
Outlook for U.S. shale oil and gas



National Capital Area Chapter

U.S. Association for Energy Economics

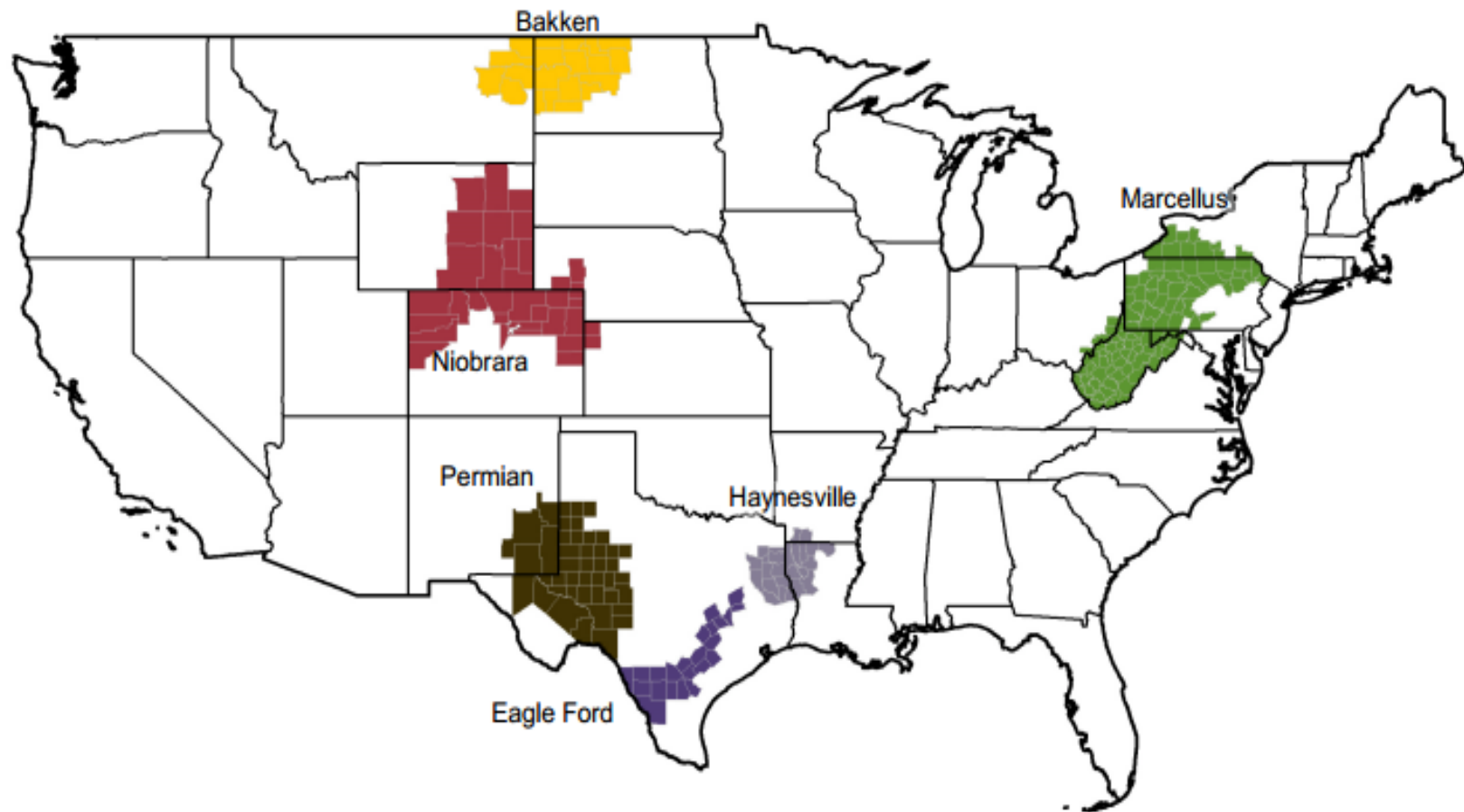
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By

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Six key plays account for nearly all recent growth in oil and natural gas production

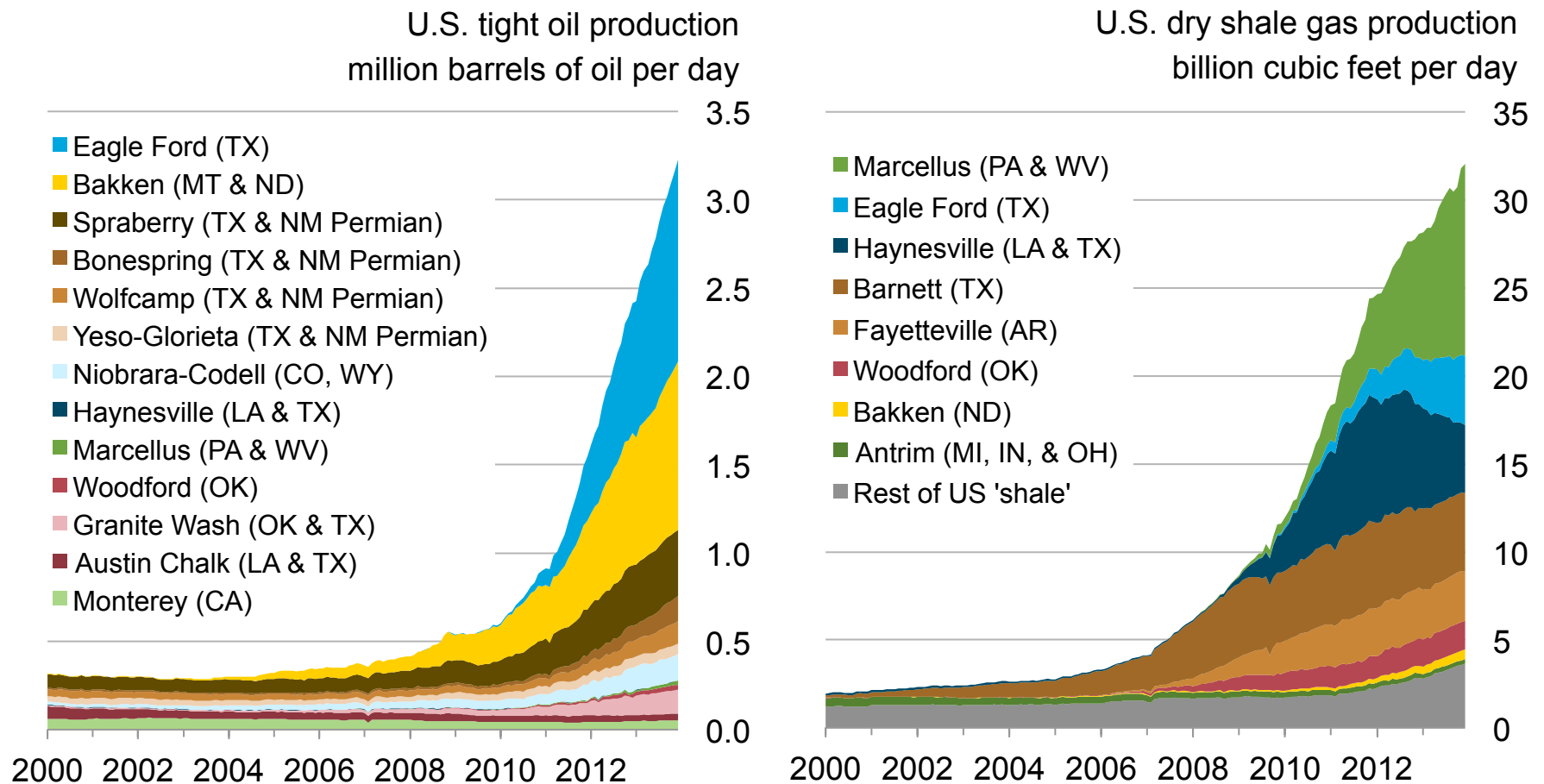


Source: EIA, *Drilling Productivity Report*

Key insights on U.S. drilling productivity and production trends

- The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources
- The number of wells drilled nationwide that produce both oil and natural gas increased from 37% in 2007 to 56% in 2012
- Higher drilling efficiency and new well productivity, rather than an increase in the rig count, have been the main drivers of recent production growth
- Steep legacy production decline rates are being offset by growing production from new wells
- Six shale plays account for nearly 90% of domestic oil production growth and virtually all domestic natural gas production growth over the last few years
- The Bakken and Eagle Ford plays account for about two-thirds of oil production growth; the Marcellus play accounts for about three-quarters of natural gas production growth

The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources



Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through December 2013 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

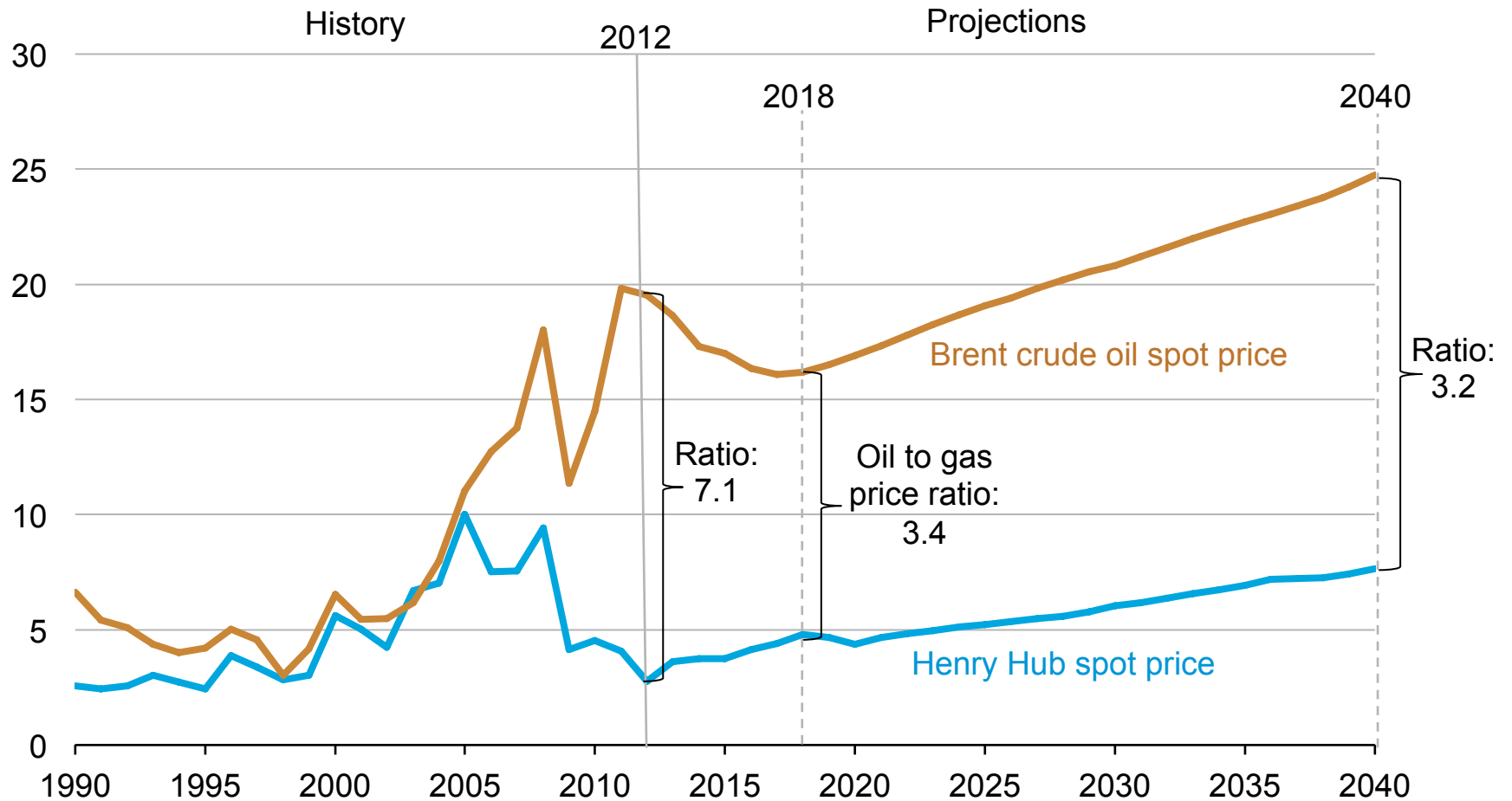
U.S. crude oil and natural gas production is up dramatically since 2010 and will continue to grow rapidly; this has strategic implications for the United States

- Refinery operations/investment
- Logistics infrastructure investment
- Exports of petroleum products
- Exports of crude oil and natural gas (LNG)
- Operation of the Strategic Petroleum Reserve

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

energy spot prices

2012 dollars per million Btu

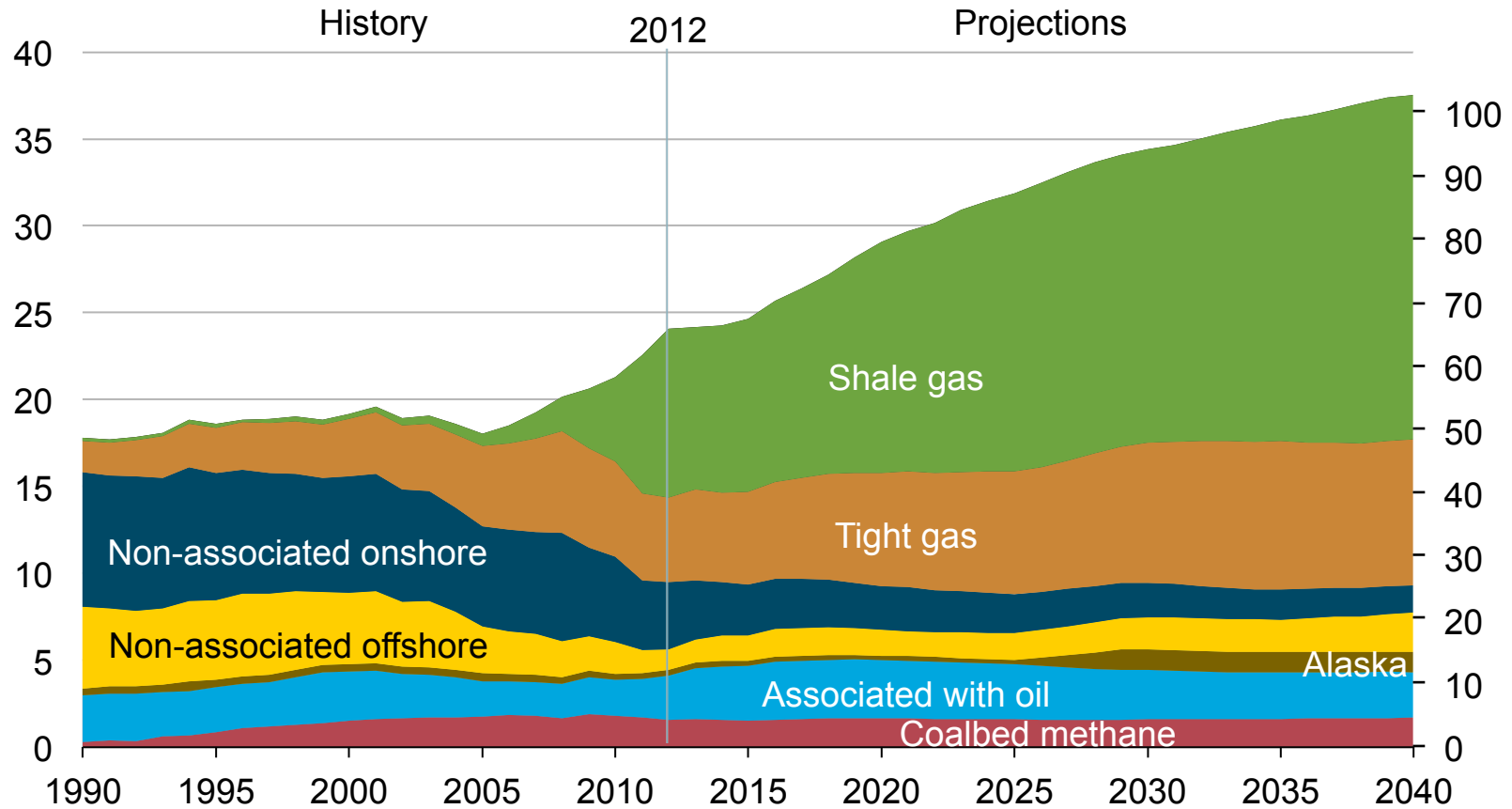


Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. shale gas leads growth in total gas production through 2040 to reach half of U.S. output

U.S. dry natural gas production
trillion cubic feet

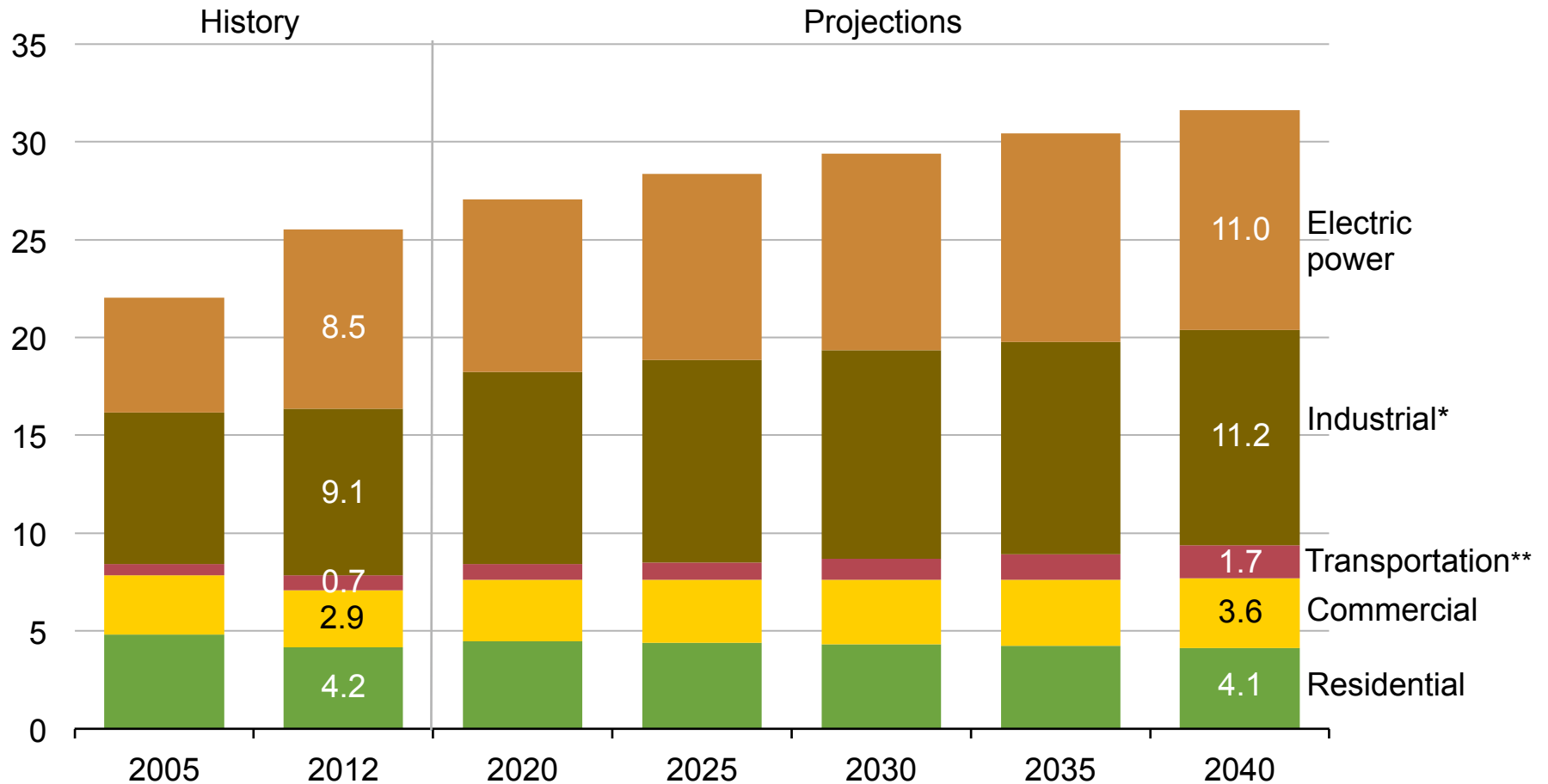
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. natural gas consumption growth is driven by electric power, industrial, and transportation use

U.S. dry gas consumption
trillion cubic feet



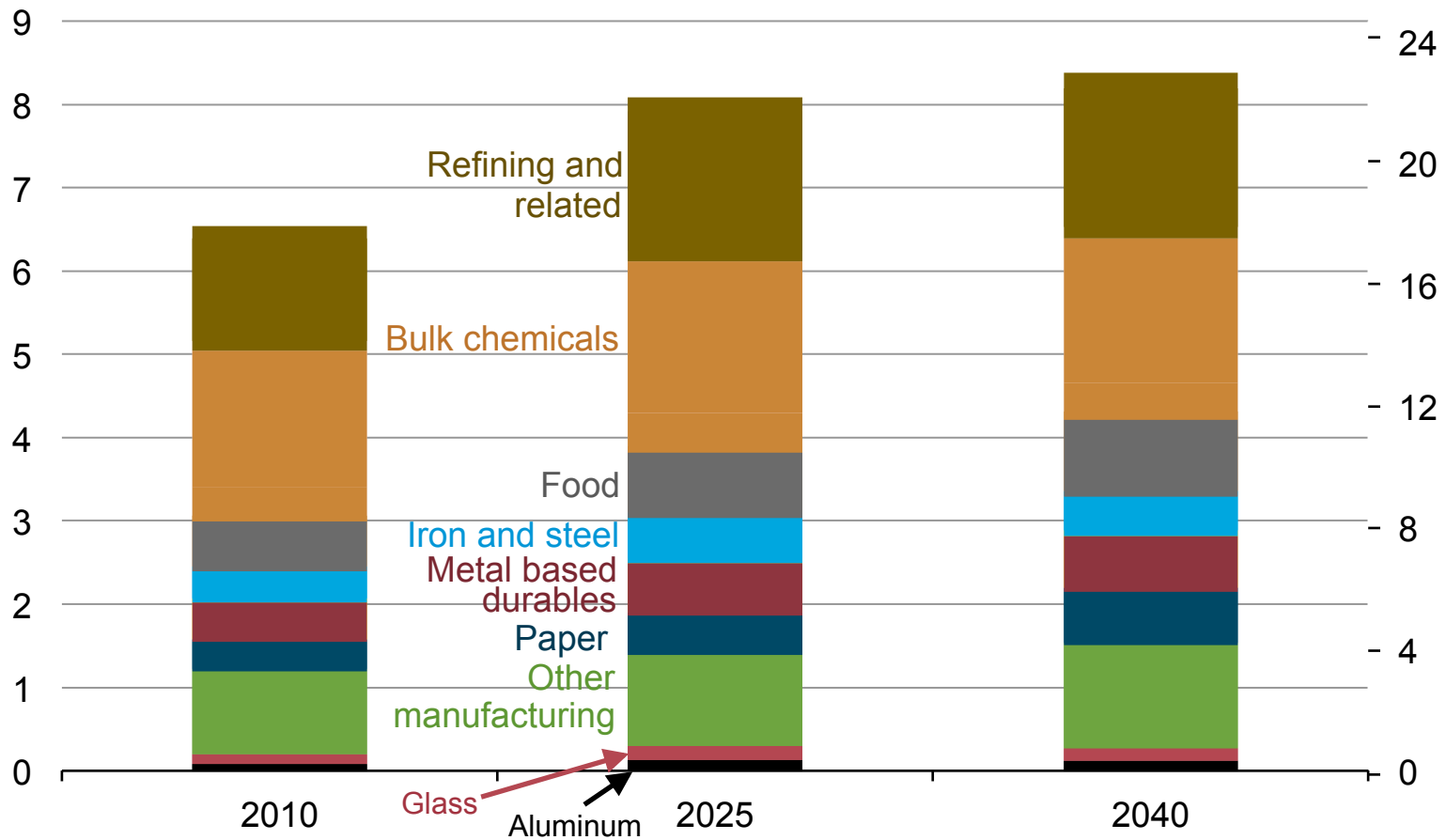
Source: EIA, Annual Energy Outlook 2014 Early Release

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

U.S. 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

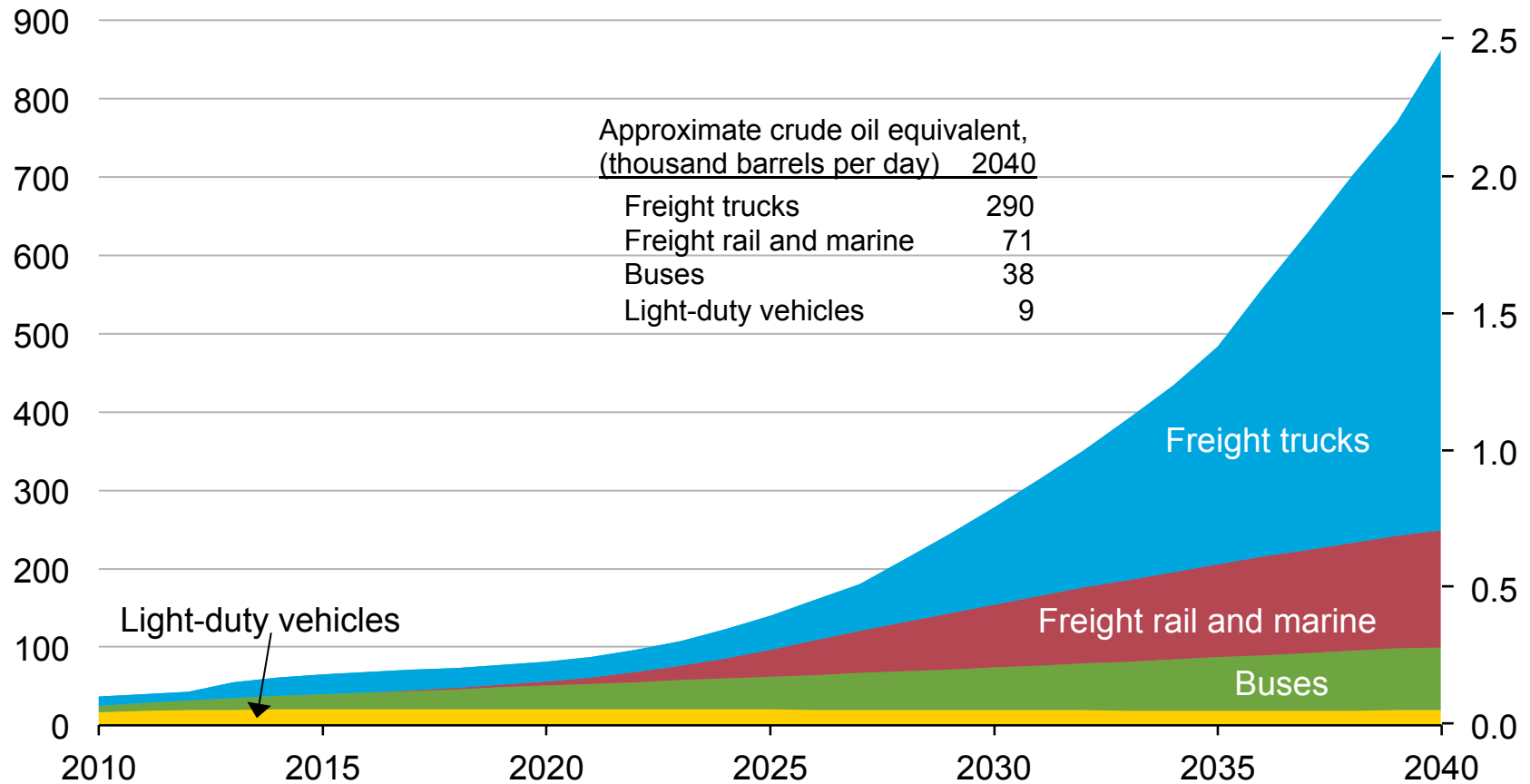


Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. natural gas 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



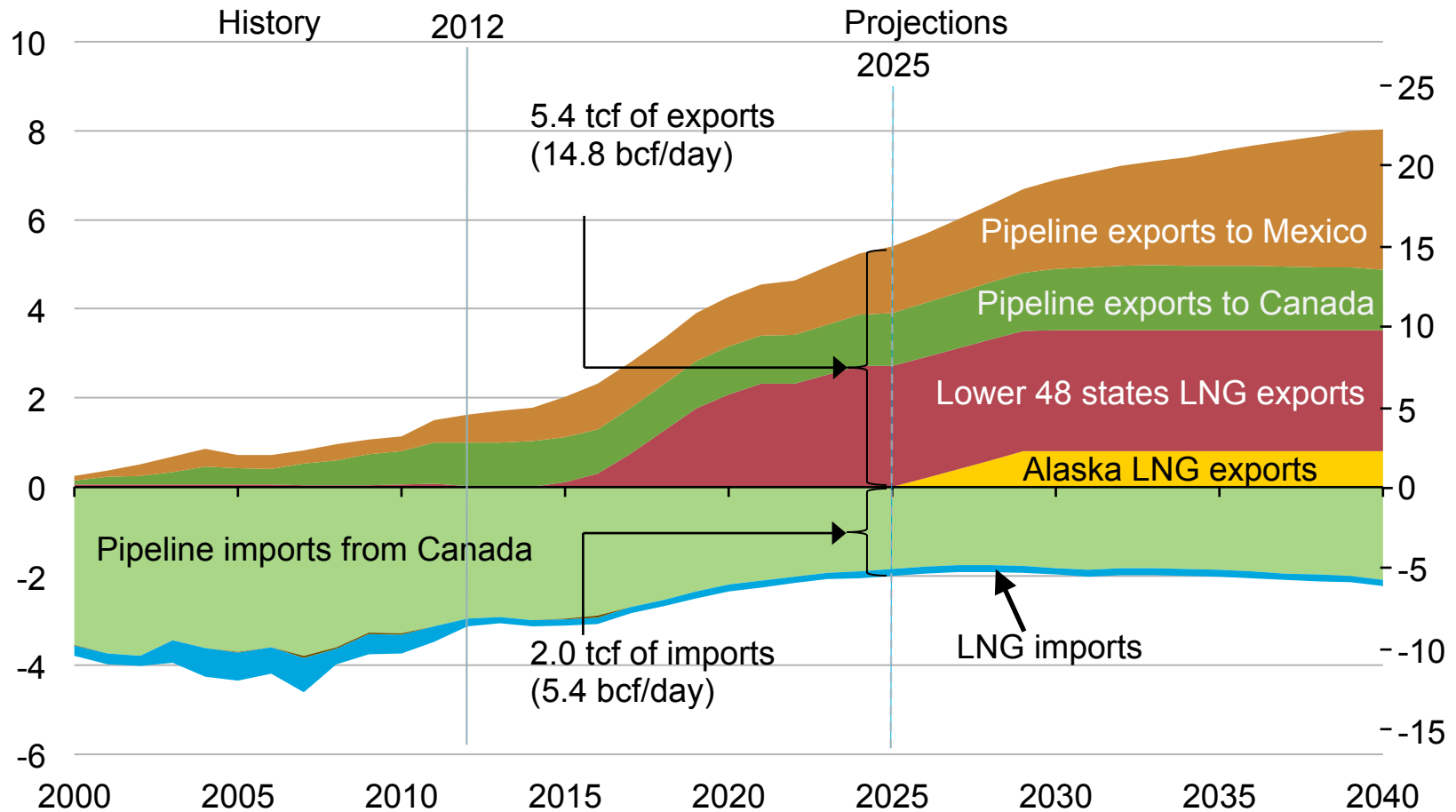
Source: EIA, Annual Energy Outlook 2014 Early Release

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



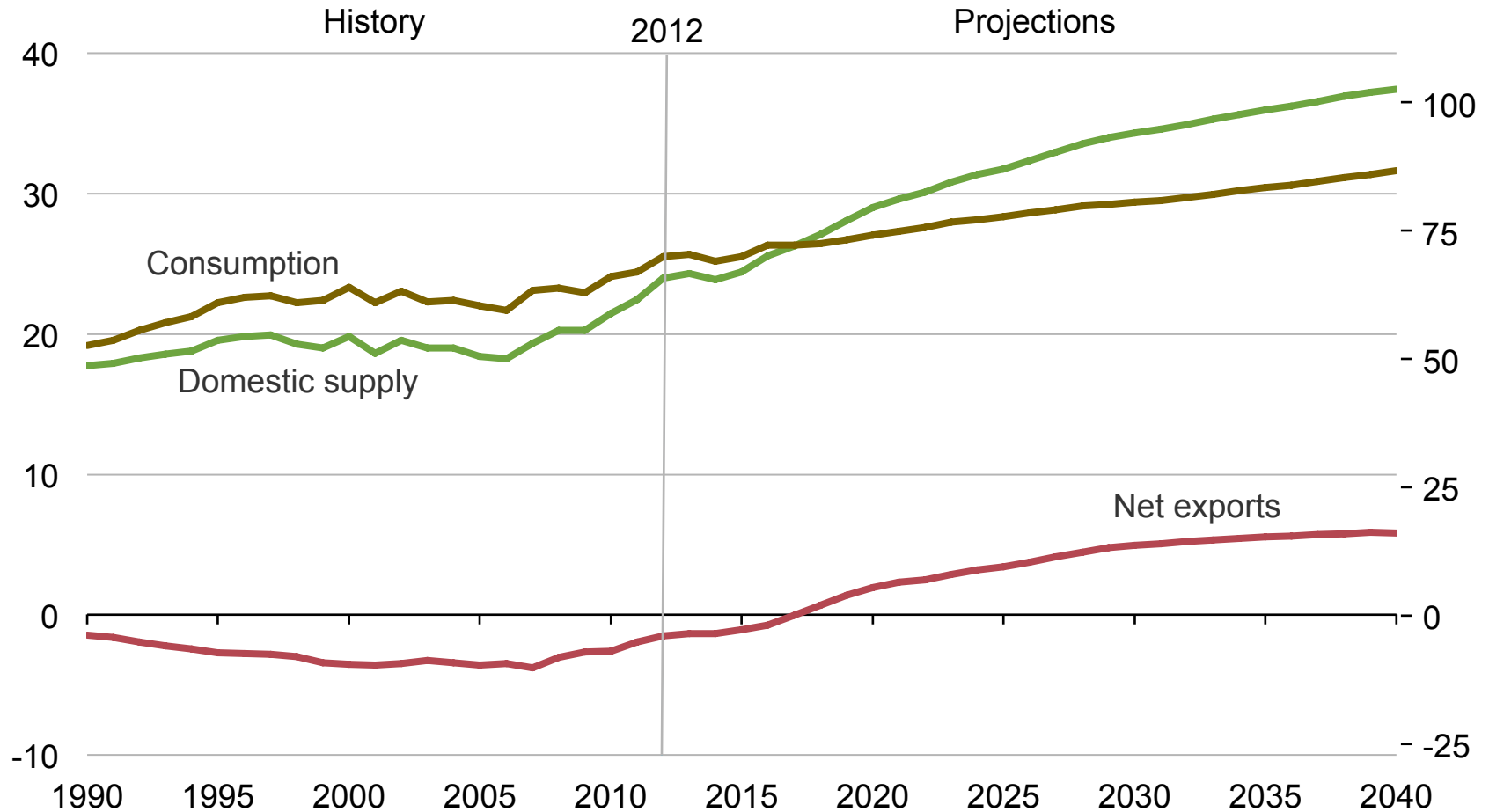
Source: EIA, Annual Energy Outlook 2014 Early Release

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

U.S. dry natural gas

trillion cubic feet per year

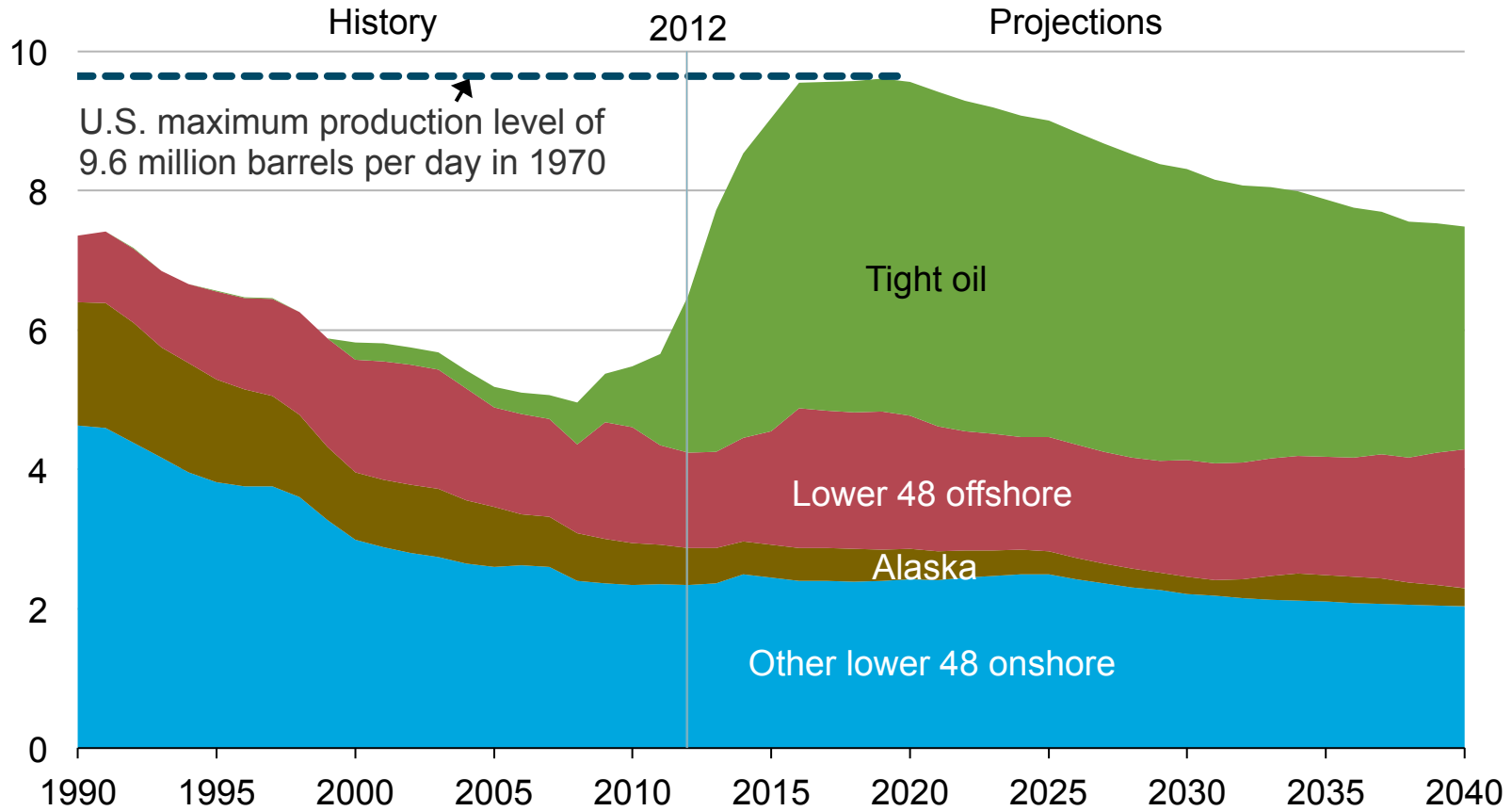
billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014 Early Release

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

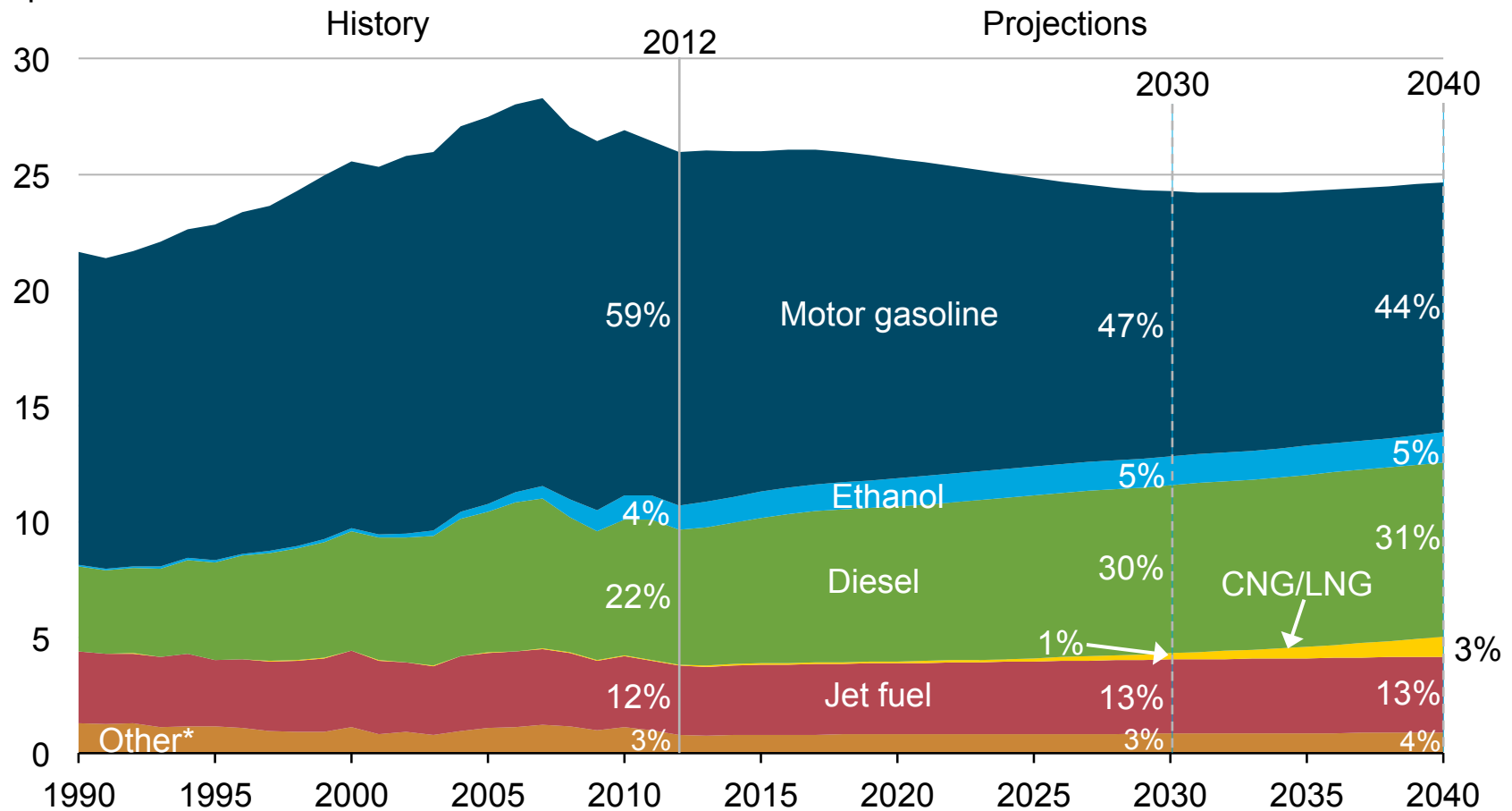
U.S. crude oil production
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. transportation sector motor gasoline demand declines, while diesel fuel accounts for a growing portion of the market

transportation energy consumption by fuel
quadrillion Btu

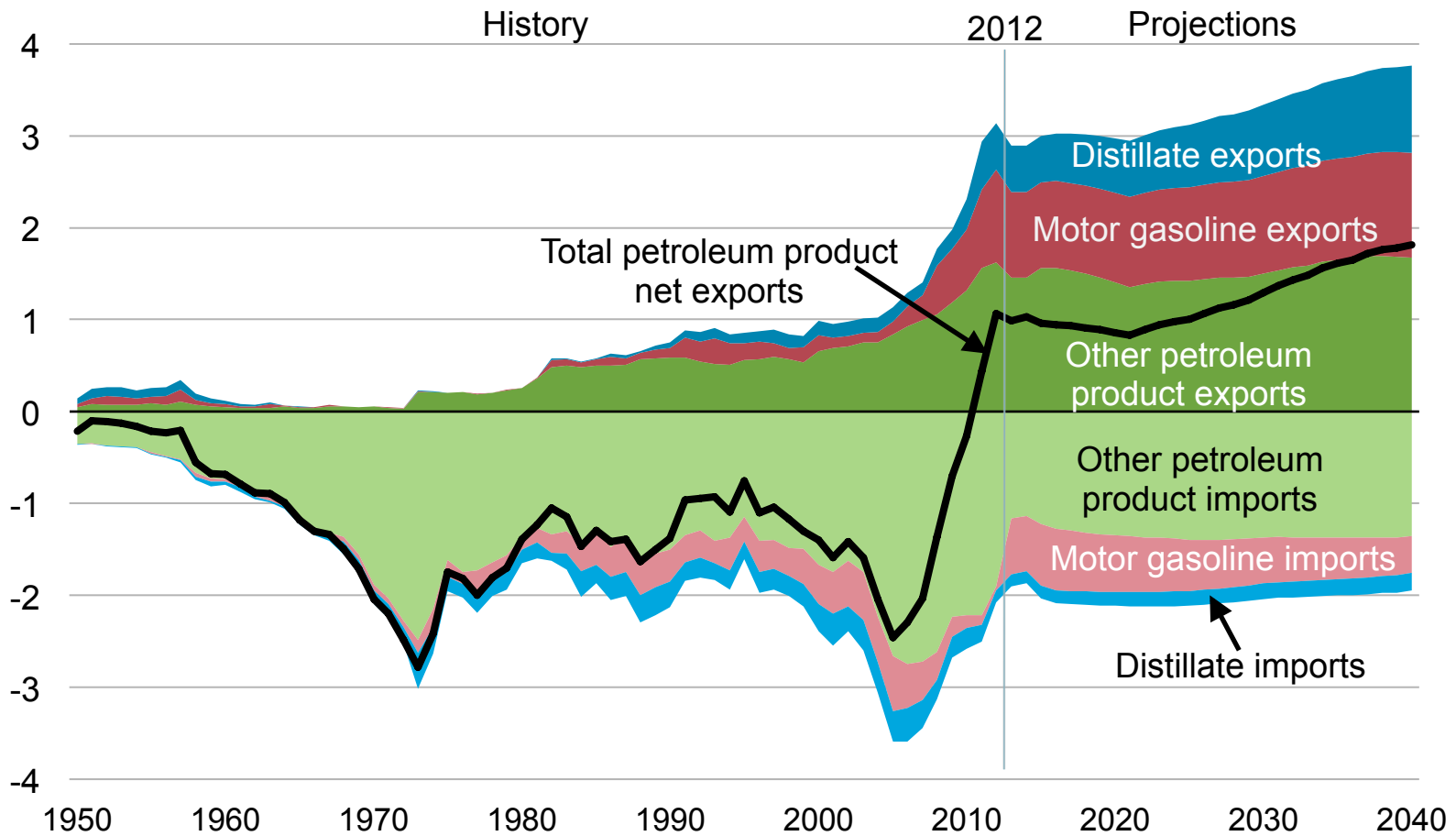


Source: EIA, Annual Energy Outlook 2014 Early Release

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

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

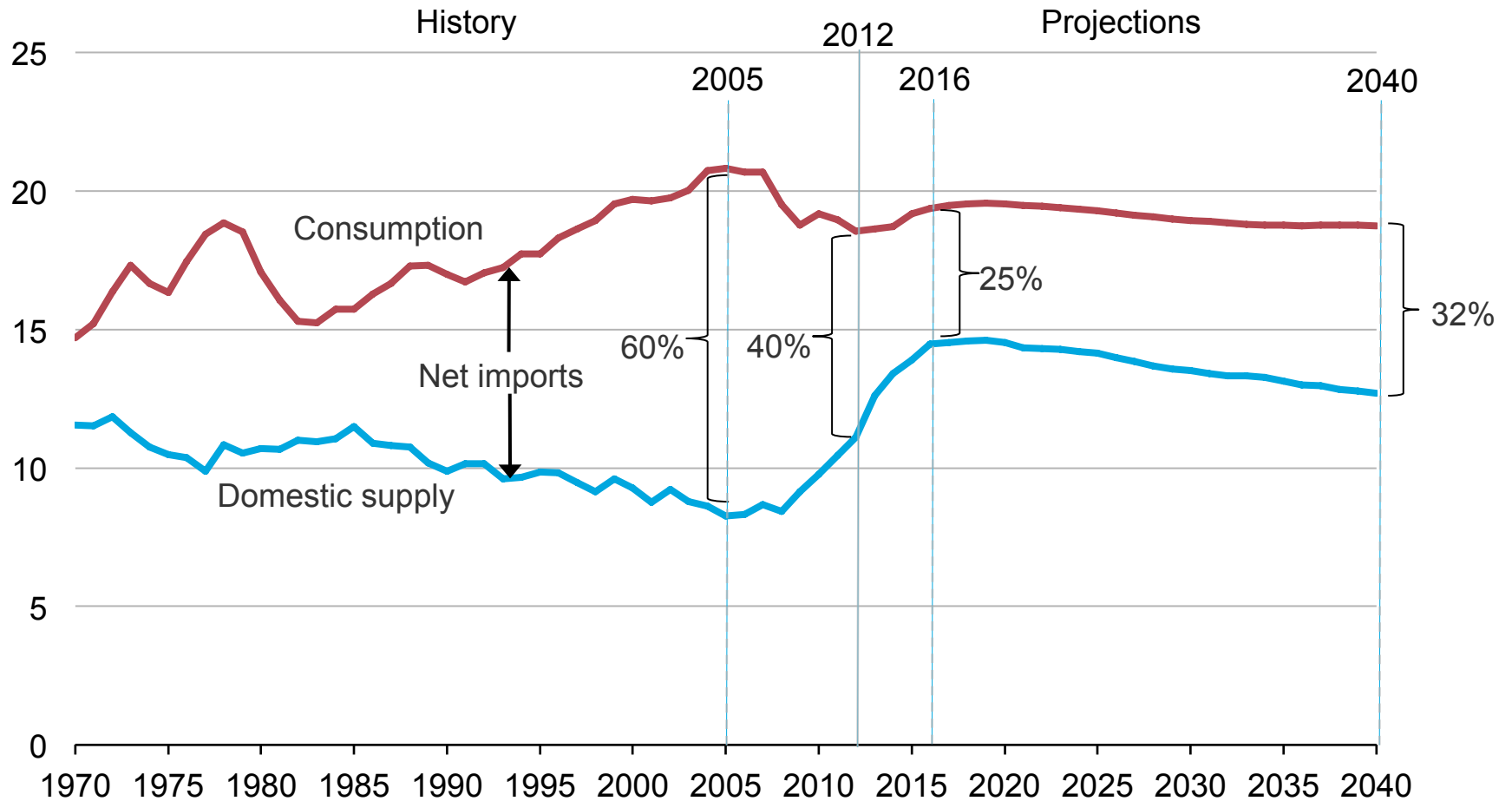
U.S. petroleum product imports and exports
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

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

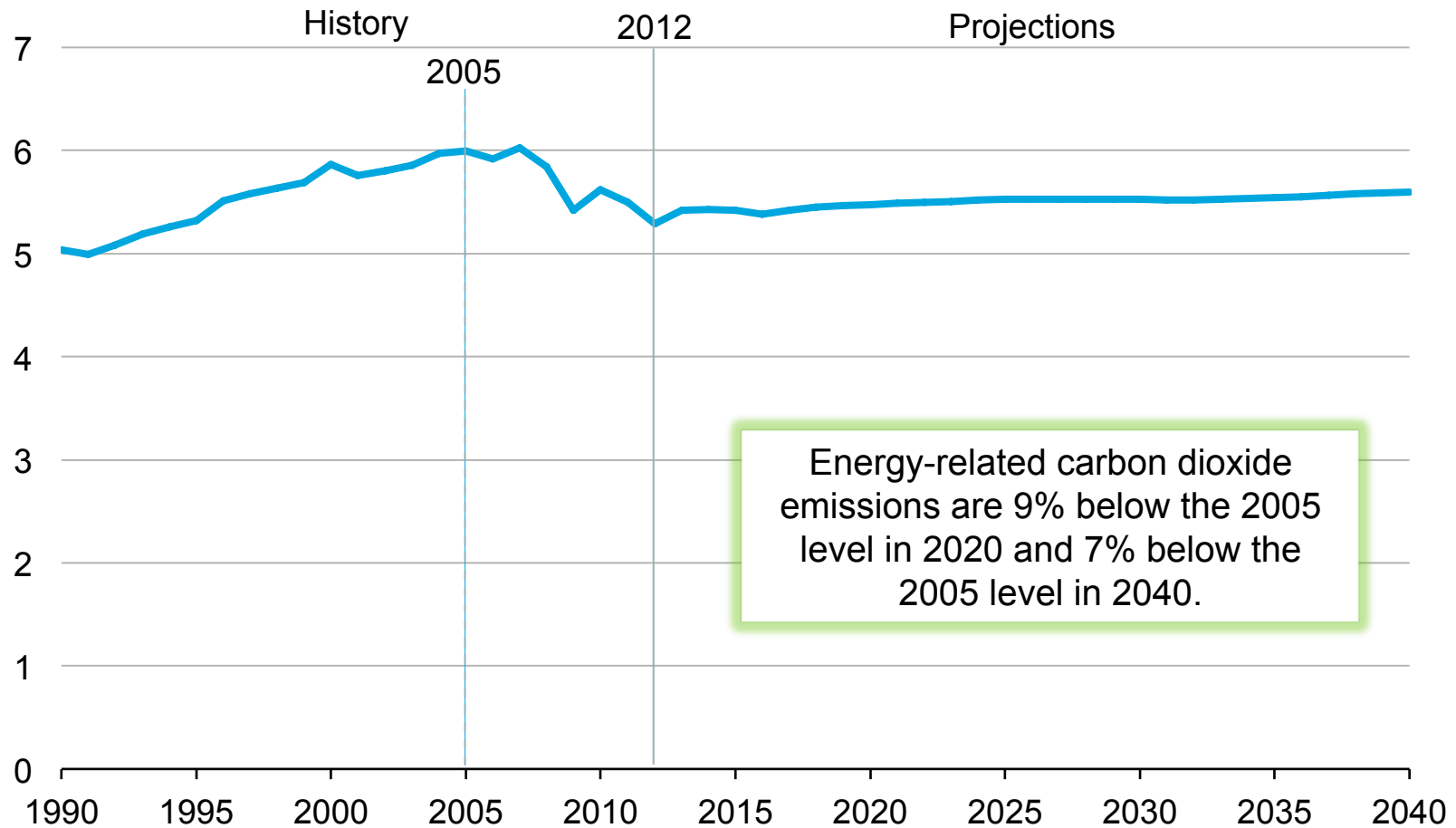
U.S. liquid fuel supply
million barrels per day



Source: EIA, Annual Energy Outlook 2014 Early Release

U.S. energy-related CO₂ emissions remain below the 2005 level throughout the projection period

carbon dioxide emissions
billion metric tons



Source: EIA, Annual Energy Outlook 2014 Early Release

Top ten countries with technically recoverable shale resources

Shale oil		
rank	country	billion barrels
1	Russia	75
2	United States	58
3	China	32
4	Argentina	27
5	Libya	26
6	Venezuela	13
7	Mexico	13
8	Pakistan	9
9	Canada	9
10	Indonesia	8
	World total	345

Shale gas		
rank	country	trillion cubic feet
1	China	1,115
2	Argentina	802
3	Algeria	707
4	United States	665
5	Canada	573
6	Mexico	545
7	Australia	437
8	South Africa	390
9	Russia	285
10	Brazil	245
	World total	7,299

Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.

Source: United States: EIA and USGS; Other basins: ARI.

Reproducibility of shale development may have limits

Many factors support production from U.S. shale resources that do not exist in many other countries:

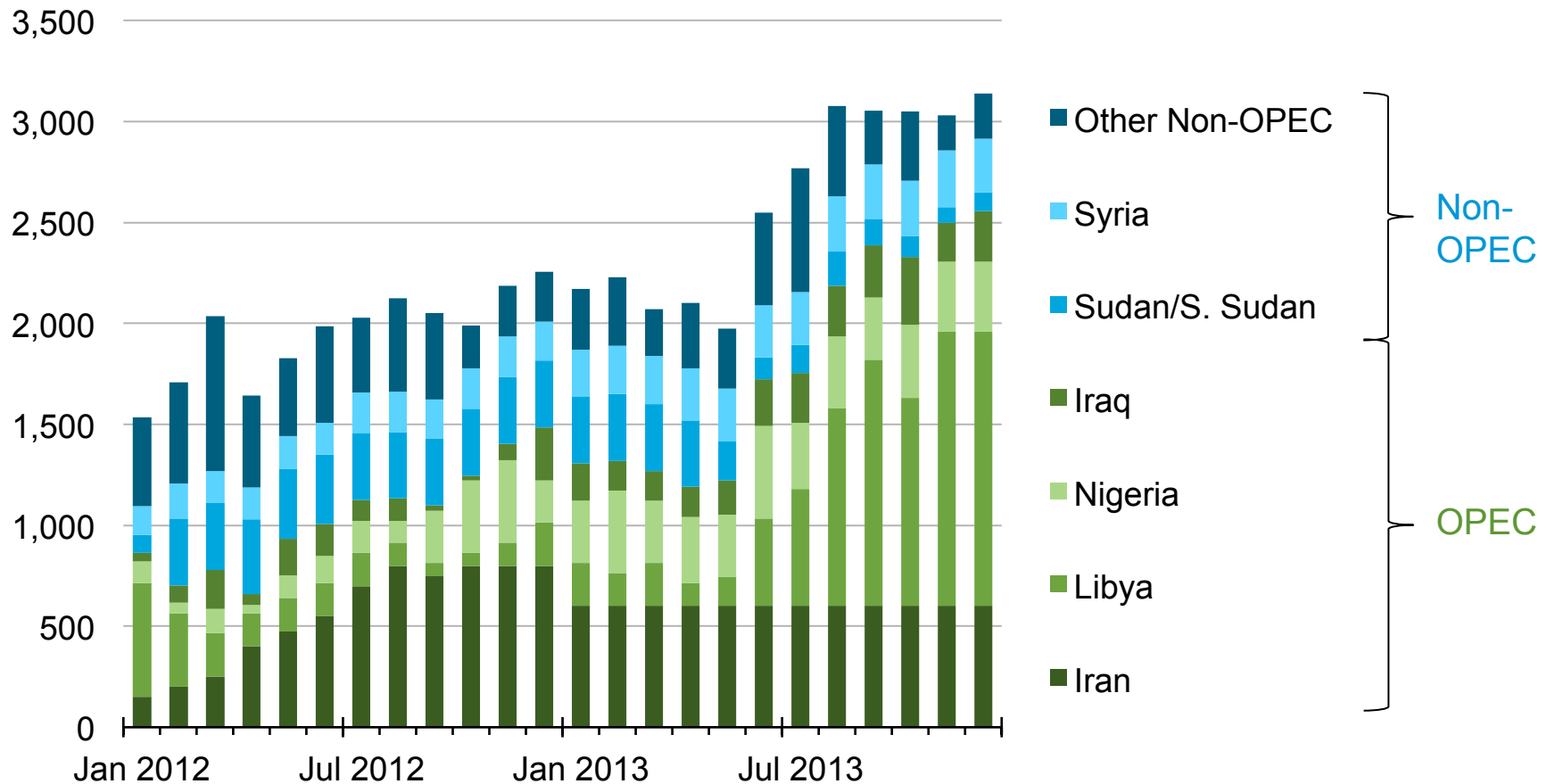
- Resource quality and geologic distribution details matter
- Major private ownership of subsurface mineral rights, often by surface owners, provides a strong incentive for development
- Availability of many independent operators and supporting contractors with critical expertise and advanced technology
- Pre-existing gathering and pipeline infrastructure
- Public acceptance of hydraulic fracturing as well as related activities, including transportation of material, and availability and disposal of water/wastewater; population density

Geopolitical implications of shale resources

- Shale oil is both light and sweet — the rapid growth in its supply has implications for crude oil pricing relationships, the value of different refinery configurations, refinery output slates, and the correspondence between SPR holdings and U.S. crude imports
- China's success in shale development and its future LNG imports (and coal use) are inversely related
- Russia's share of Europe's gas market could be reduced by increased European shale production
- High volumes of shale oil production, with other drivers, could significantly diminish the market share and pricing power of OPEC producers
- Shorter lead times for the 'manufacturing' model of production from shale resources may reduce price volatility (over an extended period) compared to the historical 'exploration/development' model for conventional resources

OPEC countries now account for most unplanned outages

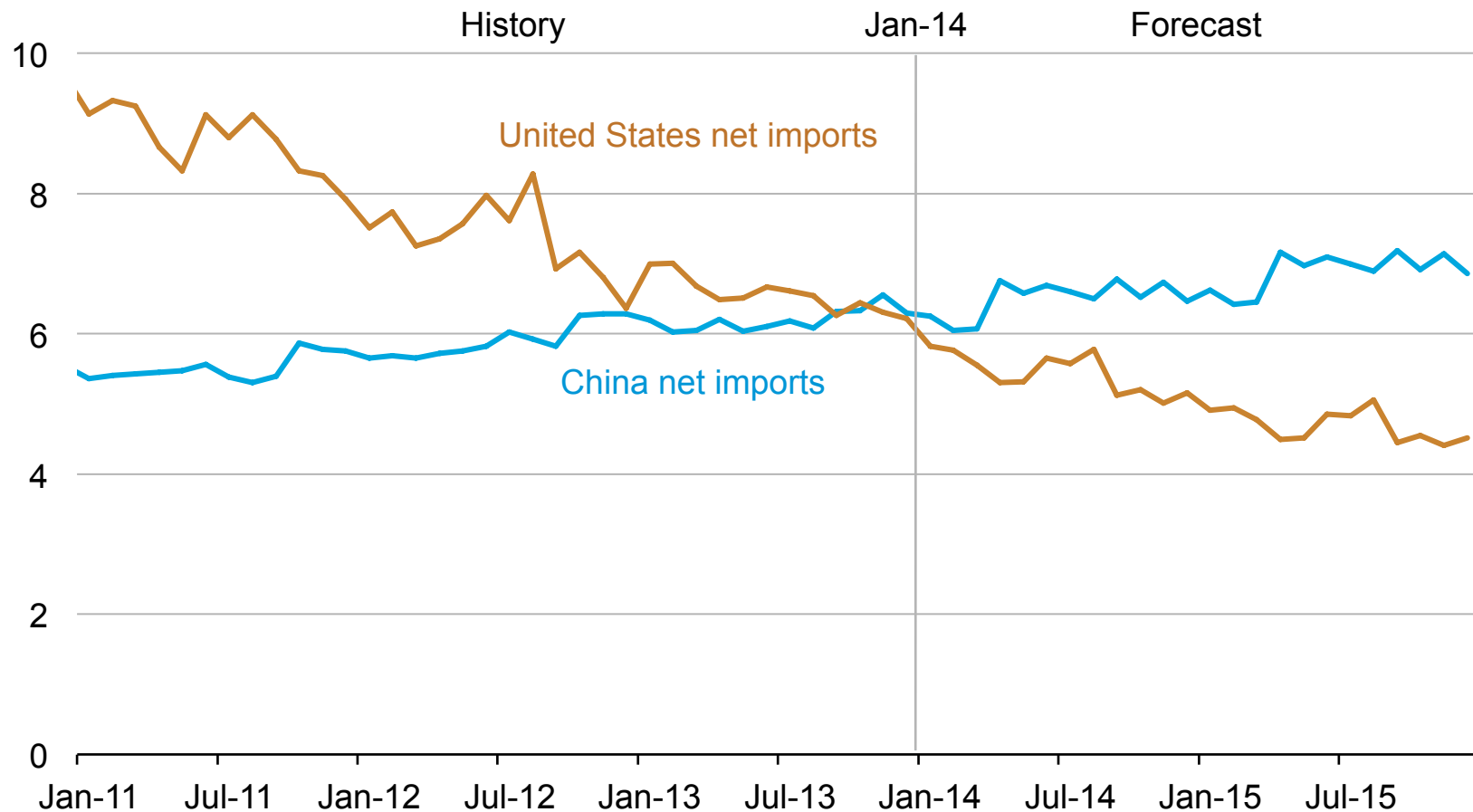
estimated unplanned crude oil production outages
thousand barrels per day



Source: EIA, Short-Term Energy Outlook, January 2014

China is now the world's largest net oil importer

net imports for China and the United States
millions of barrels per day



Note: Net oil imports are defined as total liquid fuels consumption less domestic production.

Source: EIA, Short-Term Energy Outlook, January 2014

U.S. liquids (petroleum) production projected to outpace both Saudi Arabia and Russia in 2014

Liquids (petroleum) production, 2014 (million barrels per day)

	United States	Saudi Arabia	Russia
Crude oil	8.5	10.0	10.3
NGLs	2.5	1.8	0.8
Biofuels +	1.0	0	0
Refinery gain	1.1	0.1	0.1
Total (mmbbl/d)	13.1	11.9	11.2

Source: EIA, Short-Term Energy Outlook; International Energy Outlook

There are many issues that cause uncertainty...

- Unresolved long-term effects of economic issues in the United States, Europe, and China, and their impacts on demand
- Social unrest in the Middle East and North Africa, and the potential for unrest elsewhere, and its impacts on supply
- The timing of Japan's full recovery from the impacts of the 2011 nuclear disaster at Fukushima
- Global shale gas and shale oil production potential and OPEC market share decisions
- Changing policies and regulations
- Changing consumer preferences and technological breakthroughs

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/>