Annual Energy Outlook 2018

Columbia University, Center on Global Energy Policy
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U.S. Energy Information Administration

AEO2018 Reference case highlights

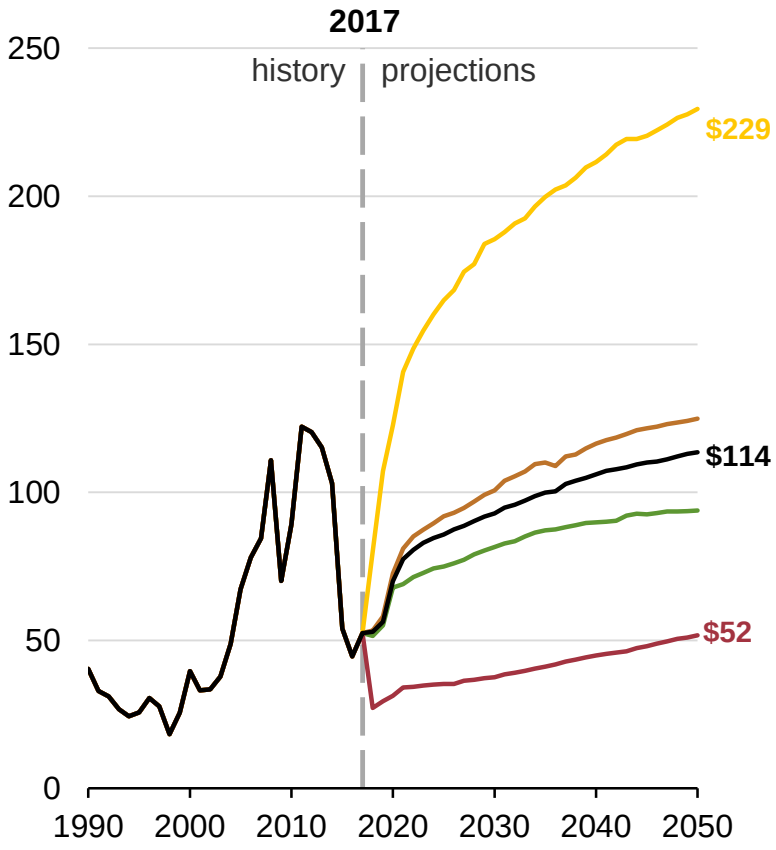
- U.S. net energy exports occur over the projection period to 2050 in most cases
  - U.S. becomes a net energy exporter by 2022
  - Strong domestic production and relatively flat demand
- Increased energy efficiency offsets growth in energy demand
  - Gross Domestic Product is expected to grow 2.0%/year to 2050
  - Population is expected to grow by about 0.6%/year on average
  - But…energy consumption grows only about 0.4%/year on average
- U.S. liquids and natural gas production continues to grow through 2042 and 2050, respectively
  - Result of further tight and shale resources development, despite relatively low prices
- Renewables are the fastest growing source of energy
- Most new electricity generation capacity will be natural gas/renewables after 2022
  - Result of low natural gas prices, declining renewables technology costs and supportive policies

AEO2018 cases examine a range of conditions through 2050

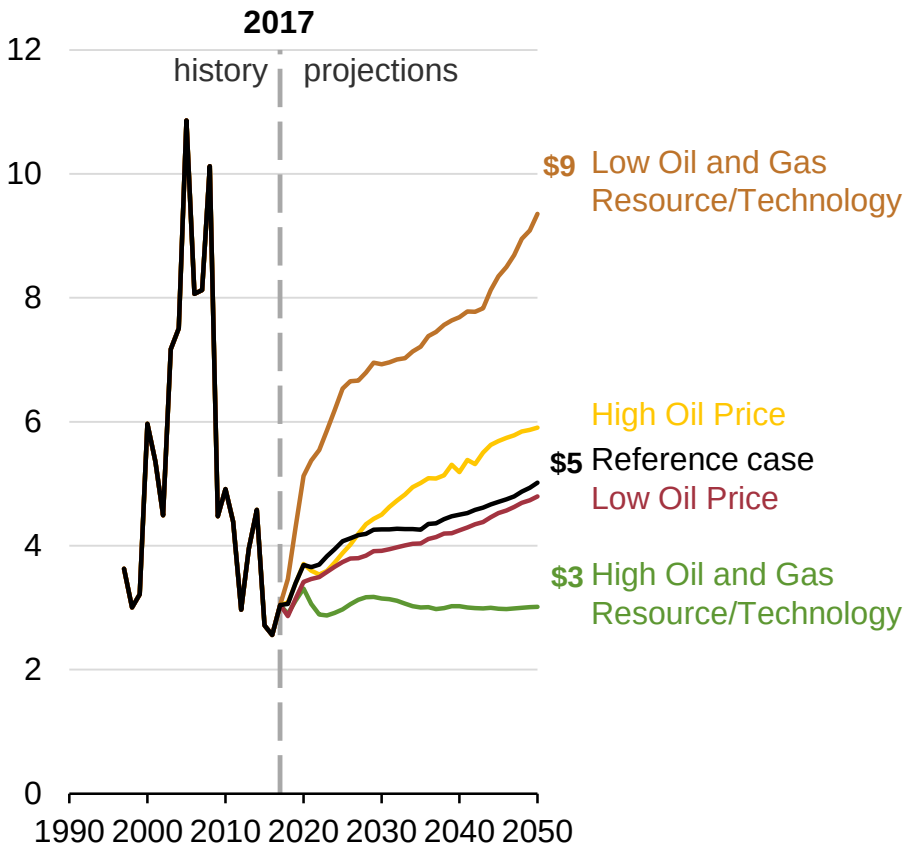
- **Reference case**:
  - Current laws and regulations remain unchanged
  - Current views in economic and demographic trend
  - Considers improvements in known technologies
- **High and Low Economic Growth cases**:
  - High case assumes compound annual growth rates for U.S. gross domestic product of 2.6%
  - Reference case 2.0%
  - Low case assumes 1.5%
- **High and Low Oil and Gas Resource and Technology cases**:
  - High case - more accessible resources and lower extraction technology costs than in the Reference case
  - Low case - fewer accessible resources and higher extraction technology costs than the Reference case
- **High and Low Oil Price cases**: Brent crude prices by 2050 in 2017 dollars
  - $229 per barrel in the High Oil Price case
  - $114/b in the Reference case
  - $52/b in the Low Oil Price case

Crude oil prices depend more on global markets, while U.S. natural gas prices depend more on domestic market

North Sea Brent oil price
2017 dollars per barrel

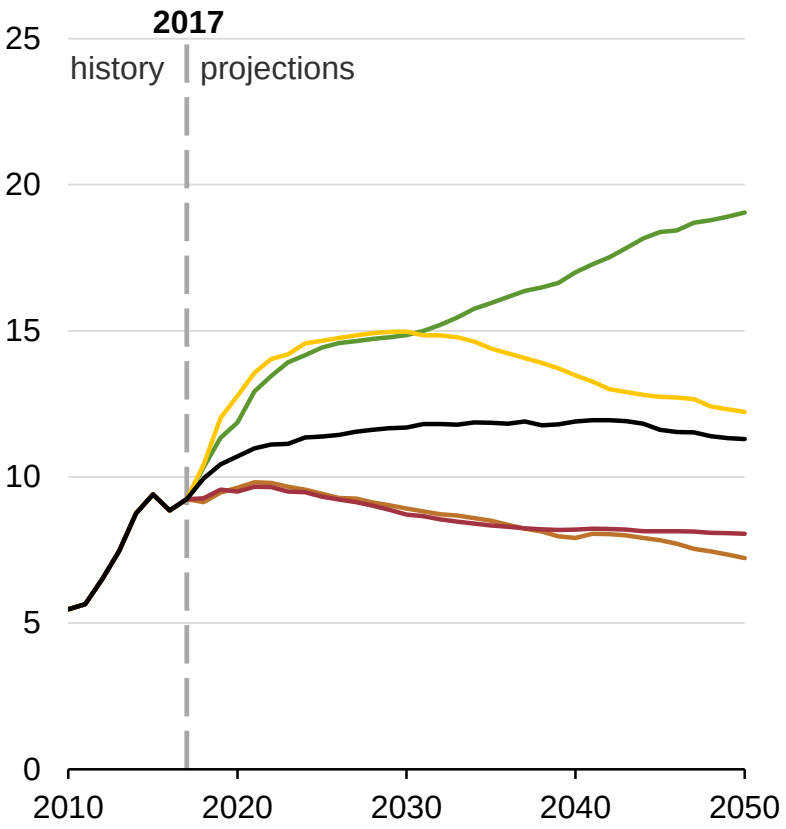


Henry Hub natural gas price
2017 dollars per million Btu

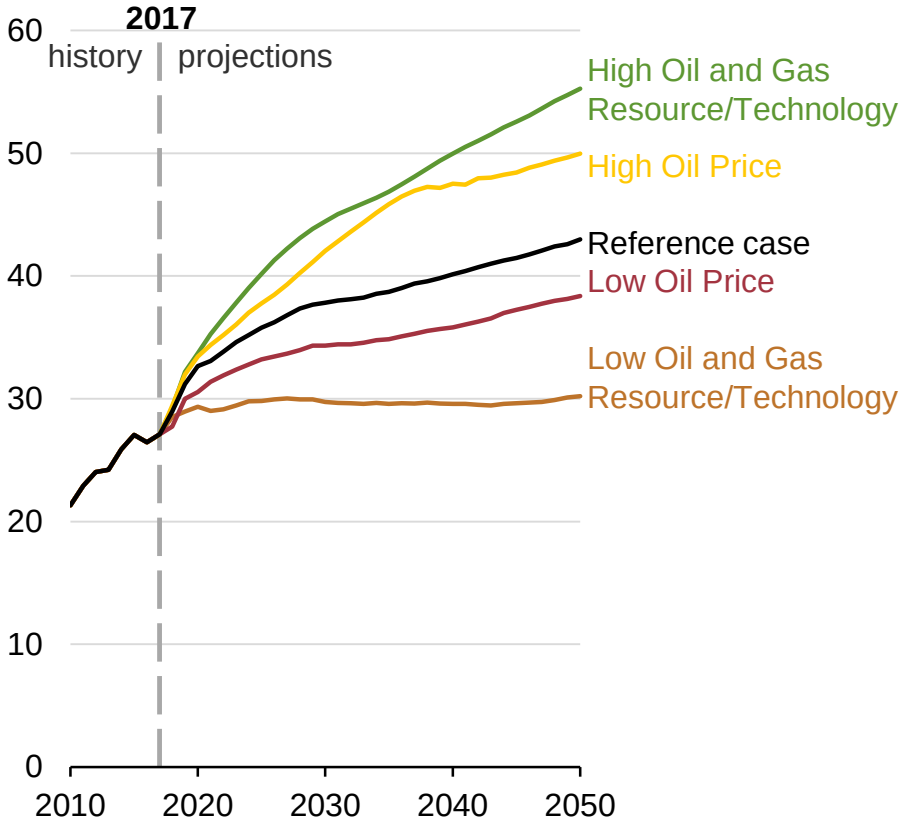


U.S. crude oil and natural gas production are more sensitive to resource availability and technological improvements

Crude oil production
million barrels per day

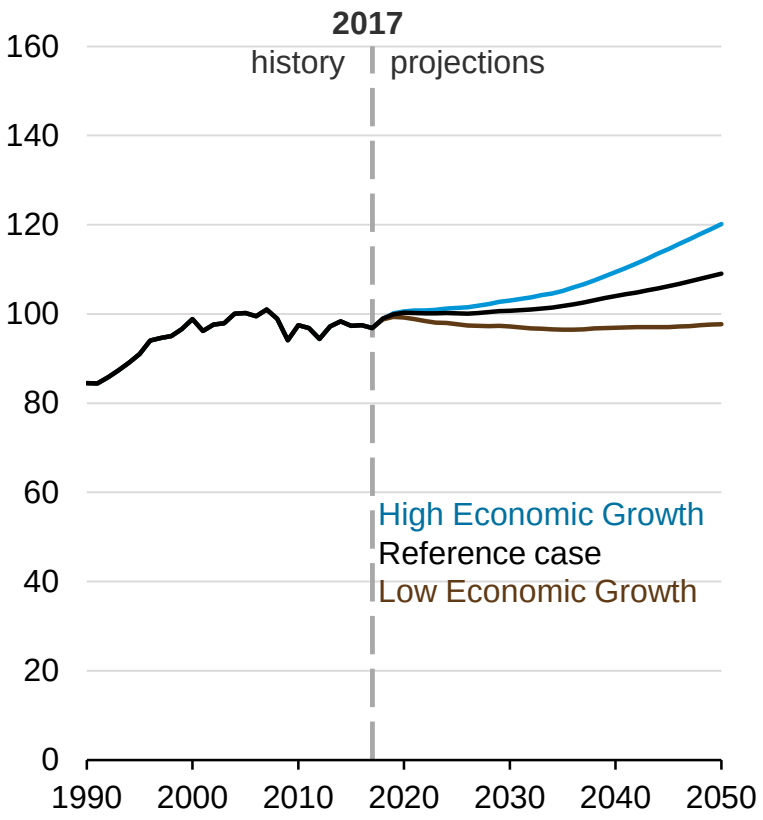


Dry natural gas production
trillion cubic feet



Growth in U.S. energy production surpasses domestic consumption in most cases

Total U.S. energy consumption
quadrillion British thermal units



Total U.S. energy production
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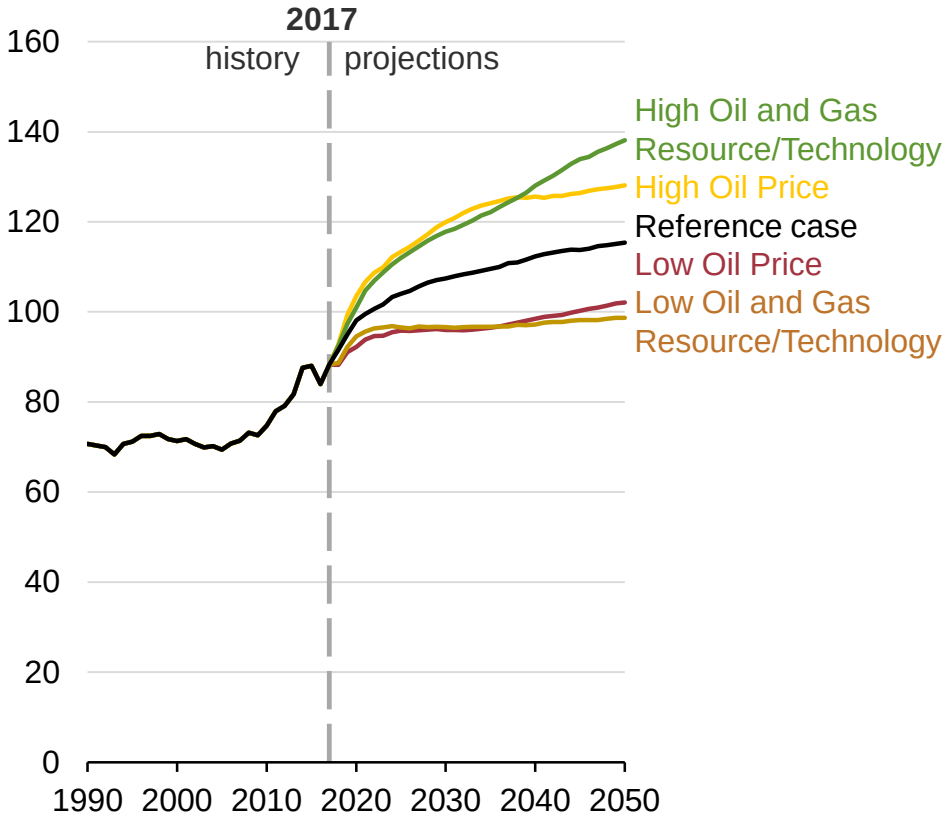
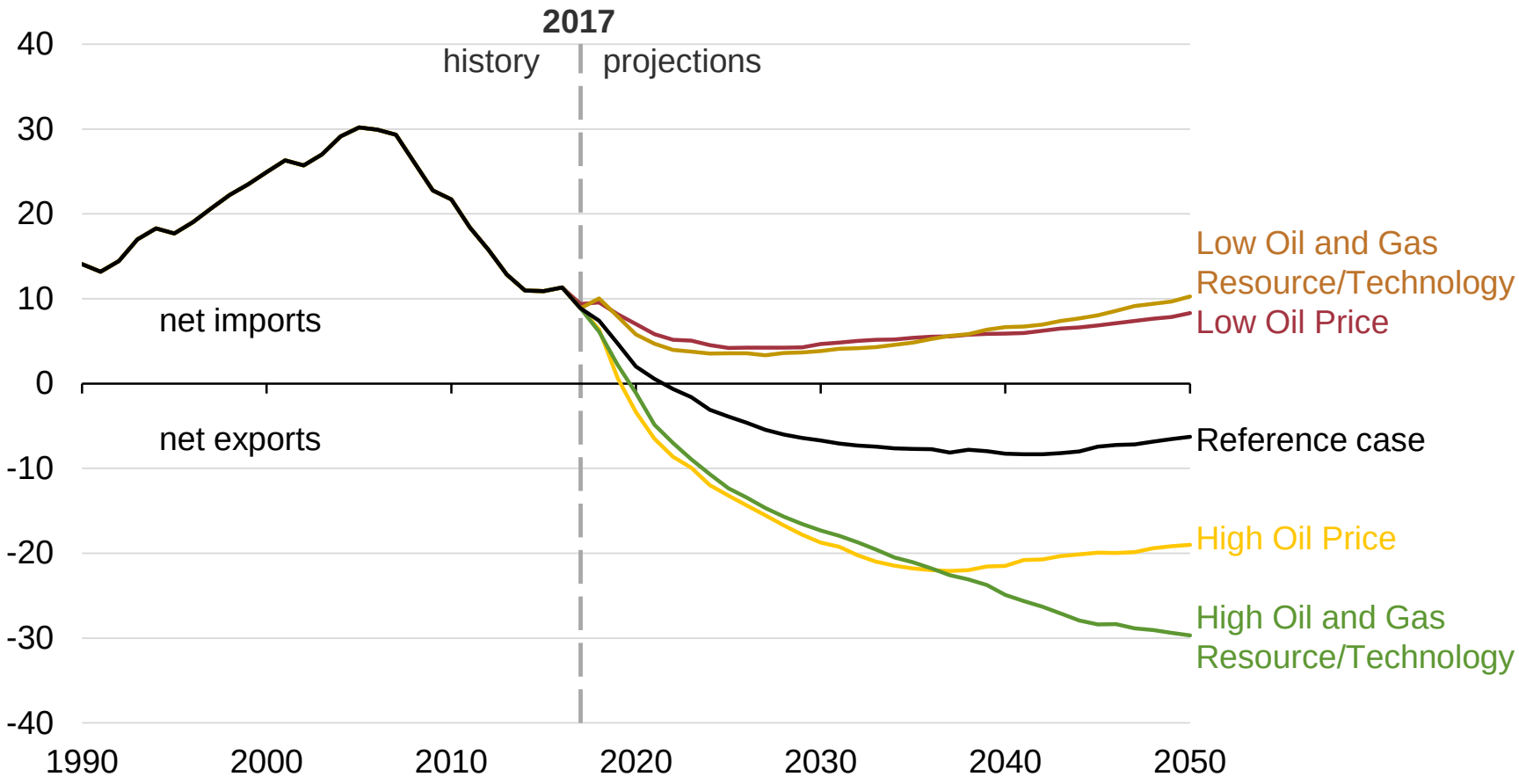


The United States becomes a net energy exporter in most cases

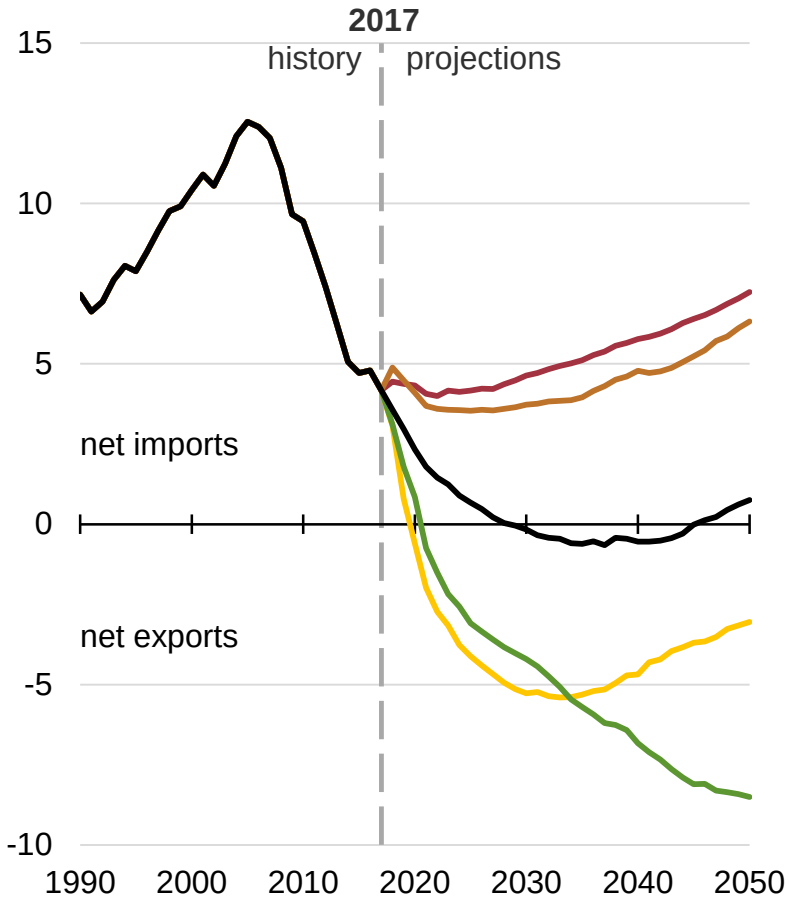
Net energy trade

quadrillion British thermal units

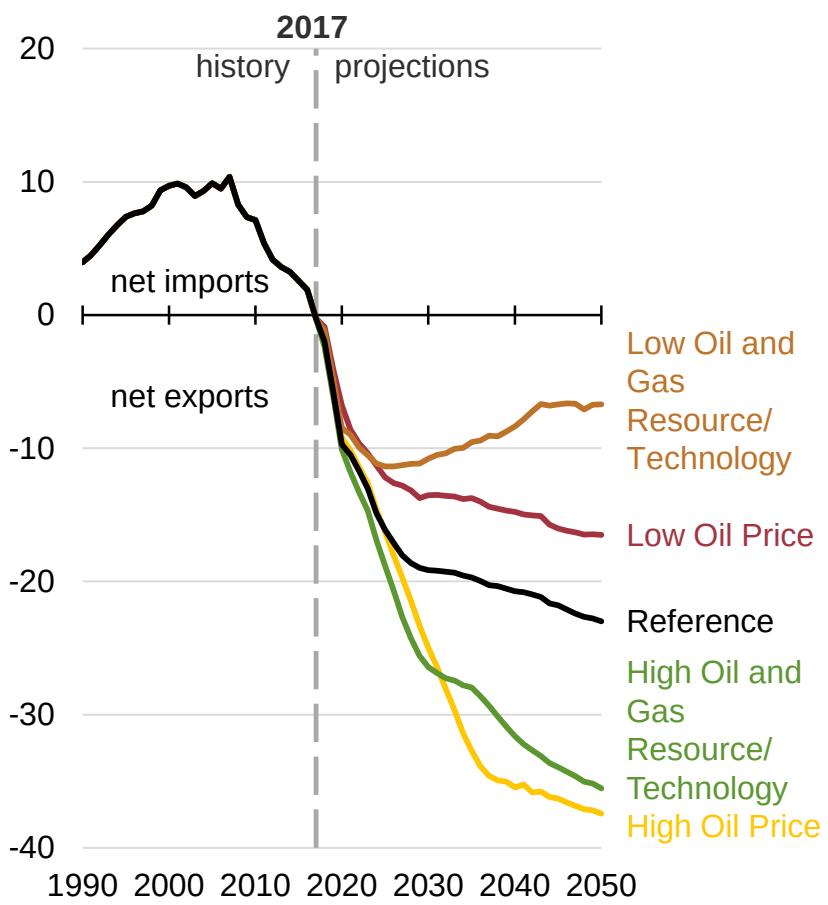


Levels of petroleum and natural gas exports are sensitive to side case assumptions

Petroleum net imports
million barrels per day



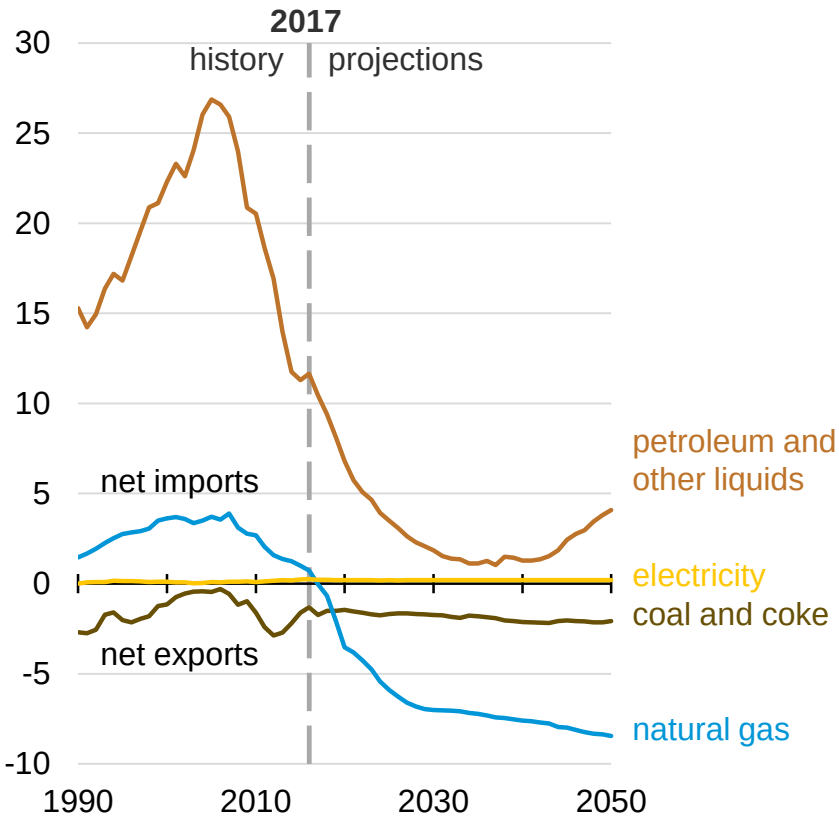
Natural gas net imports
billion cubic feet per day



The United States becomes a net energy exporter in the Reference case largely because of growing exports

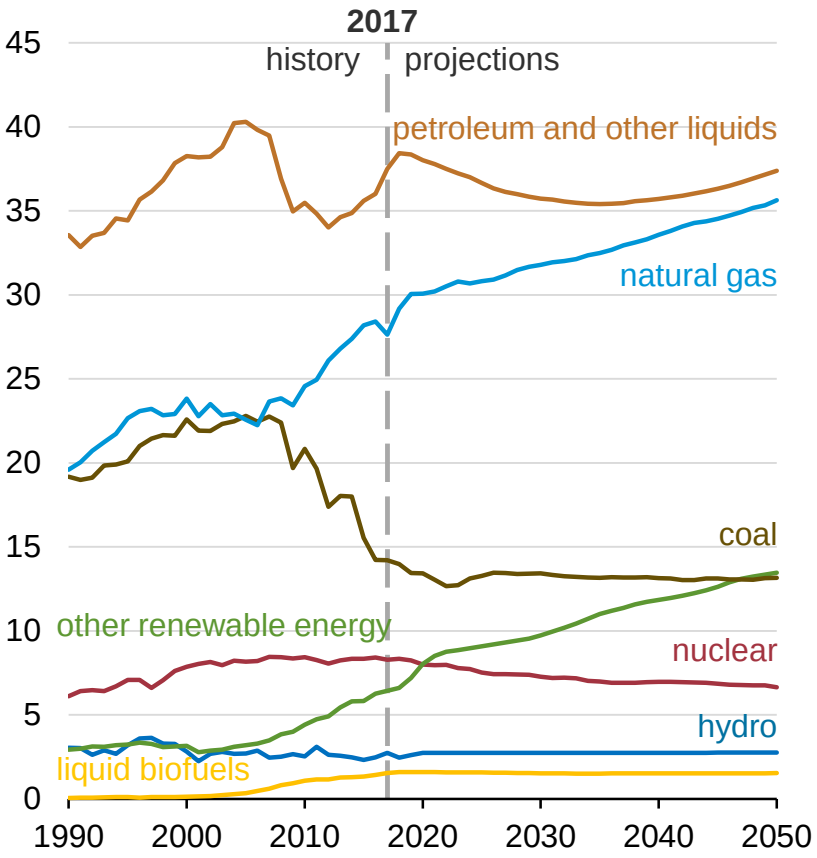
U.S. energy trade (Reference case)
quadrillion British thermal units

Net U.S. energy trade (Reference case)
quadrillion British thermal units

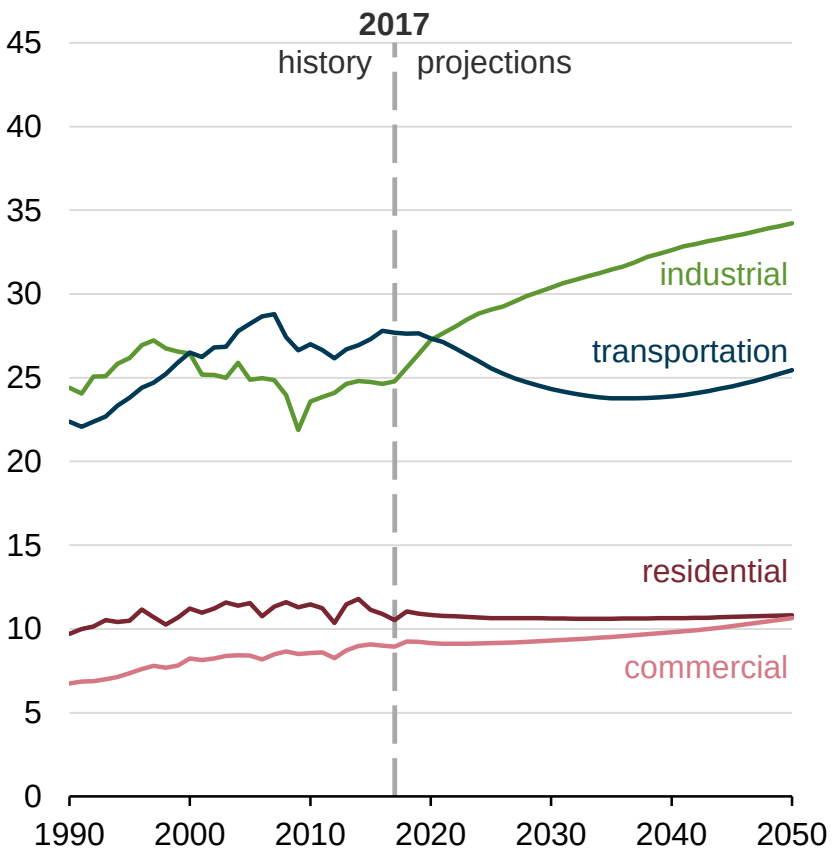


The fuel sector mix of energy consumption changes over the projected period in the Reference case

Energy Consumption by source (Reference case)
quadrillion British thermal units

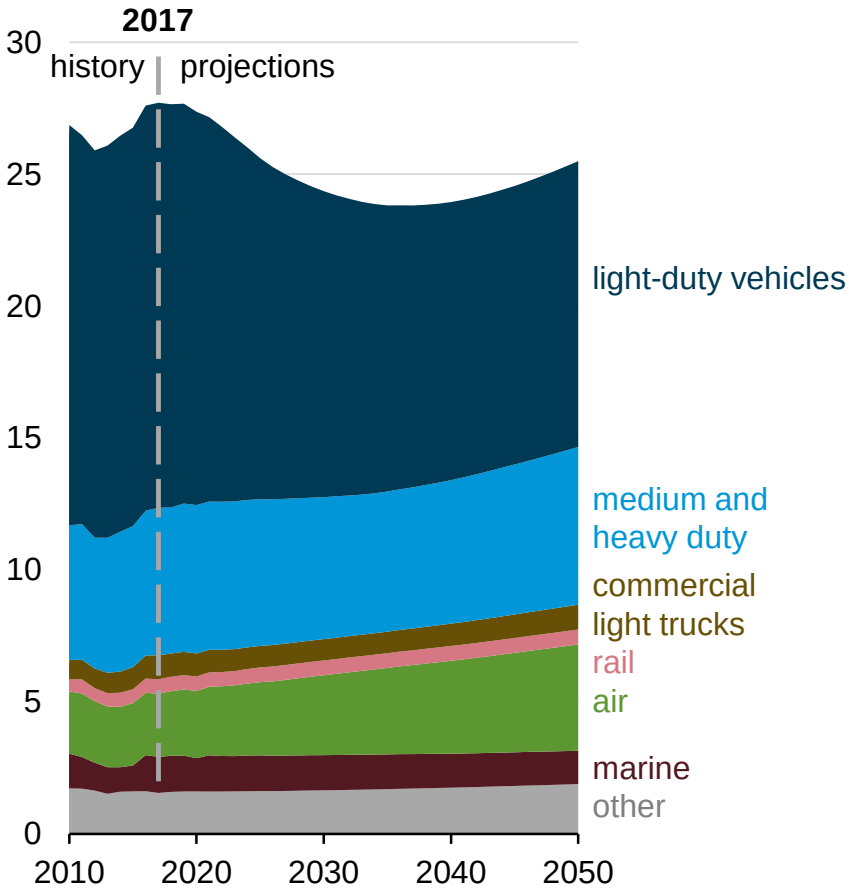


End Use Consumption by sector (Reference case)
quadrillion British thermal units

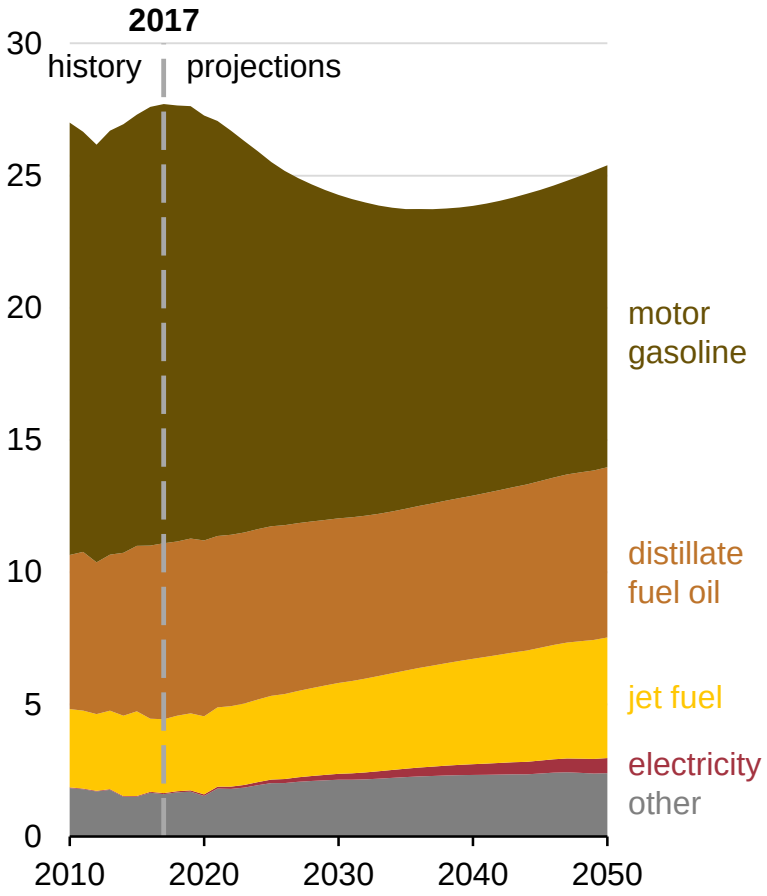


Transportation demonstrates the impact of energy efficiency on consumption

Energy consumption by travel mode – Reference case
quadrillion British thermal units



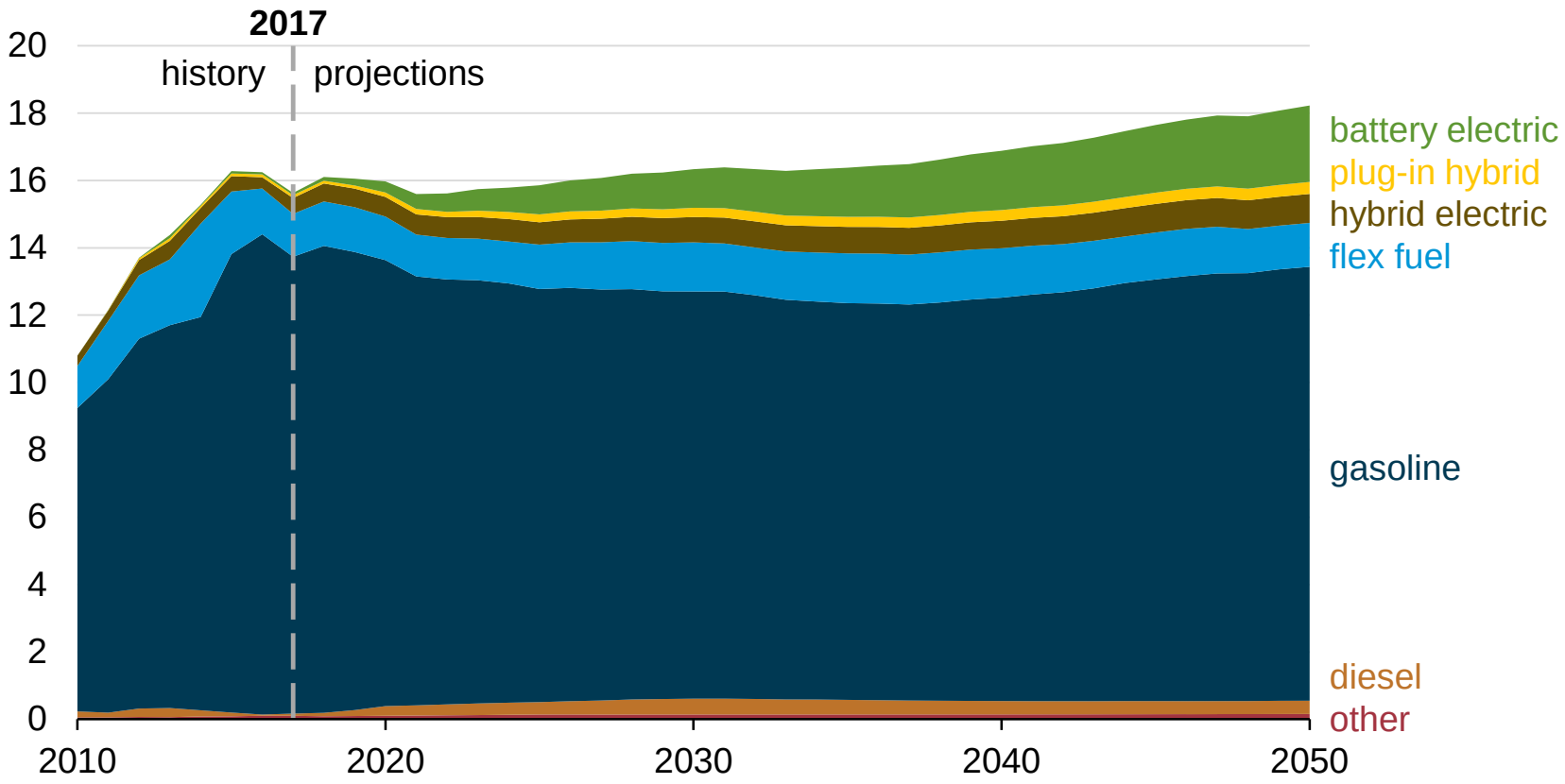
Transportation sector energy consumption by fuel type
quadrillion British thermal units



Light-duty vehicle fuel economy improves with increasing sales of more fuel-efficient cars, while electrified powertrains gain market share in the Reference case

Light-duty vehicle sales by fuel type

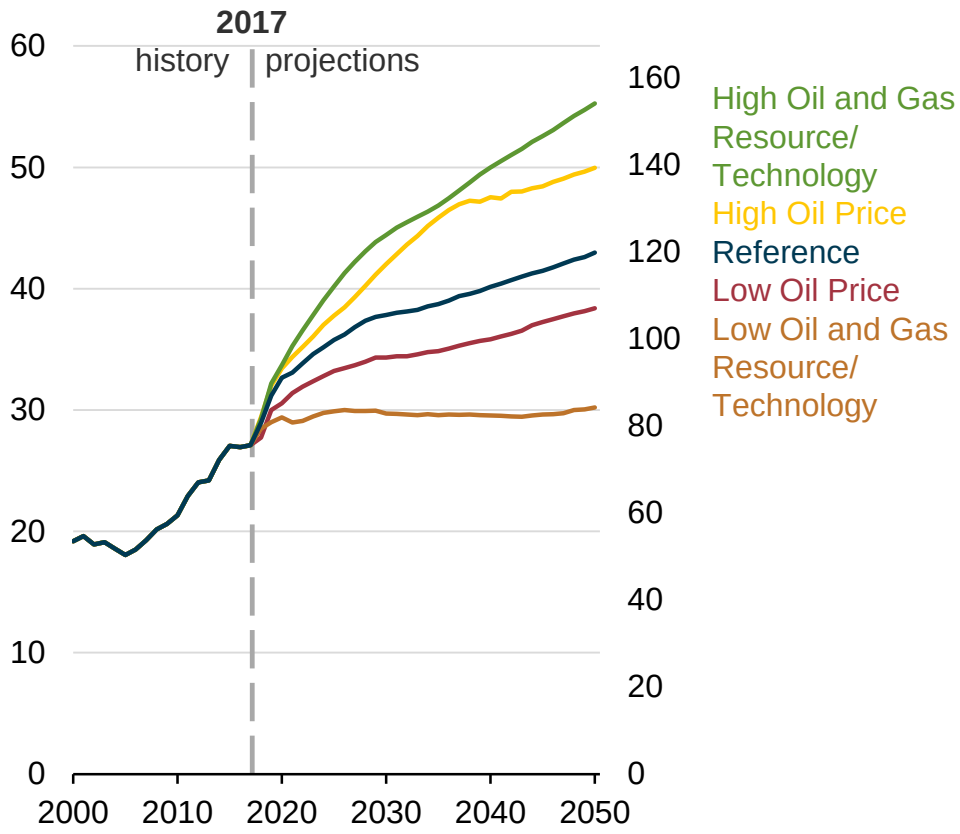
sales (millions)



U.S. natural gas production and consumption continue to increase in most cases

U.S. natural gas production

trillion cubic feet per year billion cubic feet per day



U.S. natural gas consumption

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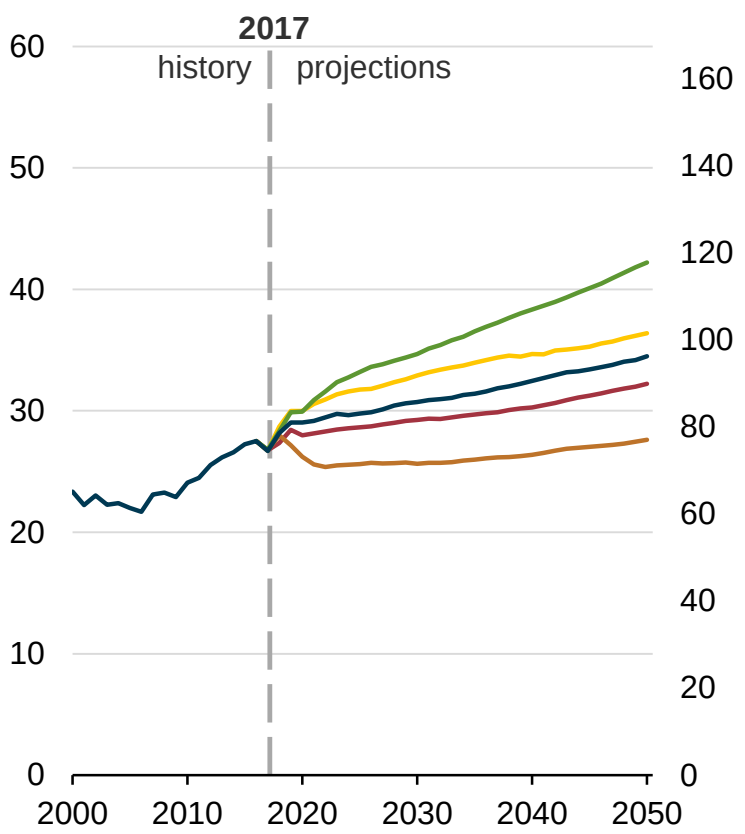
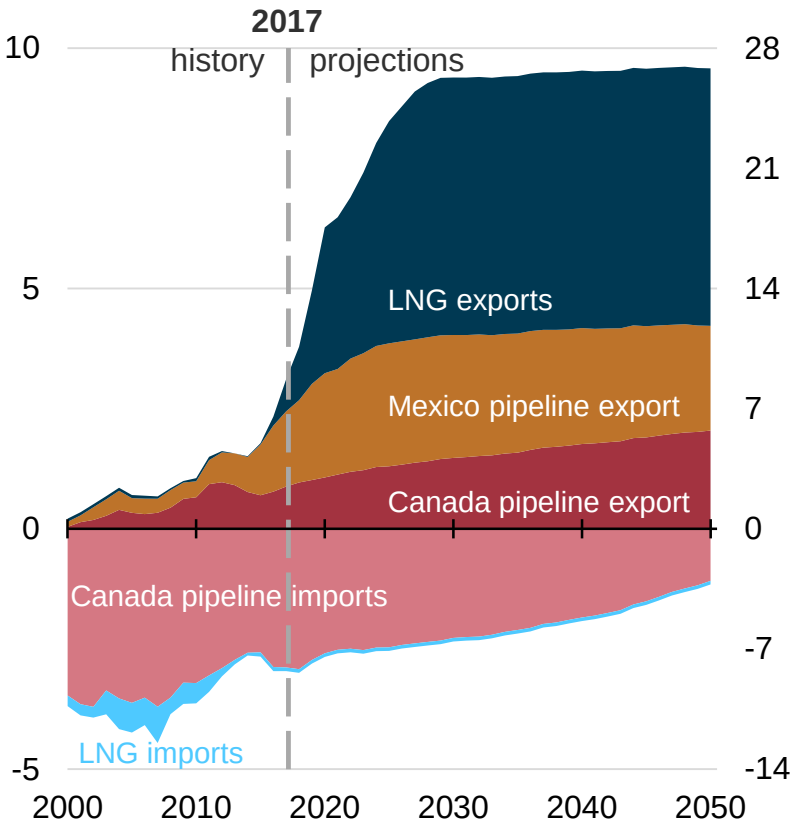
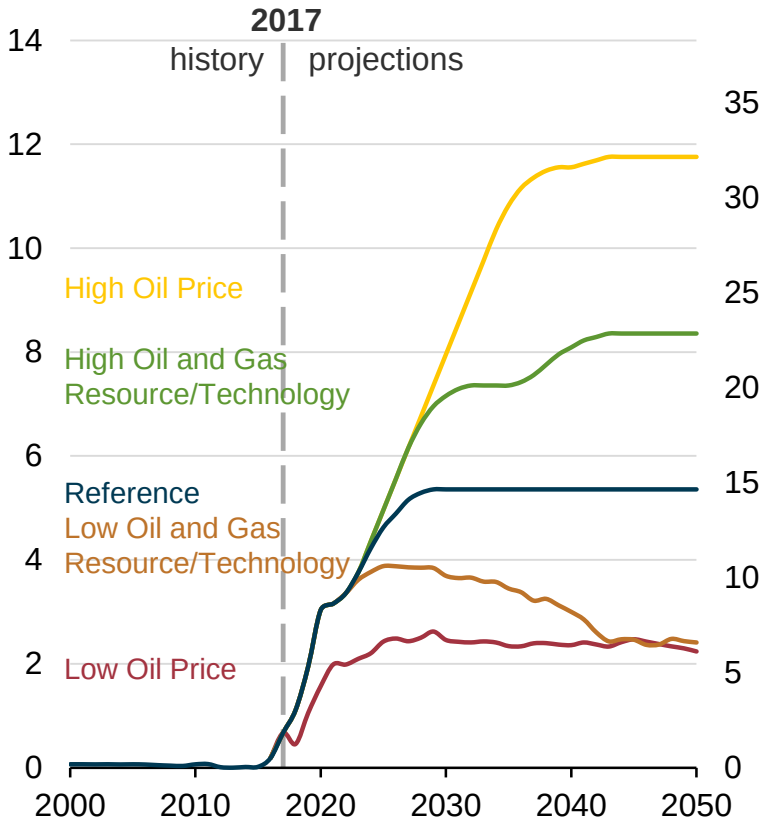


The United States becomes a net exporter of natural gas before 2020, although the level of LNG exports is uncertain

Natural gas trade
trillion cubic feet per year billion cubic feet per day



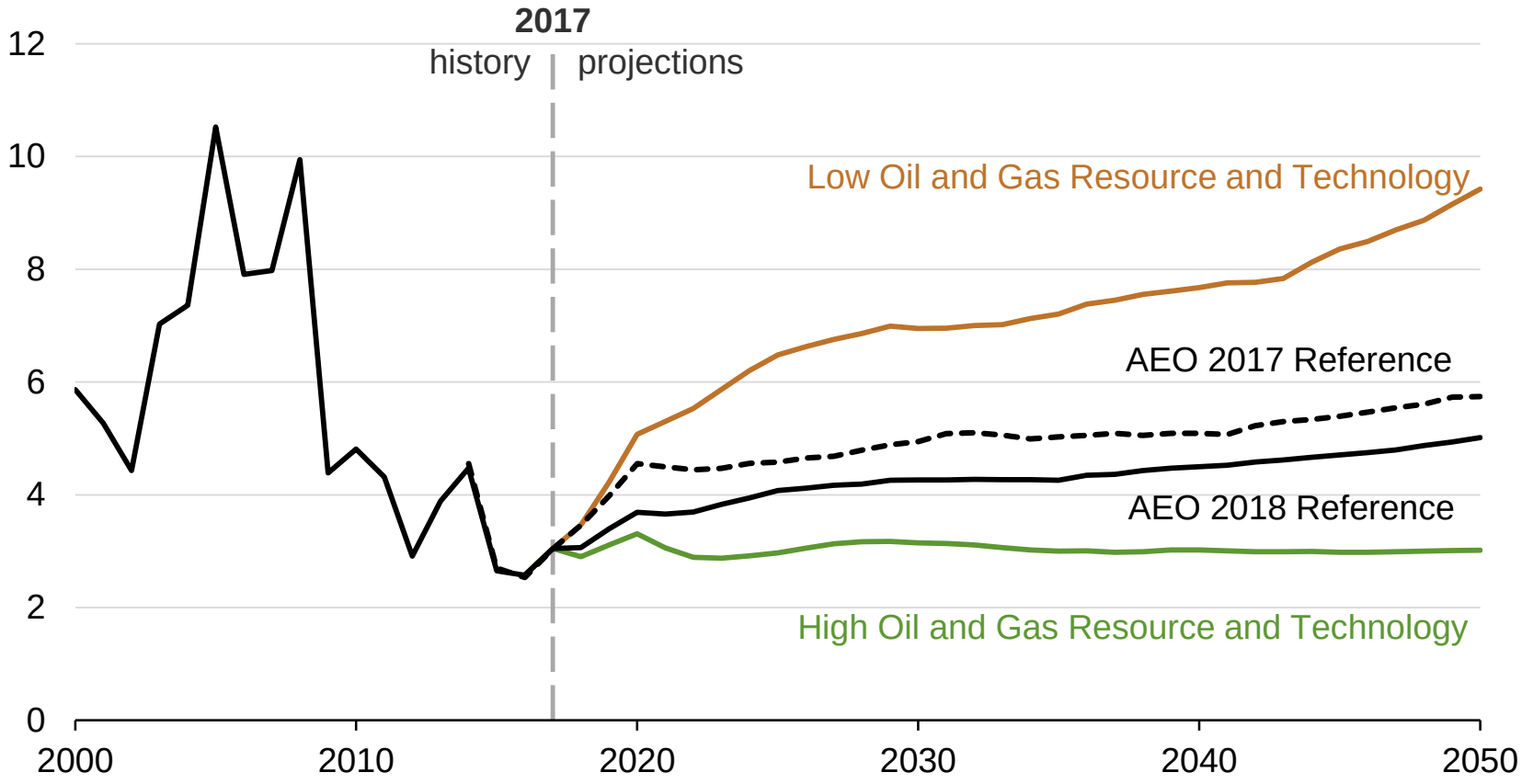
Liquefied natural gas exports
trillion cubic feet per year billion cubic feet per day



Natural gas prices remain relatively low compared to historic values

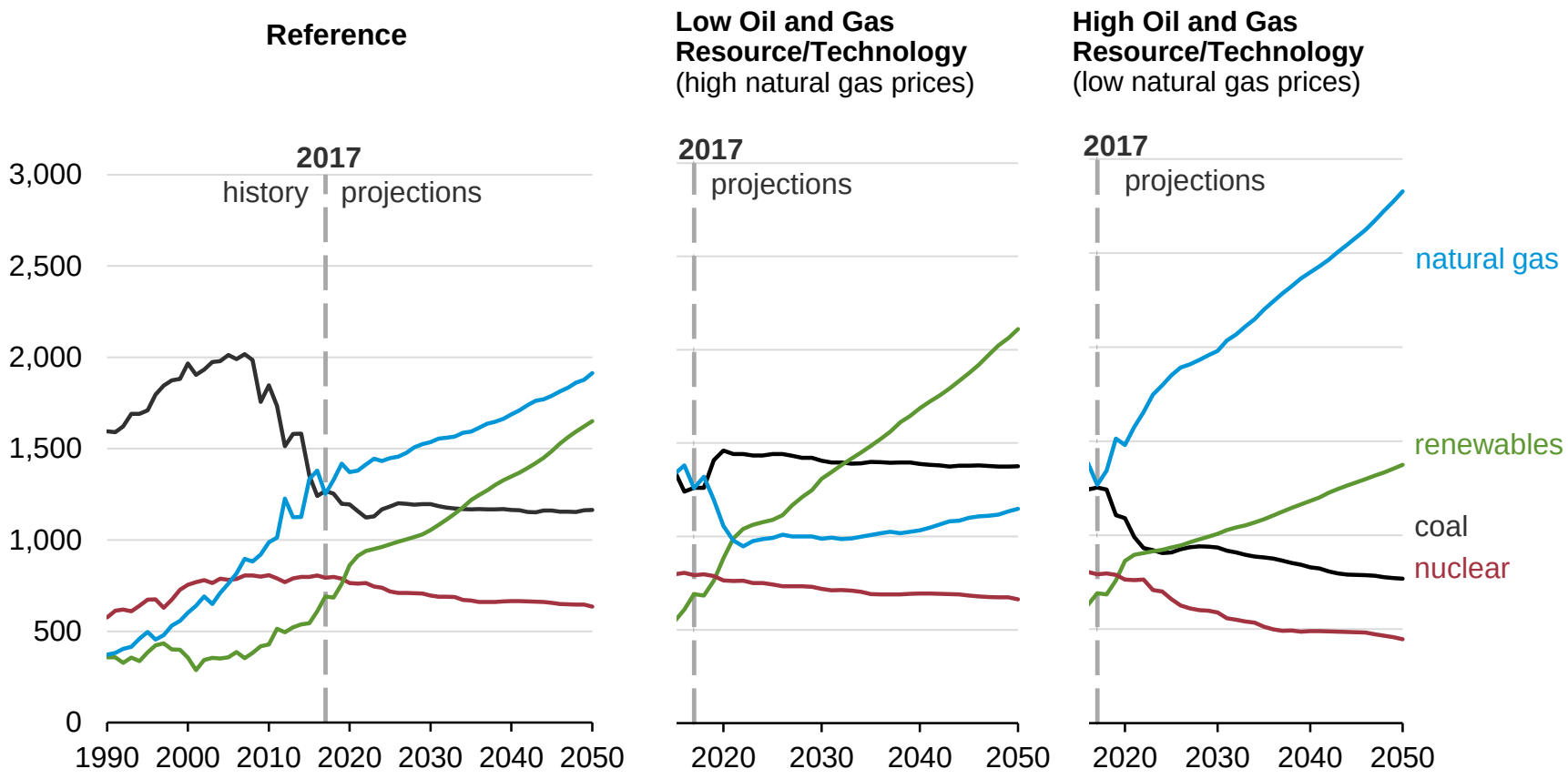
Natural gas spot price at Henry Hub

2017 dollars per million British thermal units



The projected mix of electricity generation varies widely across cases as differences in fuel prices result in significant substitution

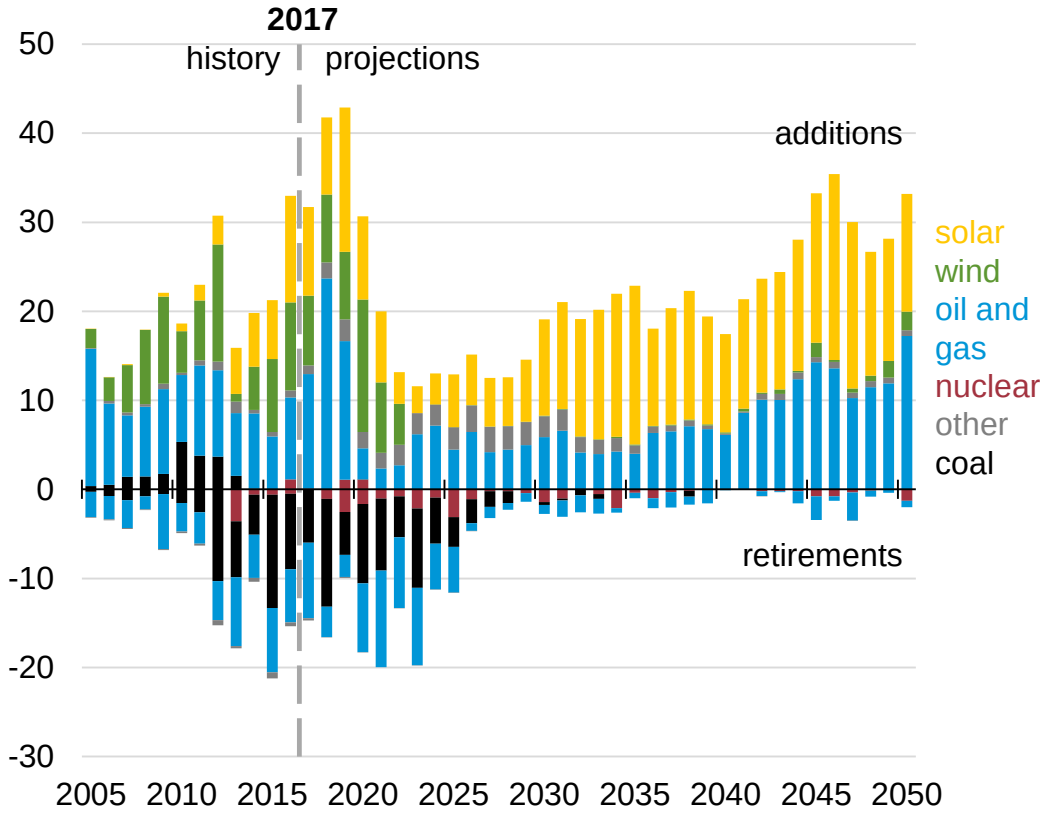
Electricity generation from selected fuels
billion kilowatthours



Economics and policy drive changes to electric generation capacity

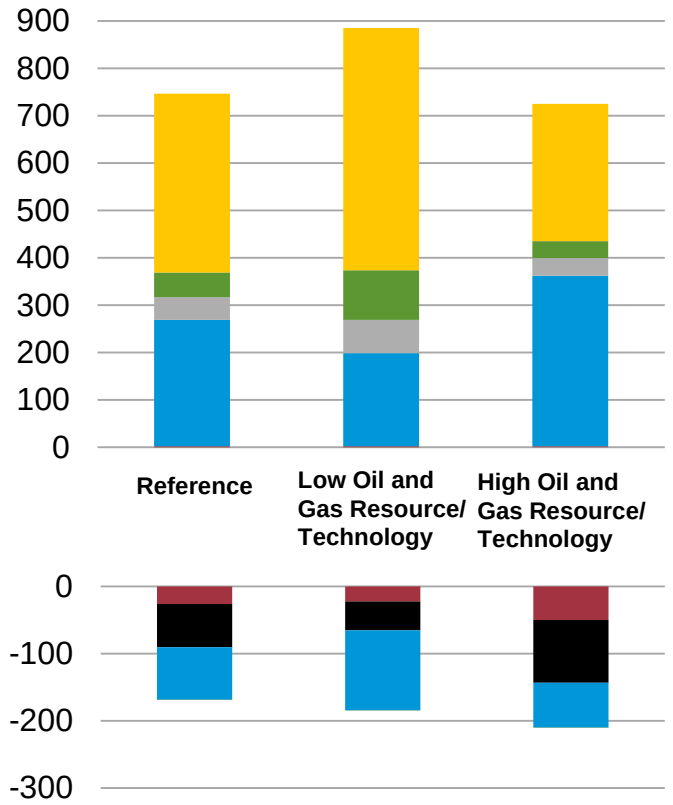
Annual electricity generating capacity additions and retirements (Reference case)

gigawatts



Cumulative generating capacity additions and retirements (2018-50)

gigawatts

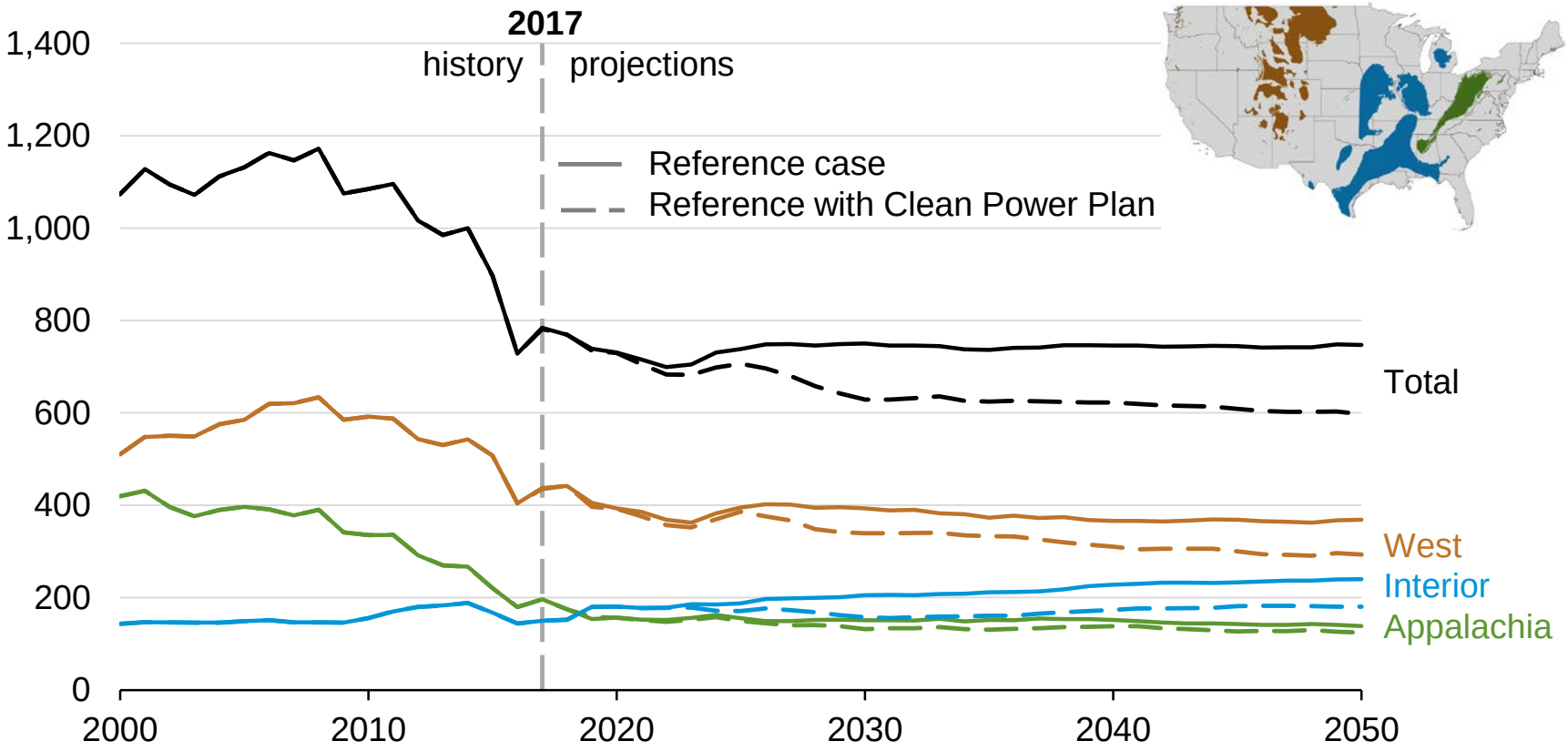


Renewables and natural gas comprise most of the capacity additions throughout the projection period in the Reference case.

The electric power sector demand for coal remains flat through 2050

U.S. Coal production by region – Reference Case with and without Clean Power Plan

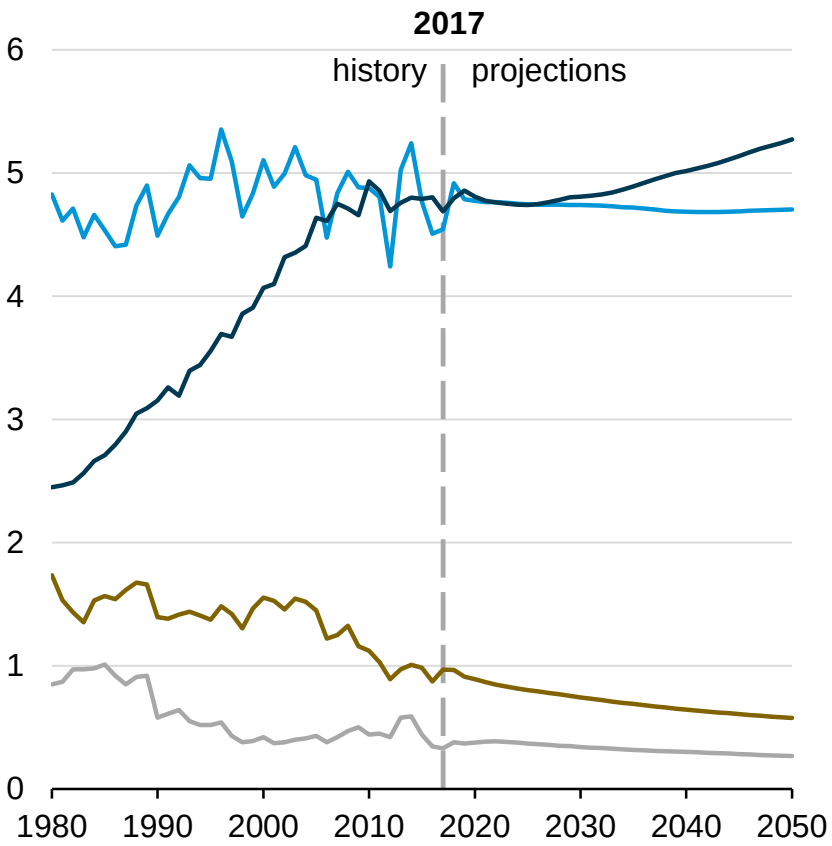
million short tons



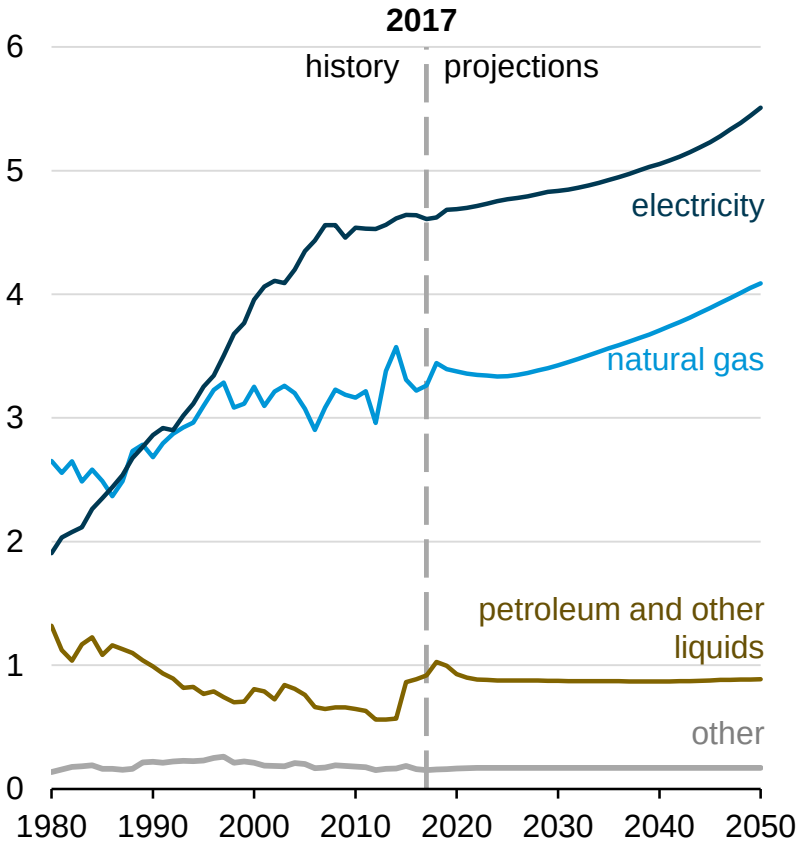
Coal production decreases through 2022 because of retirements of coal-fired electric generating capacity.

Residential and commercial energy consumption grows slowly through 2050

Residential sector delivered energy consumption
quadrillion British thermal units

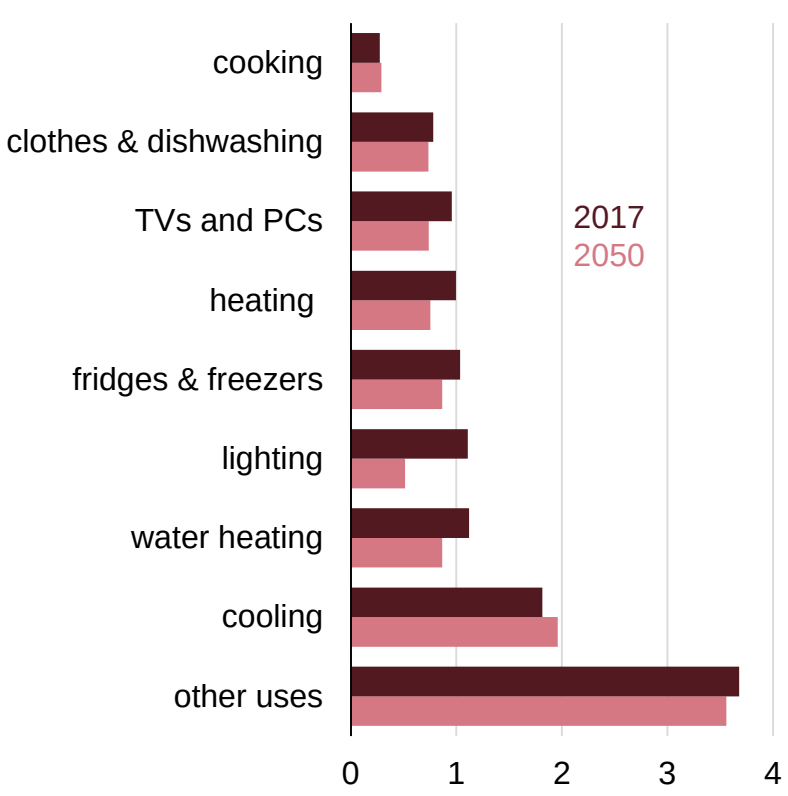


Commercial sector delivered energy consumption
quadrillion British thermal units

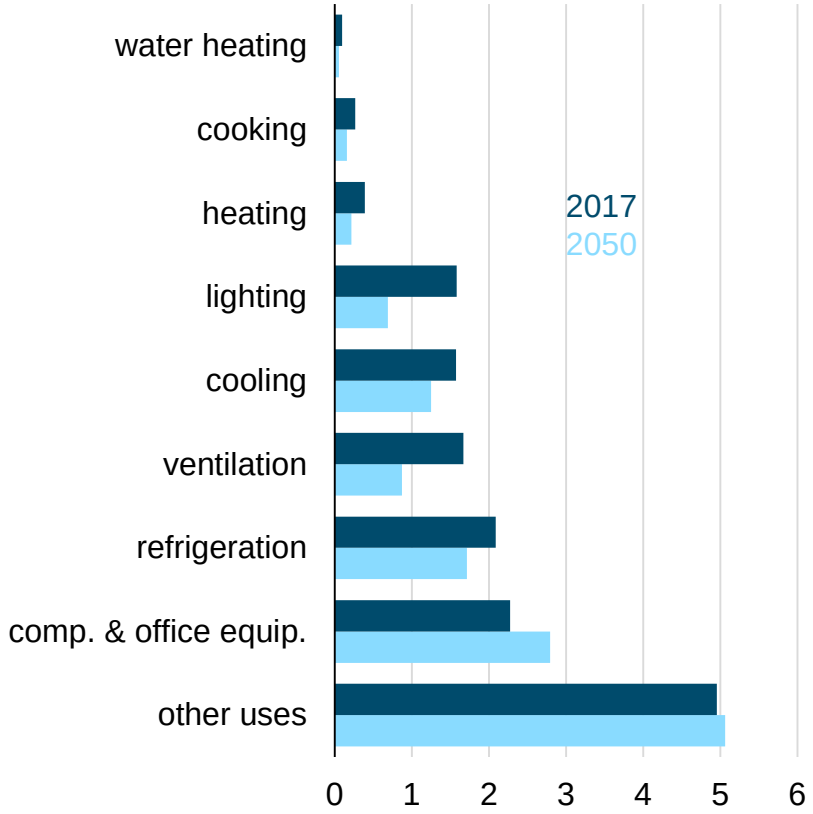


Increased efficiency contributes to slowing the growth of electricity use in buildings sector

Use of purchased electricity per household
thousand kilowatthours per household



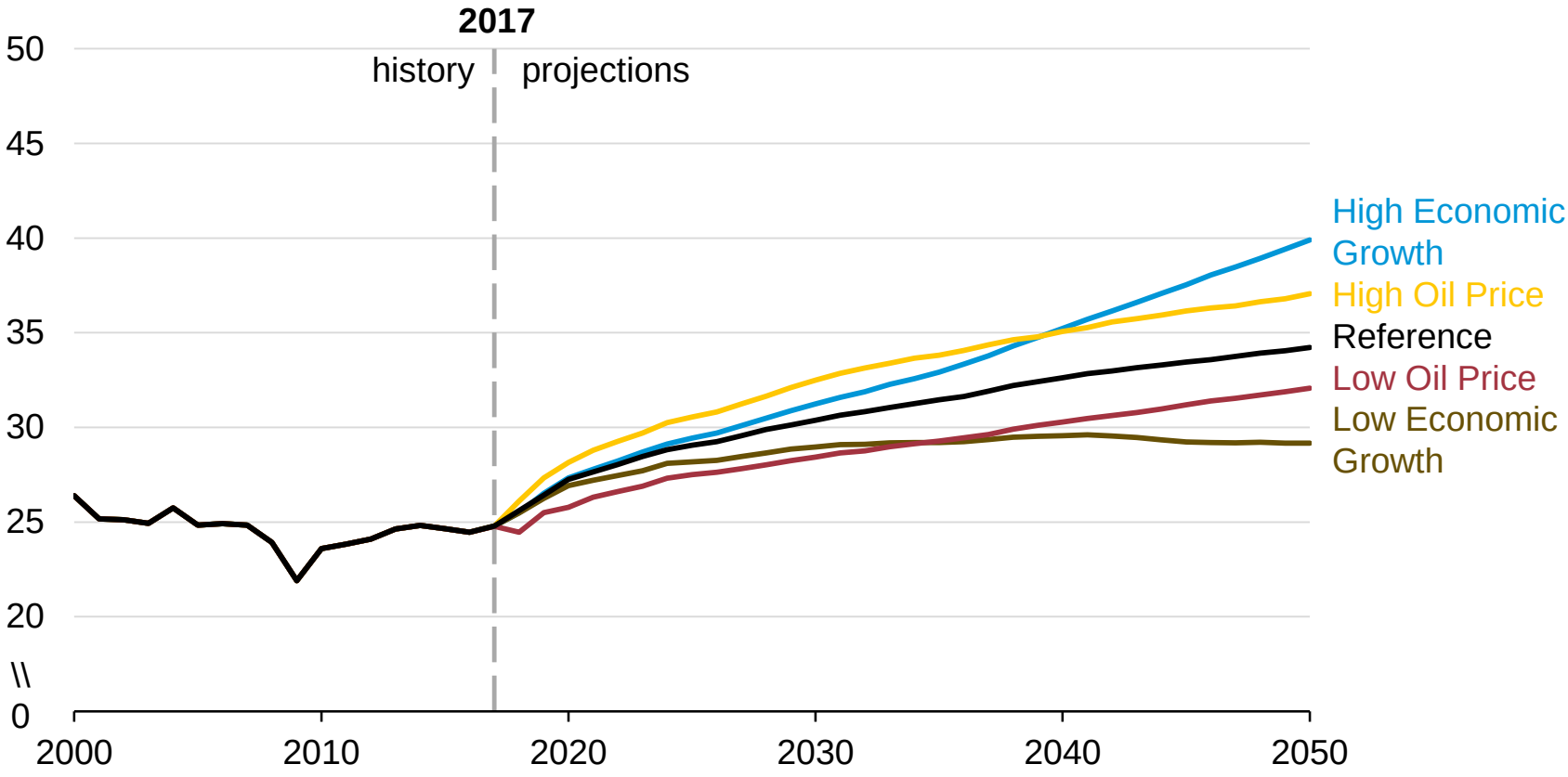
Use of purchased electricity per square foot of commercial floorspace
thousand kilowatthours per thousand square feet



Industrial energy consumption grows in all cases, driven by economic growth and relatively low energy prices

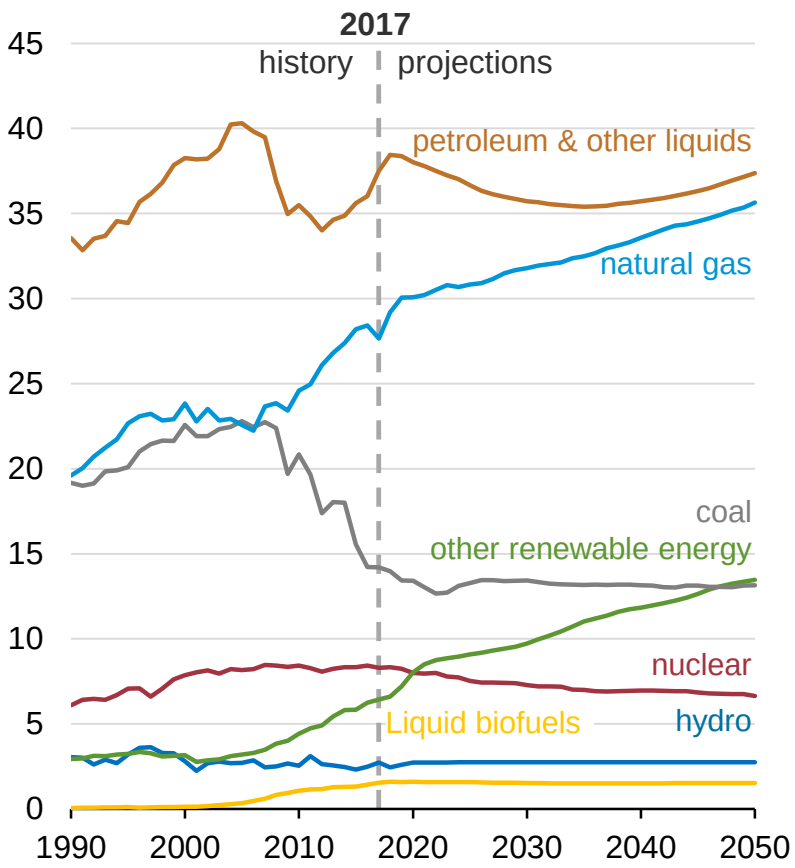
U.S. industrial delivered energy consumption

quadrillion British thermal units

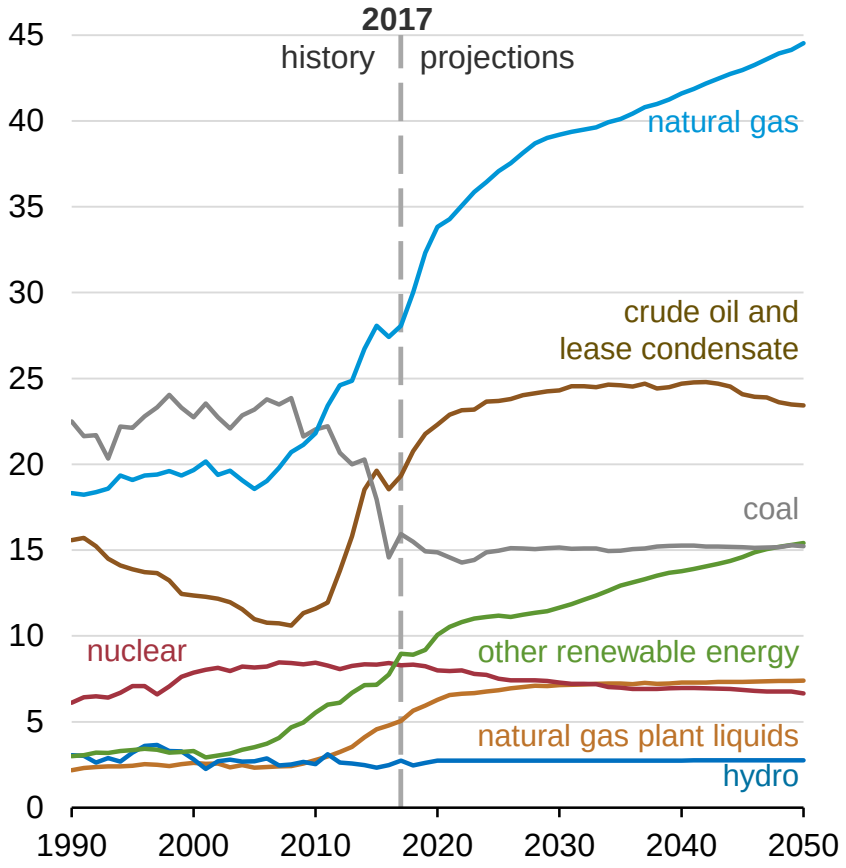


U.S. energy consumption and production sees significant changes through 2050 under current laws and policies

Energy Consumption (Reference case)
quadrillion British thermal units



Energy Production (Reference case)
quadrillion British thermal units



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For more information

Annual Energy Outlook | www.eia.gov/forecasts/aeo

- Annual Energy Outlook 2018
  - PDF (https://www.eia.gov/outlooks/aeo/pdf/AEO2018_FINAL_PDF.pdf)
  - PowerPoint (https://www.eia.gov/outlooks/aeo/ppt/AEO2018_FINAL_PPT.pptx)
  - Excel Tables (https://www.eia.gov/outlooks/aeo/tables_ref.php)
  - Interactive Table Viewer (https://www.eia.gov/outlooks/aeo/data/browser/)