

# *World and U.S. Oil and Gas Production and Price Outlook: To Infinity (or at least 2050) and Beyond*



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*by*

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Show of hands...who here uses EIA data?

# EIA is all about energy data and energy analysis

- Data (Statistics)
  - Data collection (surveys)
  - Data synthesis, curating, presentation (e.g., Excel add-in)
- Analysis
  - Present and near history
    - Disruption analysis
    - Drilling productivity report
  - Near-term forecasts: STEO
  - Longer-term projections
    - Annual Energy Outlook (AEO)
    - International Energy Outlook (IEO)

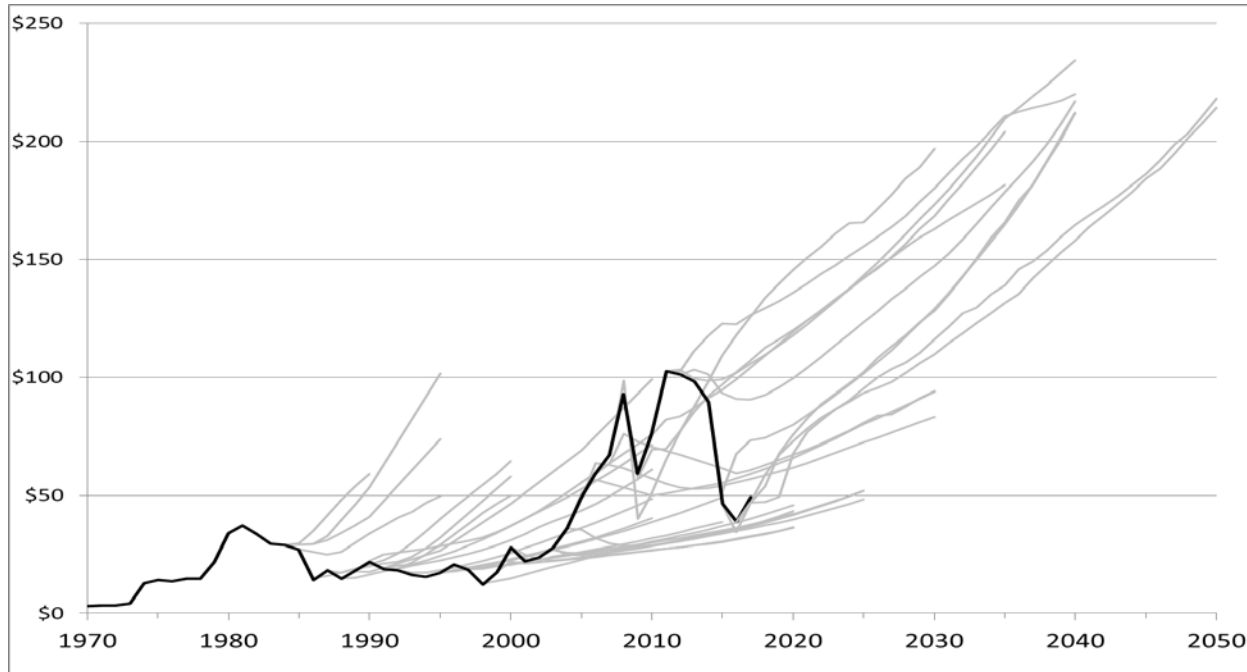


# The Annual Energy Outlook 2018 (AEO2018) represents a projection of the U.S. energy system to the year 2050

- Projection, not forecast
- Conceptually, represents peak (mode) of conditional probability distribution
  - No information about shape of distribution is given
  - Conditions include existing technologies (largely), current laws and regulations
- Infinitesimally small chance of being “right”
  - We’ve never been right in the past
  - No one has...

# EIA has never correctly predicted the crude oil price

Average imported crude oil acquisition price  
nominal dollars per barrel



Source: EIA, Annual Energy Outlooks through 2018

# Global outlook

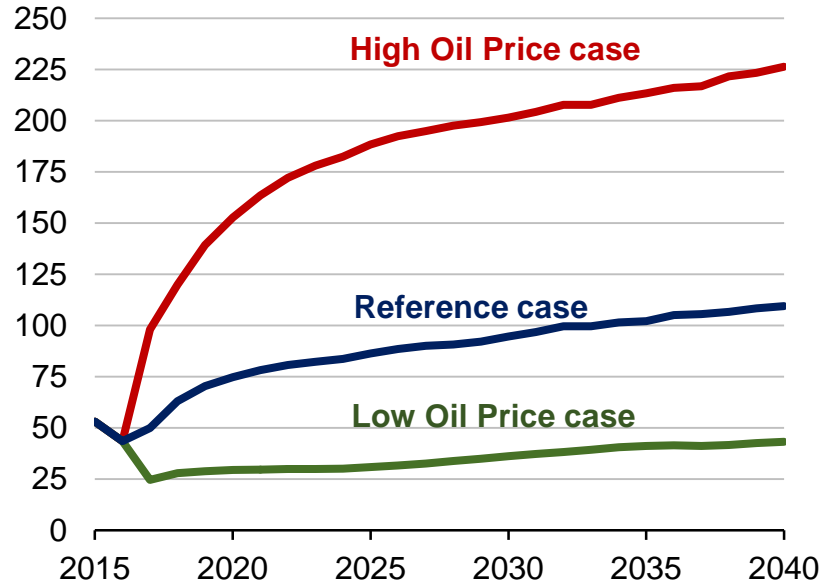
# IEO2017 addresses the uncertainty inherent in energy projections by developing side cases focusing on overall energy consumption

- The effects of assumptions about economic growth on energy consumption are addressed in the High and Low Economic Growth cases. World gross domestic product increases by 3.3%/year from 2015 to 2040 in the High Economic Growth case and by 2.7%/year in the Low Economic Growth case, compared with 3.0%/year in the Reference case
- The High and Low Oil Price cases address the uncertainty associated with the trajectory of world energy prices. In the Low Oil Price case, the price of North Sea Brent crude in 2016 dollars reaches \$43/barrel by 2040, compared with \$109/barrel in the Reference case and \$226/barrel in the High Oil Price case
- Although the graphics in this presentation focus on projections through 2040, this IEO is the first projection to include model results through 2050, which are available on the IEO page of the EIA website; EIA welcomes feedback on the assumptions and results over the period of 2040–50

# Future oil prices are another key source of uncertainty in the projections

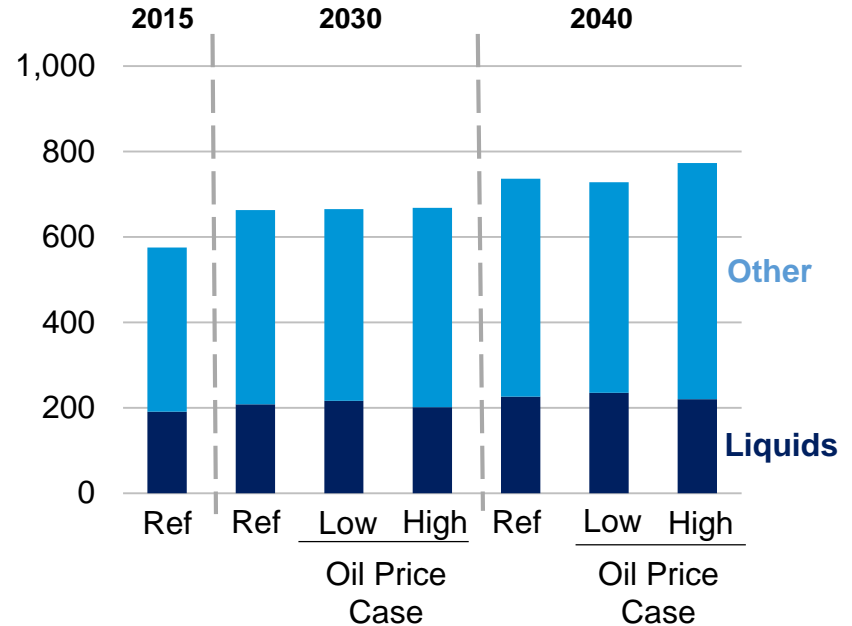
## World oil prices in three cases

real 2016 dollars per barrel



## World energy consumption in three cases

quadrillion Btu

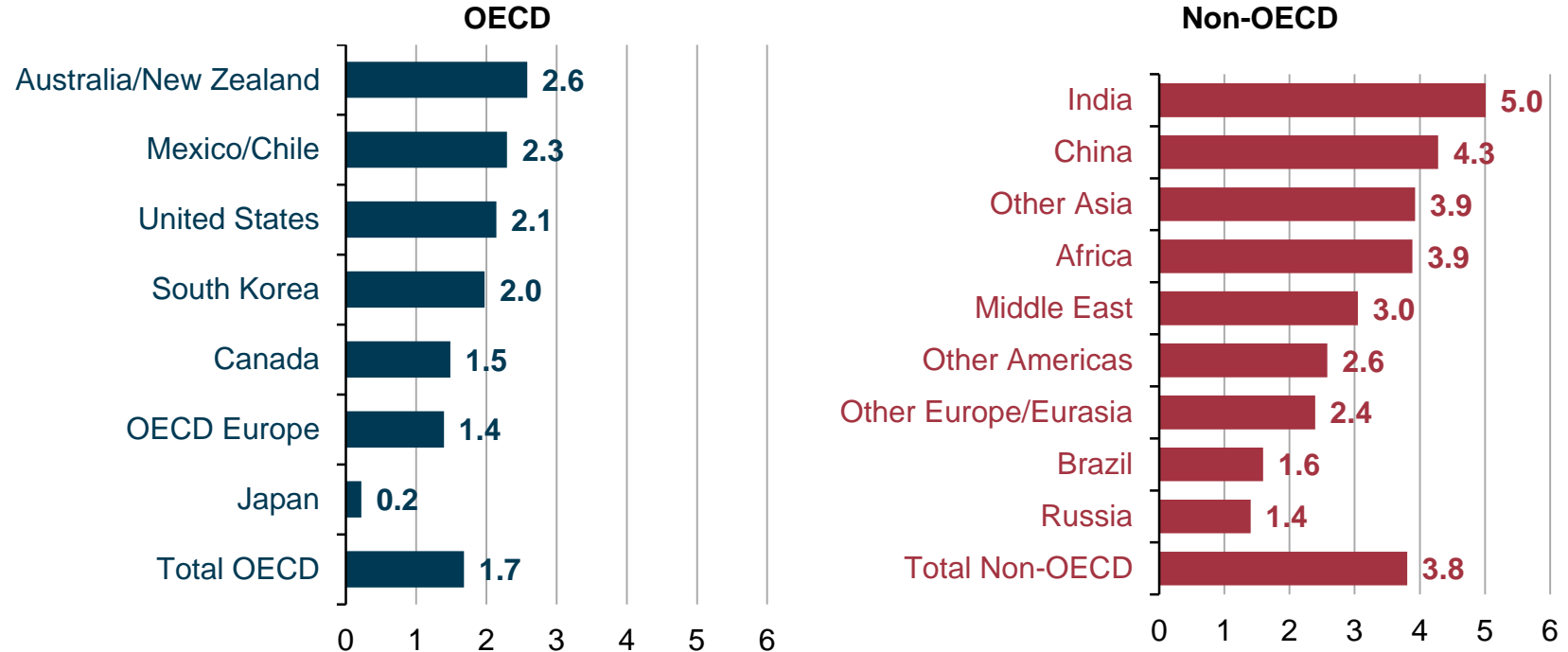


Source: EIA, International Energy Outlook 2017



# Economic growth—a major driver of energy demand—is greater on average in non-OECD countries

Average annual percent change in real GDP by region, 2015-40

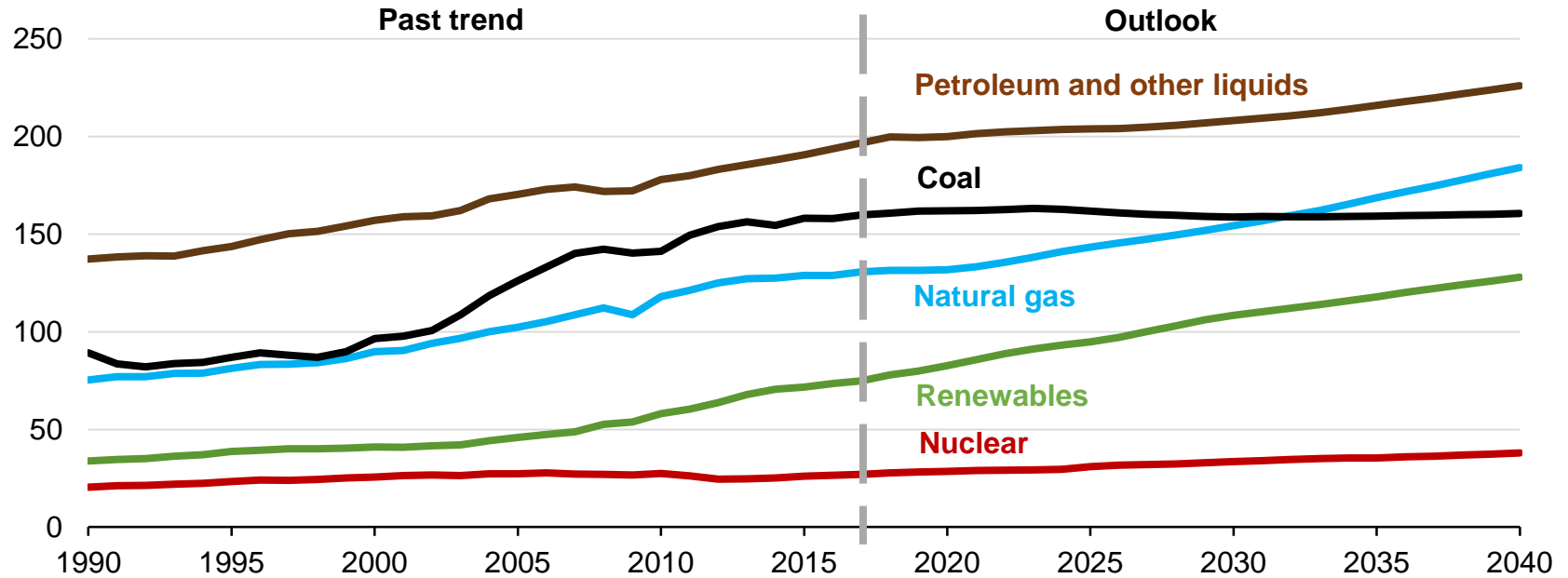


Source: EIA and Oxford Economic Model (March 2017)

# Energy consumption increases over the projection for all fuels other than coal in the Reference case with renewables being the fastest-growing energy source

## World energy consumption by energy source

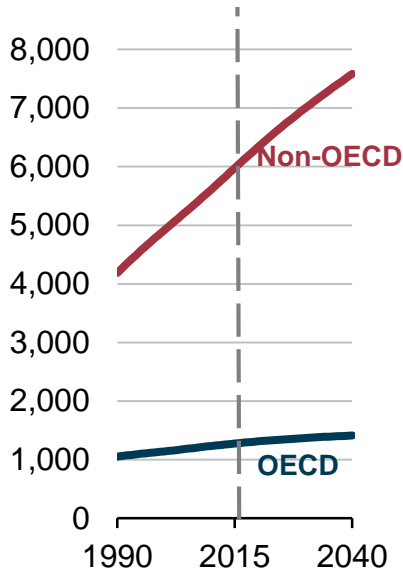
quadrillion Btu



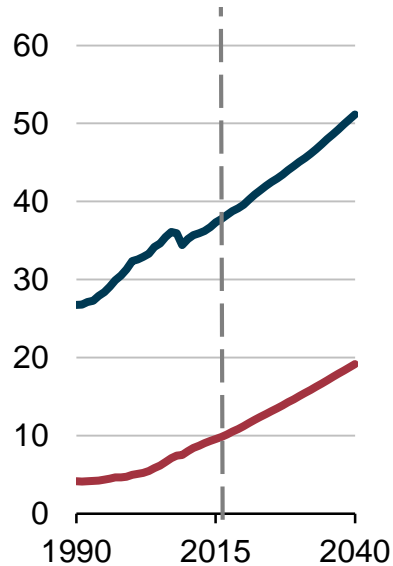
Source: EIA, International Energy Outlook 2017

# Although population and per capita output continue to rise, energy and carbon intensity are projected to continue to fall in the Reference case

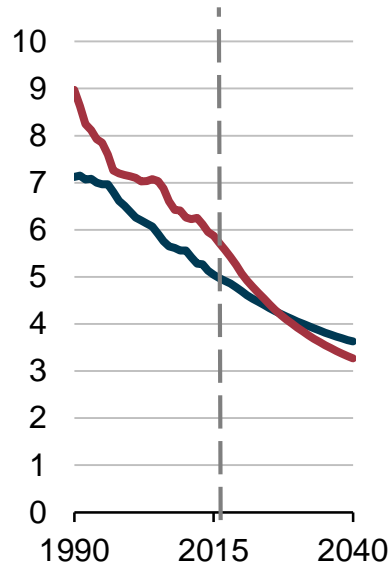
**Population**  
million people



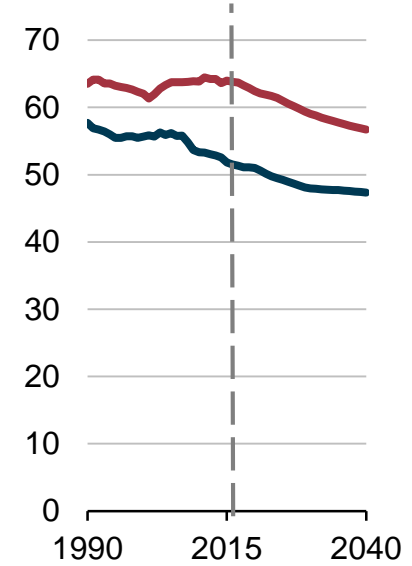
**Per capita gross domestic product**  
thousand dollars



**Energy intensity**  
thousand Btu per dollar

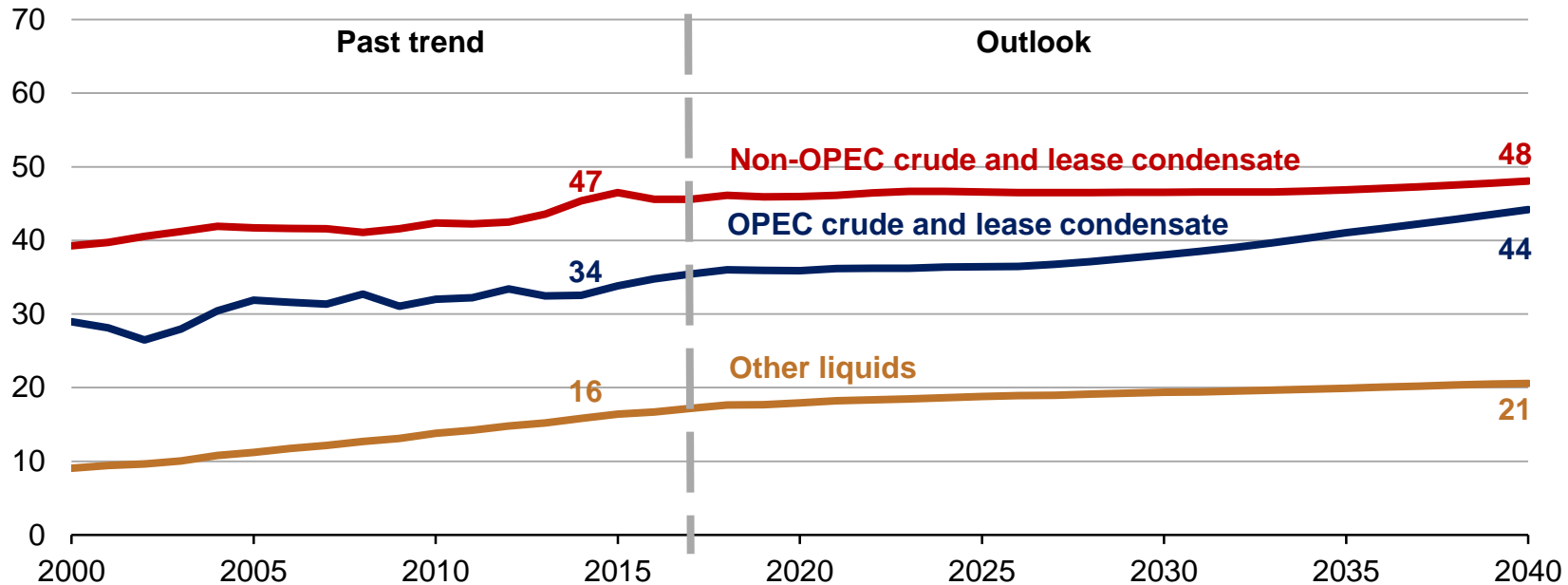


**Carbon intensity**  
metric tons CO2 per billion Btu



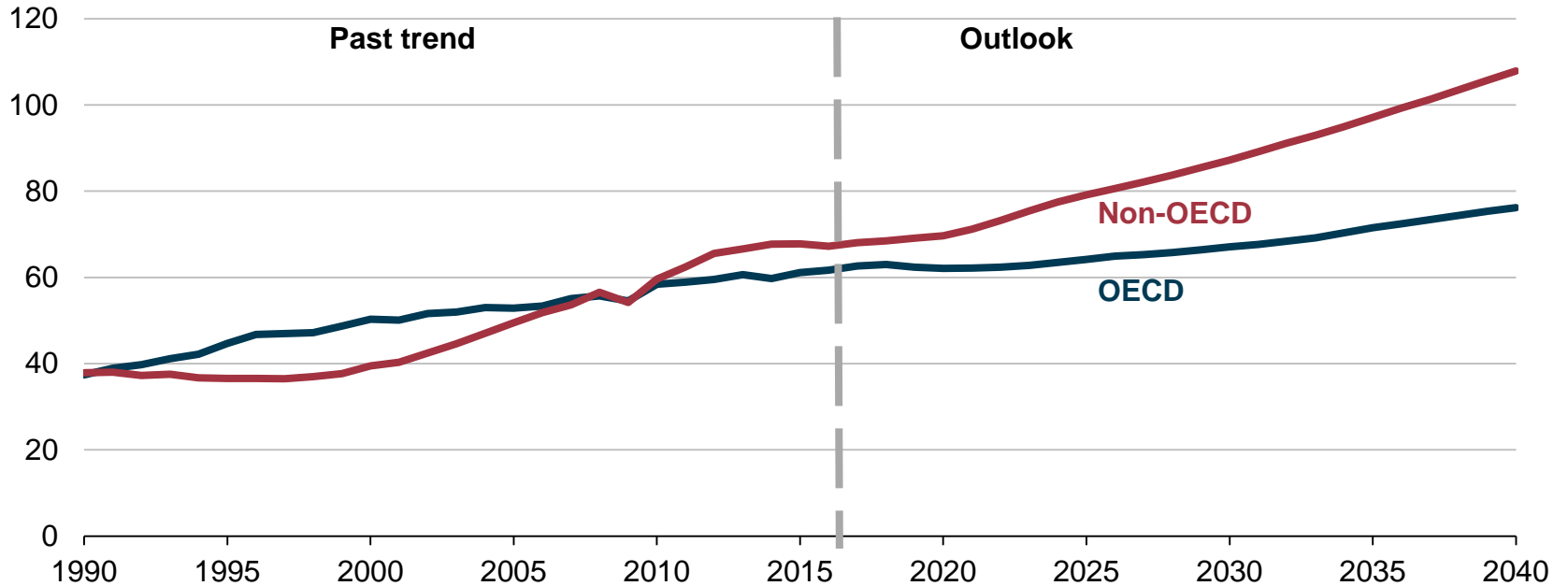
Source: EIA, International Energy Outlook 2017

# Liquid fuel supplies increase from 2015 to 2040 with most of the growth occurring in OPEC crude oil and lease condensate



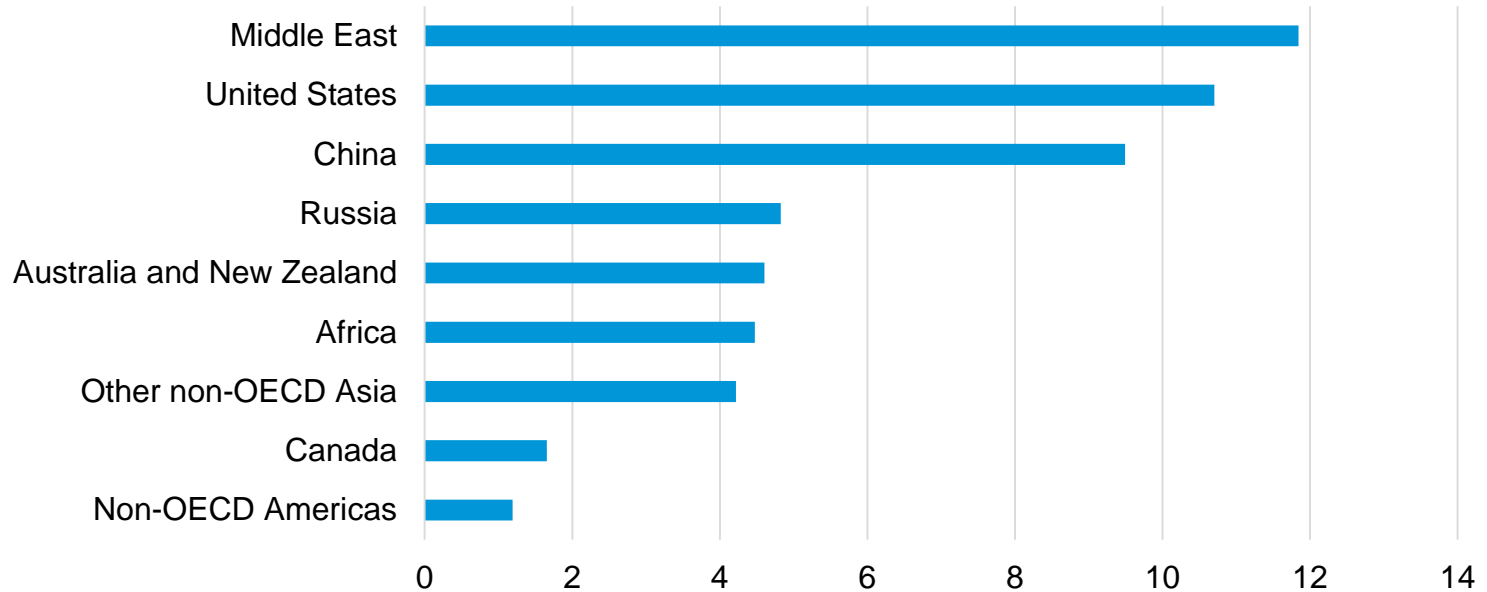
Source: EIA, International Energy Outlook 2017

# World natural gas consumption increases by 43% from 2015 to 2040 in the Reference case largely due to demand growth



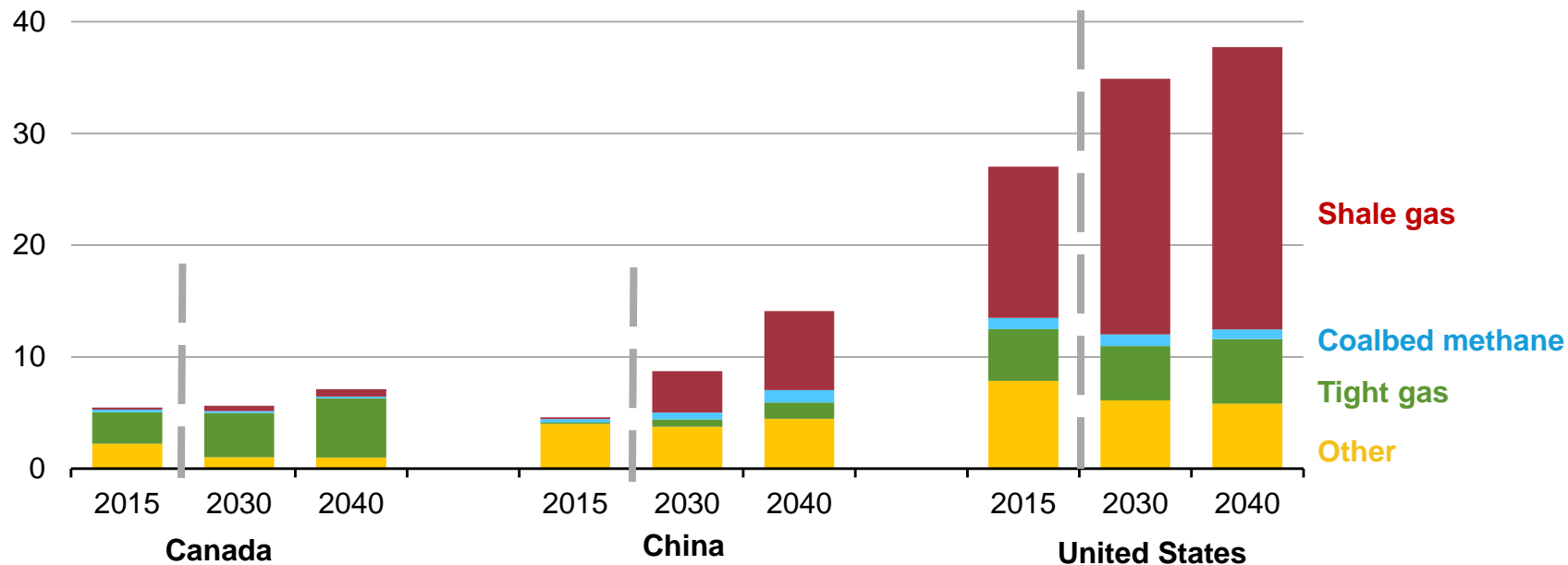
Source: EIA, *International Energy Outlook 2017*

# Middle East, the United States, and China account for more than 60% of the world increase in natural gas production



Source: EIA, *International Energy Outlook 2017*

# Shale gas and tight gas become increasingly important to gas supplies, not only for the United States, but also for China and Canada



Source: EIA, *International Energy Outlook 2017*

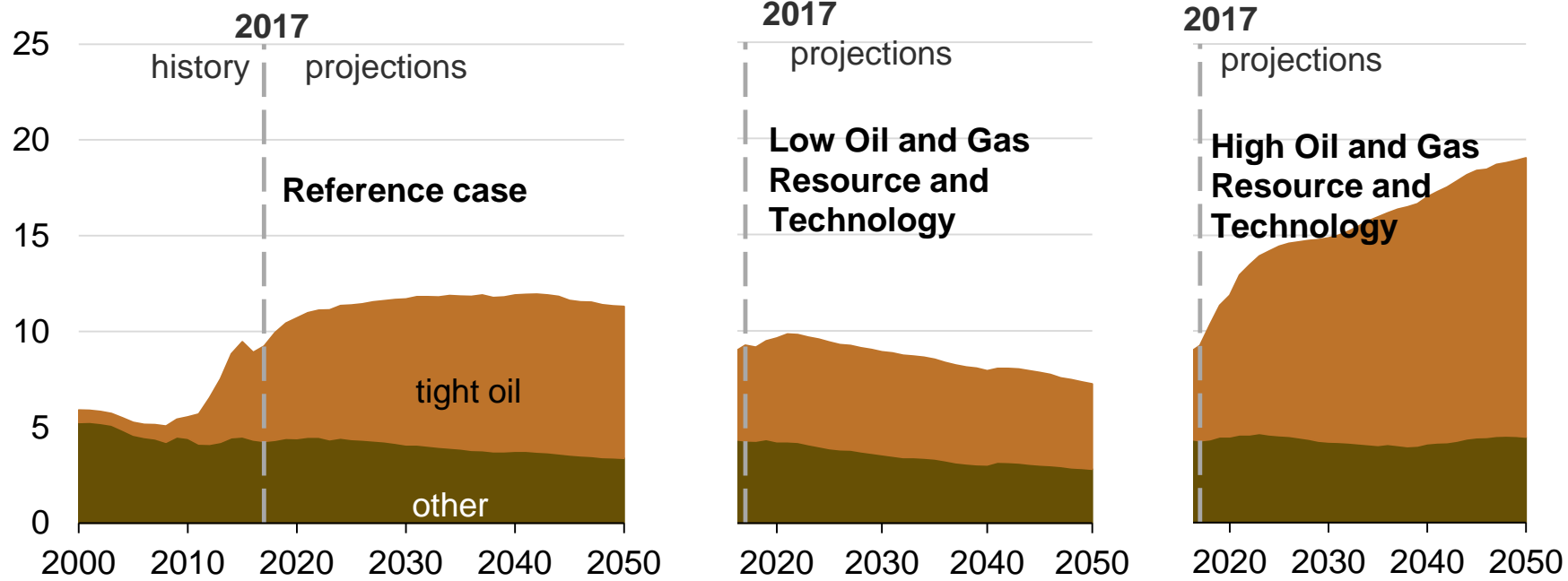
# Domestic Overview



# Tight oil production remains the leading source of U.S. crude oil production from 2017 – 2050

## Crude oil production

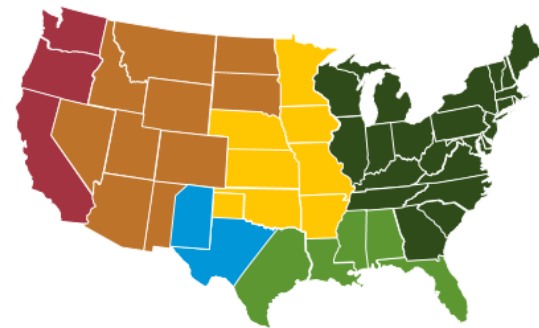
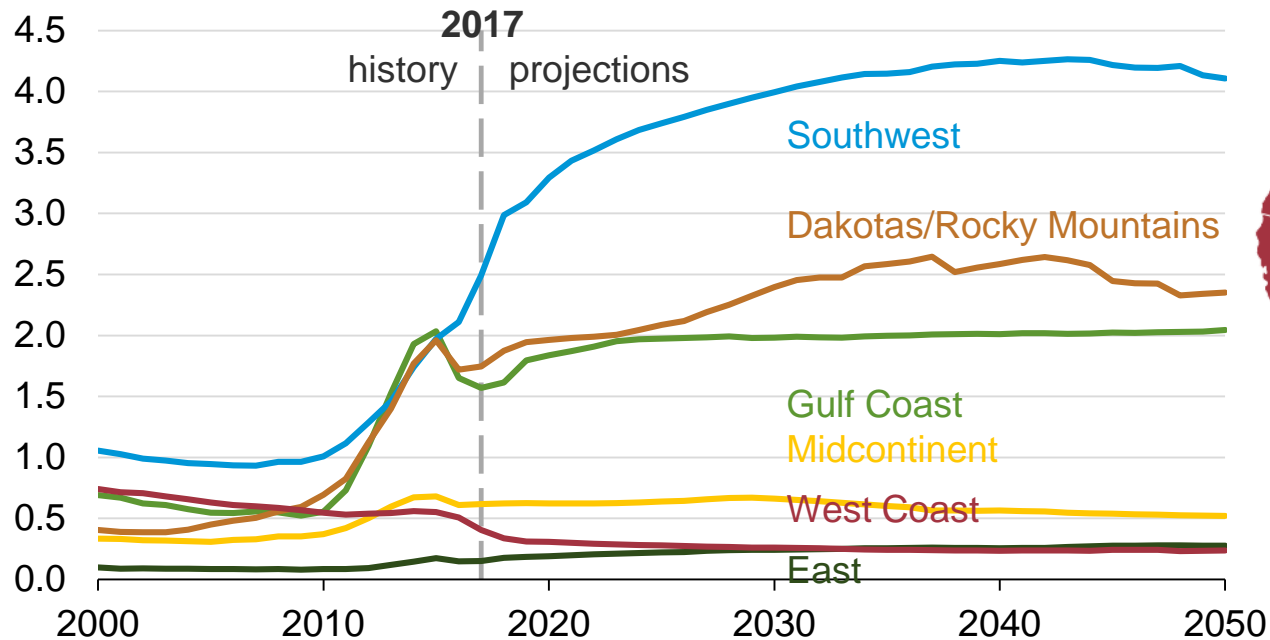
million barrels per day



# The Southwest region leads growth in tight oil production in the Reference case

## Lower 48 onshore crude oil production by region (Reference case)

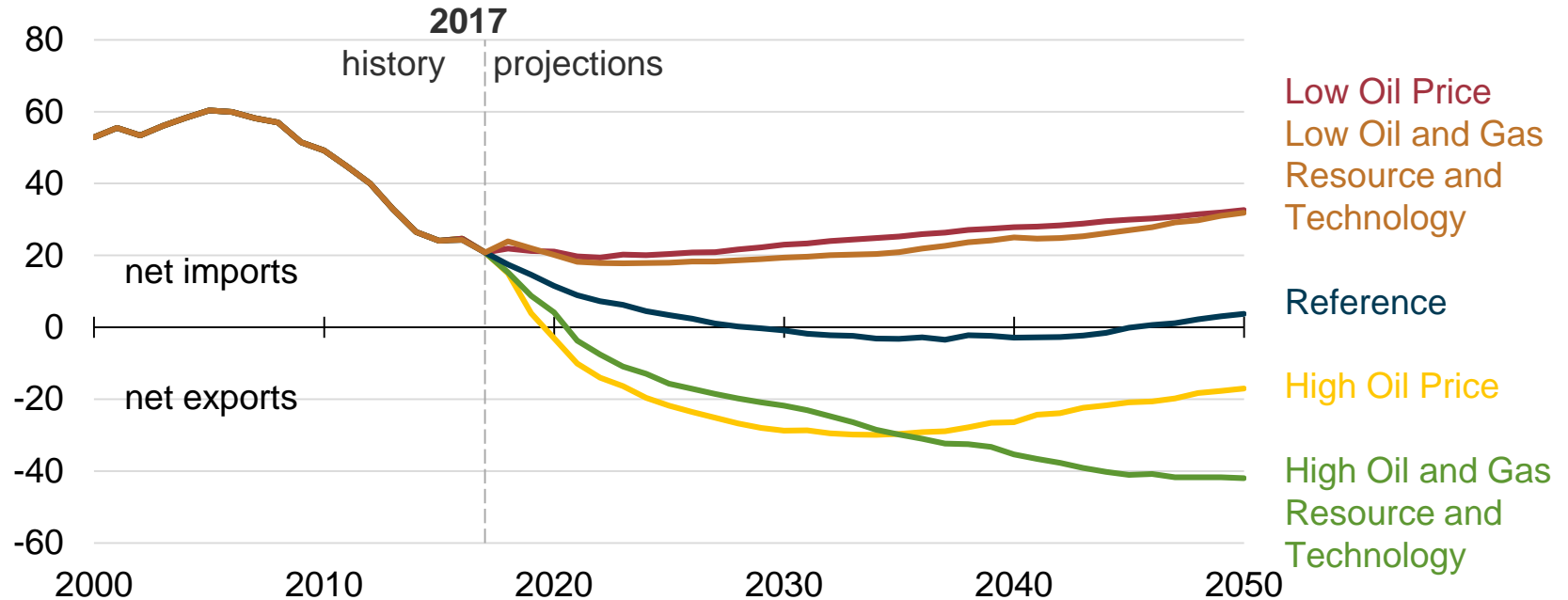
million barrels per day



# In the Reference case, the United States becomes a small net exporter of petroleum on a volume basis from 2029 to 2045

Petroleum net imports as a percentage of product supplied

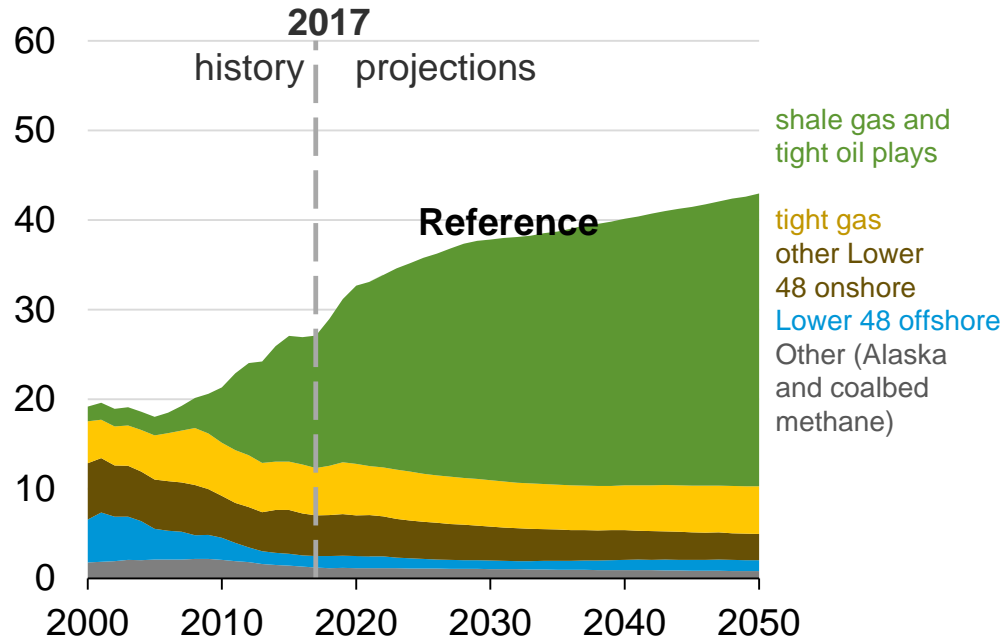
percent



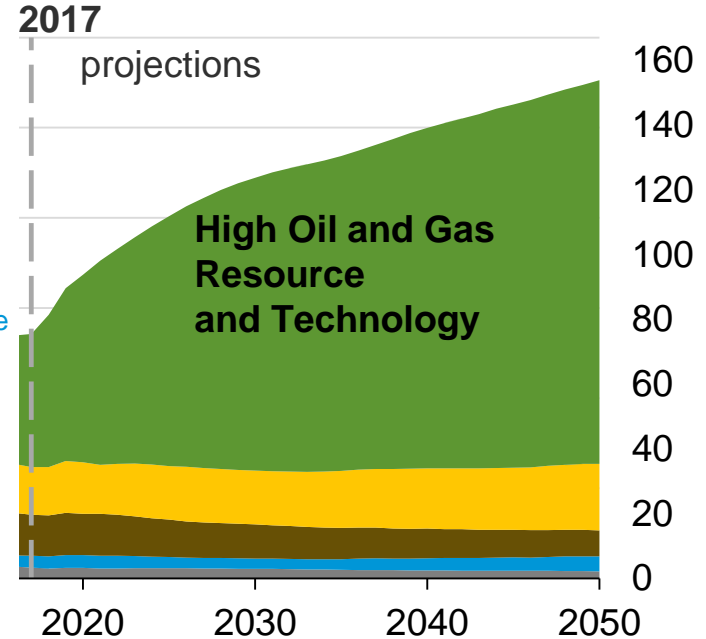
# Increased U.S. natural gas production is the result of continued development of shale gas and tight oil plays

## Natural gas production by type

trillion cubic feet



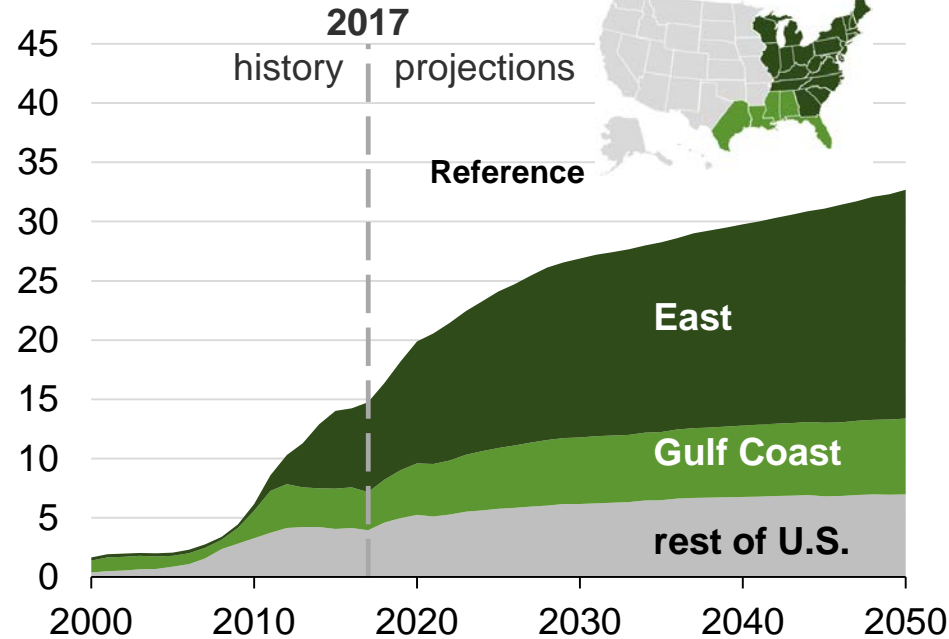
billion cubic feet per day



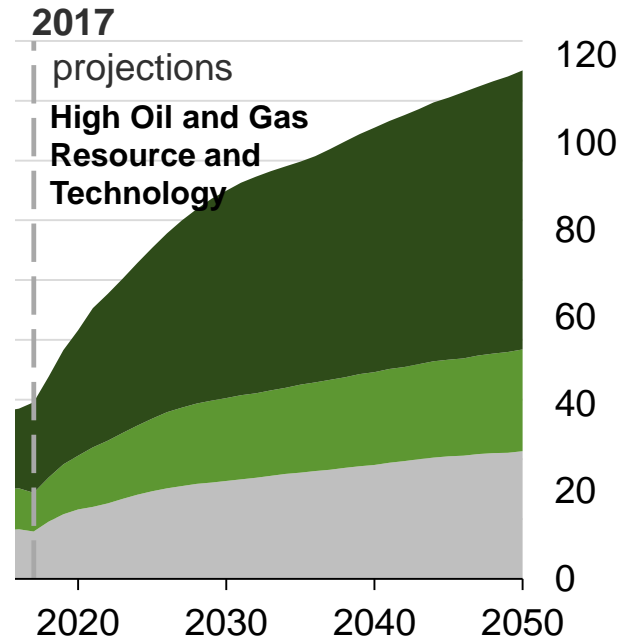
# Plays in the East lead production of U.S. natural gas from shale resources in the Reference case

## Shale gas production by region

trillion cubic feet



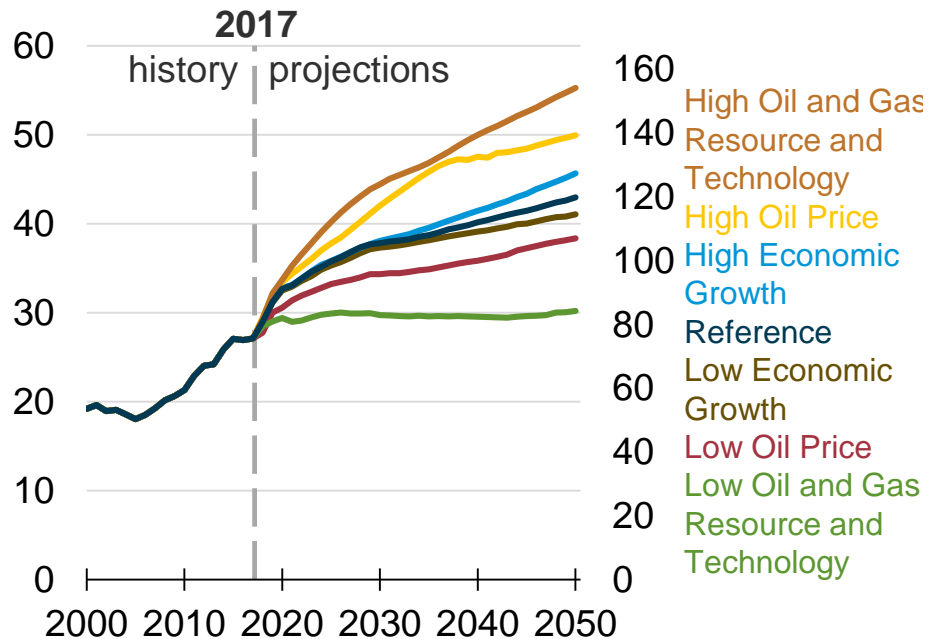
billion cubic feet per day



# U.S. natural gas consumption and production increase in most cases with production growth outpacing natural gas consumption in all cases

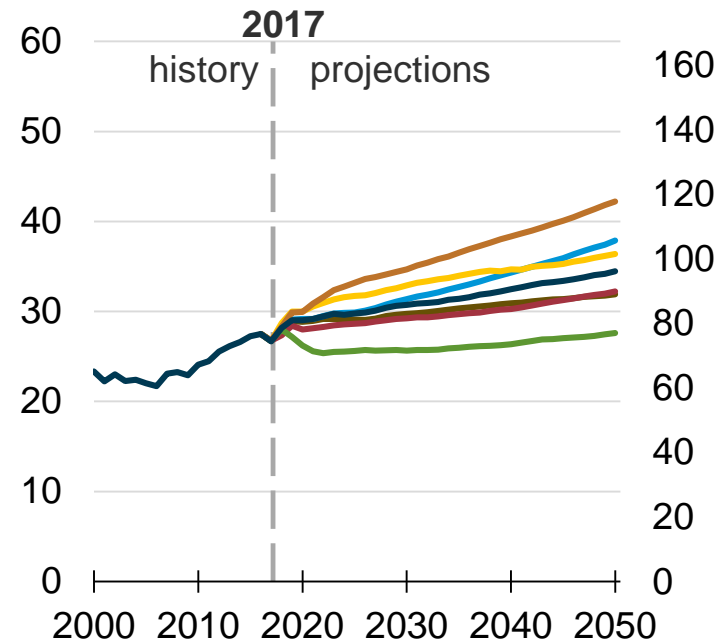
## Natural gas production

trillion cubic feet      billion cubic feet per day



## Natural gas consumption

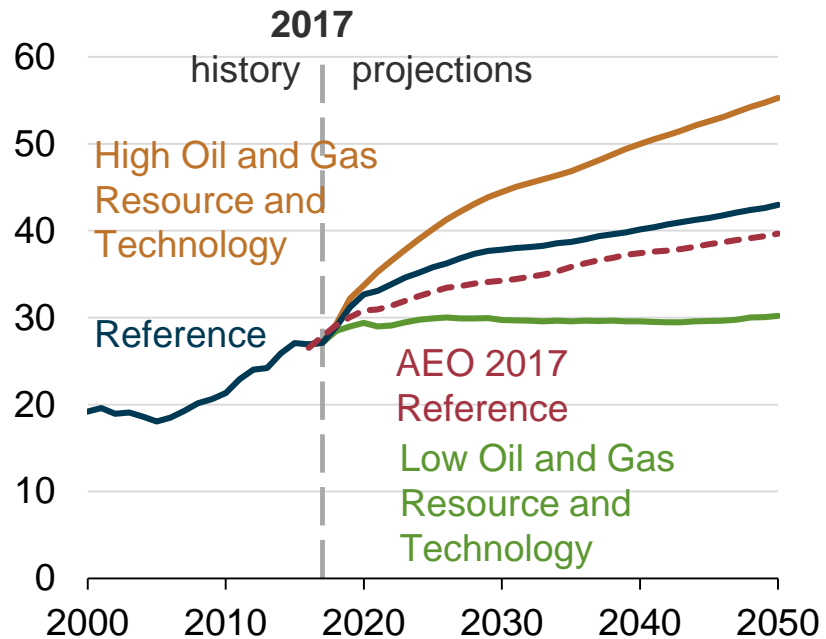
trillion cubic feet      billion cubic feet per day



# Natural gas prices across cases are dependent on resource and technology assumptions

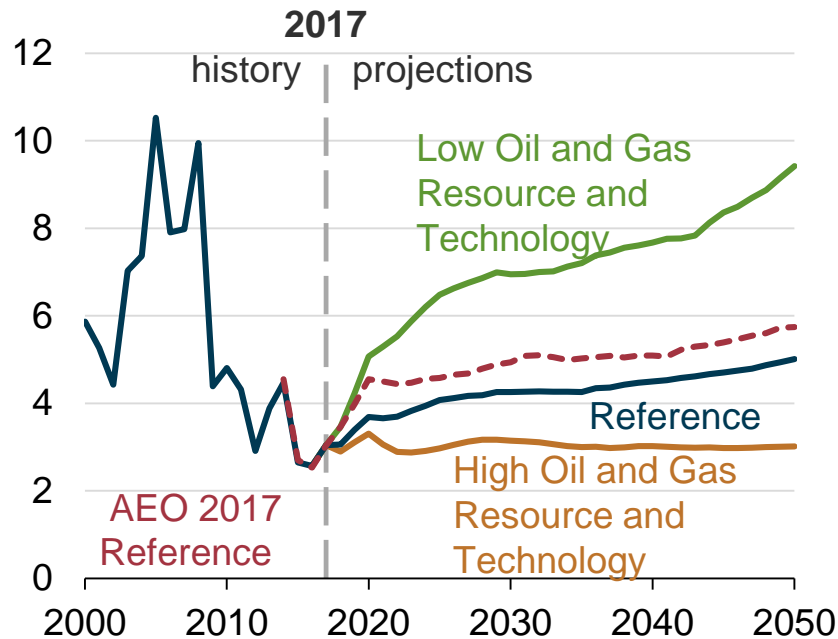
## Dry natural gas production

trillion cubic feet



## Natural gas spot price at Henry Hub

2016 dollars per million British thermal units

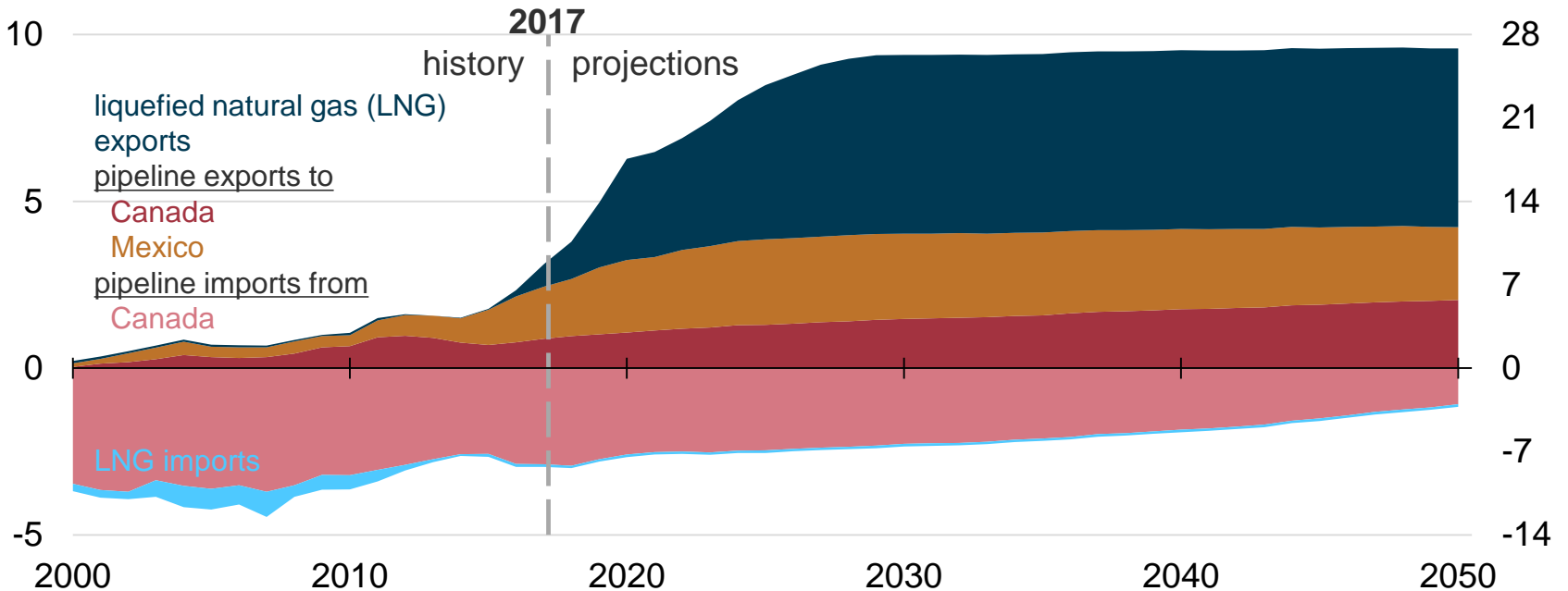


# The United States is a net natural gas exporter in the Reference case because of continued export growth and import decline

## Natural gas trade

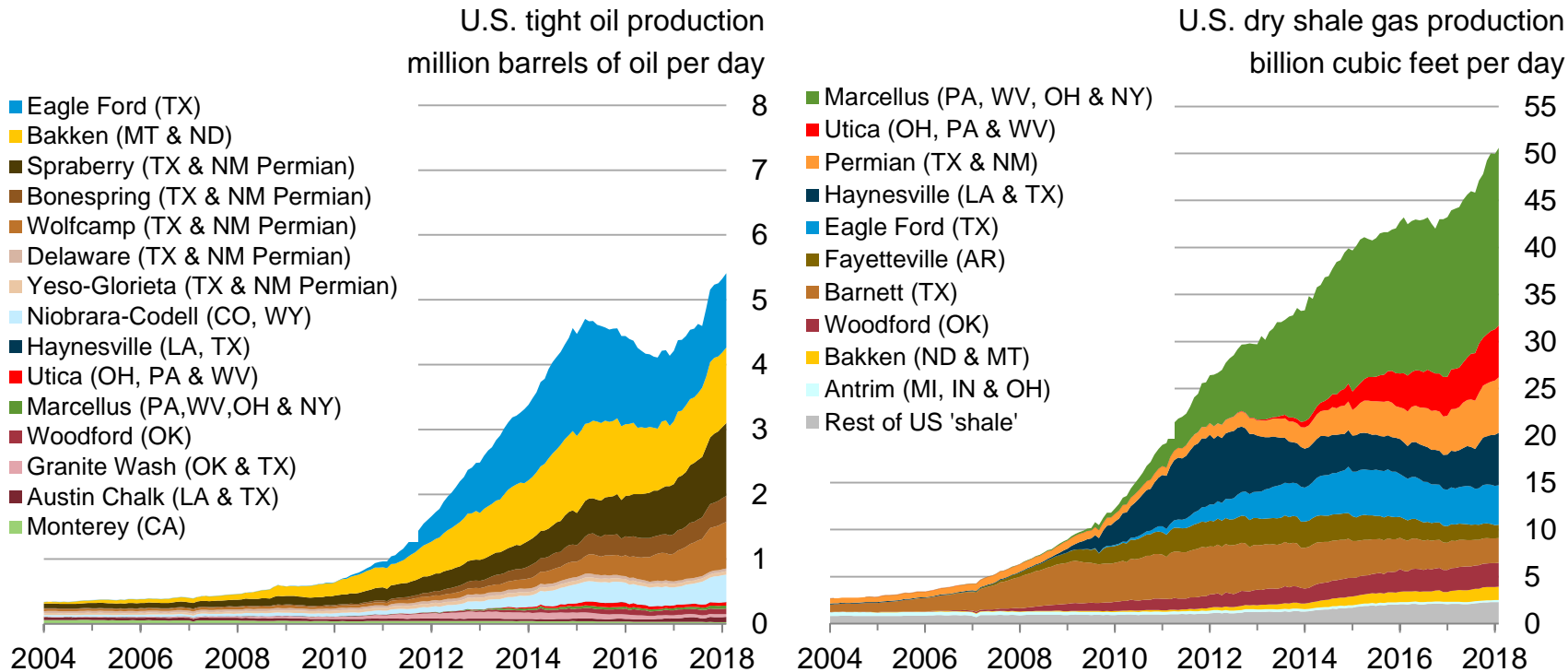
trillion cubic feet

billion cubic feet per day





# 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 2018 and represent EIA's official tight oil & shale gas estimates, but are not survey data. State abbreviations indicate primary state(s). Note: Scales are presented at approximate barrel of oil equivalent.

## EIA Products and 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)

State Energy Portal | [www.eia.gov/state](http://www.eia.gov/state)