Oil and natural gas -- outlook and drivers

for

Committee on Earth Resources

National Academies of Science, Engineering, and Medicine

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by

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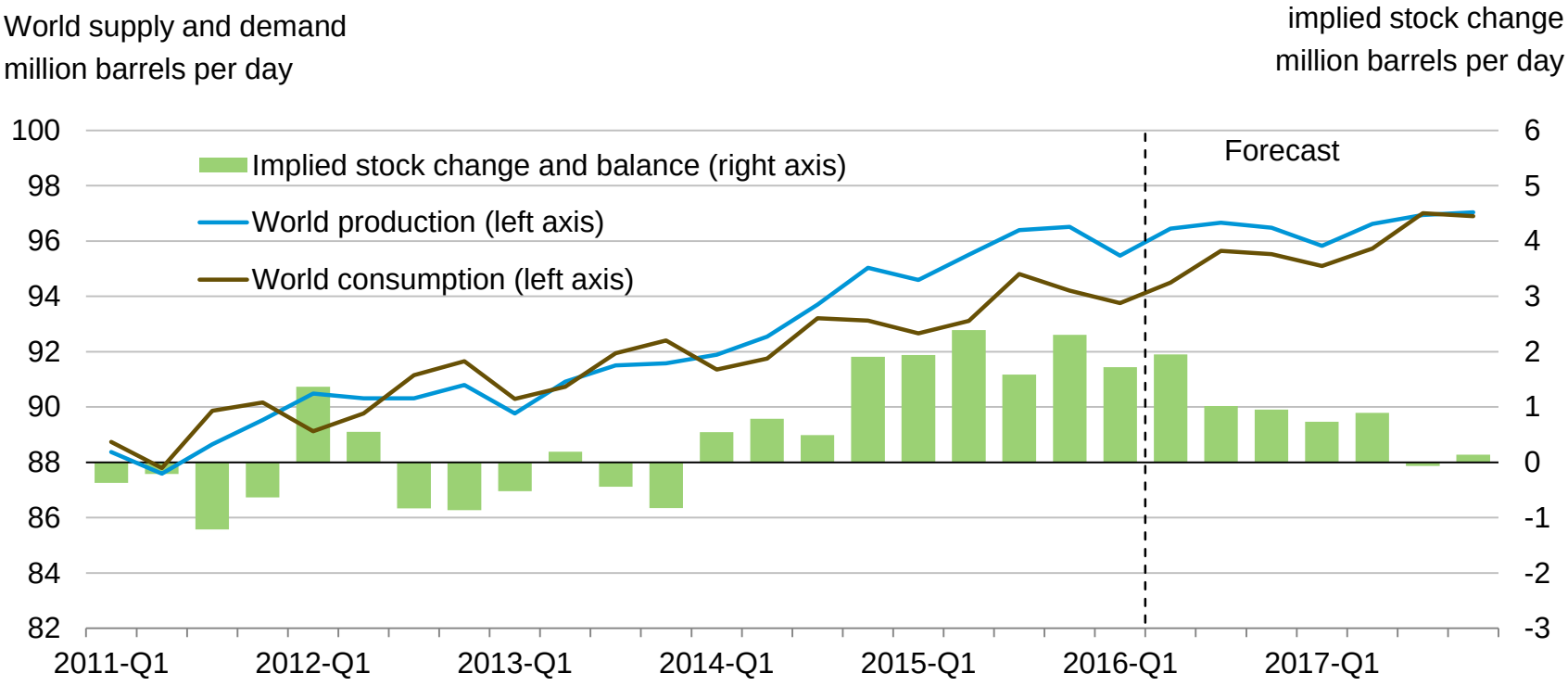
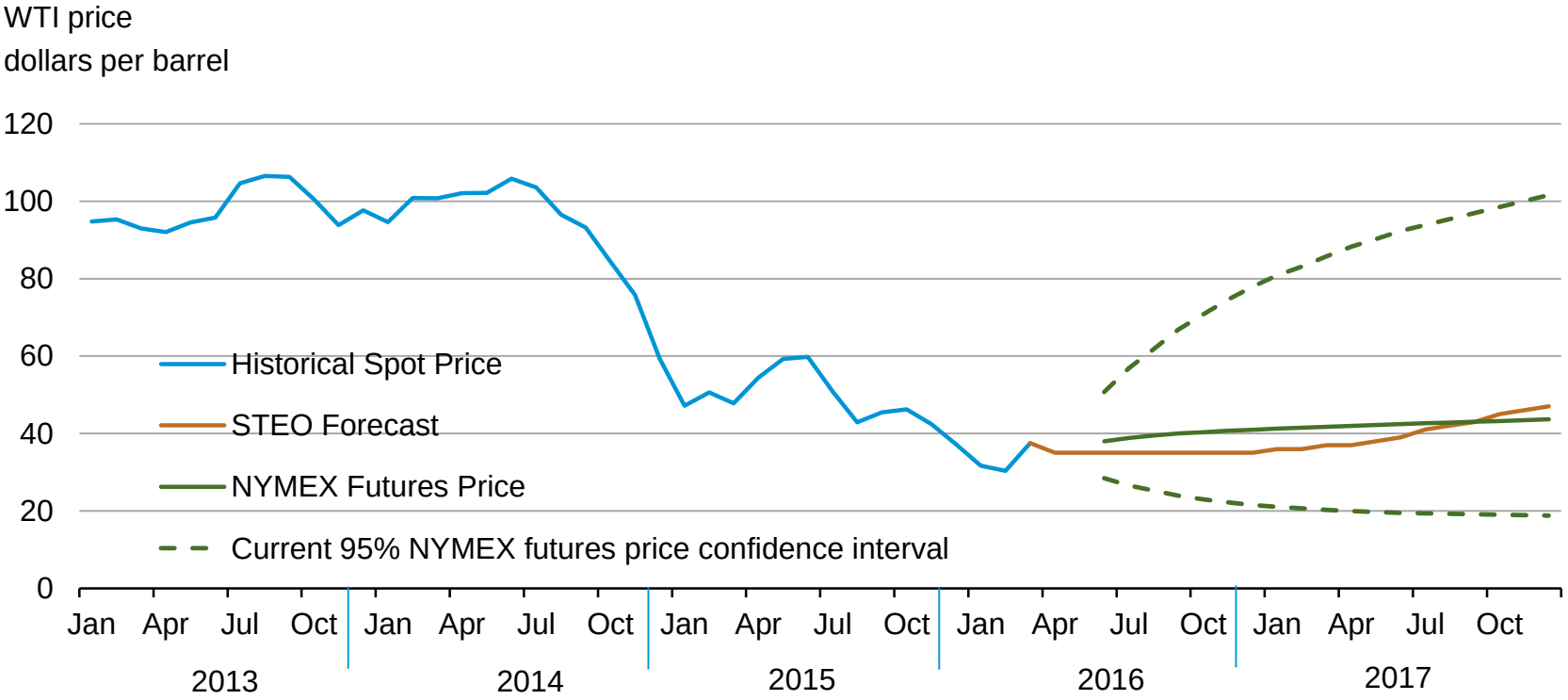
Global supply has consistently exceeded demand since the start of 2014; EIA forecasts a return to market balance in the second half of 2017



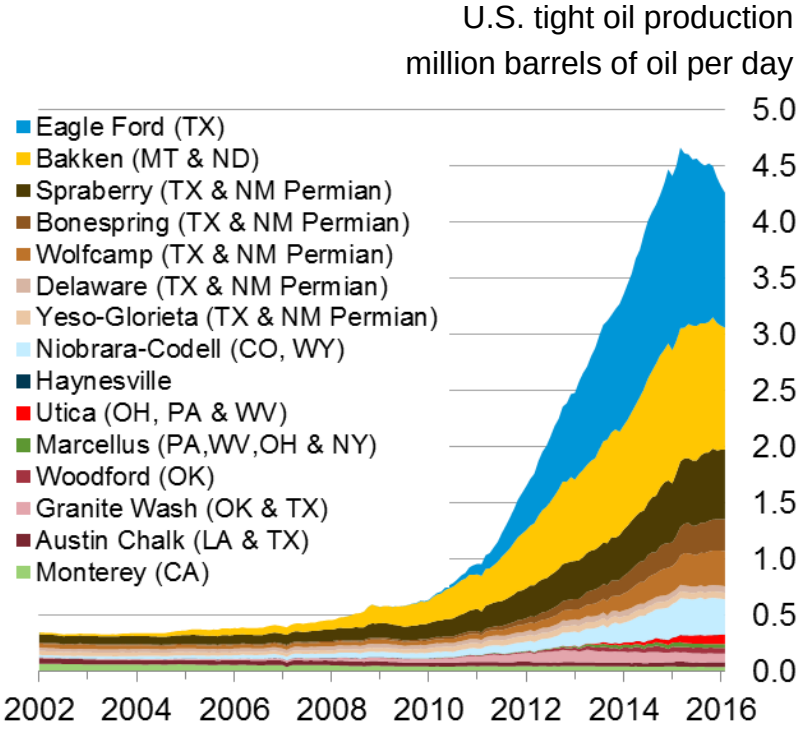
Source: EIA, Short-Term Energy Outlook, April 2016

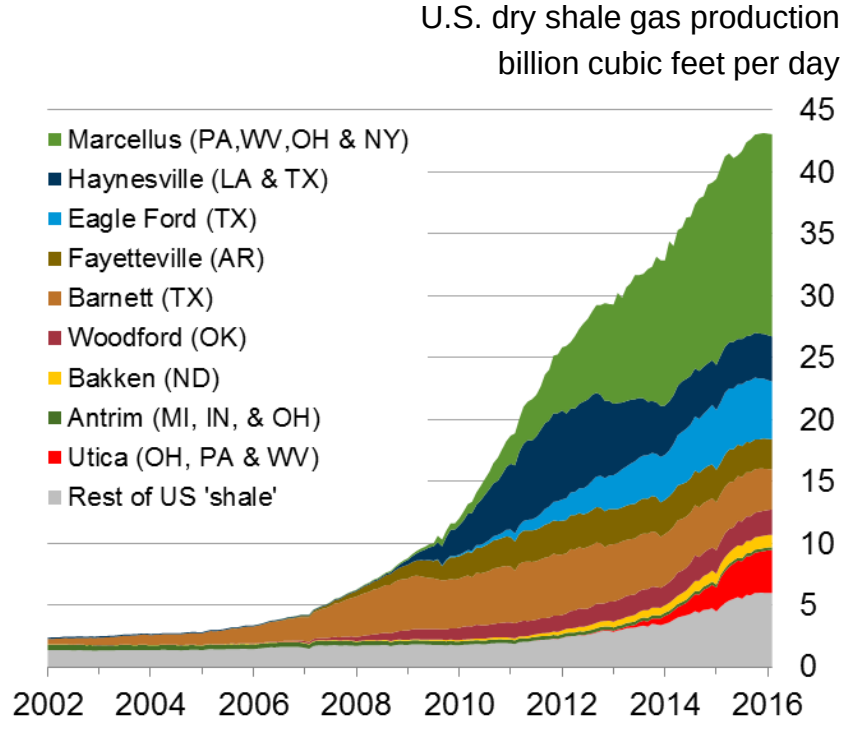
EIA expects WTI oil prices to remain low compared to recent history, but the market-implied confidence band is very wide



Source: EIA, Short-Term Energy Outlook, April 2016

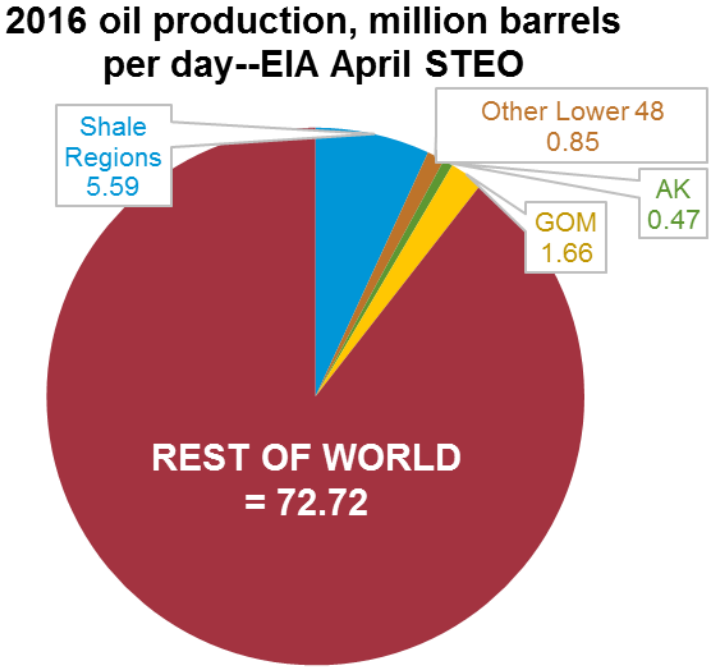
The U.S. has experienced a rapid increase in natural gas and oil production from shale and other tight resources

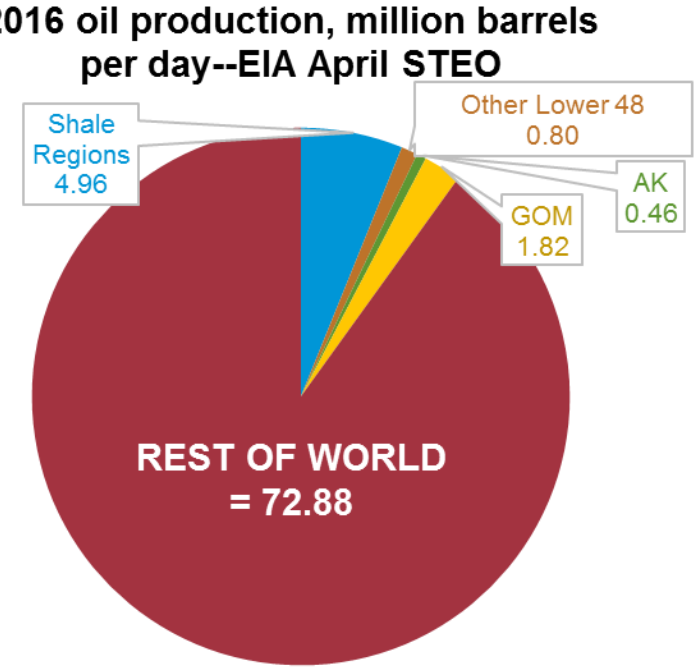




Sources: EIA derived from state administrative data collected by DrillingInfo Inc. Data are through February 2016 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s).

Crude supply trends outside the United States (red areas below) are key to future oil market balance: geopolitical developments, exporter decisions, and the timing and magnitude of supply effects stemming from reduced investment all matter





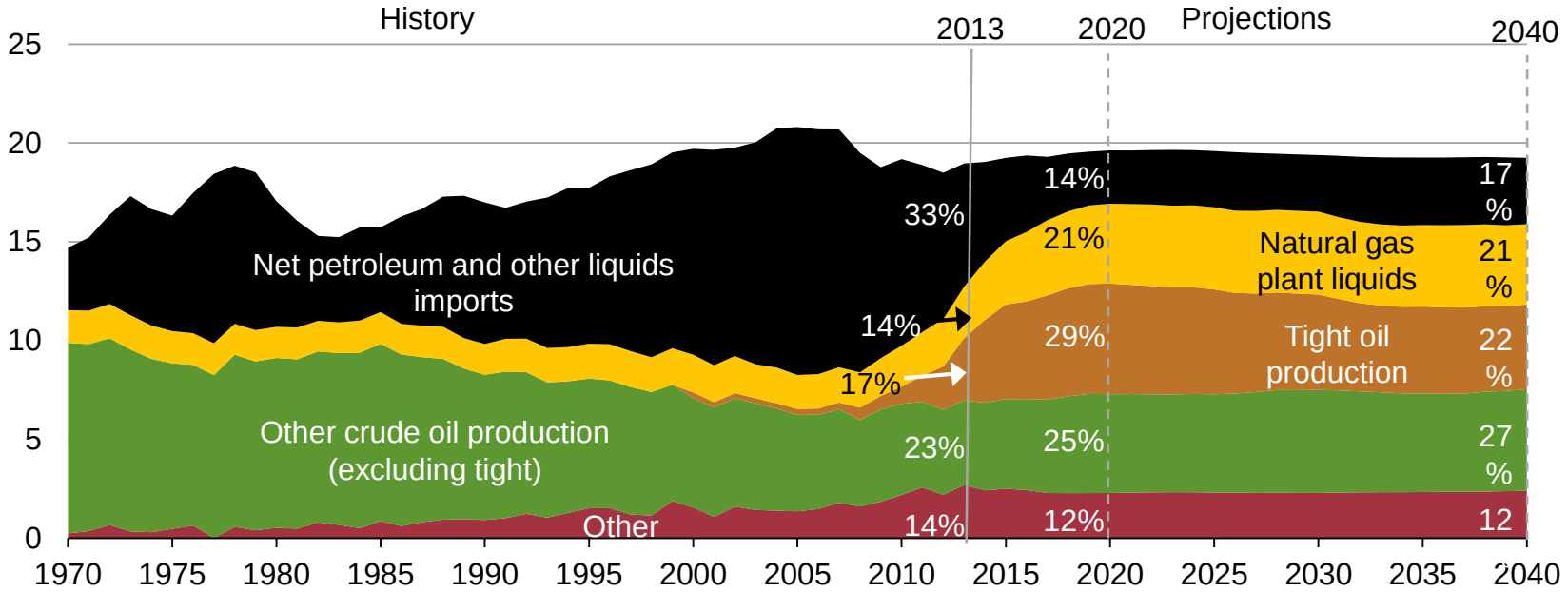
Source: EIA, Short-Term Energy Outlook and Drilling Productivity Report, April 2016; International Energy Agency

U.S. outlook

Increased production of tight oil and greater fuel efficiency drive decline in petroleum and other liquid imports

U.S. liquid fuels supply

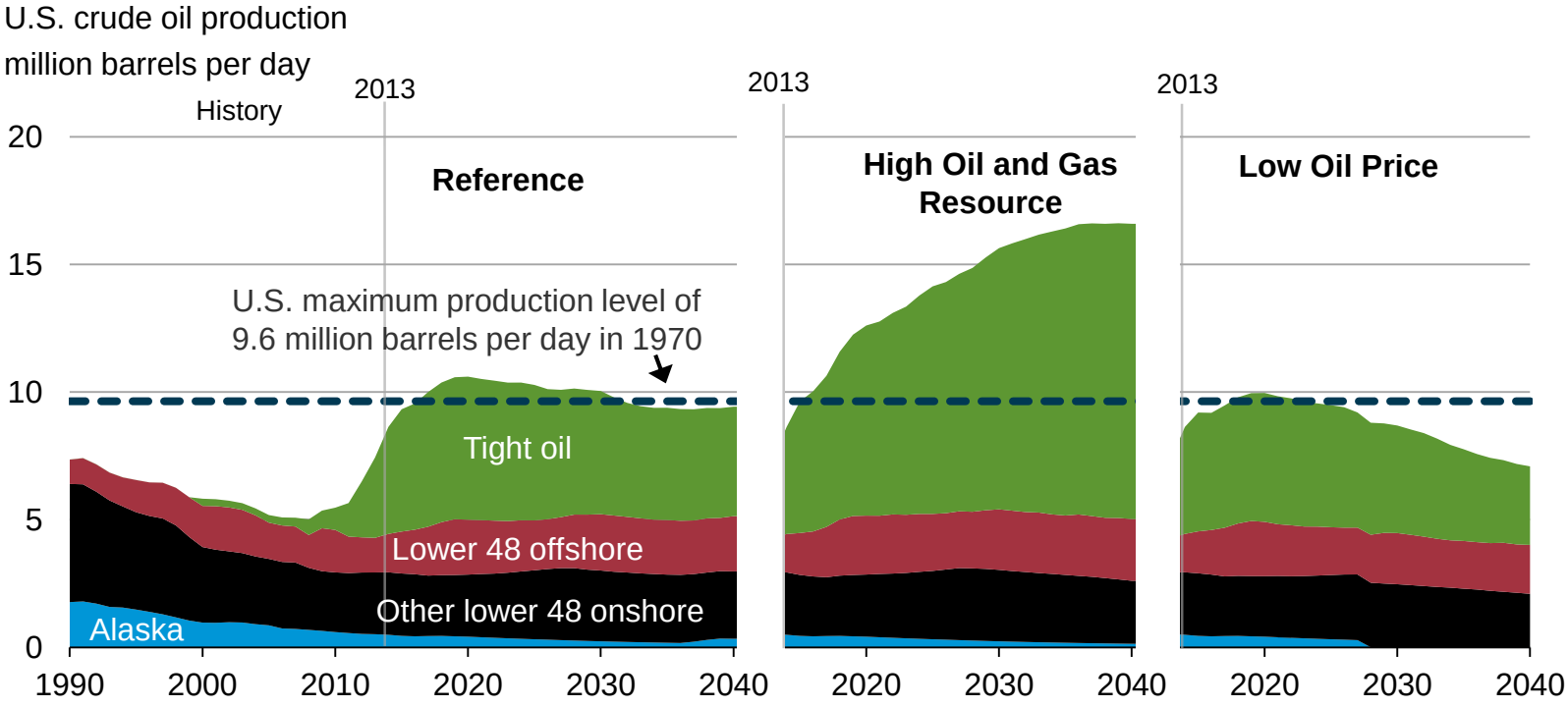
million barrels per day



Note: "Other" includes refinery gain, biofuels production, all stock withdrawals, and other domestic sources of liquid fuels

Source: EIA, Annual Energy Outlook 2015 Reference case

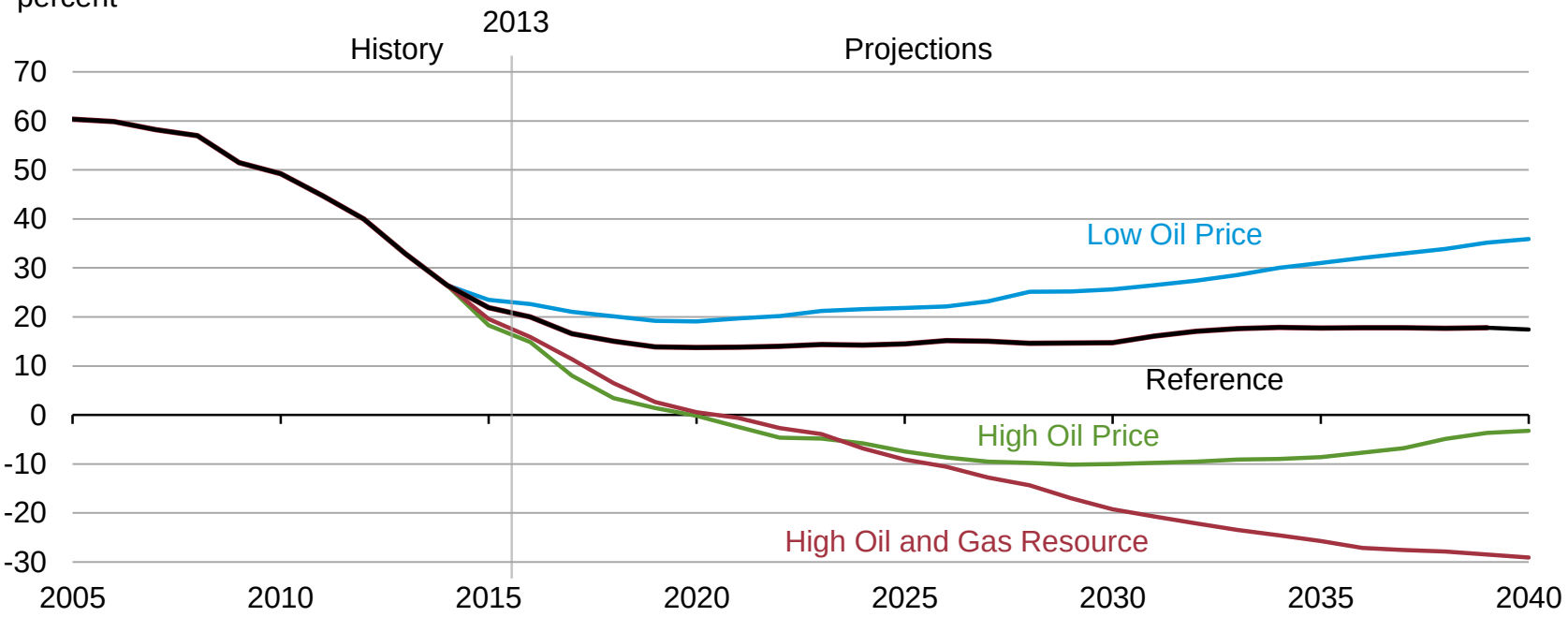
Resource and technology assumptions have major implications for projected U.S. crude oil production beyond the next few years



Source: EIA, Annual Energy Outlook 2015

U.S. reliance on net imports of petroleum and other liquids is virtually eliminated by 2035 in High Oil and Gas Resource case

net crude oil and petroleum product imports as a percentage of total U.S. supply



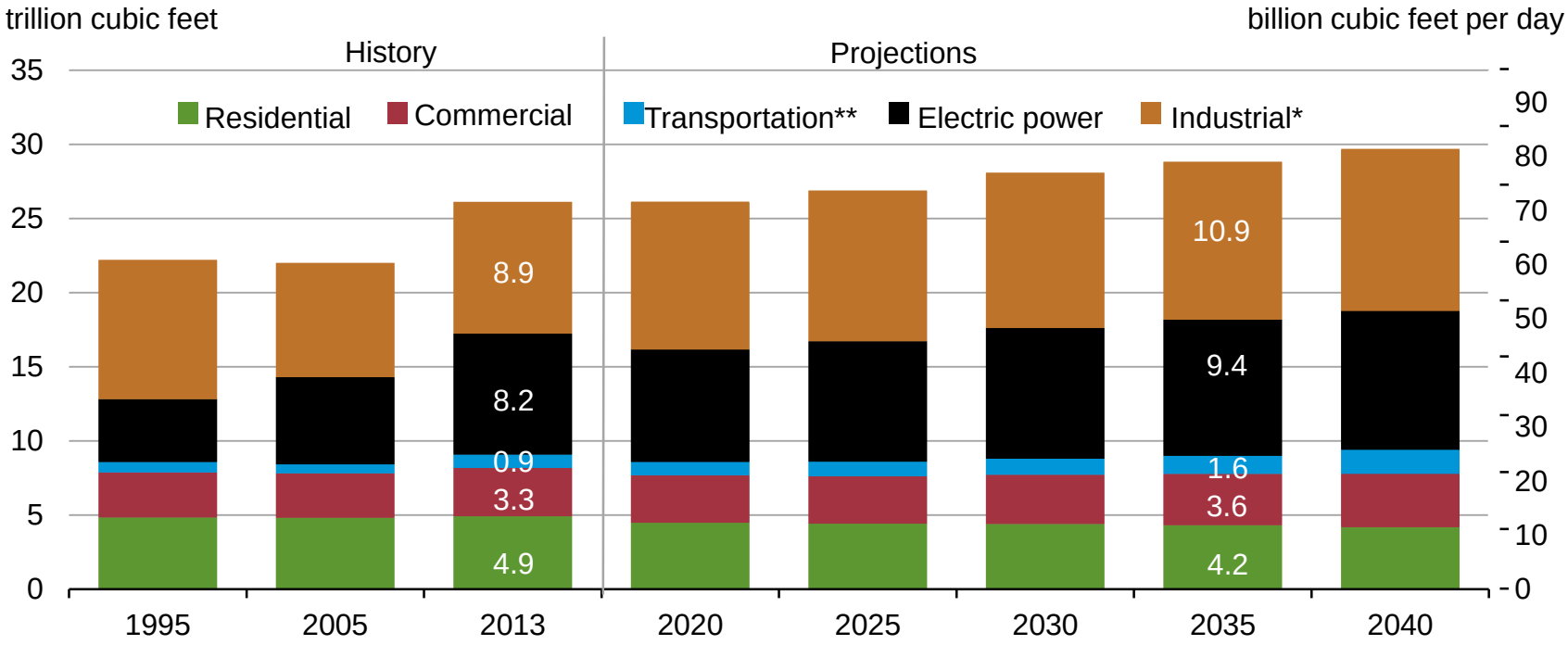
Source: EIA, Annual Energy Outlook 2015

Takeaways – Natural gas

- North American natural gas production is more likely to be limited by demand than supply
- U.S. natural gas demand growth is likely to be concentrated in electricity and industrial uses; natural gas exports and use in the transportation sector, where little natural gas is used today, are also likely to grow
- Potential challenges to natural gas demand growth include
  - Slow growth in U.S. electricity demand
  - Competition from offshore “stranded” gas for global LNG exports and siting of gas-intensive industries.
  - Long-term cheap oil would be another significant challenge to LNG exports
  - Extent and nature of global price convergence in natural gas markets
- Future policies that target particular sources or uses of energy or energy-related emissions can really matter for future natural gas demand

Natural gas consumption growth is concentrated in electricity generation and industry; gas use rises in all sectors except residential

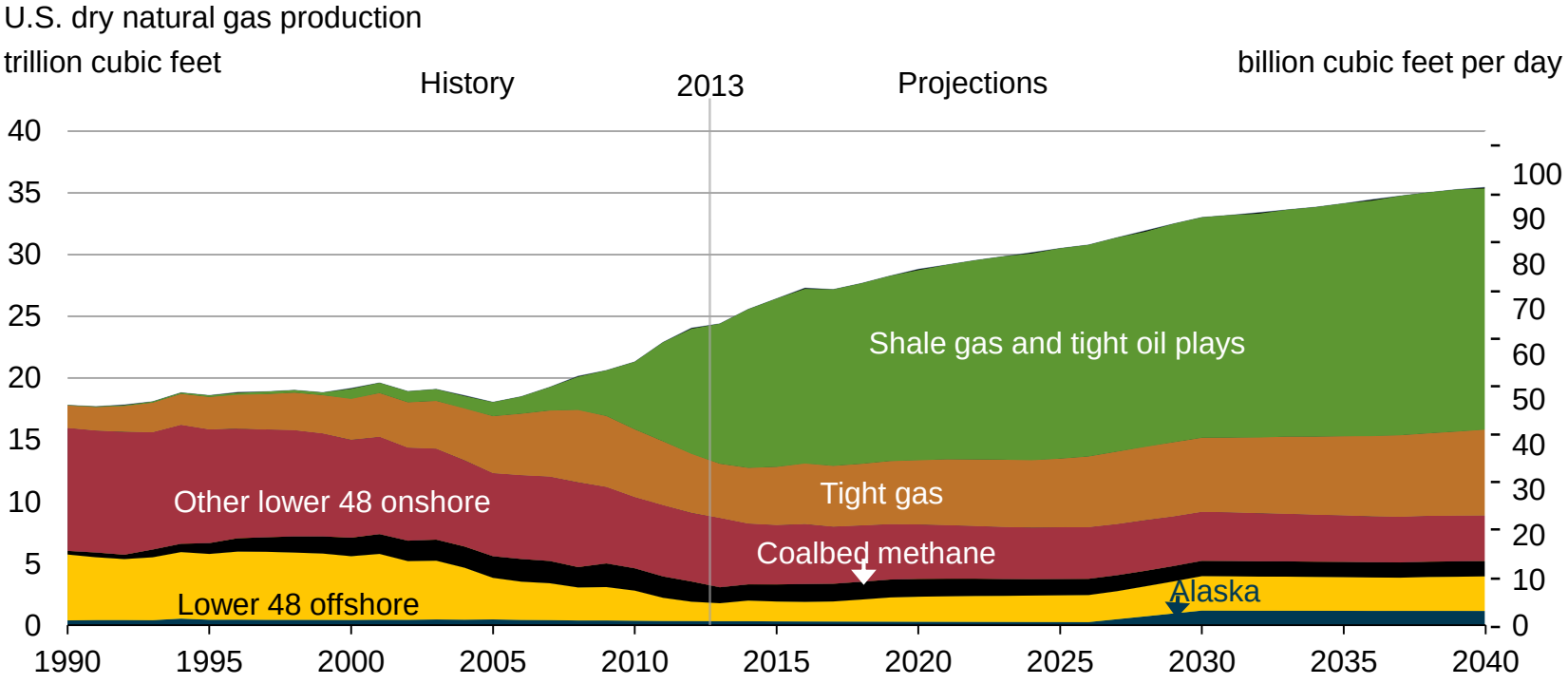
U.S. dry gas consumption



Source: EIA, Annual Energy Outlook 2015 Reference case

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

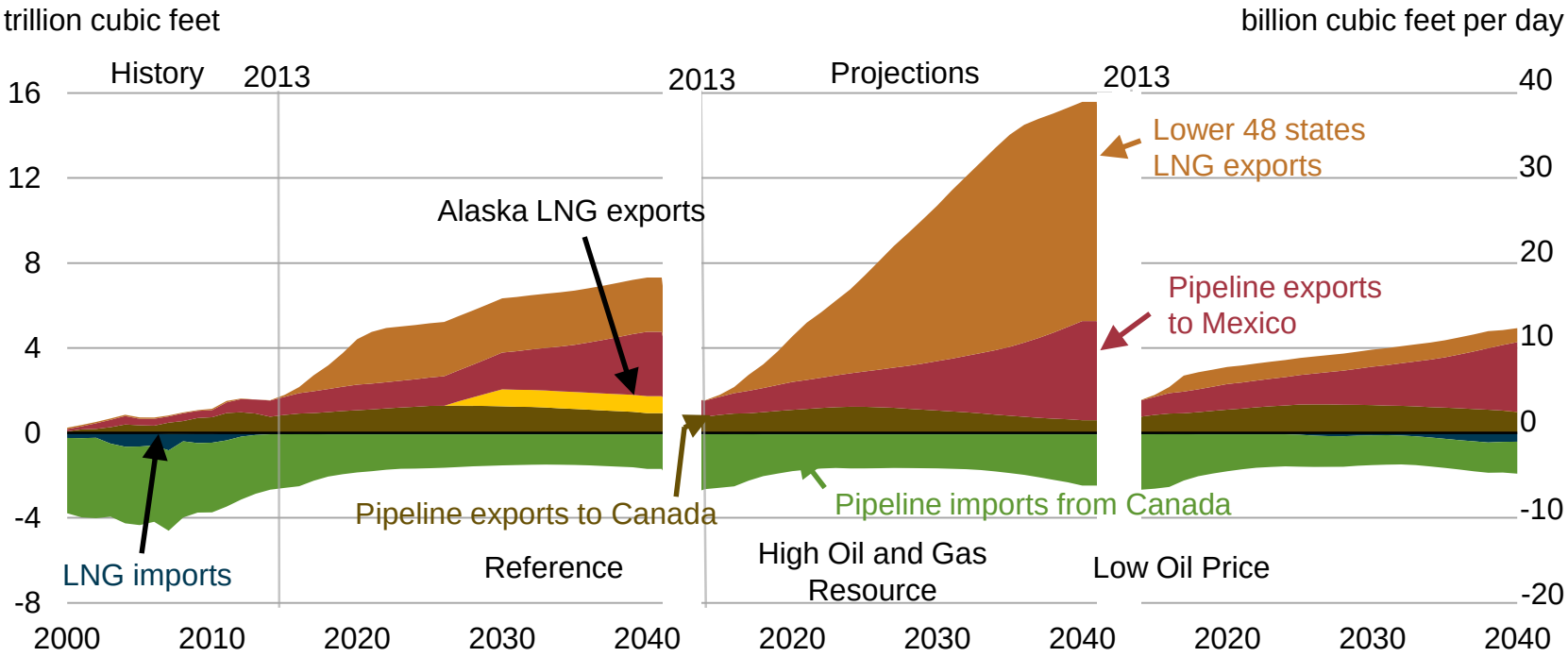
Shale resources remain the dominant source of U.S. natural gas production growth



Source: EIA, Annual Energy Outlook 2015 Reference case

Projected U.S. natural gas exports reflect the spread between domestic natural gas prices and world energy prices

U.S. natural gas imports and exports



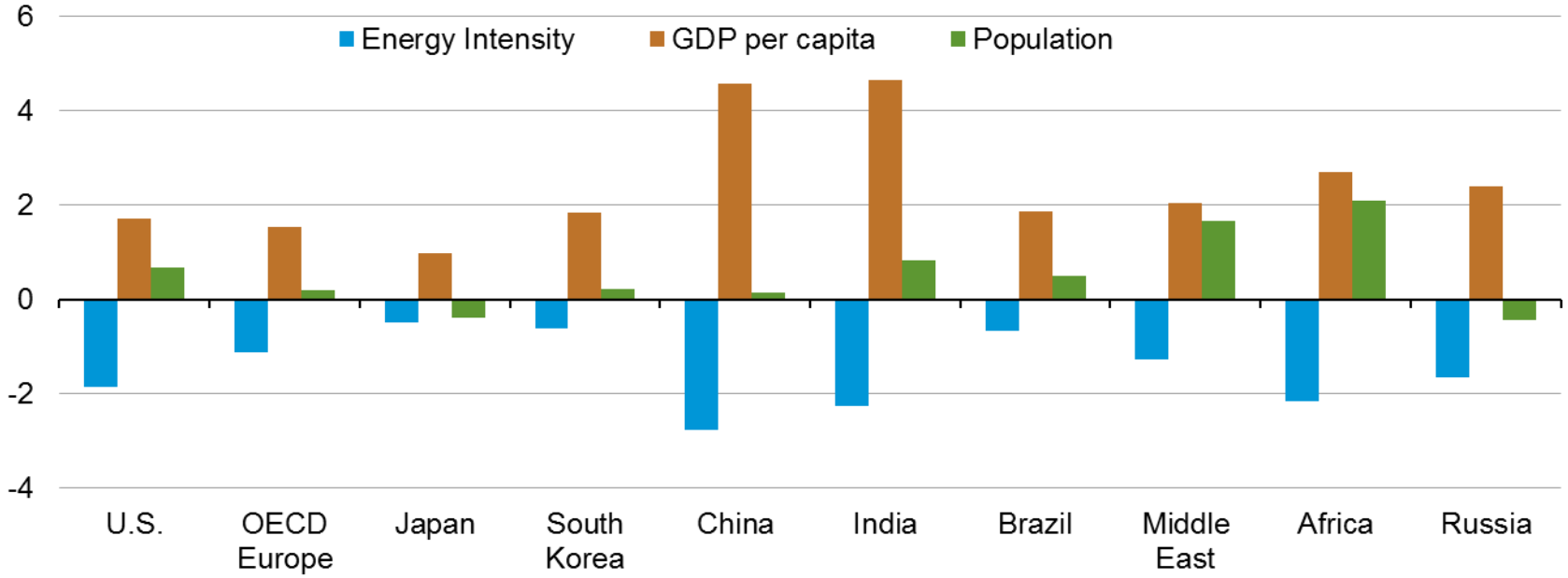
Source: EIA, Annual Energy Outlook 2015

Global outlook

Economic activity and population drive increases in energy use; energy intensity (E/GDP) improvements moderate this trend

average annual percent change (2012–40)

percent per year

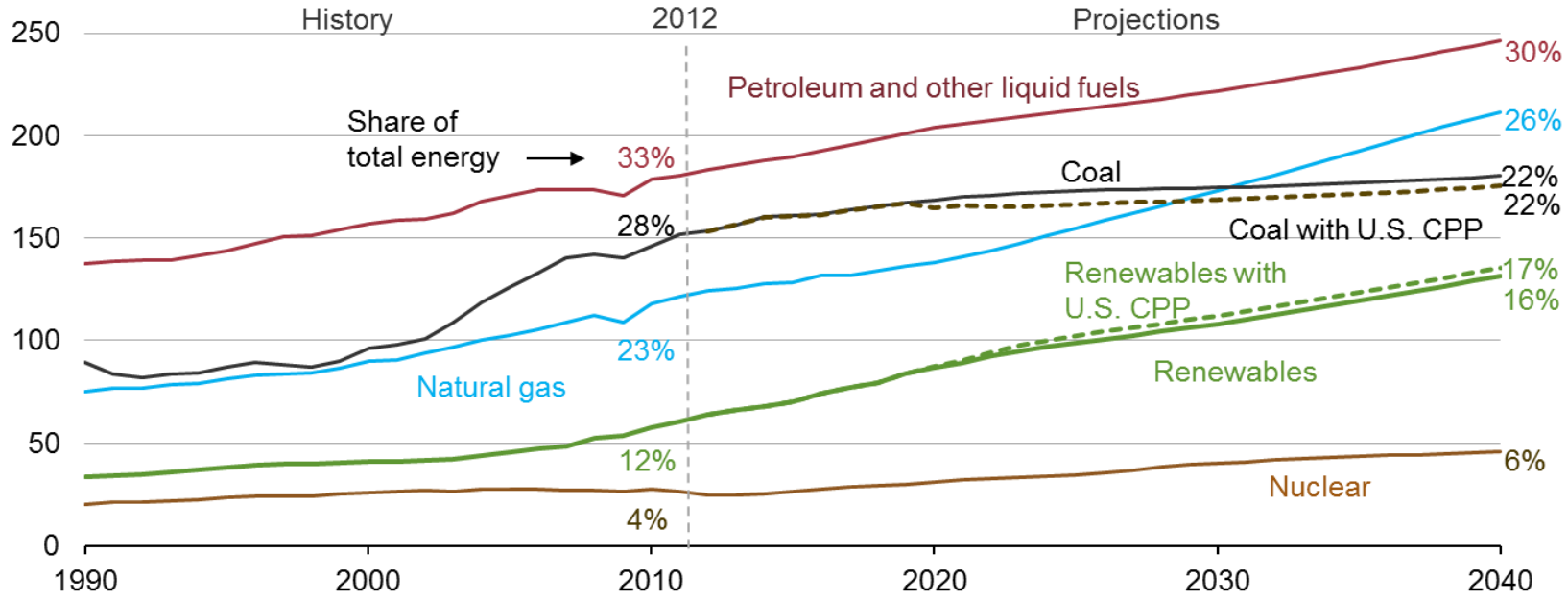


Source: Current Thinking

Renewables grow fastest, coal use plateaus, natural gas surpasses coal by 2030, and oil maintains its leading share

world energy consumption

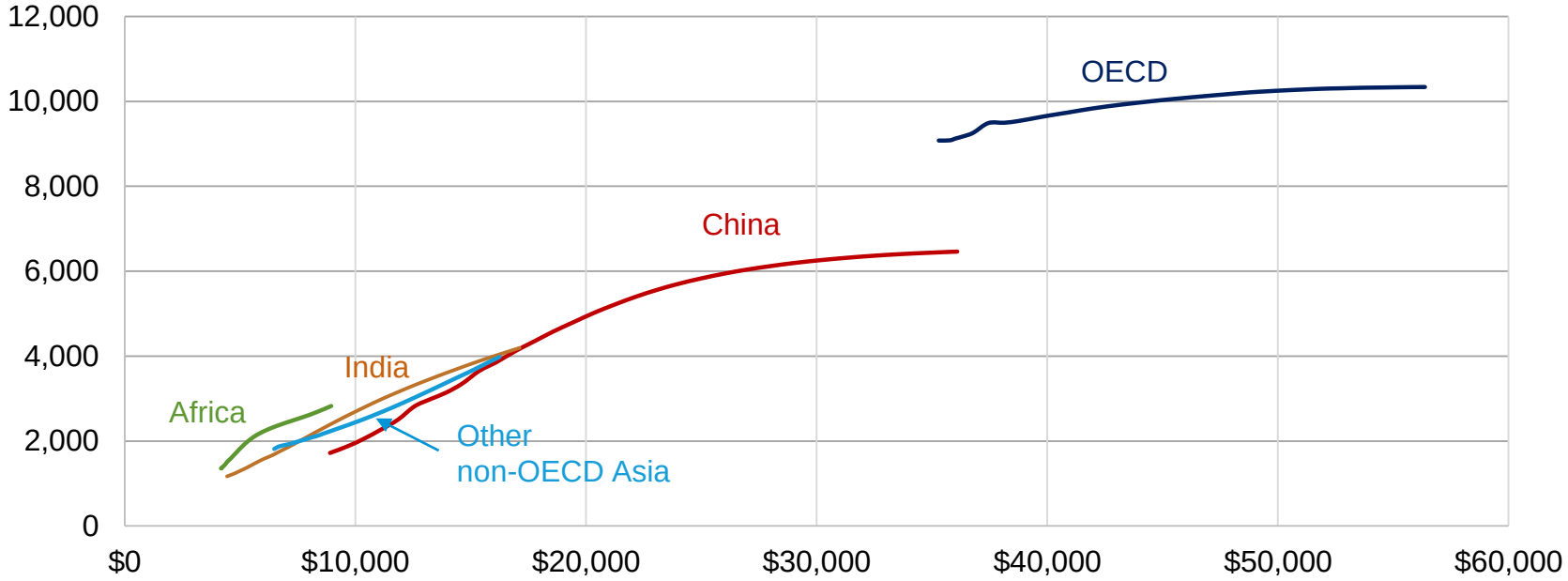
quadrillion Btu



Source: Current Thinking

Passenger-miles per person will rise as GDP per capita grows; travel growth is largely outside the OECD

passenger-miles per capita (left-axis) and GDP per capita (horizontal-axis) for selected country groupings 2010–40

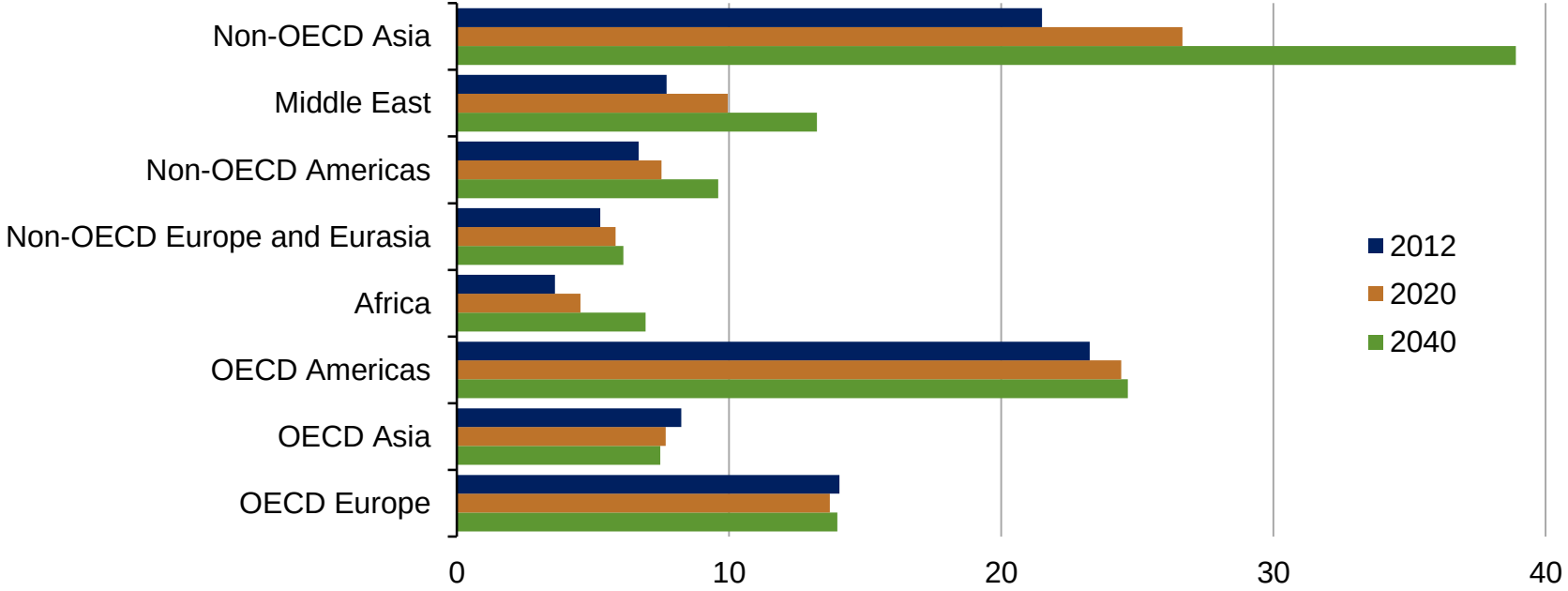


Source: EIA, International Energy Outlook 2016

Most of the growth in world oil consumption occurs in the non-OECD regions — especially Asia

world petroleum and other liquid fuels consumption

million barrels per day

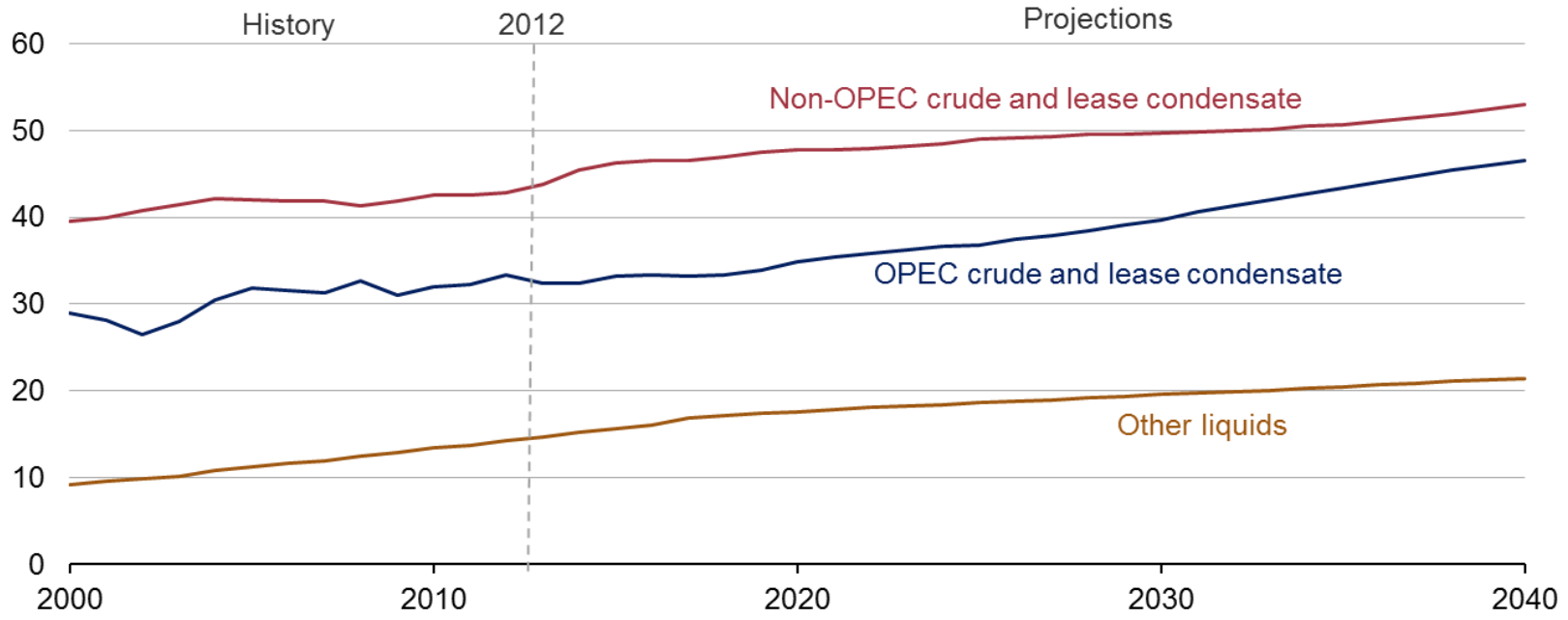


Source: EIA, International Energy Outlook 2016

Liquid fuels supplies from both OPEC and non-OPEC producers increase through 2040

world production of petroleum and other liquid fuels

million barrels per day



Source: Current thinking

LONGER TERM PERSPECTIVE: Can OPEC cohere? – Change in world liquid fuel balances for two 12-year historical periods with EIA projections for 2013-25 from AEO2015 (million barrels per day)

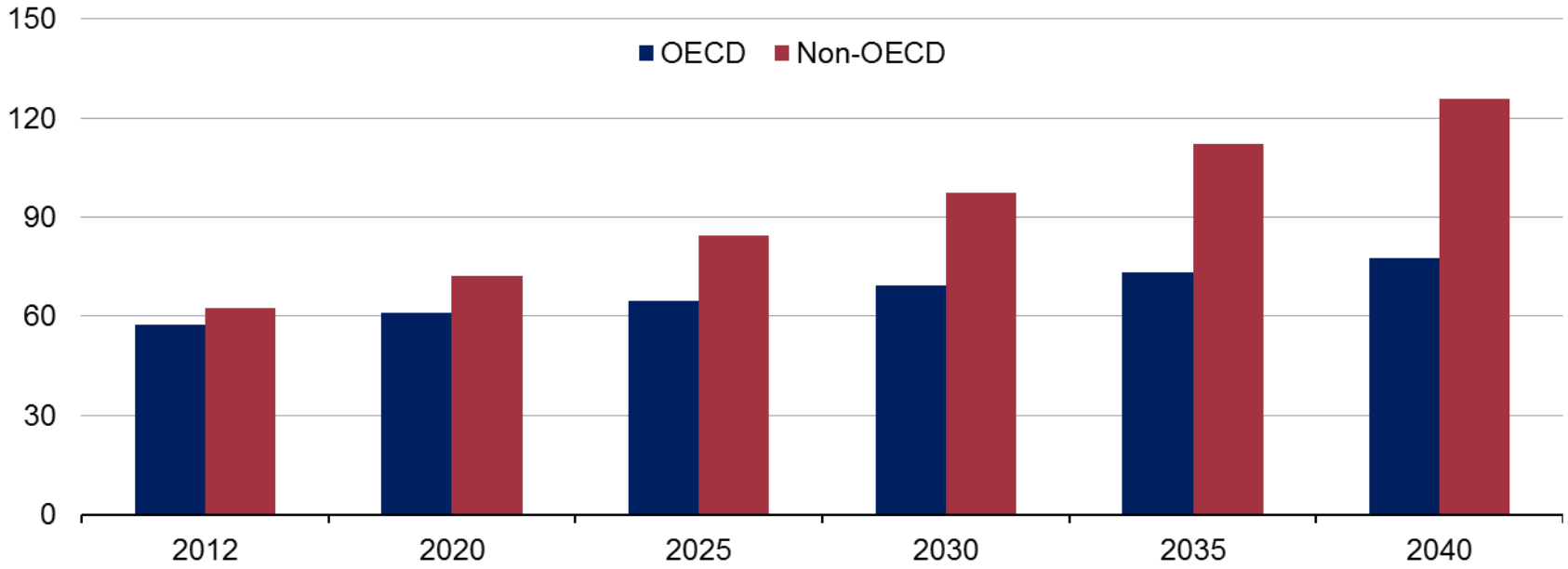
	Actual		Projected AEO 2015 Reference & HOGR Cases
	1973–85	2000–12	2013–25
World Liquids Demand	+3	+12	+12 to +13
OECD	-4	-2	+1
Non-OECD	+7	+15	+11
World Liquids Supply	-1	+12	+11 to +12
Non-OPEC Supply	+13	+ 6	+10 to +15
OPEC Production	-14	+ 6	-3 to +2

Source: EIA, Annual Energy Outlook 2015, April 2015

Non-OECD nations account for ¾ of projected growth in natural gas consumption

world natural gas consumption

trillion cubic feet

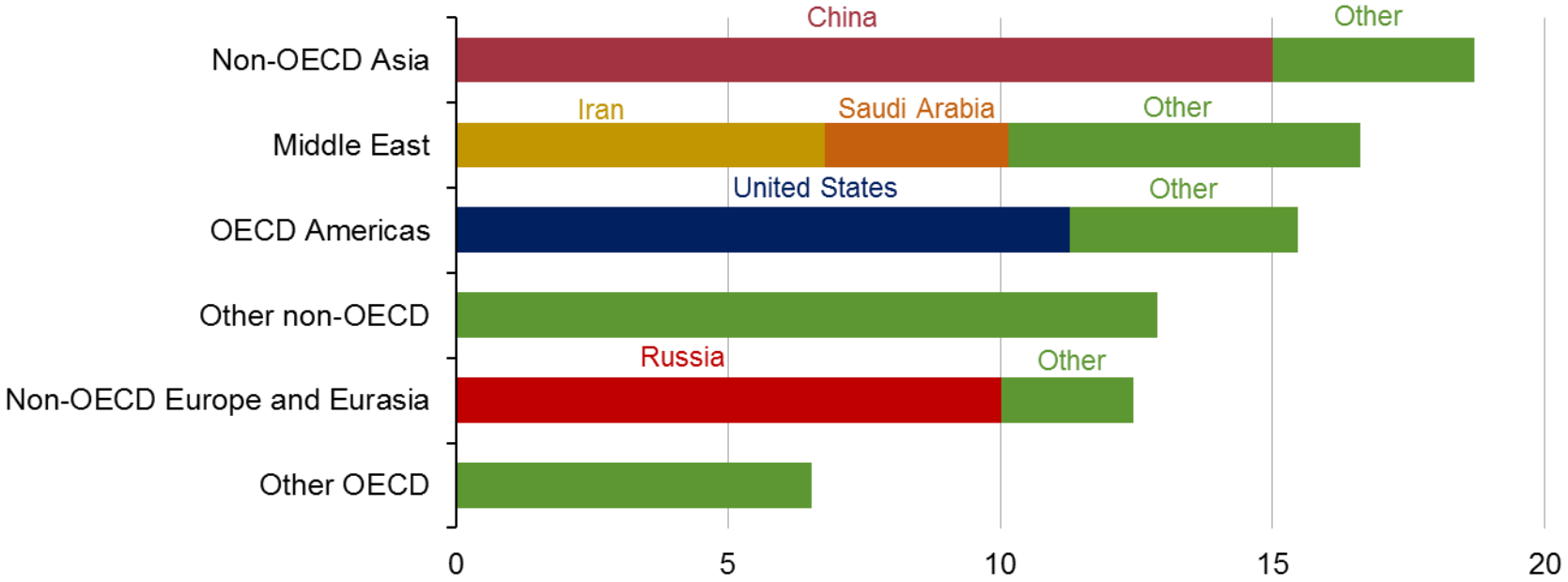


Source: Current Thinking

Non-OECD Asia, Middle East, and OECD Americas account for the largest increases in natural gas production

world change in natural gas production, 2012–40

trillion cubic feet

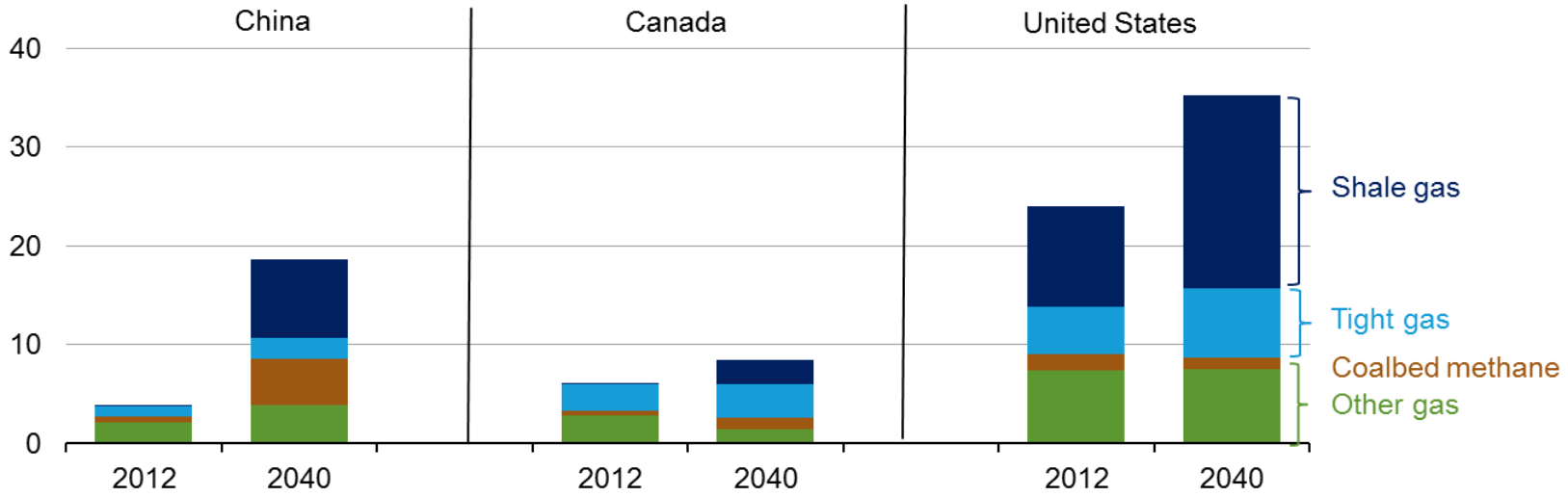


Source: Current thinking

Shale gas, tight gas, and coalbed methane become increasingly important to gas supplies, not only for the U.S., but also China and Canada

natural gas production by type

trillion cubic feet



Note: Other natural gas includes natural gas produced from structural and stratigraphic traps (e.g. reservoirs), historically referred to as 'conventional' production.

Source: Current thinking