Implications of the U.S. Shale Revolution

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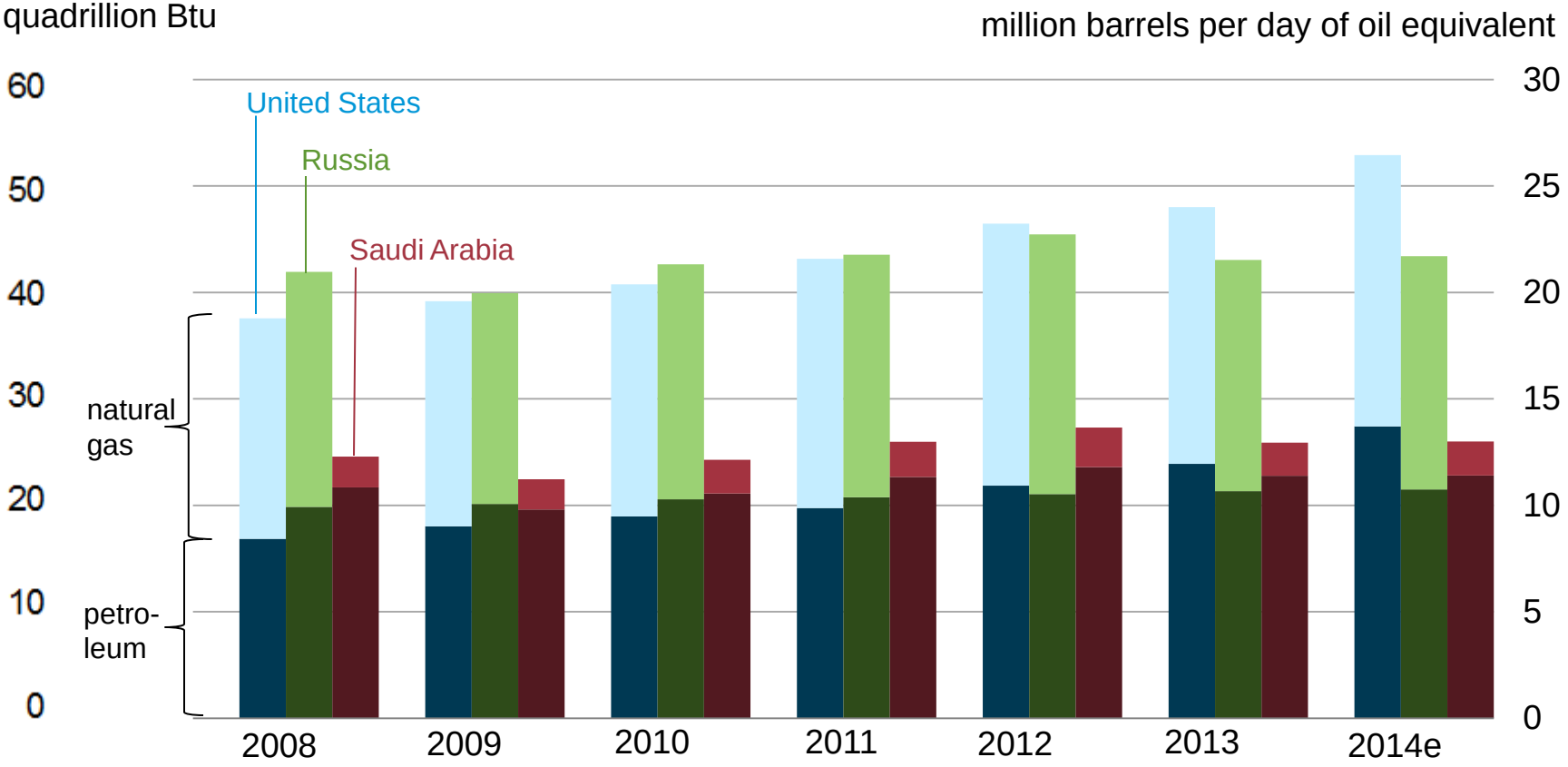
U.S. is the largest producer of petroleum and natural gas in the world

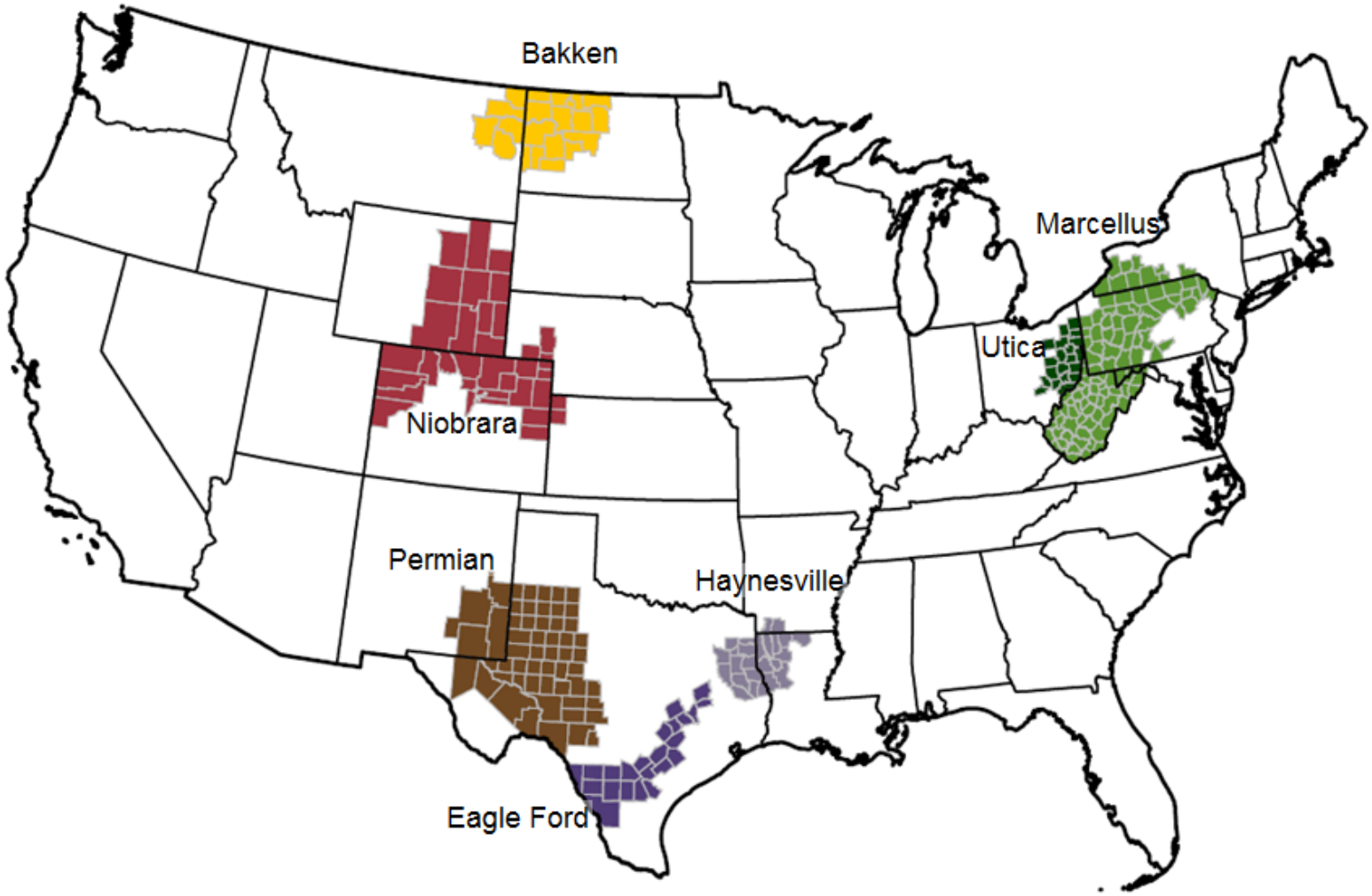
estimated U.S., Russia, and Saudi Arabia petroleum and natural gas production



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)

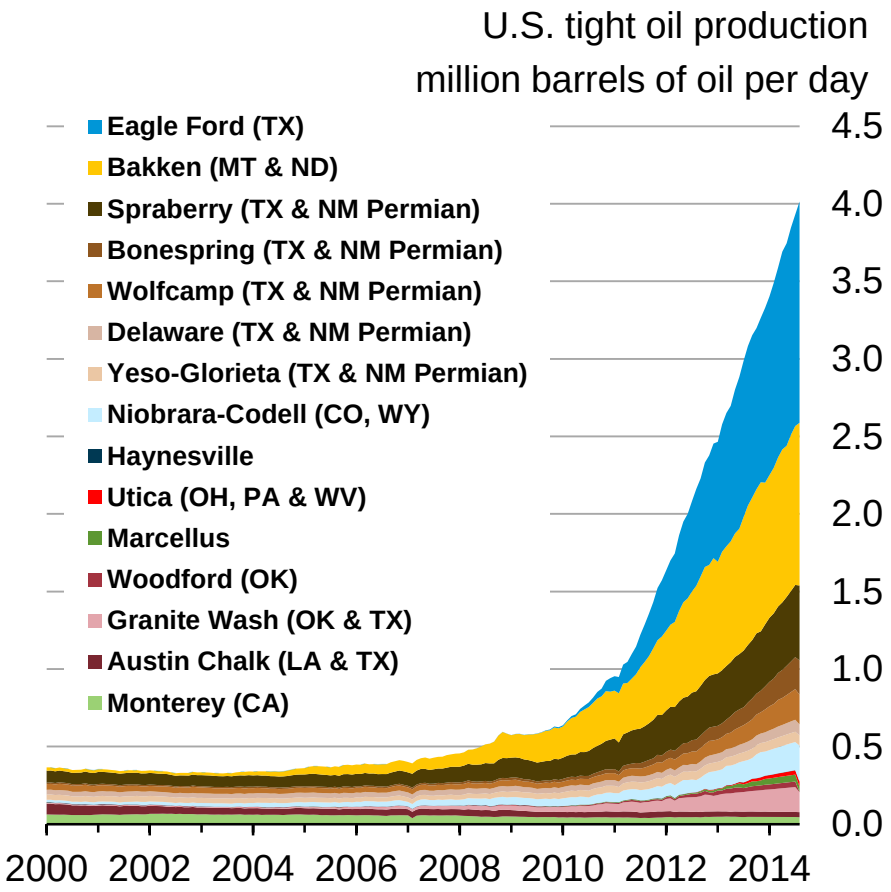

North American shale plays
(as of May 2011)
Muskwa-Otter Park, Evie-Klua
Lower Besa River
Muskwa-Otter Park
Montney
Doig Phosphate
Colorado Group
Niobrara*
Bakken ***
Cody
Heath**
Gammon
Mowry
Hilliard- Baxter-Mancos-Niobrara
Niobrara*
Mancos
Monterey-Temblor
Hermosa
Monterey
Excello-Mulky
Lewis
Pierre-Niobrara
Woodford
Fayetteville
Bend
Avalon
Barnett
Barnett-Woodford
Eagle Ford
Eagle Ford, La Casita
Eagle Ford, Tithonian
Pimienta
Pimienta, Tamaulipas
Maltrata
Haynesville-Bossier
Tuscaloosa
Floyd-Neal
Chattanooga
Conasauga
Antrim
New Albany
Devonian (Ohio)
Marcellus
Utica
Utica
Frederick Brook
Horton Bluff
Current shale plays
Stacked plays
Shallowest / youngest
Intermediate depth / age
Deepest / oldest
* Mixed shale & chalk play
** Mixed shale & limestone play
*** Mixed shale & tight dolostone-siltstone-sandstone play
Prospective shale plays
Basins
N
Miles
0
200
400
600
800
eia

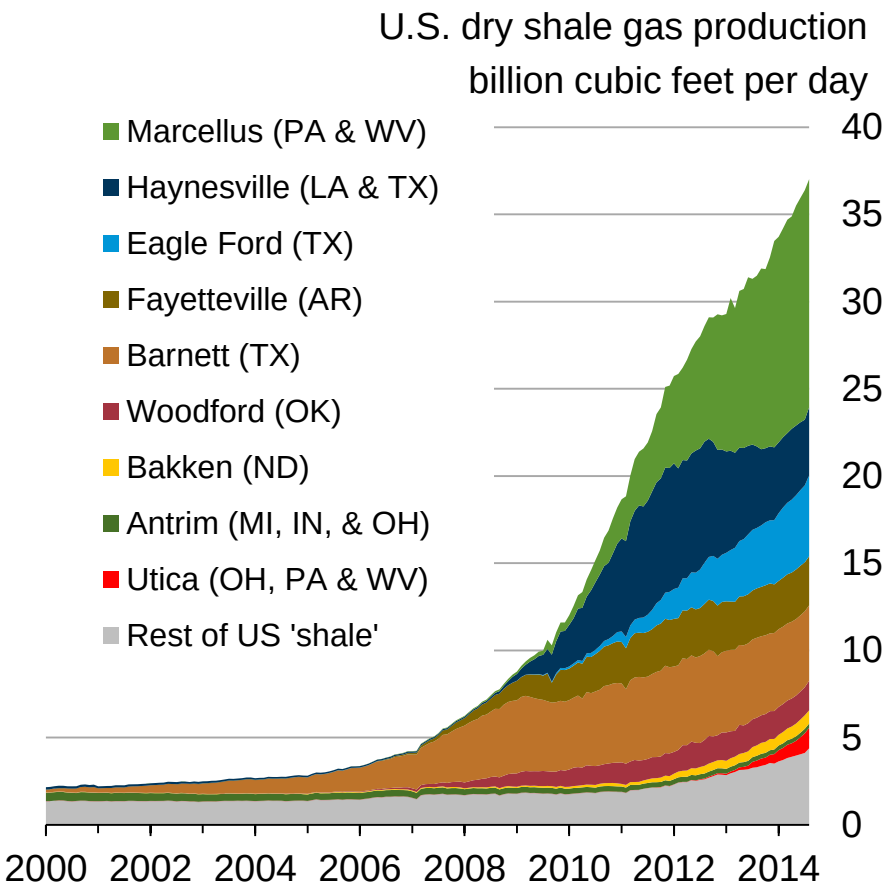
These seven regions accounted for 95% of U.S. oil production growth and all U.S. natural gas production growth from 2011-2013



Source: EIA, Drilling Productivity Report

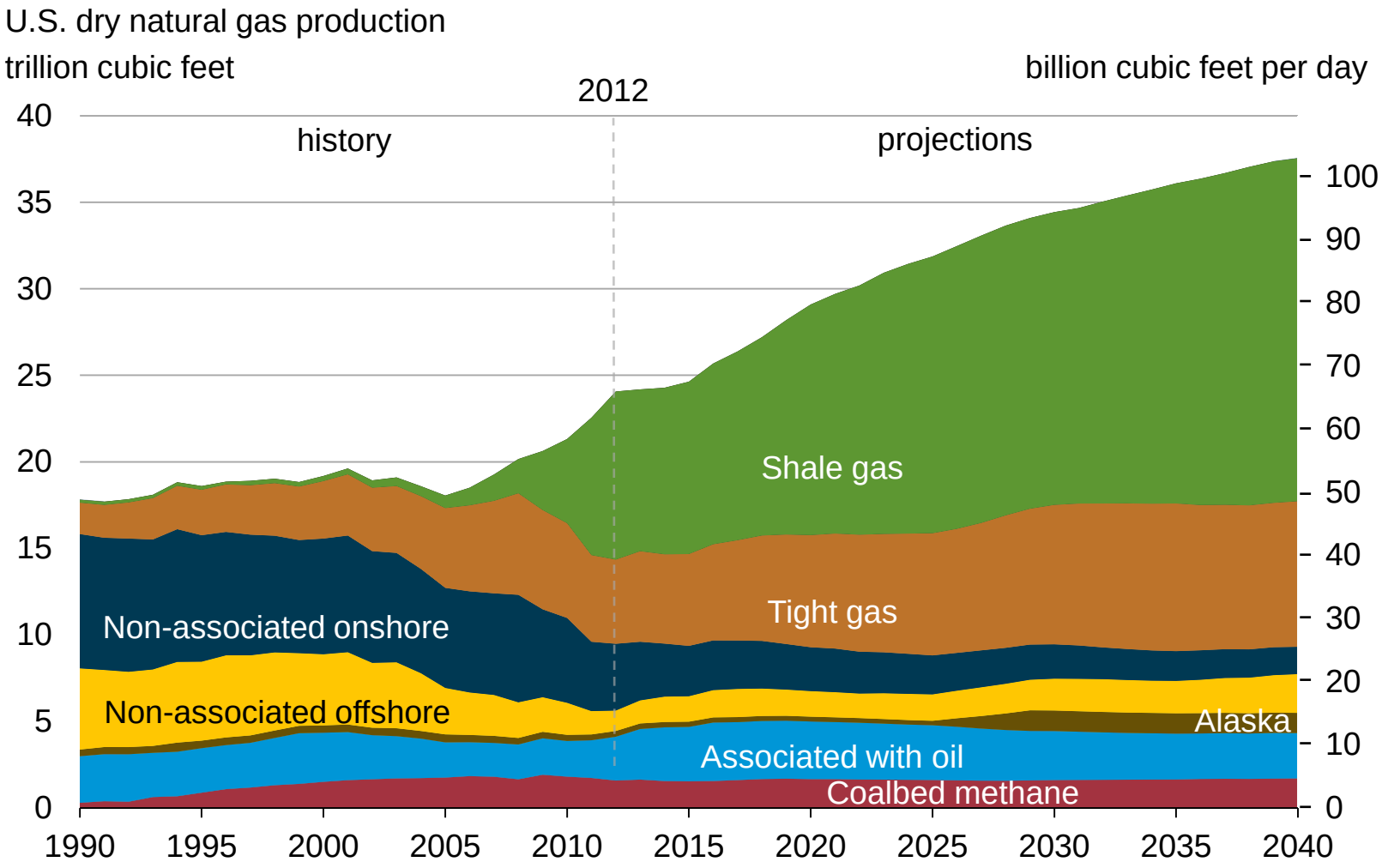
The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources





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

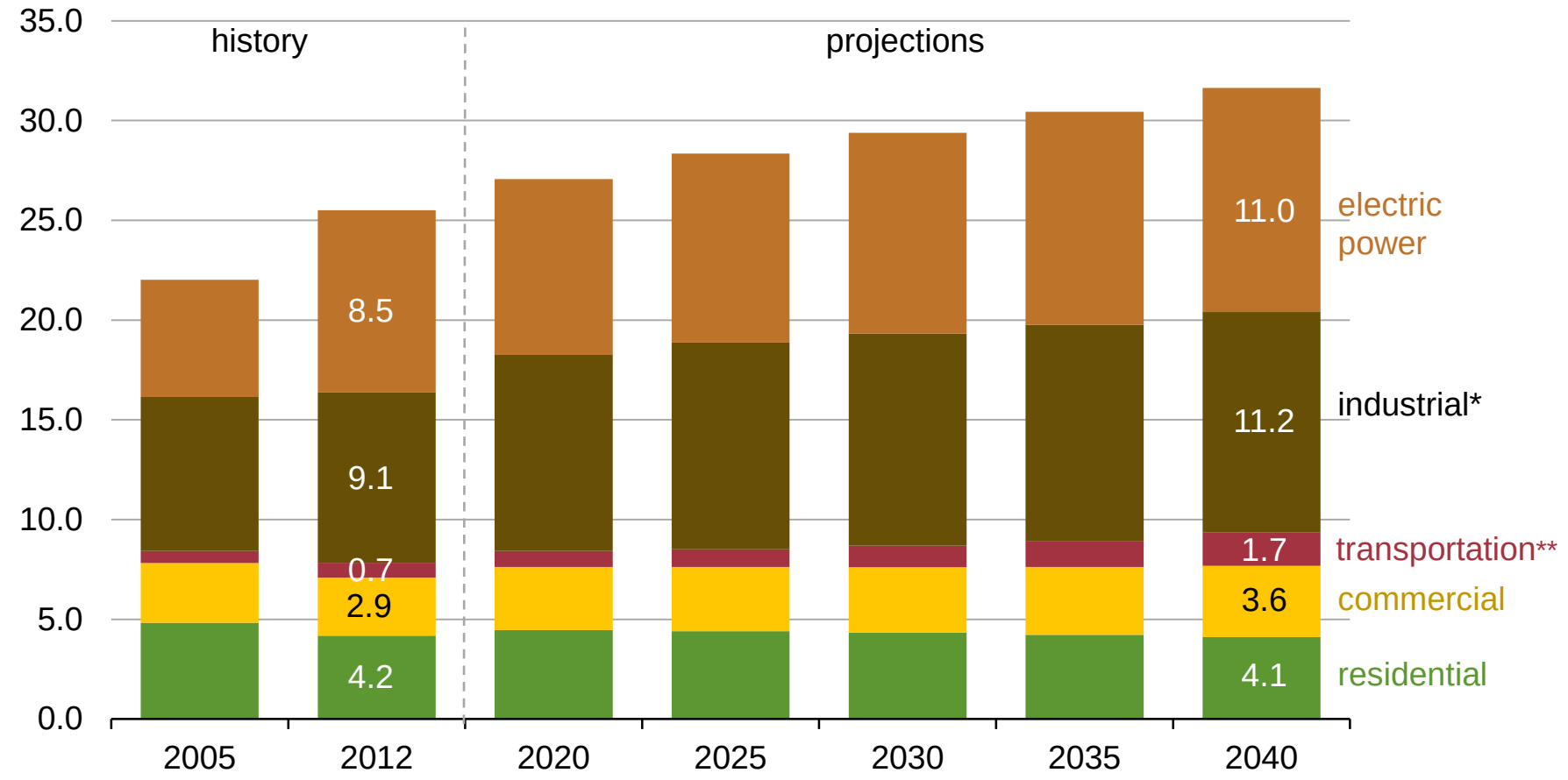
U.S. shale gas leads growth in total gas production through 2040, when production exceeds 100 billion cubic feet per day



Source: EIA, Annual Energy Outlook 2014, Reference case

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

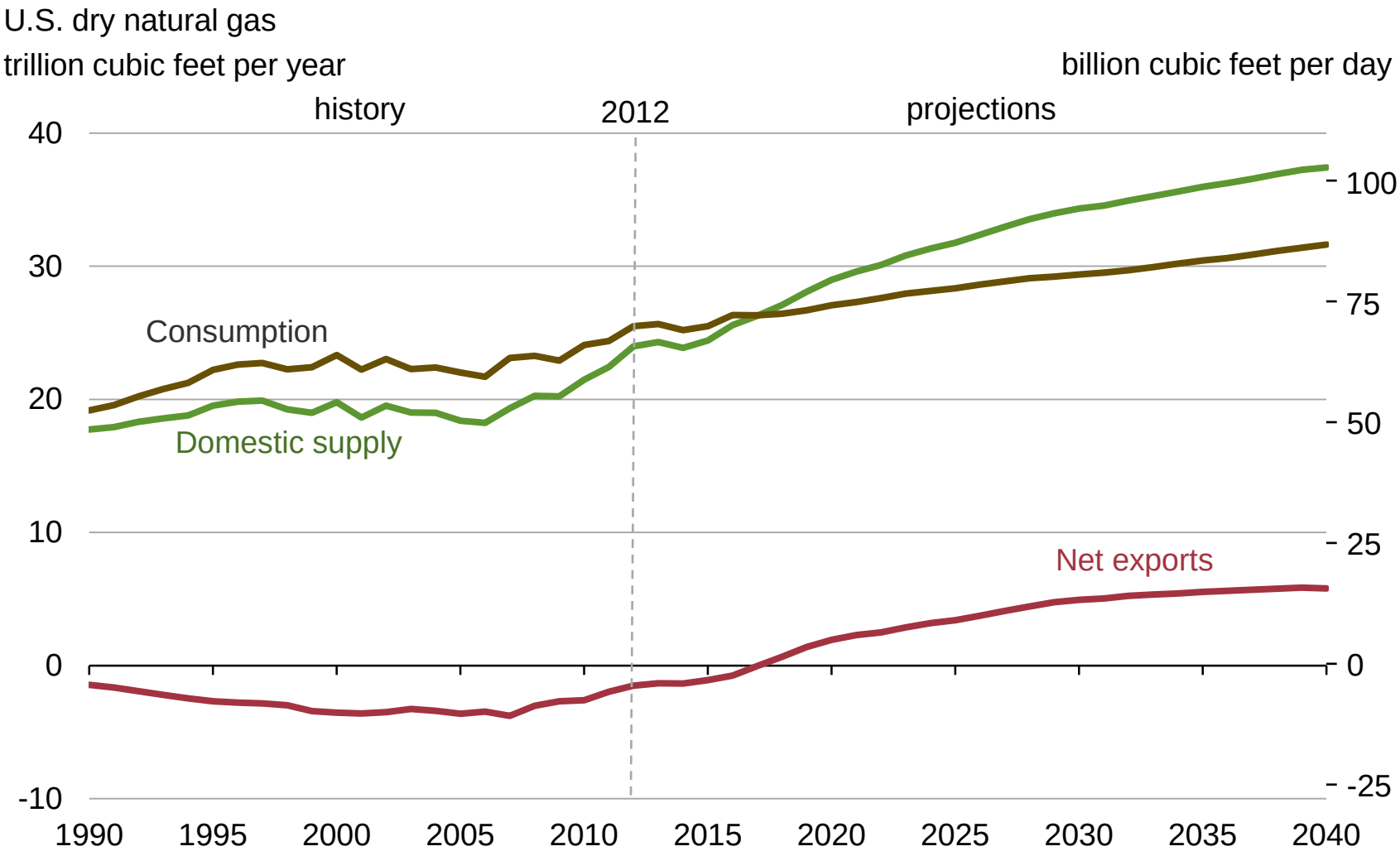
U.S. dry gas consumption
trillion cubic feet



Source: EIA, Annual Energy Outlook 2014, Reference case

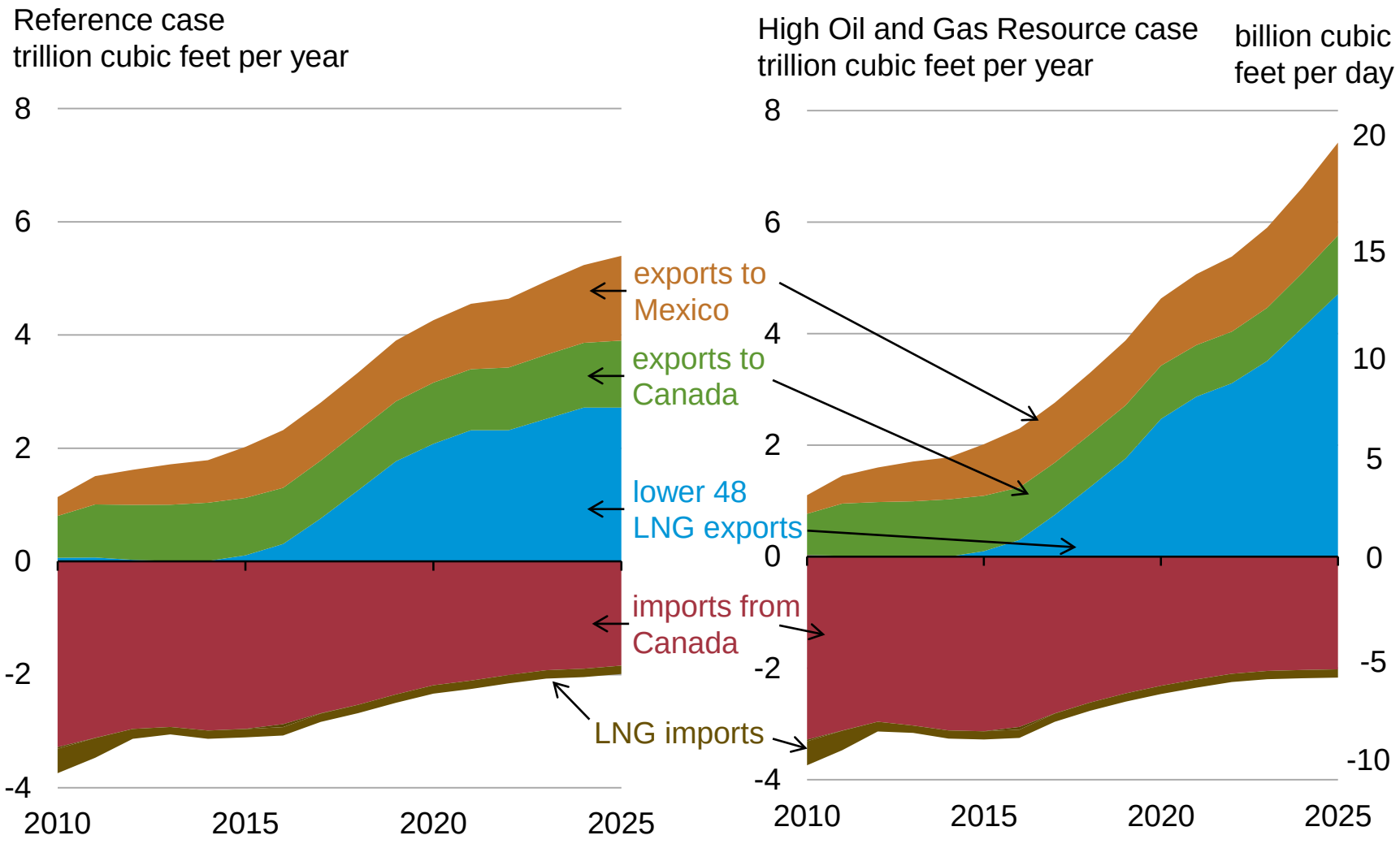
**Includes combined heat-and-power and lease and plant fuel*
***Includes pipeline fuel*

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



Source: EIA, Annual Energy Outlook 2014 Reference case

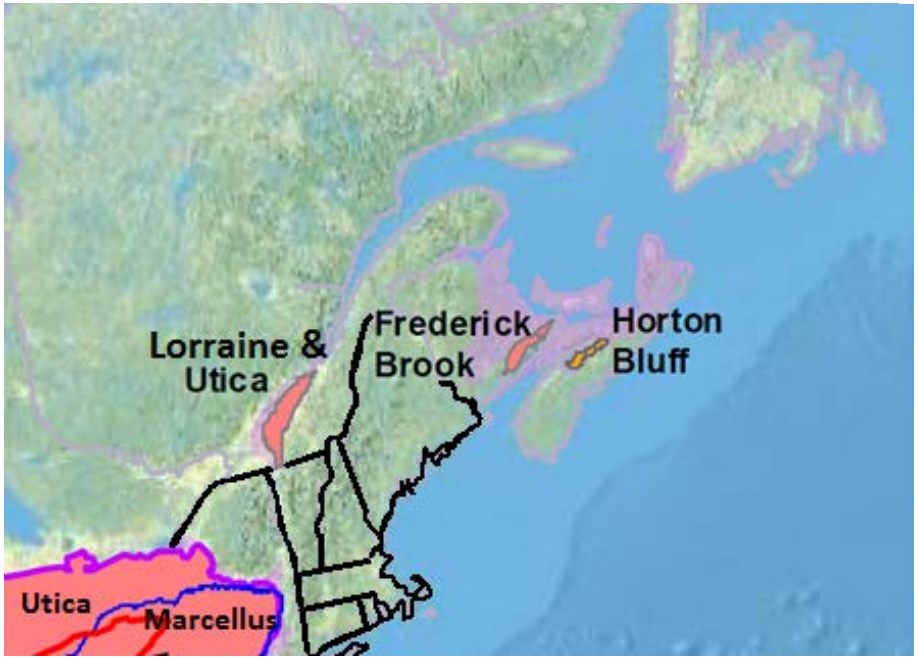
Projected U.S. natural gas trade depends on assumptions regarding resources and future technology advances



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

Shale gas in eastern Canada

- Of the four shale plays in Eastern Canada, two have been assessed by ARI
  - **Utica** in Quebec has 31.1 Tcf of technically recoverable resources
  - **Horton Bluff** in Nova Scotia has 3.4 Tcf of technically recoverable resources
- These shale resource volumes are not included in NEB's 2013 estimates
- Quebec enacted a hydraulic fracturing moratorium in 2012 pending further research
- New Brunswick permits hydraulic fracturing, but has imposed strict rules surrounding it
- Nova Scotia, similar to Quebec, will not permit hydraulic fracturing until the completion of a review, due mid-2014



Source: Advanced Resources International, "Technically Recoverable Shale Oil and Shale Gas Resources: An Assessment of 137 Shale Formations in 41 Countries Outside the United States"

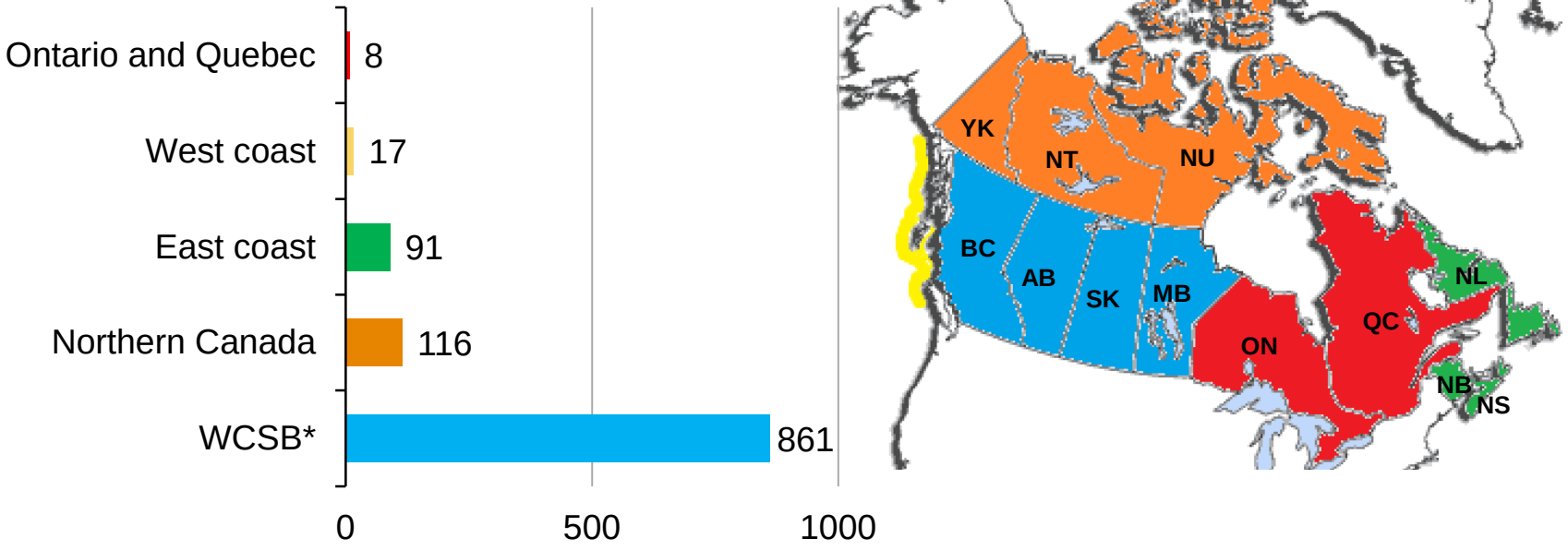
LNG export projects in eastern Canada

	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

Resources in eastern Canada are modest compared with the Canada national total

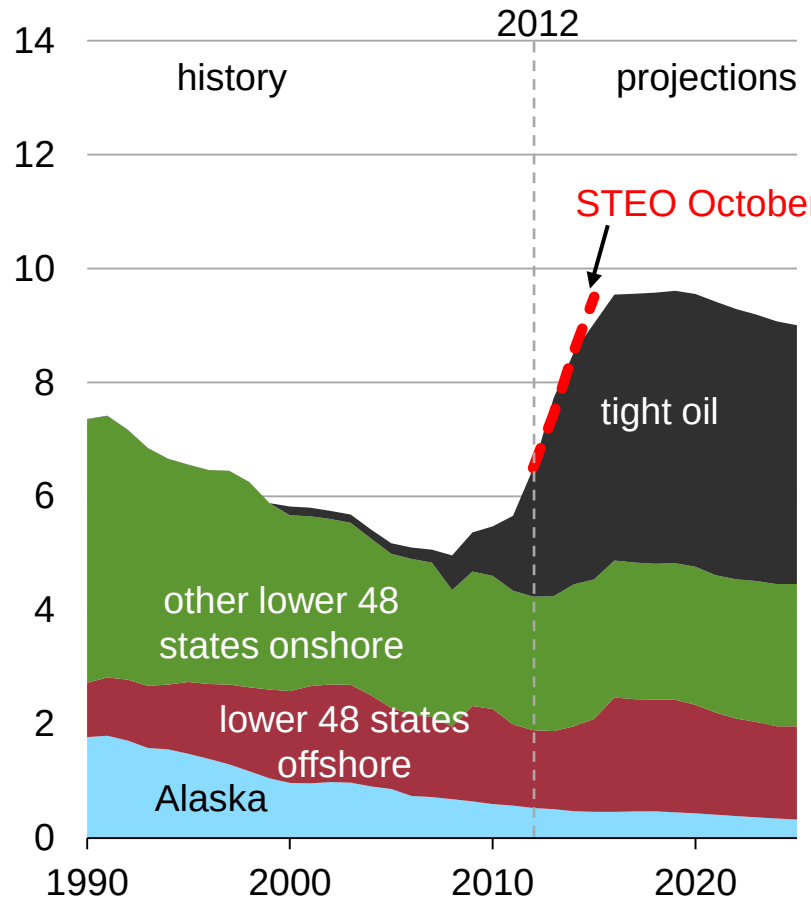
Canada marketable resources in trillion cubic feet
as of 12/31/12



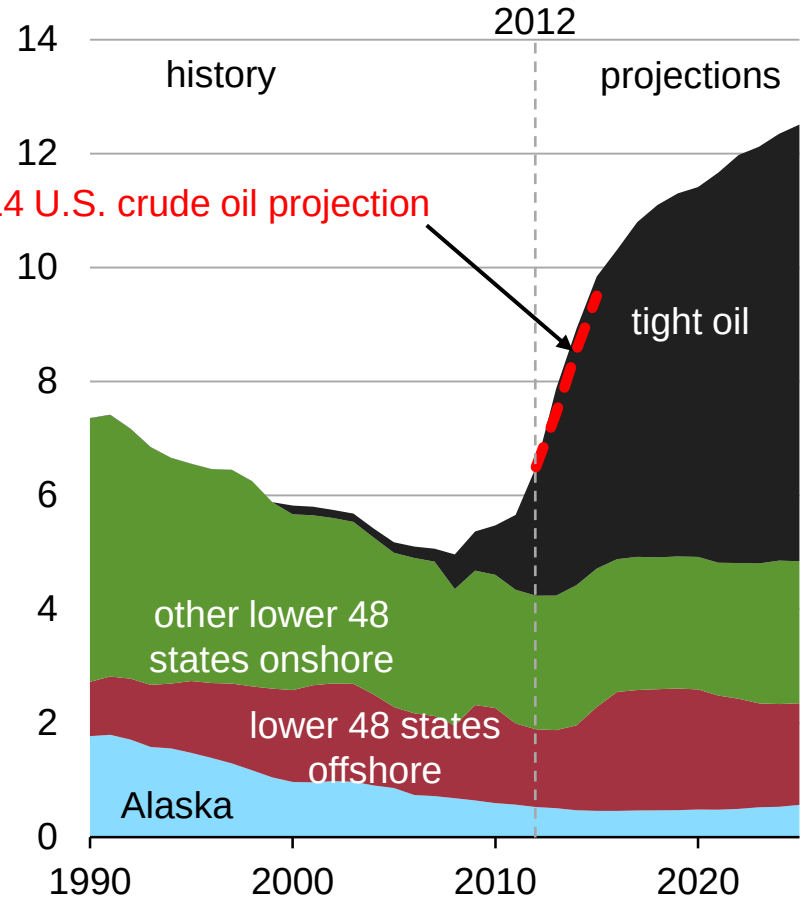
Note: WCSB stands for Western Canada Sedimentary Basin . All Territories are included under Northern Canada.
Source: National Energy Board, "Canada's Energy Future 2013"

Resource and technology assumptions have major implications for projected U.S. crude oil production beyond the next few years

Reference case
million barrels per day



High Oil and Gas Resource case
million barrels per day

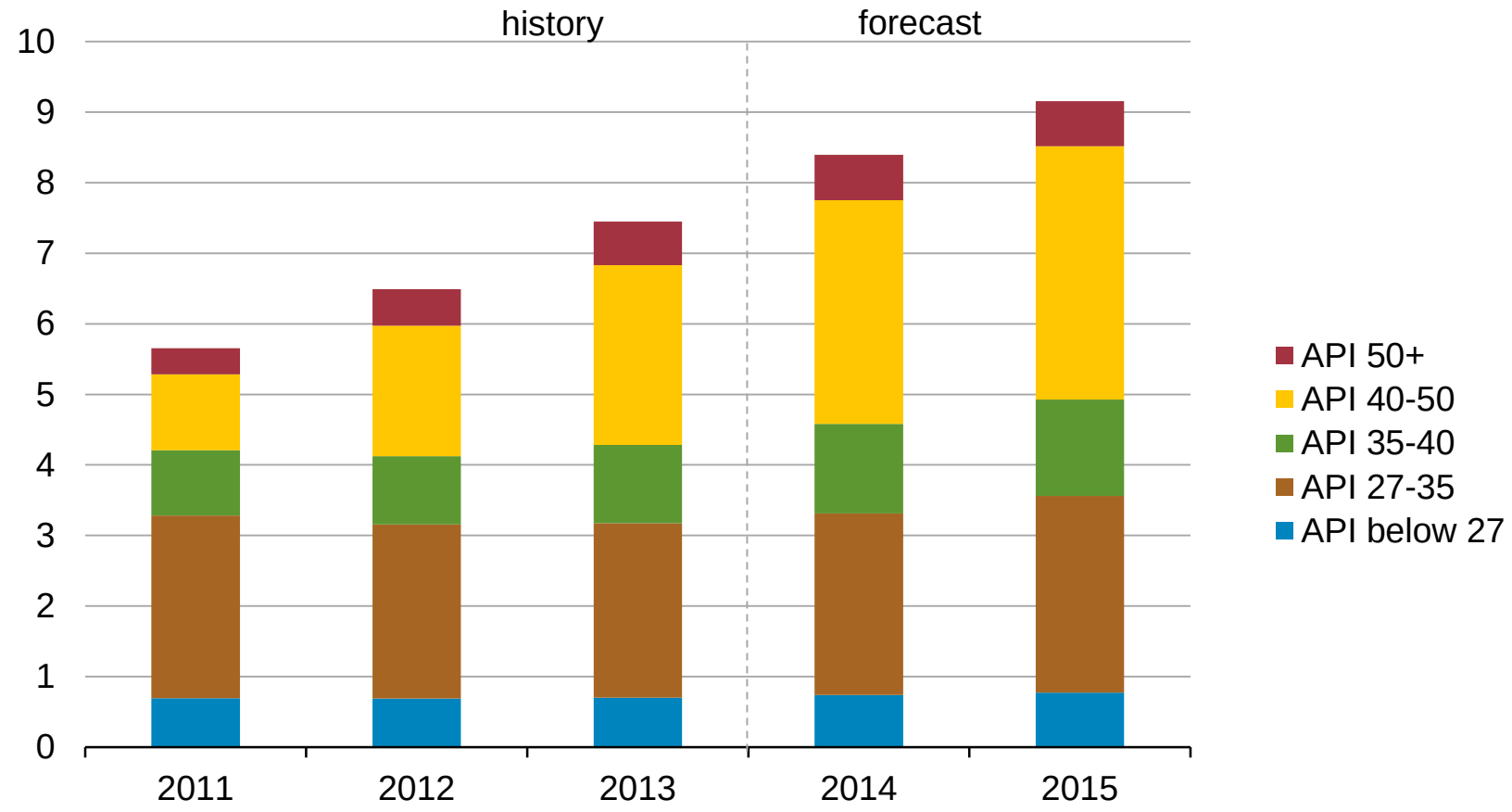


STEO October 2014 U.S. crude oil projection

Source: EIA, Annual Energy Outlook 2014; Short Term Energy Outlook, October 2014

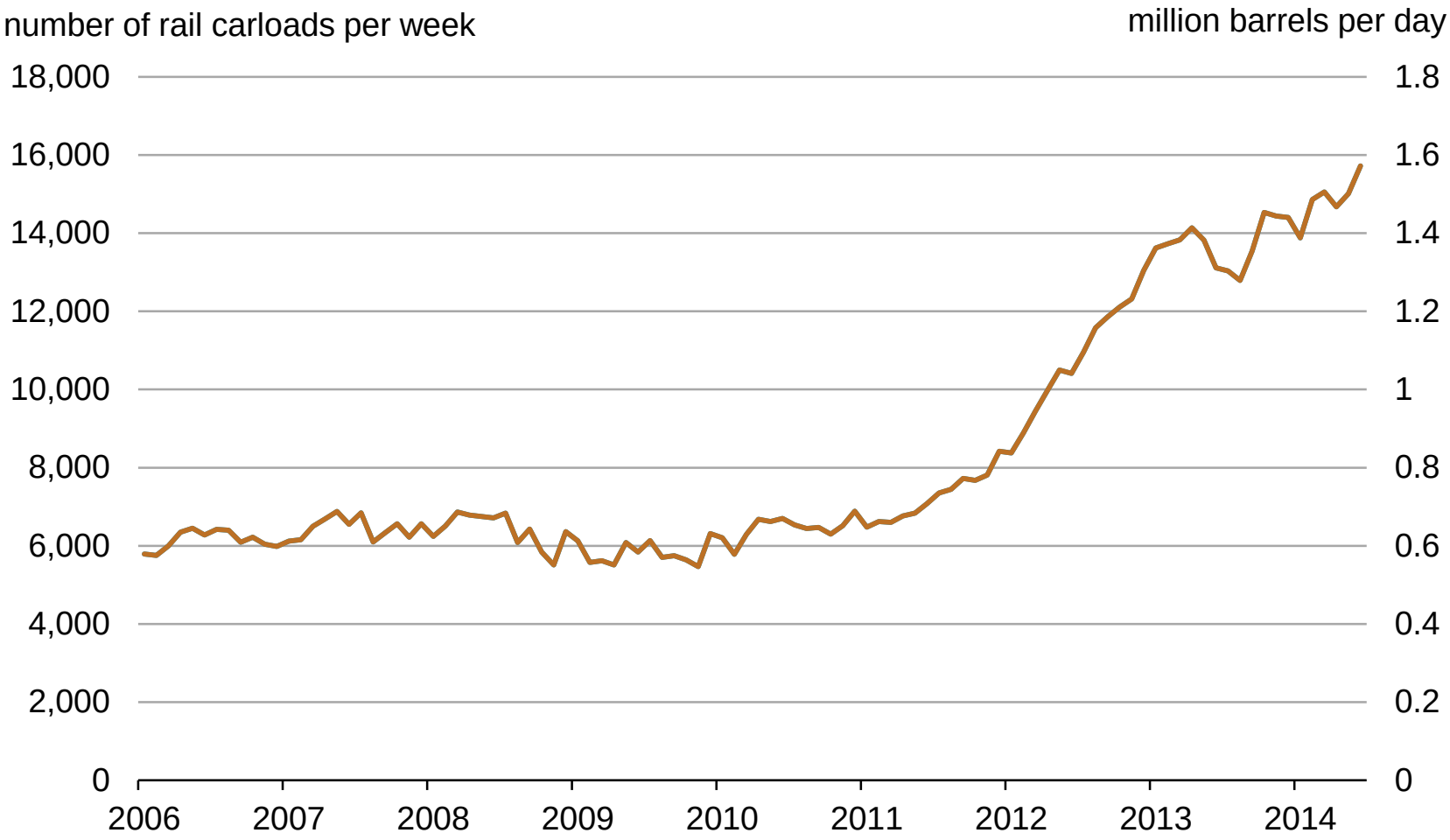
Most of the growth in production between 2011 and 2015 consists of sweet grades with API gravity of 40 or above

U.S. crude oil production by type
million barrels of oil per day



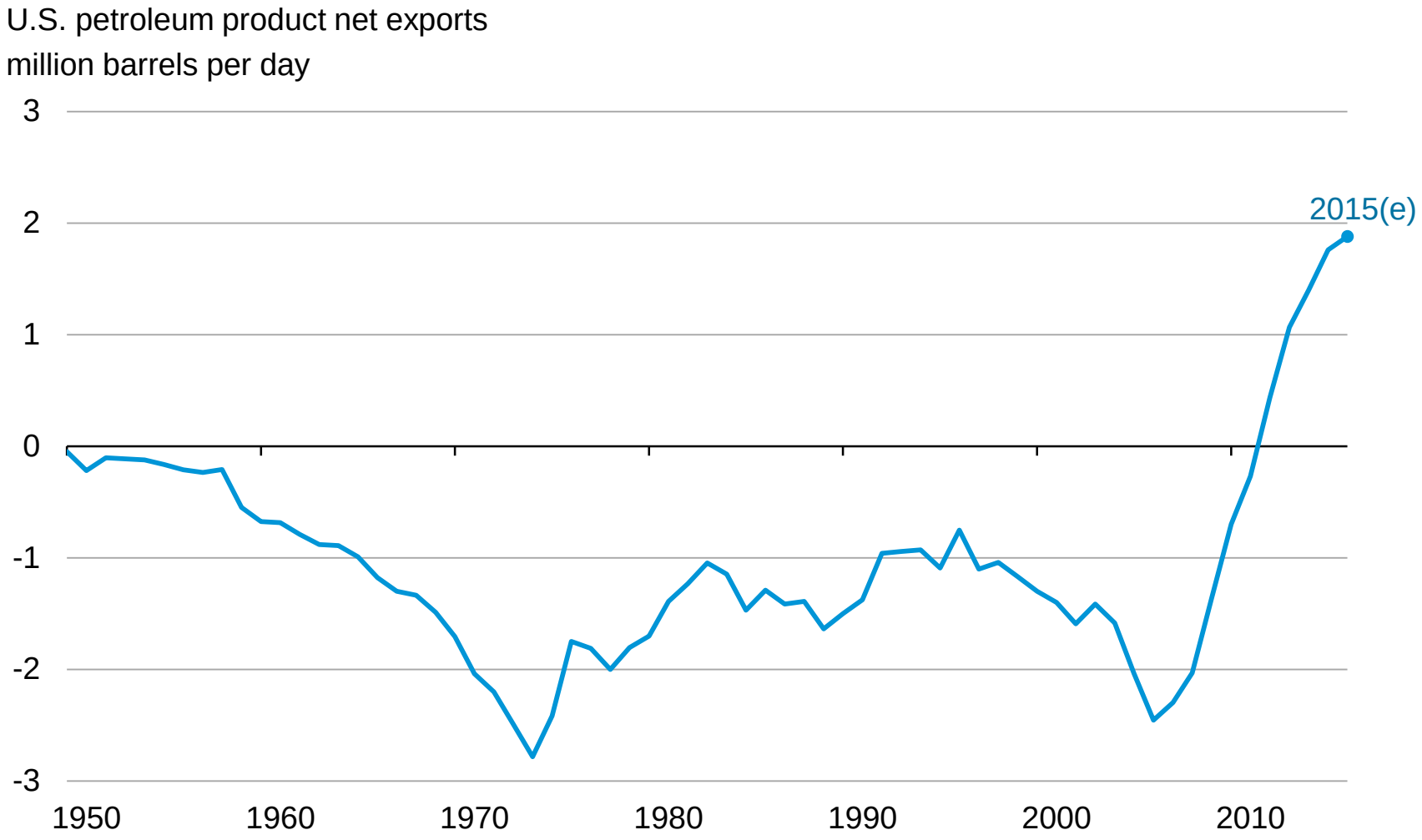
Source: EIA, DrillingInfo, Colorado DNR, Texas RRC. http://www.eia.gov/analysis/petroleum/crudetypes/

U.S. rail carloads of crude oil and petroleum products exceed 1.5 million b/d in 2014



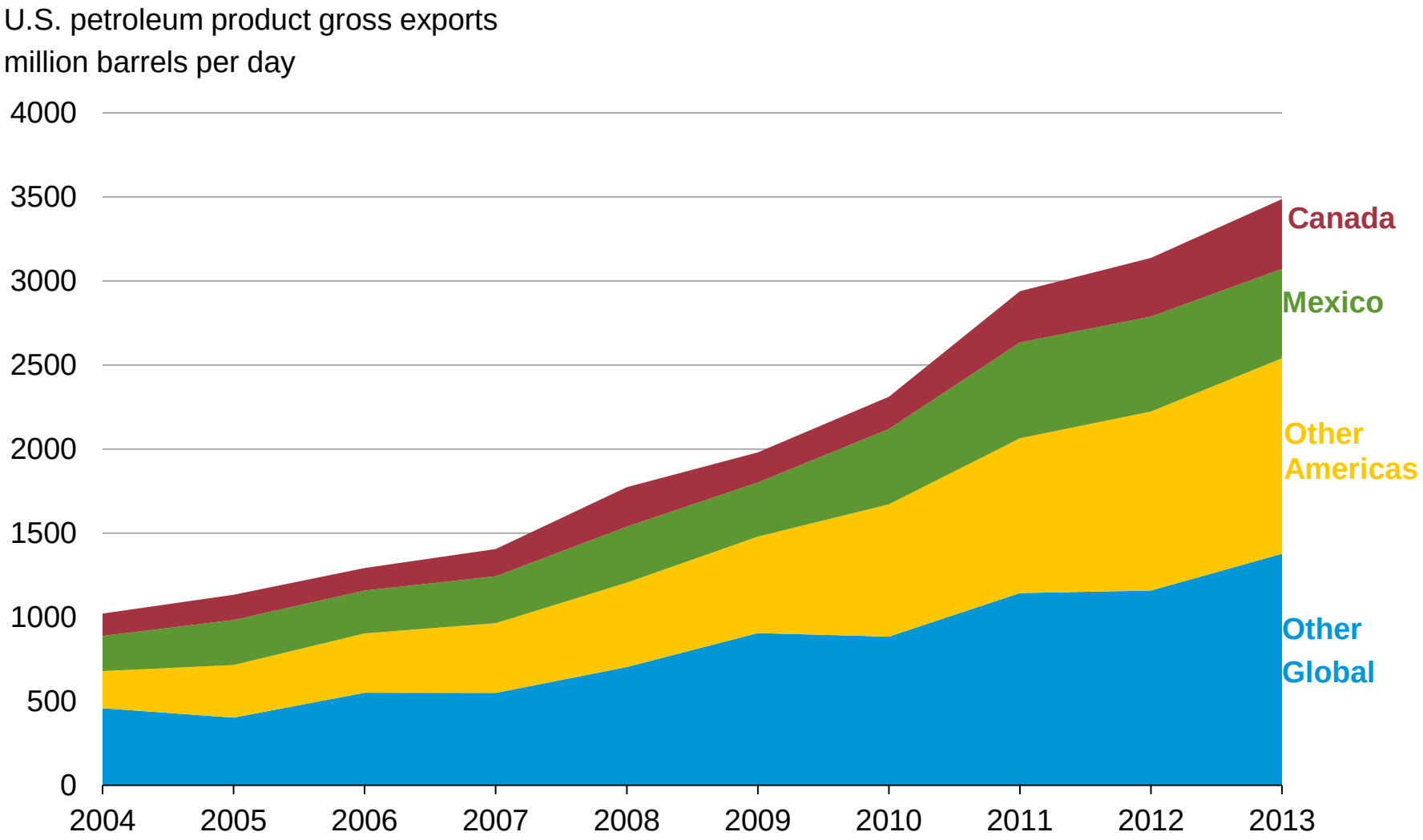
Source: U.S. Energy Information Administration, based on Association of American Railroads

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



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

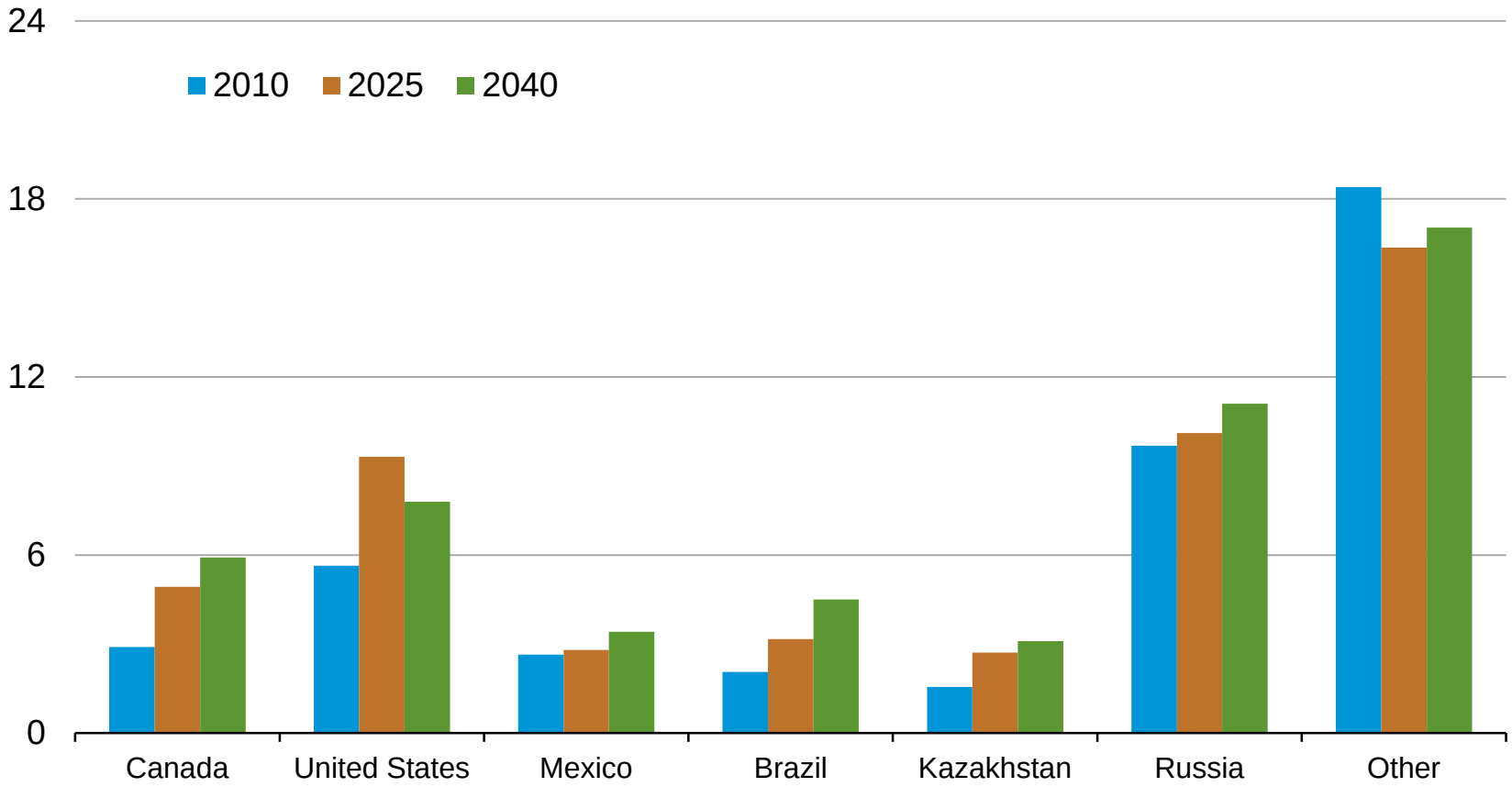
Over 60% of U.S. petroleum product exports go to the Americas, with Mexico and Canada as its largest global trading partners



Source: EIA Americas Report

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

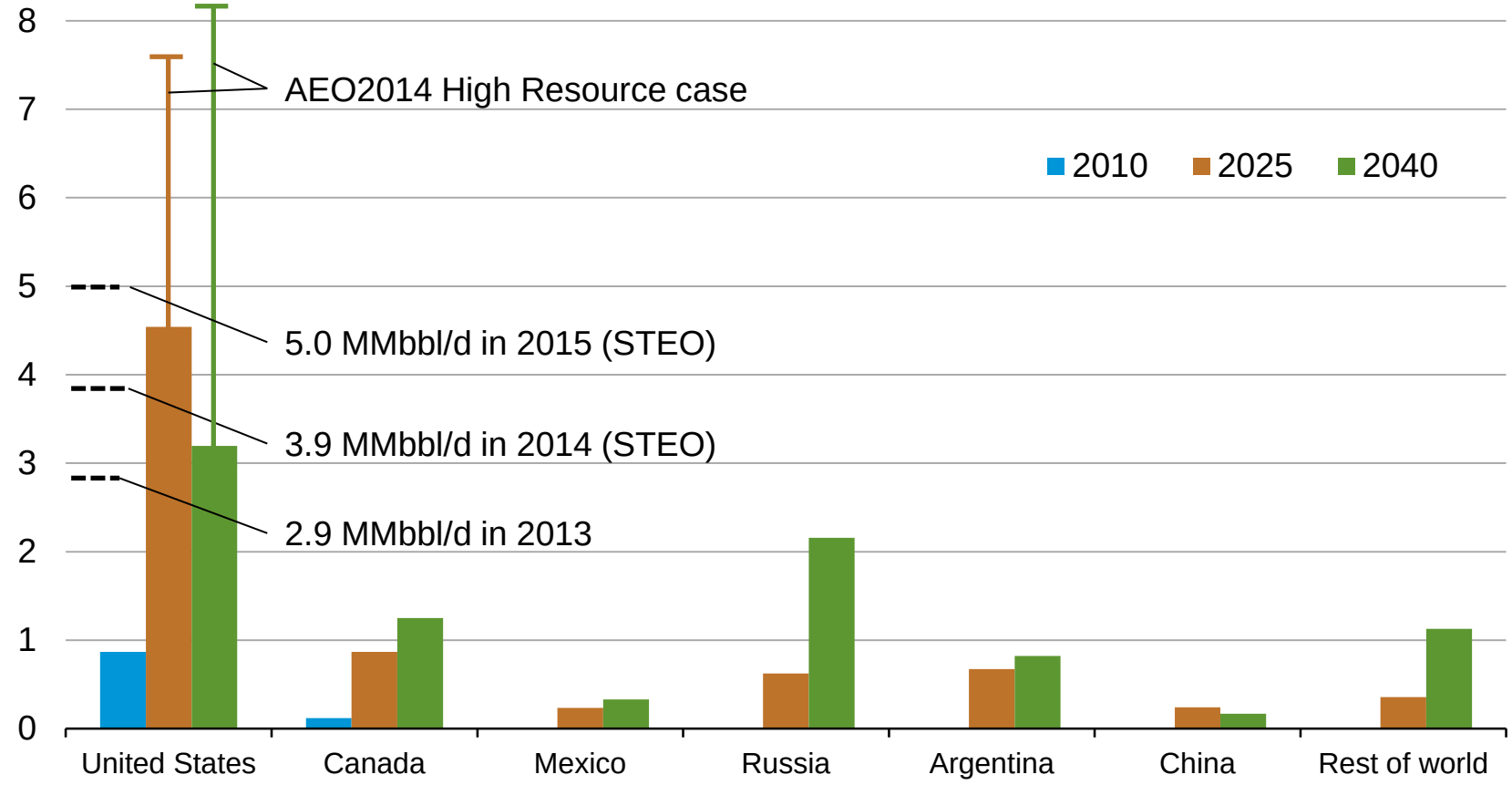


Source: EIA, International Energy Outlook 2014

Tight oil production will spread to nations outside of the United States and Canada over the projection

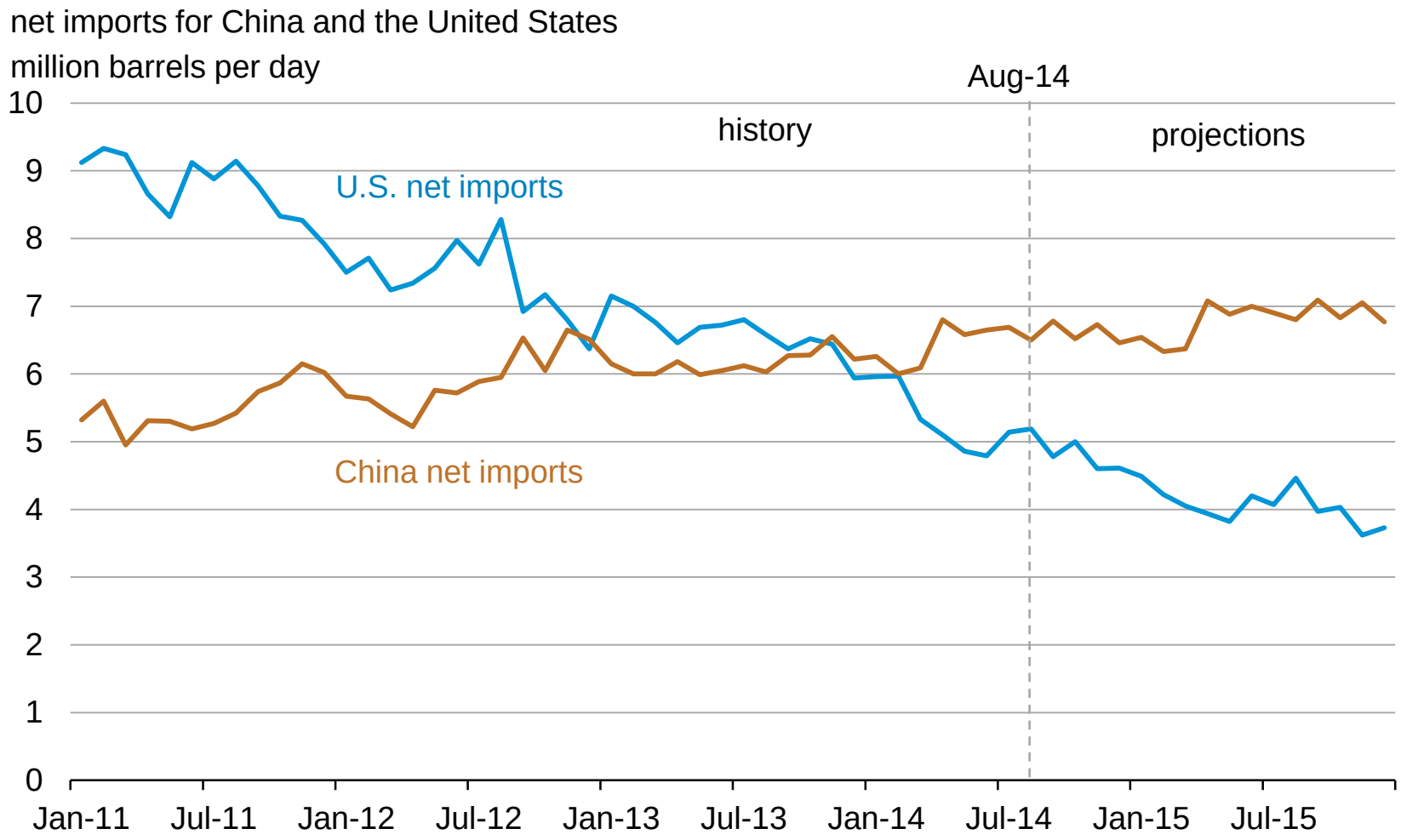
tight oil production, Reference case

million barrels per day



Source: EIA, International Energy Outlook 2014

Growing U.S. oil production and rising demand in China have together made China the world's largest net oil importer



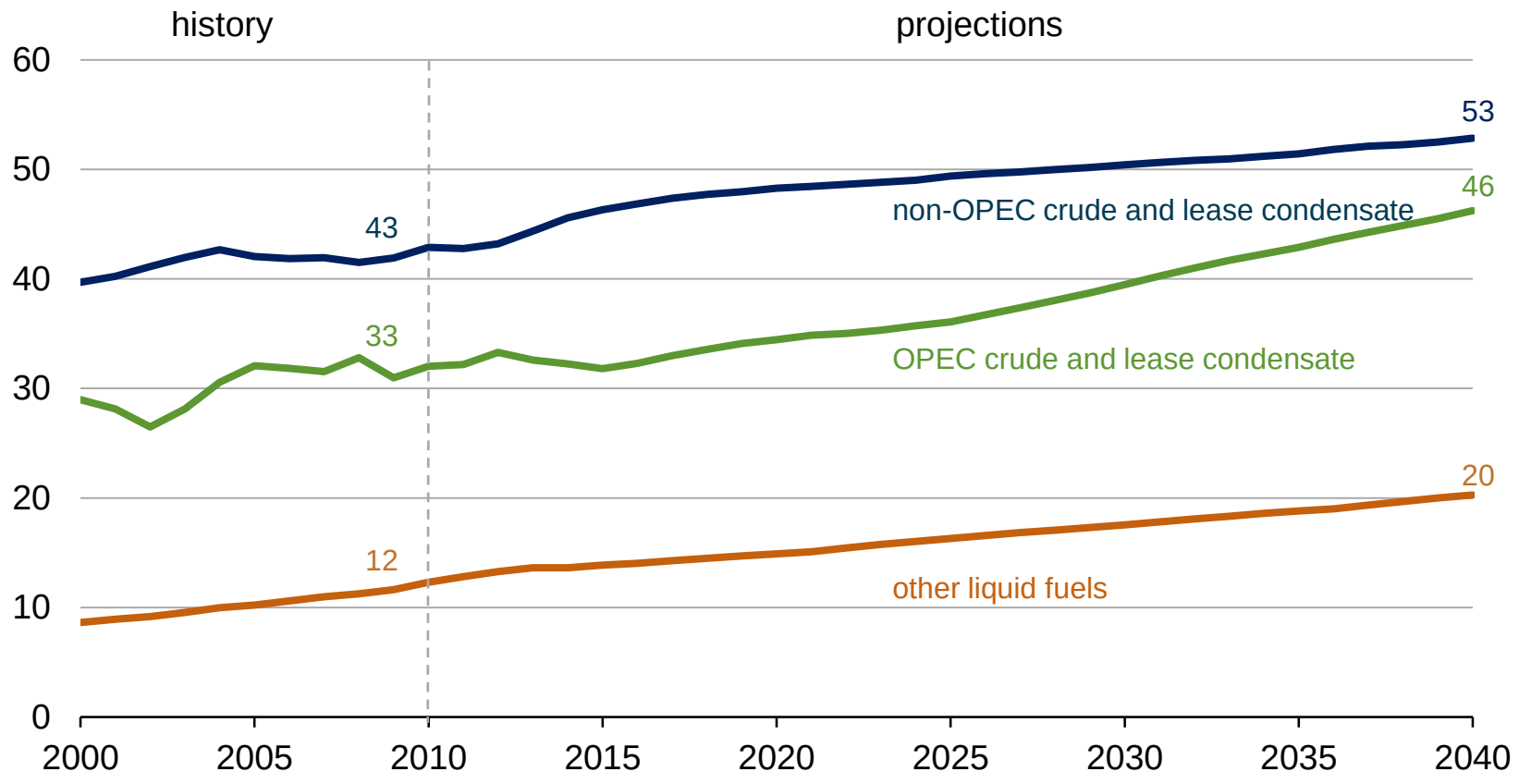
Note: Net oil imports are defined as total liquid fuels consumption less domestic production

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

Over the IEO projection, OPEC crude and lease condensate suppliers produce an additional 14 MMbbl/d

petroleum and other liquid fuels production, Reference case

million barrels per day



Source: EIA, International Energy Outlook 2014

Areas of uncertainty in the outlook

- China's energy demand growth; particularly in transportation
  - EIA is working with MIT and others to upgrade the structural and macroeconomic determinates of transportation demand in all regions for IEO2015
- Increasing global trade of natural gas and HGL in addition to oil
  - EIA is integrating the representation of oil and natural gas supply and other hydrocarbons
- Global development of tight oil and shale gas resources
  - EIA is gathering geology and production information, and conducting outreach
- Impact of geopolitical tensions on energy supply
  - EIA exploring options for representing these uncertainties in the outlook

For more information

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Short-Term Energy Outlook | www.eia.gov/steo

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Today in Energy | www.eia.gov/todayinenergy

State Energy Portal | www.eia.gov/state

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