

# *U.S. Natural Gas Production and Use in Transportation: Annual Energy Outlook 2013*



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*by*

*John Staub, Team Lead for Exploration and Production Analysis*

## Key results from the *AEO2013* Reference case:

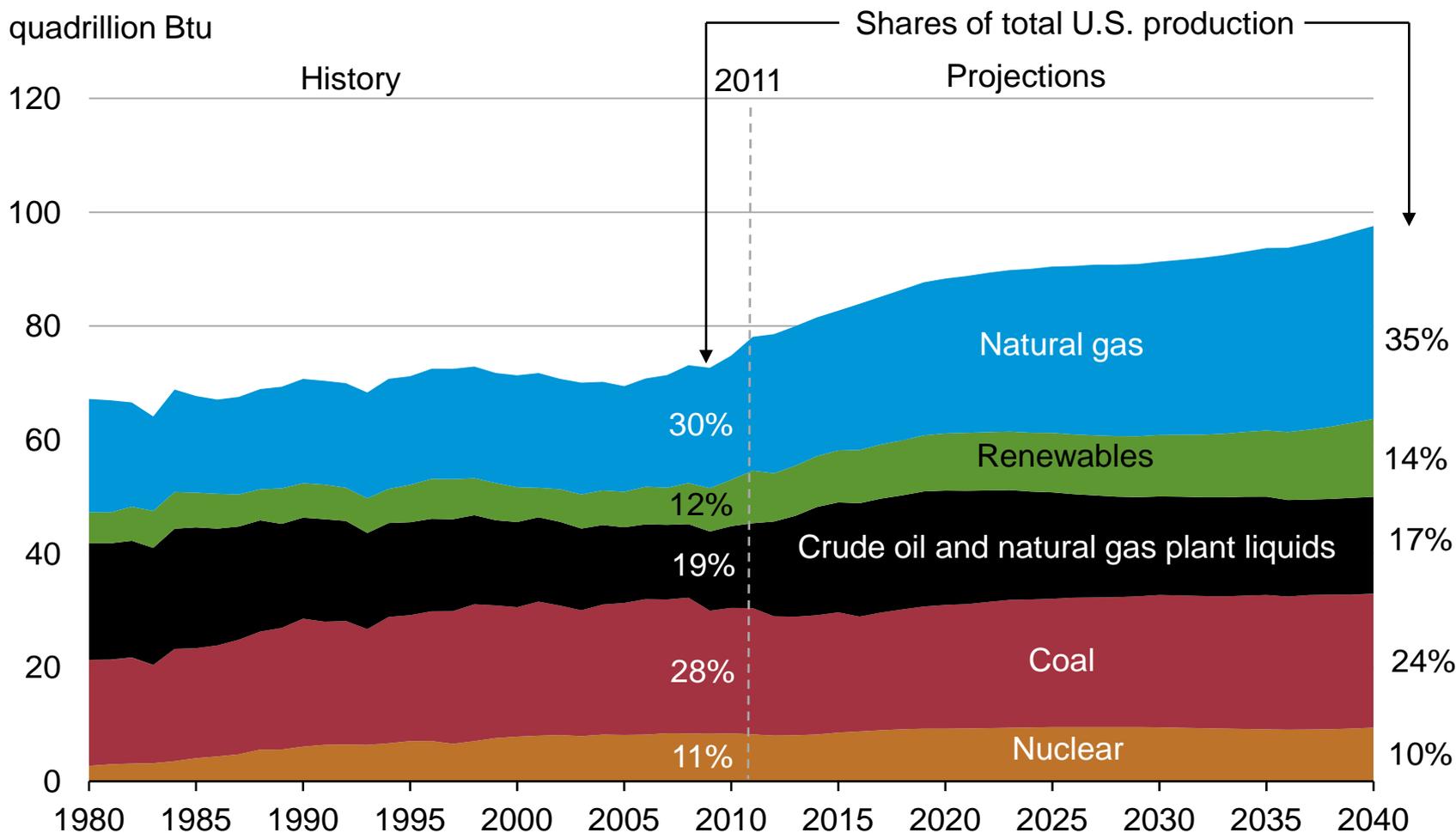
- Growth in energy production outstrips consumption growth
- Crude oil production, particularly from tight oil plays, rises sharply over the next decade
- Natural gas production is higher throughout the Reference case projection than it was in *AEO2012*, serving the industrial and power sectors and an expanding export market
- Motor gasoline consumption reflects the introduction of more stringent fuel economy standards, while diesel fuel consumption is moderated by increased natural gas use in heavy-duty vehicles
- The U.S. becomes a larger exporter of natural gas and coal than was projected in the *AEO2012* Reference case
- All renewable fuels grow, but biomass and biofuels growth is slower than in *AEO2012*
- U.S. energy-related carbon dioxide emissions remain more than five percent below their 2005 level through 2040, reflecting increased efficiency and the shift to a less carbon-intensive fuel mix

# What is included (and excluded) in developing EIA's "Reference case" projections?

- Generally assumes current laws and regulations
  - excludes potential future laws and regulations (e.g., proposed greenhouse gas legislation is not included)
  - Sunset provisions as specified in law (e.g., renewable production tax credits expire at the end of 2012)
- Some grey regulatory areas
  - adds a premium to the cost of financing CO<sub>2</sub>-intensive technologies to reflect current market behavior regarding possible future policies to mitigate greenhouse gas emissions
  - assumes implementation of existing regulations that enable the building of new energy infrastructure and resource extraction
- Includes technologies that are commercial or reasonably expected to become commercial over next decade or so
  - includes projected technology cost and efficiency improvements, as well as cost reductions linked to cumulative deployment levels
  - does not assume revolutionary or breakthrough technologies

# Domestic production grows rapidly over projection period, particularly natural gas and renewables, and liquids in the near term

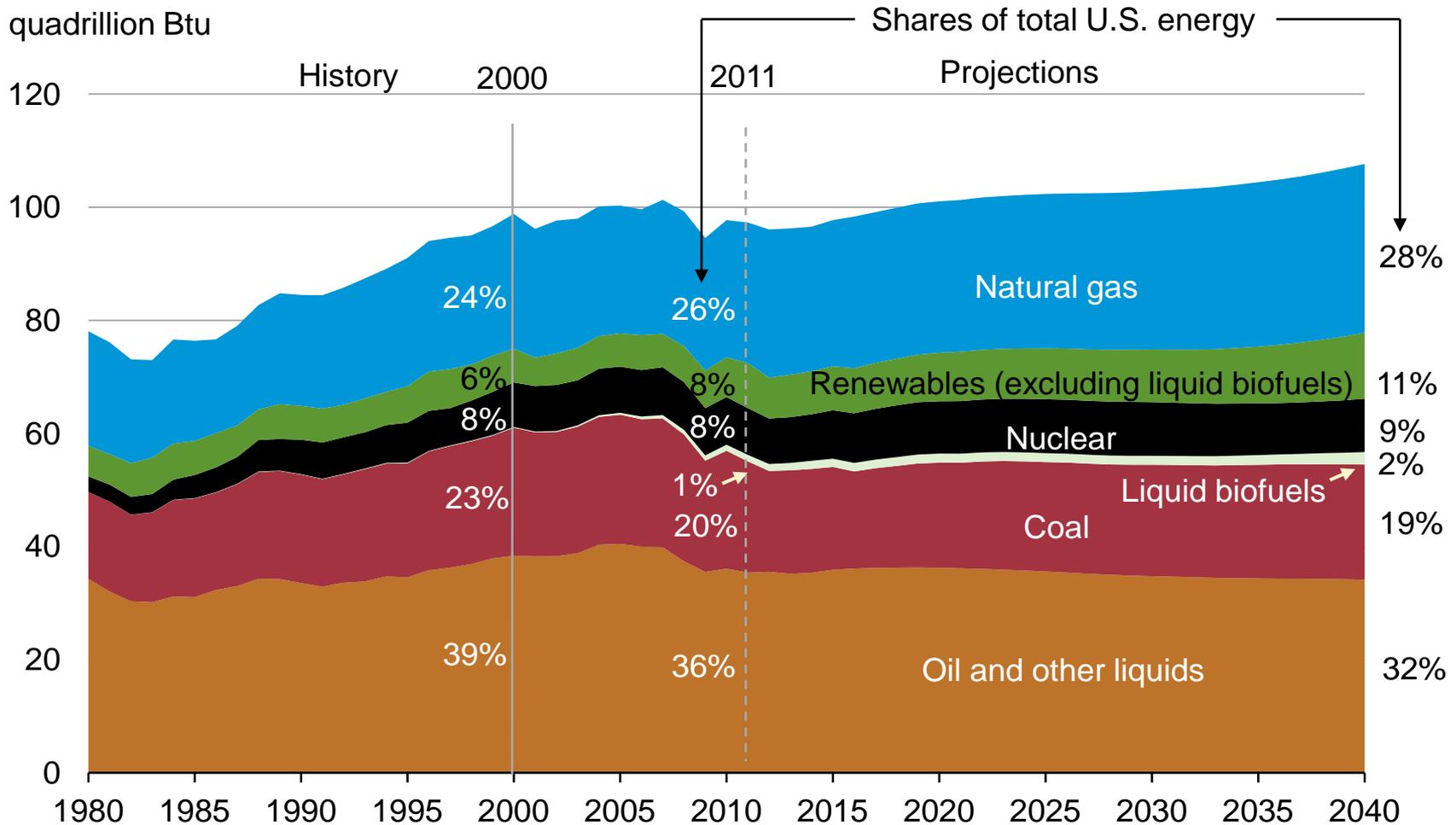
U.S. energy production  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2013 Early Release

# U.S. energy use grows slowly over the projection reflecting improving energy efficiency and a slow and extended economic recovery

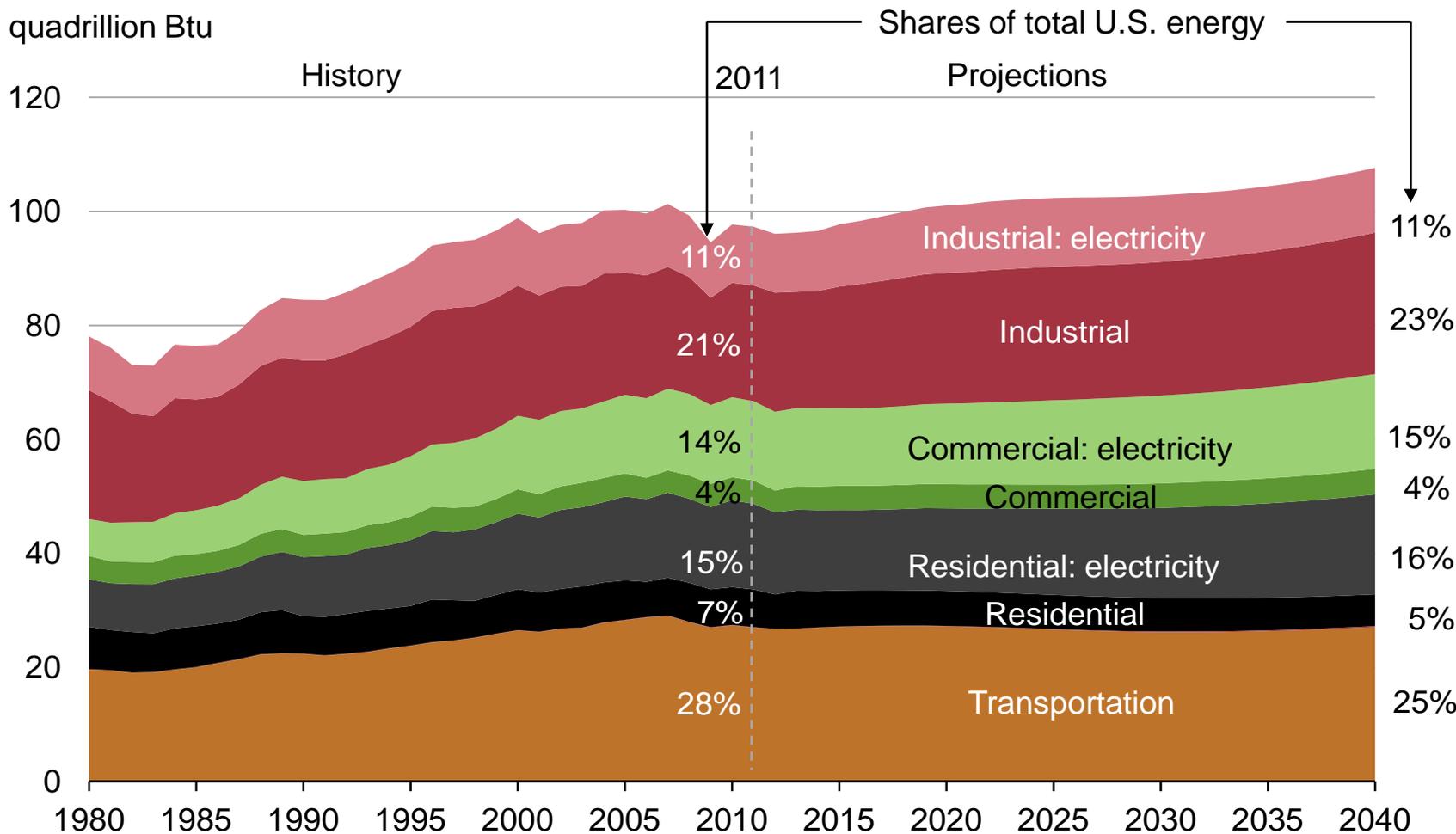
U.S. primary energy consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2013 Early Release

# U.S. energy use is slowed by rising energy prices and the adoption of new efficiency standards for vehicles

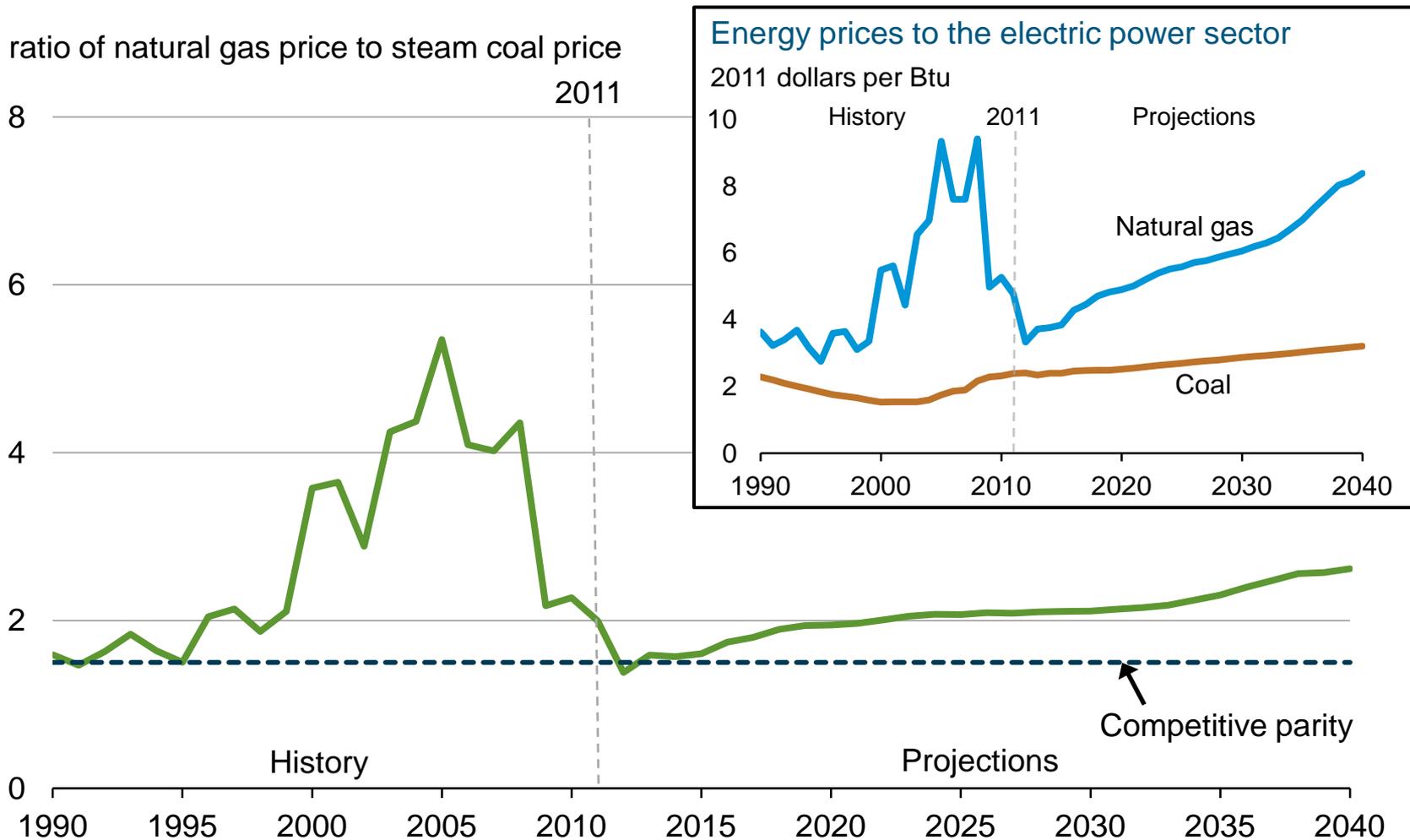
U.S. primary energy consumption  
quadrillion Btu



Source: EIA, Annual Energy Outlook 2013 Early Release

# Natural gas supply

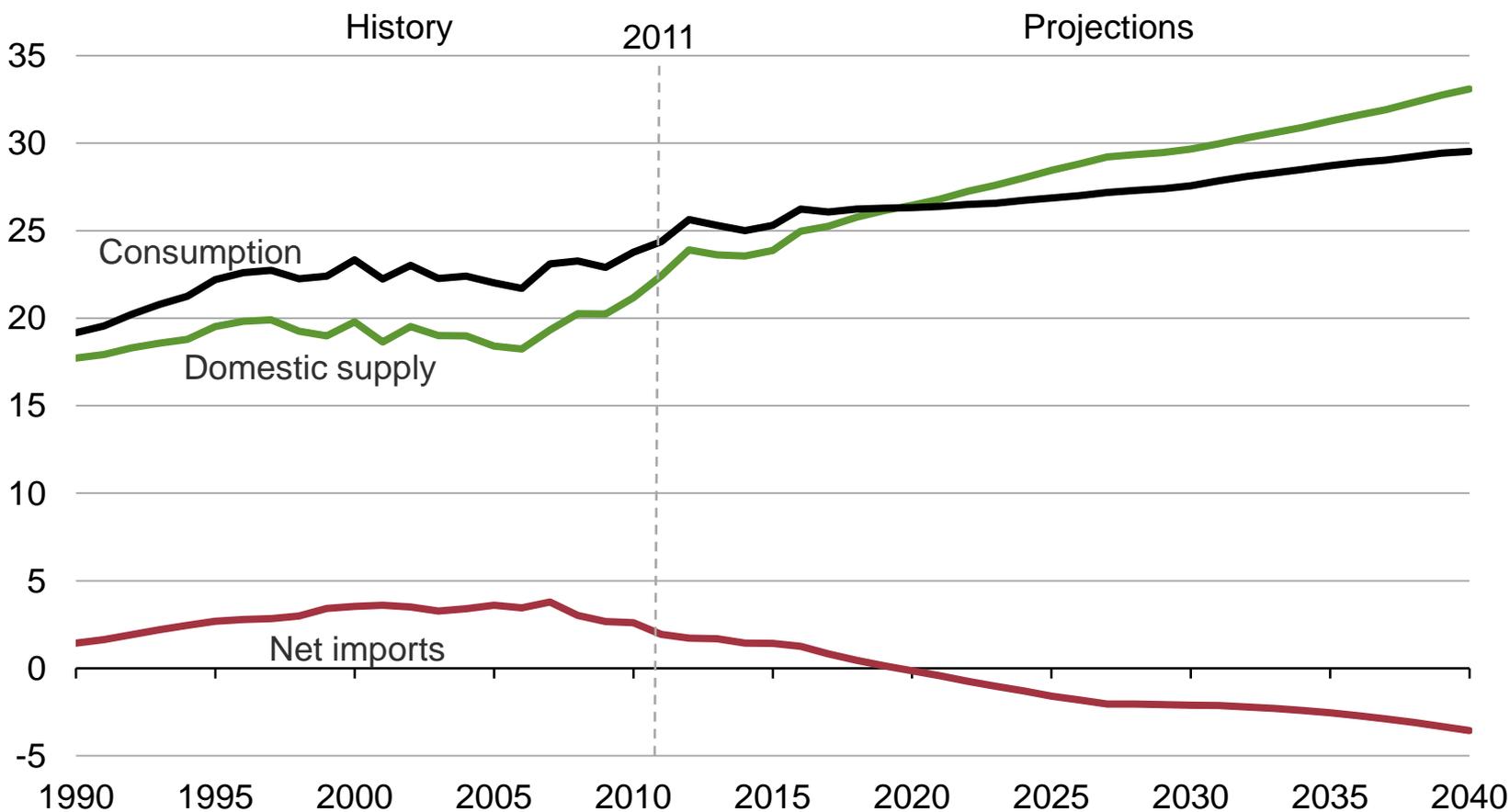
# Coal regains some competitive advantage relative to natural gas over time on a national average basis



Source: EIA, Annual Energy Outlook 2013 Early Release

# Domestic natural gas production grows faster than consumption and the U.S. becomes a net exporter of natural gas around 2020

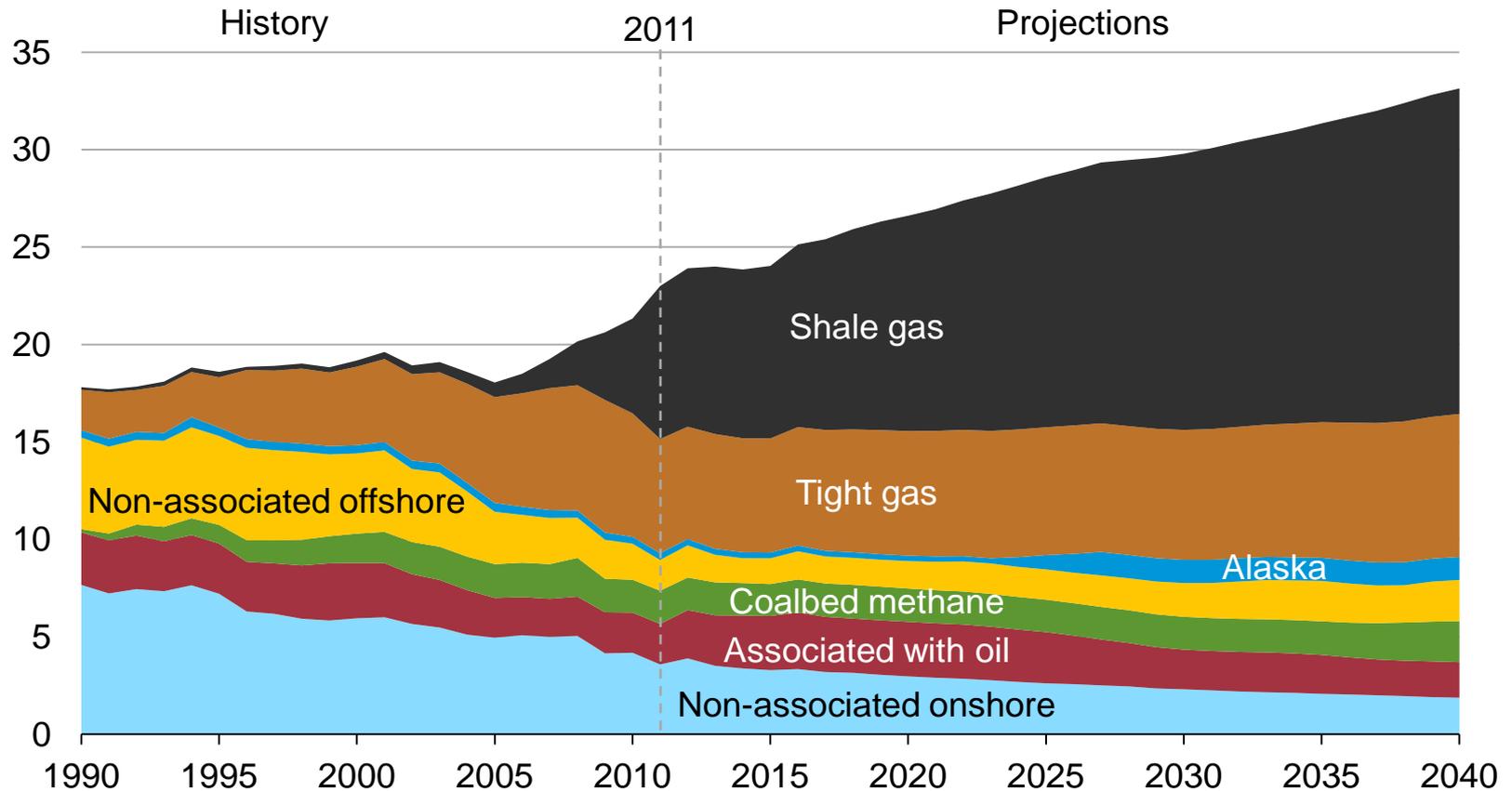
U.S. dry gas  
trillion cubic feet



Source: EIA, Annual Energy Outlook 2013 Early Release

# Shale gas production leads growth in production through 2040

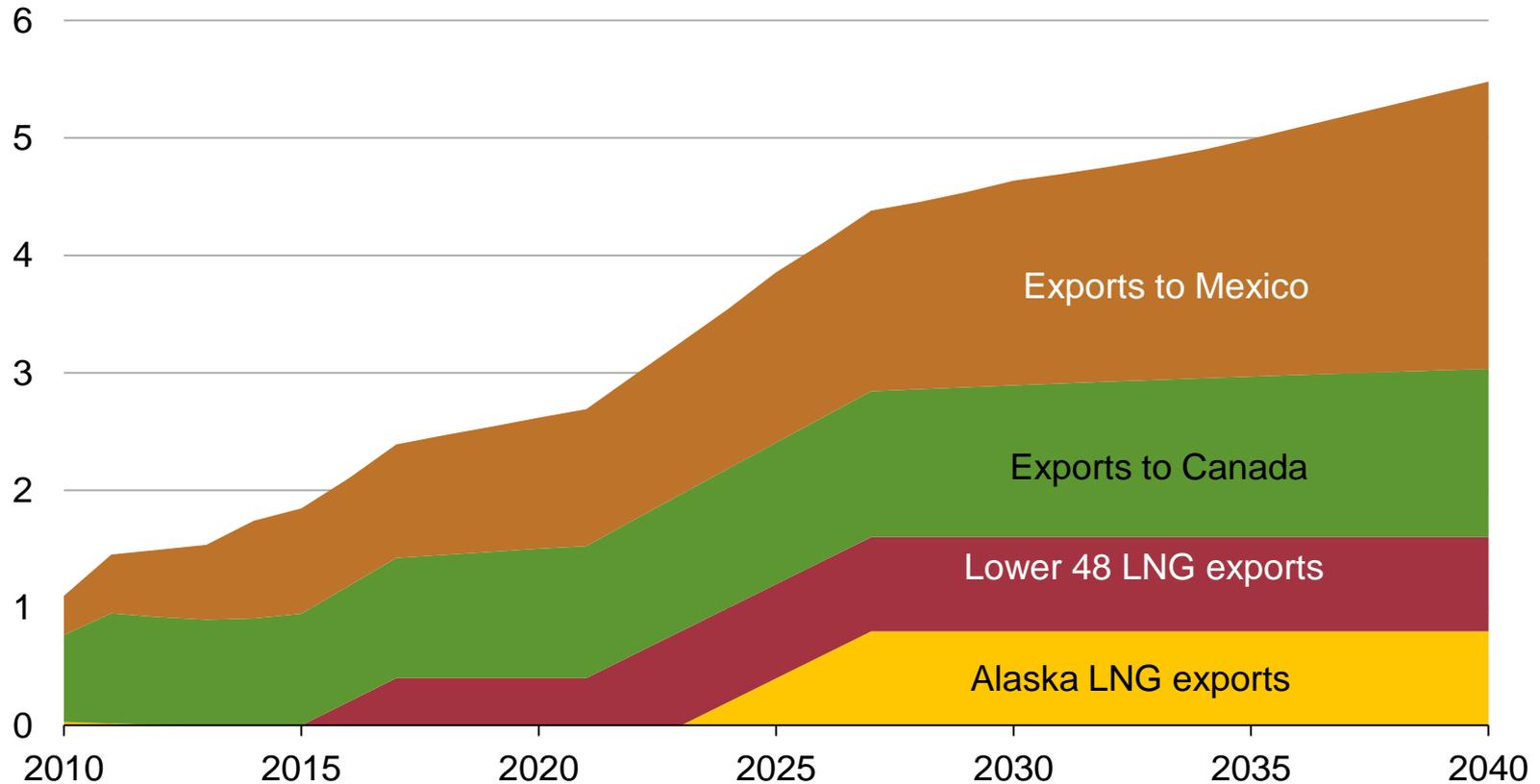
U.S. dry natural gas production  
trillion cubic feet



Source: EIA, Annual Energy Outlook 2013 Early Release

# Total natural gas exports nearly quadruple by 2040 in the AEO2013 Reference case

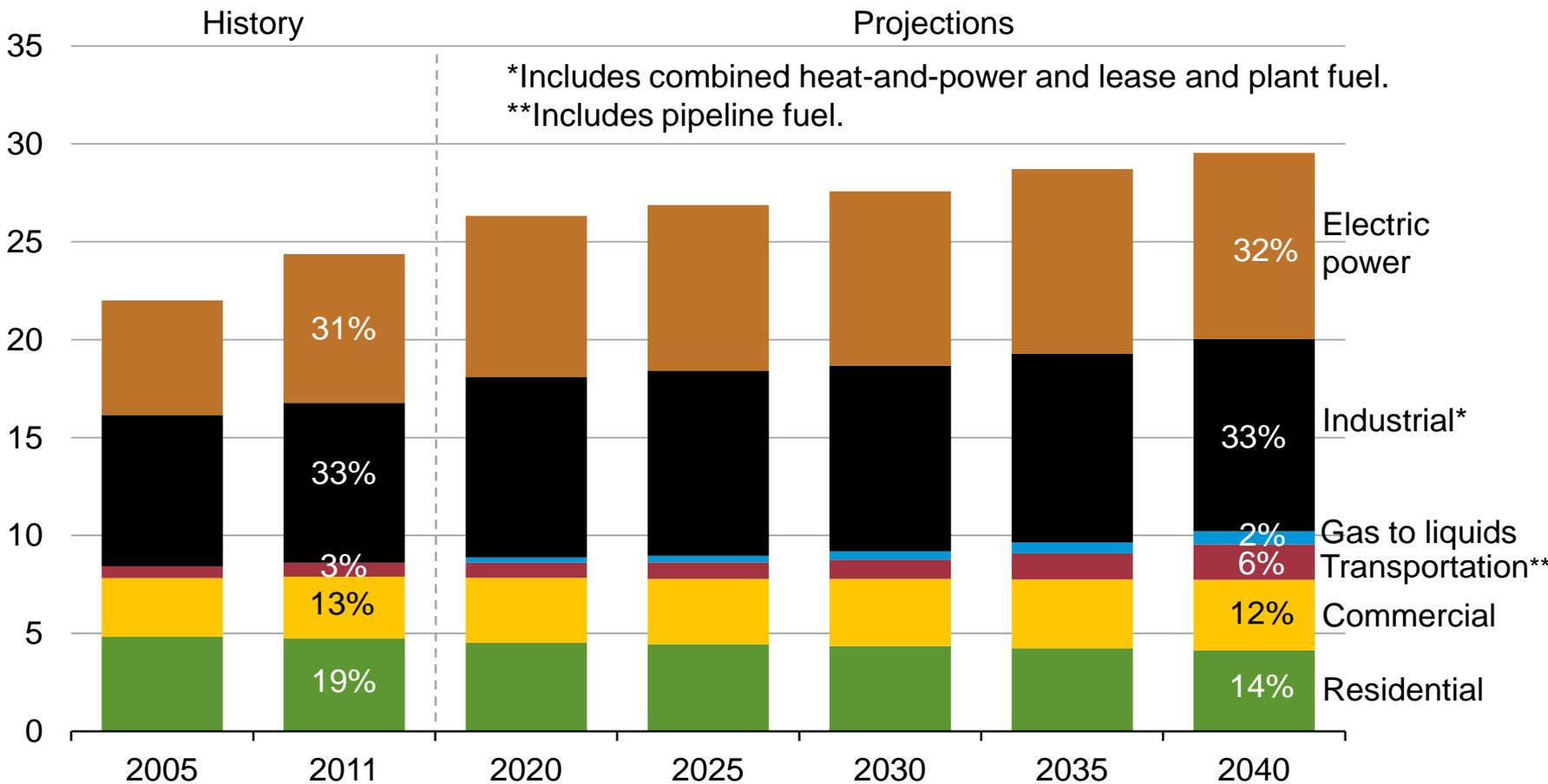
U.S. natural gas exports  
trillion cubic feet



Source: EIA, Annual Energy Outlook 2013 Early Release

# Natural gas consumption is quite dispersed with electric power, industrial, and transportation use driving future demand growth

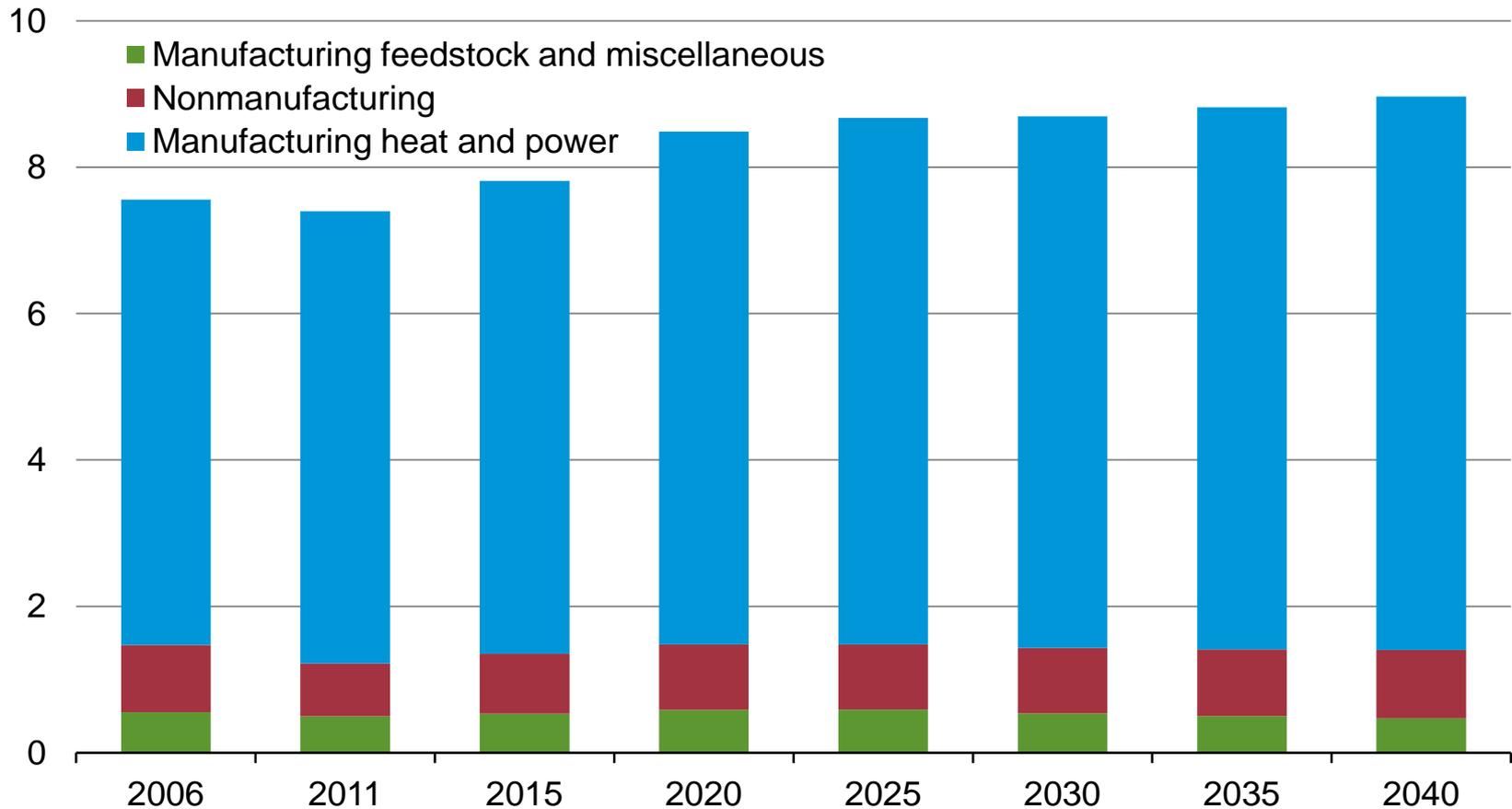
U.S. dry gas consumption  
trillion cubic feet



Source: EIA, Annual Energy Outlook 2013 Early Release

# Industrial natural gas usage grows, especially before 2025

Industrial natural gas consumption  
quadrillion Btu



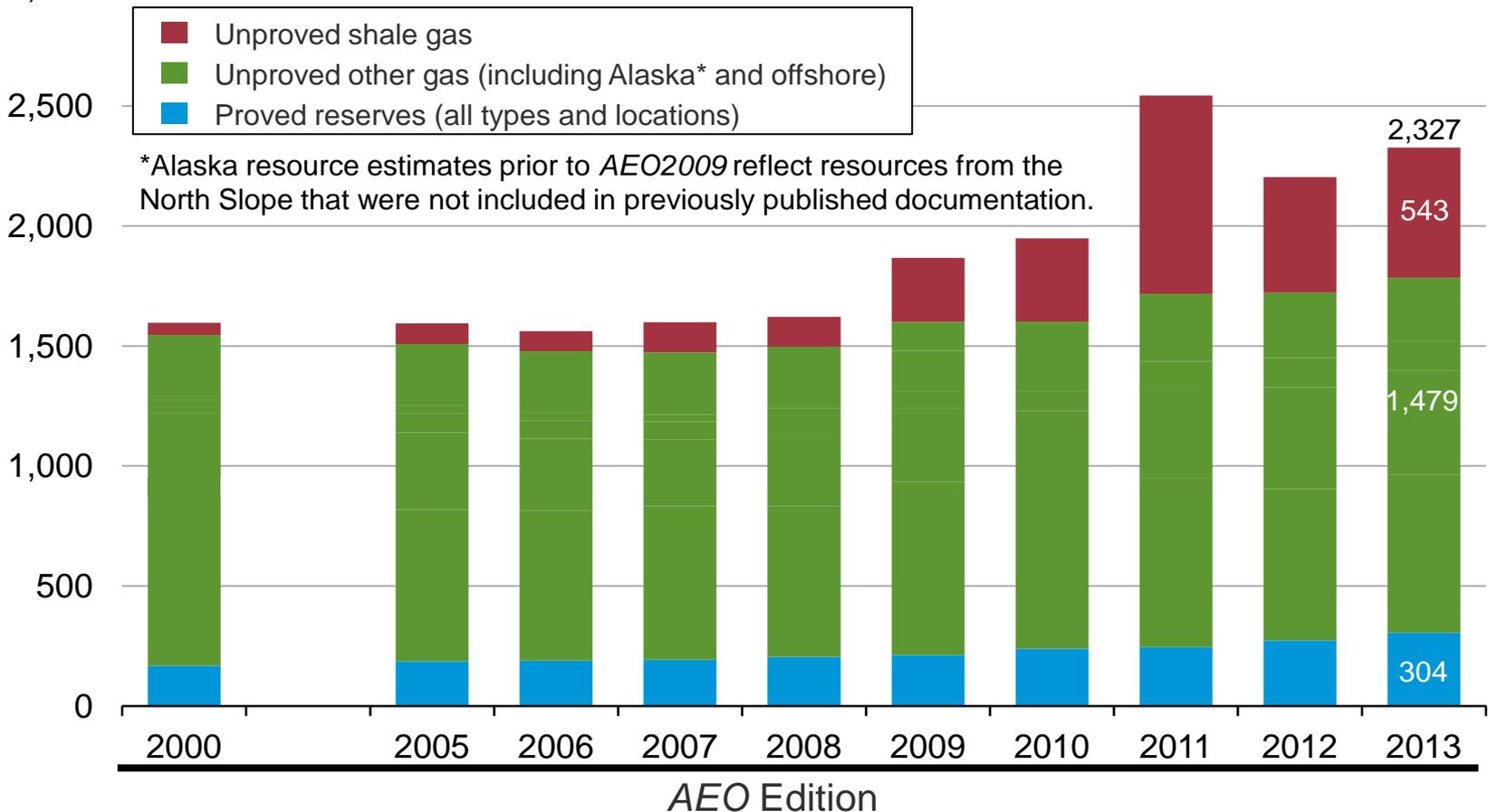
Source: EIA, Annual Energy Outlook 2013 Early Release

# Technically recoverable natural gas resources continue long-term rise

U.S. dry gas resources

trillion cubic feet

3,000

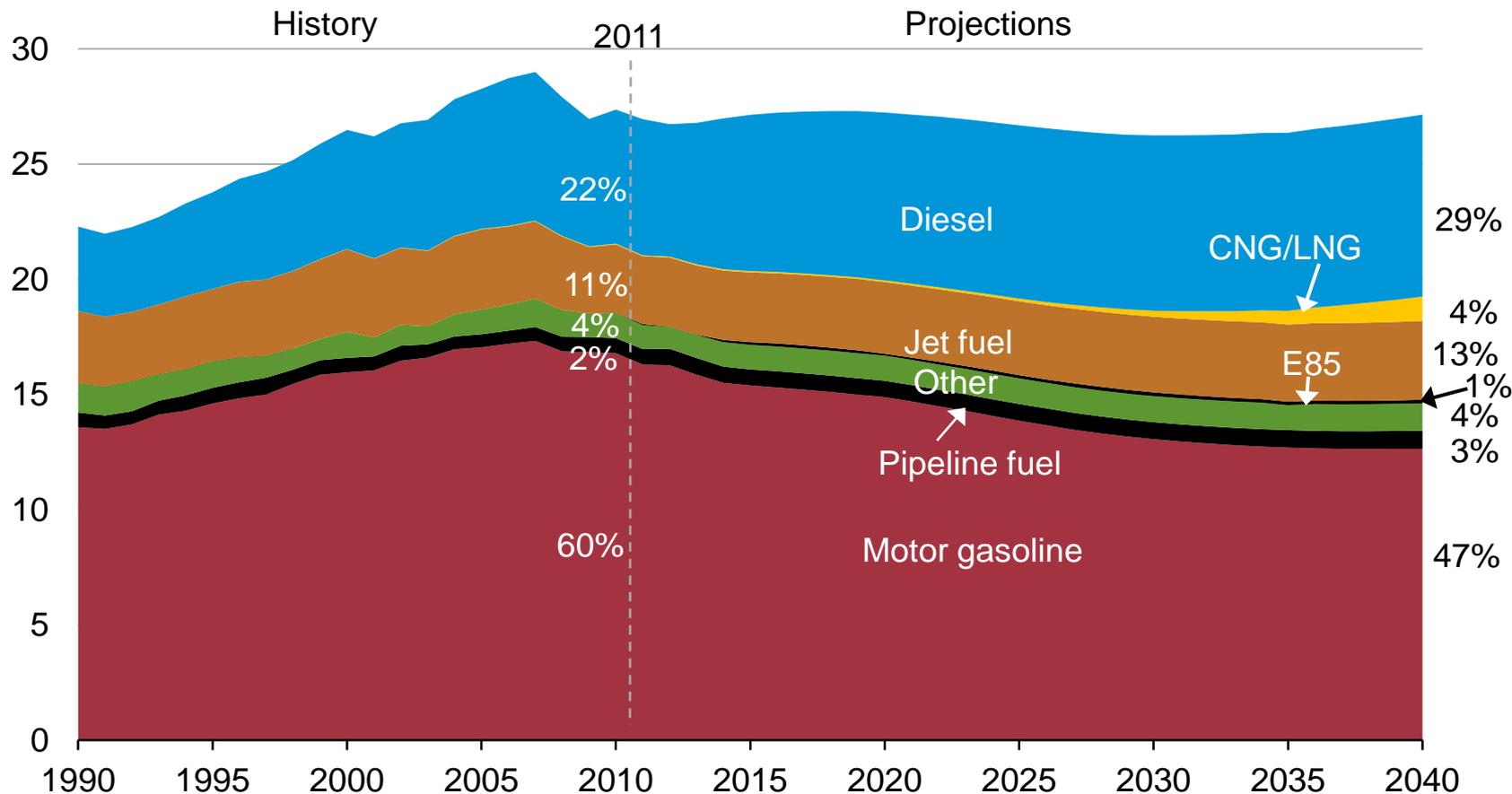


Source: EIA, Annual Energy Outlook 2013 Early Release

# Natural gas in transportation

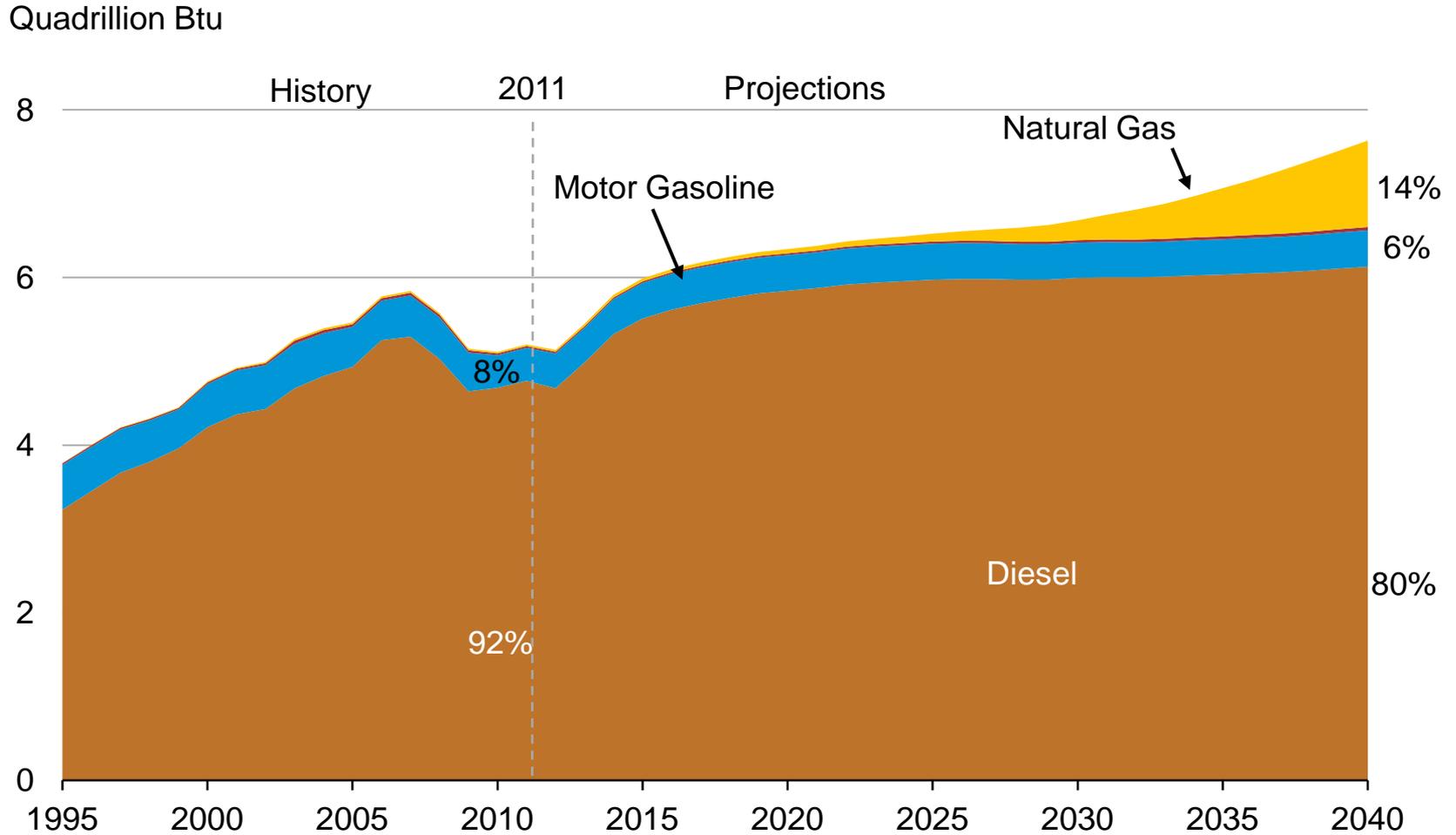
# Transportation sector motor gasoline demand declines, while diesel and natural gas increase

Transportation energy consumption by fuel quadrillion Btu



Source: EIA, Annual Energy Outlook 2013 Early Release

# Heavy-duty vehicle natural gas consumption rises across projection due to difference in natural gas and diesel fuel prices



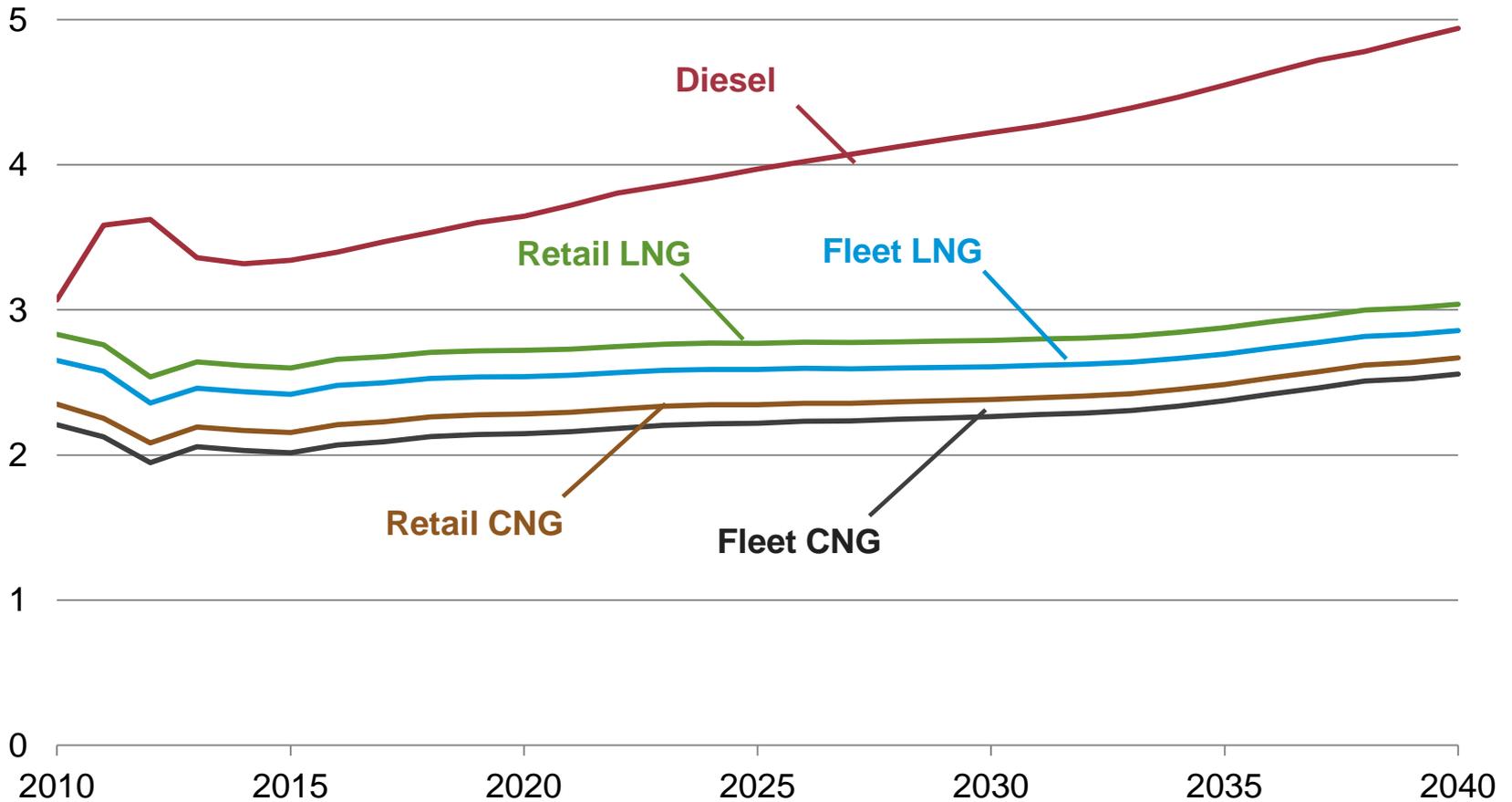
Source: EIA, Annual Energy Outlook 2013 Early Release

# Assumptions and modeling methodology

- EIA Transportation Team models vehicle fleet according to Annual Vehicle Miles Traveled (AVMT)
- Heavy Duty Vehicle Lifecycle:
  - Long Haul: ~400,000-500,000 miles (~2-3 years)
  - Regional: ~50,000 miles/yr (~10 years)
  - Local: ~20,000 miles/yr
- Model analyzes costs of NGV purchase, operation, and refueling, and compares to expected returns in industry
- If NG is cost effective, model begins purchasing NGV trucks
- Market penetration in any given year is constrained by model. Full market penetration at approximately 10-15 years after cost effectiveness

# Diesel and natural gas transportation fuel prices in the AEO2013 Early Release, 2010-2040

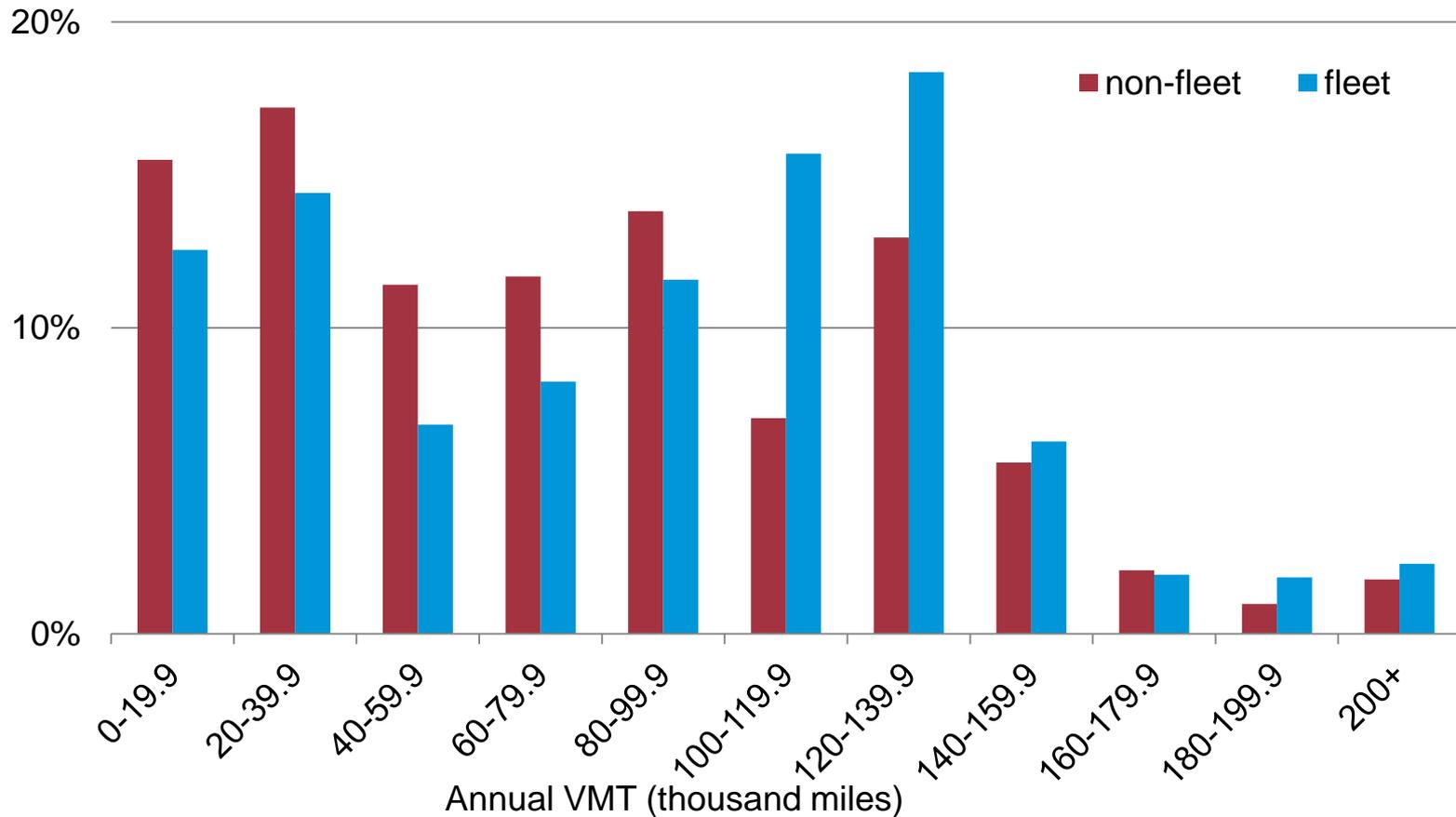
2011 dollars per diesel gallon equivalent



Source: EIA, Annual Energy Outlook 2013 Early Release

# Distribution of vehicle miles travelled by class 7-8

Percent of new vehicles



Source: EIA, Annual Energy Outlook 2013 Early Release

# Who will adopt natural gas?

- Long Haul vehicles
  - Under current price differentials between NG and Diesel, makes commercial sense for high mileage vehicles, (i.e. - Long Haul)
- Municipal vehicles – buses, garbage trucks, etc.
  - Don't travel as many miles, but they do burn a lot of fuel because they run their engines all day
  - Municipalities may convert their fleet to satisfy environmental regulations, not purely because of economics
- Specially regulated vehicles
  - Government regulations and incentives may encourage additional conversions (e.g. - California port initiative requires trucks serving ports to convert to NG)

# Open questions

- What comes first – natural gas vehicles or refueling stations?
- How will the distribution chain evolve?
  - Who will own the fuel?
  - Who will own the retail station? Public or private stations?
  - How will the fuel and station be affiliated with traditional operators?
- How will fuel be priced?
  - Benchmarked to “diesel equivalent” or sold at cost?

# 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)

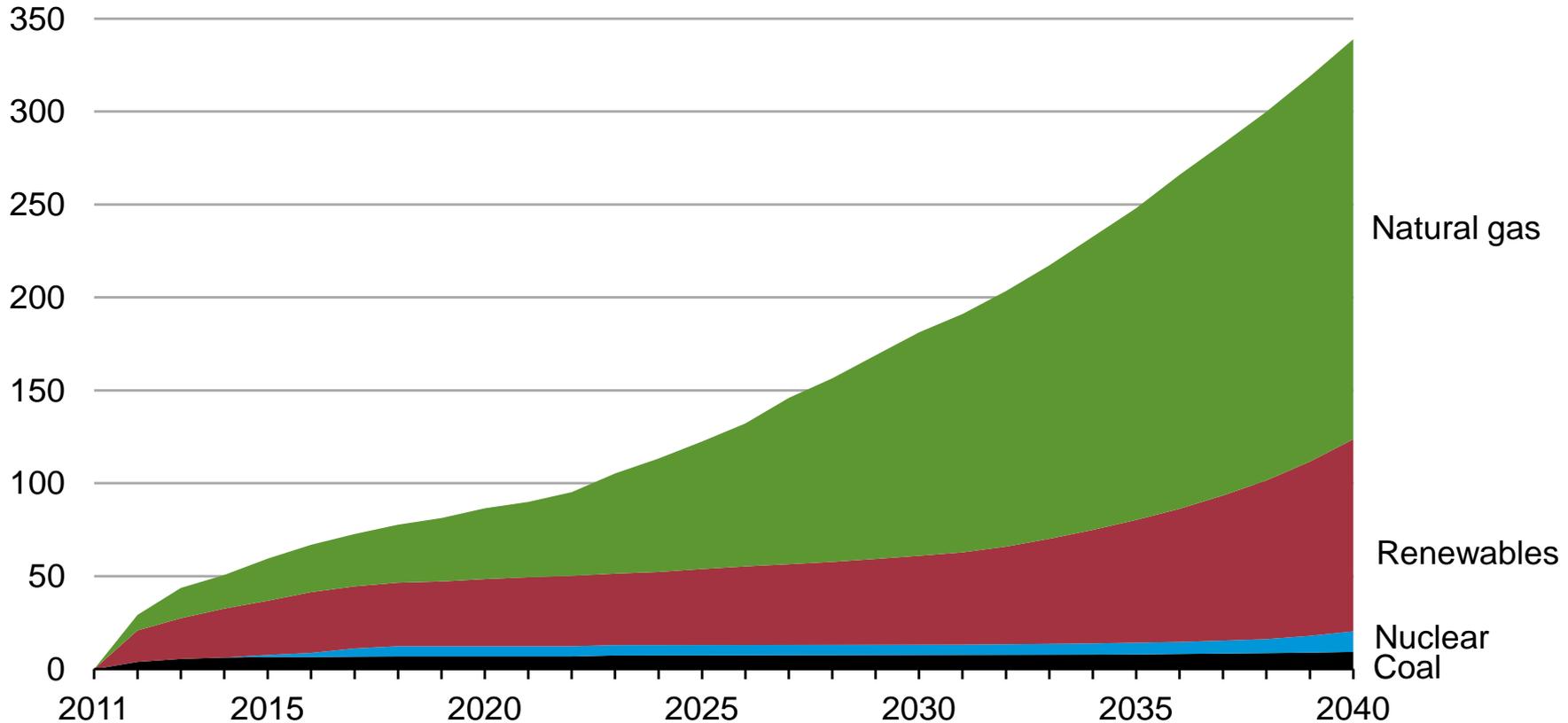
Monthly Energy Review | [www.eia.gov/totalenergy/data/monthly](http://www.eia.gov/totalenergy/data/monthly)

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

# Supplemental slides

# Natural gas and renewables account for the vast majority of capacity additions from 2012 to 2040

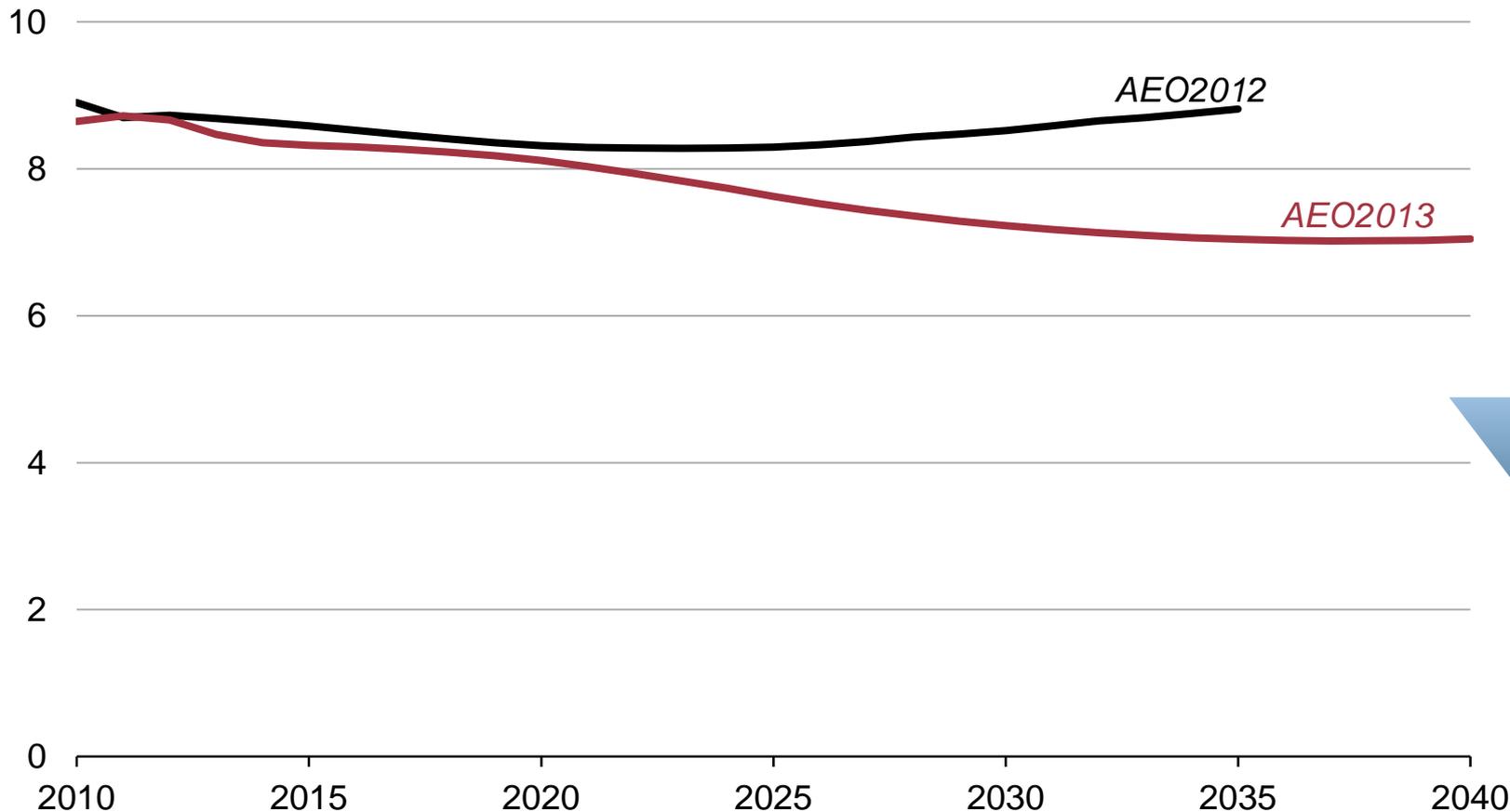
U.S. cumulative capacity additions  
gigawatts



Source: EIA, Annual Energy Outlook 2013 Early Release

# Light-duty vehicle liquids consumption is lower primarily due to more stringent CAFE standards

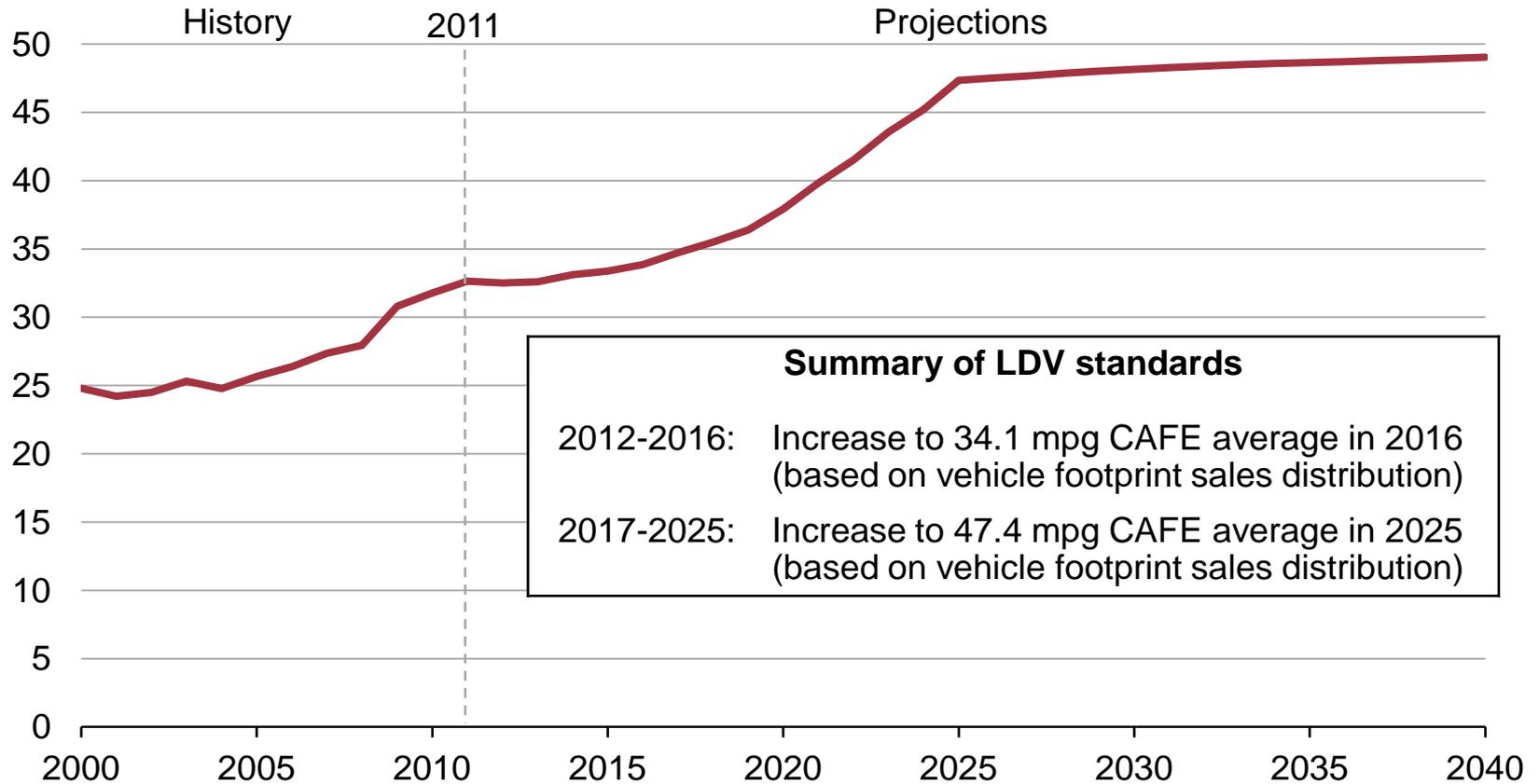
Light-duty vehicle liquids consumption  
million barrels per day



Source: EIA, Annual Energy Outlook 2013 Early Release

# New light-duty vehicle fuel economy approaches 50 mpg by 2040

LDV fuel efficiency  
miles per gallon



Source: EIA, Annual Energy Outlook 2013 Early Release