
Annual Energy Outlook 2015



For

Columbia University

May 2015 | New York, NY

By

Adam Sieminski

U.S. Energy Information Administration



U.S. Energy Information Administration

Independent Statistics & Analysis | www.eia.gov

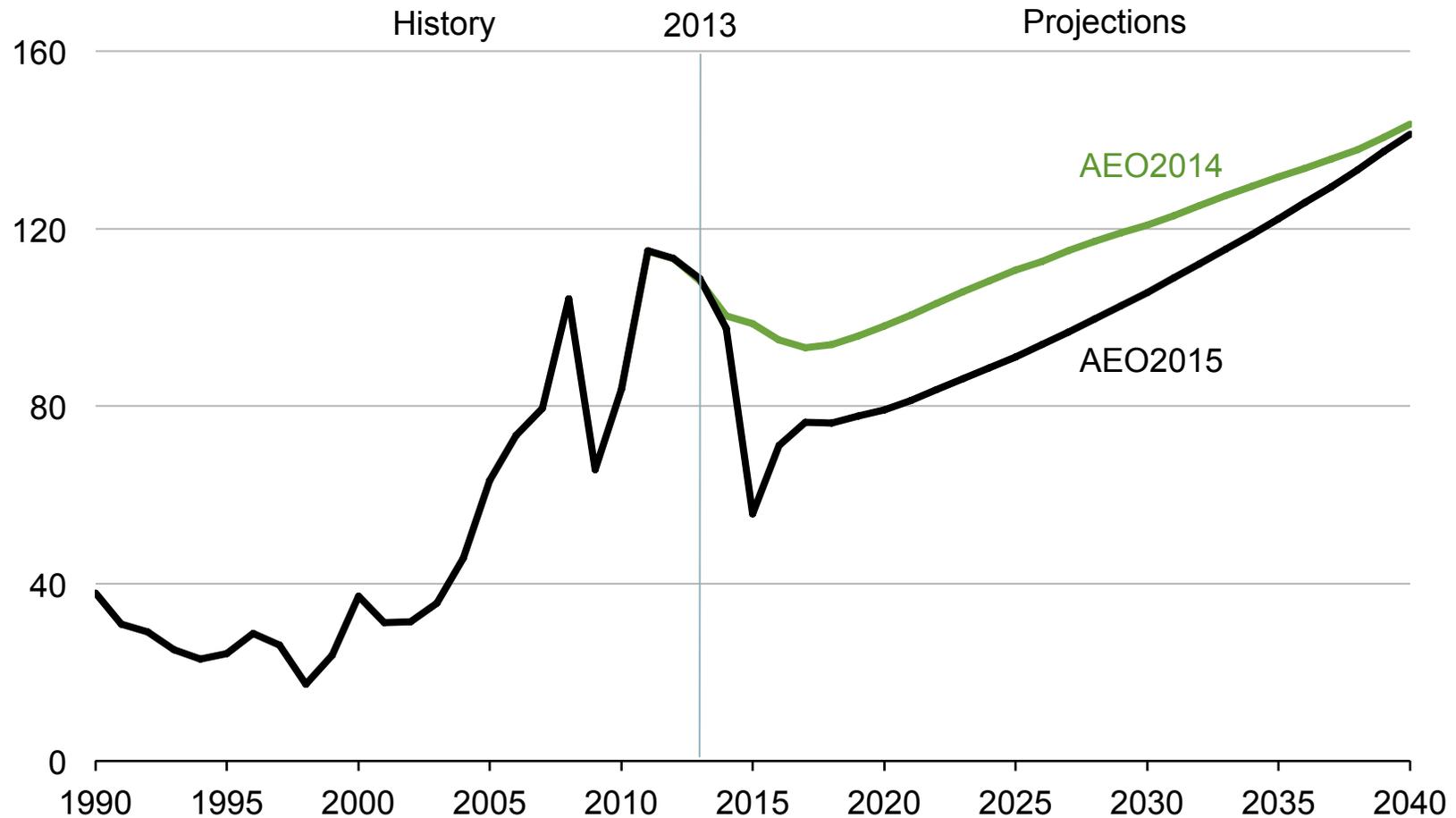
Key results from *Annual Energy Outlook 2015 (AEO2015)*

- 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
- 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

Overview of *AEO2015*

Crude oil price projection is lower in the AEO2015 Reference case than in AEO2014, particularly in the near term

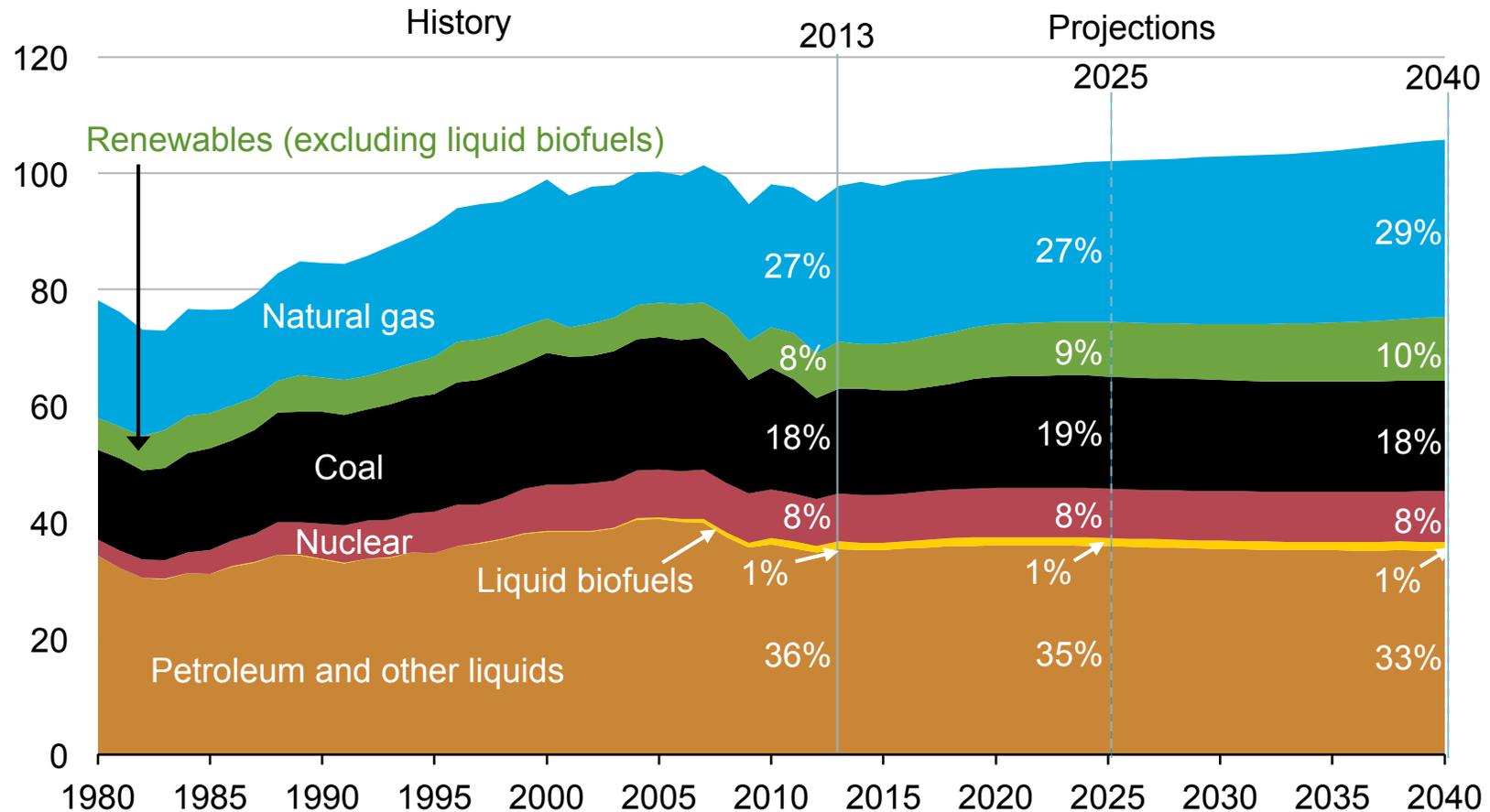
Brent crude oil spot price
2013 dollars per barrel



Source: EIA, Annual Energy Outlook 2015 Reference case and Annual Energy Outlook 2014 Reference case

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

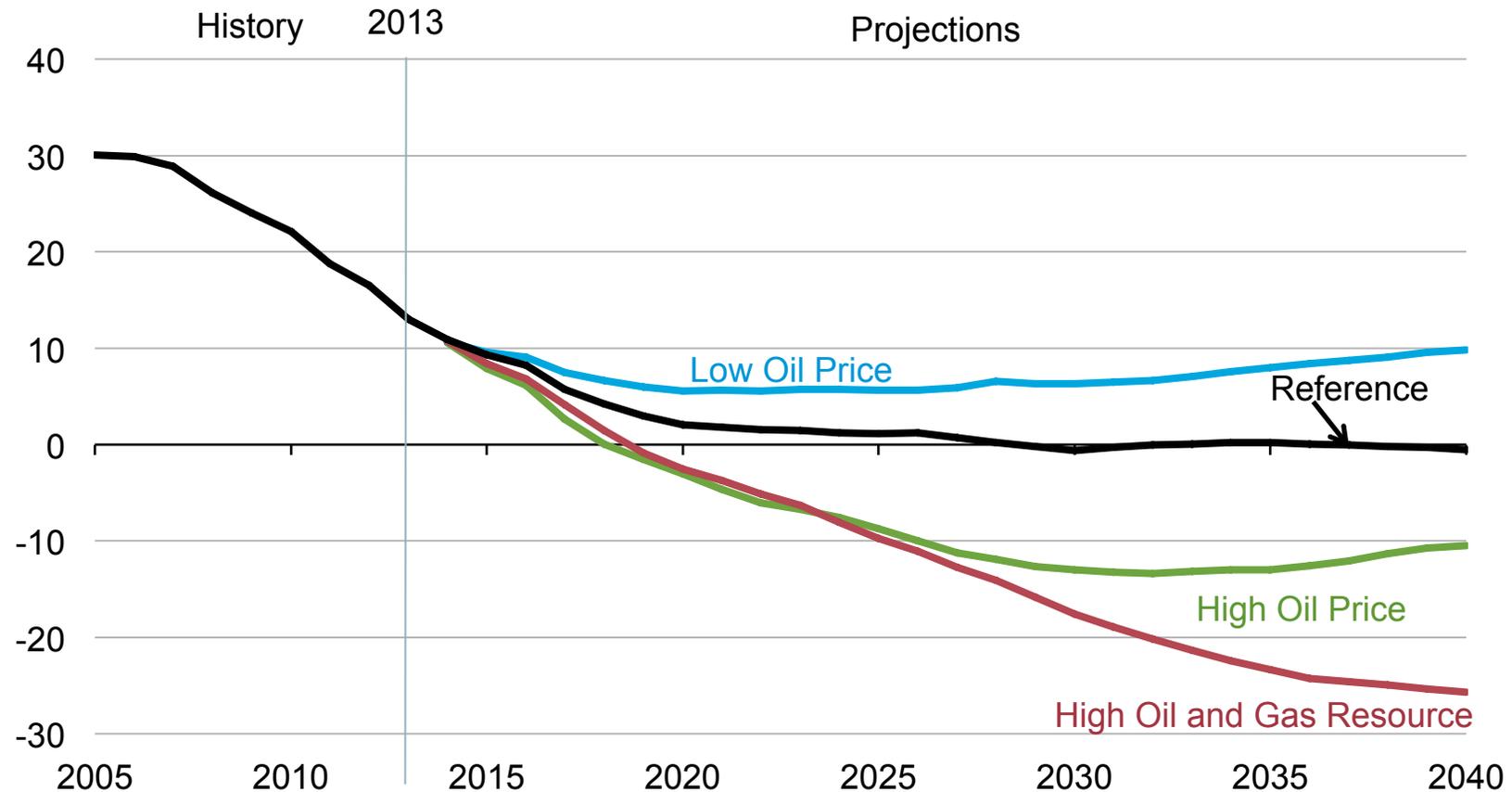
U.S. primary energy consumption
quadrillion Btu



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

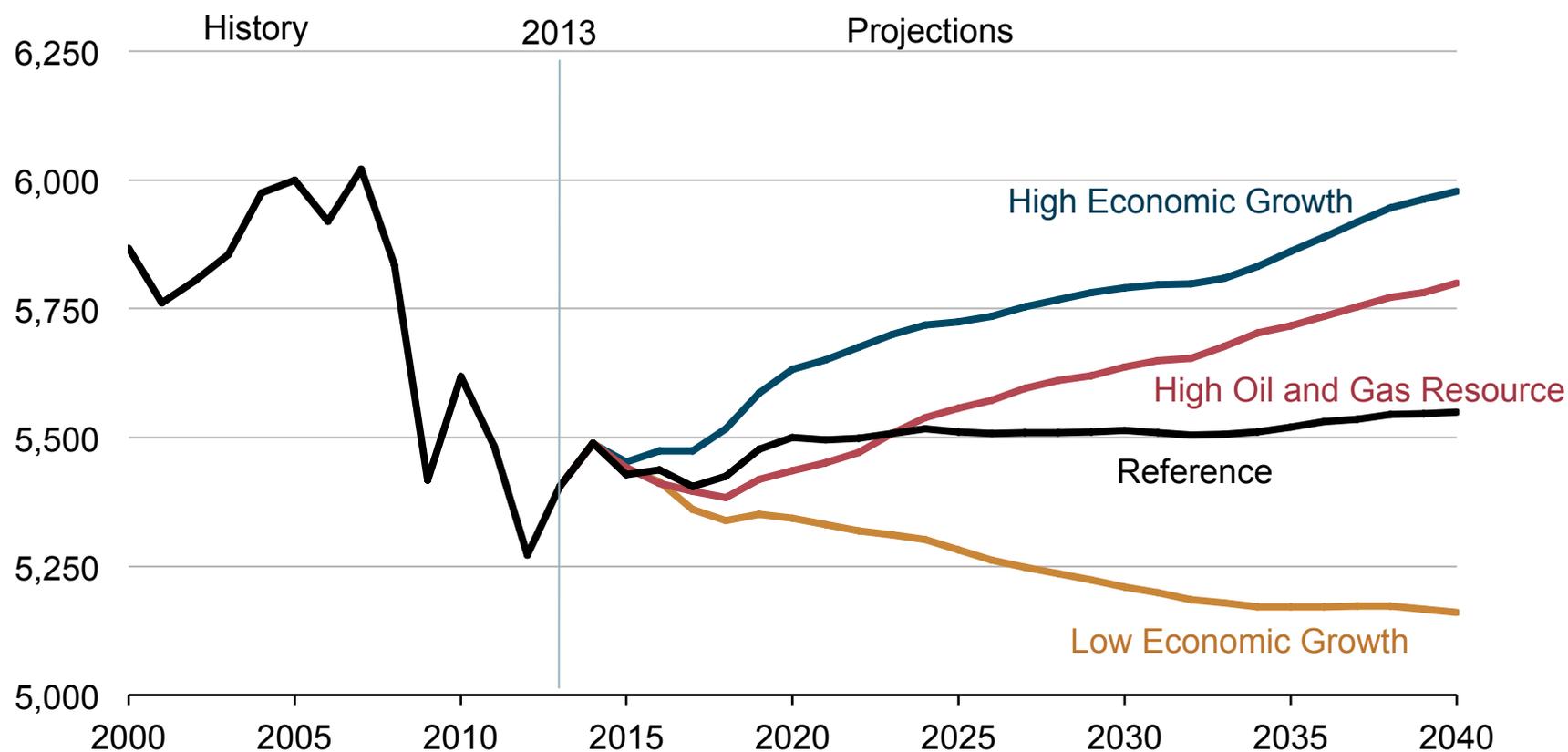
U.S. net energy imports
quadrillion Btu



Source: EIA, Annual Energy Outlook 2015

CO₂ emissions are sensitive to the influence of future economic growth and energy price trends on energy consumption

energy-related carbon dioxide emissions
million metric tons

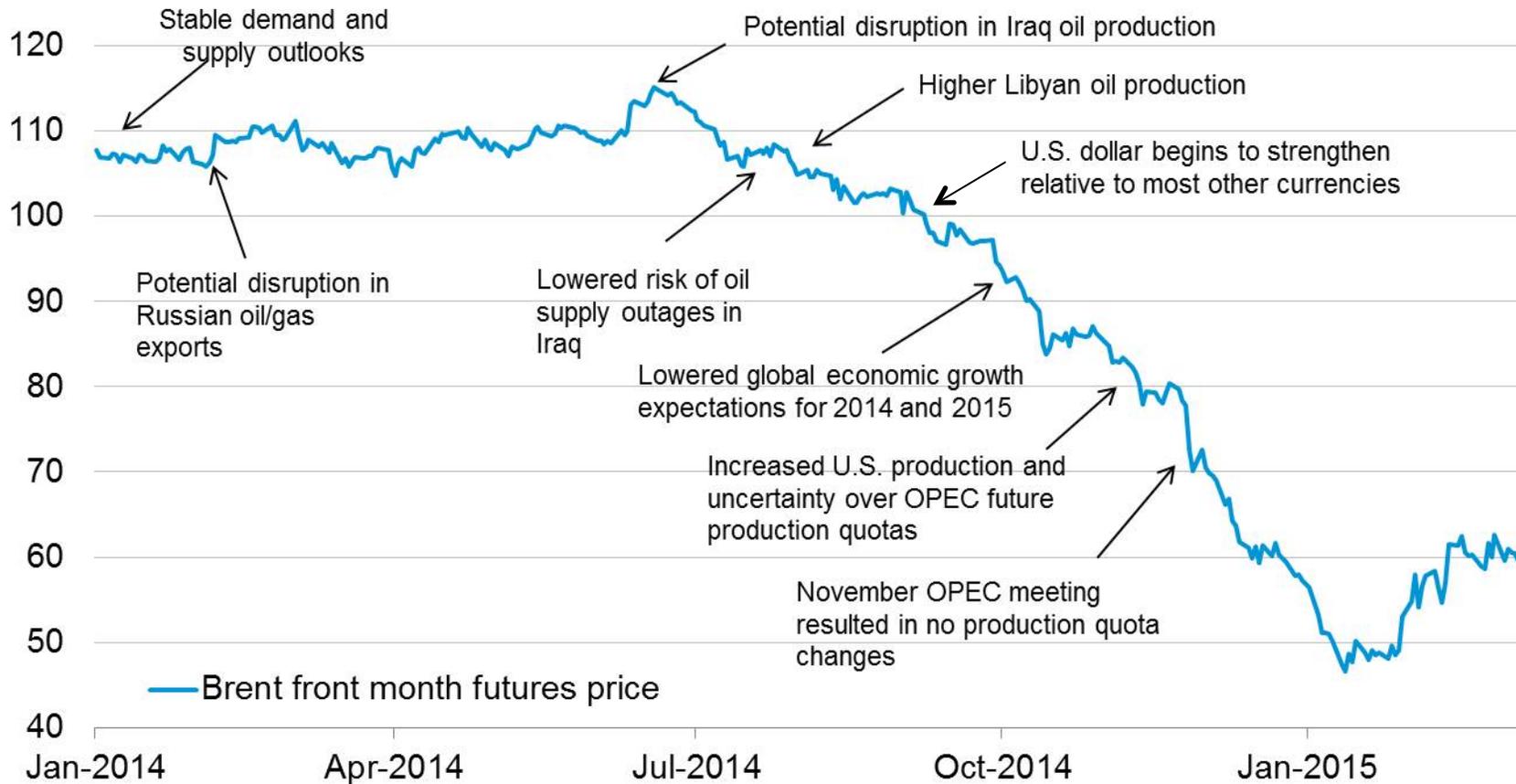


Source: EIA, Annual Energy Outlook 2015

Short-term and long-term outlook: Petroleum

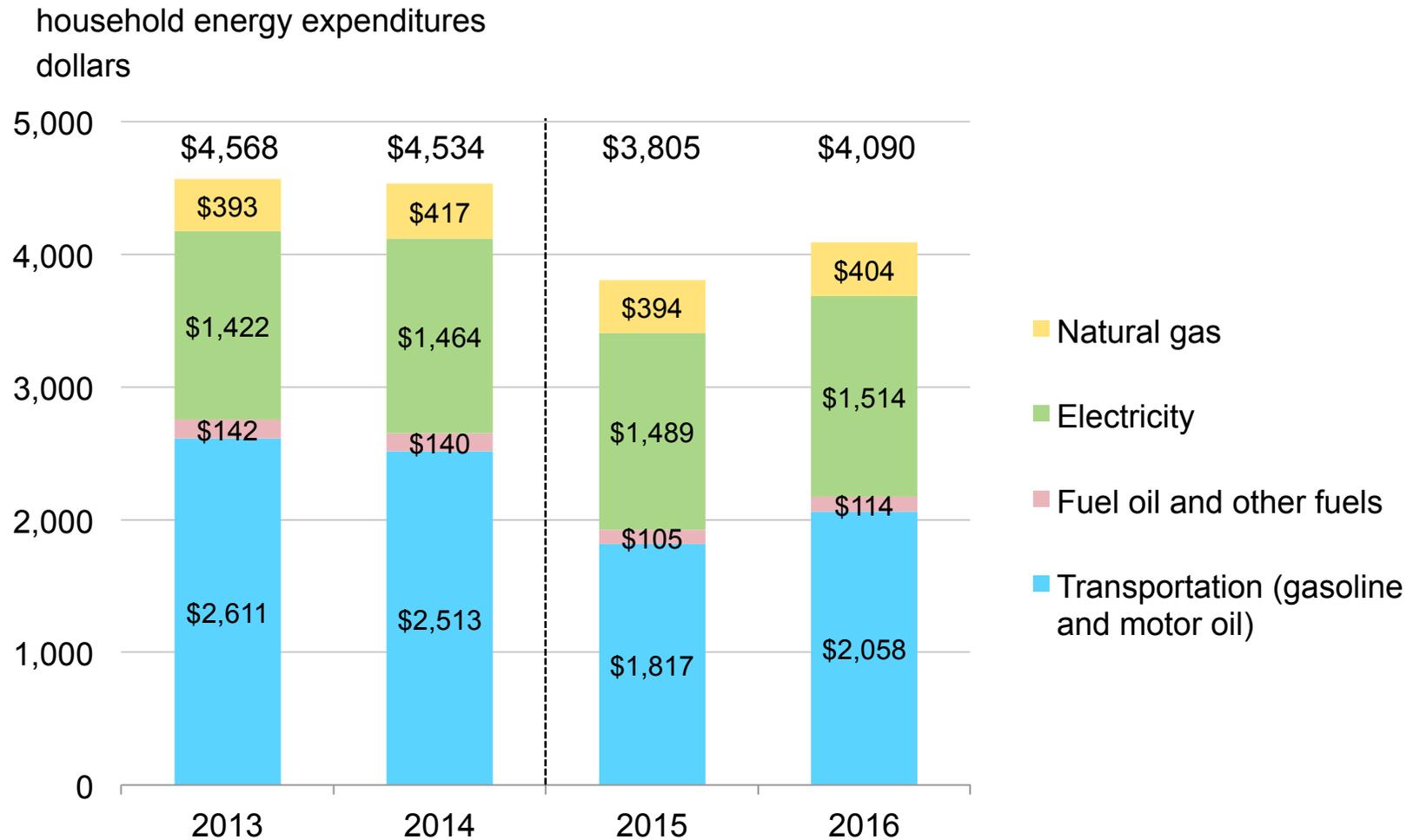
Brent crude oil prices were relatively stable through the first half of 2014; increased oil supply and lower global economic growth expectations lowered prices from July 2014 to January 2015

dollars per barrel



Source: EIA, Bloomberg

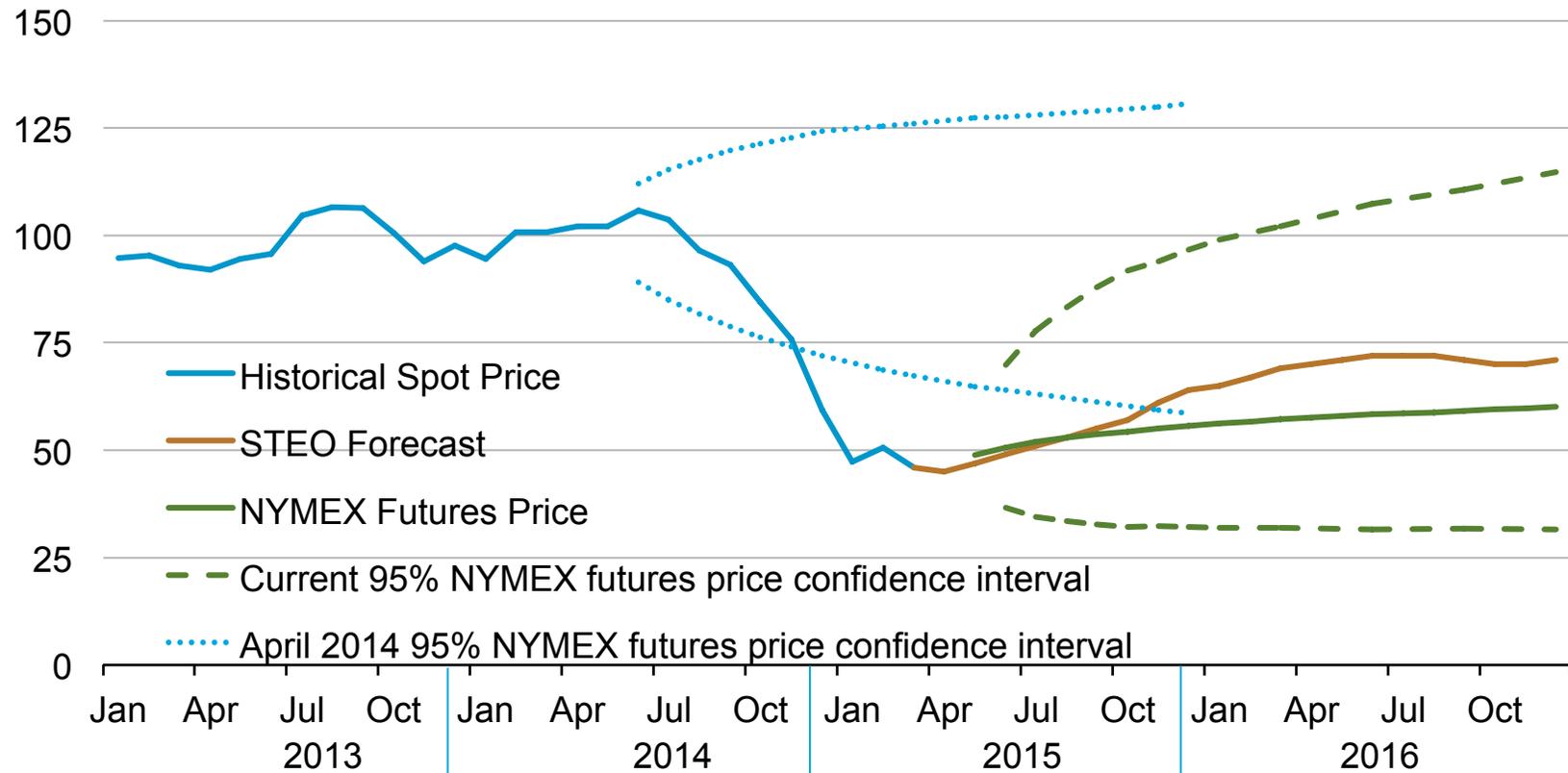
Average household energy expenditures fall by 16% in 2015, then increase somewhat in 2016 (based on EIA price forecast)



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

Oil prices rise from mid-2015 through mid-2016 in EIA's forecast – however, the market-implied confidence band is very wide

WTI price
dollars per barrel



Source: EIA, Short-Term Energy Outlook, April 2015

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

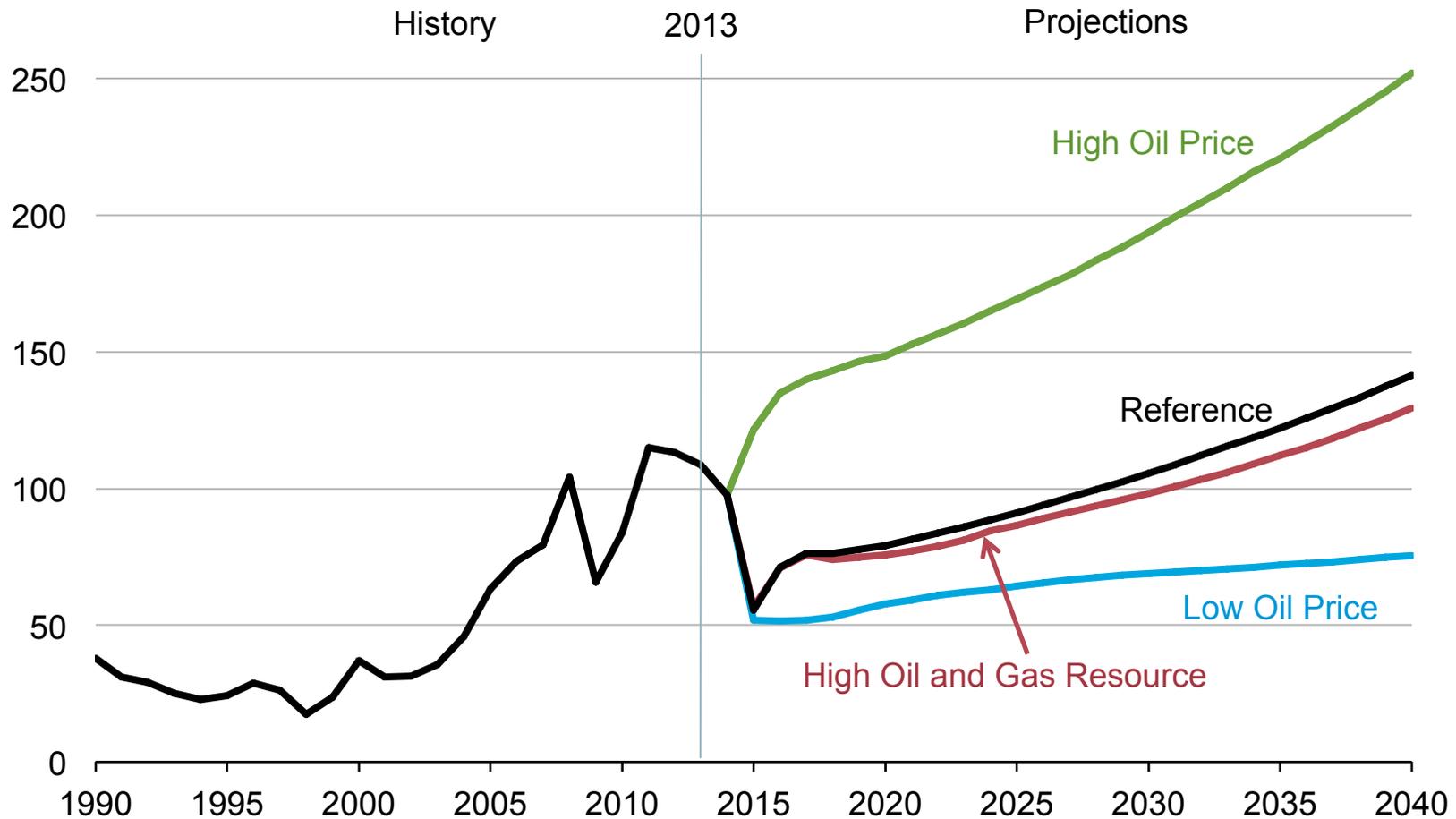
Event
Oil demand growth surprises to the upside (economy- or price-driven)
Key OPEC producers cut output more than expected
Iraq production is significantly disrupted (ISIL? other discord?)
Social unrest in oil-dependent countries leads to supply disruptions
Non-OPEC production slows more than expected

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

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

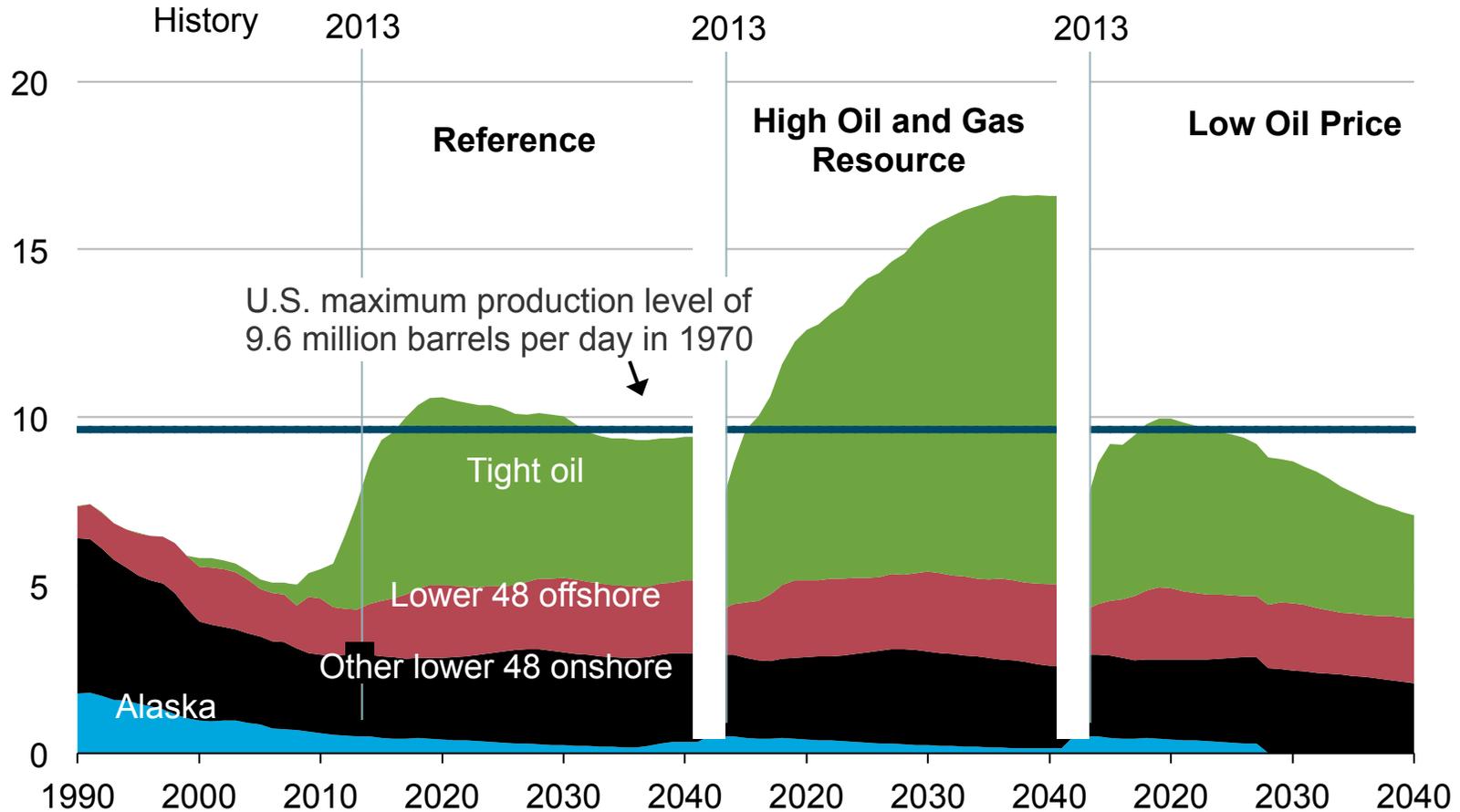
Brent crude oil spot price
2013 dollars per barrel



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

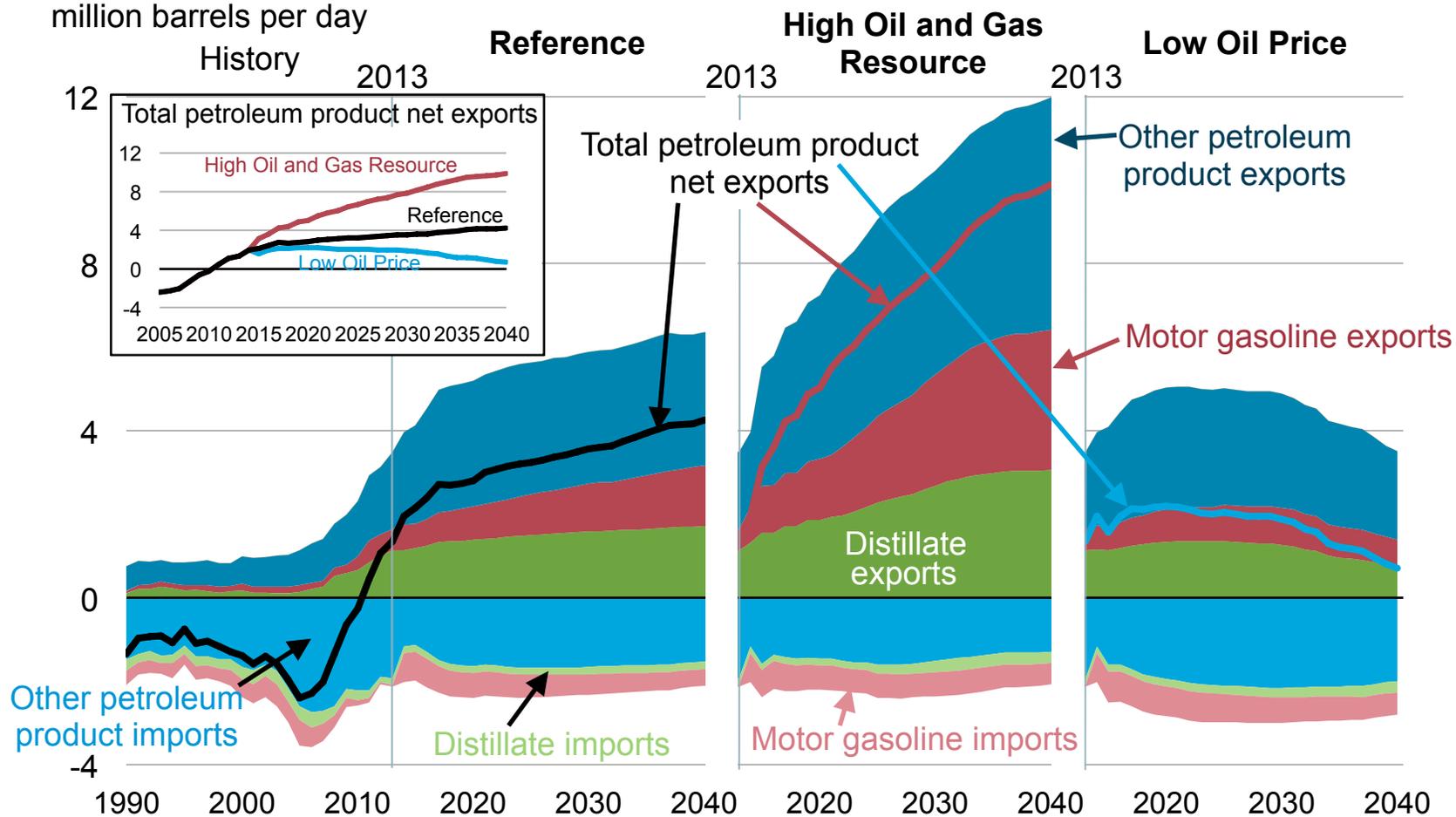
U.S. crude oil production
million barrels per day



Source: EIA, Annual Energy Outlook 2015

U.S. net exports of petroleum products vary with the level of domestic oil production given current limits on U.S. crude oil exports

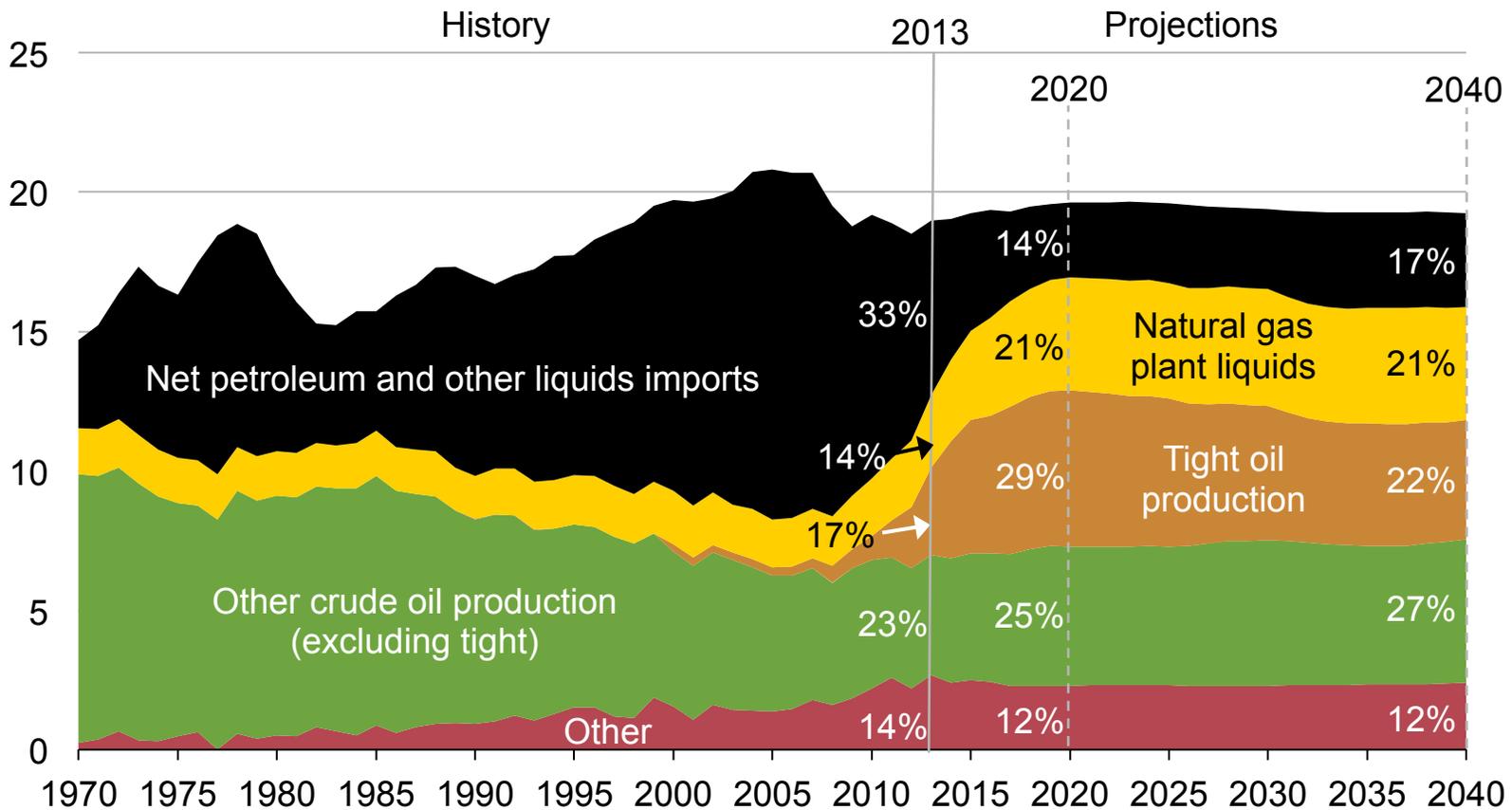
U.S. petroleum product imports and exports
million barrels per day



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

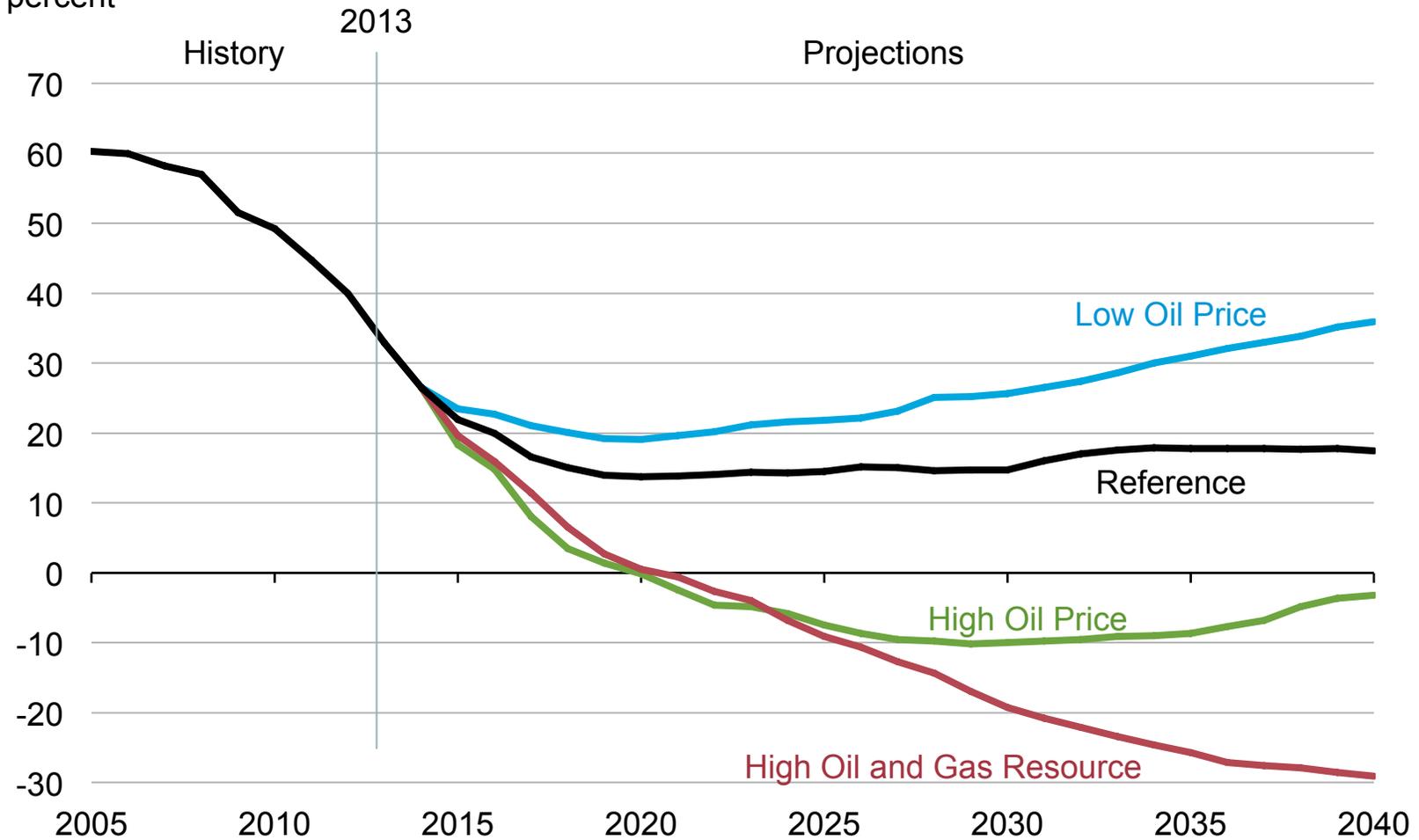


Note: "Other" includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels

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

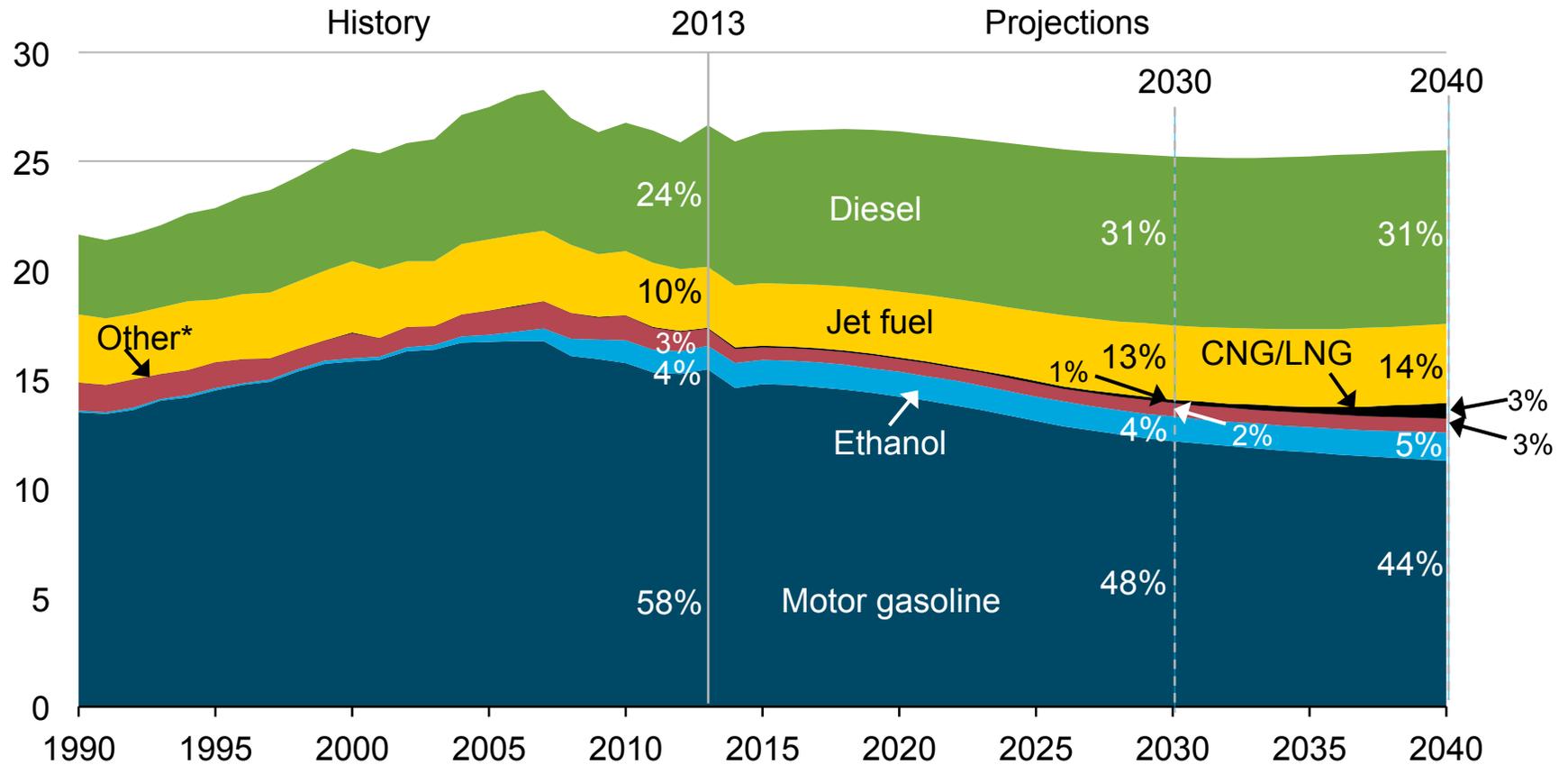
net crude oil and petroleum product imports as a percentage of total U.S. supply
percent



Source: EIA, Annual Energy Outlook 2015

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

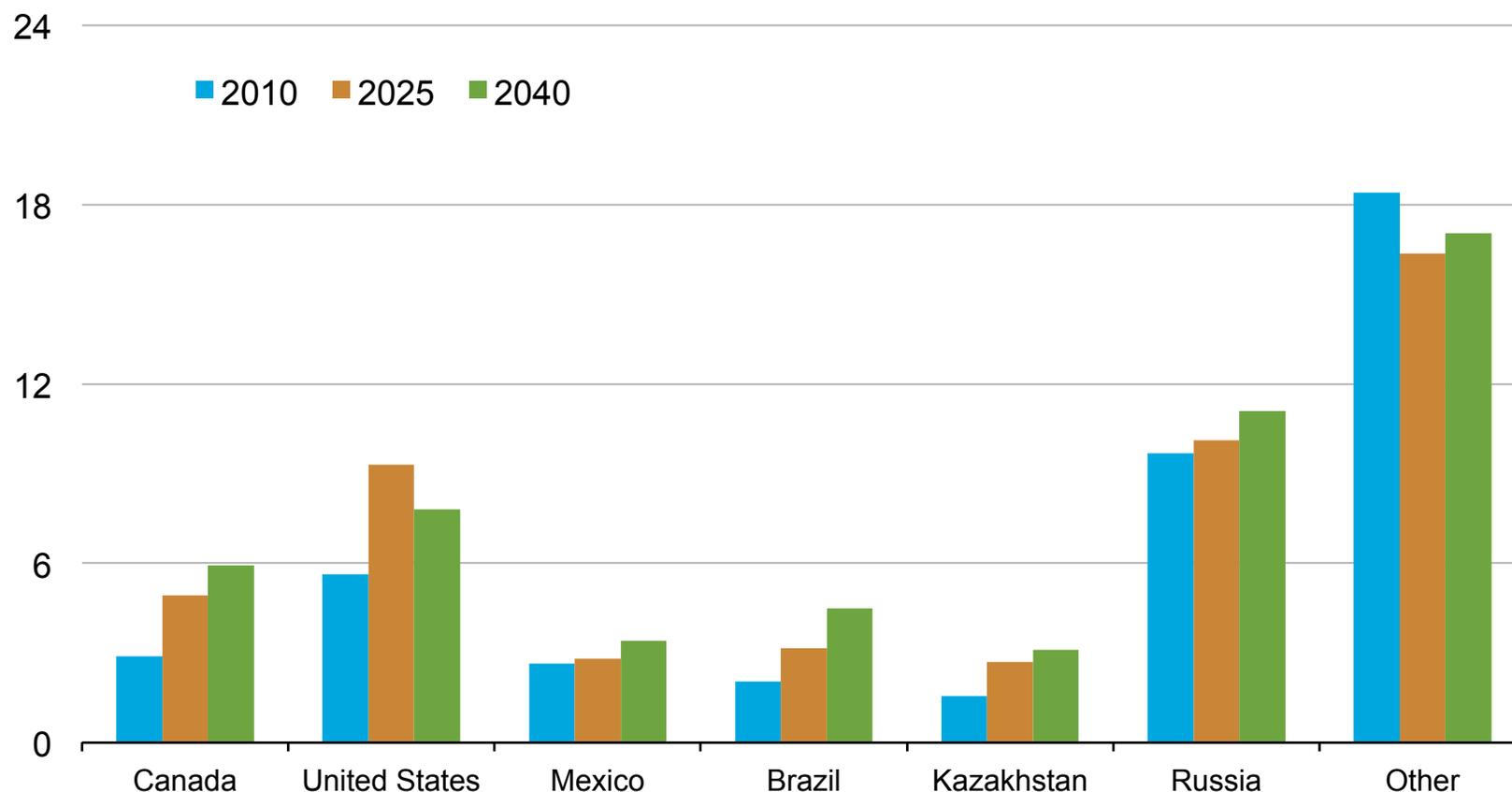


Source: EIA, Annual Energy Outlook 2015 Reference case

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

Most significant contributors to non-OPEC crude and lease condensate production: Canada, Brazil, U.S., Kazakhstan, Russia

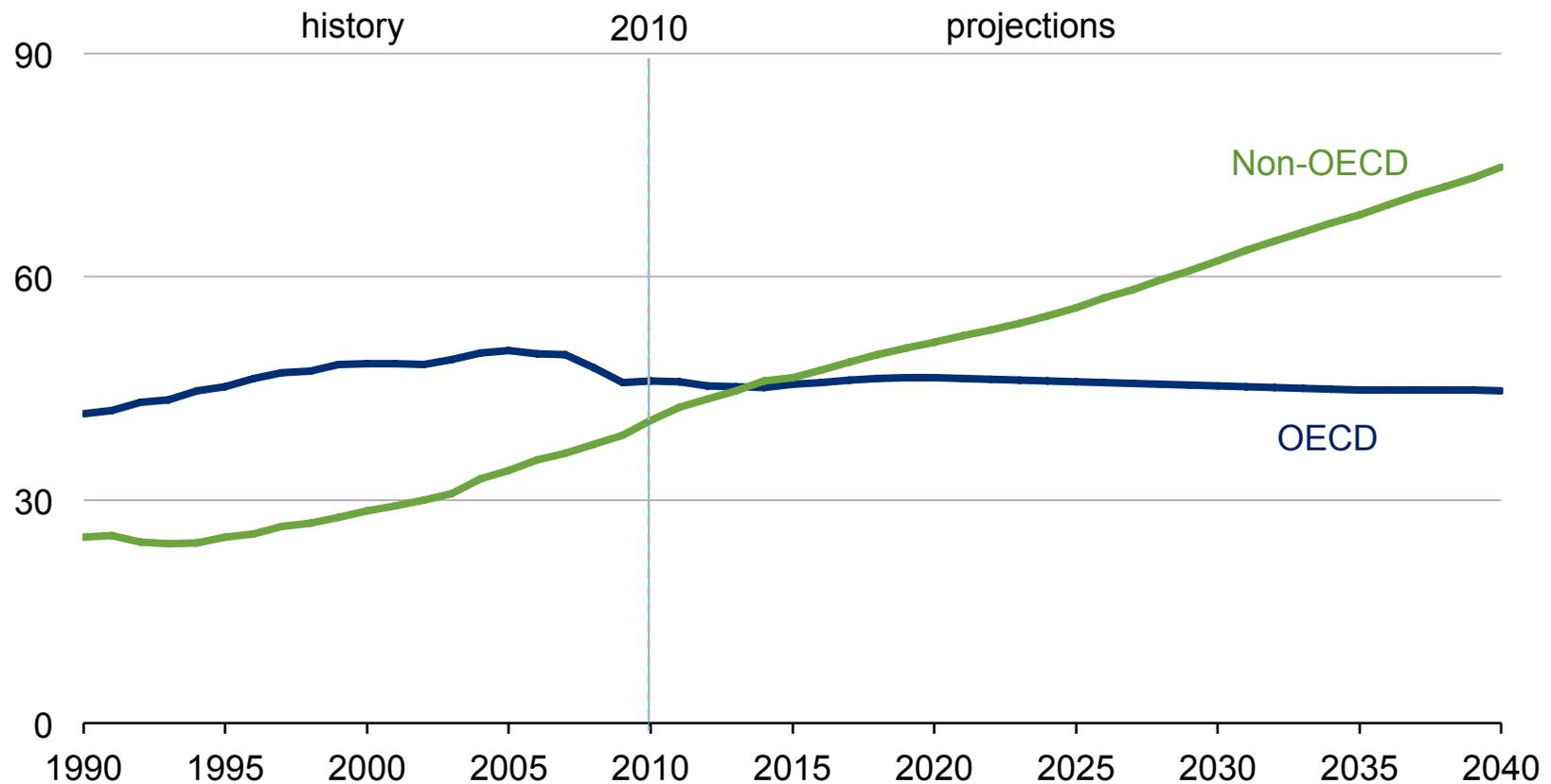
non-OPEC crude and lease condensate production, Reference case
million barrels per day



Source: EIA, *International Energy Outlook 2014*

All of the growth in liquid fuels consumption occurs in the emerging non-OECD (million barrels per day)

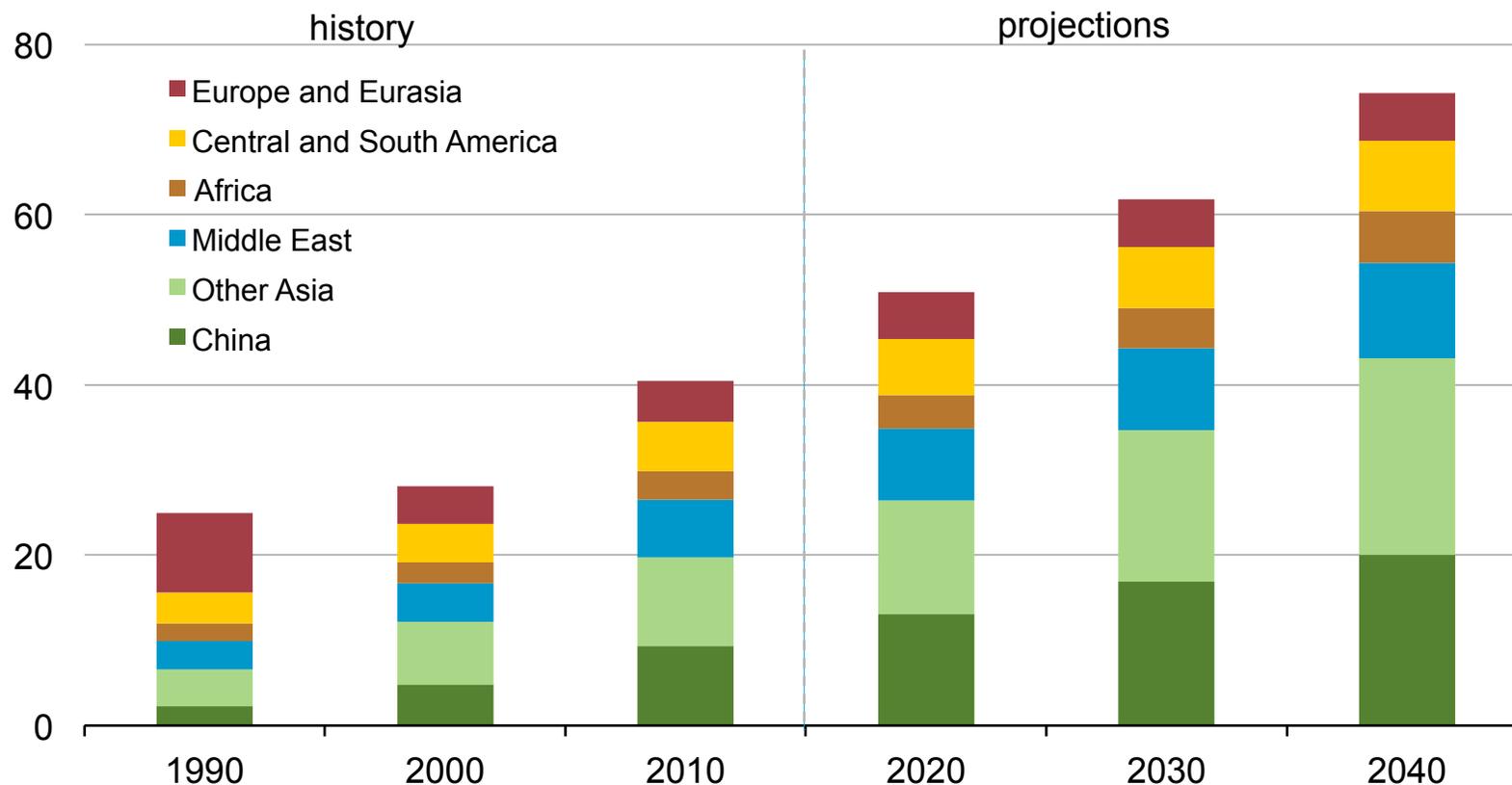
petroleum and other liquid fuels consumption, 1990-2040
million barrels per day



Source: EIA, International Energy Outlook 2014

Non-OECD Asia and the Middle East account for 85% of the world's growth in liquids consumption over the projection

non-OECD petroleum and other liquid fuels consumption, Reference case, 1990-2040
million barrels per day

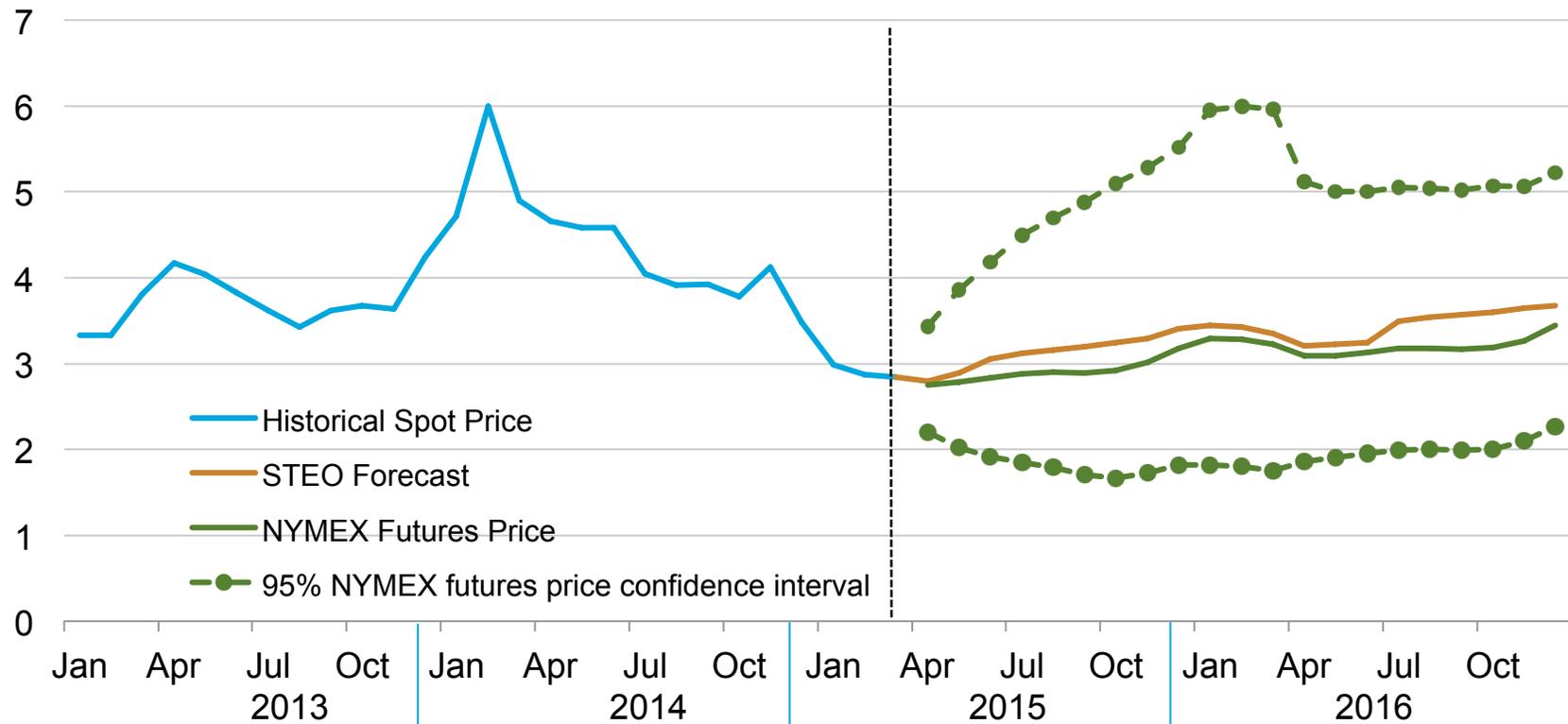


Source: EIA, International Energy Outlook 2014

Short-term and long-term outlook: Natural gas

Henry Hub spot prices are expected to average \$3.07/million Btu in 2015 and \$3.45/million Btu in 2016

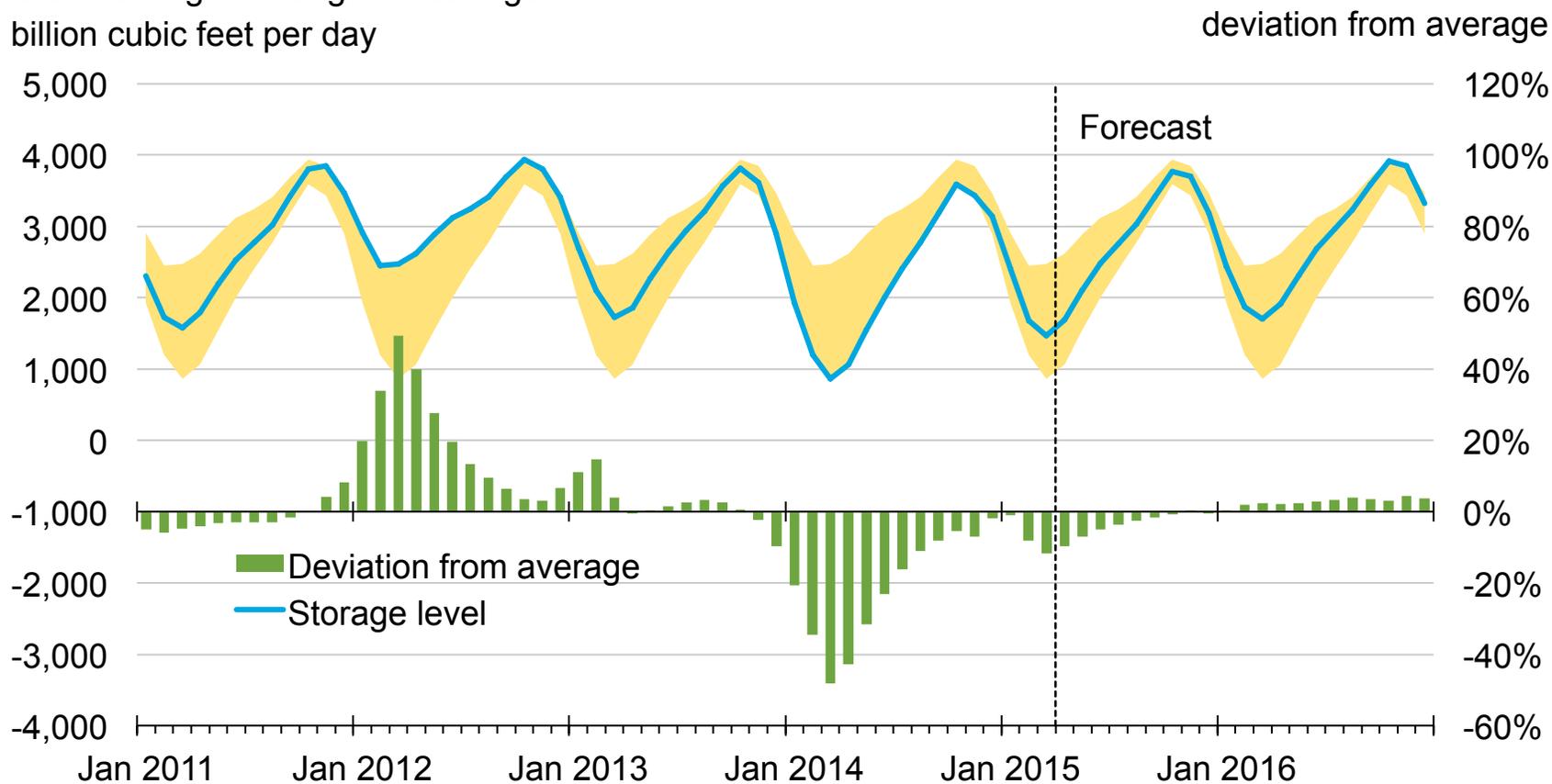
Henry Hub spot price
dollars per million Btu



Source: EIA, Short-Term Energy Outlook, April 2015

After cold weather caused large natural gas storage withdrawals in 2014, inventories are expected to remain within historical average levels in 2015 and 2016

U.S. working natural gas in storage
billion cubic feet per day

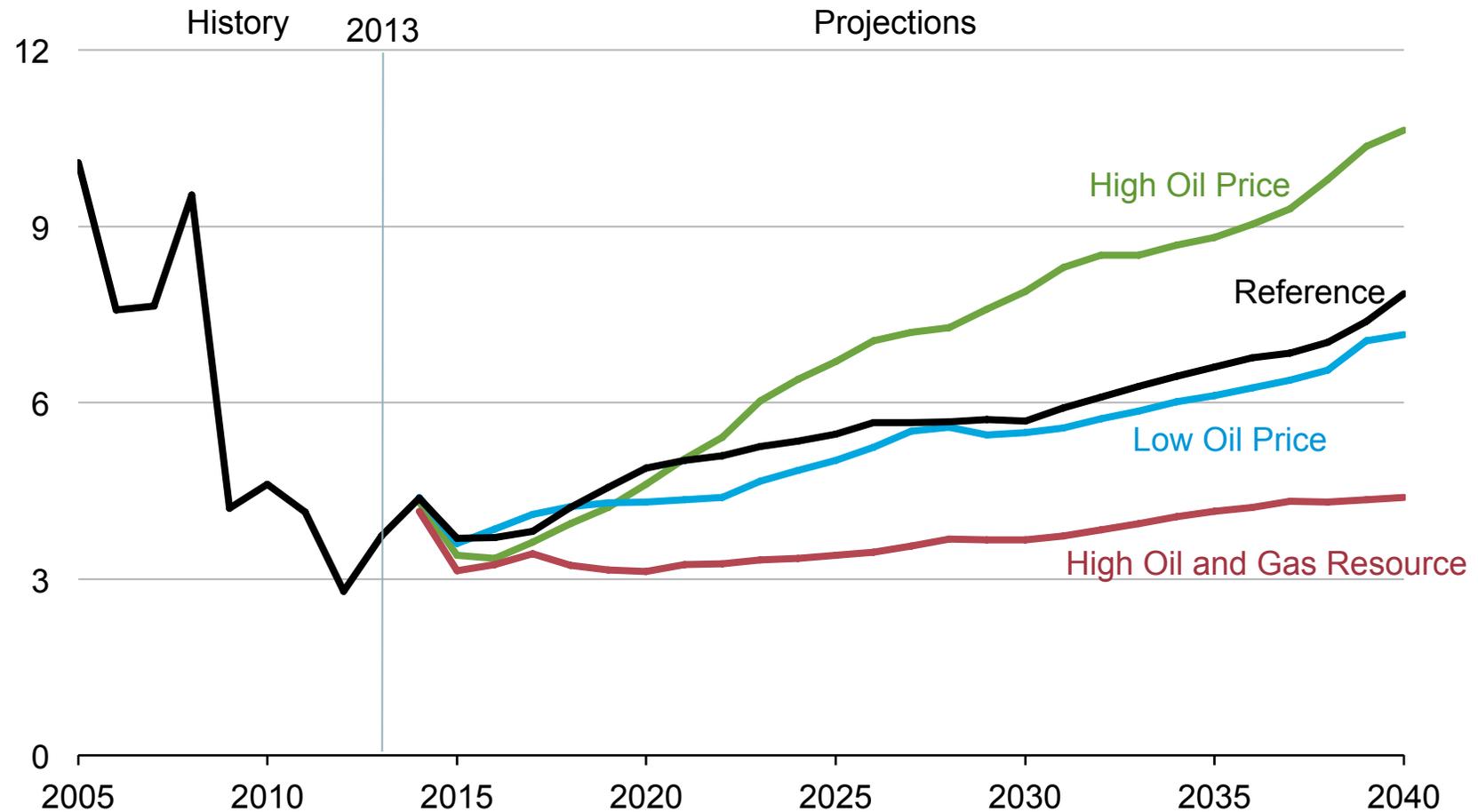


Note: Colored band around storage levels represents the range between the minimum and maximum from Jan. 2010 - Dec. 2014.

Source: EIA, *Short-Term Energy Outlook*, April 2015

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

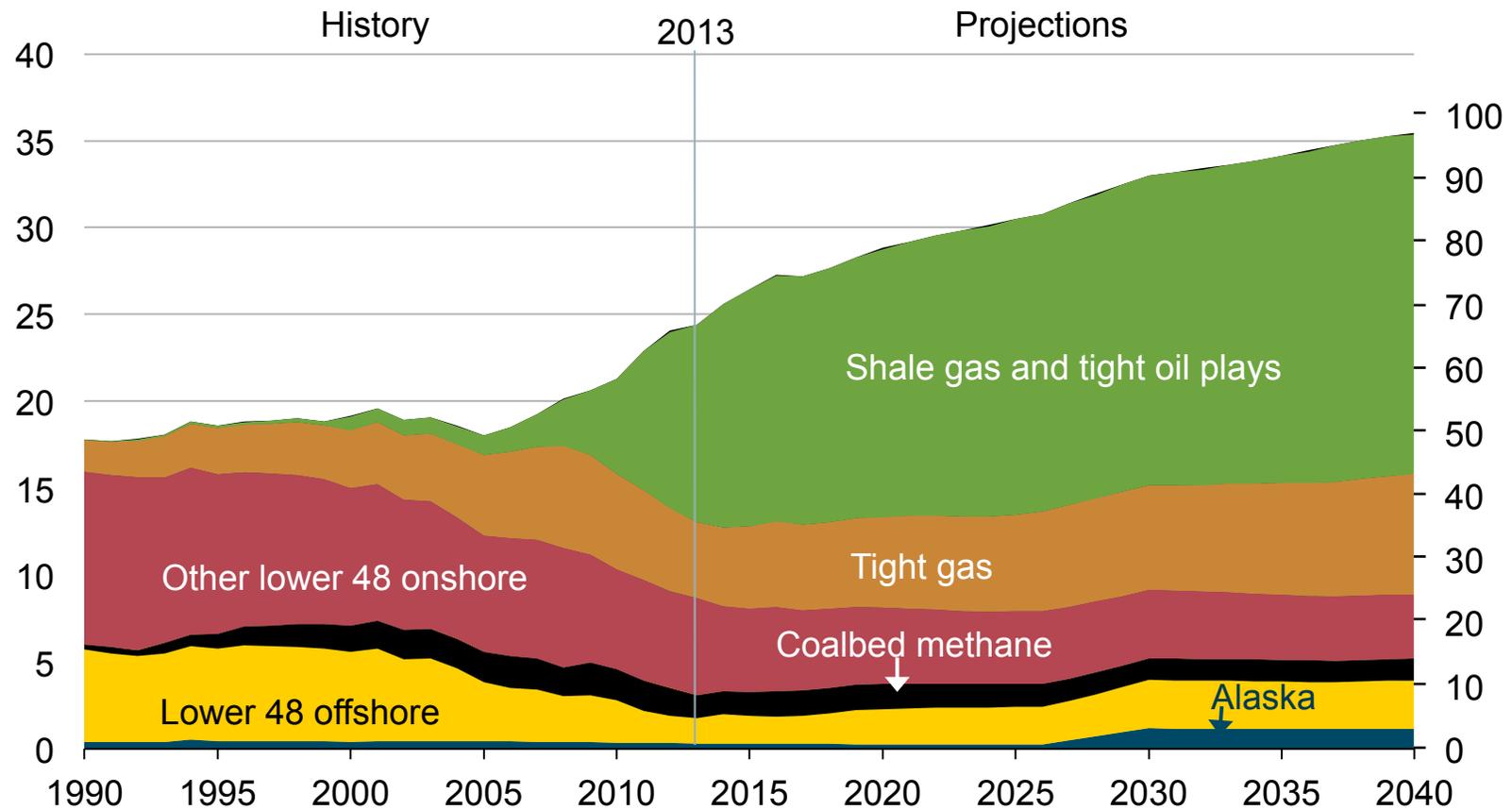


Source: EIA, Annual Energy Outlook 2015

Shale resources remain the dominant source of U.S. natural gas production growth

U.S. dry natural gas production
trillion cubic feet

billion cubic feet per day

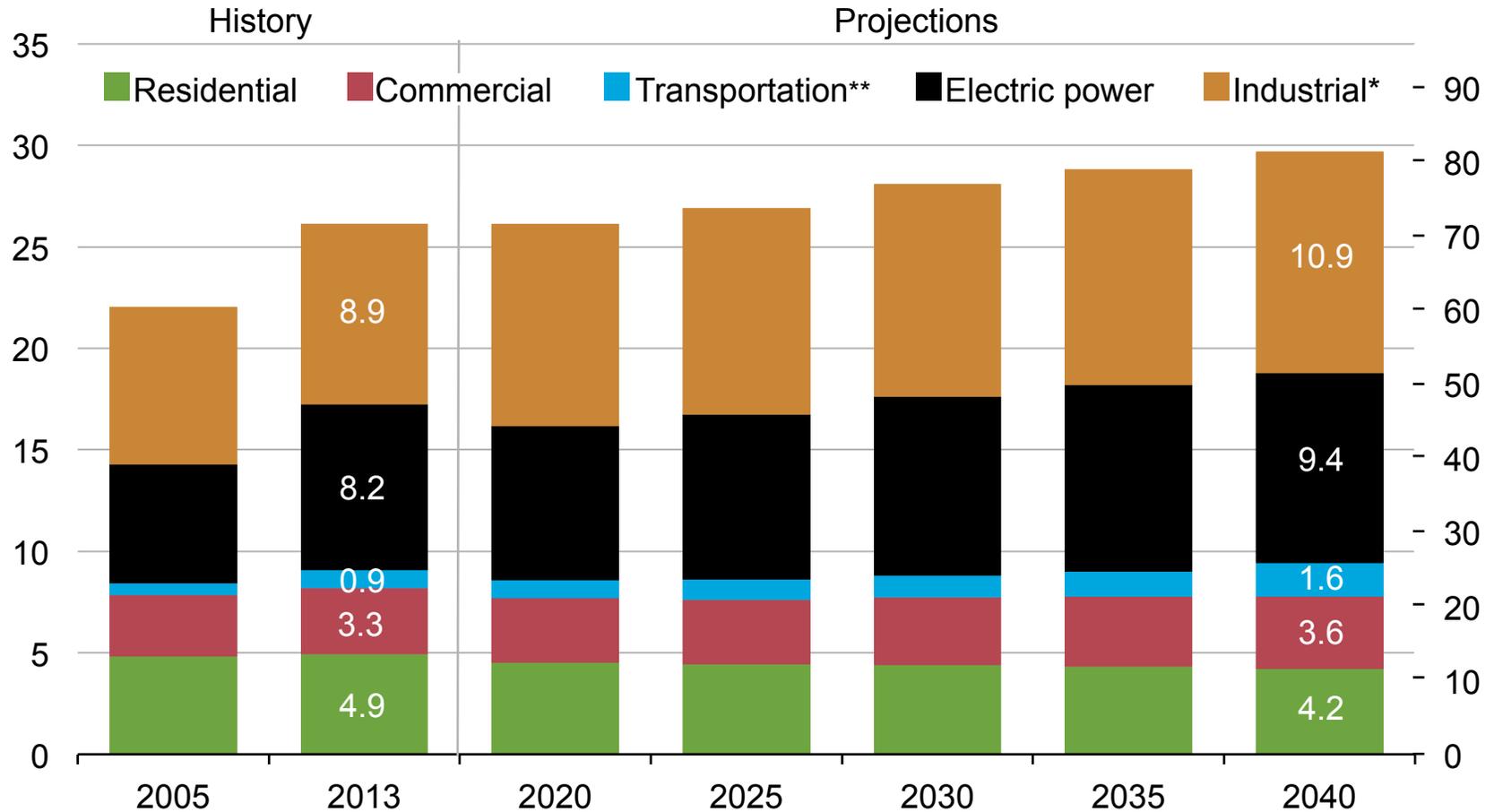


Source: EIA, Annual Energy Outlook 2015 Reference case

Natural gas consumption growth is driven by increased use in all sectors except residential

U.S. dry gas consumption
trillion cubic feet

billion cubic feet per day



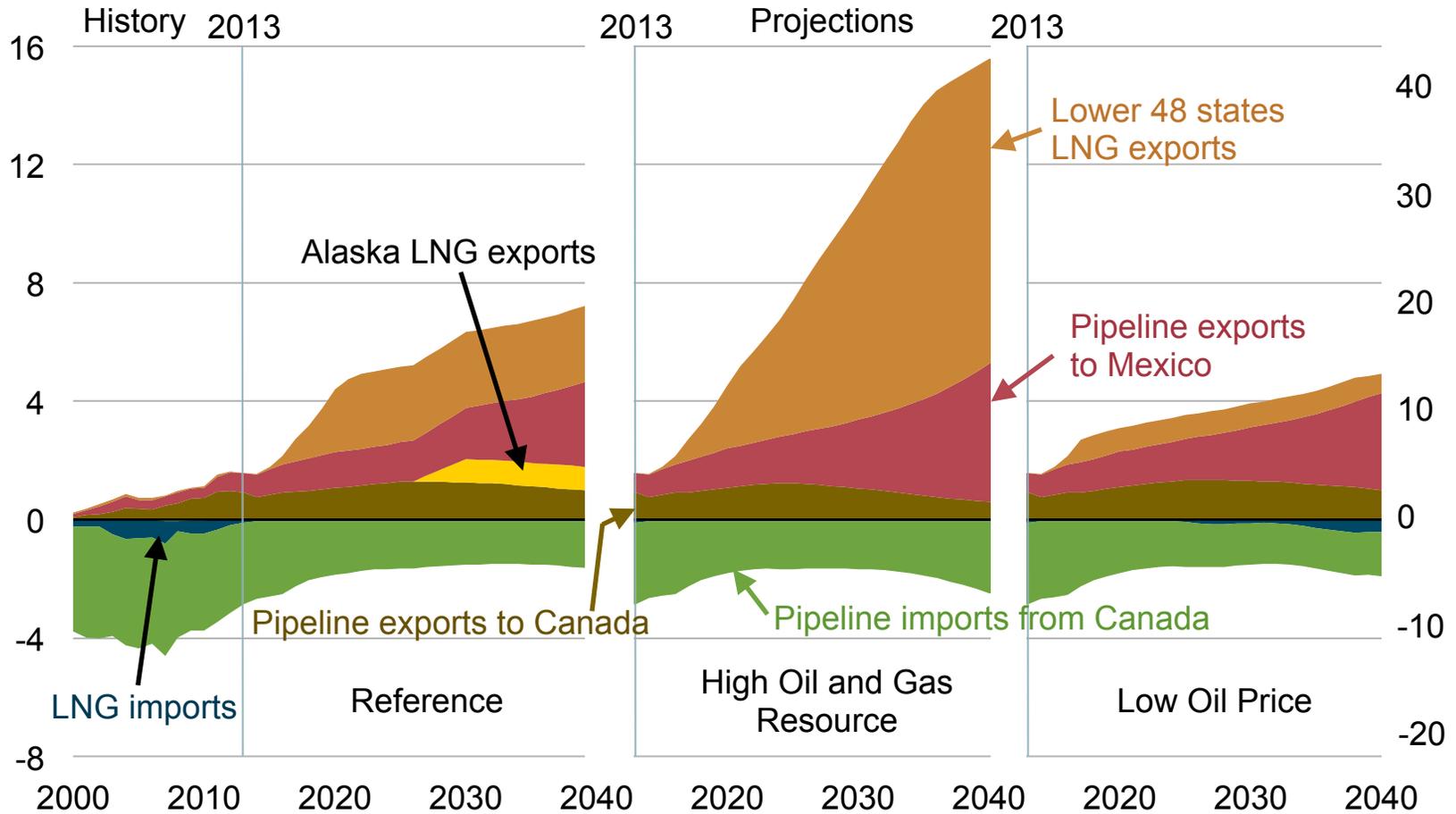
Source: EIA, Annual Energy Outlook 2015 Reference case

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

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

billion cubic feet per day

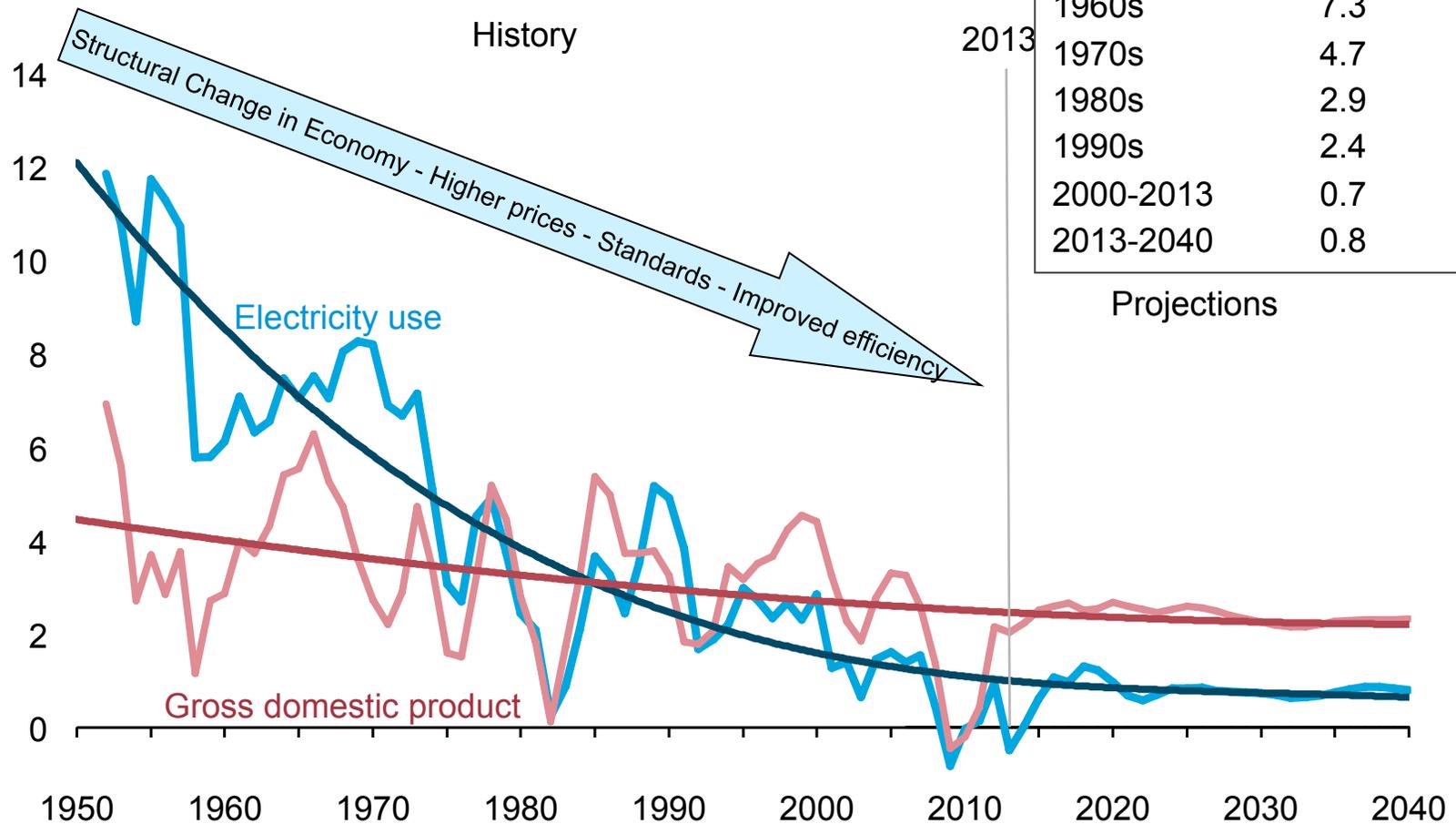


Source: EIA, Annual Energy Outlook 2015

Short-term and long-term outlook: Electricity

Growth in electricity use slows, but electricity use still increases by 24% from 2013 to 2040

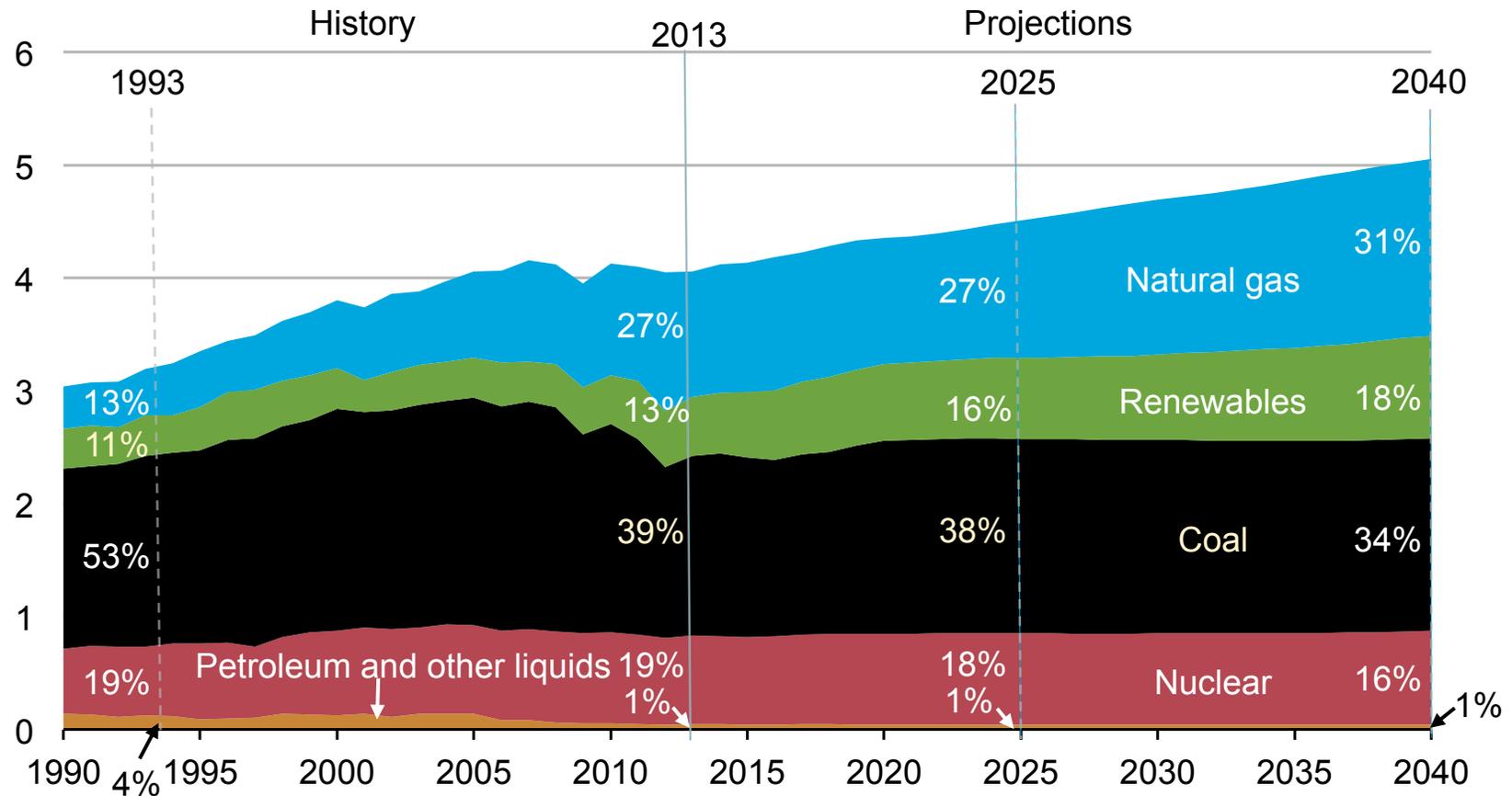
U.S. electricity use and GDP
percent growth (rolling average of 3-year periods)



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

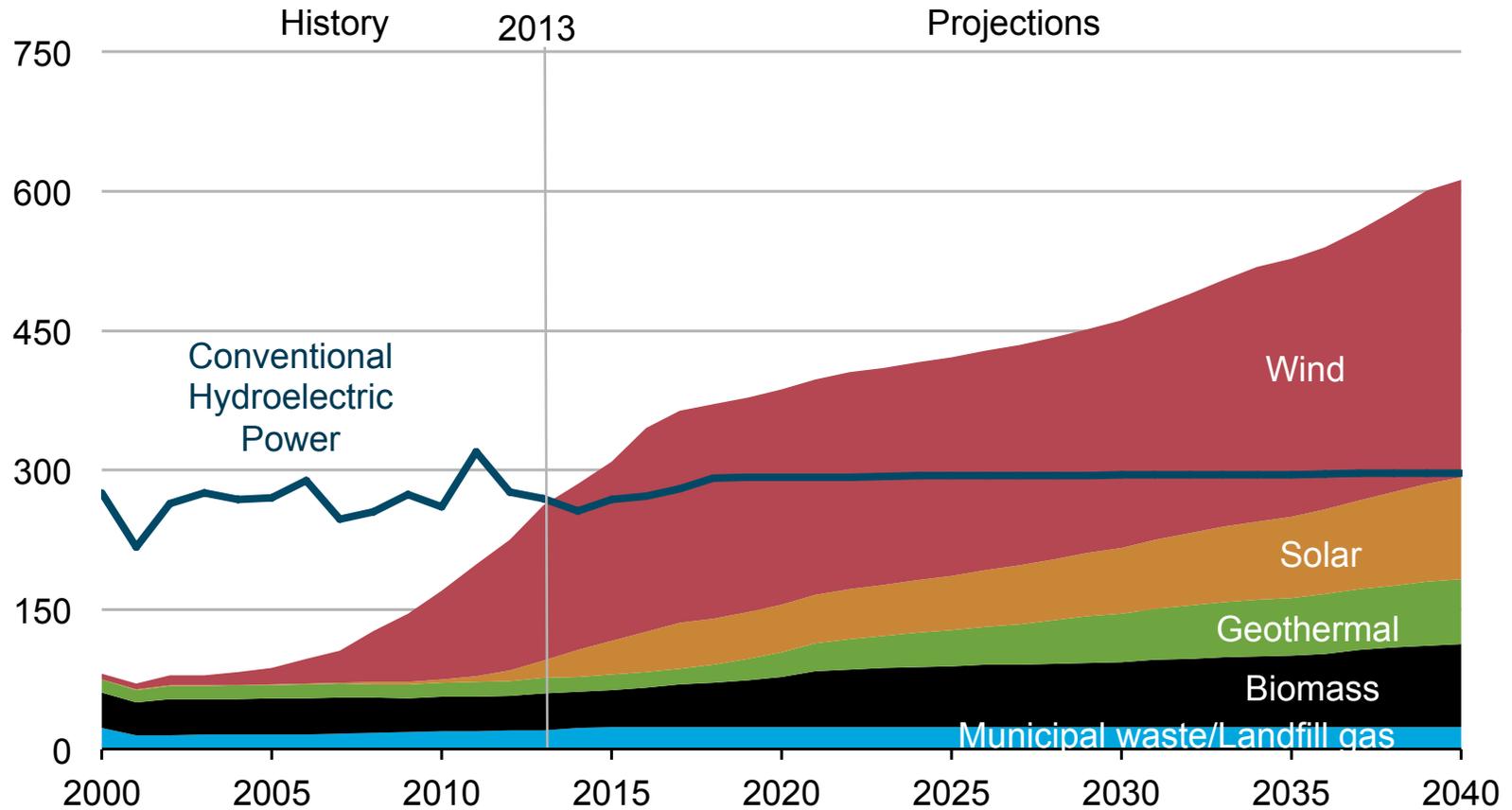
electricity net generation
trillion kilowatthours



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

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

State Energy Profiles | <http://www.eia.gov/state>

Drilling Productivity Report | <http://www.eia.gov/petroleum/drilling/>