Energy outlook

For

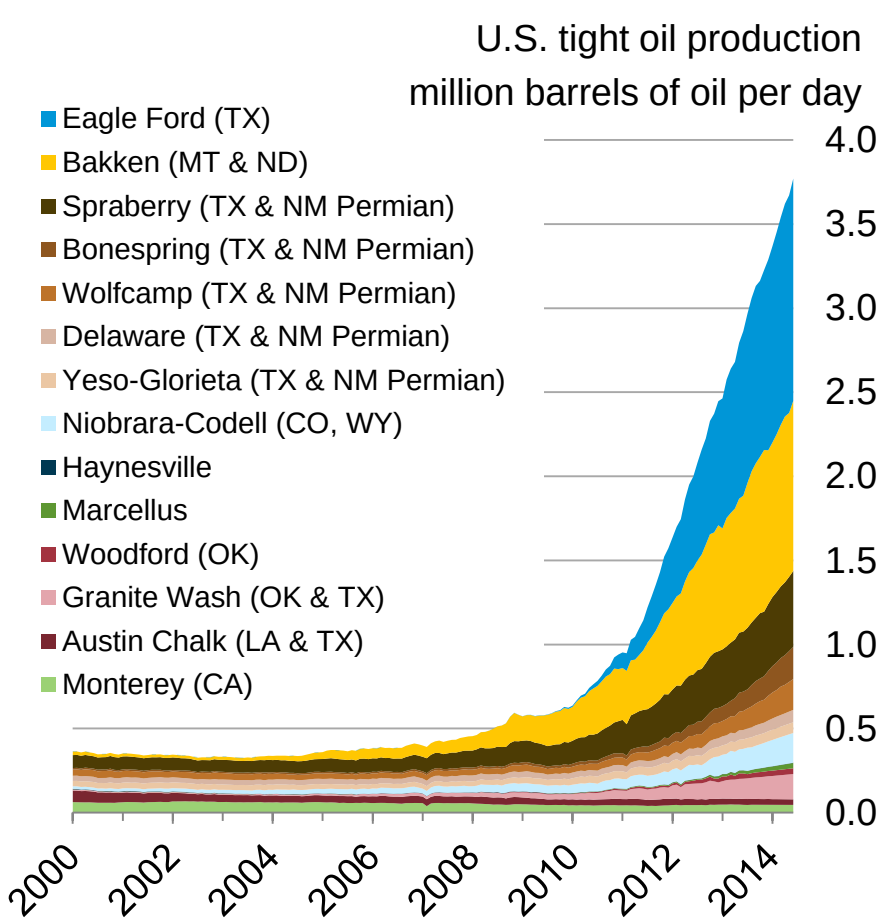
Government of Canada

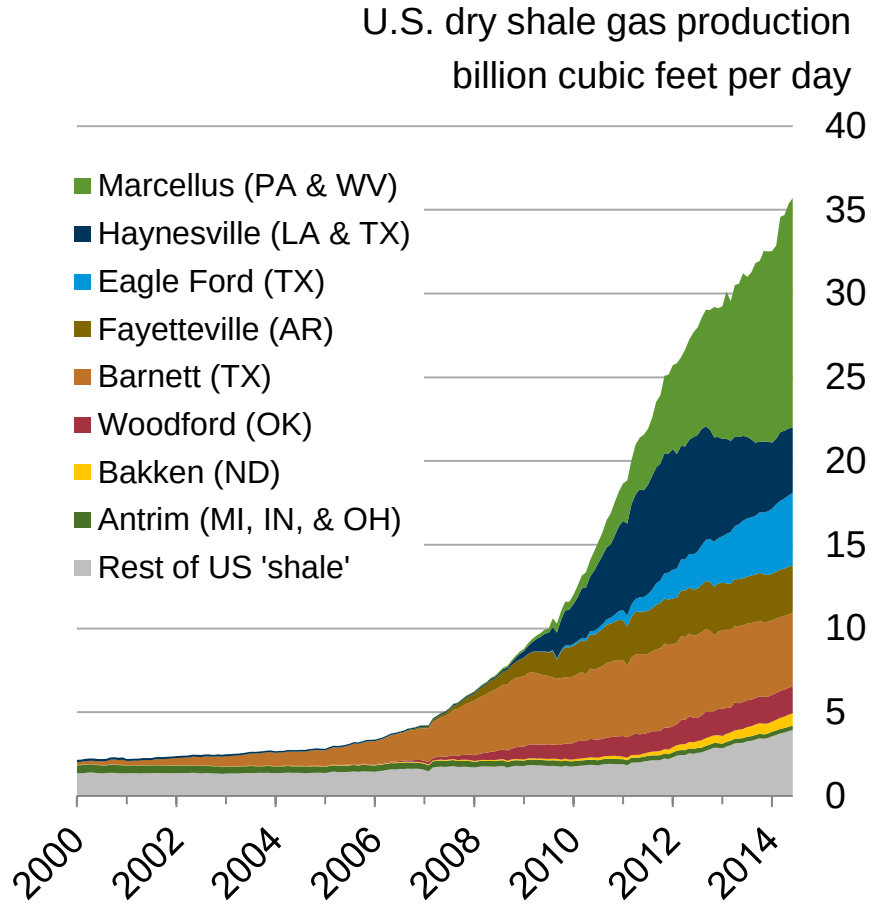
July 21, 2014 | Ottawa, Ontario, Canada

By

Adam Sieminski, EIA Administrator

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

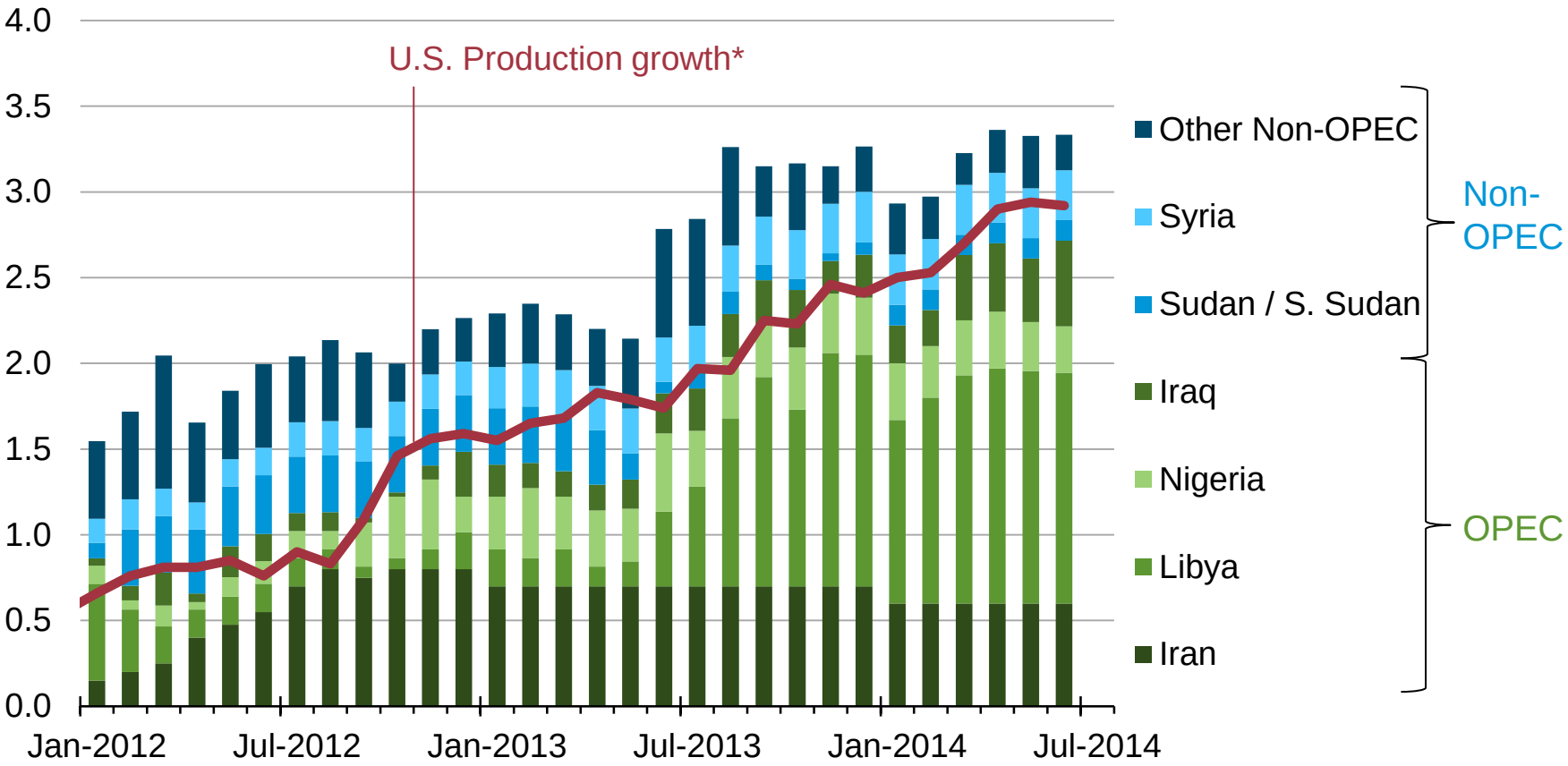




Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through June 2014 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

U.S. oil production growth helping to offset unplanned outages

estimated unplanned crude oil production outages
million barrels per day

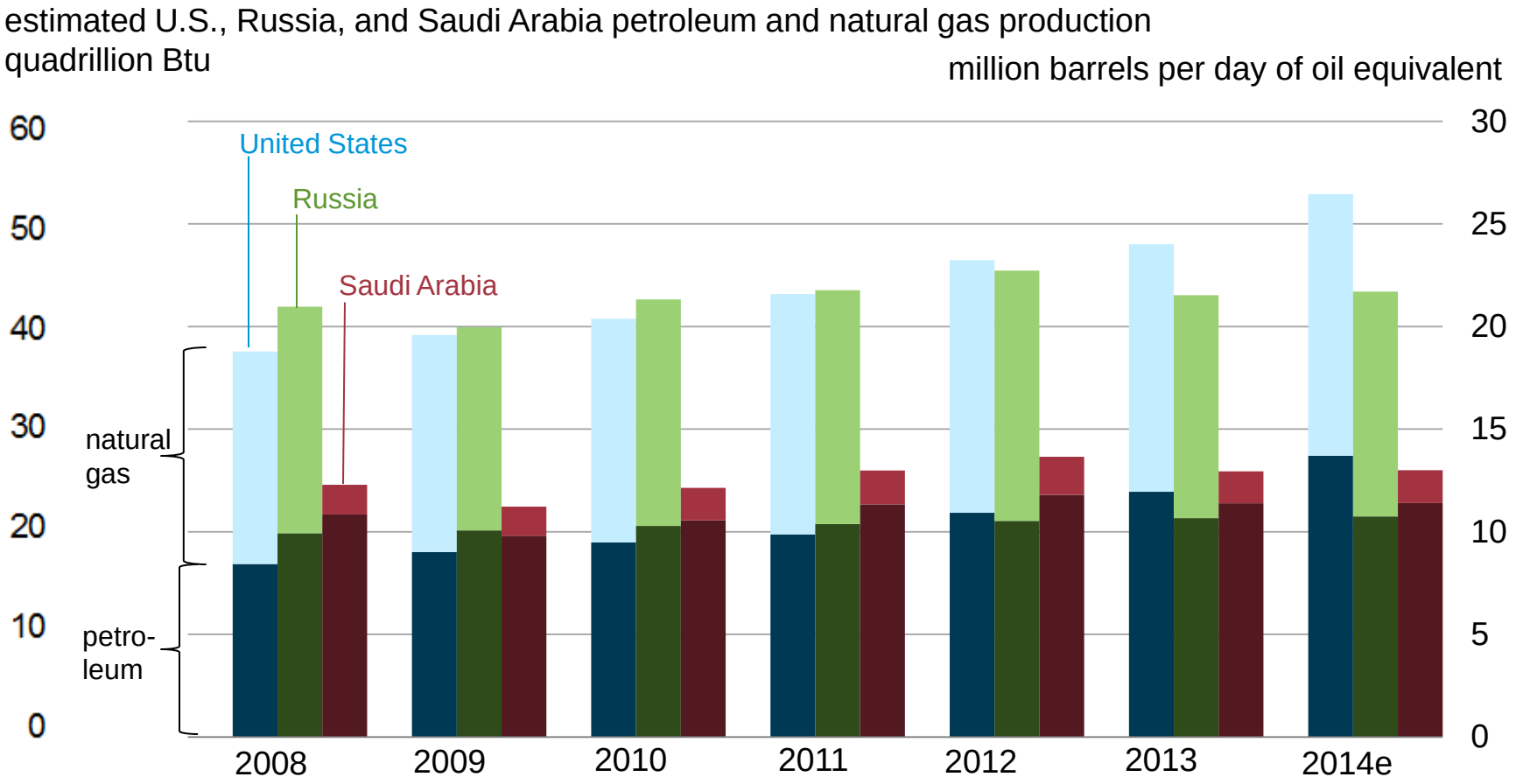


Source: EIA, Short-Term Energy Outlook, July 2014

**Monthly production delta versus Jan. 2011 production level*

U.S. is the largest producer of petroleum and natural gas in the world

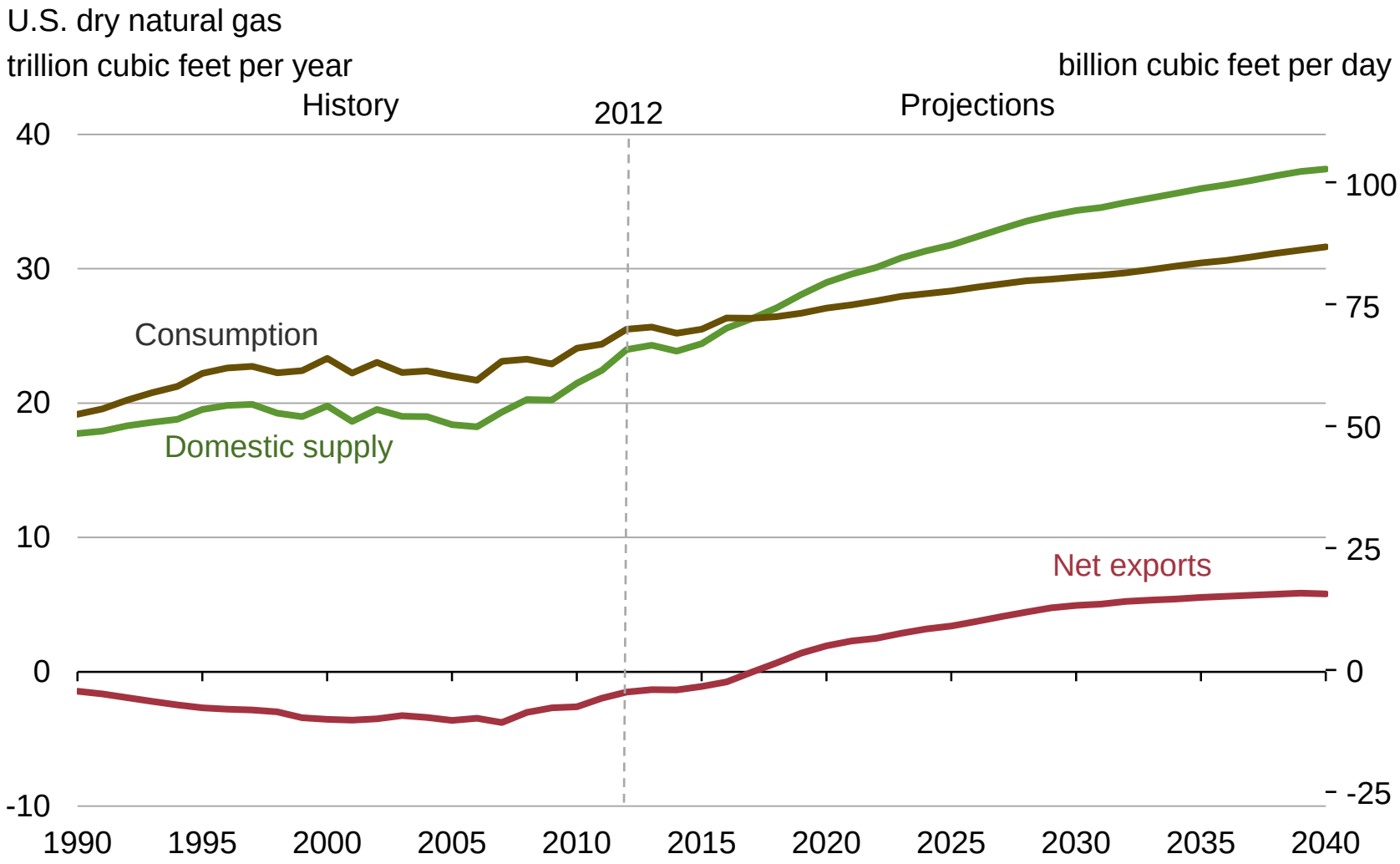
estimated U.S., Russia, and Saudi Arabia petroleum and natural gas production



Source: U.S. Energy Information Administration

Note: Petroleum production includes crude oil, natural gas liquids, condensates, refinery processing gain, and other liquids, including biofuels; barrels per day oil equivalent were calculated using a conversion factor of 1 barrel oil equivalent=5.55 million British thermal units (Btu)

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

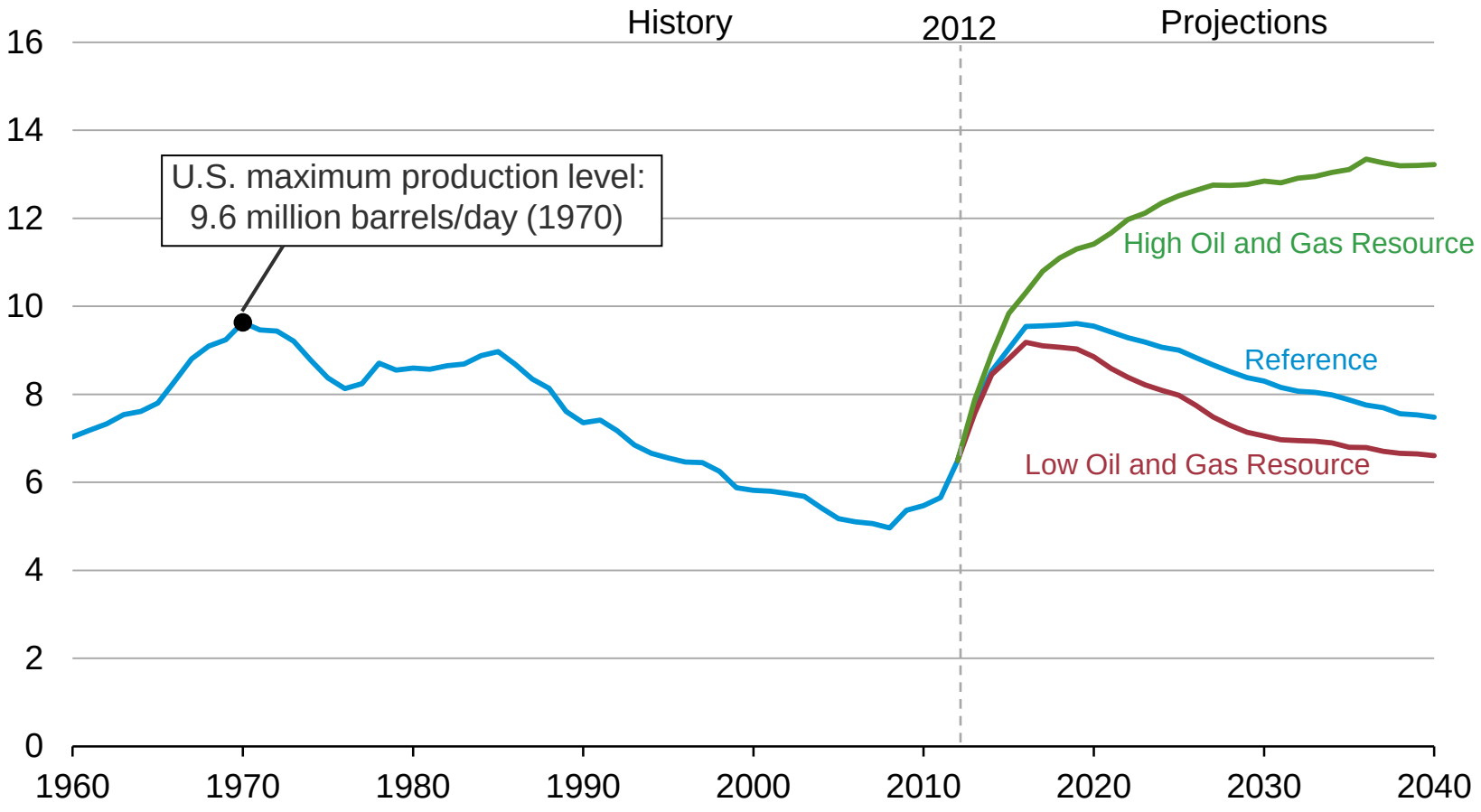


Source: EIA, Annual Energy Outlook 2014 Reference case

U.S. crude oil production exceeds 13 million b/d in High Oil and Gas Resource case

U.S. crude oil production in three cases

million barrels per day



Source: EIA, Annual Energy Outlook 2014 Reference case, High Oil and Gas Resource case, and Low Oil and Gas Resource case

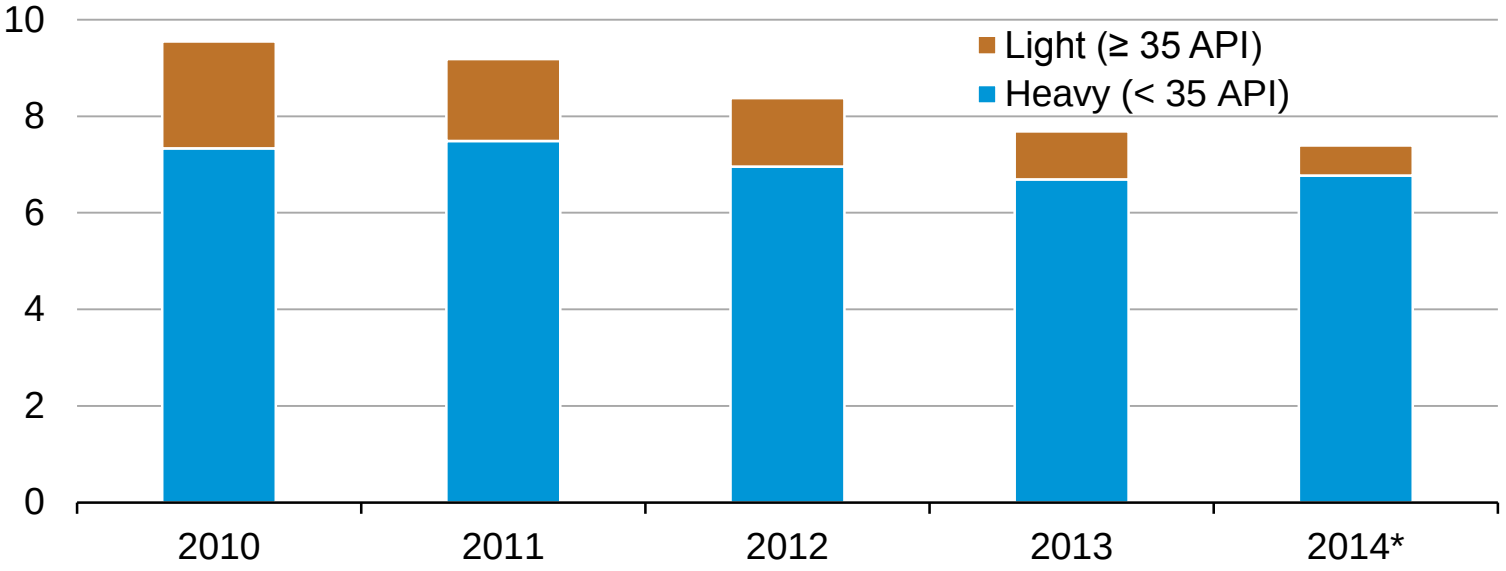
Consequences of increased domestic oil production

- Additional production of light oil over the past several years has for the most part been absorbed by reducing imports of similar grades oils
- Other responses include:
  - Increased crude oil exports (244,000 b/d in first quarter 2014)
  - Increased average API gravity of crude inputs to domestic refining
  - Increased refinery runs – and product exports
- Future options include:
  - Continued shifts in the refinery input mix
  - Added splitters to convert light crude into a mix of heavier fractions to feed domestic refineries and light products valued in other markets
  - Continued increases in crude oil exports

Imports of light crude fell from 1.7 million b/d in 2011 to 0.6 million b/d during first two months of 2014

U.S. crude oil imports

million barrels of oil per day

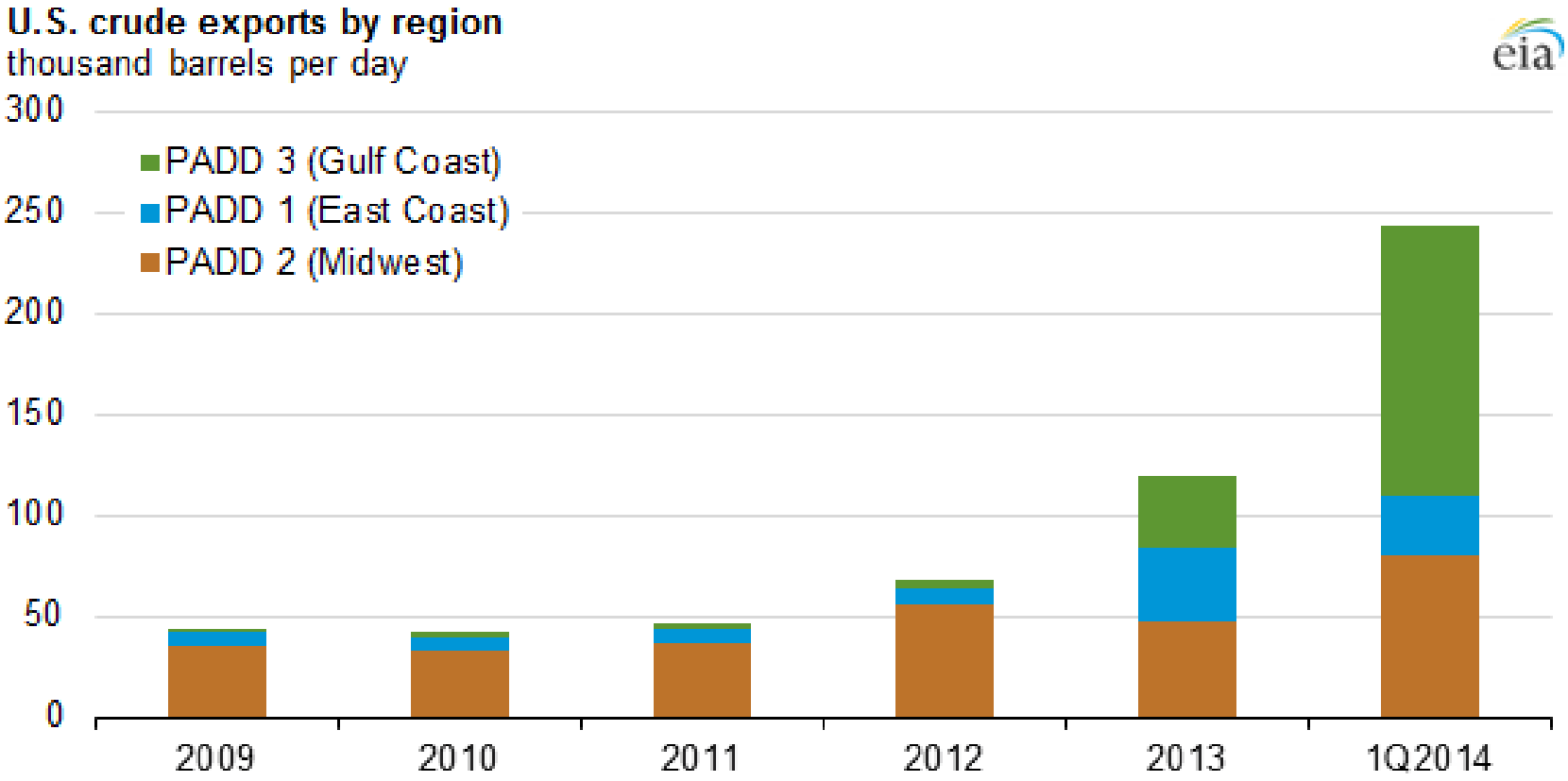


Note: 2014 data is January and February only.

Source: U.S. Energy Information Administration, Petroleum Supply Monthly

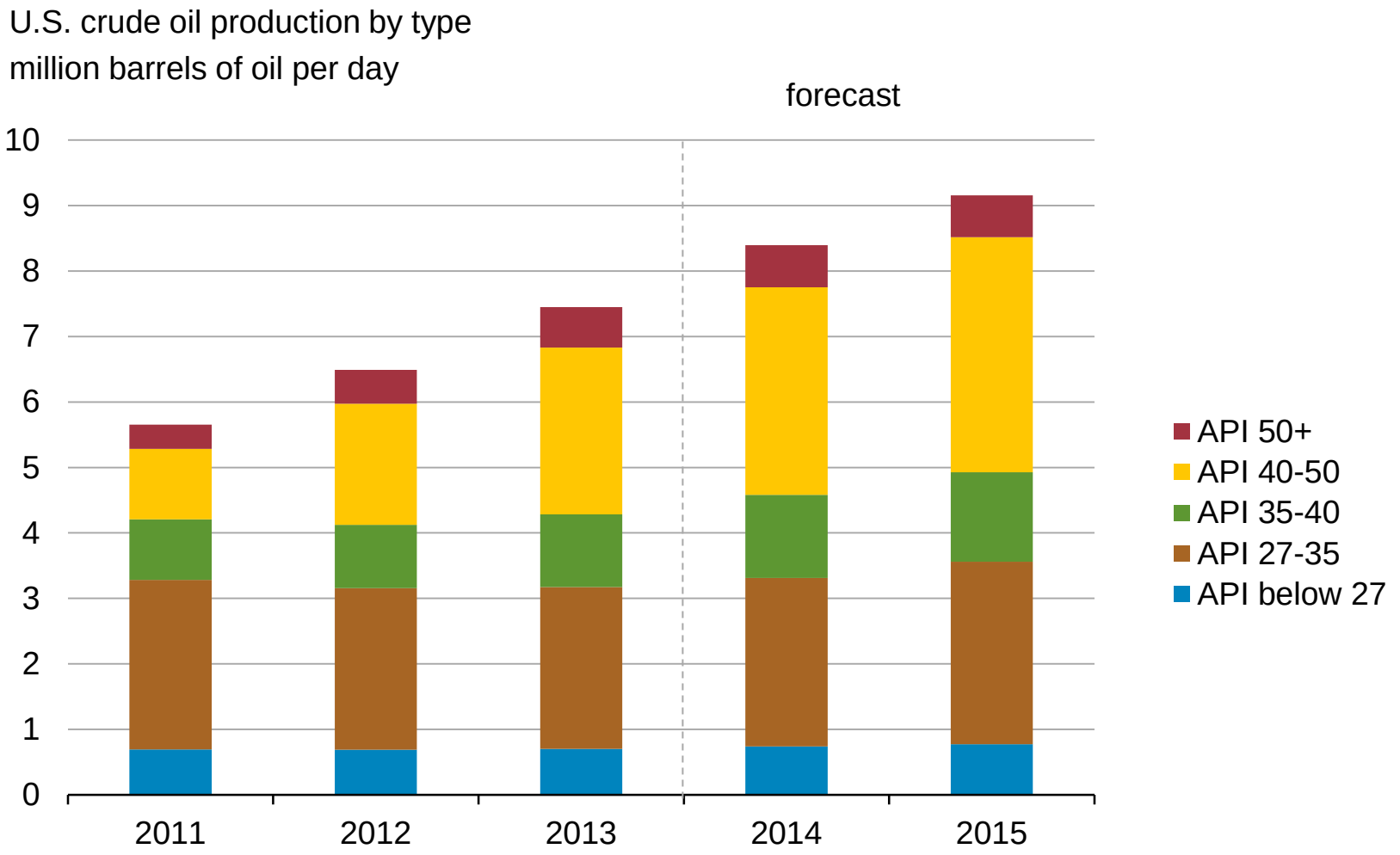
- Of the total 1.5 million b/d decline in crude oil imports between 2011 and 2013, nearly 50% was light crude (API gravity 35+)
- API 40+ imports fell from 0.6 million b/d in 2011 to 0.2 million b/d in 2013, and averaged only 0.1 million b/d during the first two months of 2014

U.S. crude exports rise to highest level in 15 years



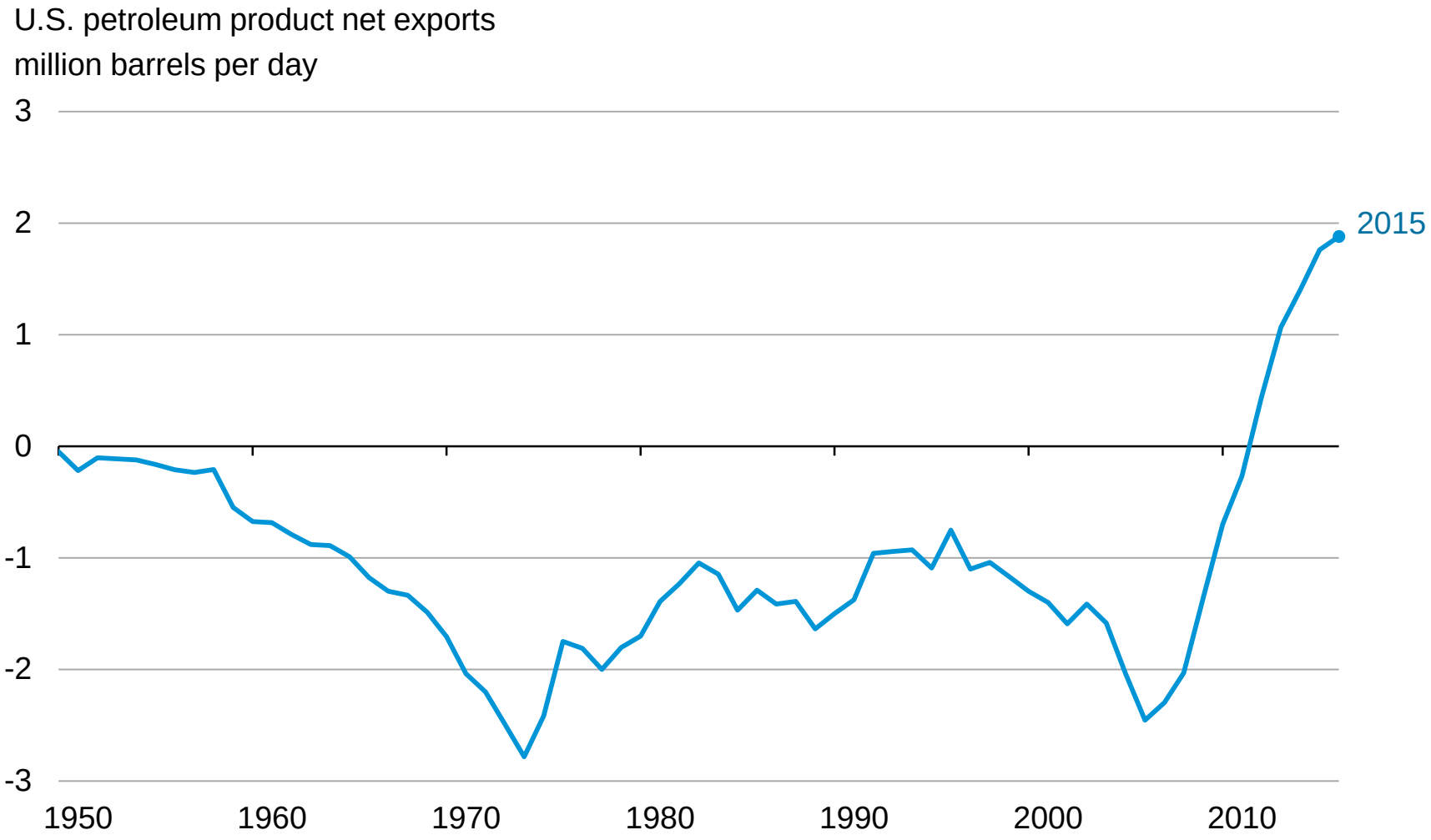
Source: *U.S. Energy Information Administration, Petroleum Supply Monthly*
Note: *2014 regional data are through March. PADD denotes Petroleum Administration for Defense District*

Roughly 96% of the growth in production between 2011 and 2013 consisted of sweet grades with API gravity of 40 or above



Source: EIA, DrillingInfo, Colorado DNR, Texas RRC. http://www.eia.gov/analysis/petroleum/crudetypes/

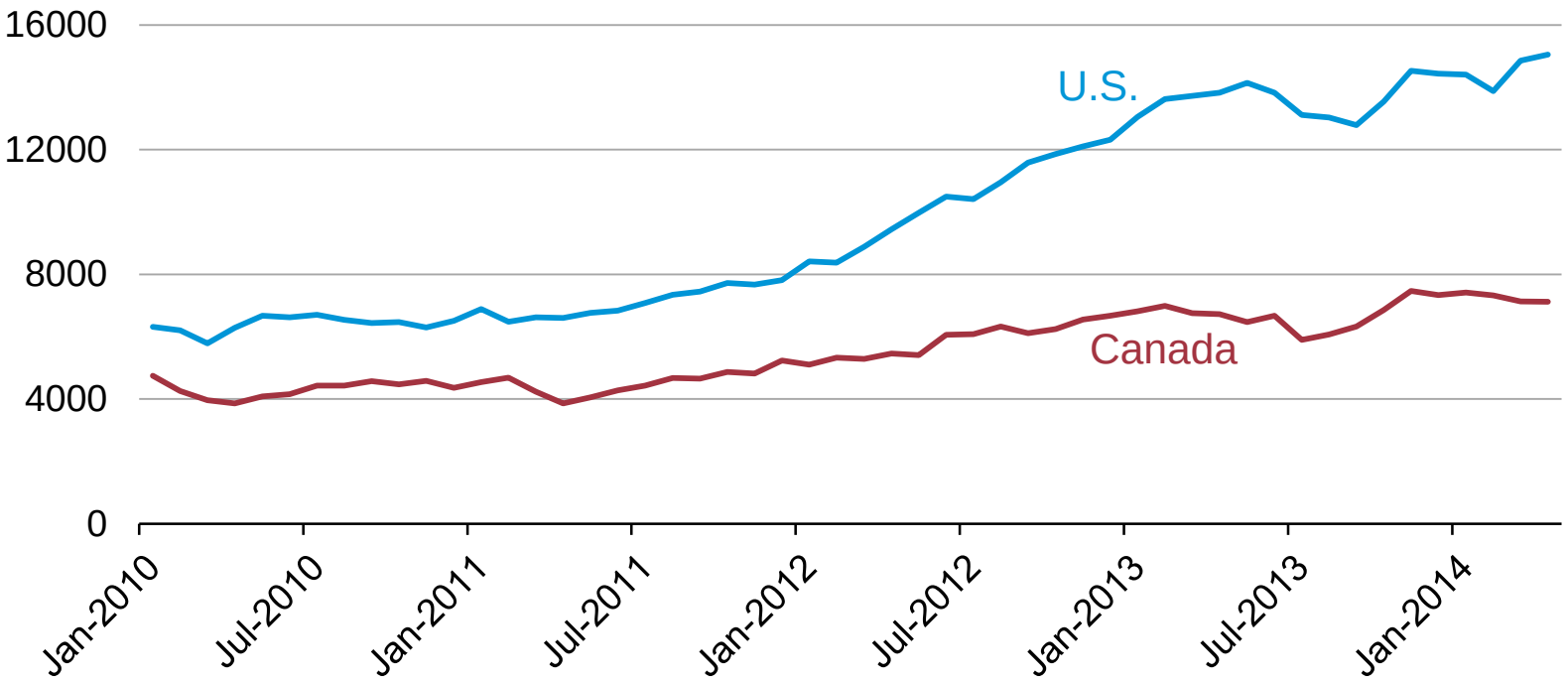
U.S. is now a major net exporter of petroleum products



Source: EIA, Annual Energy Outlook 2014 Reference case and Short Term Energy Outlook

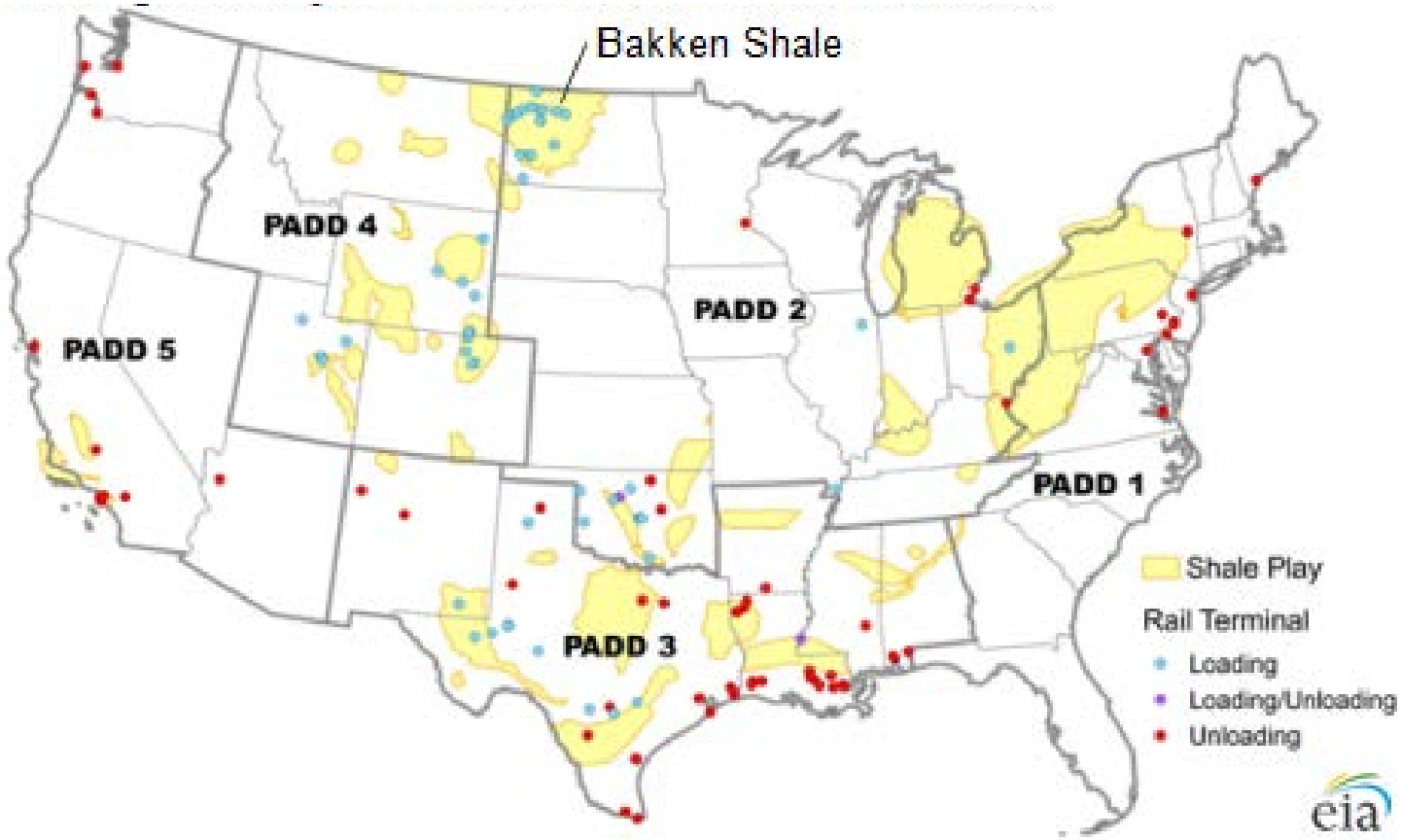
Rail car loadings of crude oil and petroleum products in the U.S. and Canada have significantly increased since 2010

U.S. and Canadian crude oil and petroleum products
average weekly carloads



Note: Data are weekly average originations for each month, are not seasonally adjusted and reflect revisions to the original reporting
Source: AAR

Existing crude-by-rail infrastructure in the United States



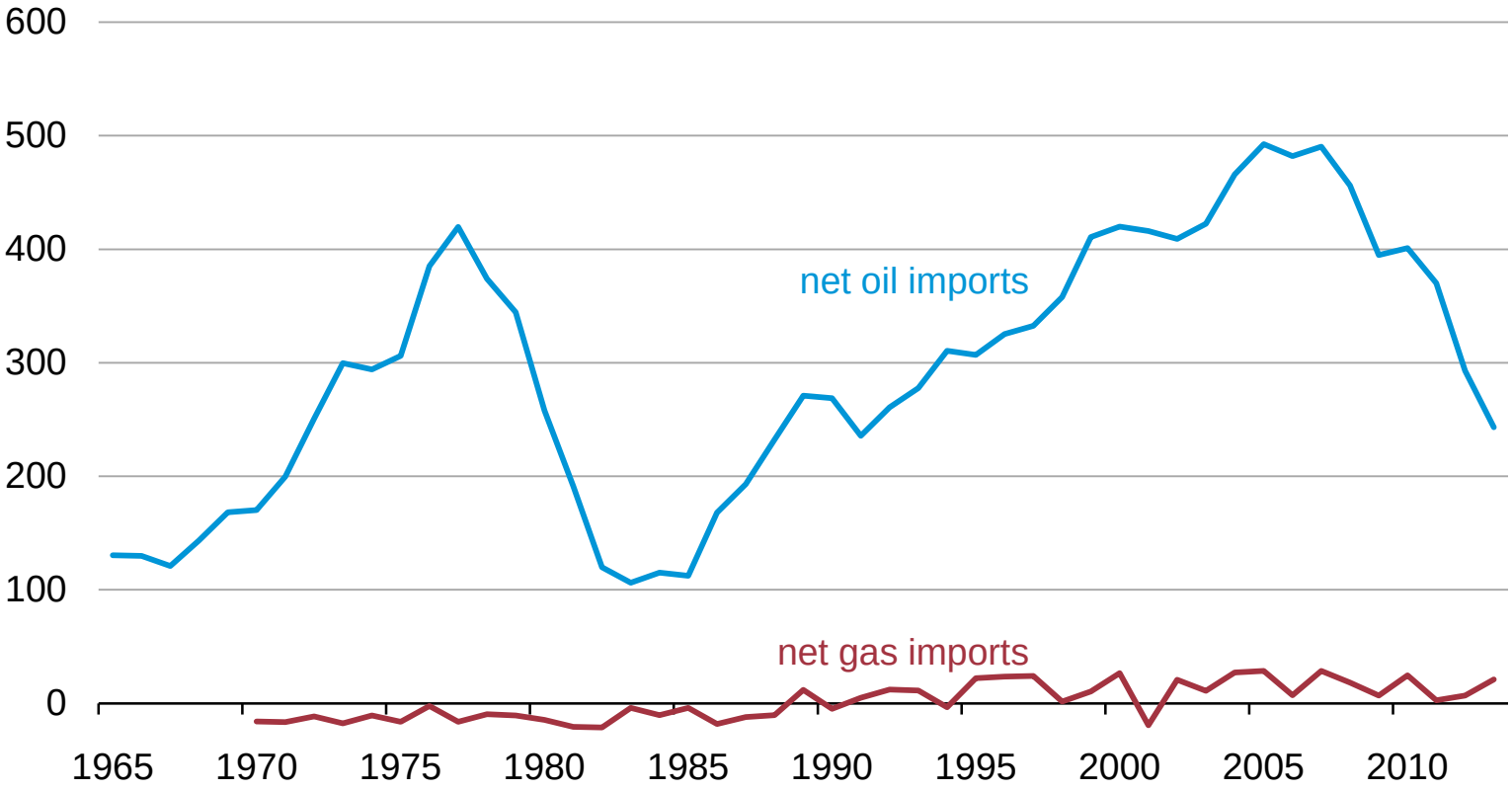
Bakken rail outflow capacity totaled 965,000 barrels per day (b/d) at the end of 2013, compared to 515,000 b/d of pipeline capacity. Eagle Ford rail outflow is over 200,000 b/d.

Source: U.S. Energy Information Administration
Note: Data as of March 2014. PADD denotes Petroleum Administration for Defense District.

North American net imports of oil and natural gas

North American net imports, 1965-2013

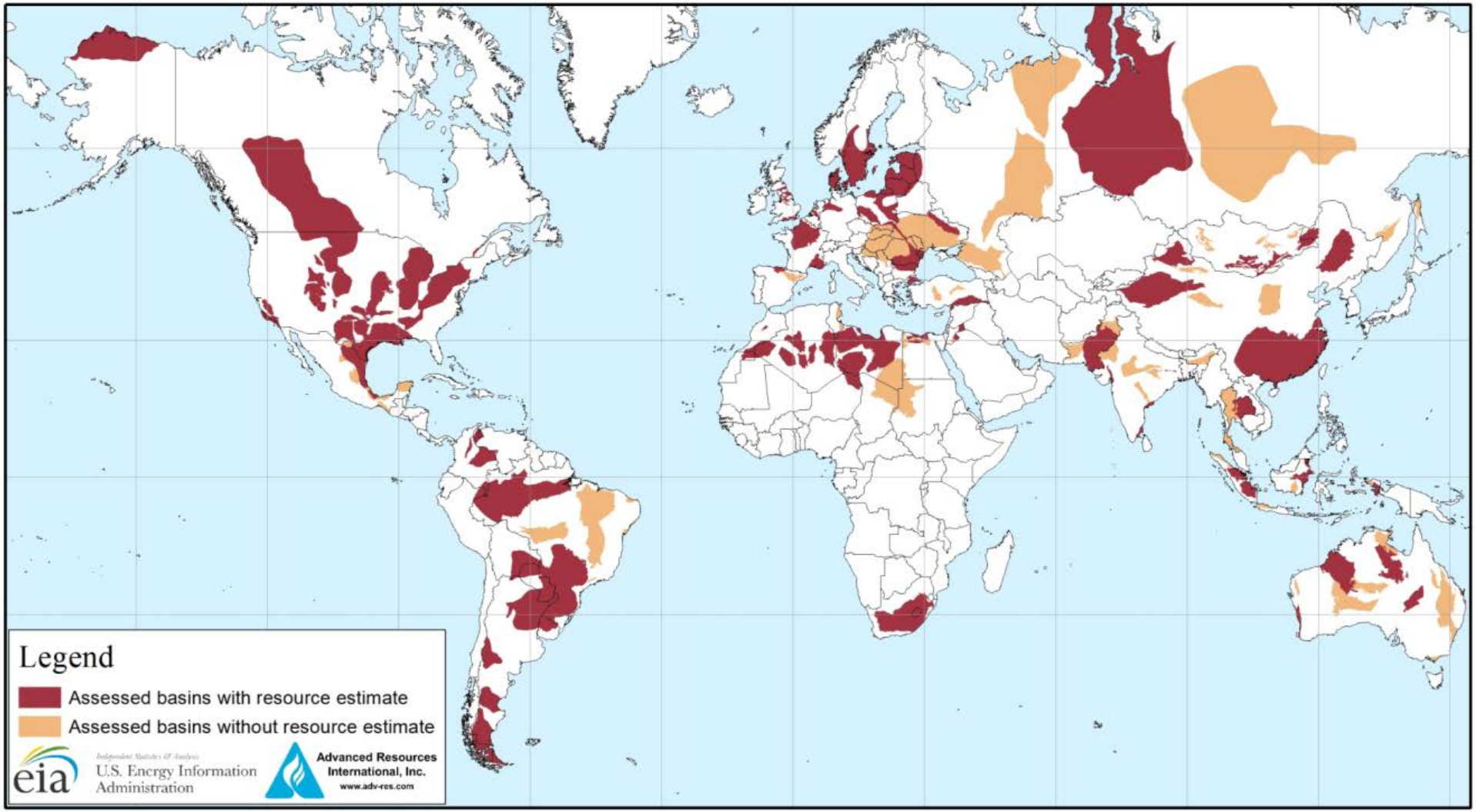
million metric tons



Source: BP Statistical Review of World Energy 2014

Shale oil and gas in a world energy context

EIA / ARI assessed shale oil and shale gas resources 2013



Source: United States basins from EIA and United States Geological Survey, other basins from ARI based on data from various published studies

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**

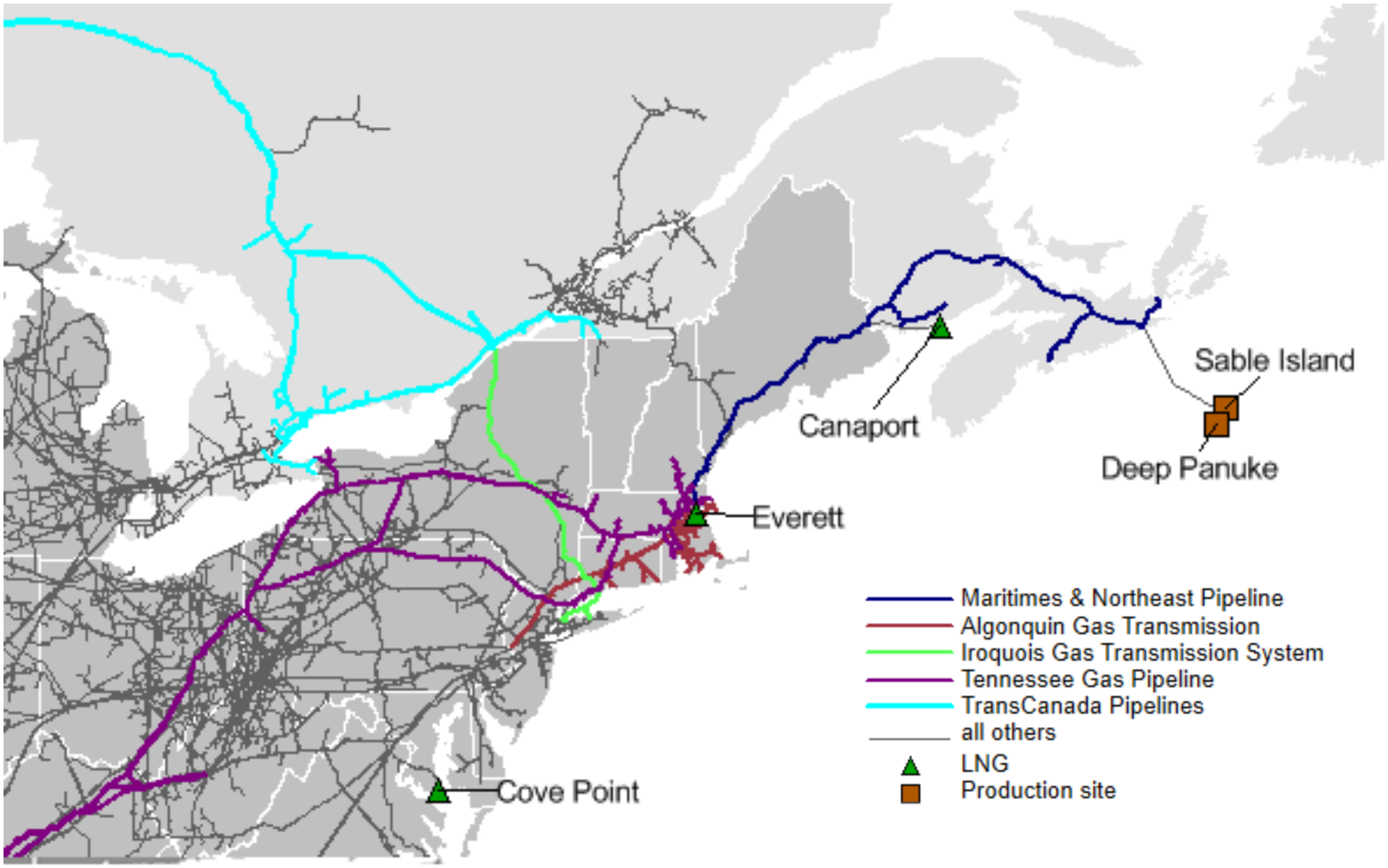
Note: ARI estimates U.S. shale oil resources at 48 billion barrels and U.S. shale gas resources at 1,161 trillion cubic feet.

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

Geopolitical implications of shale resources

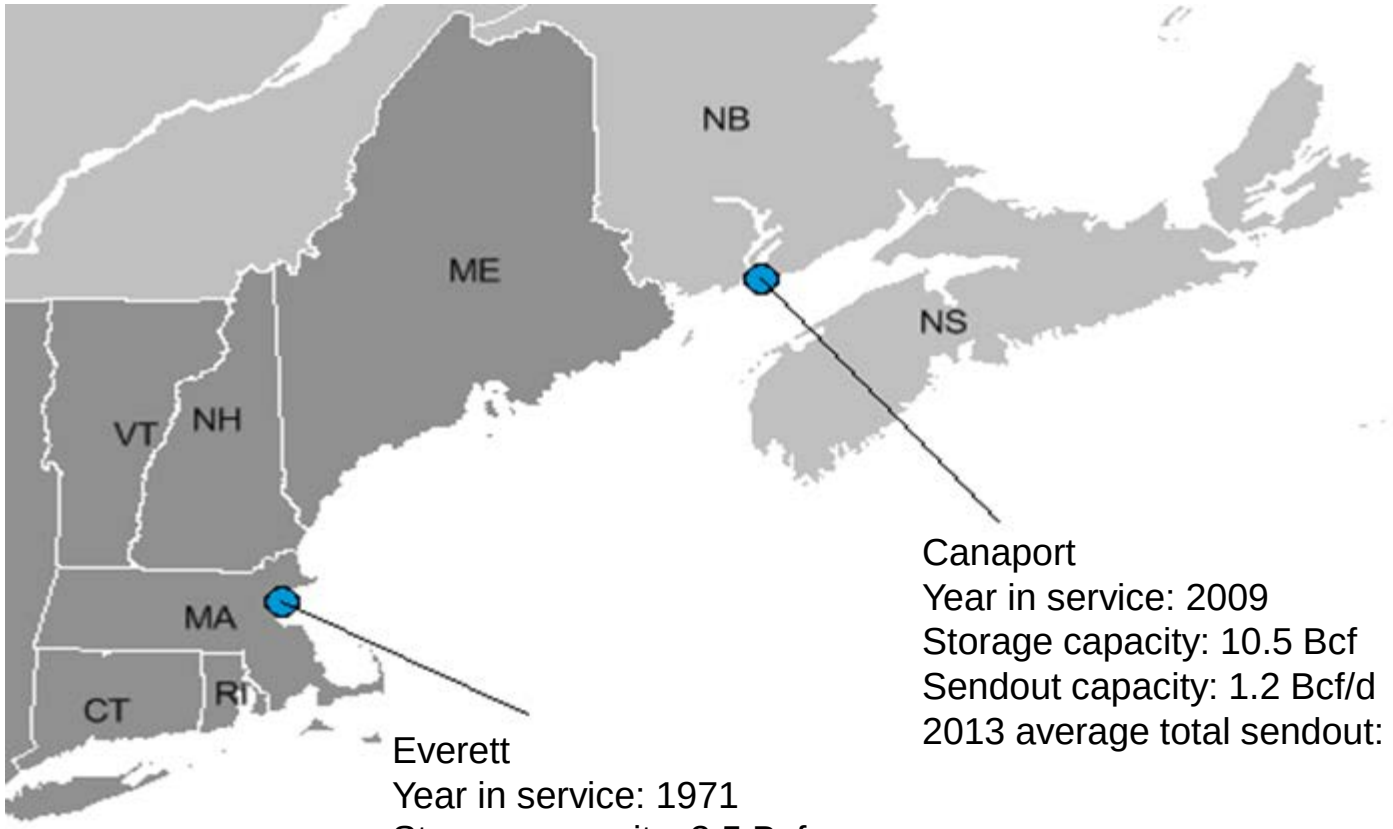
- Shale oil is both light and sweet — the rapid growth in its supply has implications for crude oil pricing relationships, the value of different refinery configurations, refinery output slates, and the correspondence between SPR holdings and U.S. crude imports
- China's success in shale development 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 key 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

Natural gas infrastructure in the northeastern U.S. and eastern Canada



Source: EIA and Ventyx

Liquefied natural gas marine terminals in the Northeast

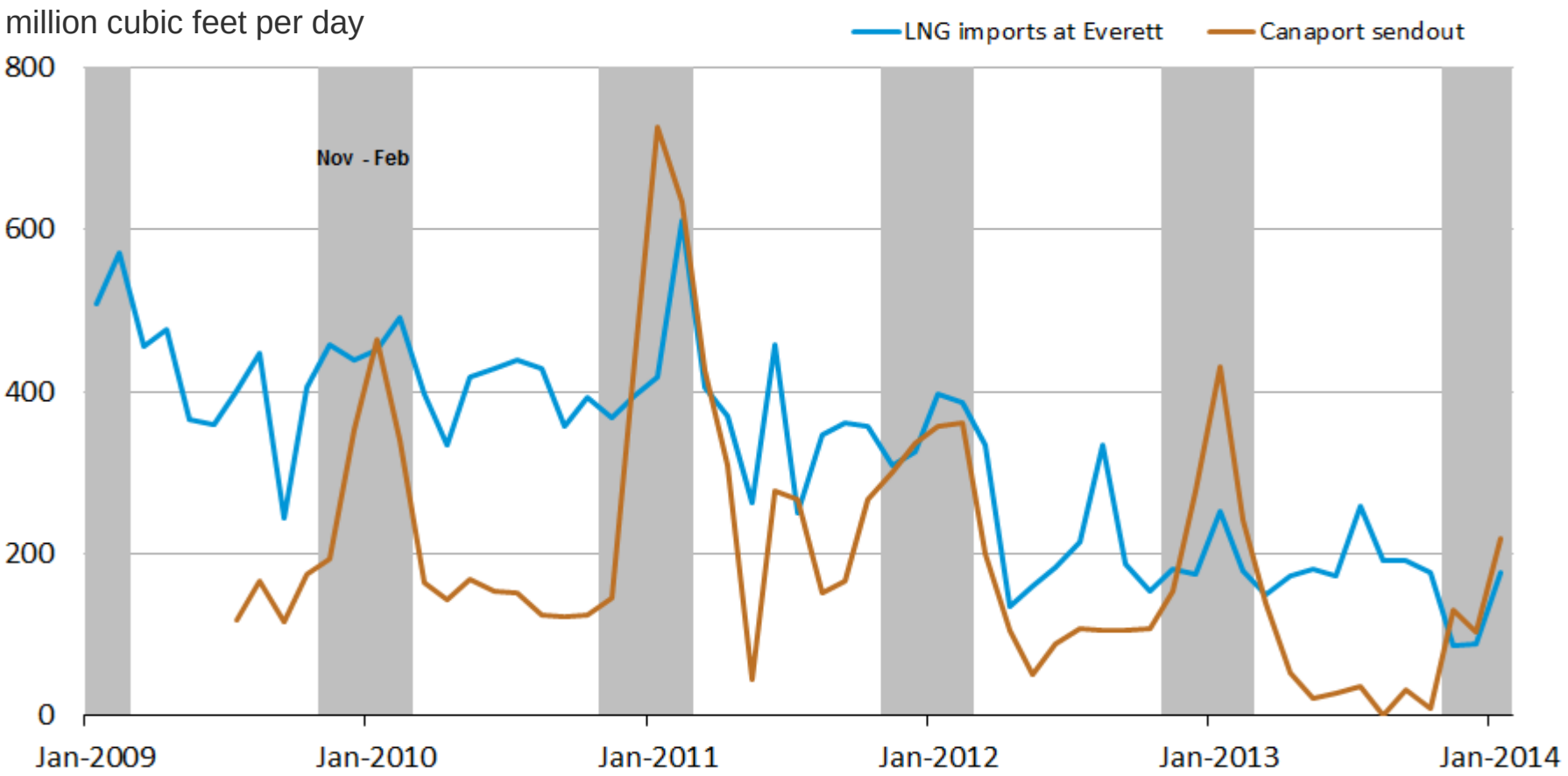


Canaport
Year in service: 2009
Storage capacity: 10.5 Bcf
Sendout capacity: 1.2 Bcf/d
2013 average total sendout: 0.1 Bcf/d

Everett
Year in service: 1971
Storage capacity: 3.5 Bcf
Sendout capacity: 0.9 Bcf/d
2013 average total sendout: 0.2 Bcf/d

Source: EIA; Canada-Nova Scotia Offshore Petroleum Board; Ventyx; company websites

LNG imports are decreasing at Canaport and Everett terminals



Source: Ventyx, and Canada-Nova Scotia Offshore Petroleum Board

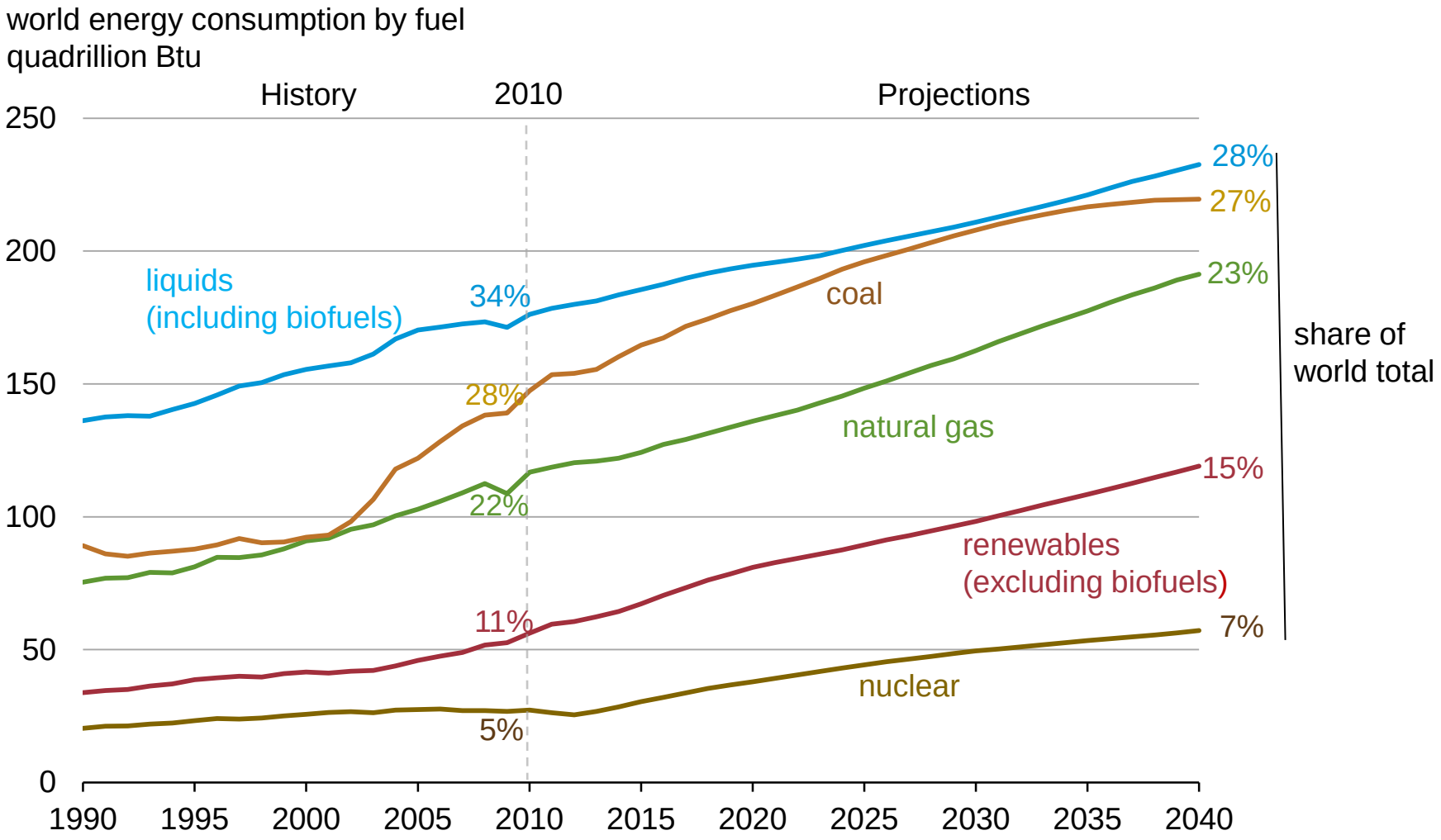
LNG export projects in eastern Canada

	Goldboro LNG Terminal	H-Energy LNG Terminal
Planned year in service	2019	2020
Liquefaction capacity	1.3 Bcf/d	0.6 Bcf/d
Storage capacity	14.6 Bcf	N/A
Contract	20 year supply deal with E. On AG	N/A
Supply sources	Marcellus, eastern Canada	N/A
NEB approval	Under review	N/A

Source: Company websites

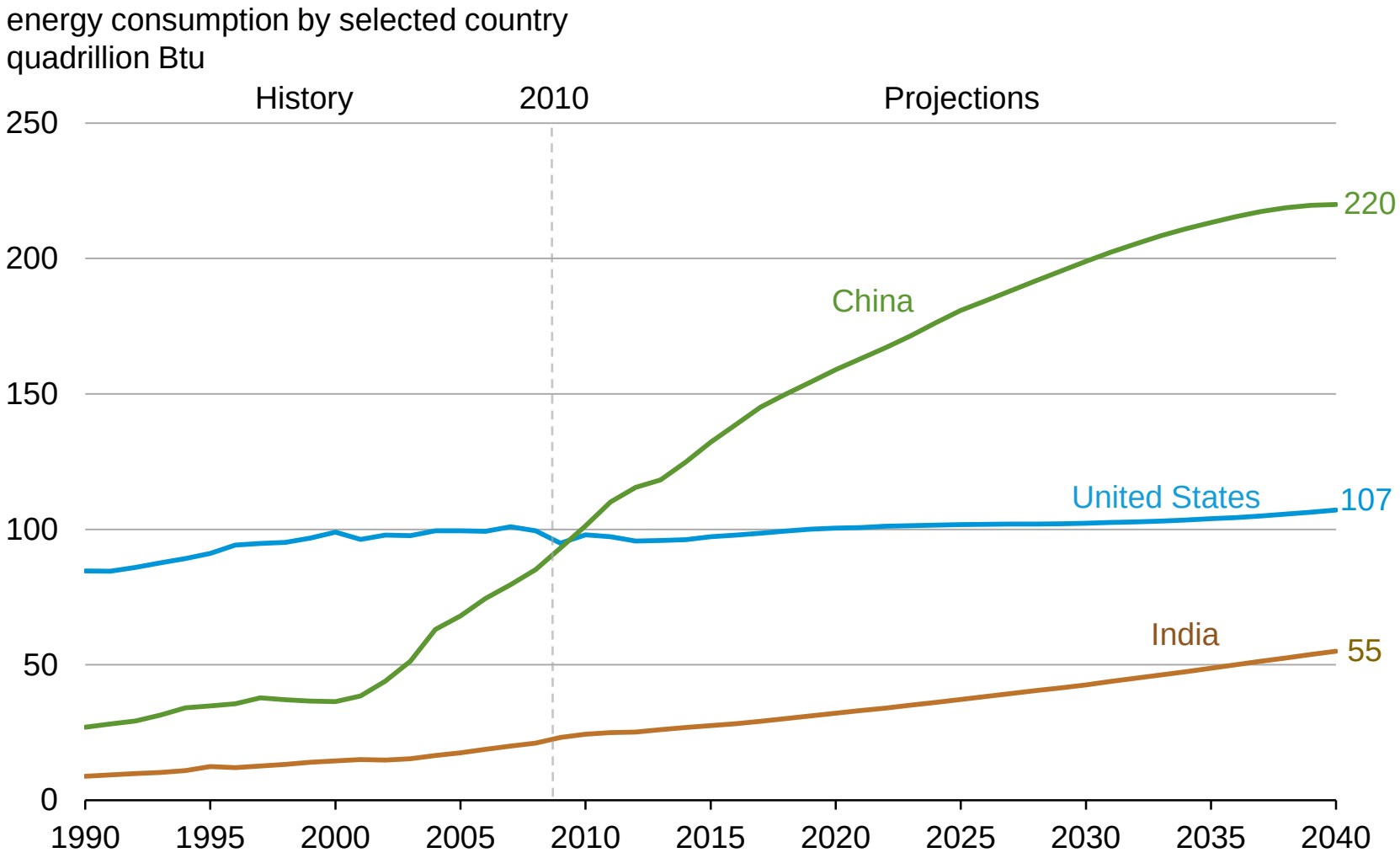
World energy markets

Renewable energy and nuclear power are the fastest growing sources of world energy consumption out to 2040



Source: EIA, International Energy Outlook 2013

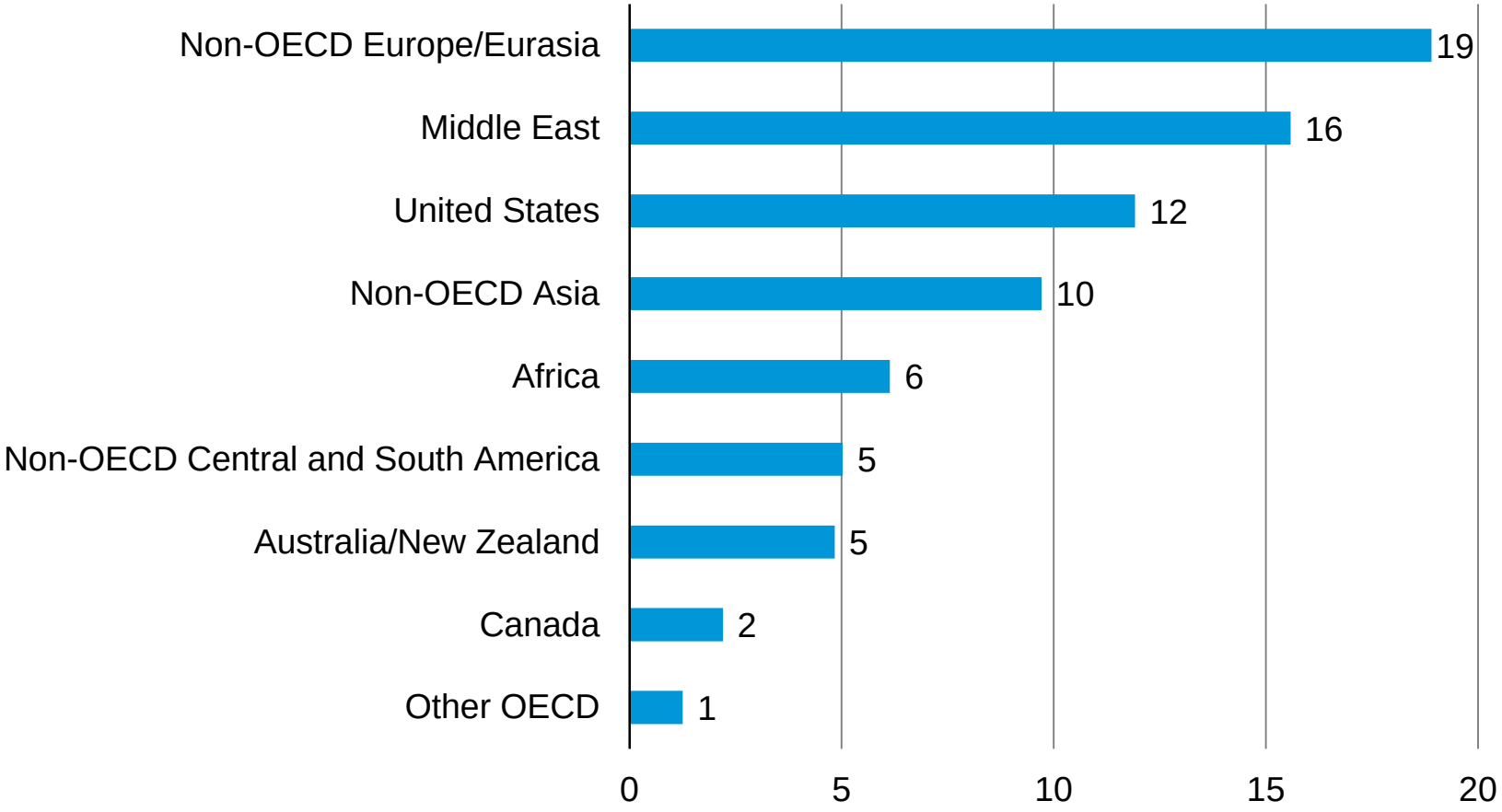
By 2040, China's energy use will be double the U.S. level; India's a little more than half despite its faster GDP growth



Source: EIA, International Energy Outlook 2013

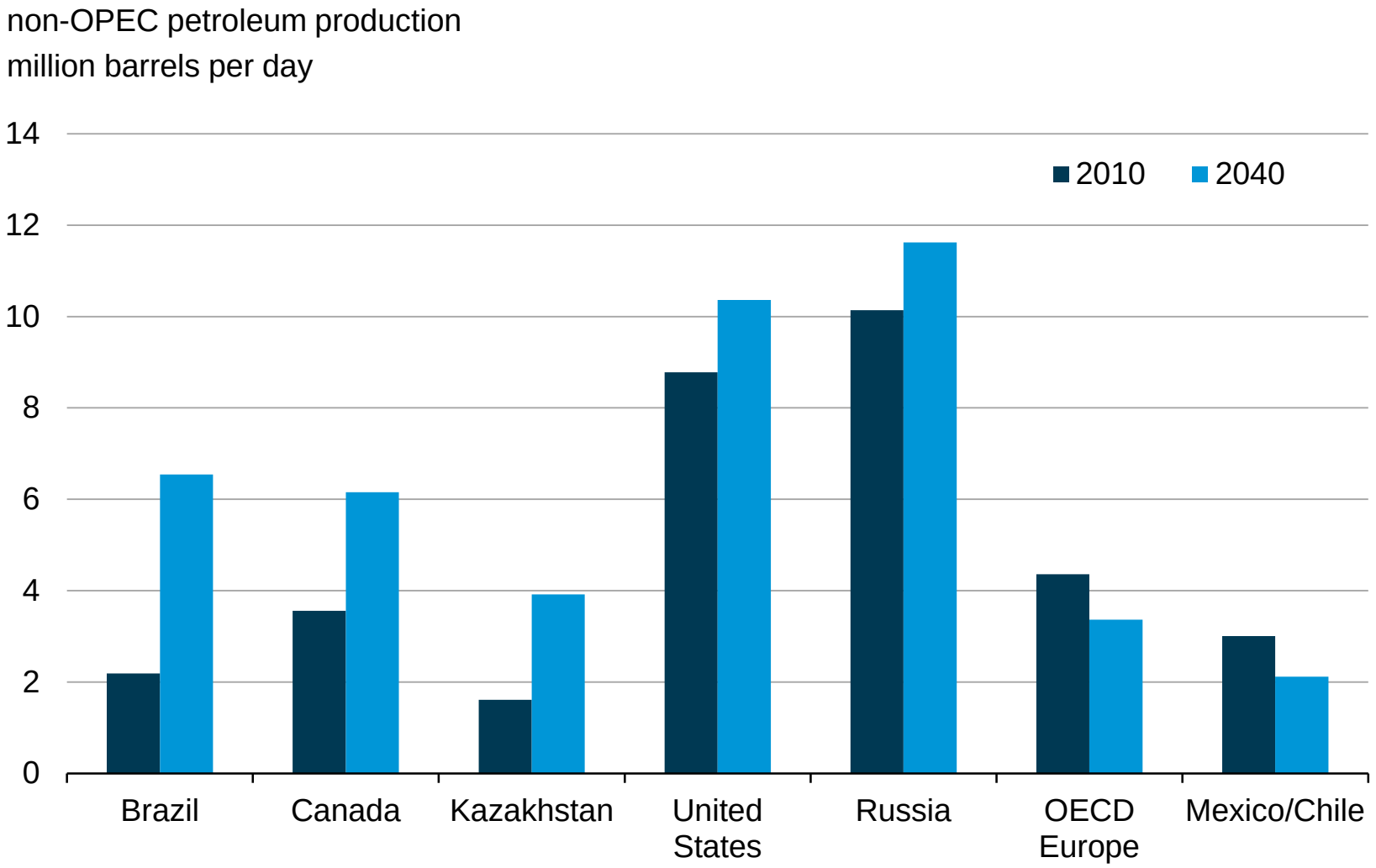
Non-OECD Europe/Eurasia, Middle East, and the United States account for the largest increases in natural gas production

Change in natural gas production, 2010-2040
trillion cubic feet



Source: EIA, International Energy Outlook 2013

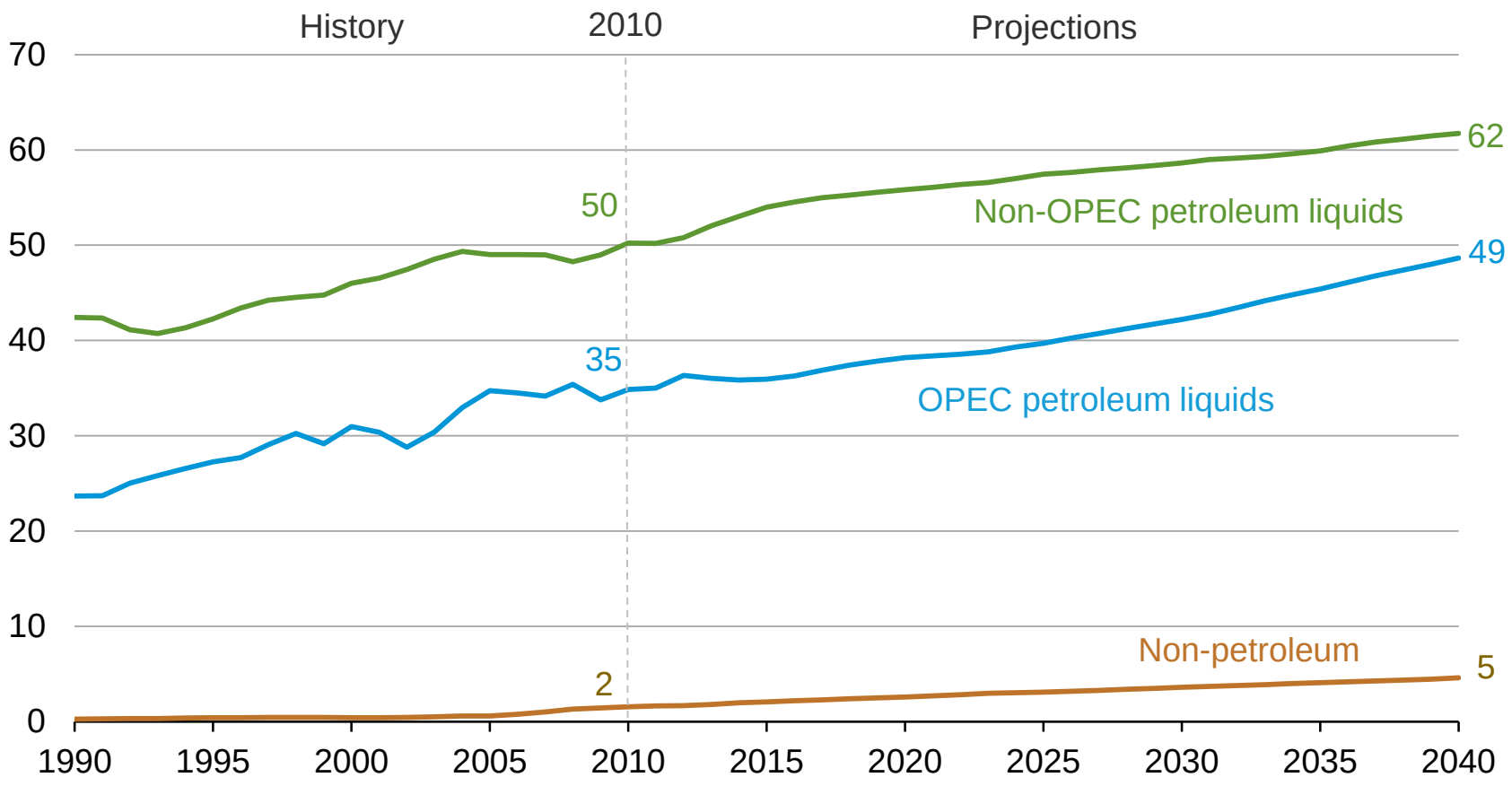
Non-OPEC oil supply growth is concentrated in five countries



Source: EIA, International Energy Outlook 2013

OPEC market share grows after 2025

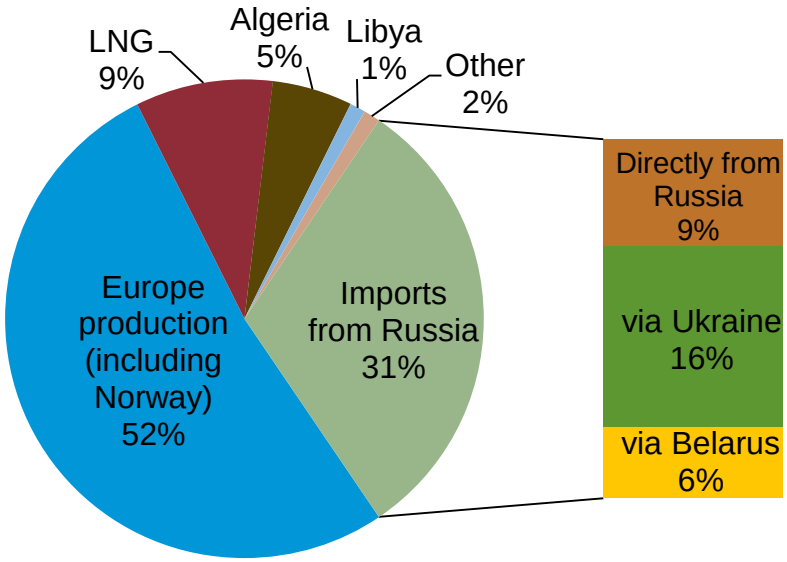
world liquids production
million barrels per day



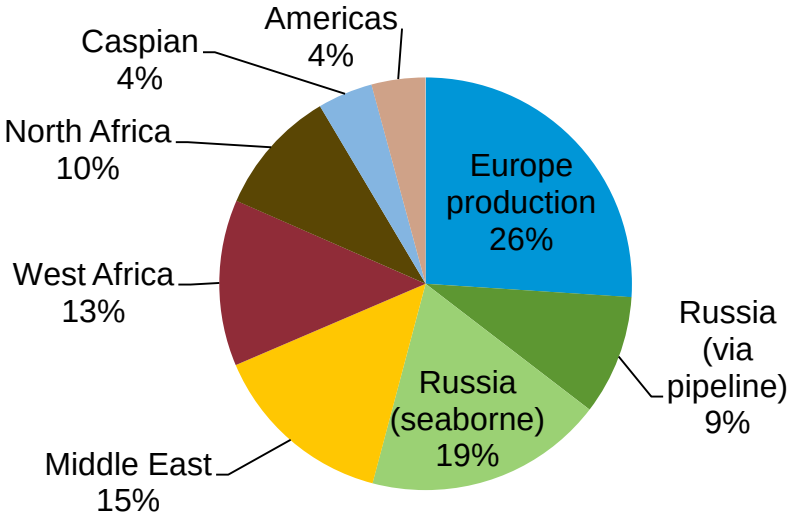
Source: EIA, International Energy Outlook 2013

European energy overview

European natural gas supply mix, 2013



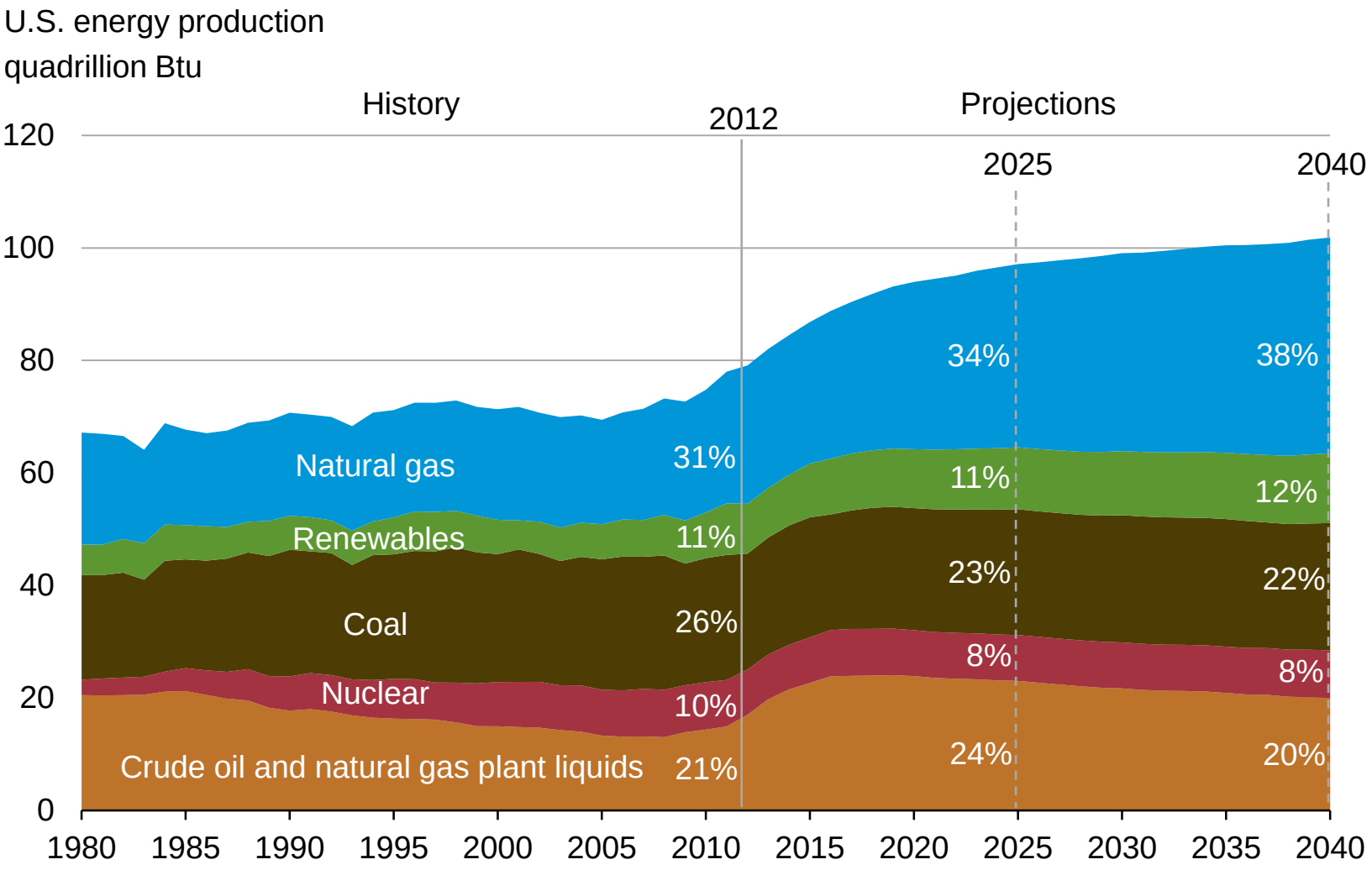
European crude oil supply mix, 2013



Sources: U.S. Energy Information Administration estimates based on Eastern Bloc Research, Cedigaz, Gas LNG Europe, Lloyd's List Marine Intelligence, Argus FSU

Context for U.S. CO_2 emissions

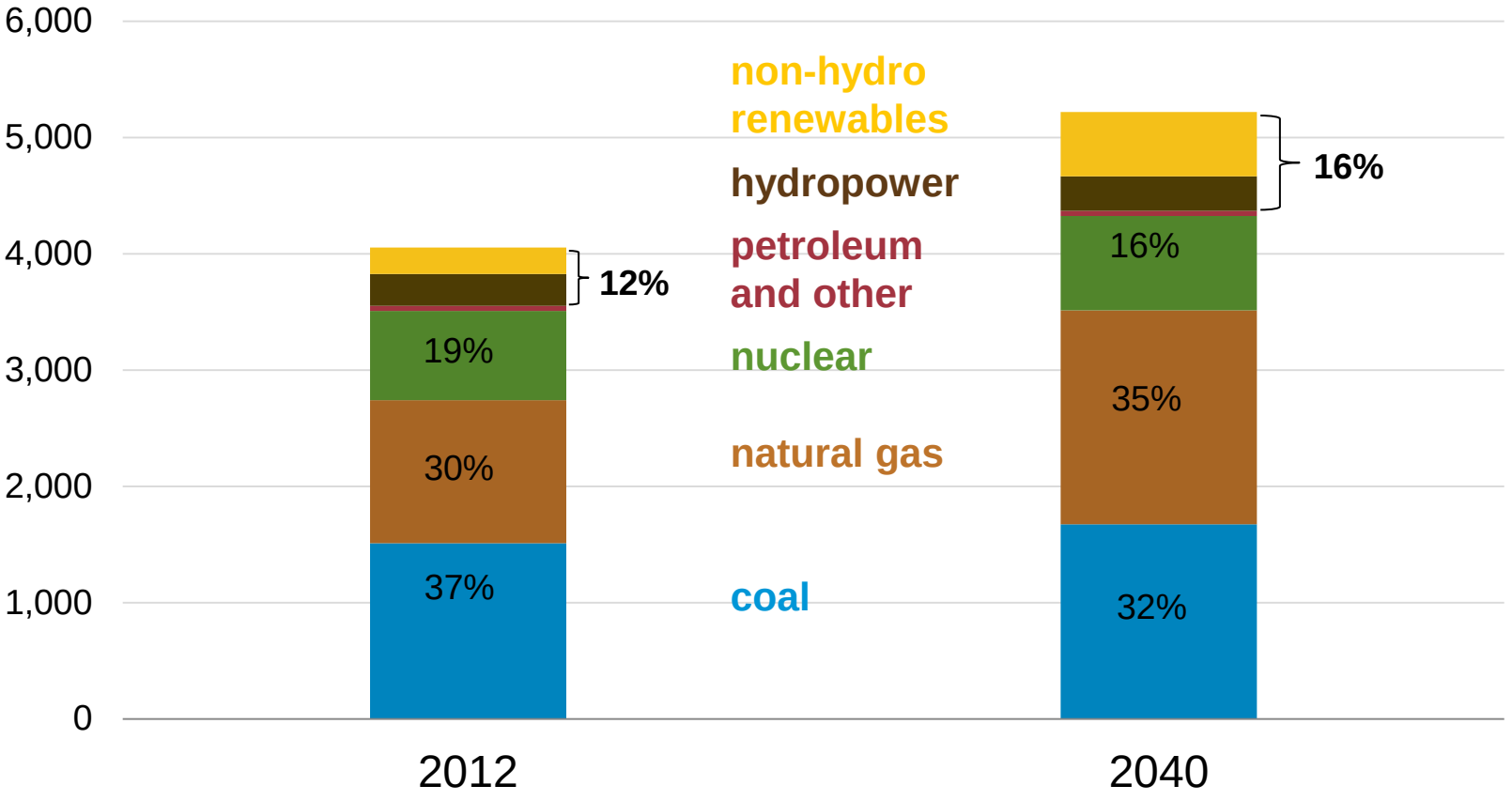
U.S. production grows rapidly, particularly natural gas, renewables, and liquids in the near term



Source: EIA, Annual Energy Outlook 2014 Early Release

Role of natural gas and renewable electricity in the U.S. generation mix

Net generation by fuel source in the AEO2014 Reference case
billion kilowatthours

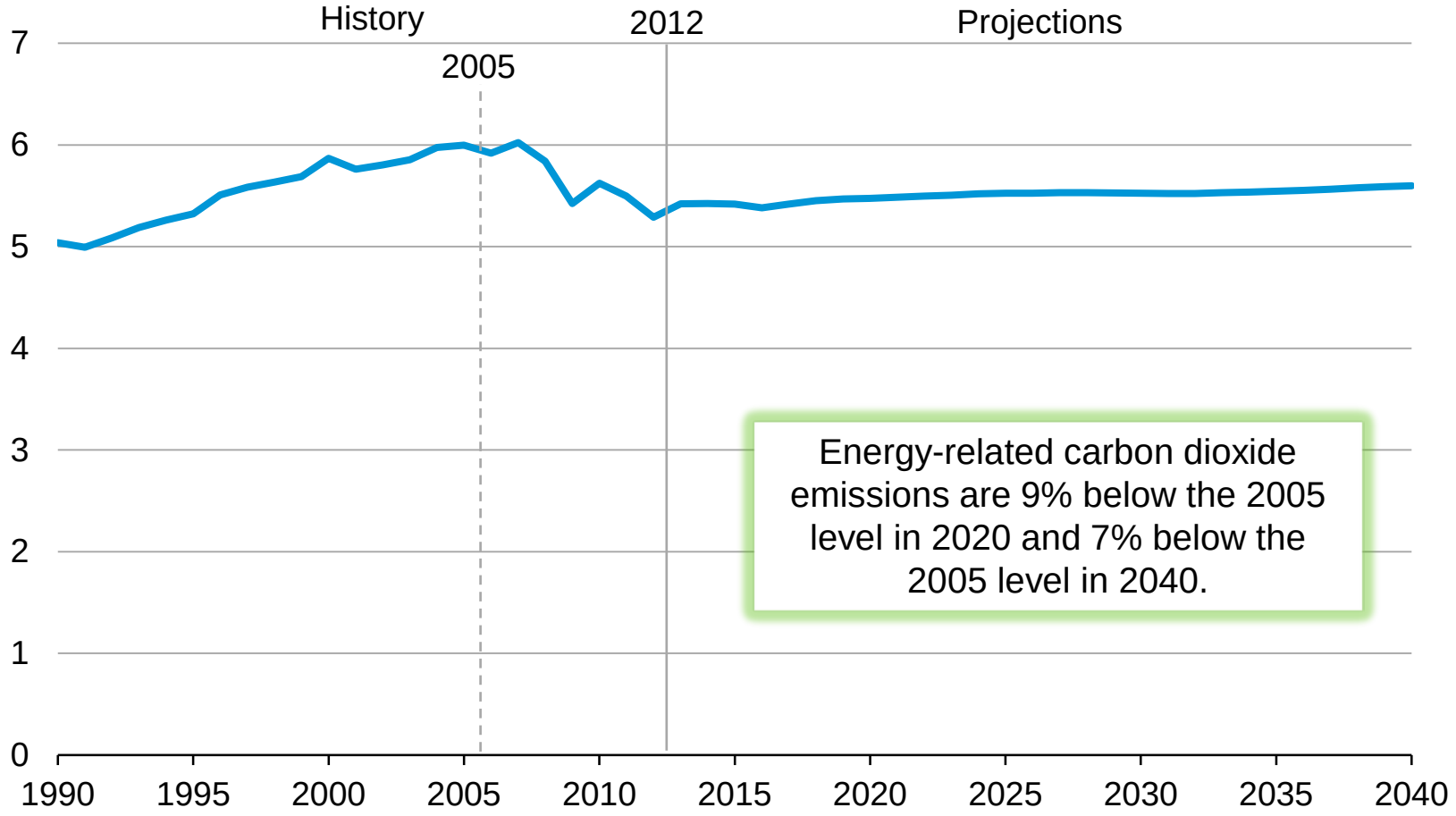


Source: EIA, Annual Energy Outlook

U.S. energy-related CO_2 emissions remain below the 2005 level throughout the projection period

carbon dioxide emissions

billion metric tons

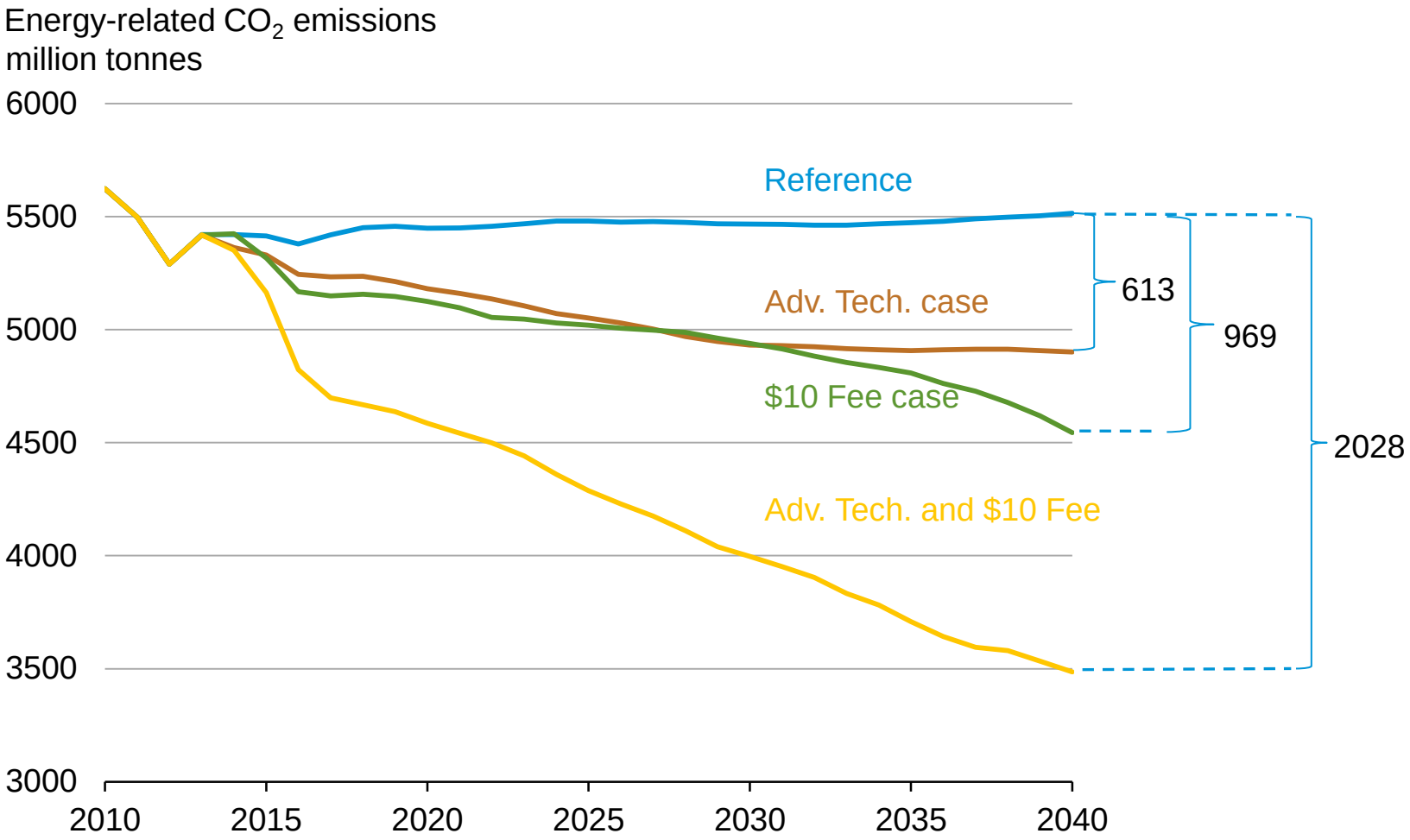


Source: EIA, Annual Energy Outlook 2014 Early Release

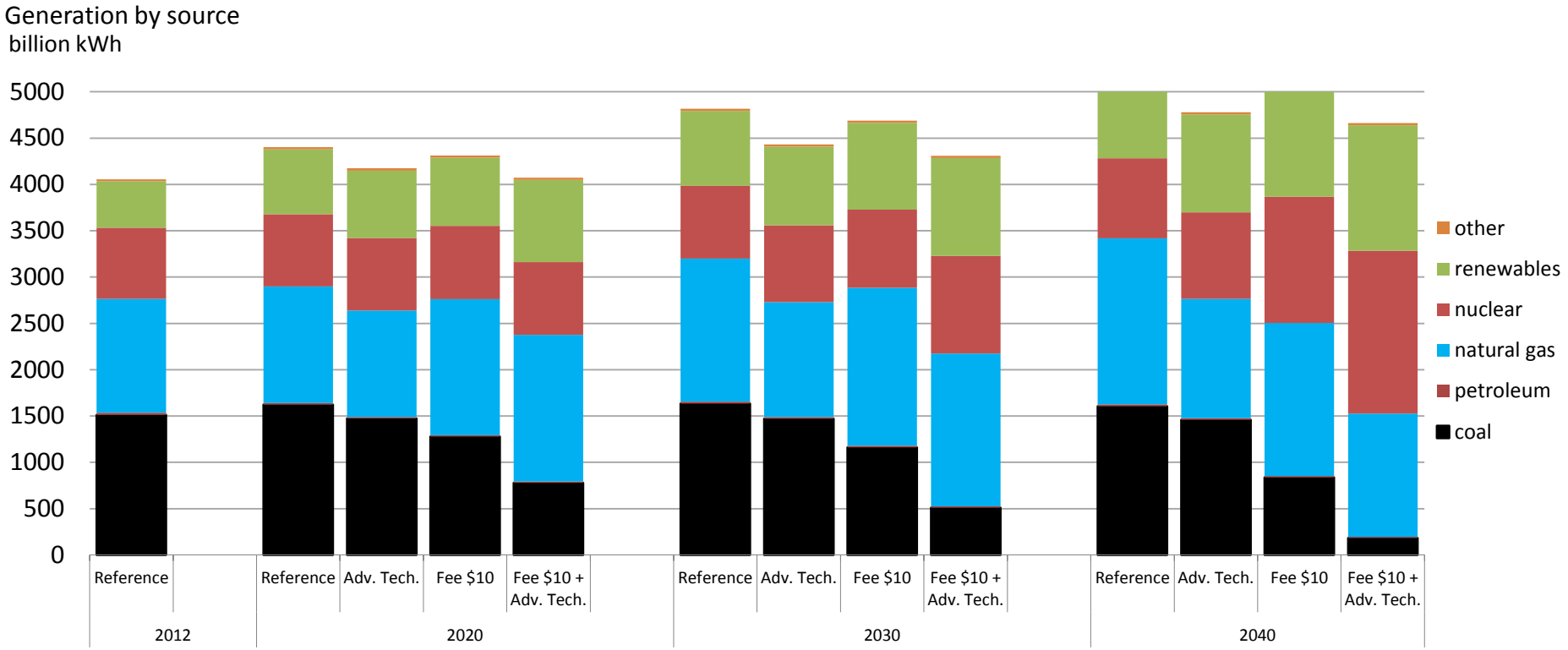
EPA 111(d) proposed rule

- The proposed rule issued by EPA on June 2 establishes state-level targets to reduce CO_2 emissions from existing generating plants that burn fossil fuels to produce electricity. The targets for each state, applied over 2020-2030, reflect four “building blocks”:
  - heat rate improvement at existing coal units
  - increased dispatch of existing natural gas plants
  - expanded use of renewable resources
  - load reduction through energy efficiency programs
- These building blocks comprise EPA’s proposed ‘Best System of Emission Reductions’ (BSER) under the Clean Air Act Section 111(d), but the states have broad flexibility in their specific compliance measures, including the option to engage in regional compliance partnerships

Another possible option for carbon reduction involves combining advanced technology assumptions with a $10 CO_2 fee, which reduces emissions synergistically



Combining advanced technology with a CO_2 fee induces more coal retirements and more new, low-carbon power sources



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Drilling Productivity Report | www.eia.gov/petroleum/drilling/