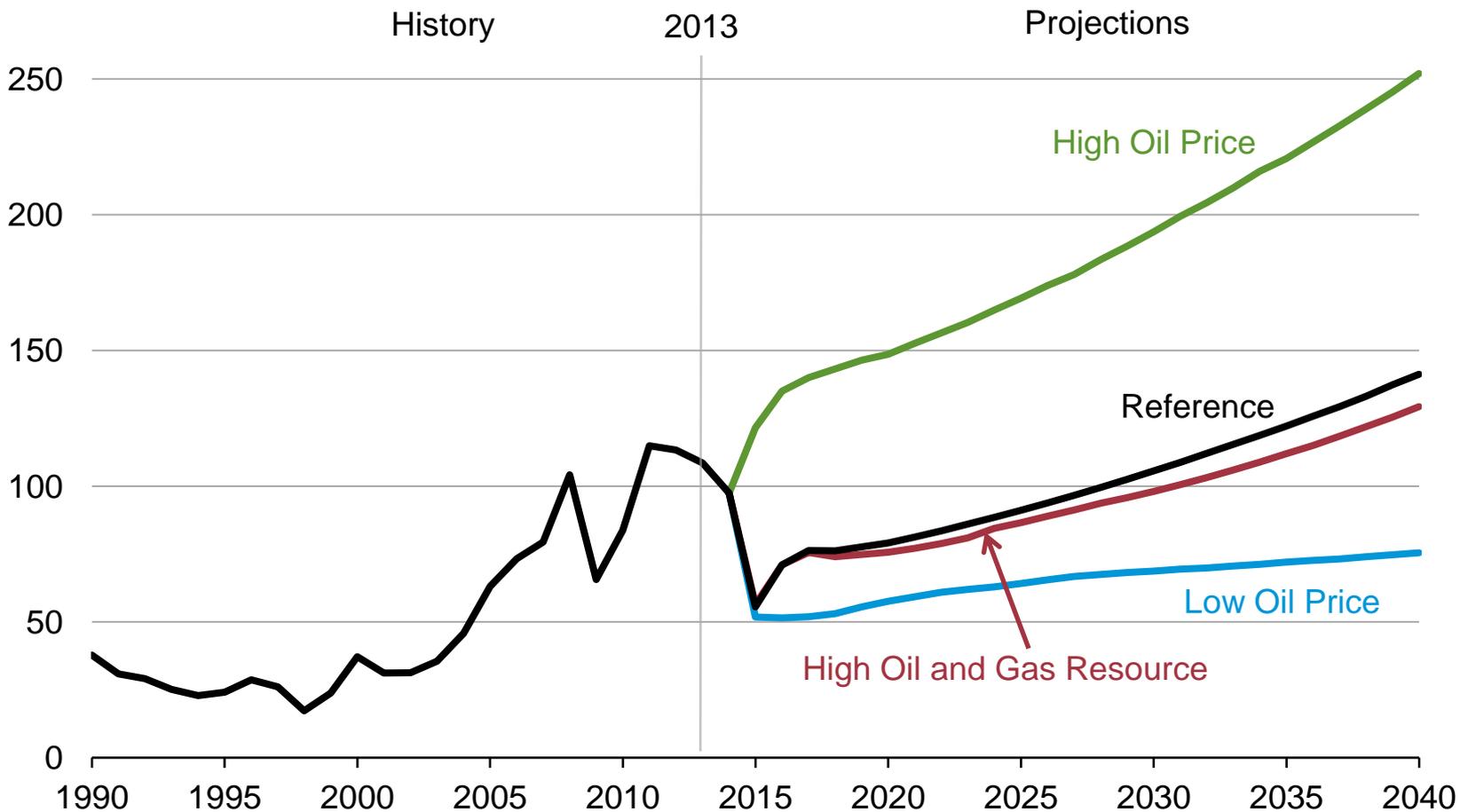
- In most AEO2015 cases, U.S. net energy imports, including all fuels, decline and ultimately end by 2030 for the first time since the 1950s
 - Strong growth in domestic production of crude oil from tight formations through 2020 and limited growth in domestic demand after 2020 leads to a decline in net 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

AEO2015 explores scenarios that encompass a wide range of future crude oil price paths

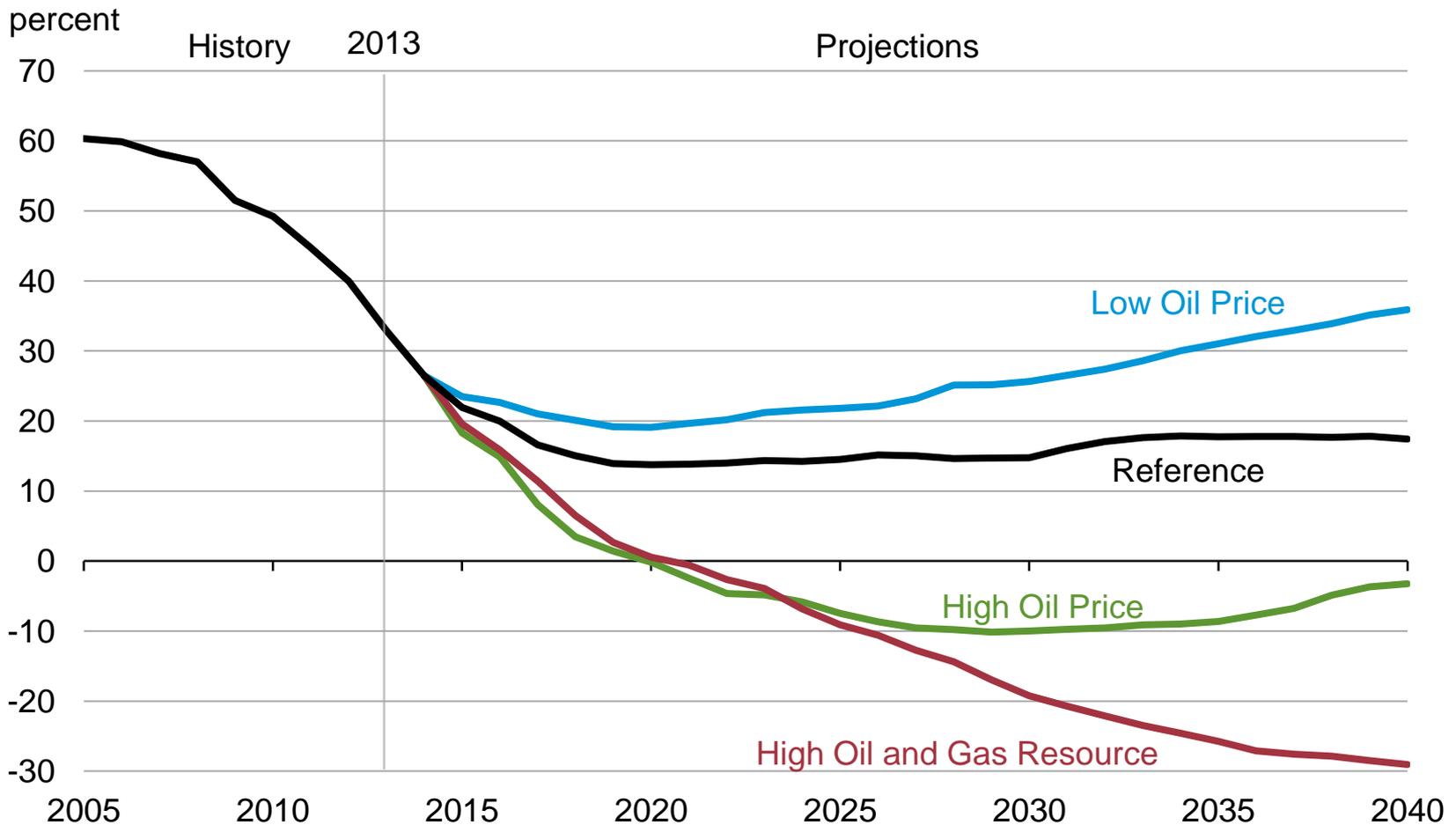
Brent crude oil spot price
2013 dollars per barrel



Source: EIA, Annual Energy Outlook 2015

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

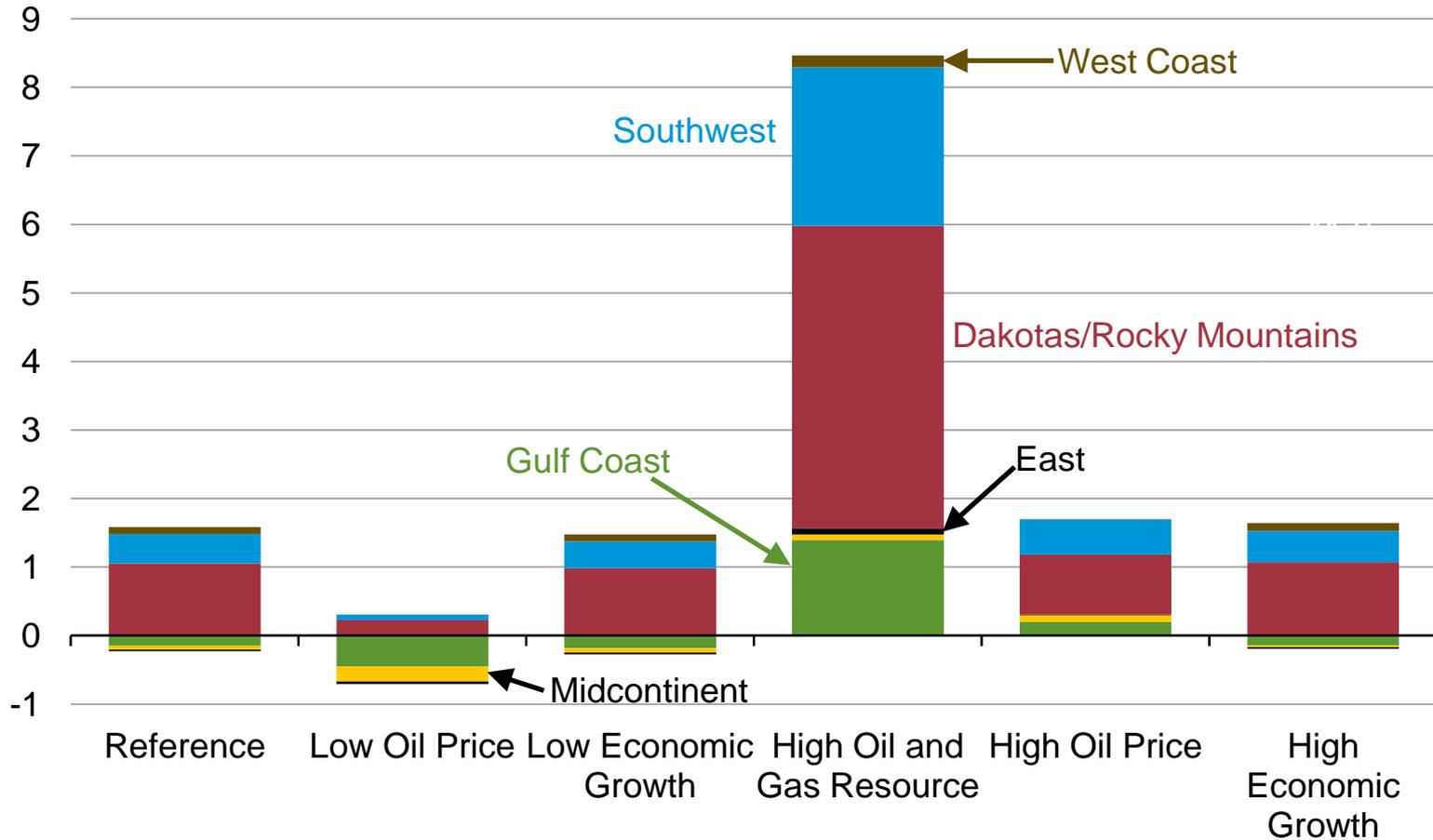
net crude oil and petroleum product imports as a percentage of total U.S. supply



Source: EIA, Annual Energy Outlook 2015

Change in U.S. Lower 48 onshore crude oil production by region in six cases, 2013-2040

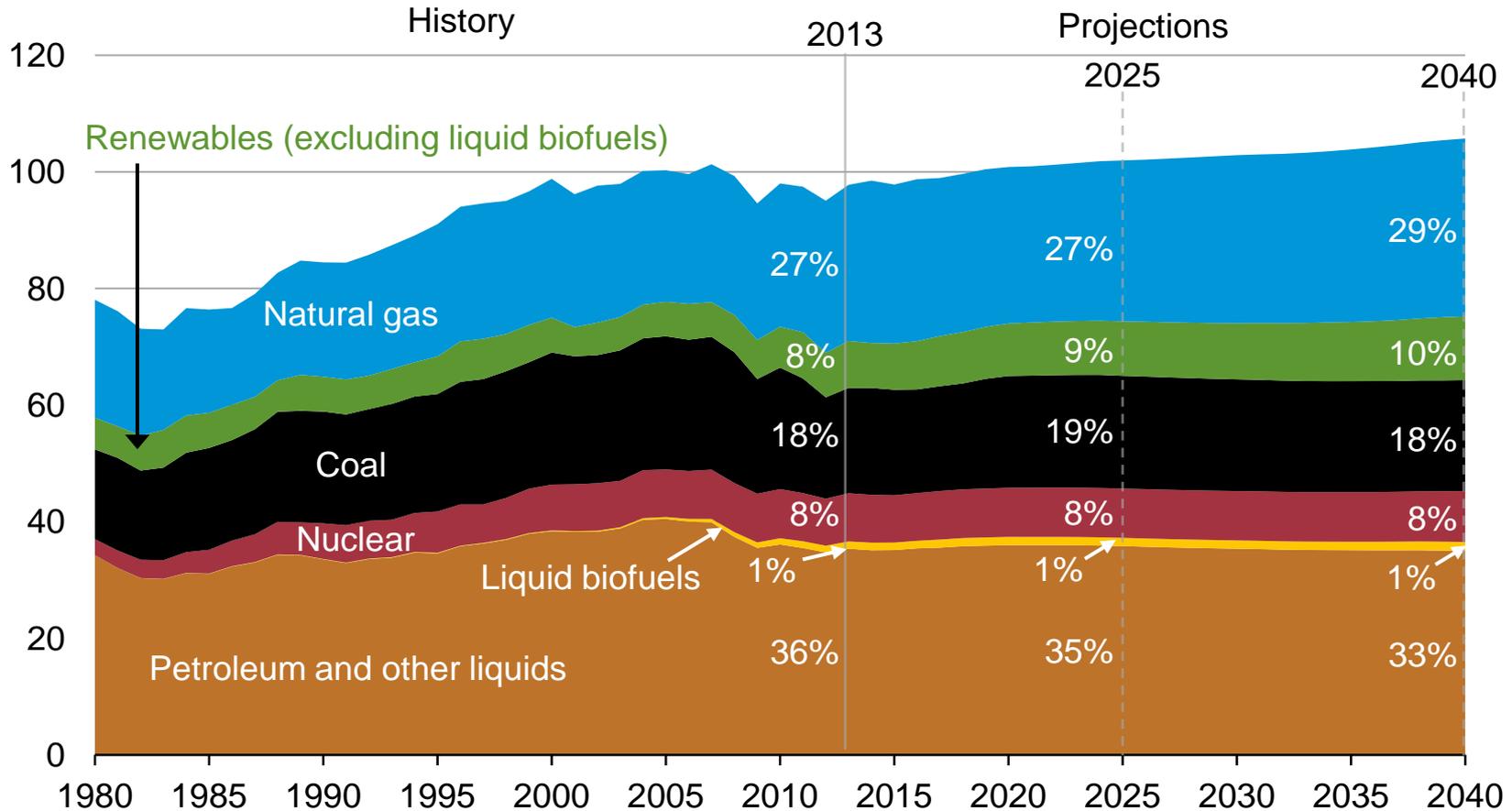
change in U.S. lower 48 onshore crude production between 2013 and 2040
million barrels per day



Source: EIA, Annual Energy Outlook 2015

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

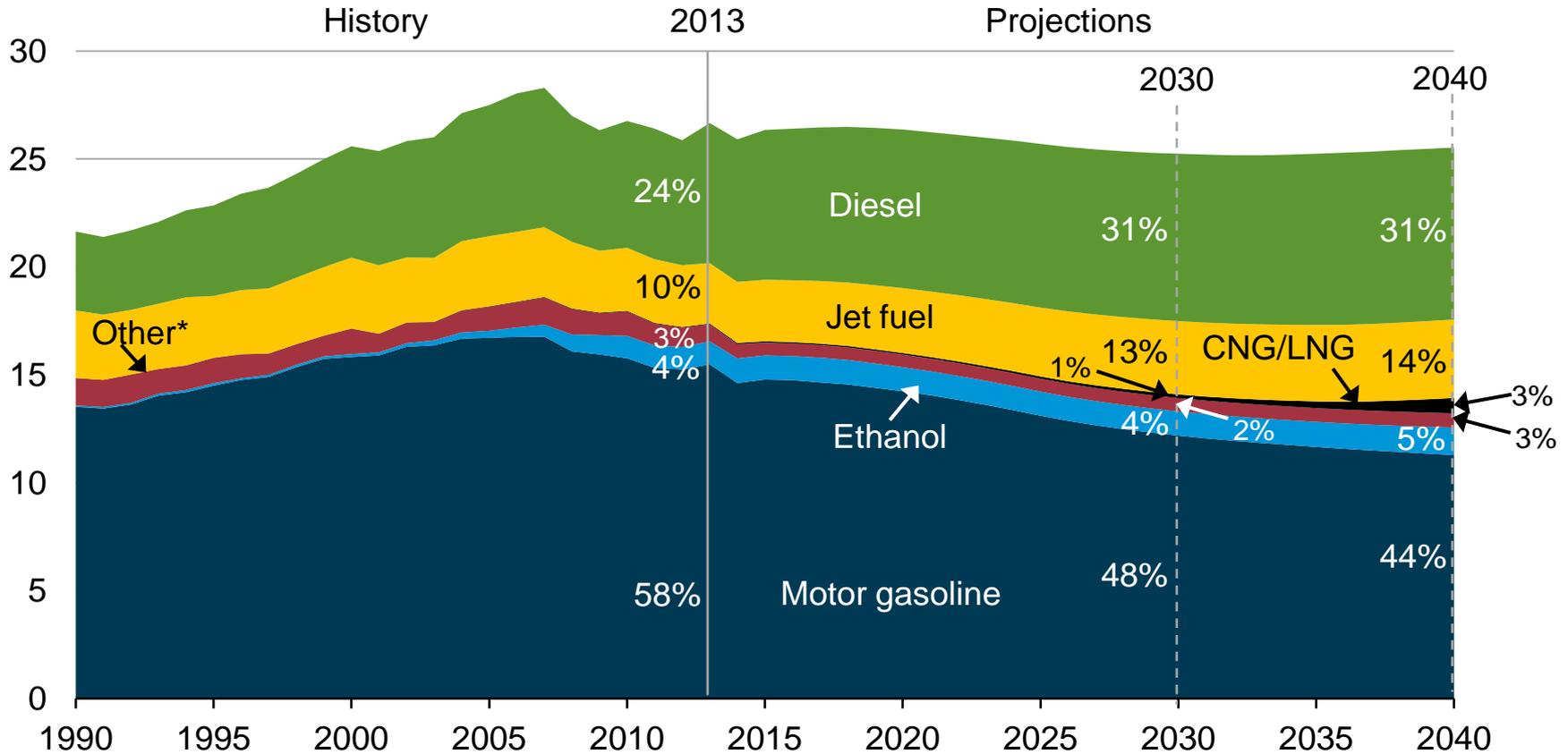
U.S. primary energy consumption
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015 Reference case

In the transportation sector, motor gasoline use declines; diesel fuel, jet fuel, and natural gas use all grow

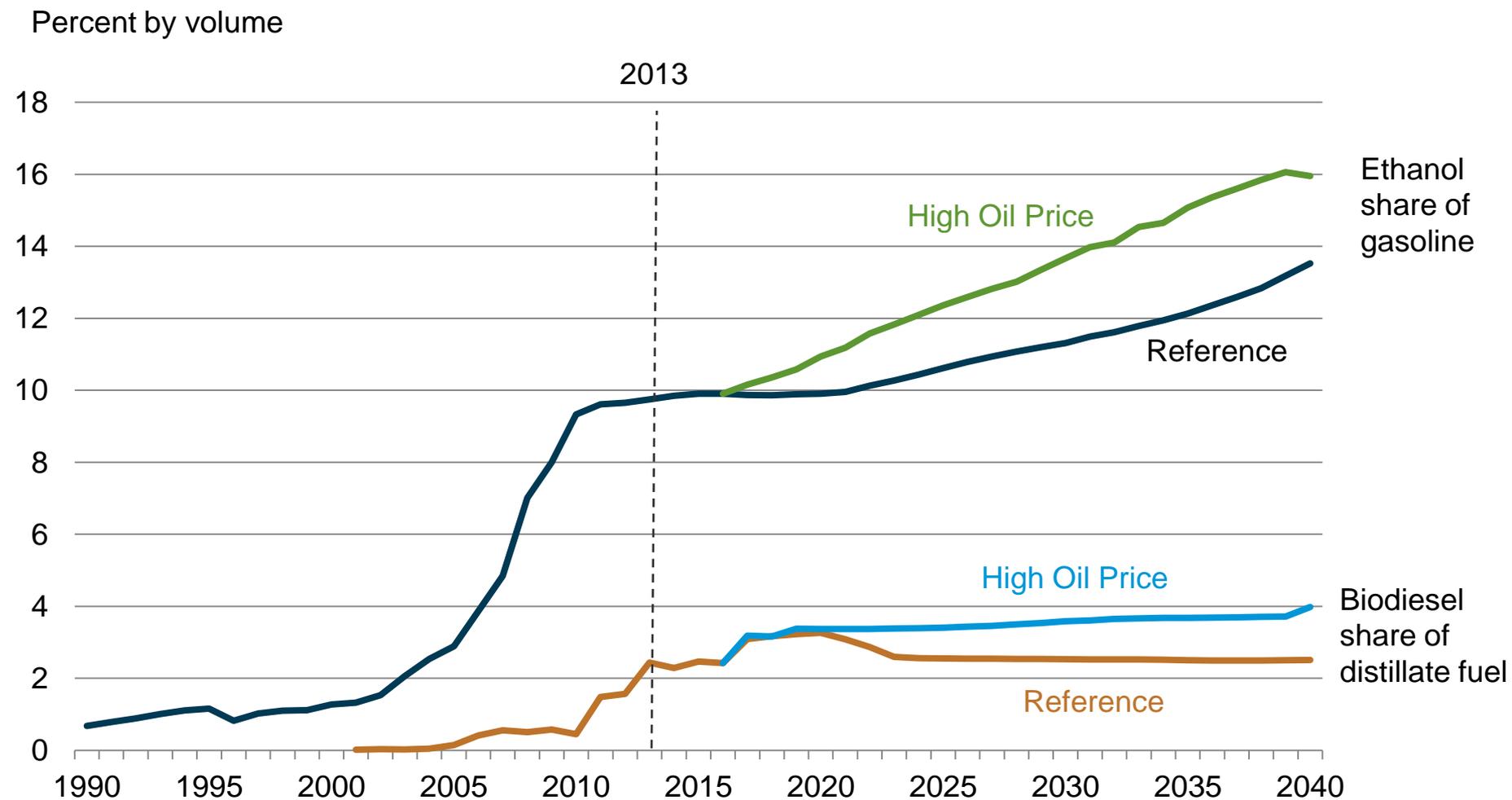
transportation energy consumption by fuel
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015 Reference case

*Includes aviation gasoline, propane, residual fuel oil, lubricants, electricity, and liquid hydrogen

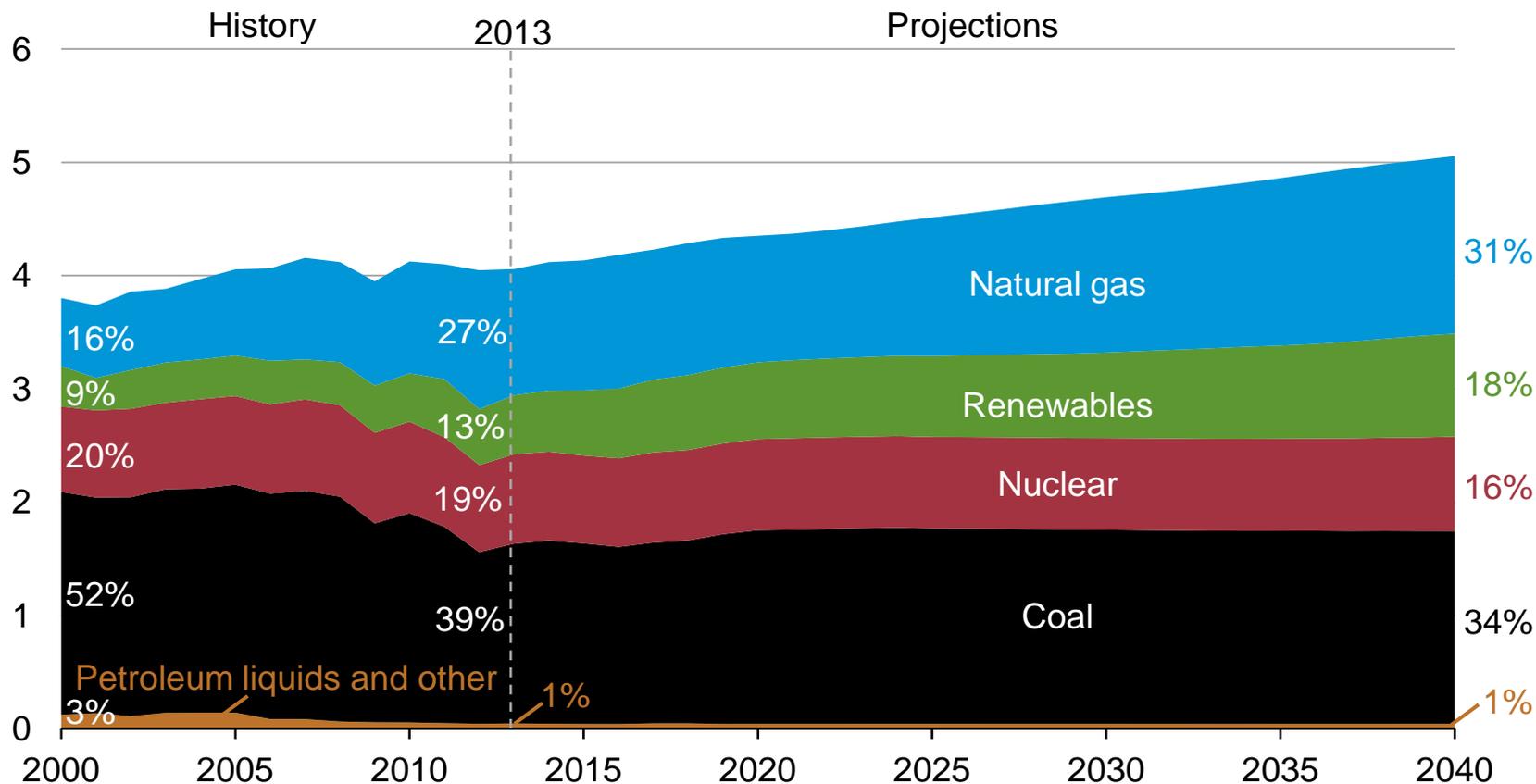
The ethanol share of gasoline continues to grow but the biodiesel share of distillate fuel peaks in 2020 in the AEO2014 Reference case



Sources: EIA, August 2015 Monthly Energy Review and Annual Energy Outlook 2015

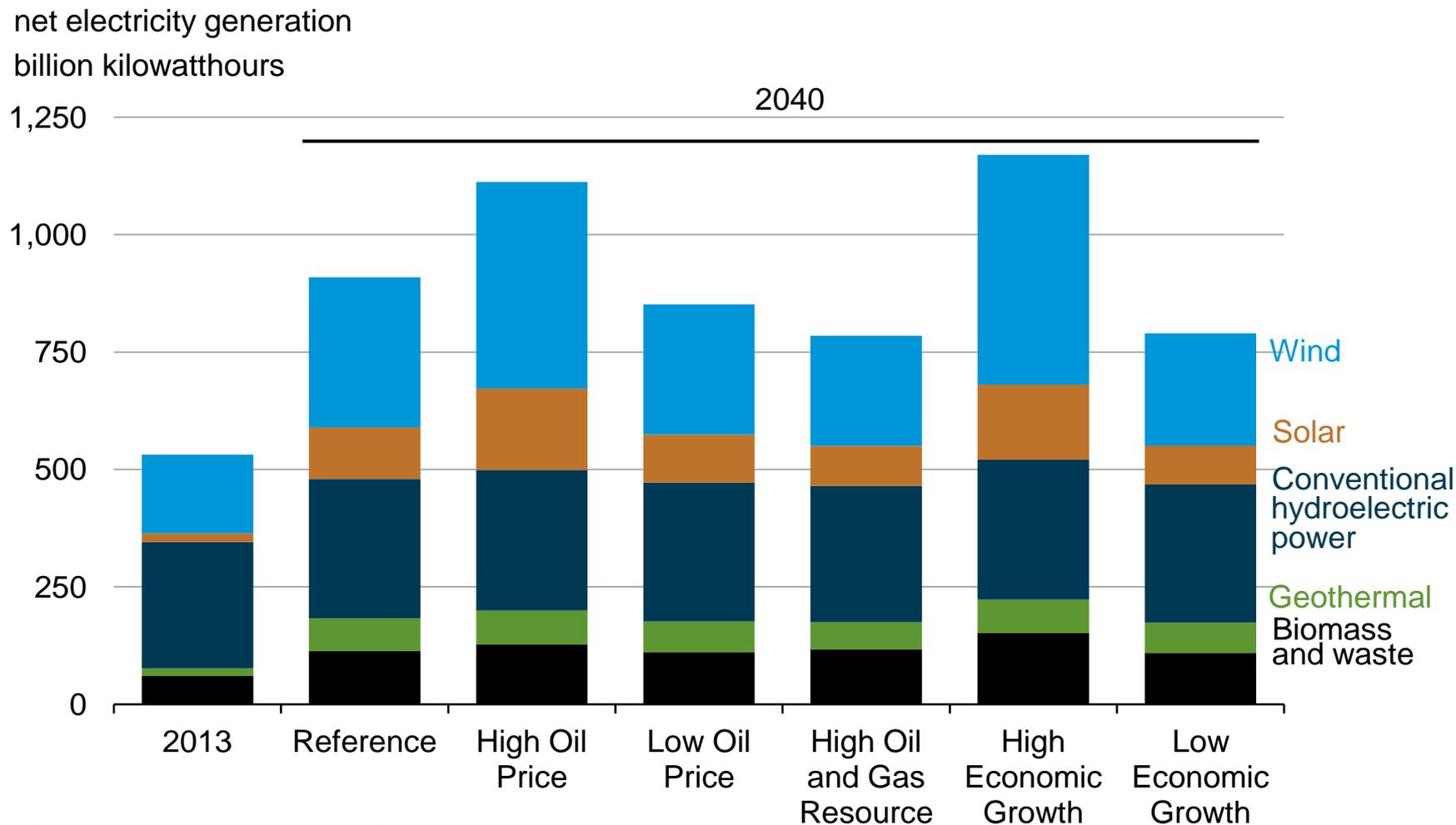
Natural gas and renewables will meet the growth in electricity demand

electricity net generation
trillion kilowatthours



Source: EIA, Annual Energy Outlook 2015

Wind and solar generation account for nearly two-thirds of the increase in total renewable generation in the Reference case, and over 50% of the total across all cases



Source: EIA, Annual Energy Outlook 2015

For more information

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

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