

# *Annual Energy Outlook 2014*

## Early Release Reference Case



---

*AEO2014 Early Release Rollout Presentation*

*Paul H. Nitze School of Advanced International Studies*

*Johns Hopkins University*

*December 16, 2013 | Washington, D.C.*

*by*

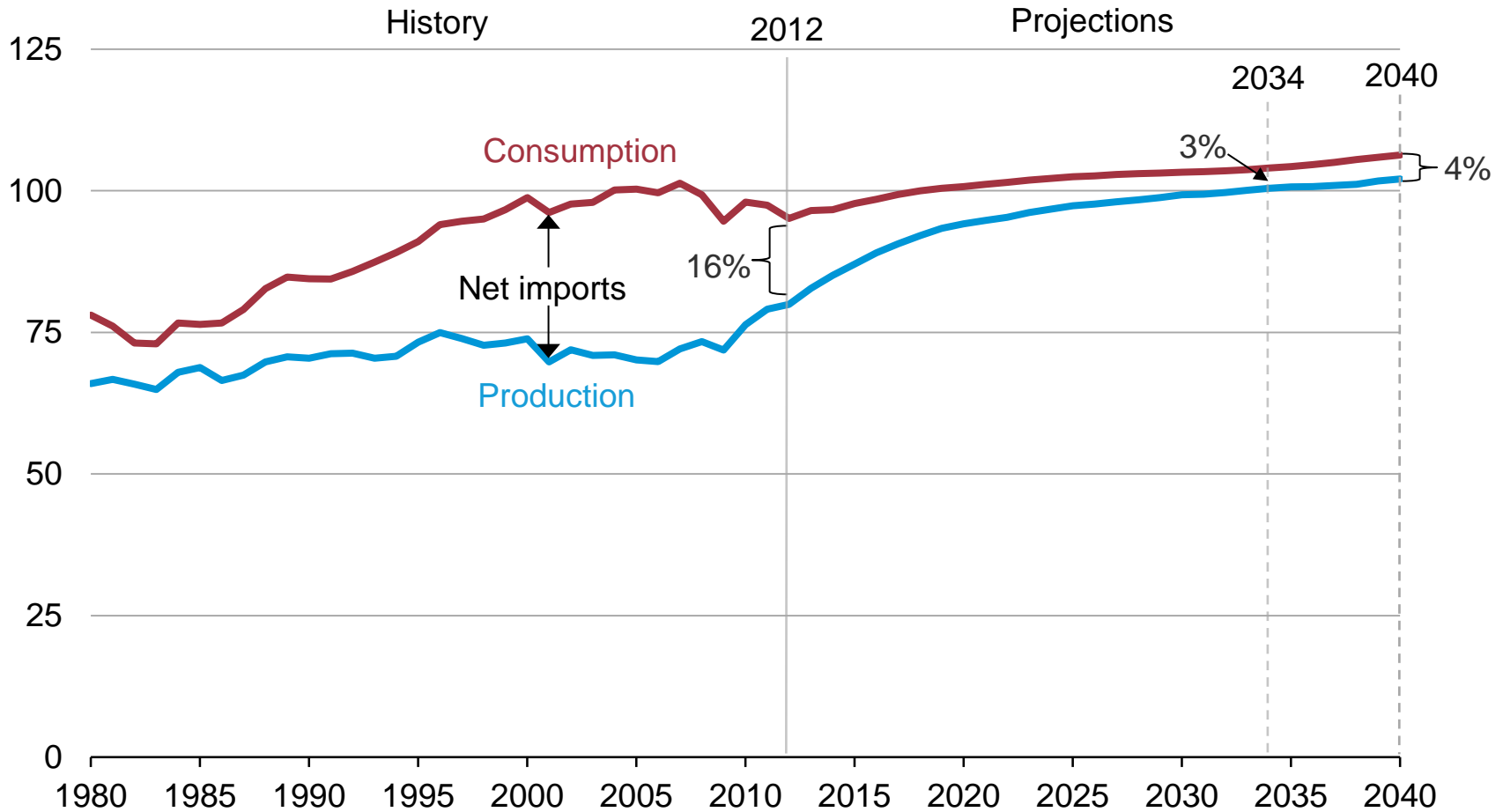
*Adam Sieminski, Administrator*

## Key results from the *AEO2014* Reference case

- Growing domestic production of natural gas and oil continues to reshape the U.S. energy economy, with crude oil approaching the 1970 all-time high of 9.6 million barrels per day
- Light-duty vehicle energy use declines sharply reflecting slowing growth in vehicle miles traveled and accelerated improvement in vehicle efficiency
- With continued growth in shale gas production, natural gas becomes the largest source of U.S. electric power generation, surpassing coal by 2035, and boosting production and natural gas consumption in manufacturing
- Strong growth in domestic natural gas production supports increased exports of both pipeline and liquefied natural gas
- With strong growth in domestic oil and gas production, U.S. dependence on imported fuels falls sharply
- Improved efficiency of energy use and a shift away from carbon-intensive fuels keep U.S. energy-related carbon dioxide emissions below their 2005 level through 2040

# Growth in U.S. energy production outstrips growth in consumption leading to a reduction in net imports

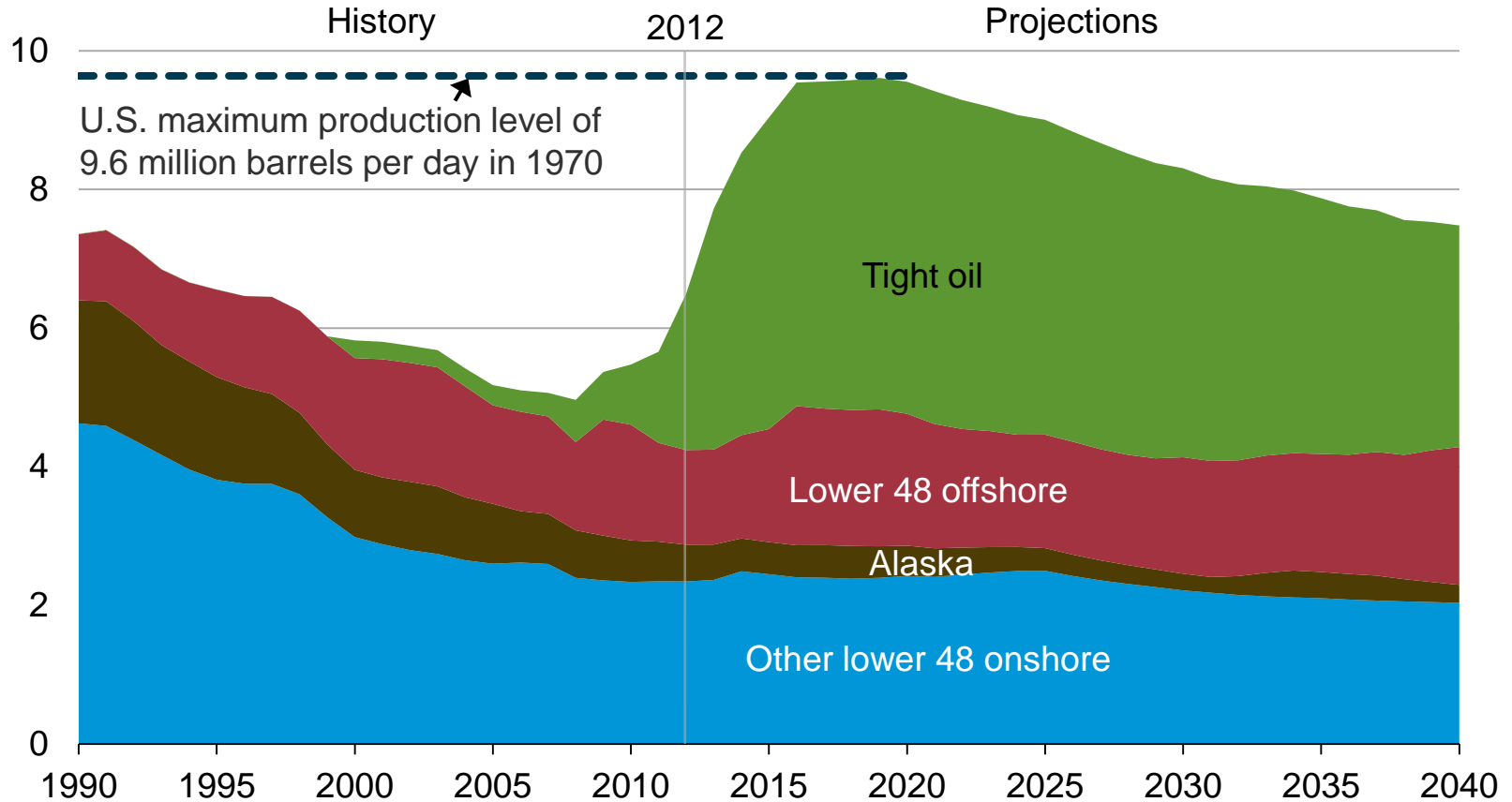
U.S. energy production and consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2014 Early Release

# Growing tight oil and offshore crude oil production drive U.S. output close to historical high

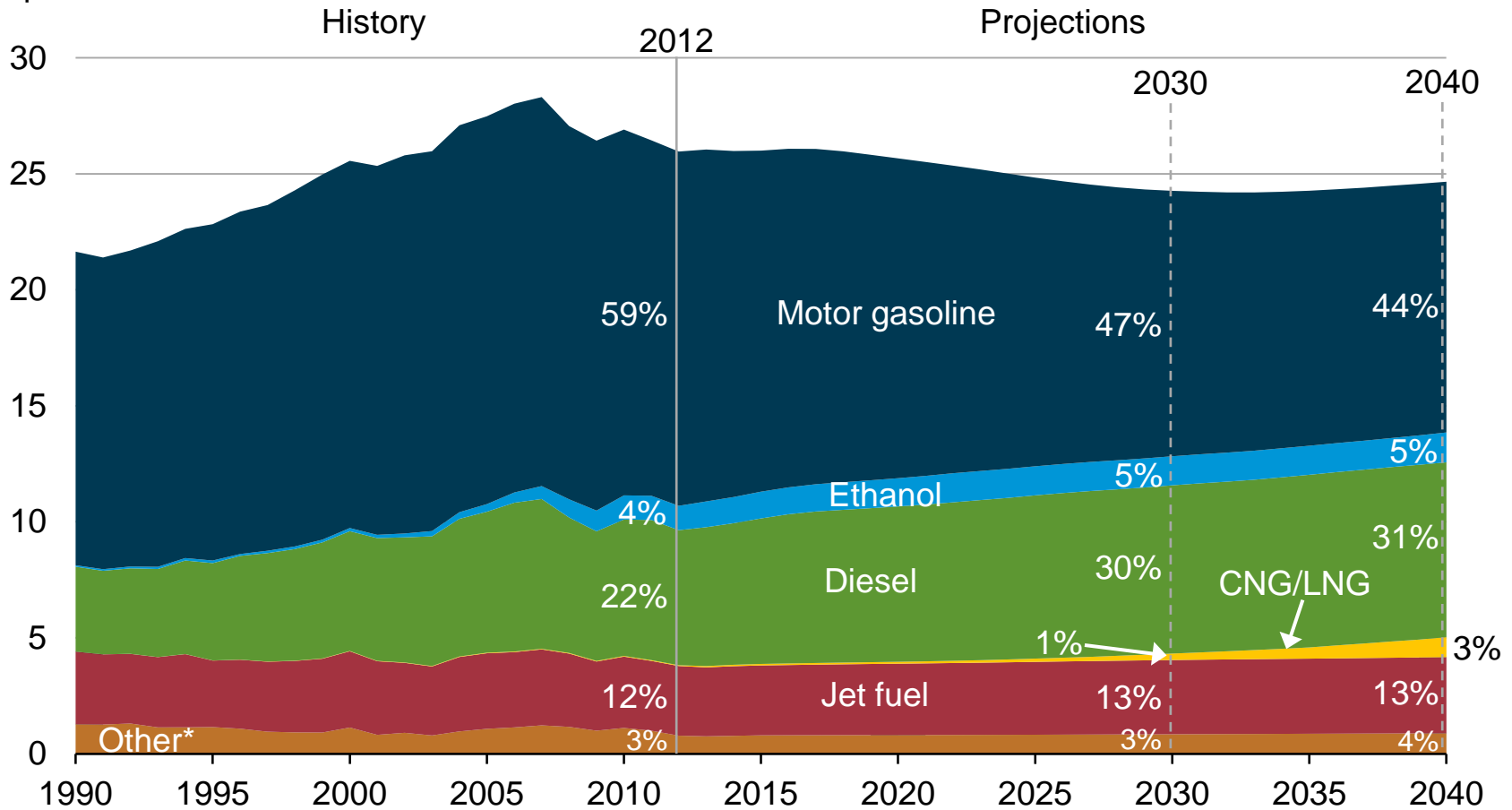
U.S. crude oil production  
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# Transportation sector motor gasoline demand declines, while diesel fuel accounts for a growing portion of the market

transportation energy consumption by fuel  
quadrillion Btu



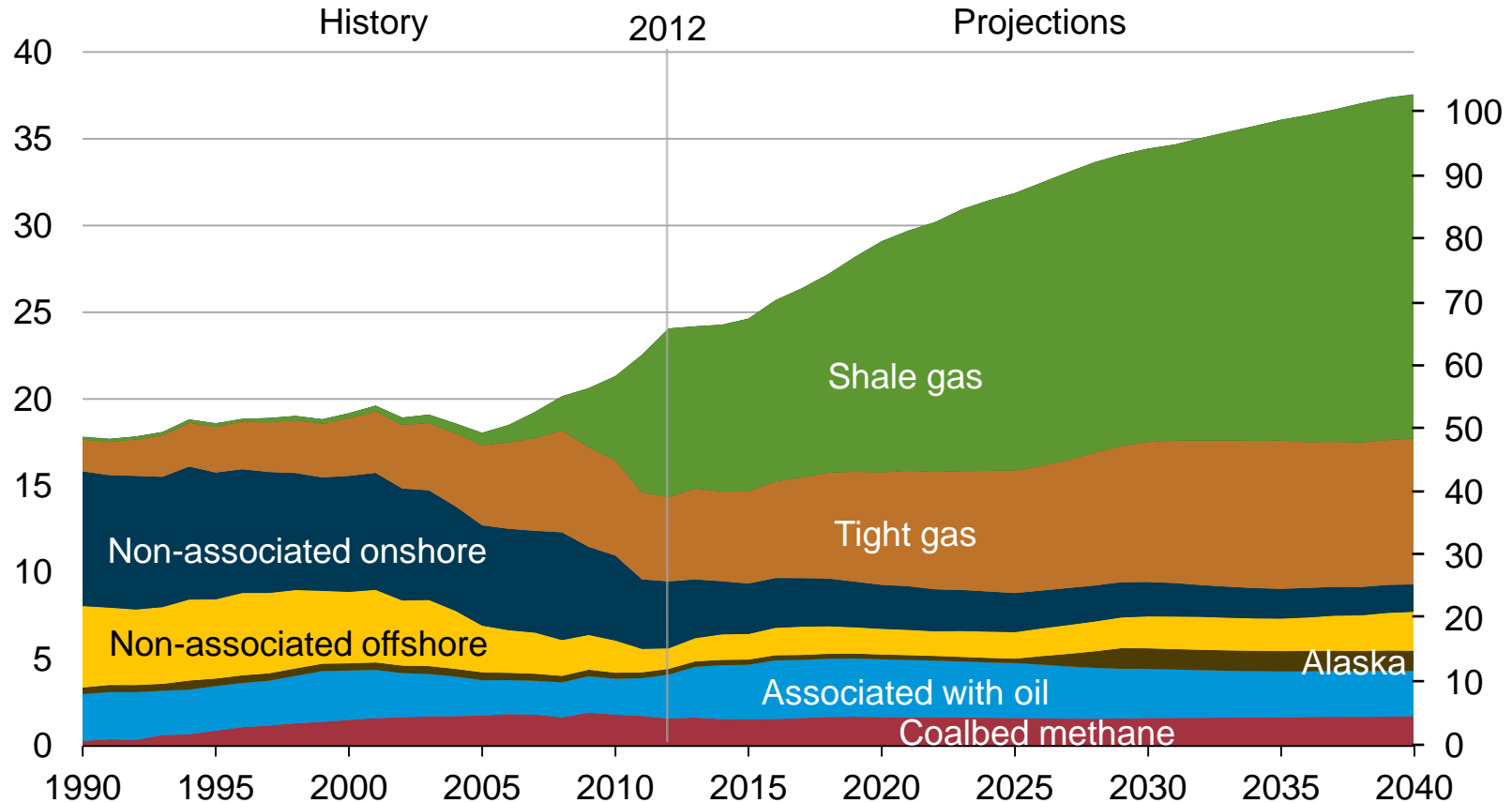
Source: EIA, Annual Energy Outlook 2014 Early Release

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

# Shale gas leads U.S. production growth

U.S. dry natural gas production  
trillion cubic feet

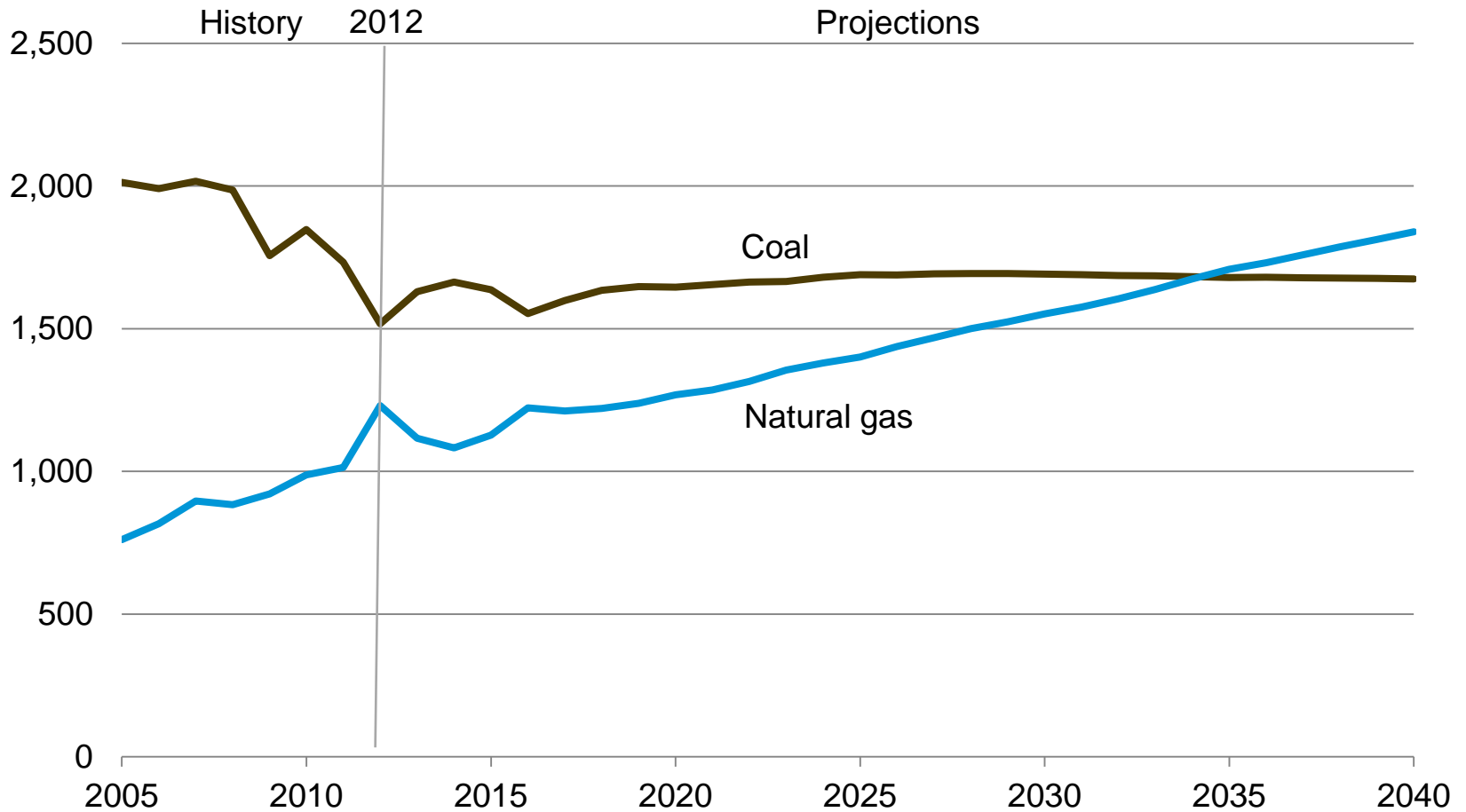
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# Electricity generation from natural gas surpasses coal

electricity generation by fuel  
billion kilowatthours

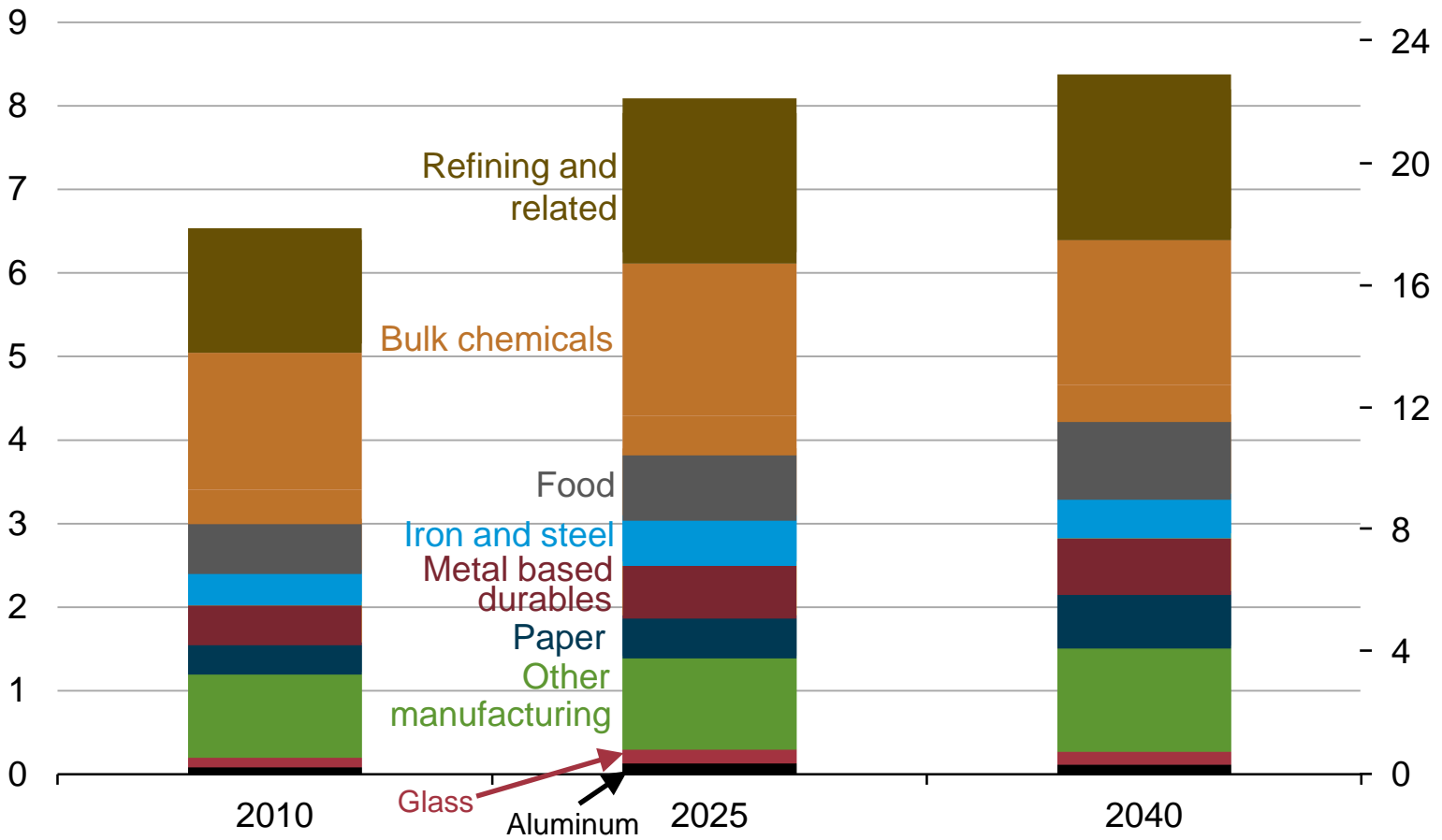


Source: EIA, Annual Energy Outlook 2014 Early Release

# Manufacturing output and natural gas use grows with low natural gas prices, particularly in the near term

manufacturing natural gas consumption  
quadrillion Btu

billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

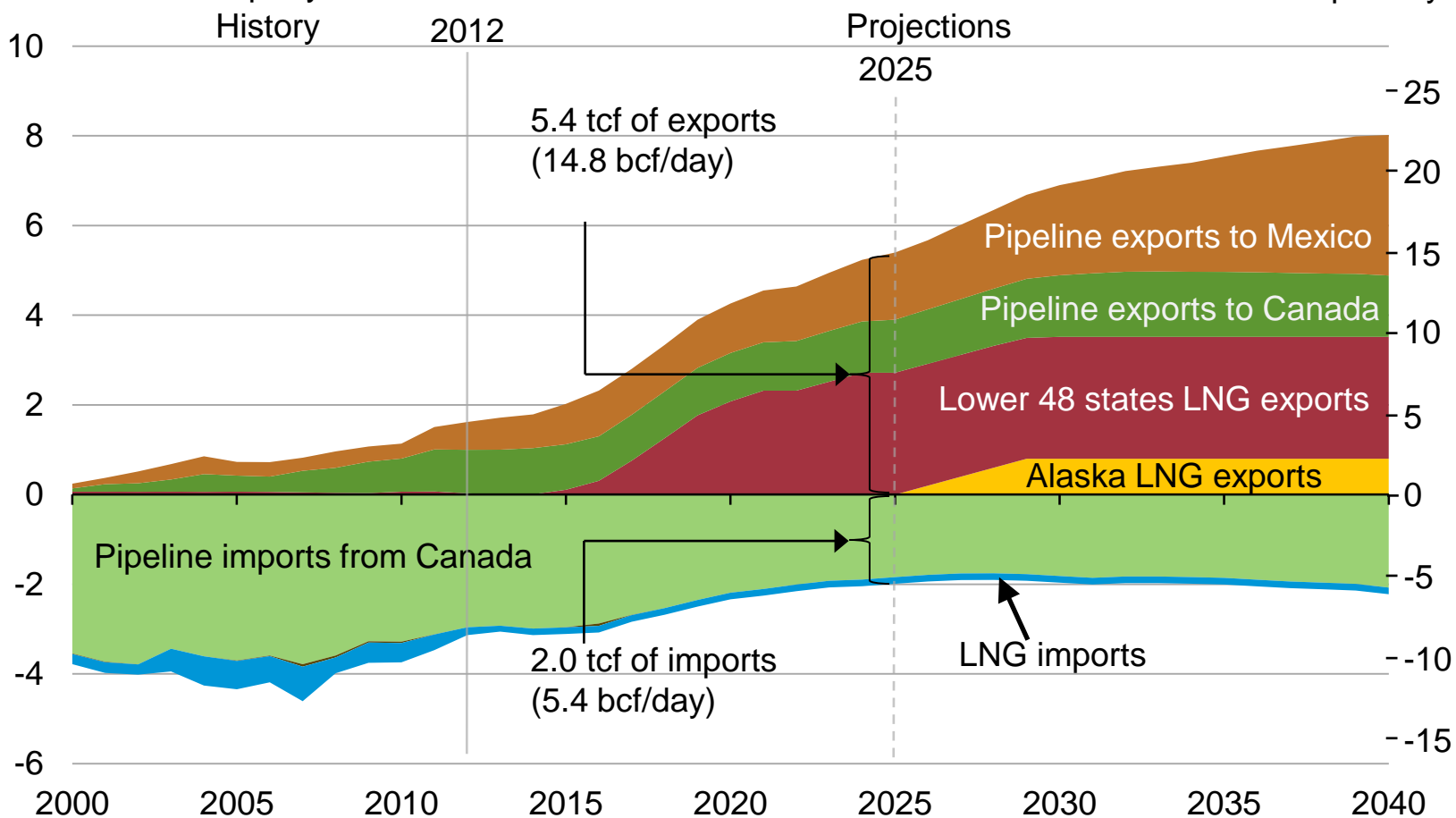


# U.S. natural gas gross exports exceed 5 tcf in 2025

U.S. natural gas imports and exports

trillion cubic feet per year

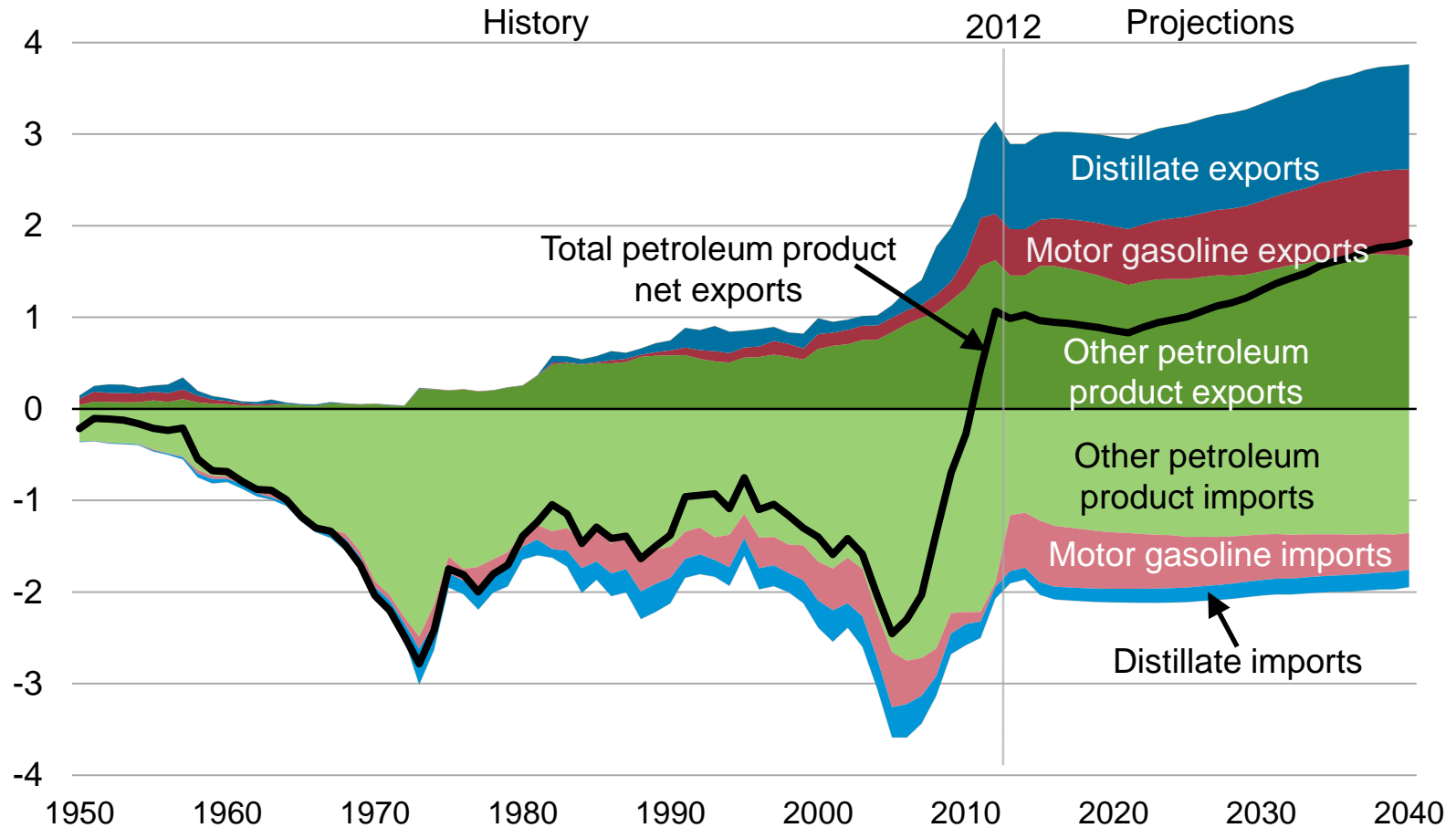
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# U.S. maintains status as a net exporter of petroleum products

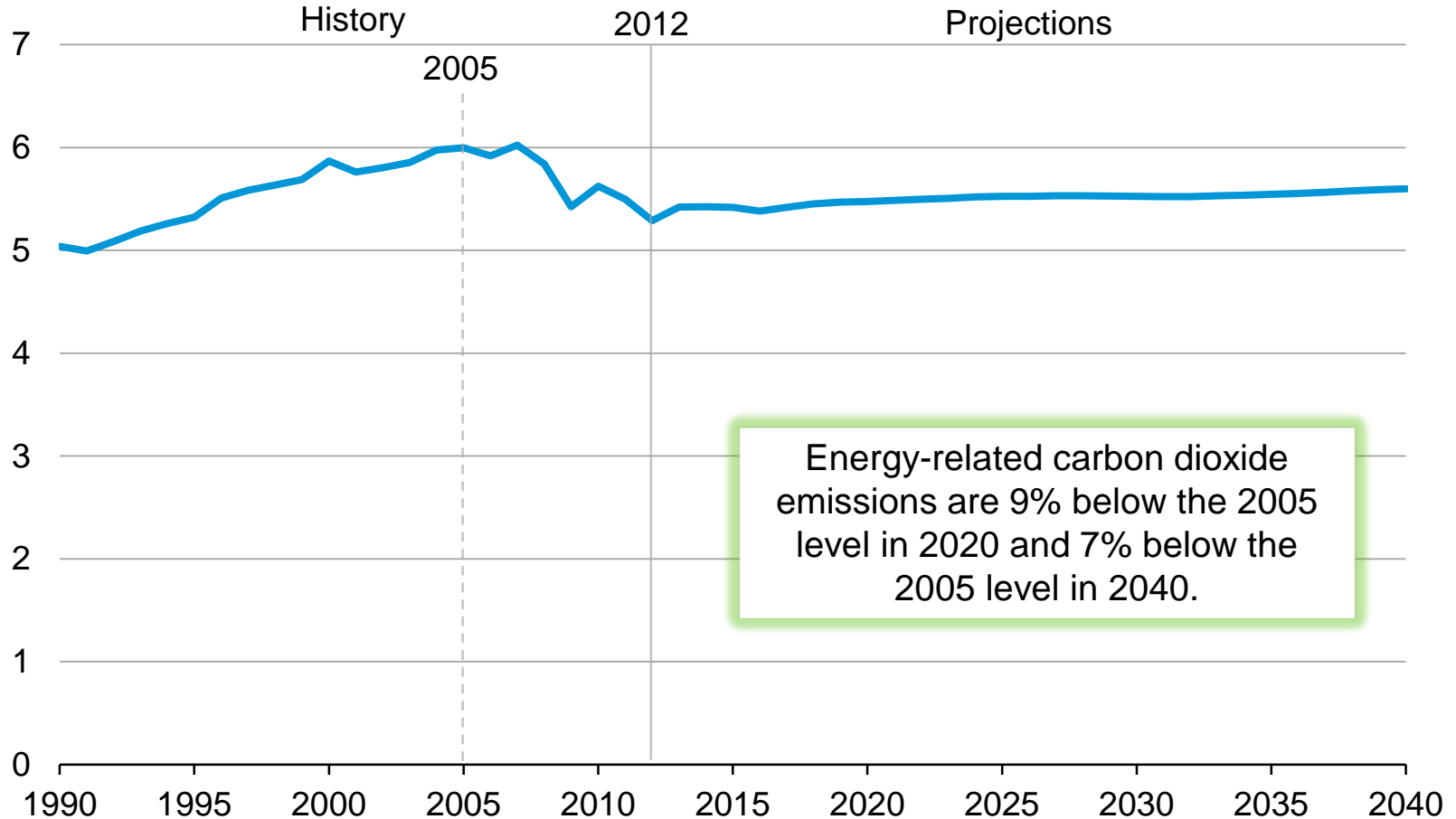
U.S. petroleum product imports and exports  
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# Energy-related CO<sub>2</sub> emissions remain below the 2005 level over the projection period

carbon dioxide emissions  
billion metric tons

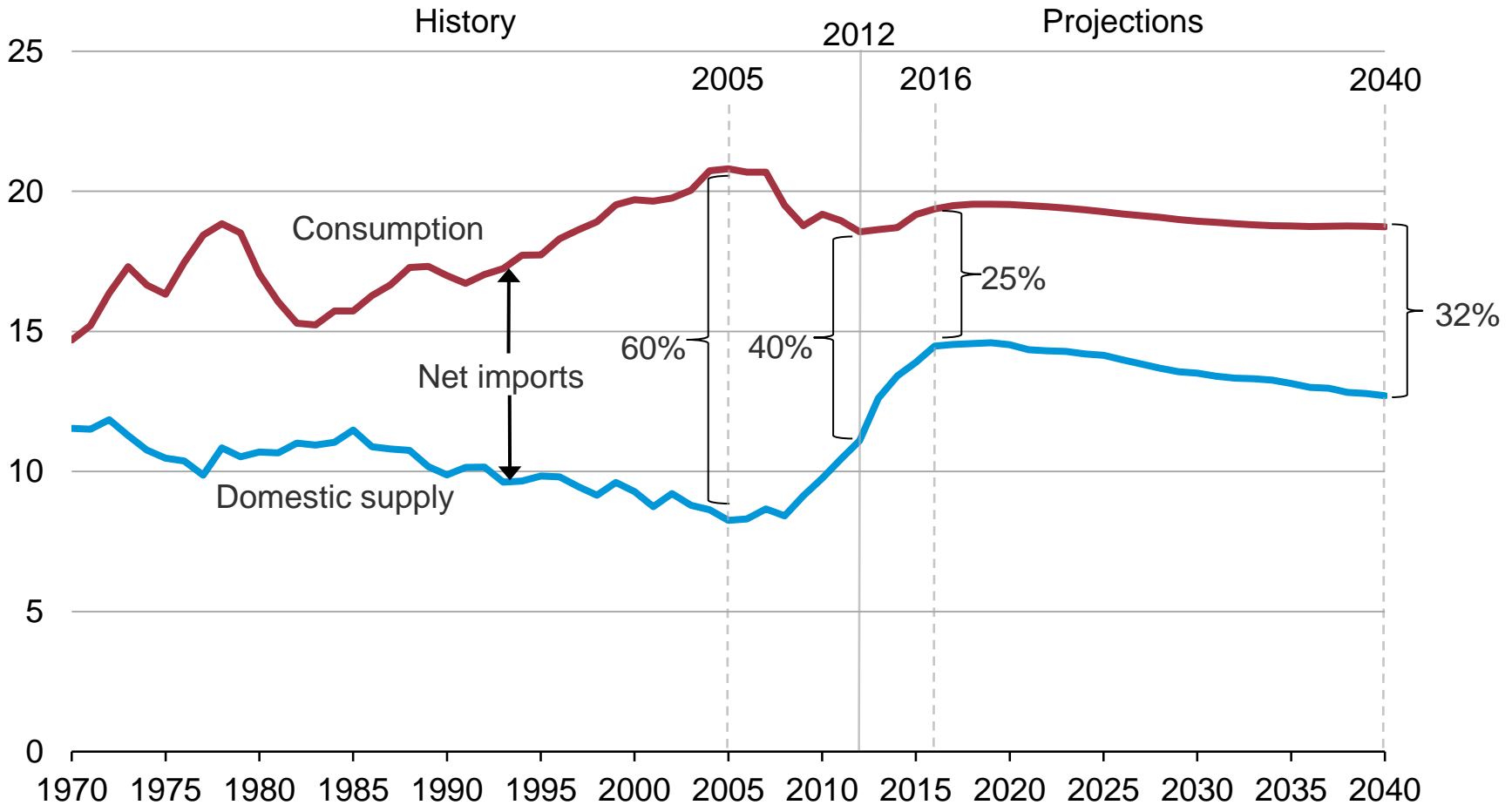


Source: EIA, Annual Energy Outlook 2014 Early Release

# Petroleum and other liquid supply

# U.S. dependence on imported liquids declines, particularly in the near term

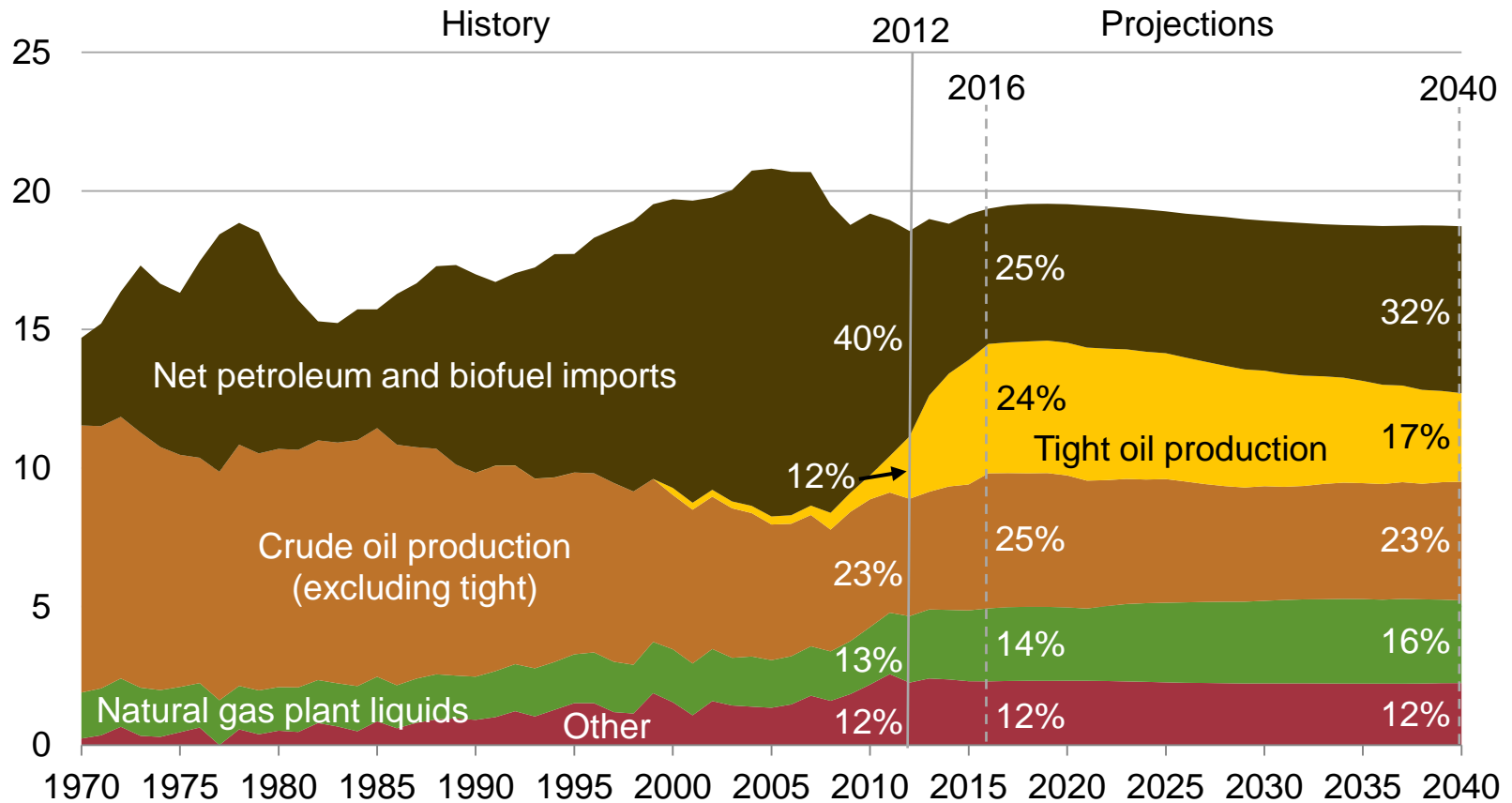
U.S. liquid fuel supply  
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# Increased production of tight oil and greater fuel efficiency drive decline in petroleum and other liquids 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

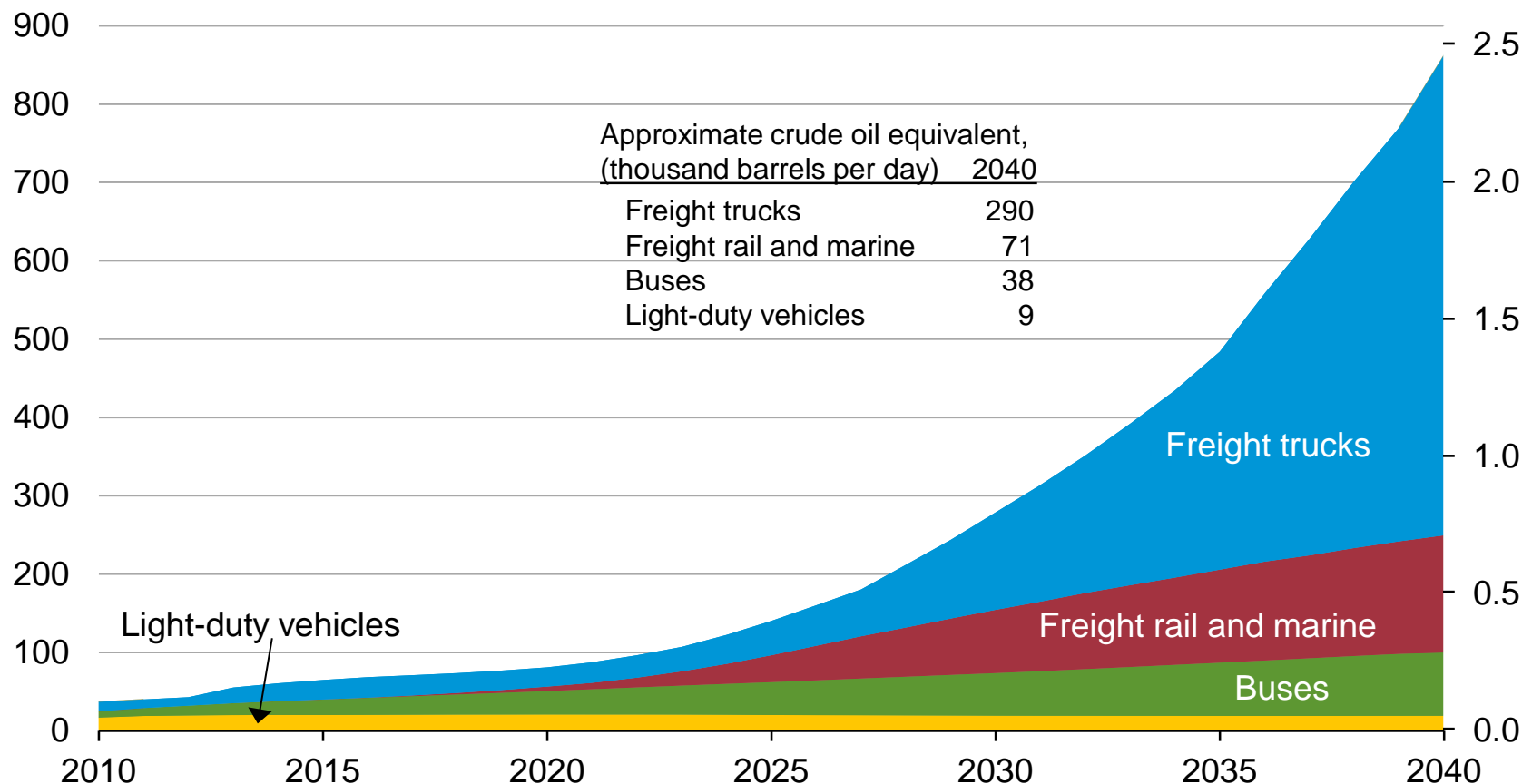
Source: EIA, Annual Energy Outlook 2014 Early Release

# Natural gas use in the transportation sector grows rapidly with the largest share in freight trucks

natural gas use by mode

trillion Btu

billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

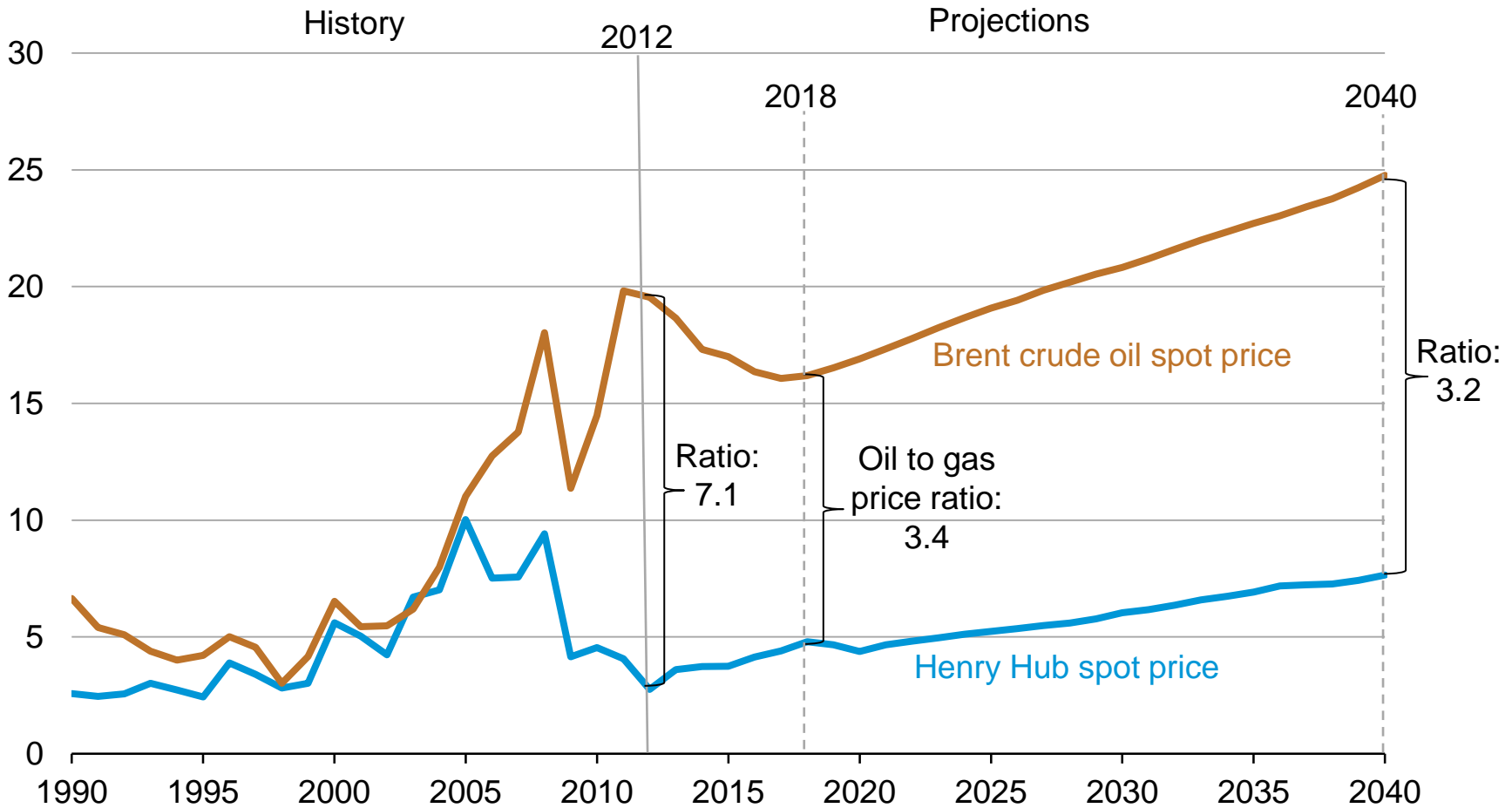
# Natural gas



# U.S. natural gas prices remain well below crude oil prices

energy spot prices

2012 dollars per million Btu



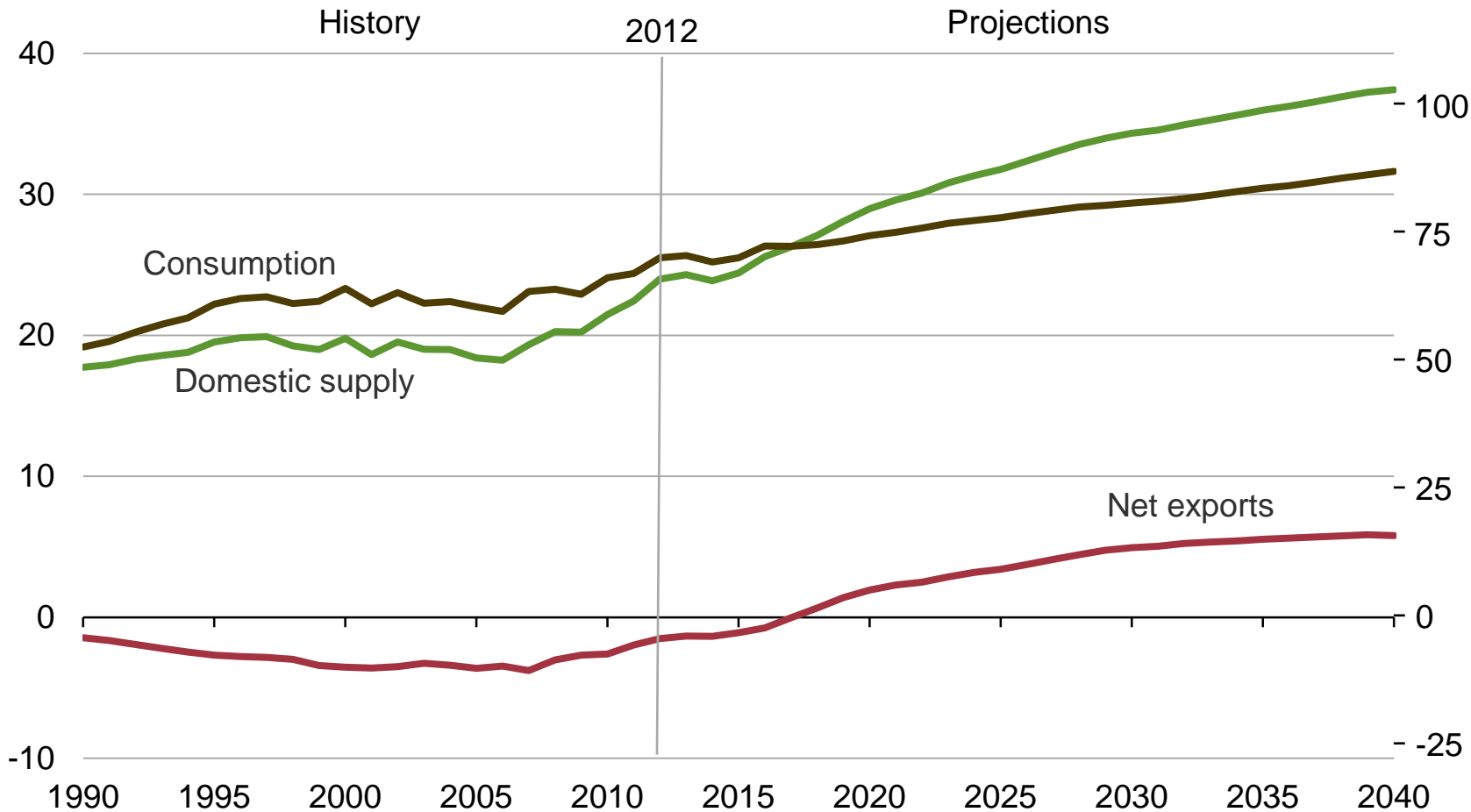
Source: EIA, Annual Energy Outlook 2014 Early Release

# U.S. becomes a net exporter of natural gas in the near future

U.S. dry natural gas

trillion cubic feet per year

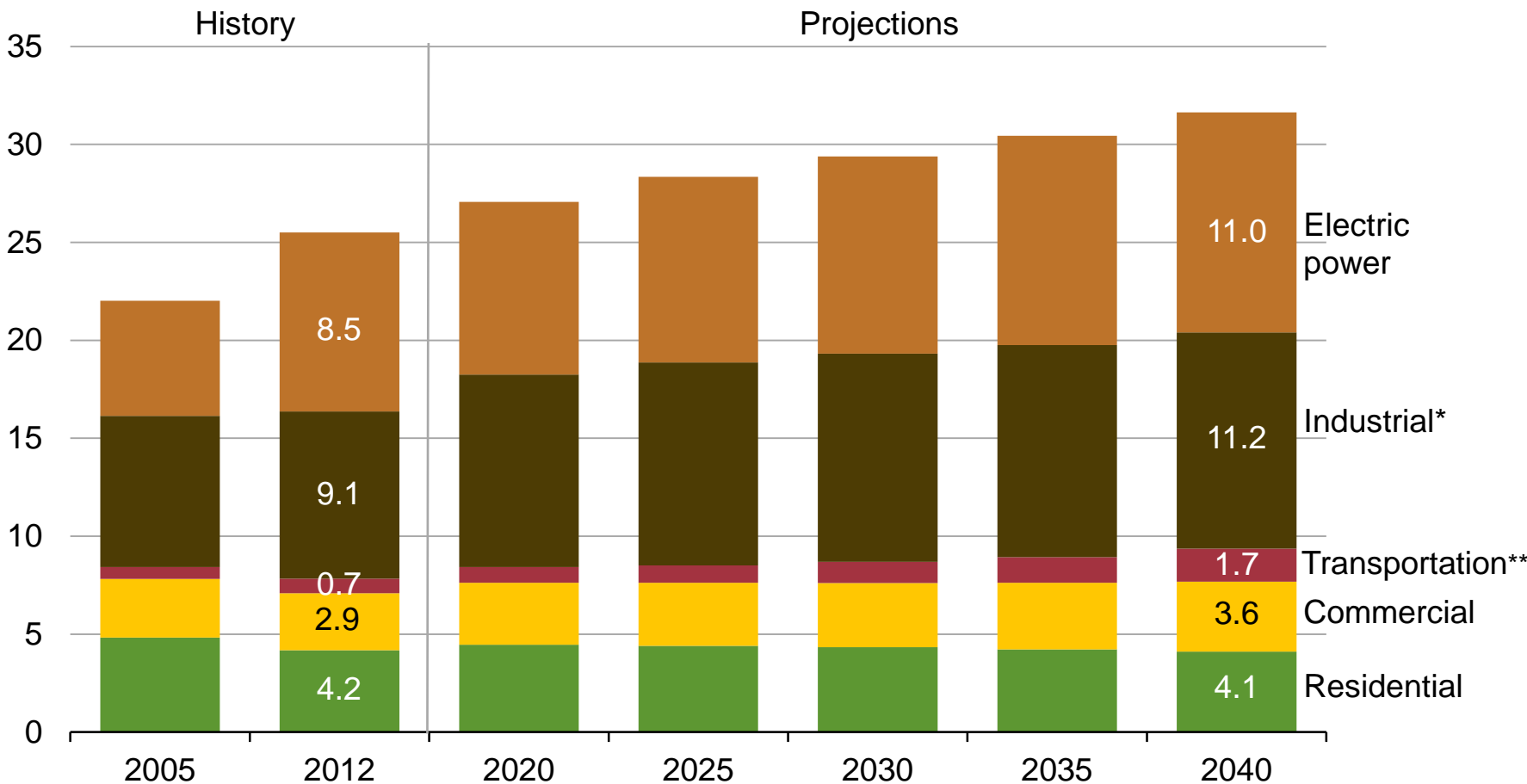
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

# Natural gas consumption growth is driven by electric power, industrial, and transportation use

U.S. dry gas consumption  
trillion cubic feet



Source: EIA, Annual Energy Outlook 2014 Early Release

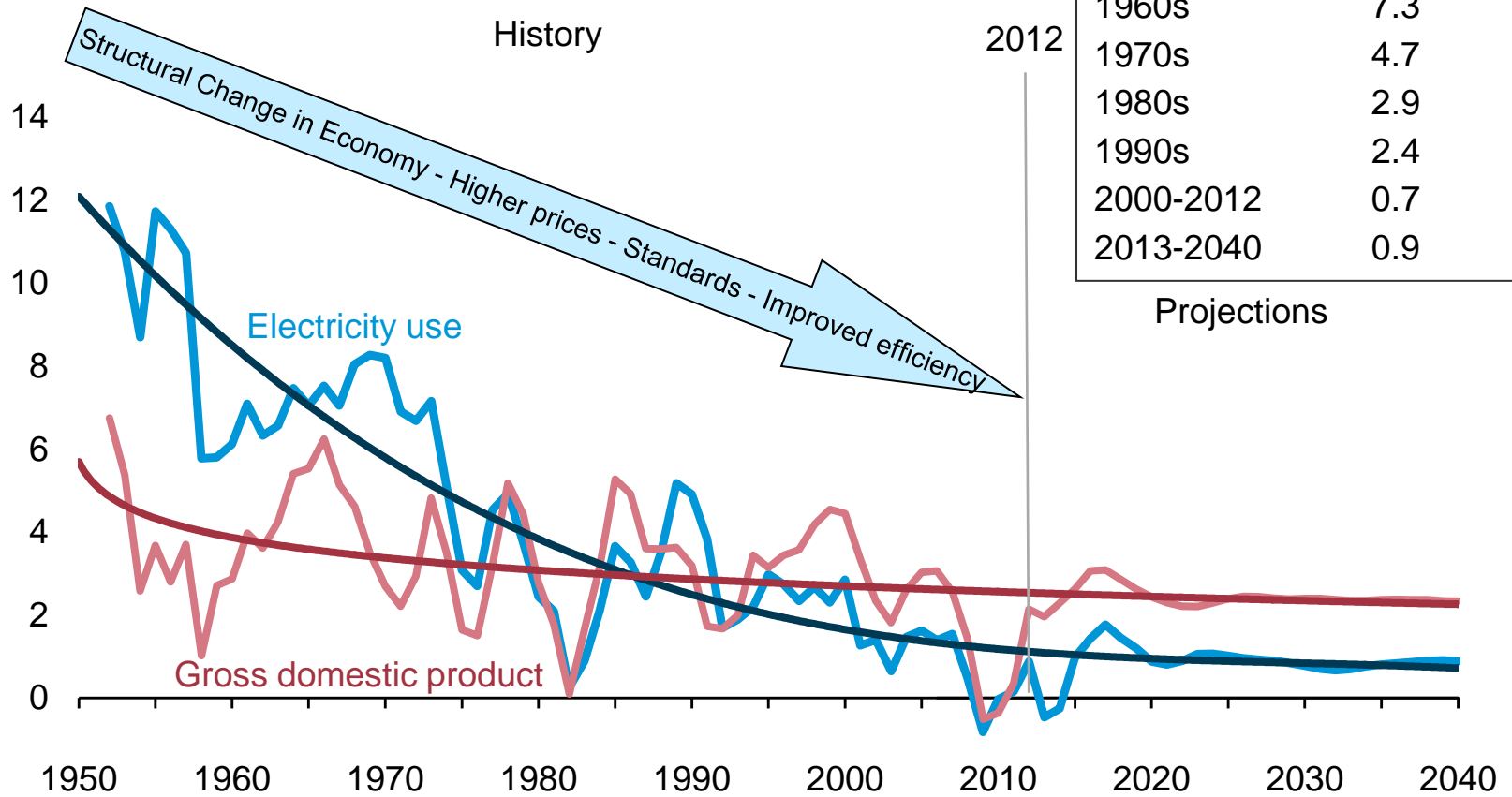
\*Includes combined heat-and-power and lease and plant fuel

\*\*Includes pipeline fuel

# Electricity

# Growth in electricity use slows, but still increases by 29% from 2012 to 2040

U.S. electricity use  
percent growth (3-year rolling average)

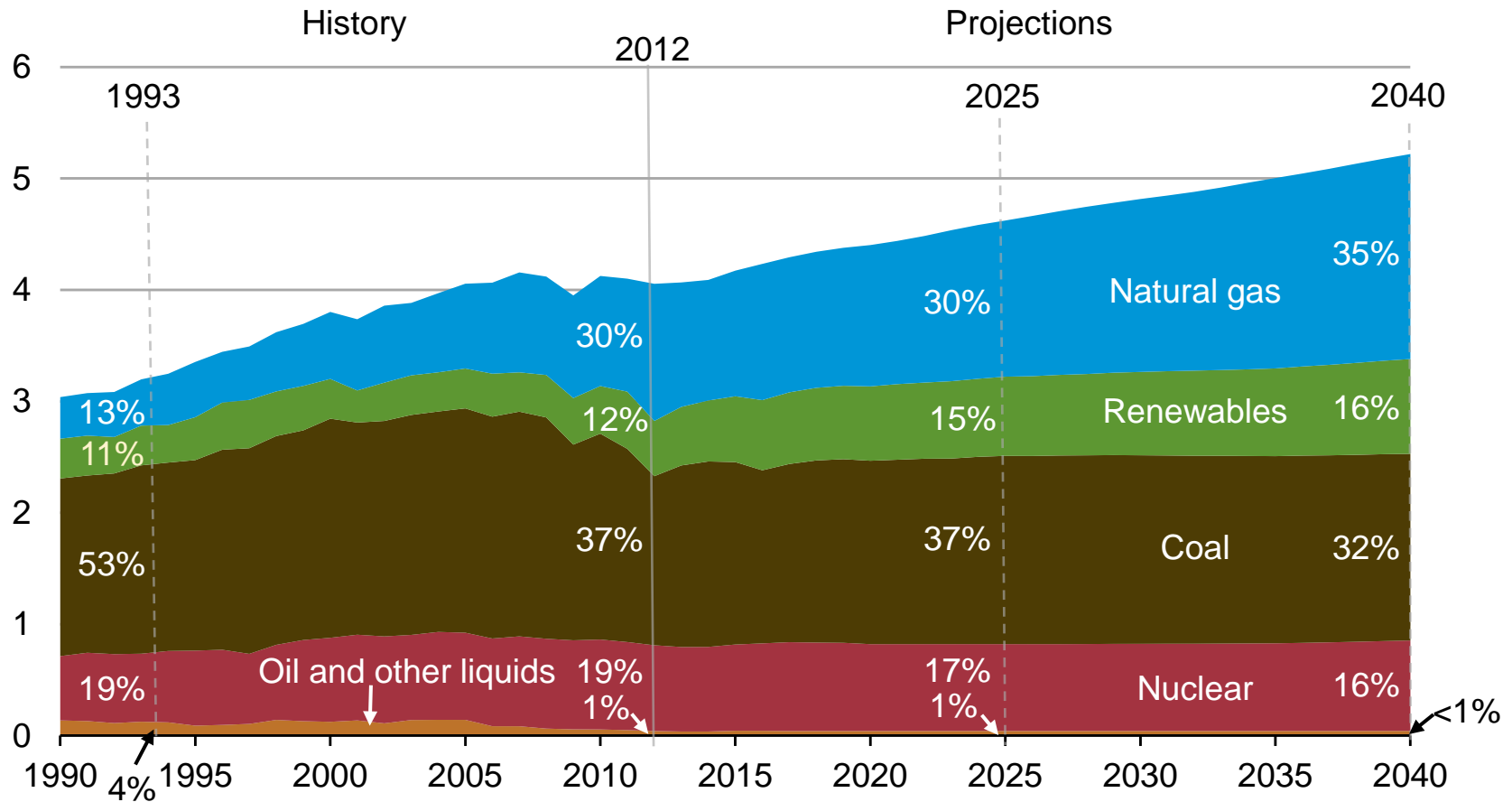


Period	Annual Growth	
	Electricity use	GDP
1950s	9.8	4.1
1960s	7.3	4.4
1970s	4.7	3.2
1980s	2.9	3.0
1990s	2.4	3.2
2000-2012	0.7	1.8
2013-2040	0.9	2.4

Source: EIA, Annual Energy Outlook 2014 Early Release

# Over time the electricity mix gradually shifts to lower-carbon options, led by growth in natural gas and renewable generation

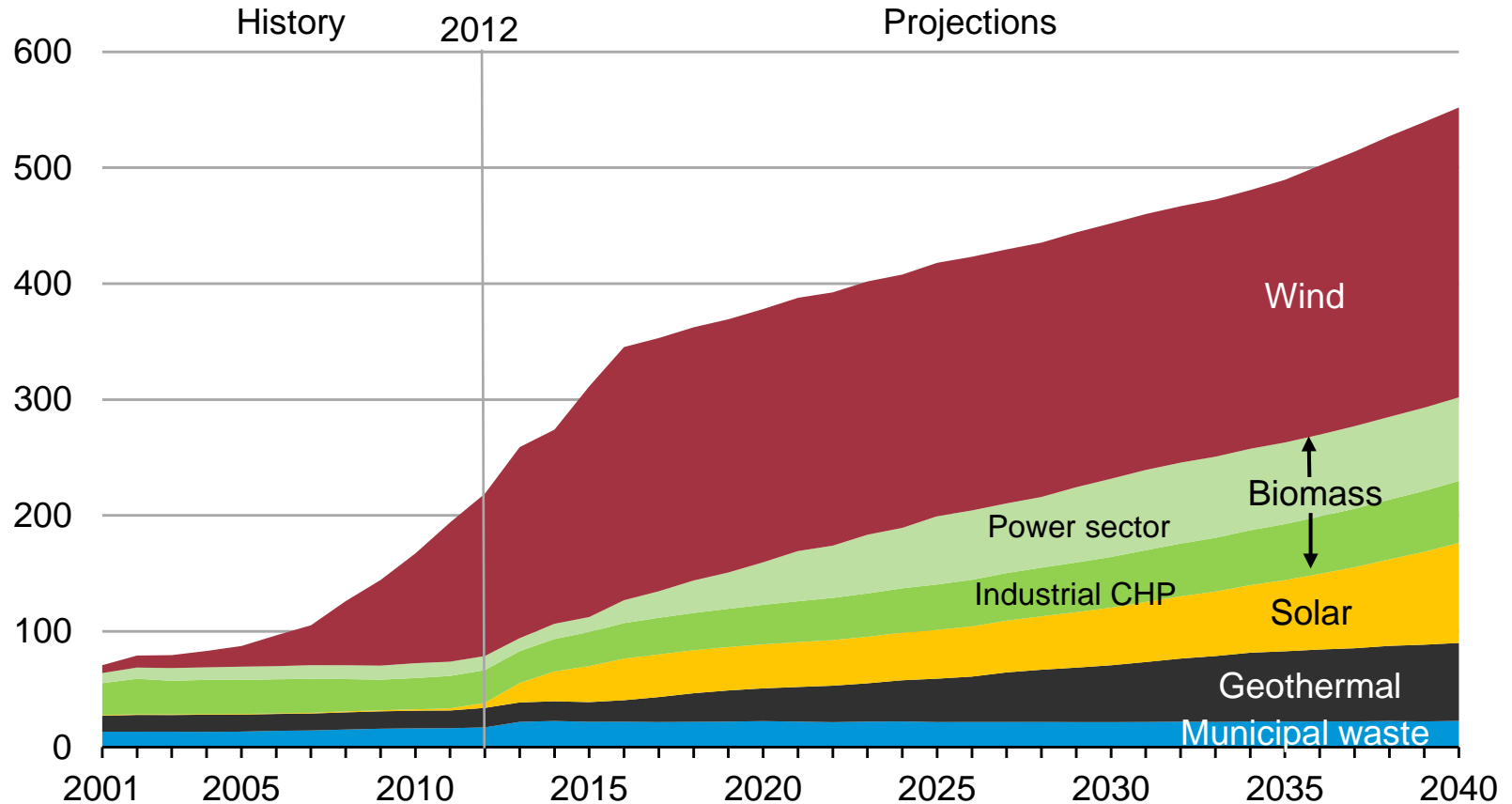
electricity net generation  
trillion kilowatthours per year



Source: EIA, Annual Energy Outlook 2014 Early Release

# Non-hydro renewable generation more than doubles between 2012 and 2040

non-hydropower renewable generation  
billion kilowatthours per year



Source: EIA, Annual Energy Outlook 2013 Early Release

# For more information

U.S. Energy Information Administration home page | [www.eia.gov](http://www.eia.gov)

Annual Energy Outlook | [www.eia.gov/forecasts/aeo](http://www.eia.gov/forecasts/aeo)

Short-Term Energy Outlook | [www.eia.gov/forecasts/steo](http://www.eia.gov/forecasts/steo)

International Energy Outlook | [www.eia.gov/forecasts/ieo](http://www.eia.gov/forecasts/ieo)

Today In Energy | [www.eia.gov/todayinenergy](http://www.eia.gov/todayinenergy)

Monthly Energy Review | [www.eia.gov/totalenergy/data/monthly](http://www.eia.gov/totalenergy/data/monthly)

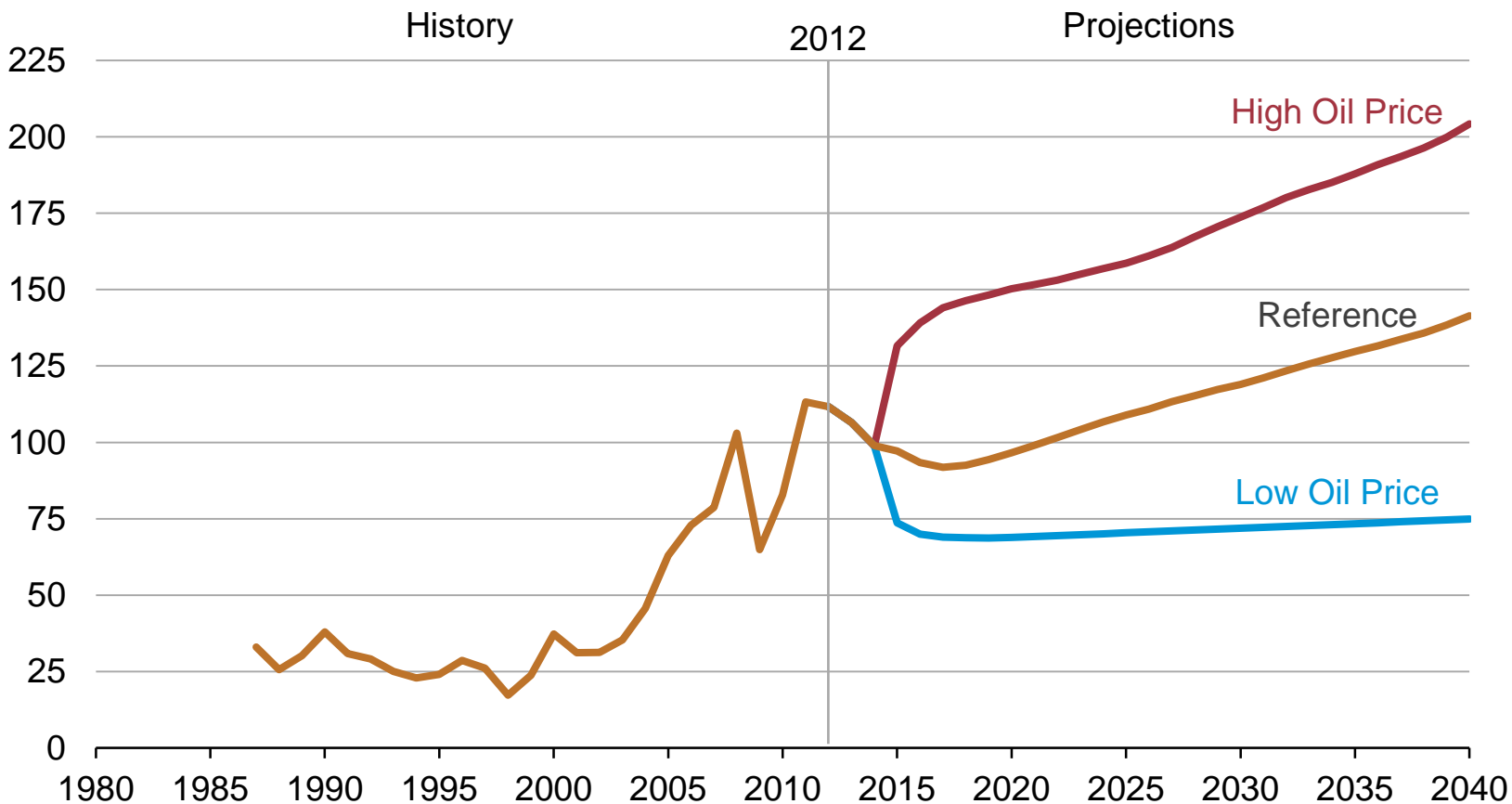
State Energy Portal | [www.eia.gov/state](http://www.eia.gov/state)



# Supplemental slides

# Reference case oil price initially drops and then rises steadily, but there is uncertainty about the future trajectory

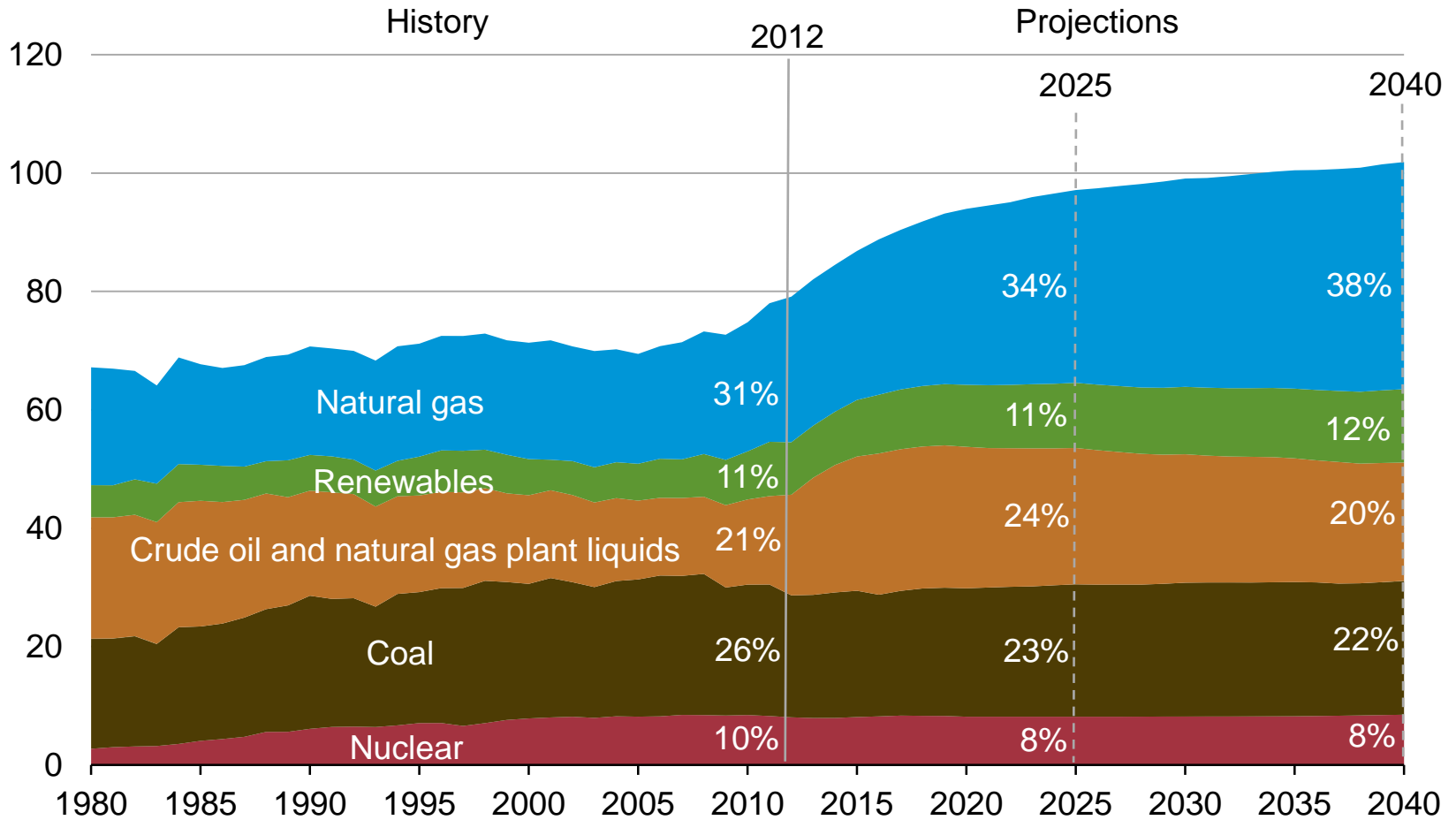
annual average price of Brent crude oil  
real 2012 dollars per barrel



Source: EIA, Annual Energy Outlook 2014 Early Release

# U.S. production grows rapidly, particularly natural gas, renewables, and liquids in the near term

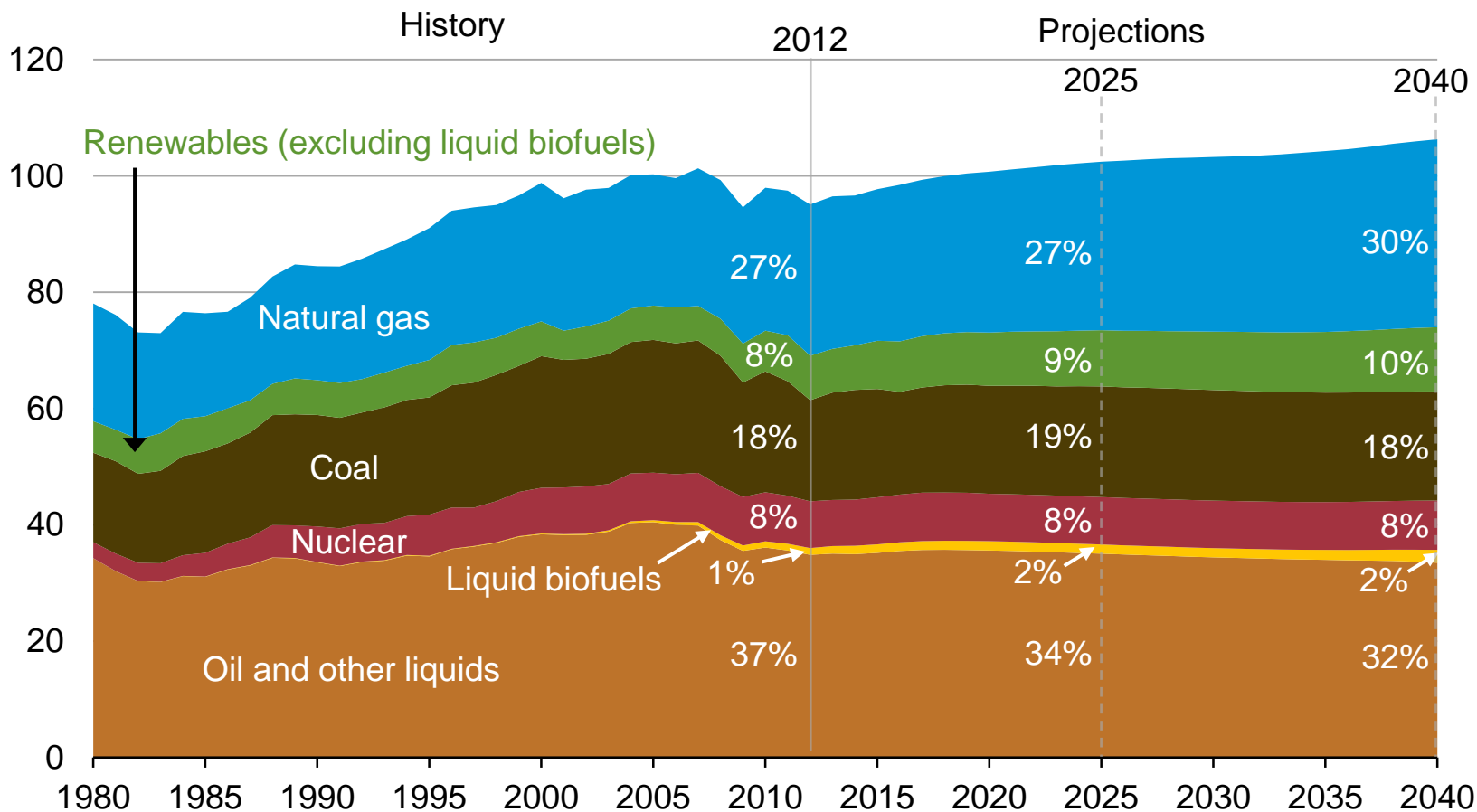
U.S. energy production  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2014 Early Release

# U.S. energy use grows slowly over the projection reflecting steady growth in GDP offset by improving energy efficiency

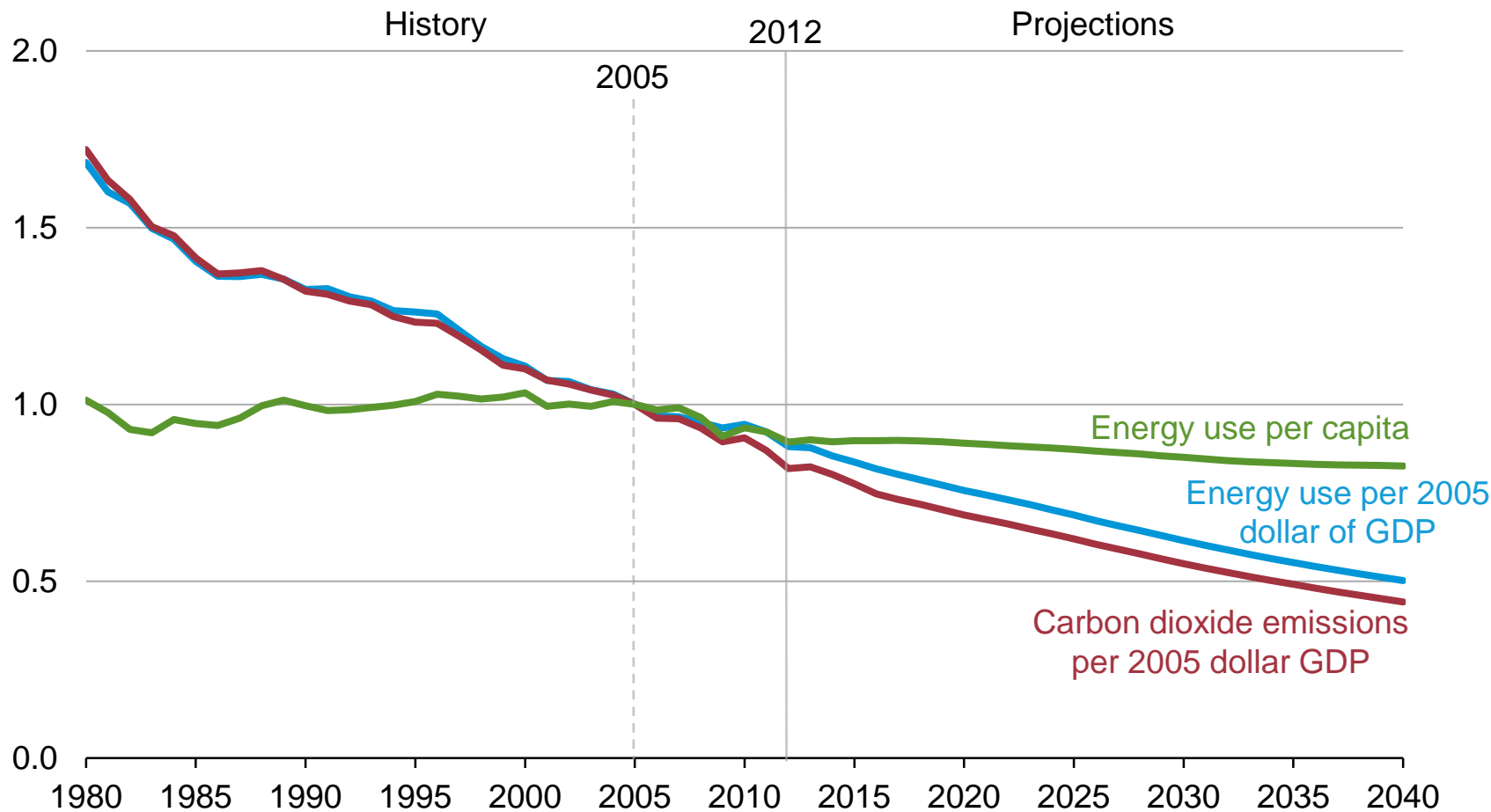
U.S. primary energy consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2014 Early Release

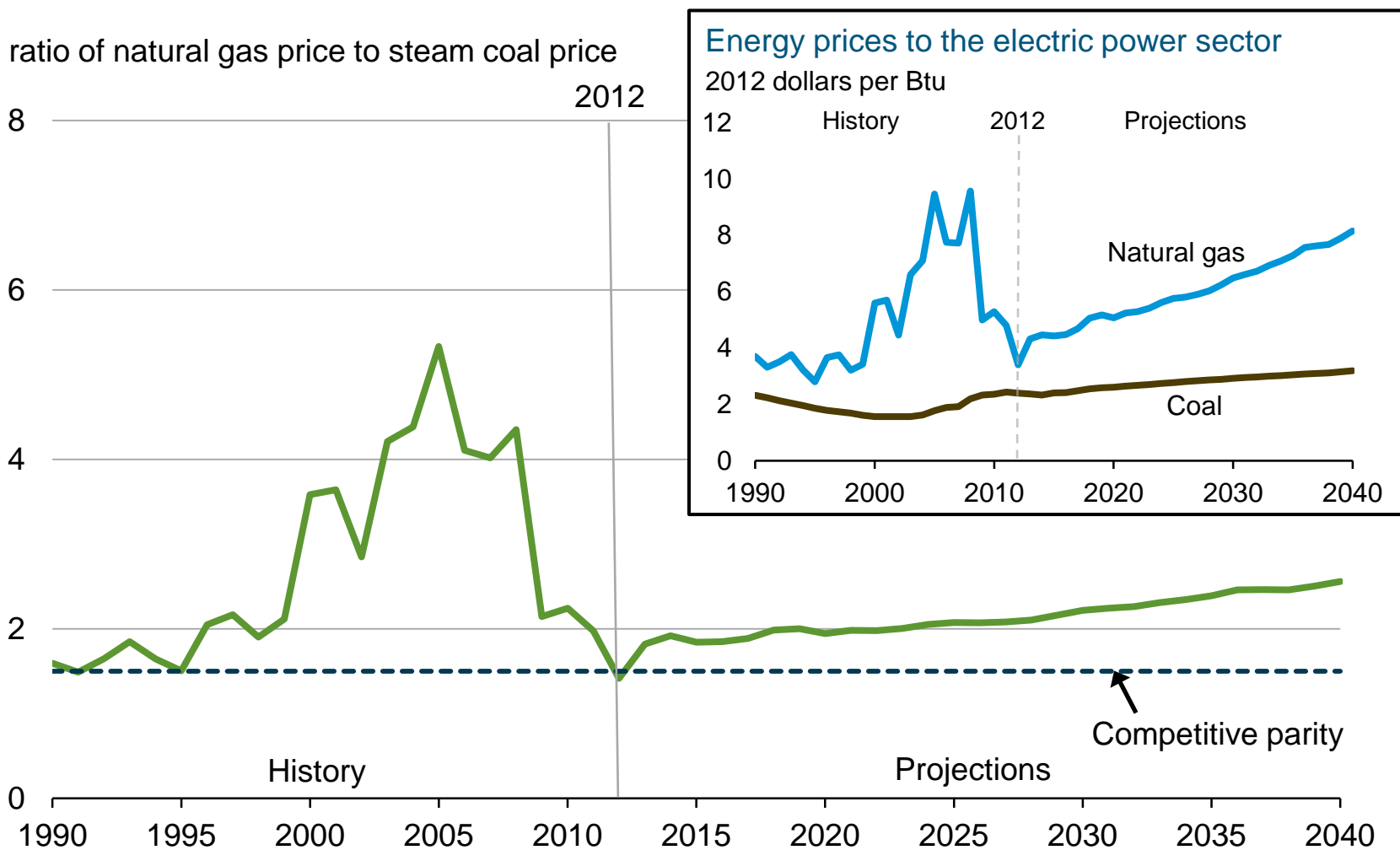
# CO<sub>2</sub> per dollar of GDP declines faster than energy use per dollar of GDP reflecting the shift to lower carbon fuels

energy and emission intensity  
index, 2005=1



Source: EIA, Annual Energy Outlook 2014 Early Release

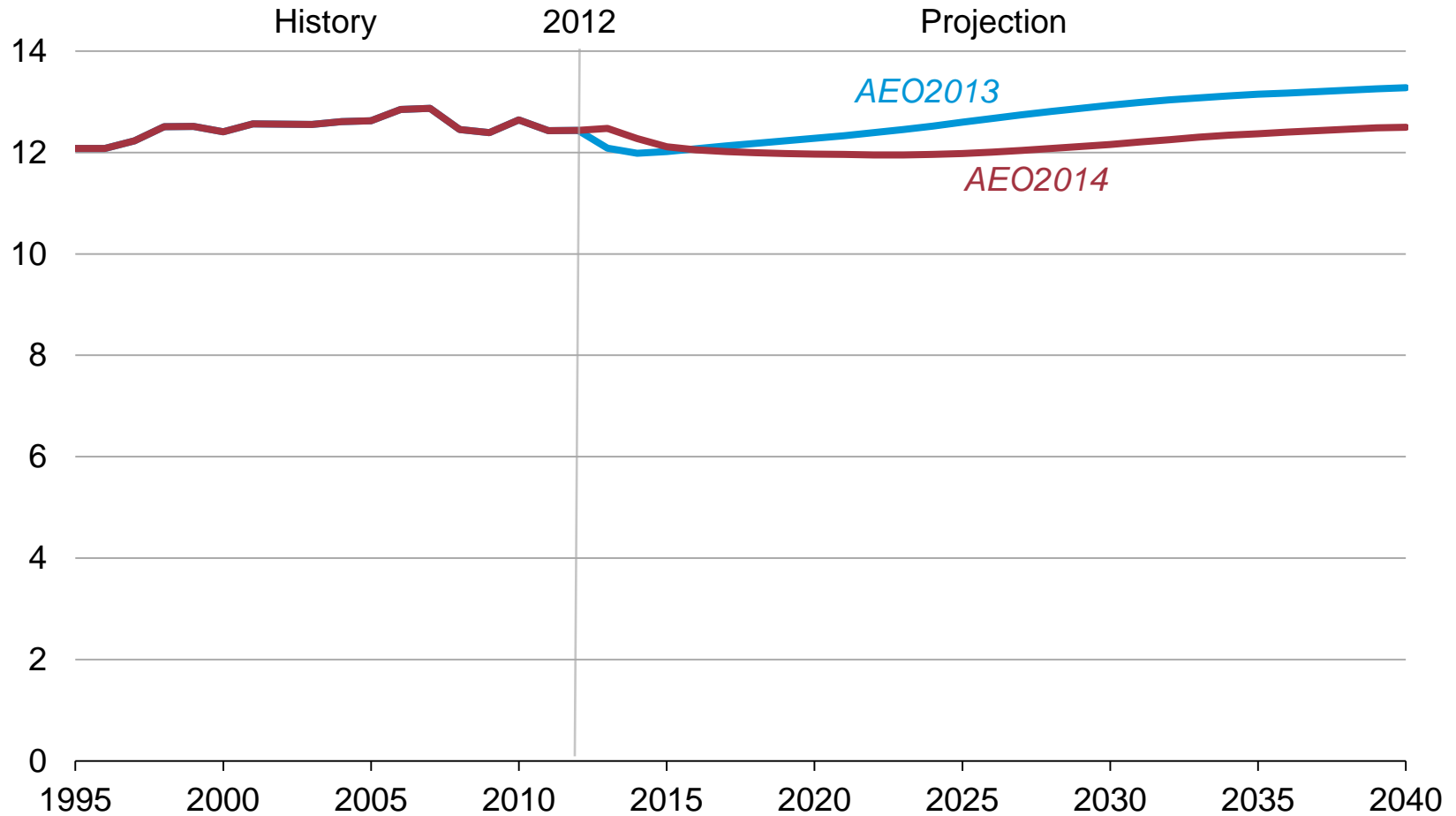
# Coal regains some competitive advantage relative to natural gas over time on a national average basis



Source: EIA, Annual Energy Outlook 2014 Early Release

# VMT per licensed driver decreases until 2024 in *AEO2014* and is much lower than in *AEO2013* due to consideration of age cohorts

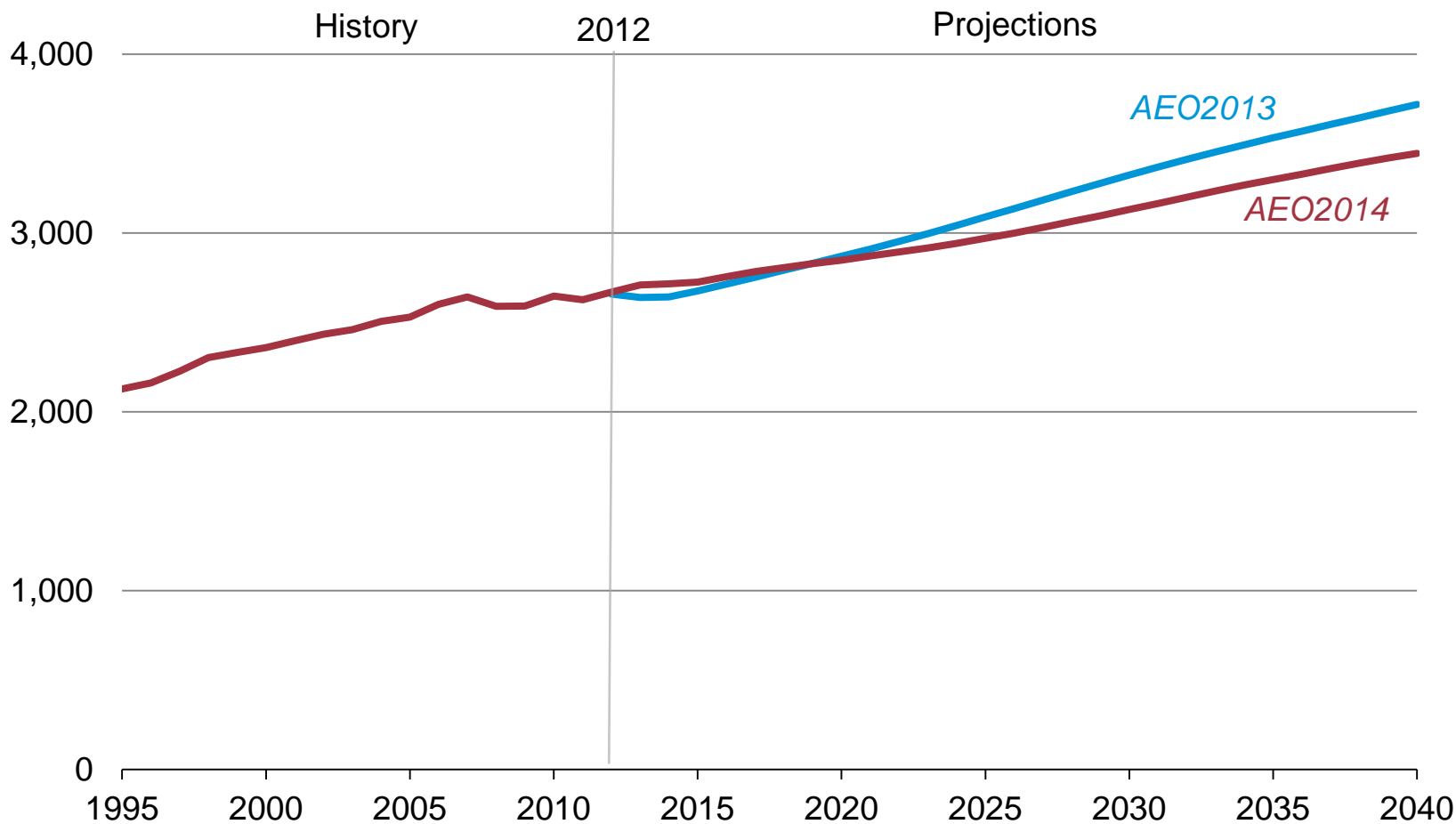
vehicle miles traveled per licensed driver  
thousand miles



Source: EIA, Annual Energy Outlook 2014 Early Release

# Light-duty vehicle travel is lower in *AEO2014* than in *AEO2013*

light-duty vehicle miles traveled  
billion miles

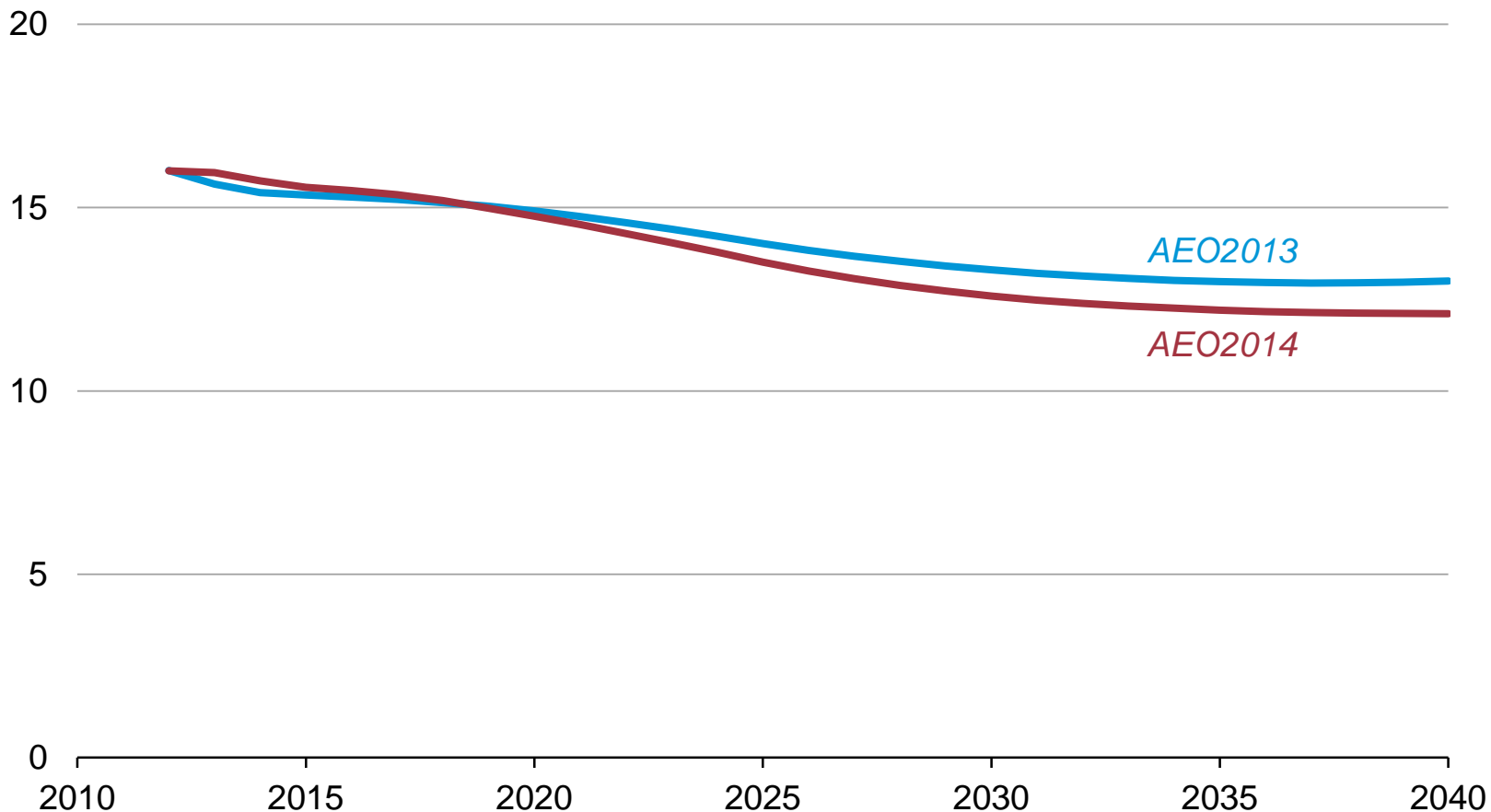


Source: EIA, Annual Energy Outlook 2014 Early Release



# Light-duty vehicle liquids consumption is lower primarily due to lower growth in vehicle miles traveled

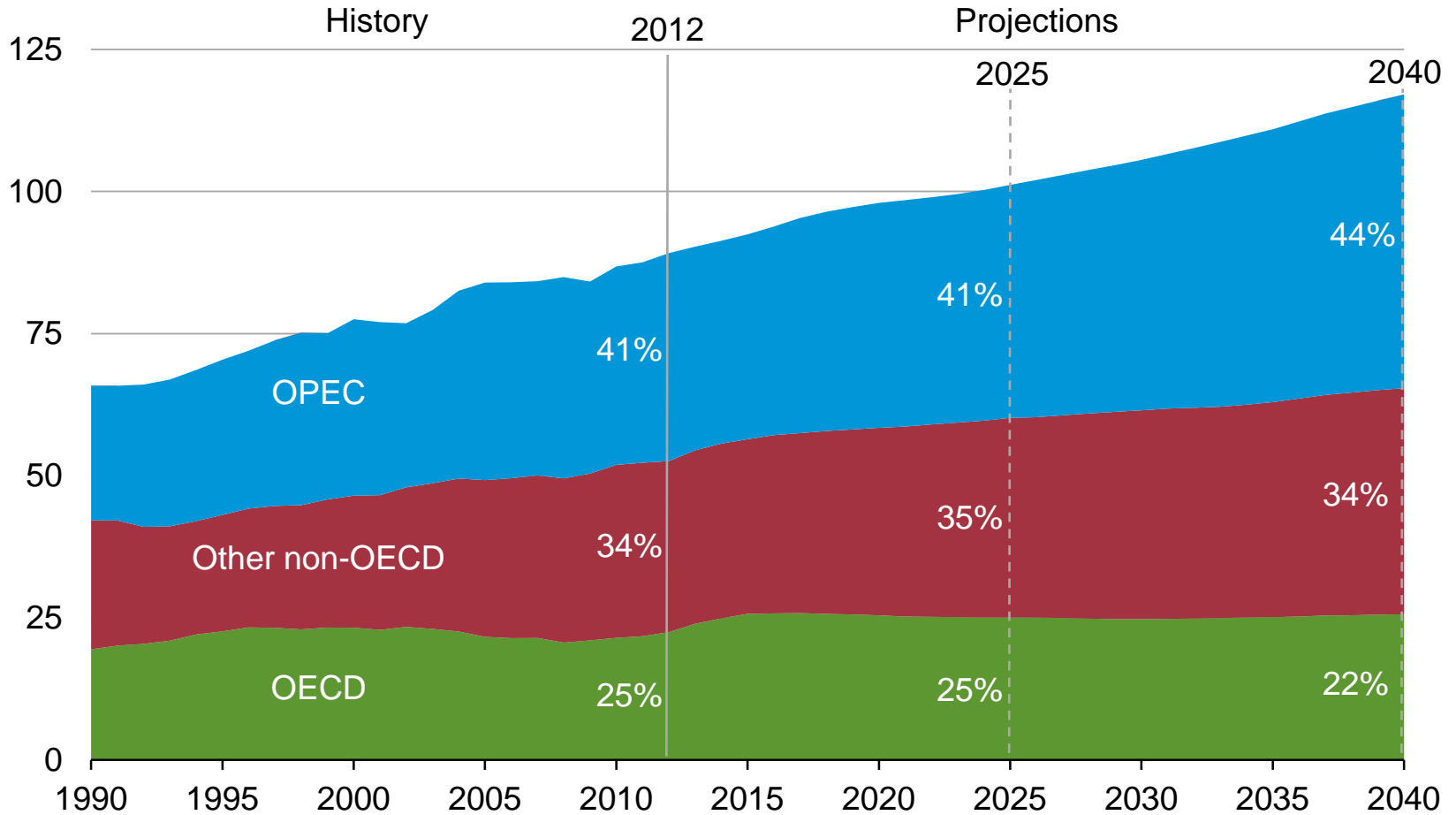
light-duty vehicle liquids consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2014 Early Release

# Global liquids supply increases by almost one-third with OPEC's share relatively stable

global liquids supply  
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

## Why long-term projections ~~might could~~ will be wrong

- Different relative fuel prices
- Faster / slower demand growth
- Changing policies and regulations
- Changing consumer preferences
- Faster / slower technological progress
- Technological breakthroughs