Annual Energy Outlook 2022

with projections to 2050

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U.S. Energy Information Administration

#AEO2022

March 3, 2022
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with projections to 2050

March 2022

Office of Energy Analysis
U.S. Energy Information Administration
U.S. Department of Energy
Washington, DC 20585

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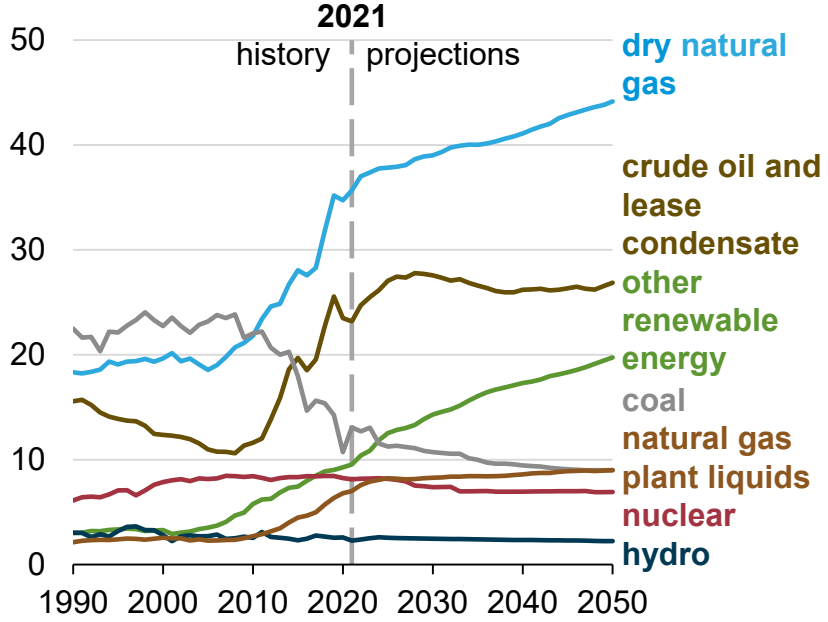
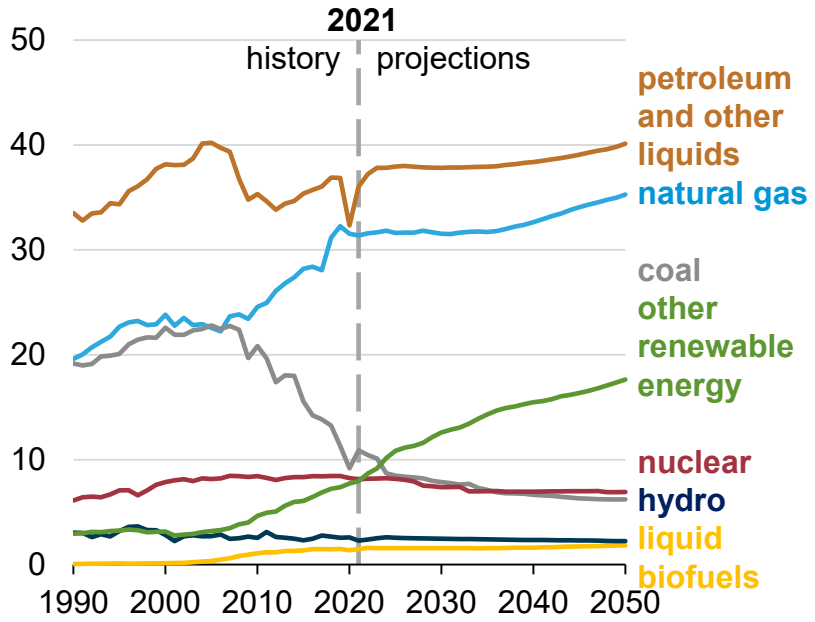
Energy production and consumption

Energy production by source
AEO2022 Reference case
quadrillion British thermal units



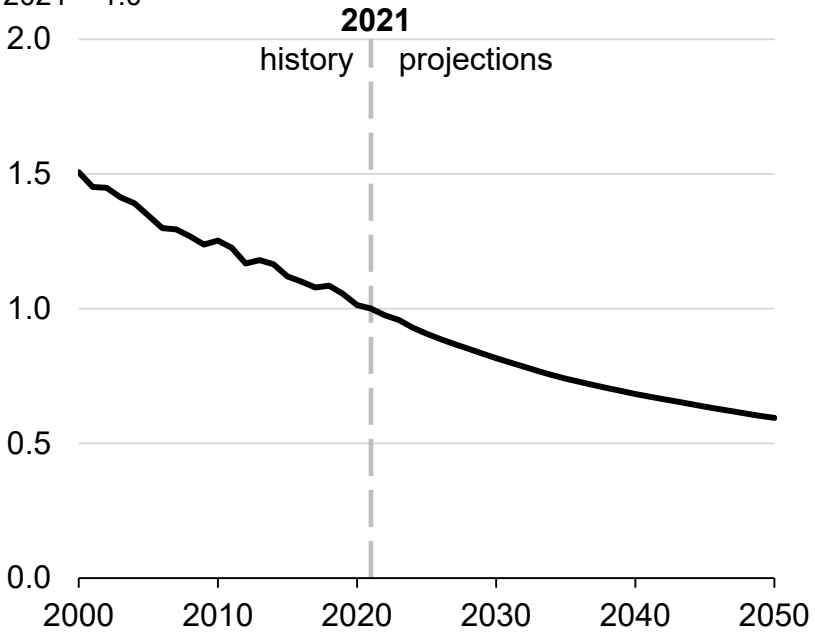
Energy consumption by fuel
AEO2022 Reference case
quadrillion British thermal units



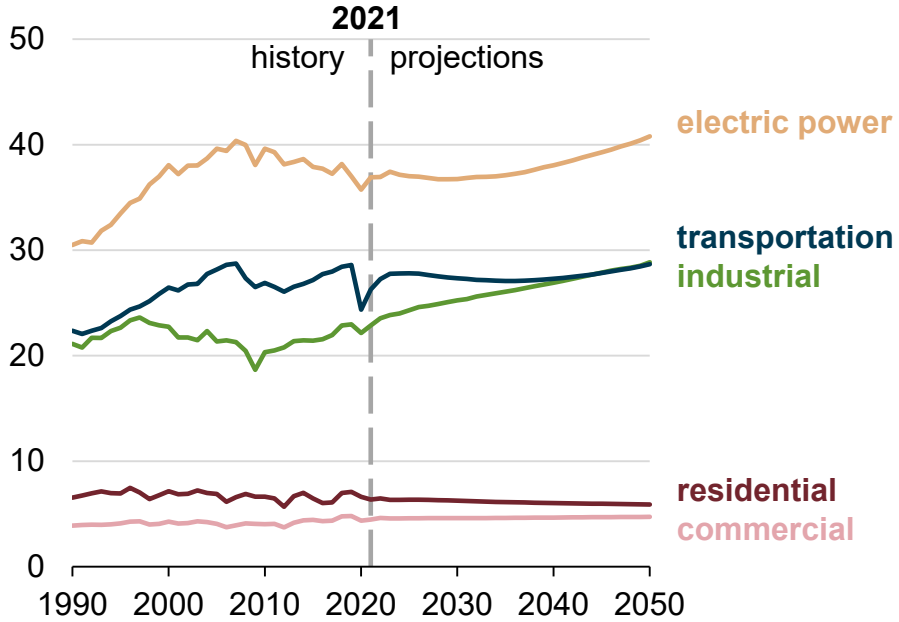
Note: Biofuels are shown separately and included in petroleum and other liquids.

Energy intensity and consumption

Indexed total energy intensity of the U.S. economy
AEO2022 Reference case
2021 = 1.0



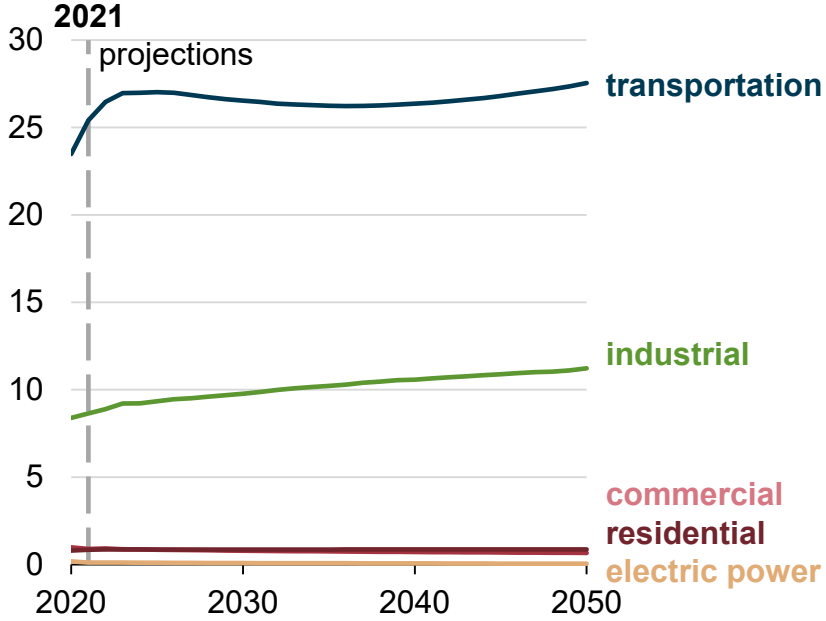
Energy consumption by sector
AEO2022 Reference case
quadrillion British thermal units



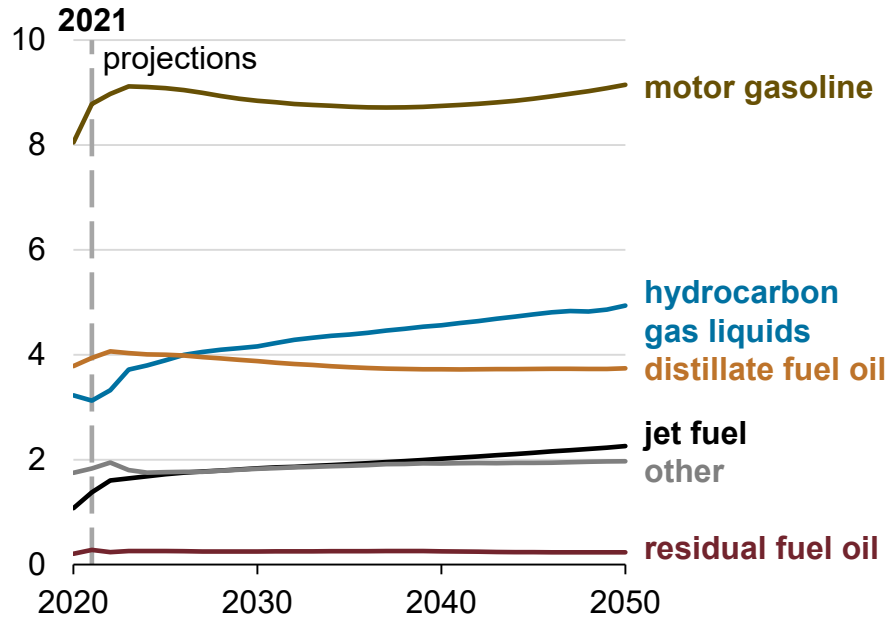
Note: Total energy intensity calculation reflects primary energy, which includes electricity losses.

Petroleum consumption by sector and fuel type

Petroleum and other liquids consumption by sector
AEO2022 Reference case
quadrillion British thermal units

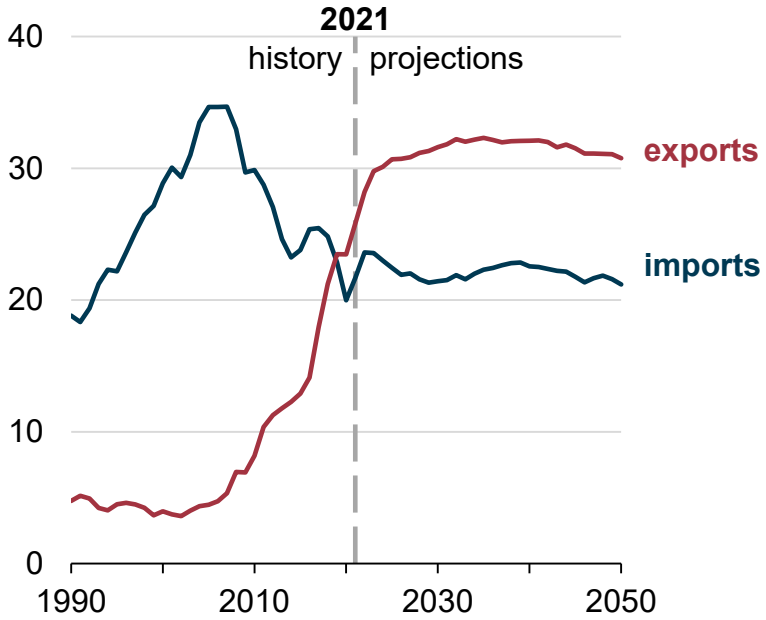


Petroleum and other liquids consumption by fuel type
AEO2022 Reference case
million barrels per day

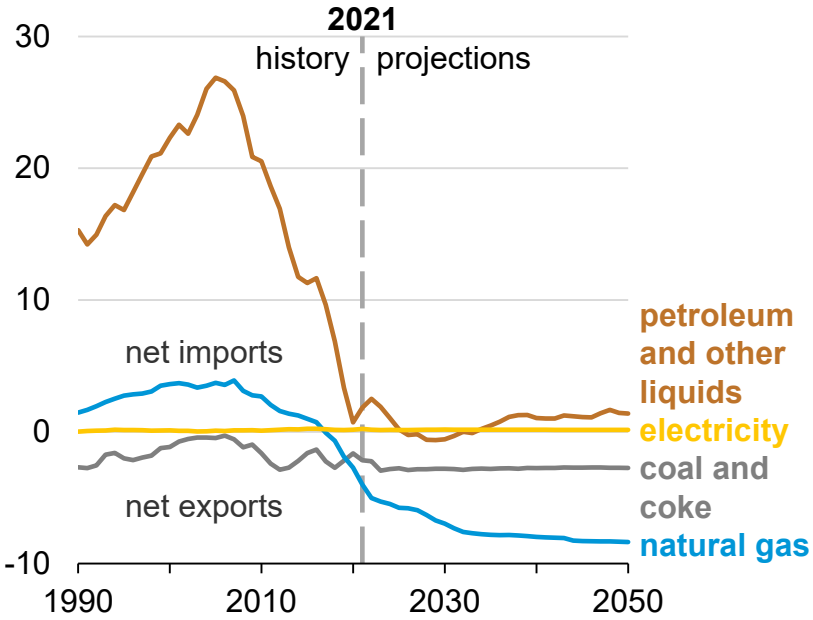


Energy imports and exports

Gross energy trade
AEO2022 Reference case
quadrillion British thermal units

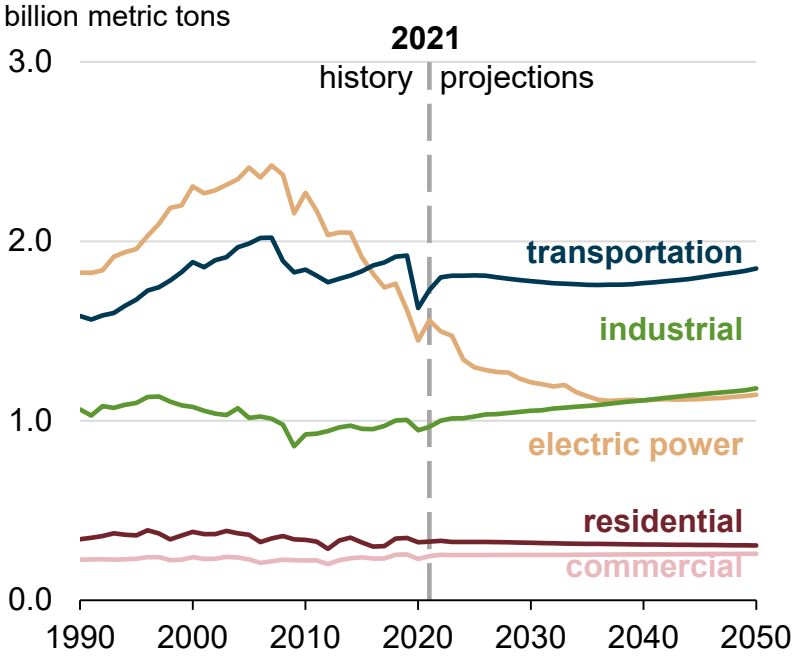


Net energy imports
AEO2022 Reference case
quadrillion British thermal units

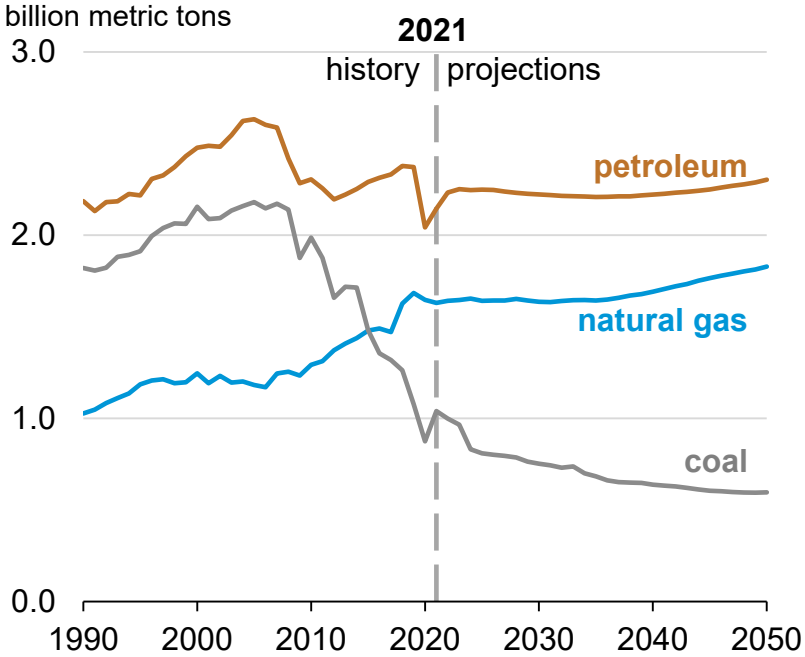


Energy-related CO_2 emissions by sector and fuel source

Energy-related CO_2 emissions by sector AEO2022 Reference case



Energy-related CO_2 emissions by fuel source AEO2022 Reference case

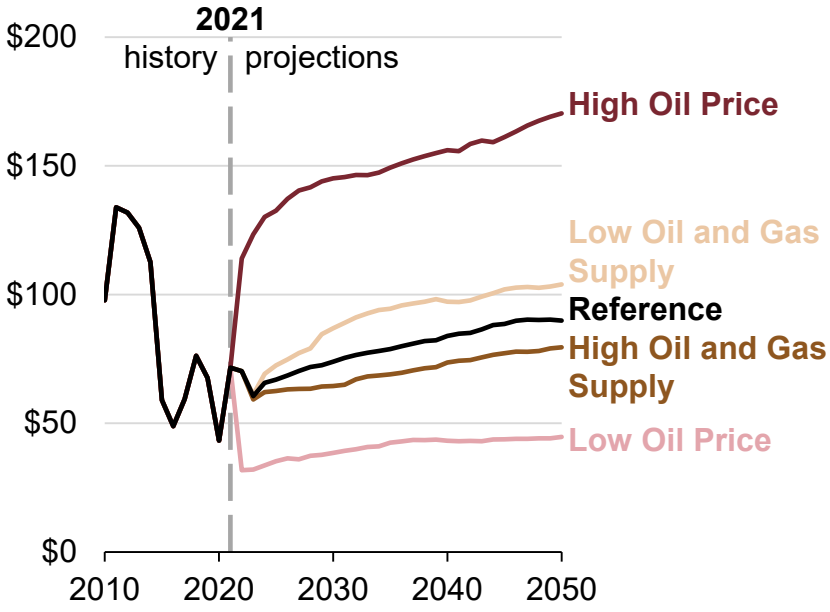


Note: Series does not include greenhouse gases other than CO_2. Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production.

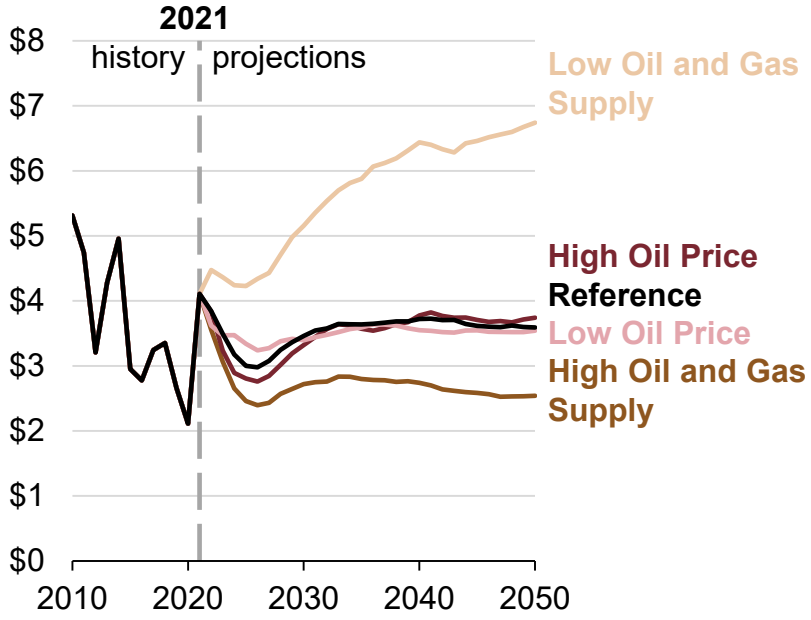
Critical drivers

Crude oil price projections and natural gas price projections

North Sea Brent crude oil price
AEO2022 side cases
2021 dollars per barrel

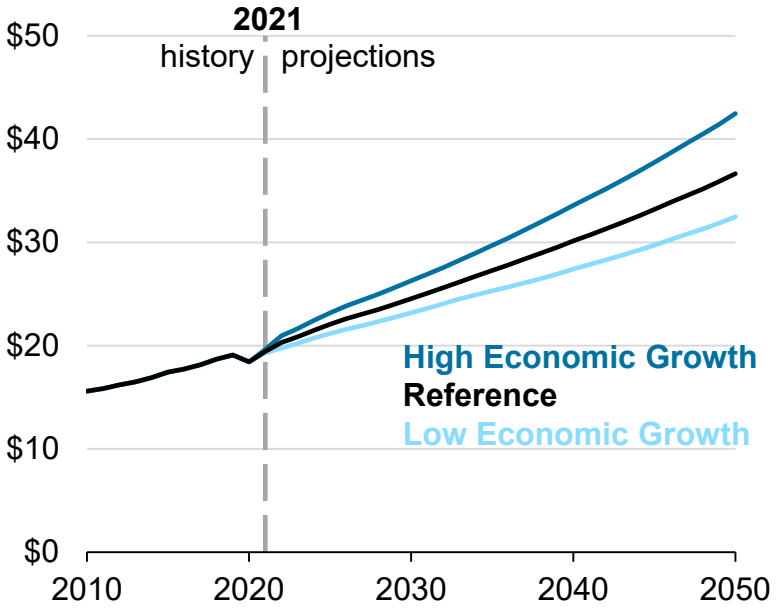


Natural gas price at Henry Hub
AEO2022 side cases
2021 dollars per million British thermal units

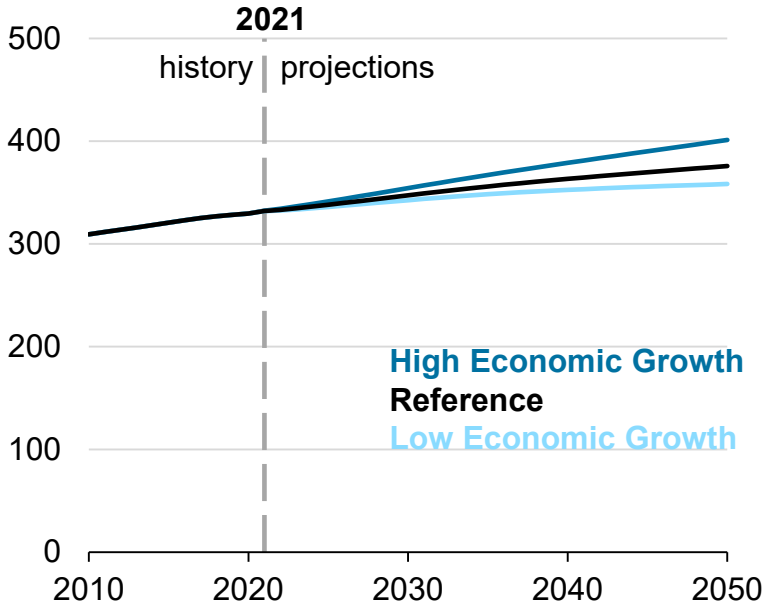


GDP and population growth assumptions

U.S. gross domestic product assumptions
AEO2022 economic growth cases
trillion 2012 dollars

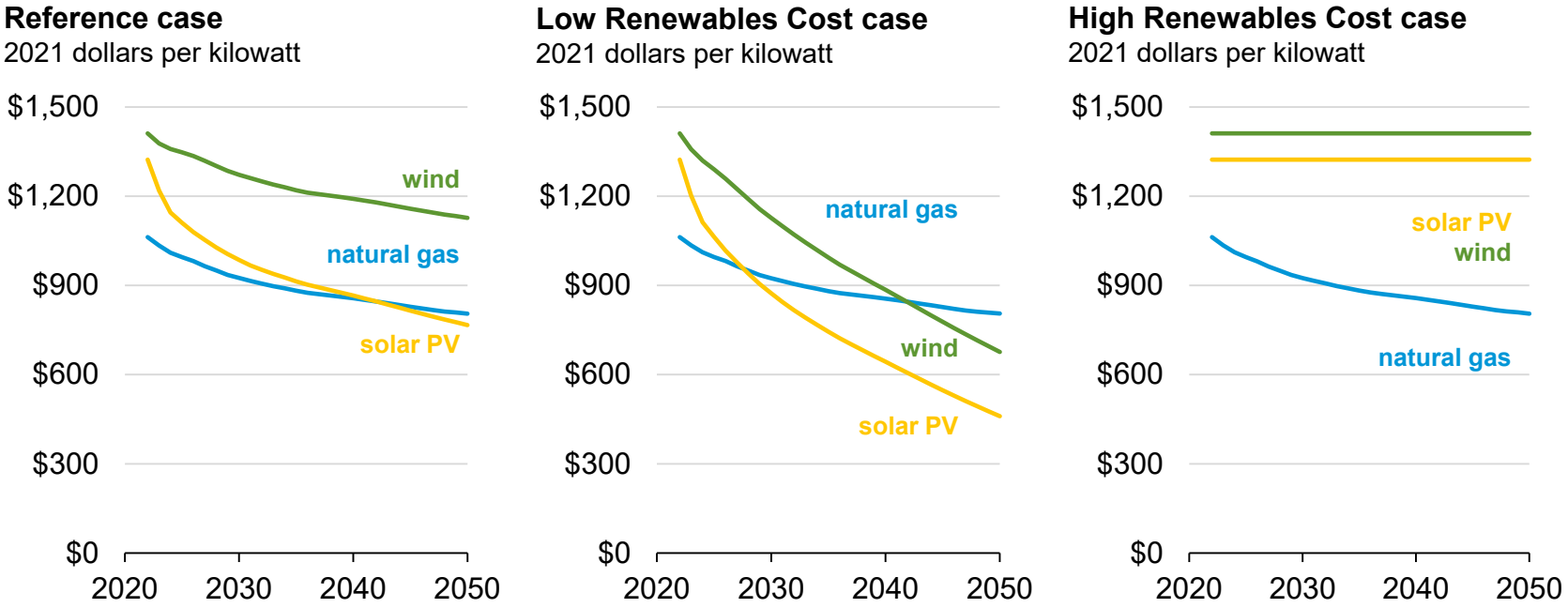


U.S. population assumptions
AEO2022 economic growth cases
millions



Installation cost for solar photovoltaic (PV), wind, and natural gas capacity in renewable cost cases

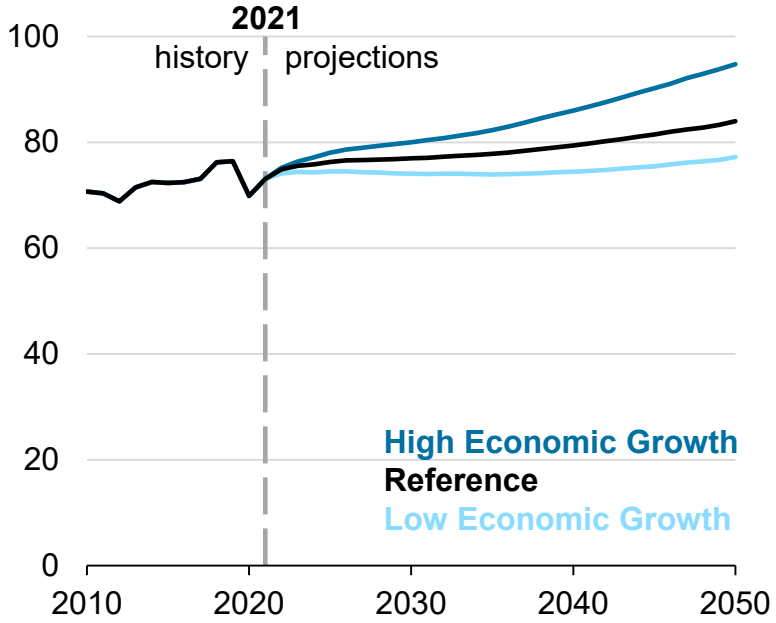
Overnight installation cost, AEO2022 renewables cost cases



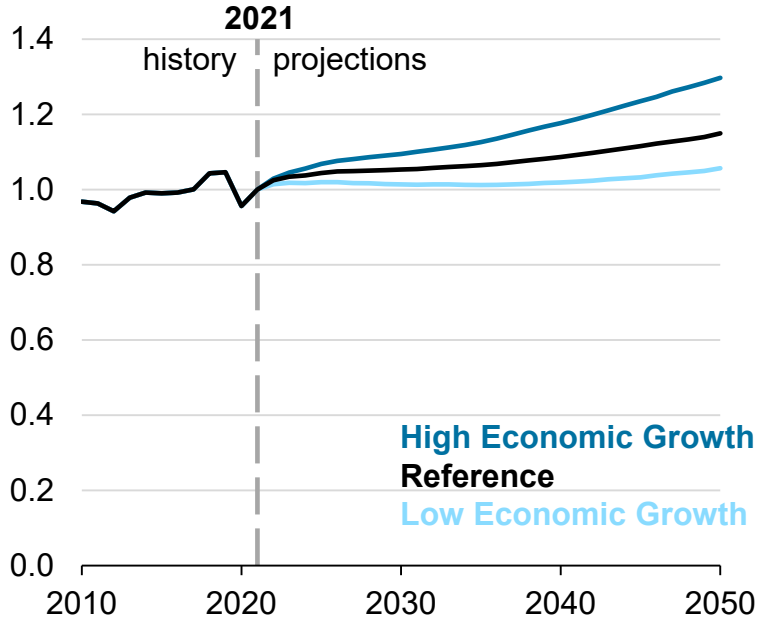
Note: Series begin in 2022.

Delivered energy

Delivered energy across end-use sectors
AEO2022 economic growth cases
quadrillion British thermal units

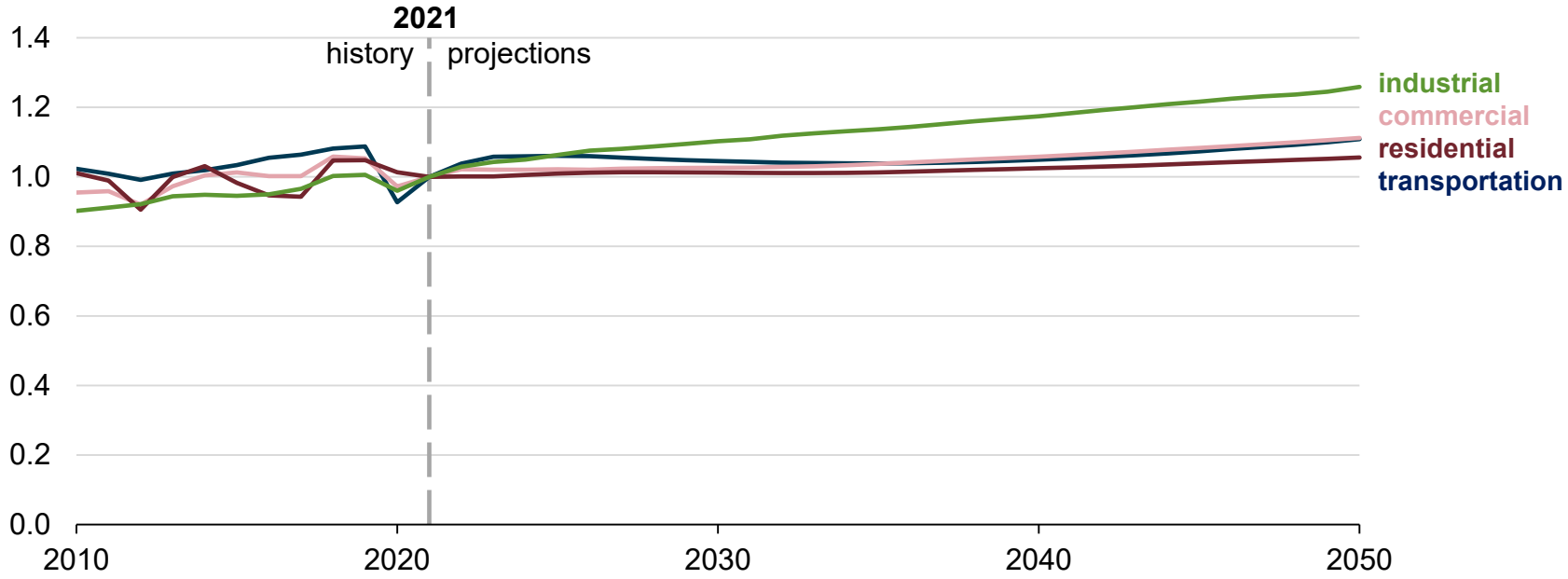


Indexed delivered energy across end-use sectors
AEO2022 economic growth cases
2021 = 1.0



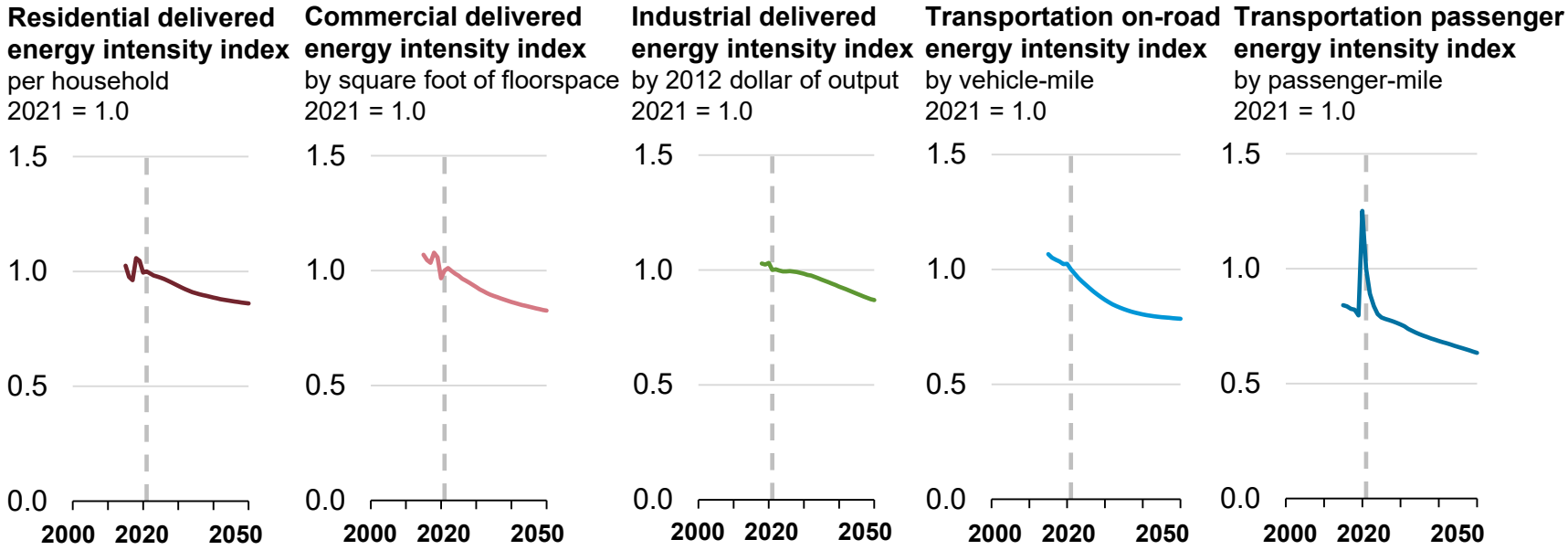
Delivered energy by end-use sector

Indexed delivered energy by end-use sector
AEO2022 Reference case
2021 = 1.0



Delivered energy intensity by sector

Indexed delivered energy intensity by sector
AEO2022 Reference case

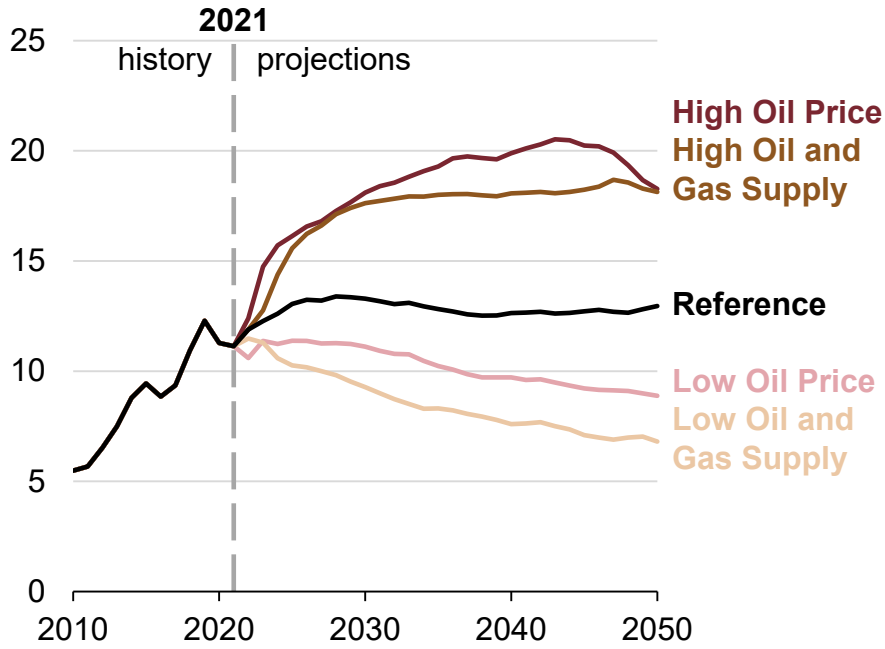


Note: Energy intensity at the end-use sector level is typically measured as energy use relative to an indicator that most directly affects delivered energy consumption within the sector (for example, energy use per household is a key energy intensity indicator for the residential sector).

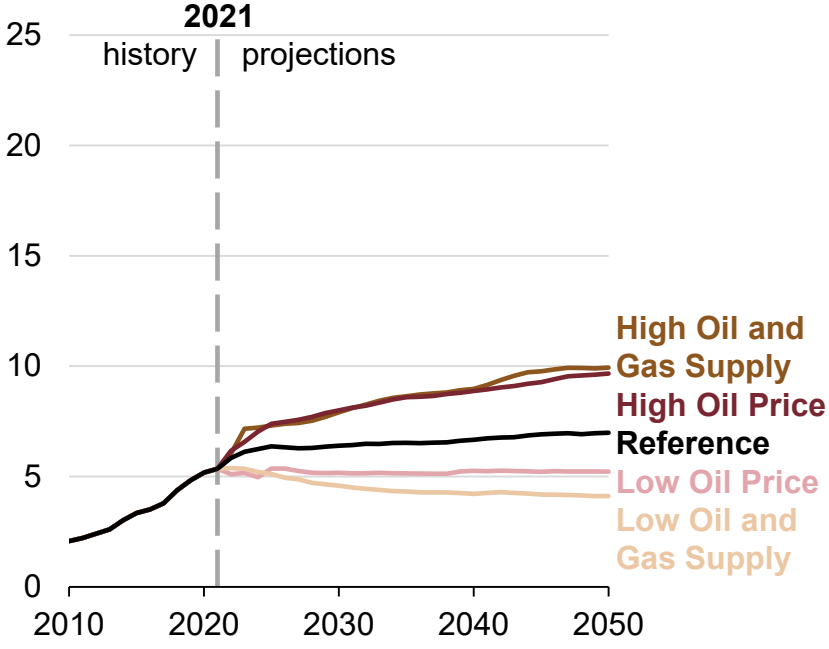
Petroleum and other liquids

Production of U.S. crude oil and natural gas plant liquids

U.S. crude oil production
AEO2022 Reference case and side cases
million barrels per day

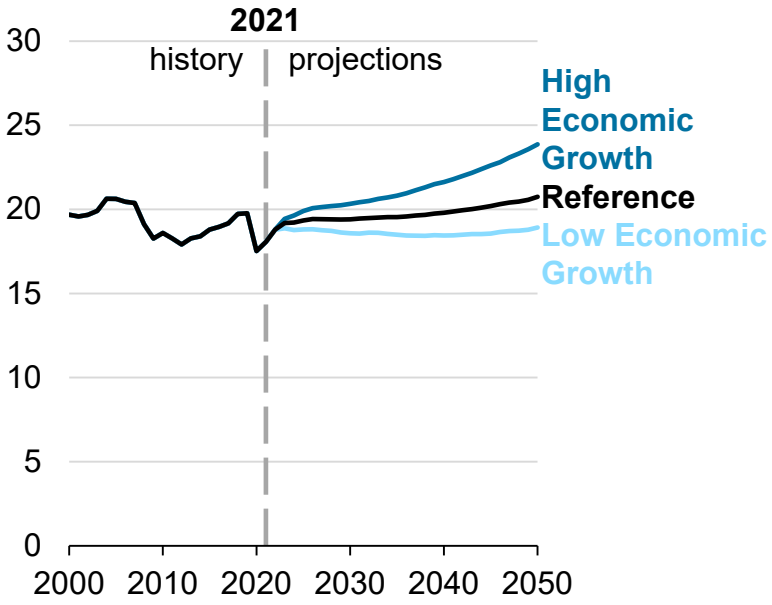


U.S. natural gas plant liquids production
AEO2022 Reference case and side cases
million barrels per day

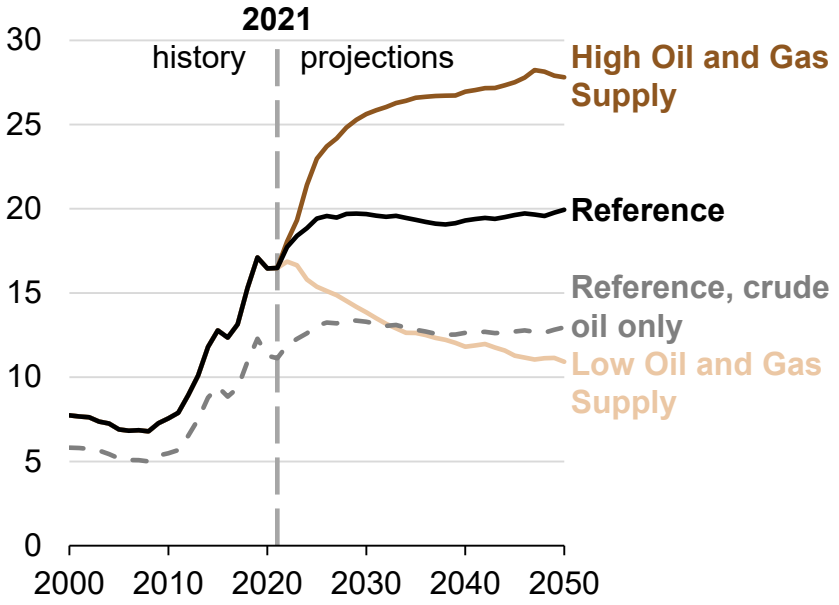


U.S. crude oil and natural gas plant liquids production and consumption

Petroleum liquids consumption
AEO2022 economic growth cases
million barrels per day



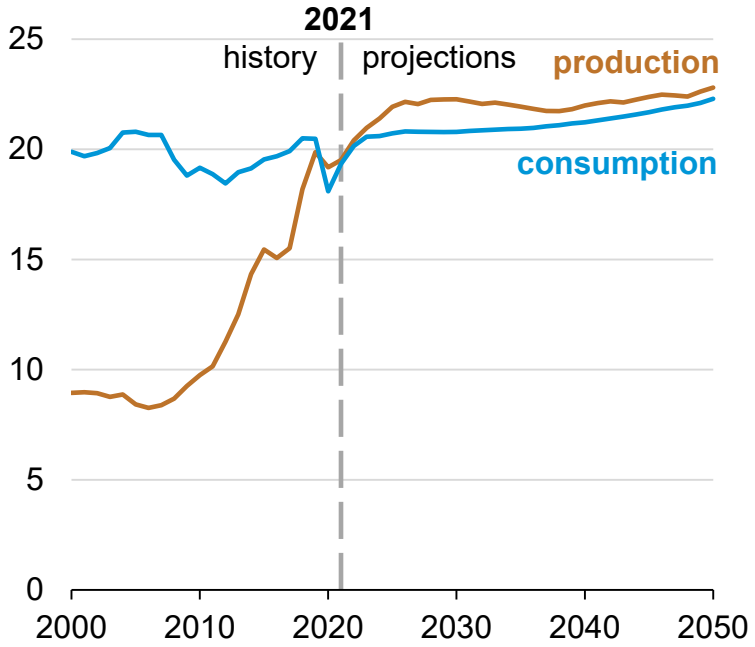
Crude oil and natural gas plant liquids production
AEO2022 oil and natural gas supply cases
million barrels per day



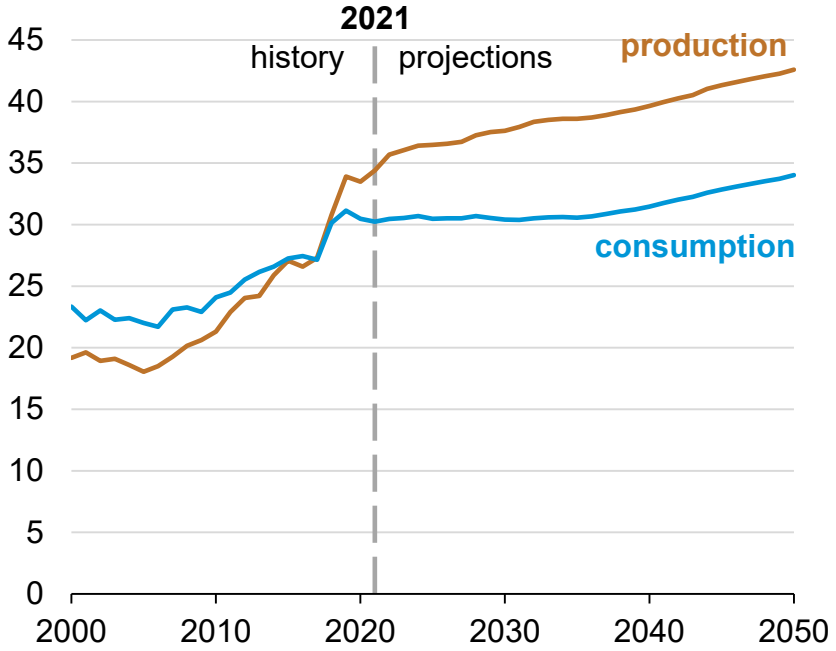
Note: Petroleum liquids does not include biofuels.

U.S. petroleum, other liquids, and natural gas production and consumption

Petroleum and other liquids balance
AEO2022 Reference case
million barrels per day

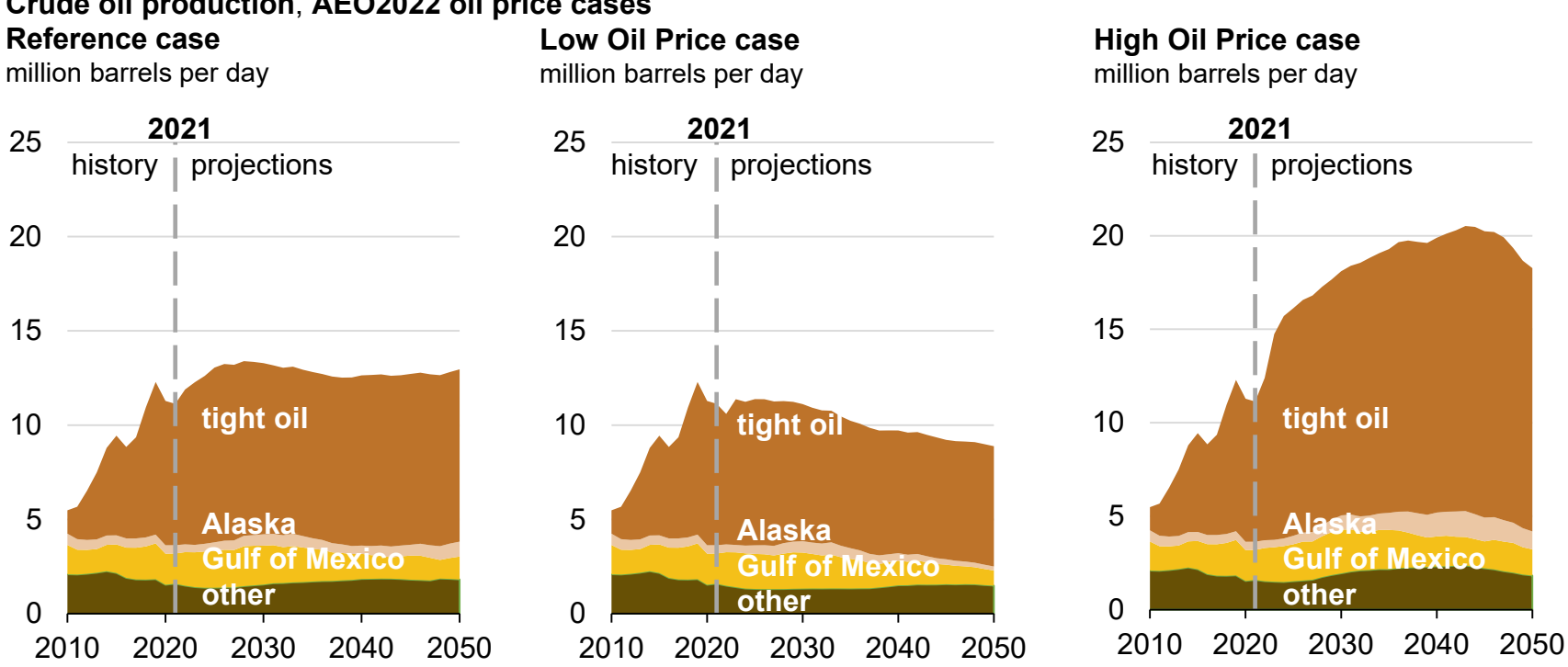


Natural gas balance
AEO2022 Reference case
trillion cubic feet



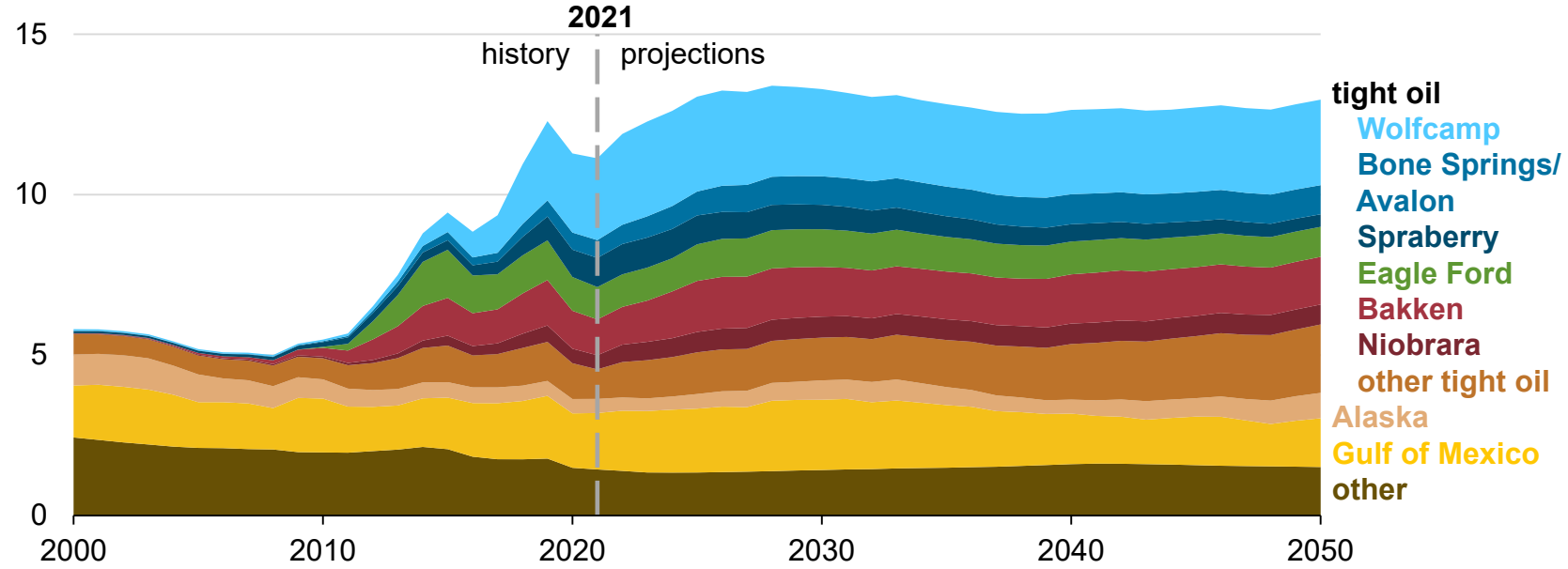
U.S. crude oil production

Crude oil production, AEO2022 oil price cases



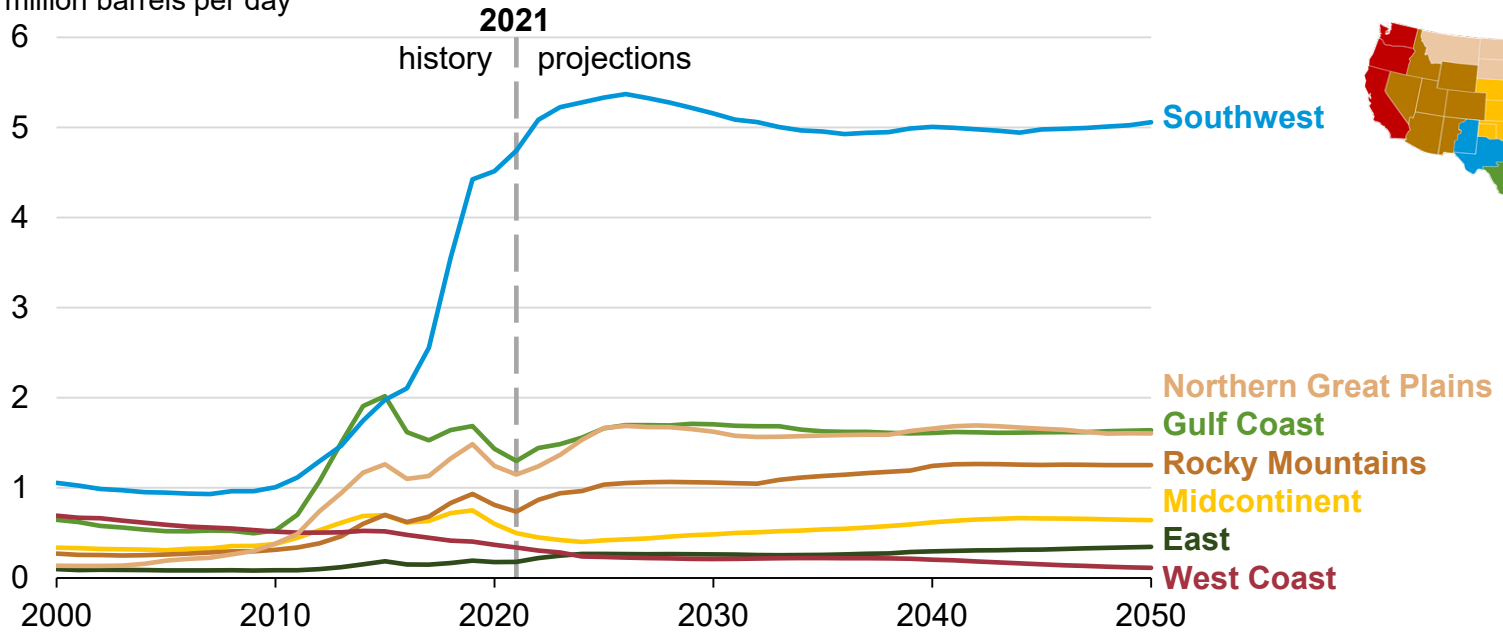
U.S. crude oil production

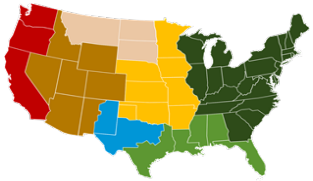
Crude oil production by play
AEO2022 Reference case
million barrels per day



Onshore crude oil production in the Lower 48 states

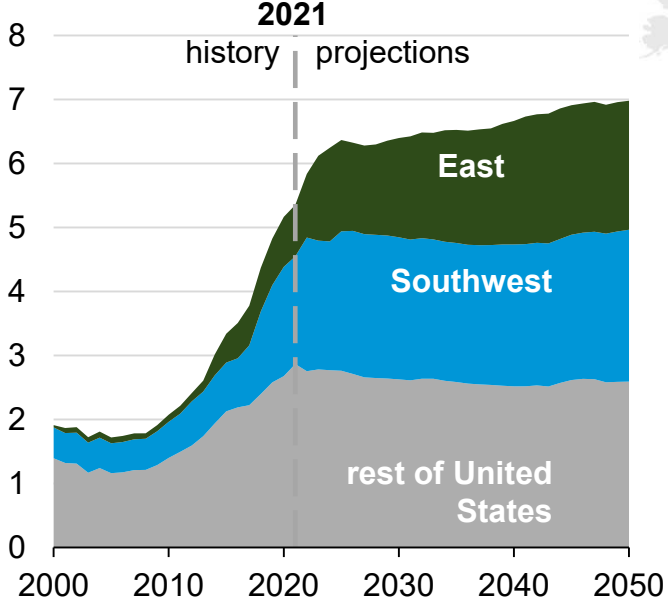
Onshore crude oil production in the Lower 48 states
AEO2022 Reference case
million barrels per day



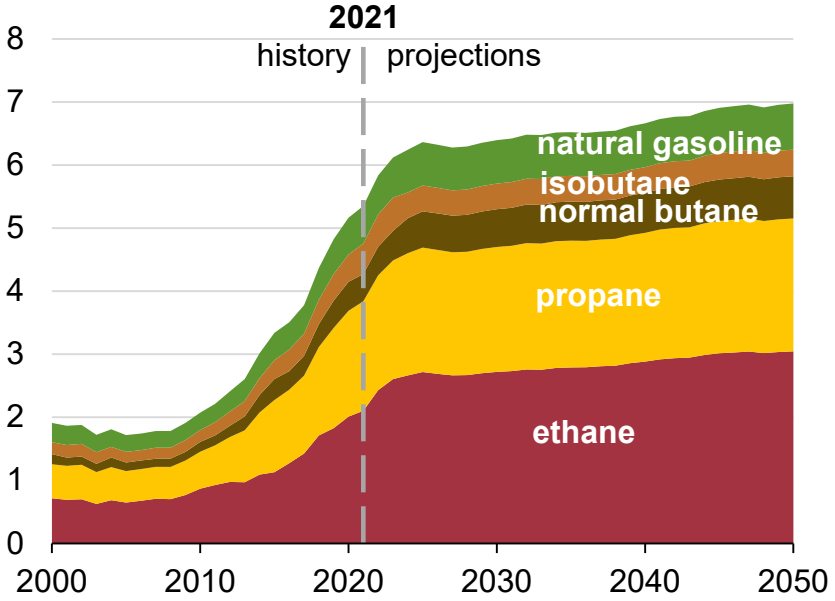


U.S. natural gas plant liquids production by region and type

Natural gas plant liquids production by region
AEO2022 Reference case
million barrels per day

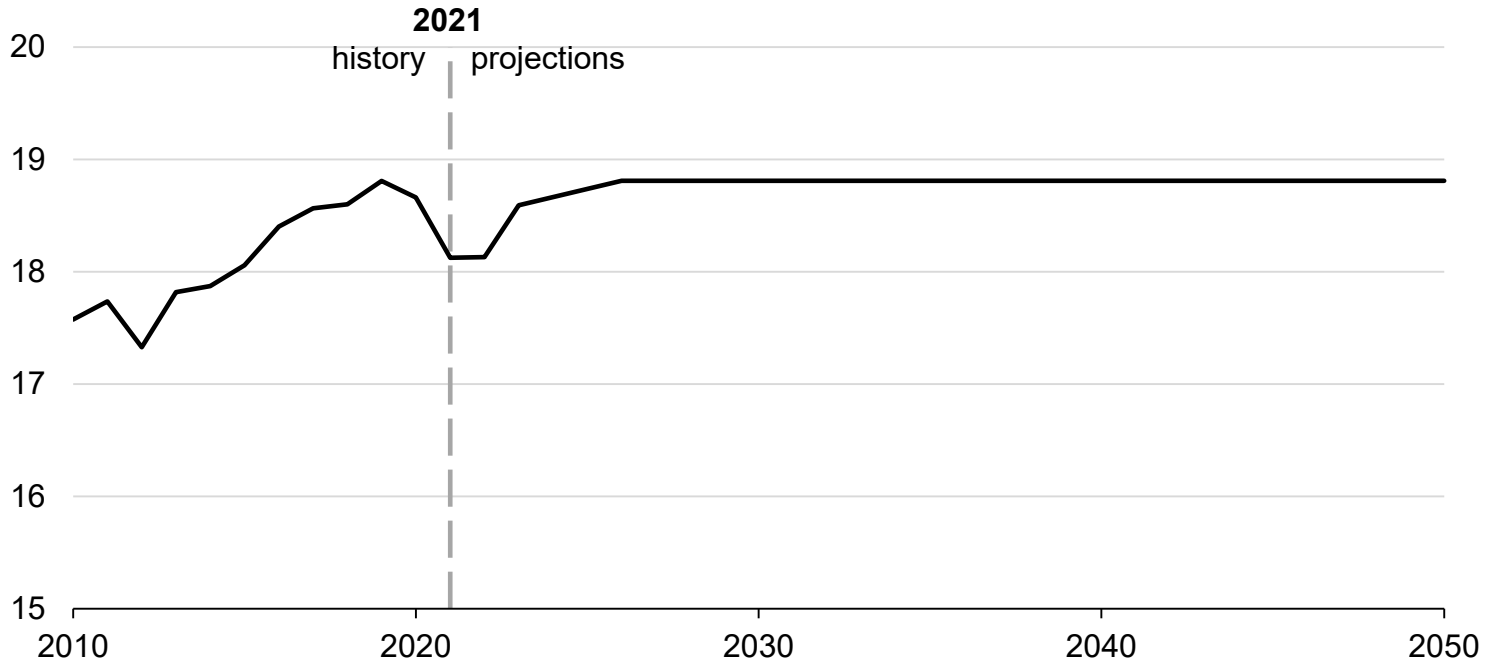


Natural gas plant liquids production by type
AEO2022 Reference case
million barrels per day



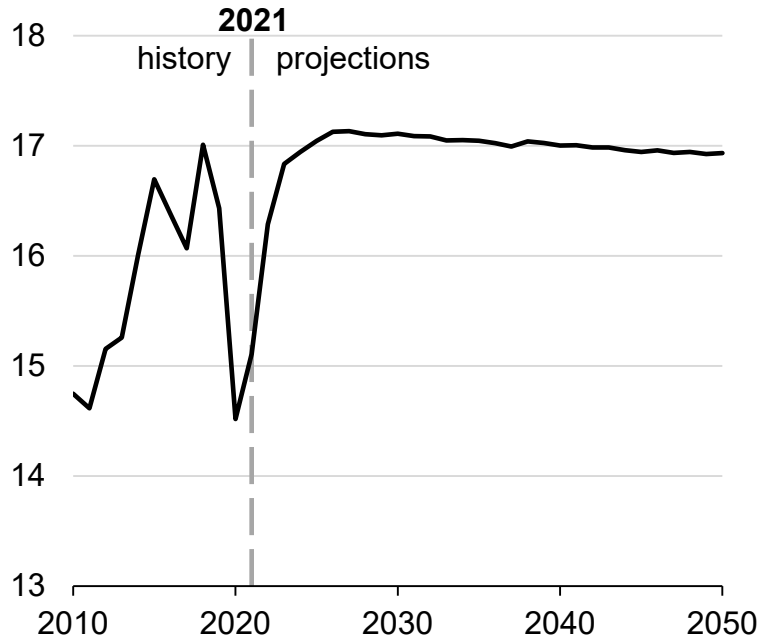
U.S. refinery capacity

Refinery capacity
AEO2022 Reference case
million barrels per day

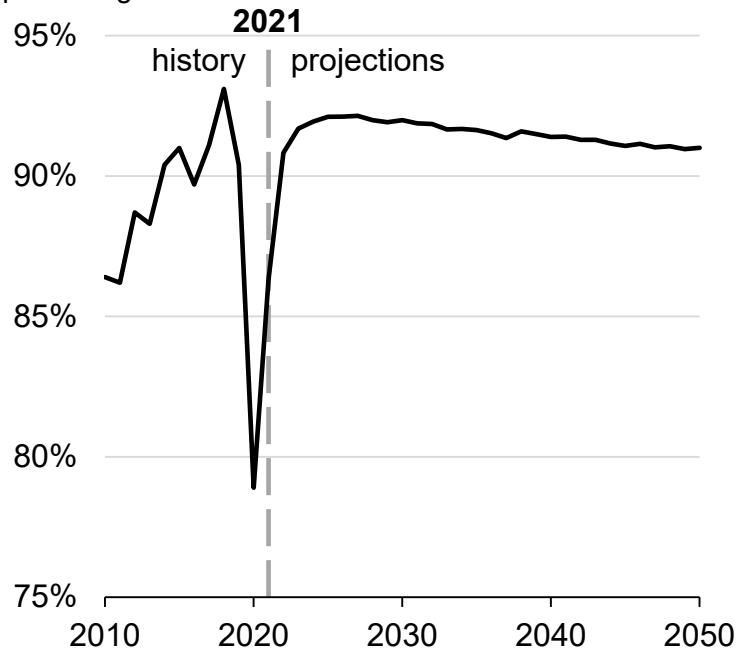


U.S. crude oil supply and refinery utilization

Crude oil supply to domestic refineries
AEO2022 Reference case
million barrels per day

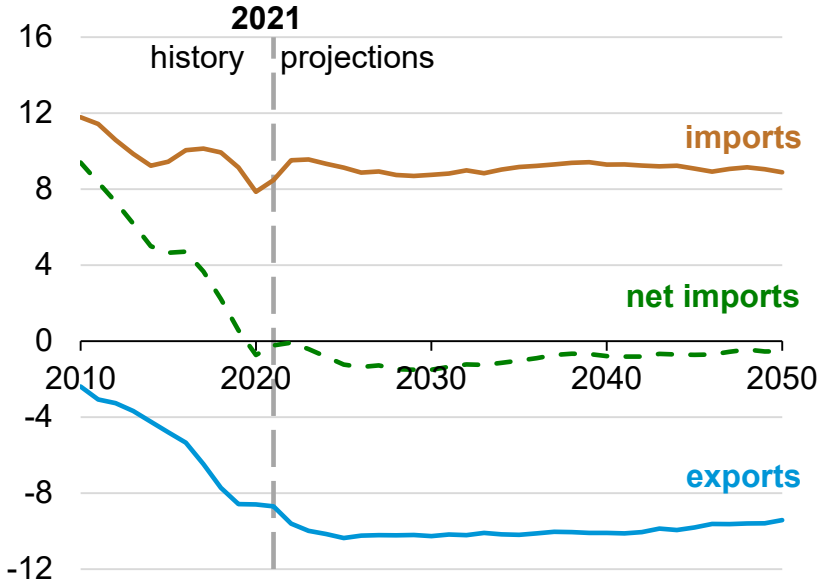


Refinery utilization
AEO2022 Reference case
percentage

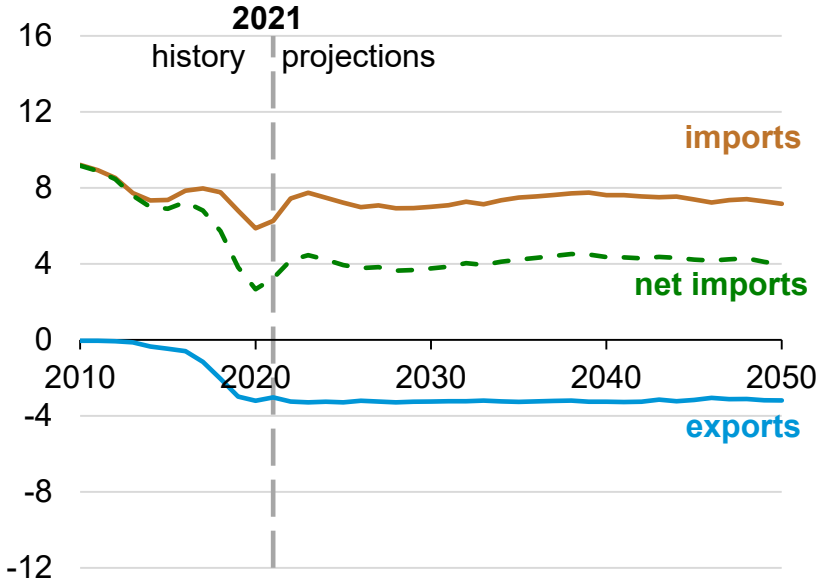


U.S. crude and petroleum and other liquids trade

Total petroleum and other liquids trade
AEO2022 Reference case
million barrels per day

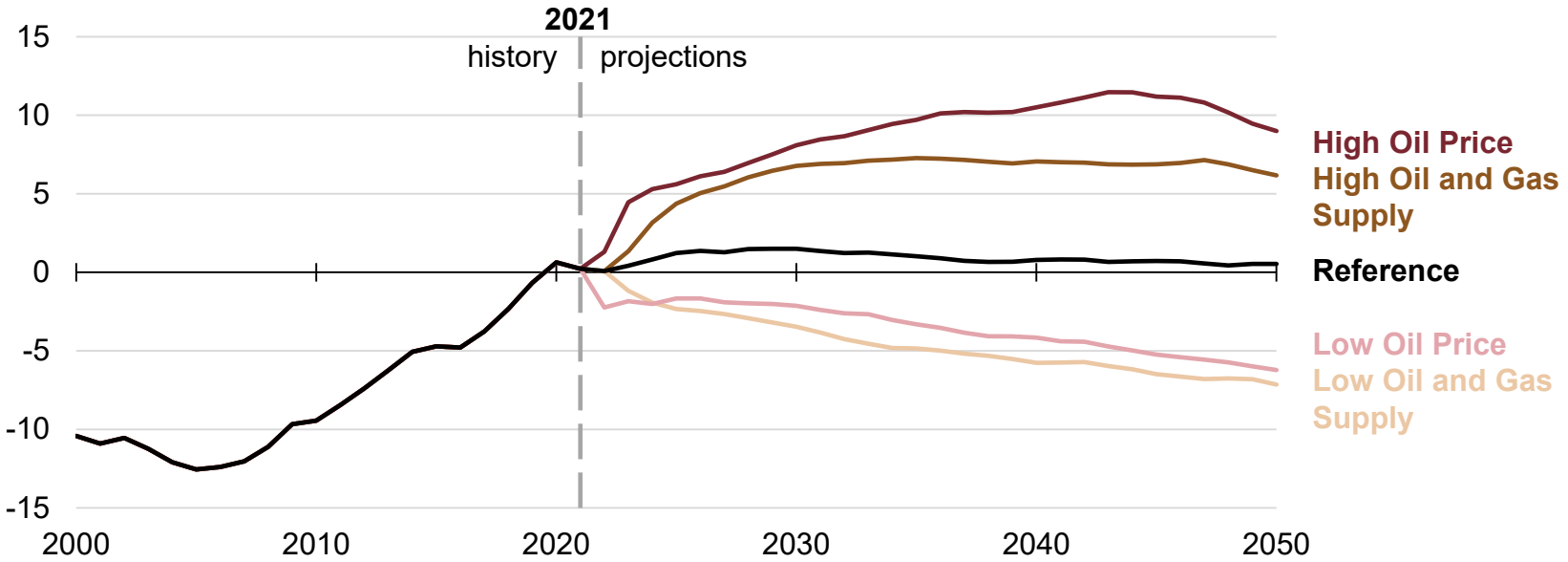


Crude oil trade
AEO2022 Reference case
million barrels per day



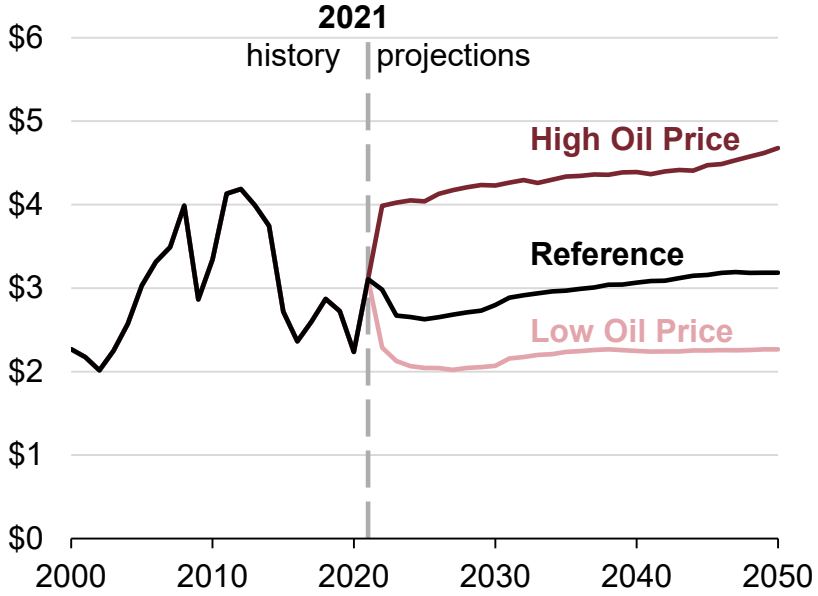
U.S. petroleum and other liquids trade

Petroleum and other liquids net exports
AEO2022 side cases
million barrels per day

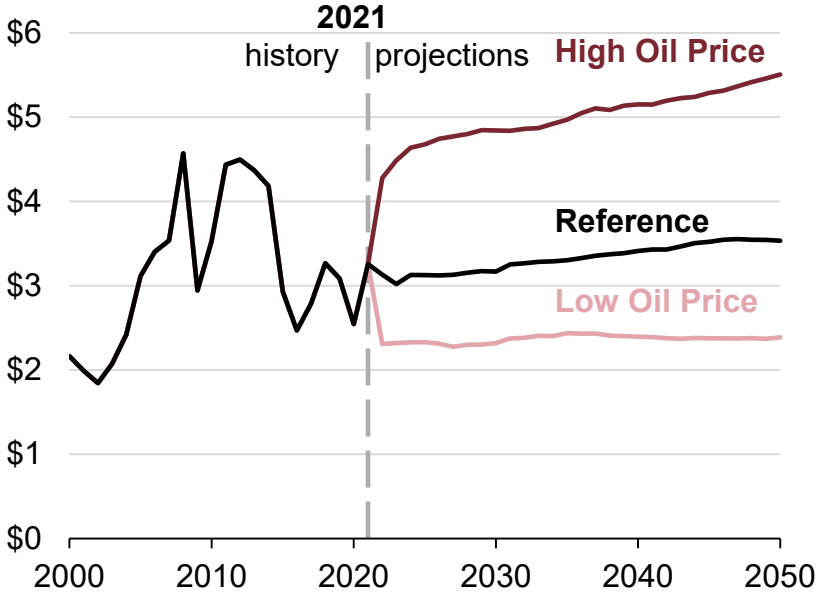


U.S. motor gasoline and diesel prices

Retail prices of motor gasoline
AEO2022 oil price cases
2021 dollars per gallon

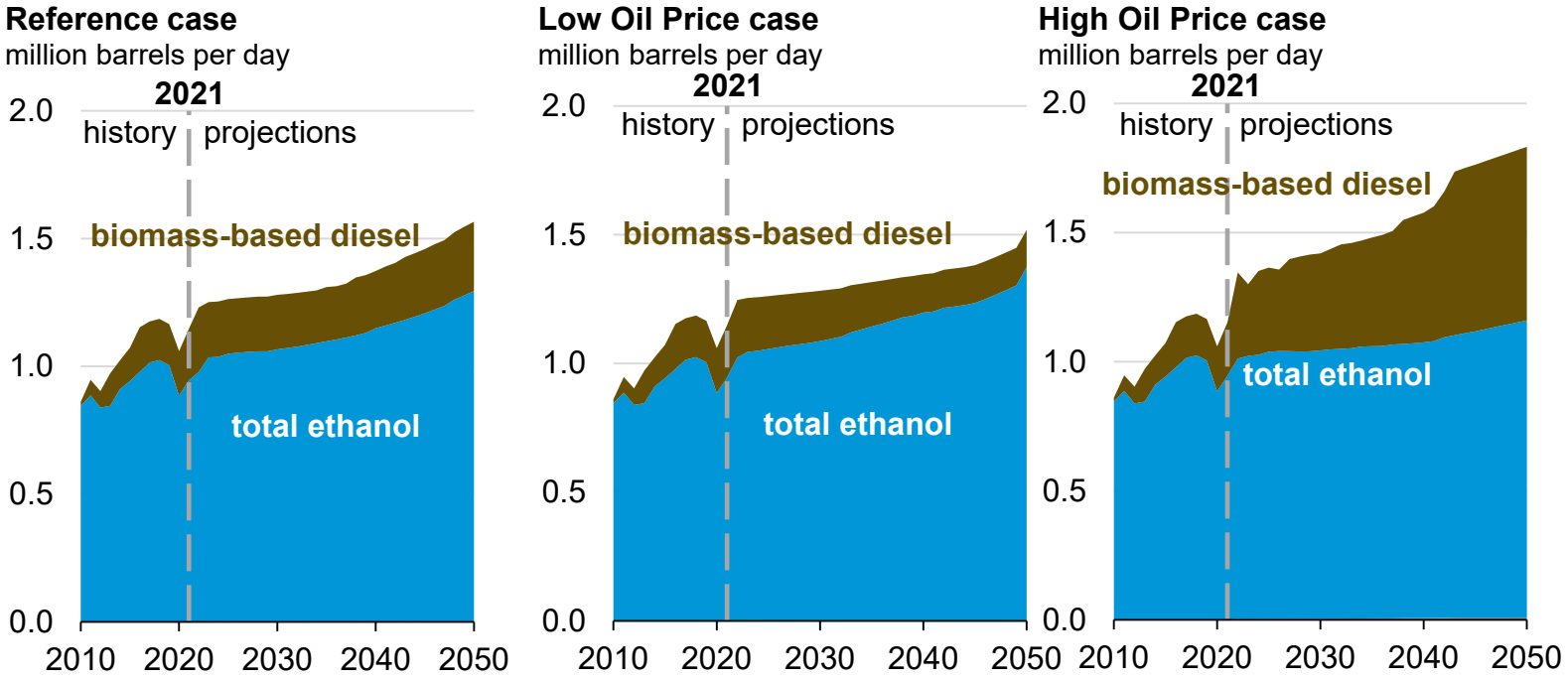


Retail prices of diesel
AEO2022 oil price cases
2021 dollars per gallon



U.S. biofuels production

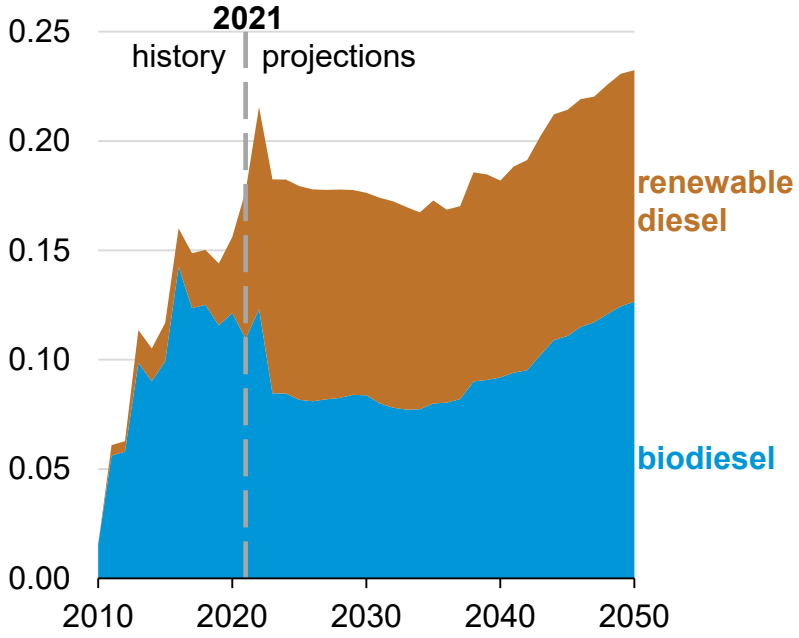
Biofuels production, AEO2022 oil price cases



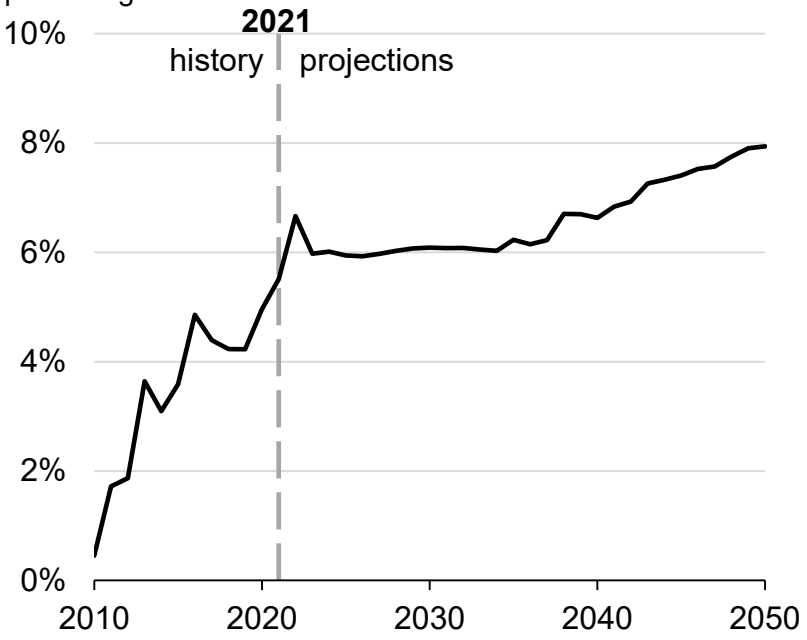
Note: Other biofuels make up less than 0.2% of biofuel production and are therefore not visible.

U.S. biomass-based diesel production

Biomass-based diesel production
AEO2022 Reference case
million barrels per day



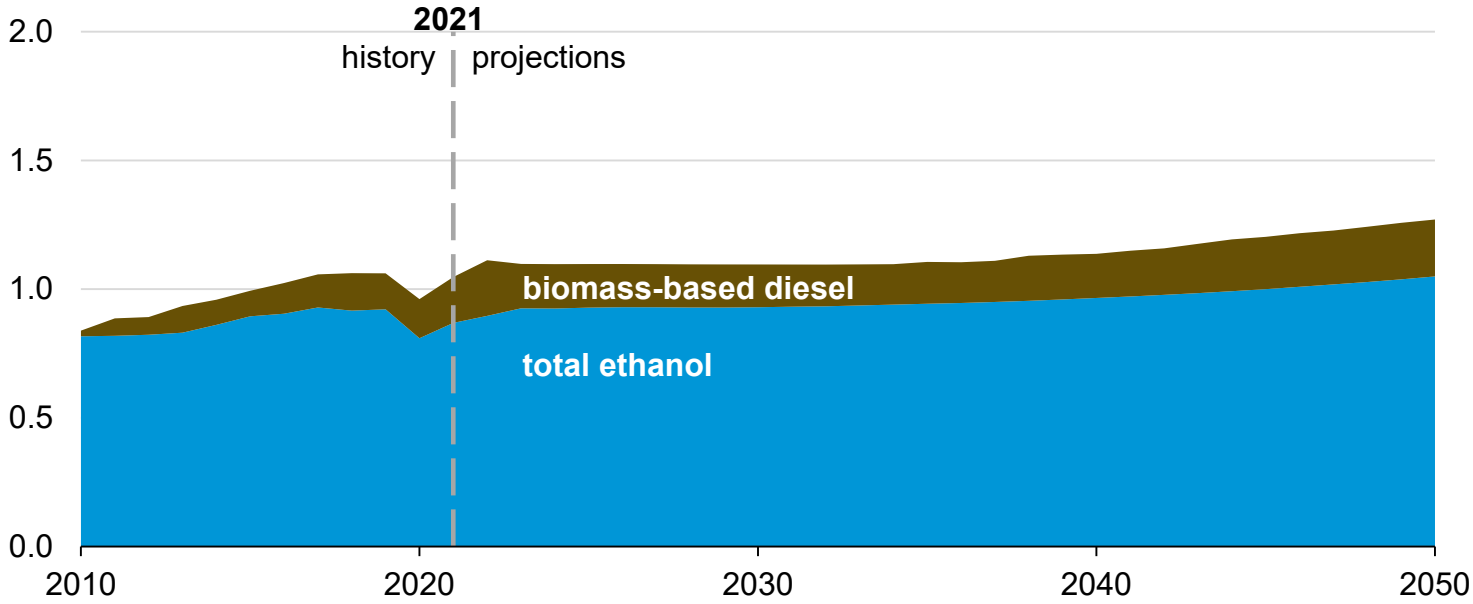
Biomass-based diesel production as a percentage of petroleum diesel production
AEO2022 Reference case
percentage



U.S. biofuels consumption

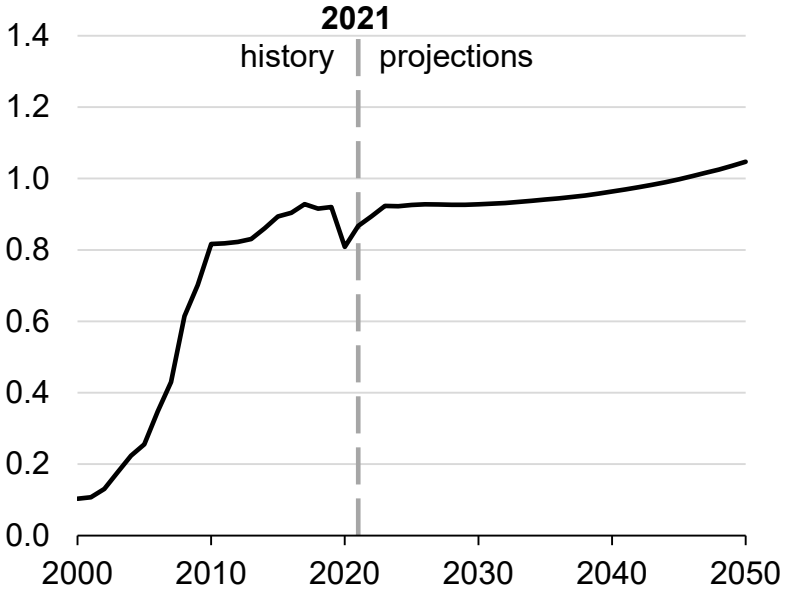
Energy-related biofuels consumptionAEO2022 Reference case

million barrels per day

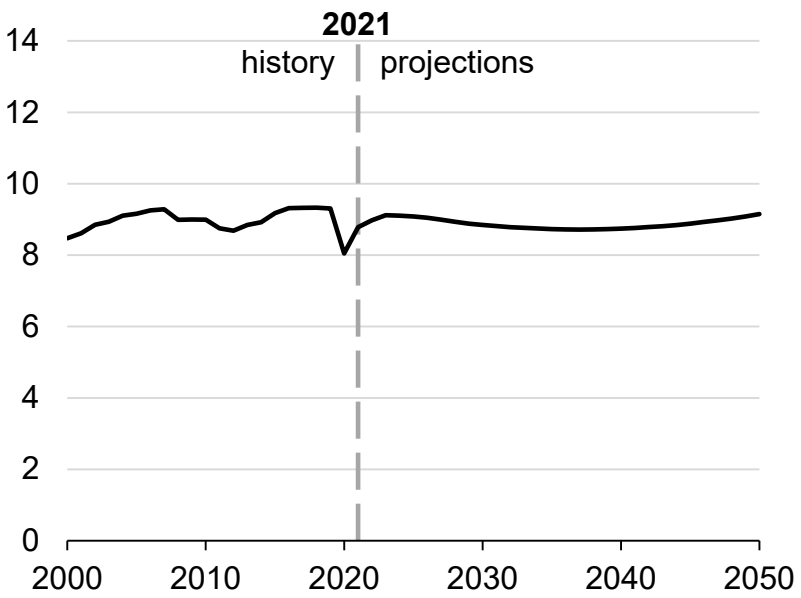


U.S. ethanol and motor gasoline consumption

U.S. ethanol consumption
AEO2022 Reference case
million barrels per day

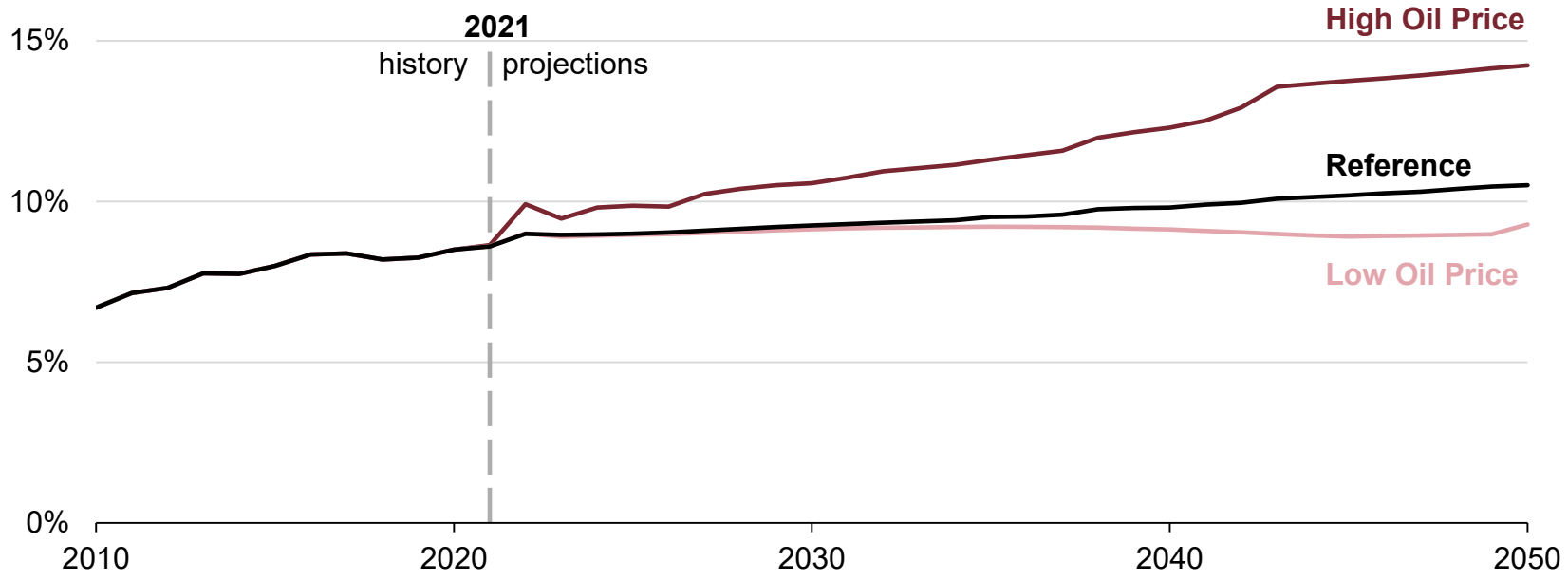


U.S. motor gasoline consumption
AEO2022 Reference case
million barrels per day



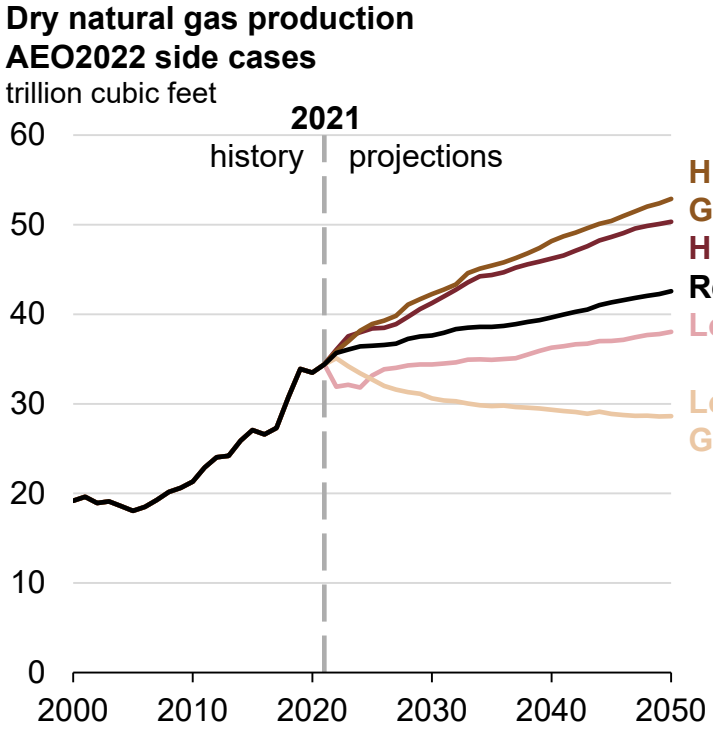
Biofuels as a percentage of U.S. motor gasoline and diesel consumption

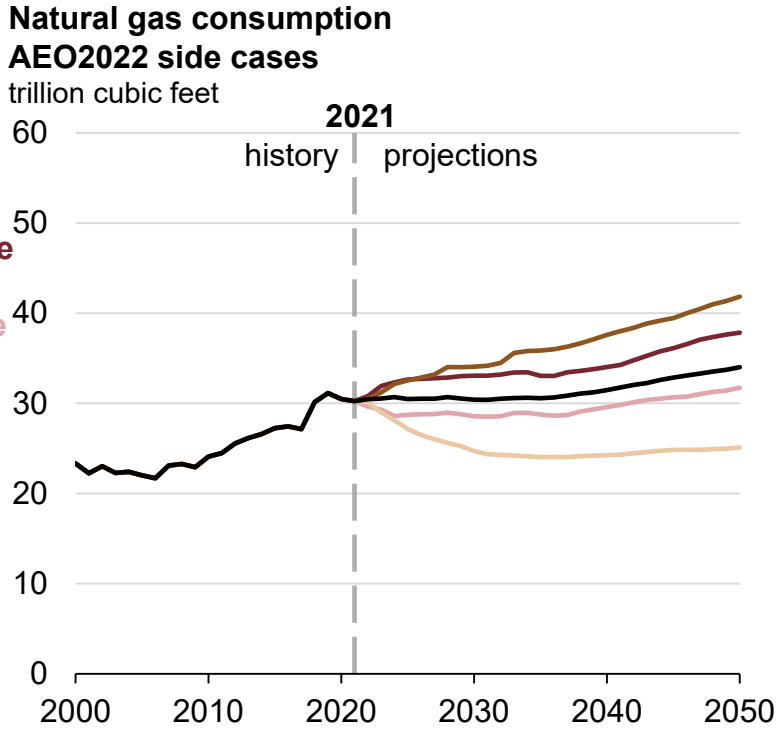
Biofuels percentage of gasoline and diesel consumption
AEO2022 oil price cases
percentage



Natural gas

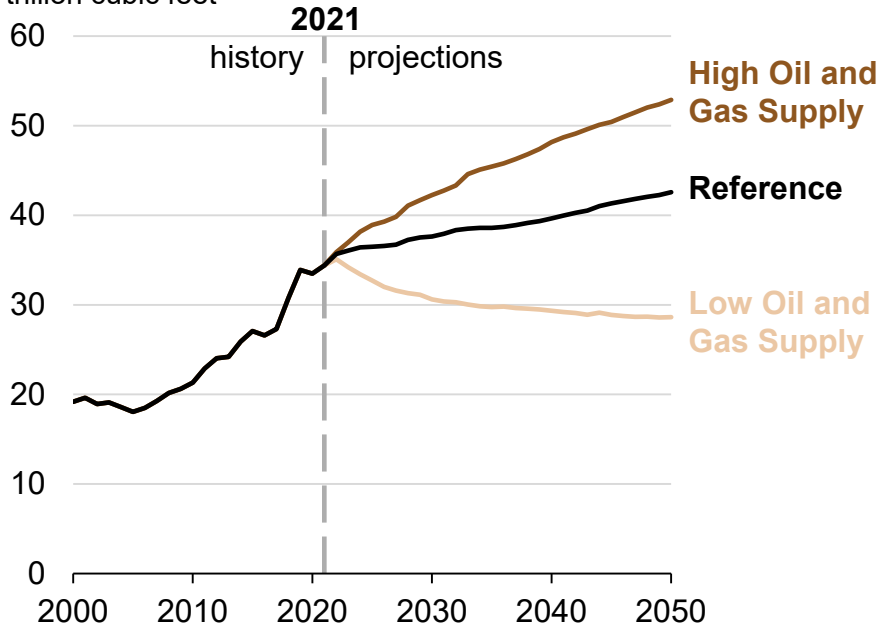
U.S. natural gas production and consumption



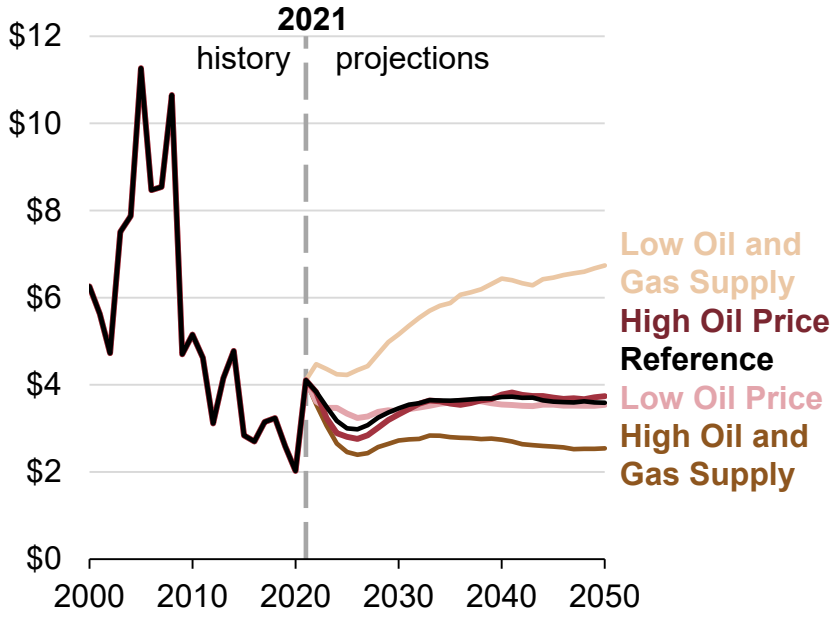


U.S. natural gas production and prices

U.S. dry natural gas production
AEO2022 oil and gas supply cases
trillion cubic feet

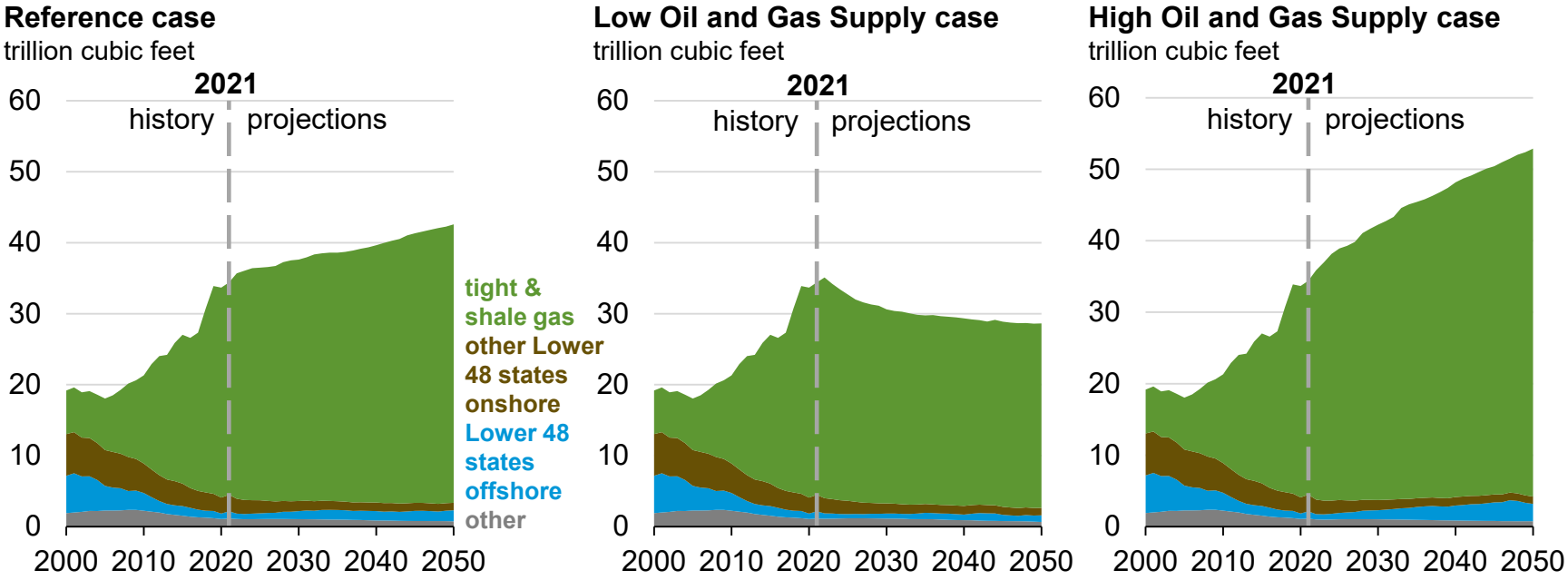


Natural gas spot price at Henry Hub
AEO2022 side cases
2021 dollars per million British thermal unit



U.S. dry natural gas production

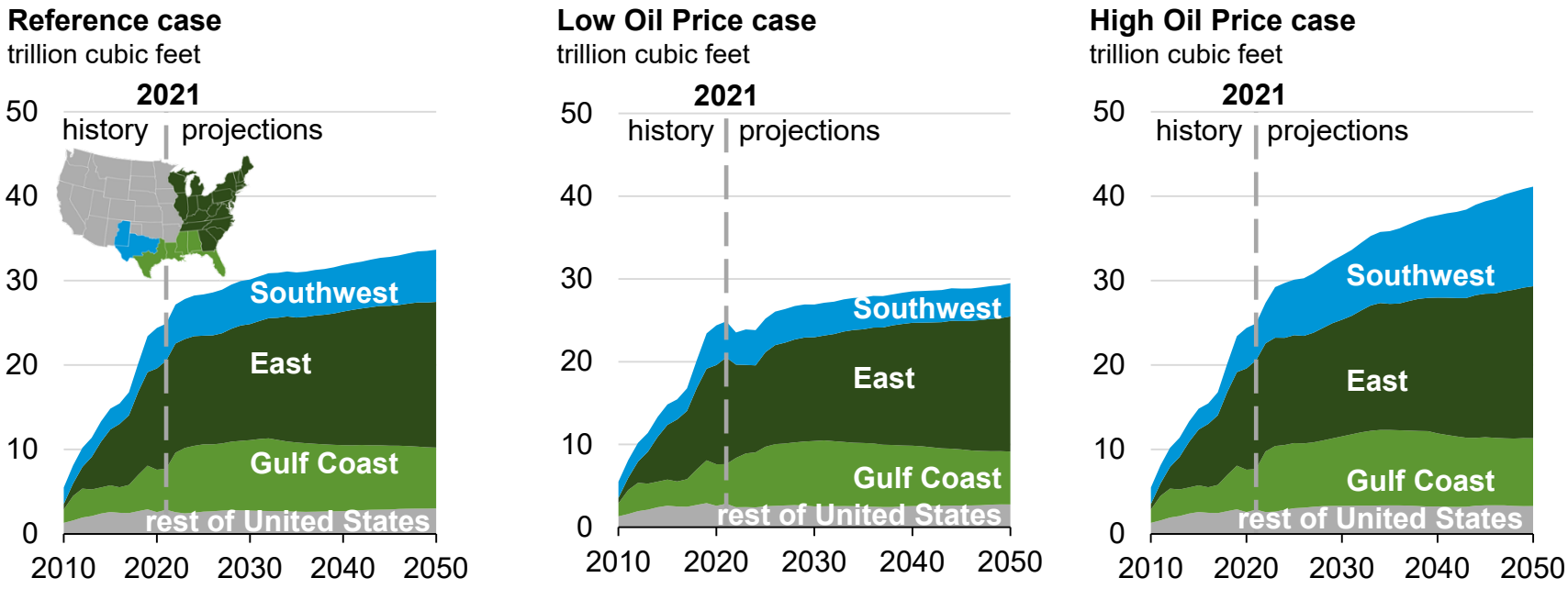
Dry natural gas production, AEO2022 oil and natural gas supply cases



Note: *Tight and shale* gas includes tight gas, shale gas, and natural gas from tight oil formations.

U.S. production of natural gas from shale resources by region

Dry natural gas production from shale resources, AEO2022 oil price cases

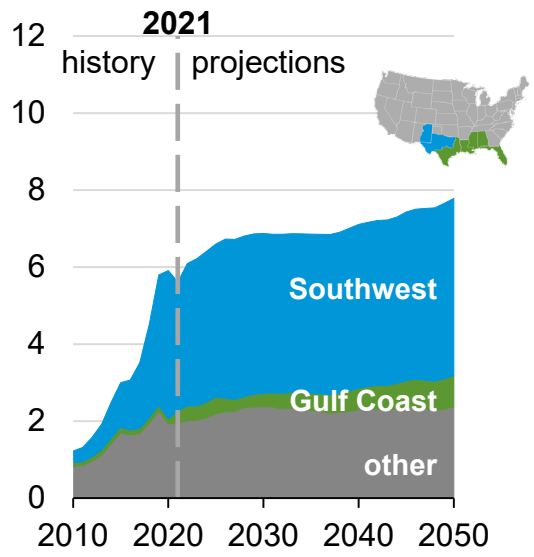


Note: *Shale resources* includes natural gas production from tight oil formations and excludes natural gas from tight gas formations.

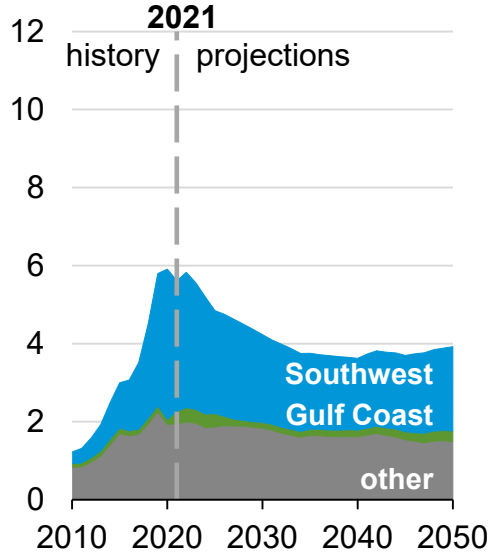
U.S. production of natural gas from oil formations

Dry natural gas production from oil formations, AEO2022 oil and gas supply cases

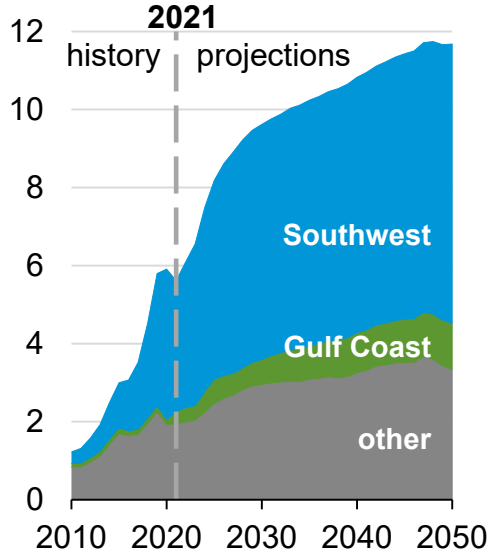
Reference case
trillion cubic feet



Low Oil and Gas Supply case
trillion cubic feet

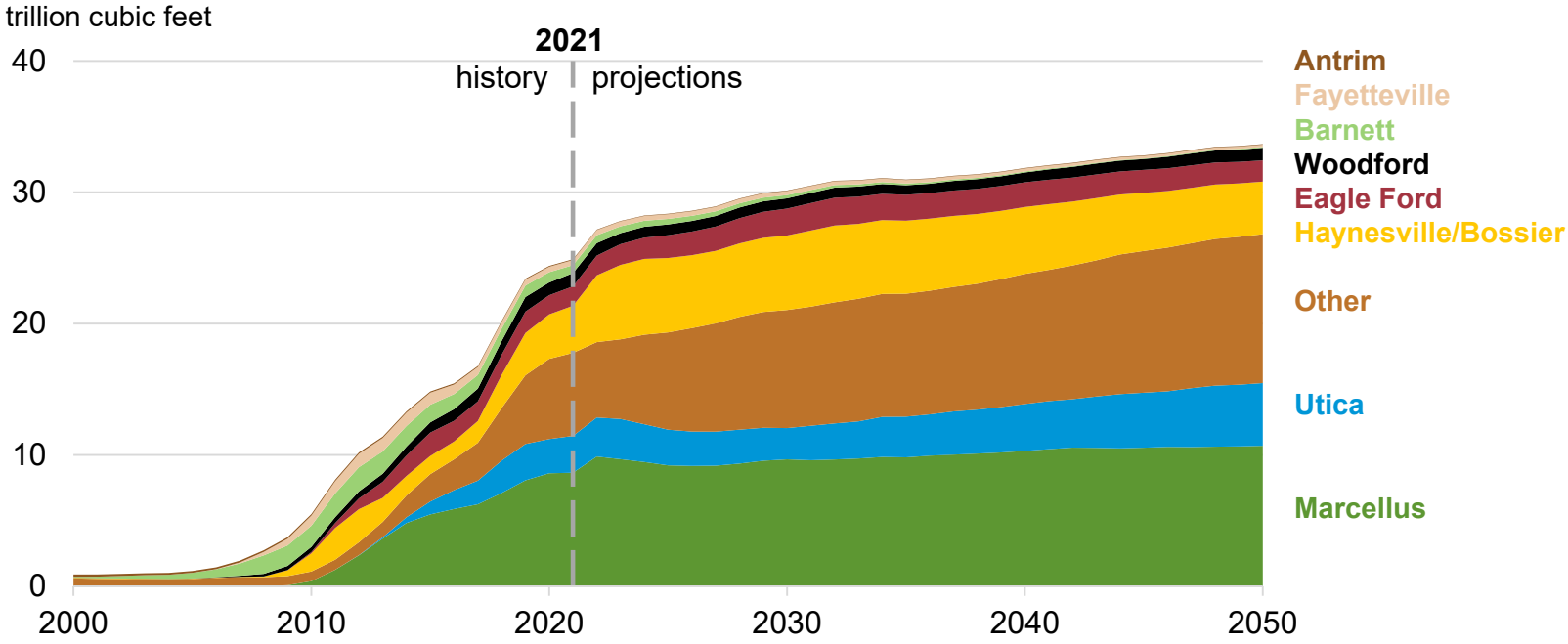


High Oil and Gas Supply case
trillion cubic feet



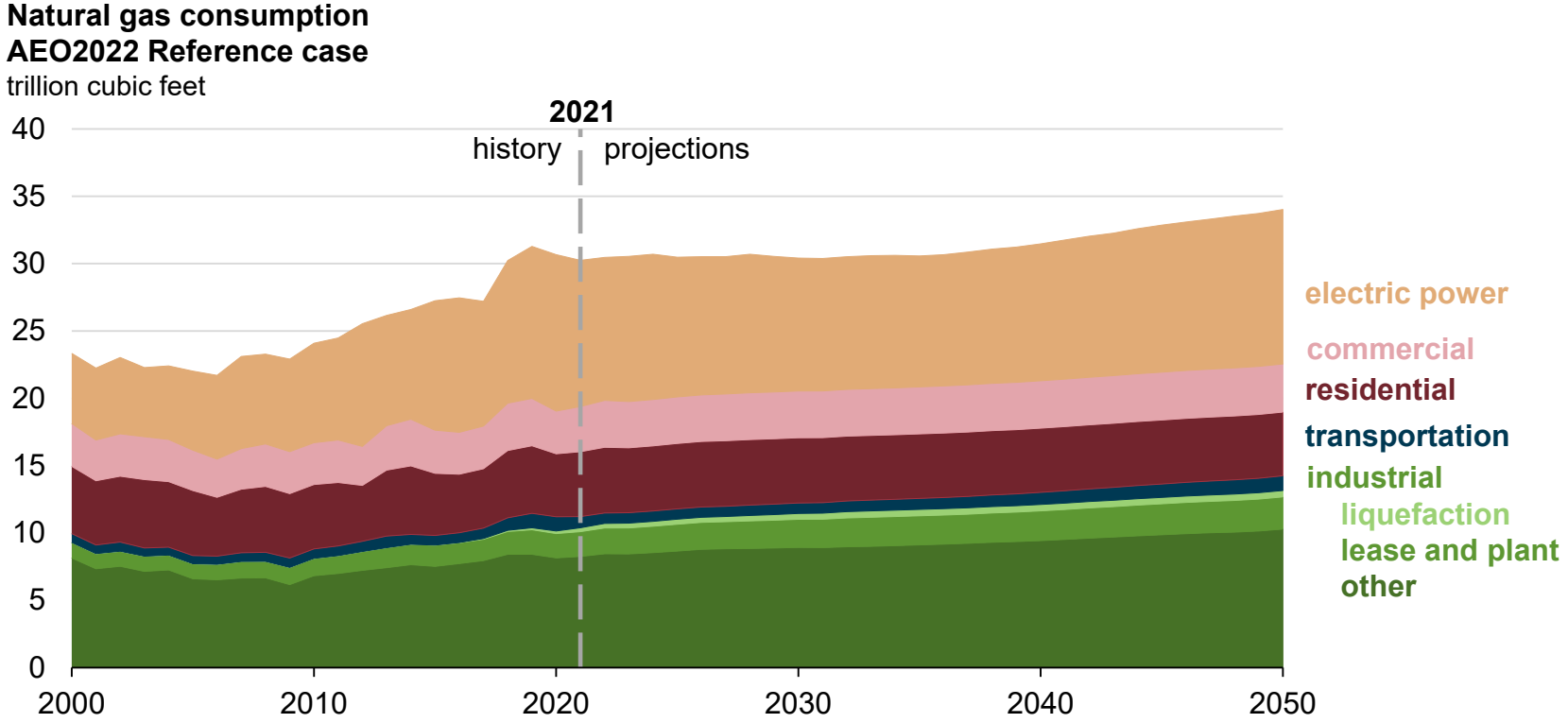
U.S. natural gas production from shale resources

Dry natural gas production by selected shale play



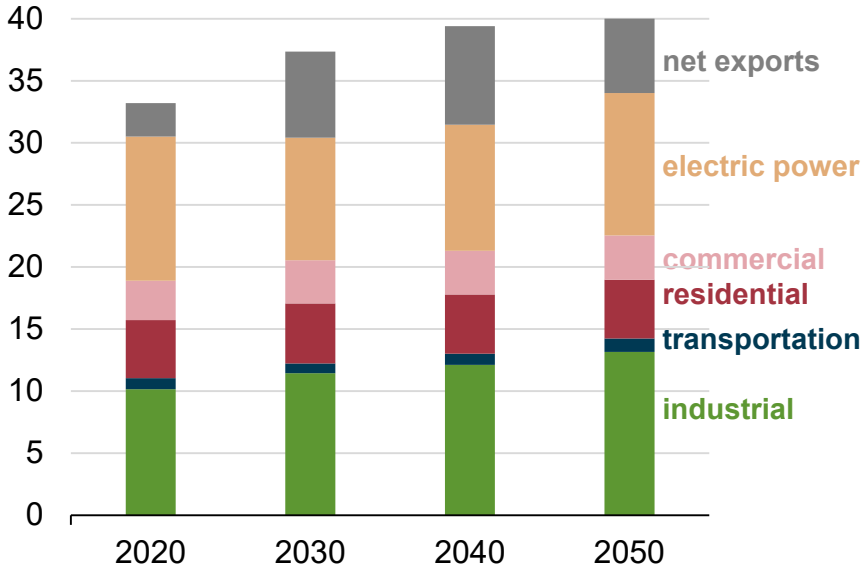
Note: *Other* includes natural gas production from other tight oil formations.

U.S. natural gas consumption by sector

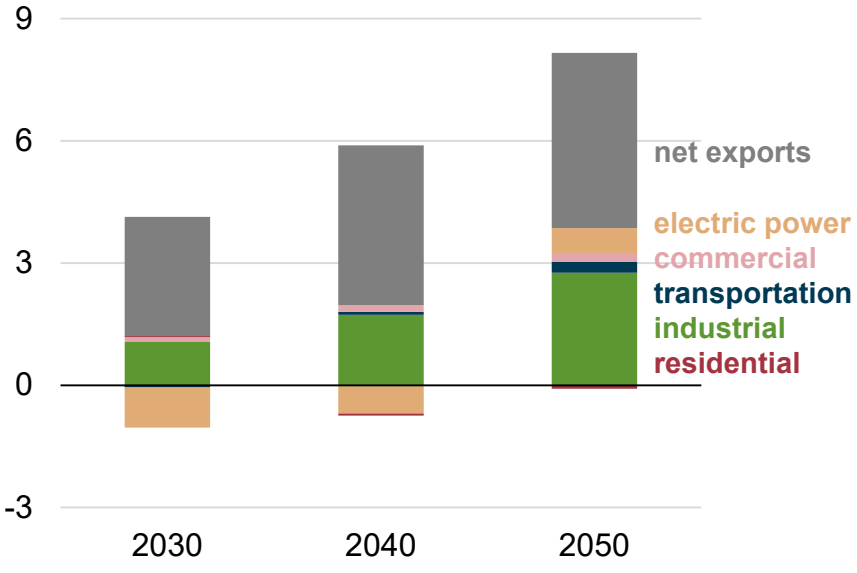


U.S. natural gas disposition by sector

Natural gas disposition and net exports
AEO2022 Reference case
trillion cubic feet

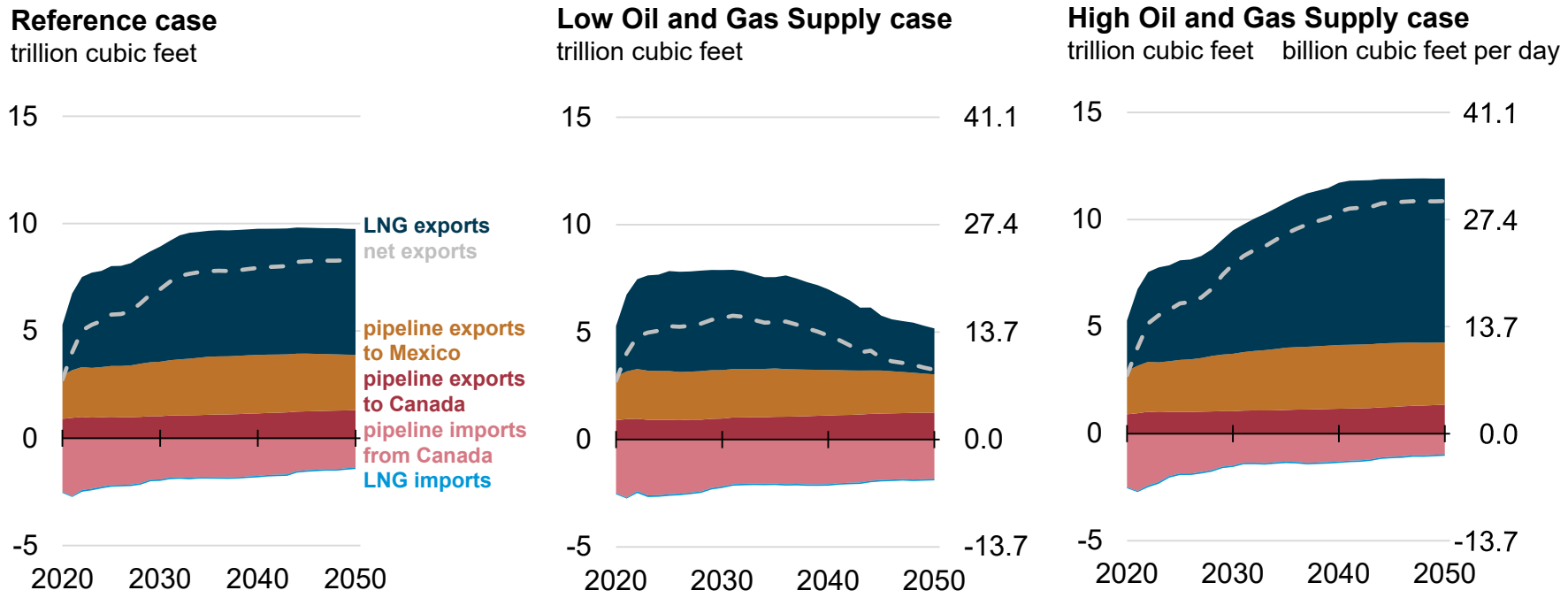


Change in natural gas disposition and net exports
AEO2022 Reference case
relative to 2021 in trillion cubic feet



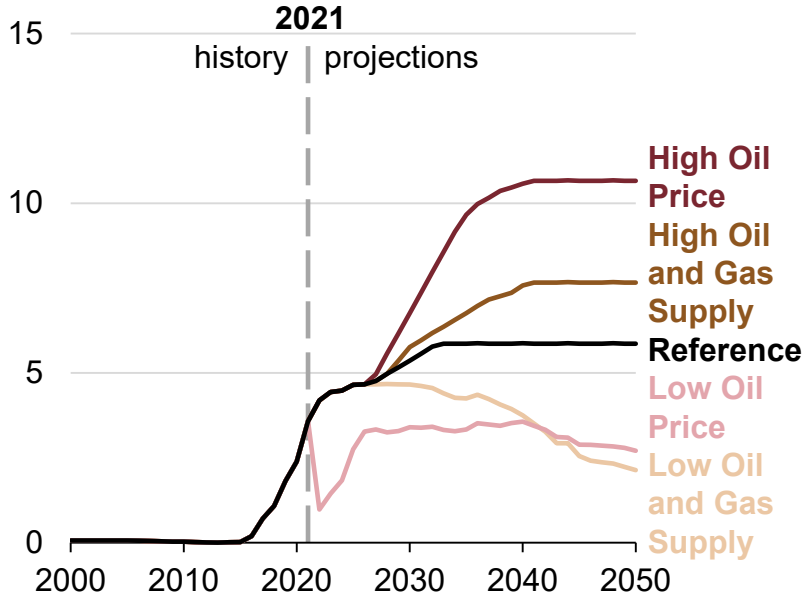
U.S. natural gas and liquefied natural gas (LNG) trade

Natural gas trade, AEO2022 oil and natural gas supply cases

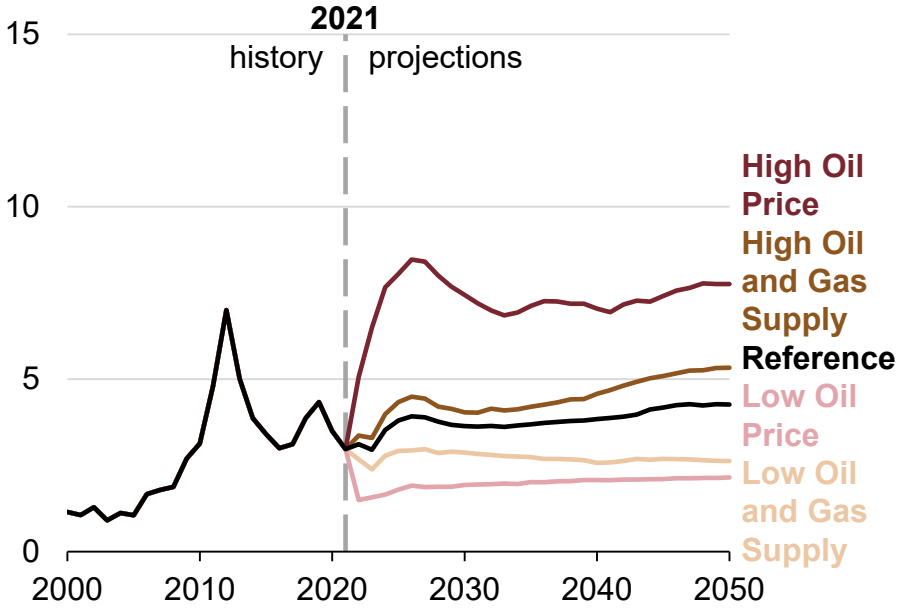


U.S. liquefied natural gas (LNG) exports and oil and natural gas prices

LNG exports
AEO2022 supply and price cases
trillion cubic feet



Ratio of Brent crude oil price to natural gas price at Henry Hub, AEO2022 supply and price cases
energy-equivalent terms

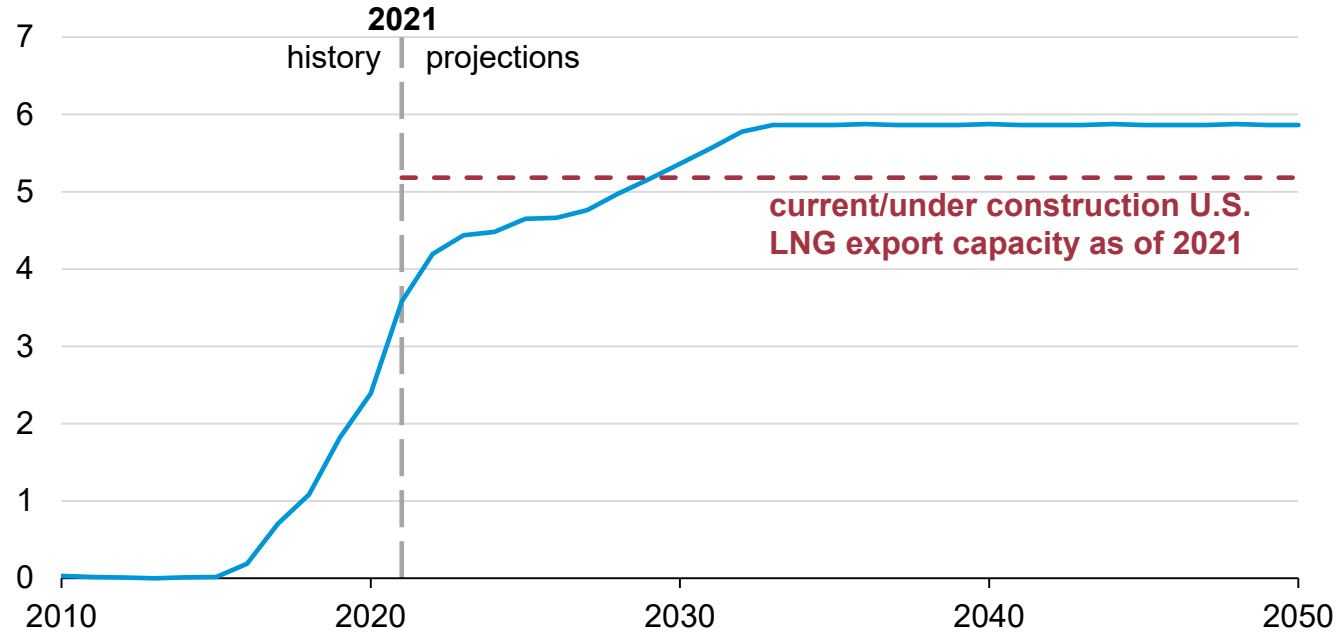


U.S. liquefied natural gas exports and export capacity

Liquefied natural gas (LNG) exports and capacity

AEO2022 Reference case

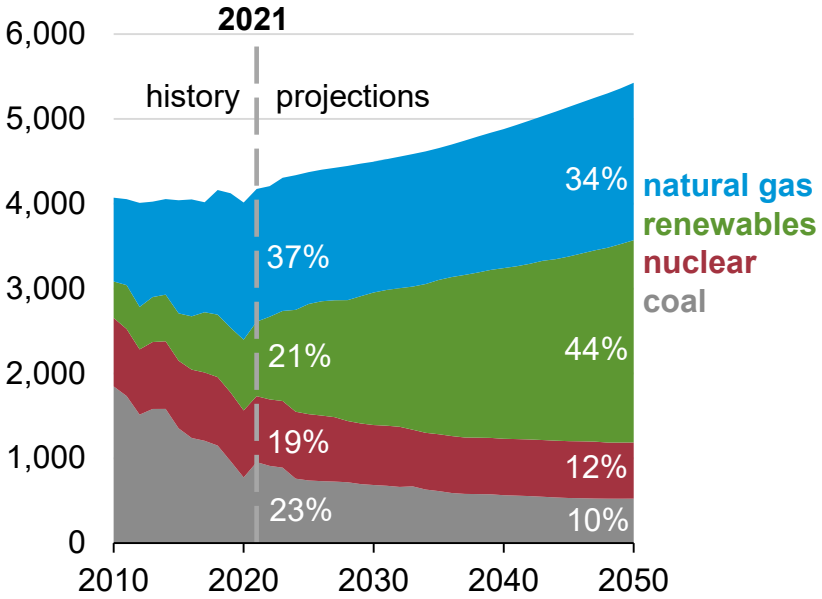
trillion cubic feet



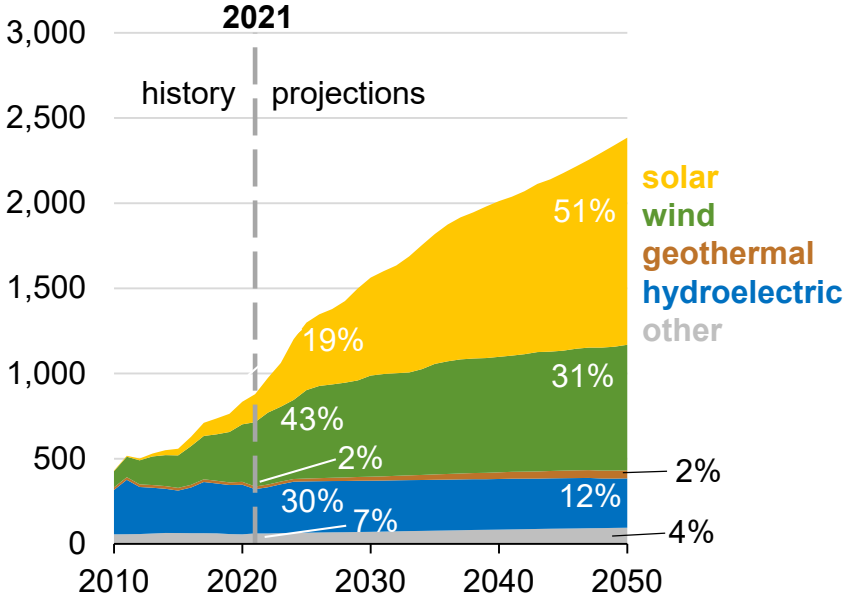
Electricity

U.S. electricity generation and shares from selected fuels and renewable sources

U.S. electricity generation from selected fuels
AEO2022 Reference case
billion kilowatthours

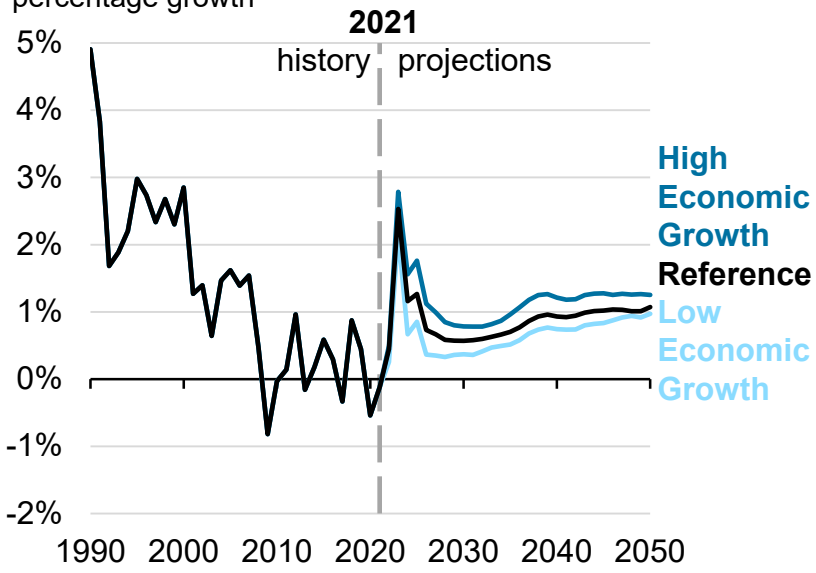


U.S. renewable electricity generation, including end use
AEO2022 Reference case
billion kilowatthours

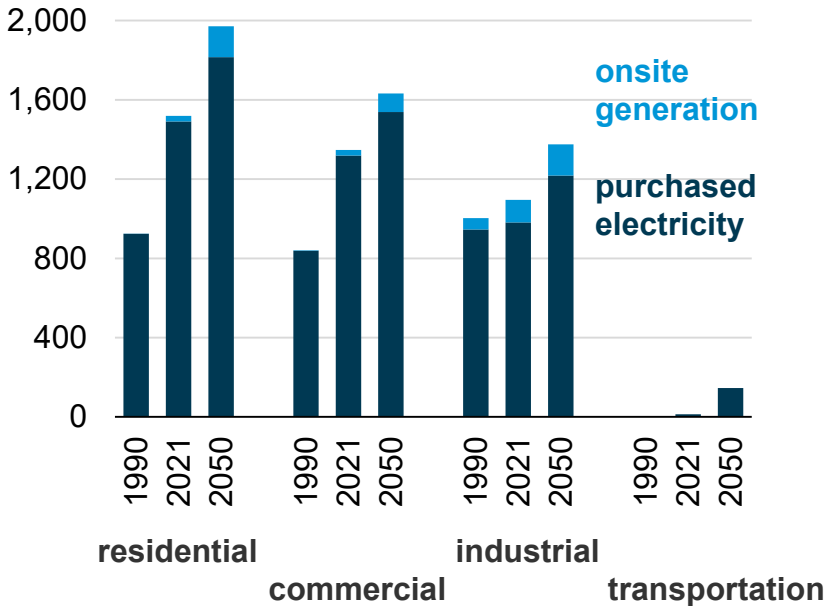


U.S. electricity demand

U.S. electricity use growth rate, three-year rolling average
AEO2022 economic growth cases
percentage growth



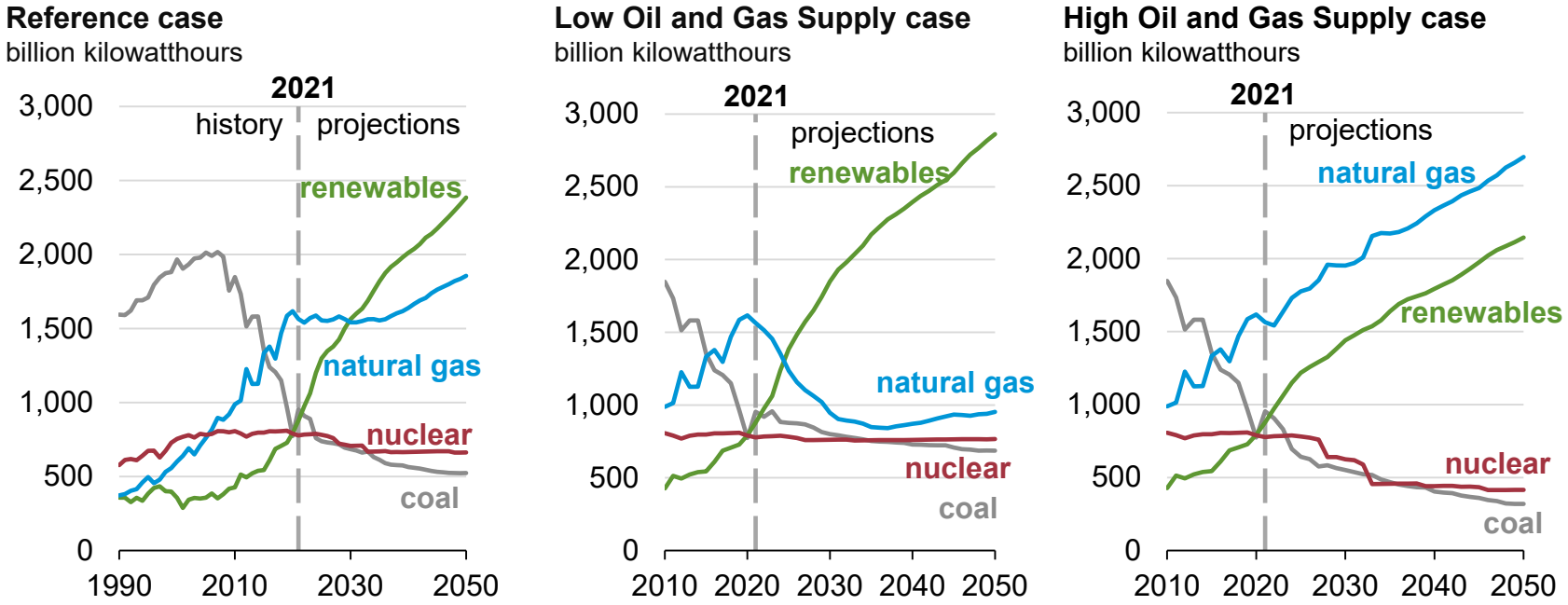
U.S. electricity use by end-use sector
AEO2022 Reference case
billion kilowatthours



Note: Onsite generation is electricity produced onsite for own use.

U.S. electricity generation levels from selected fuels and renewable sources

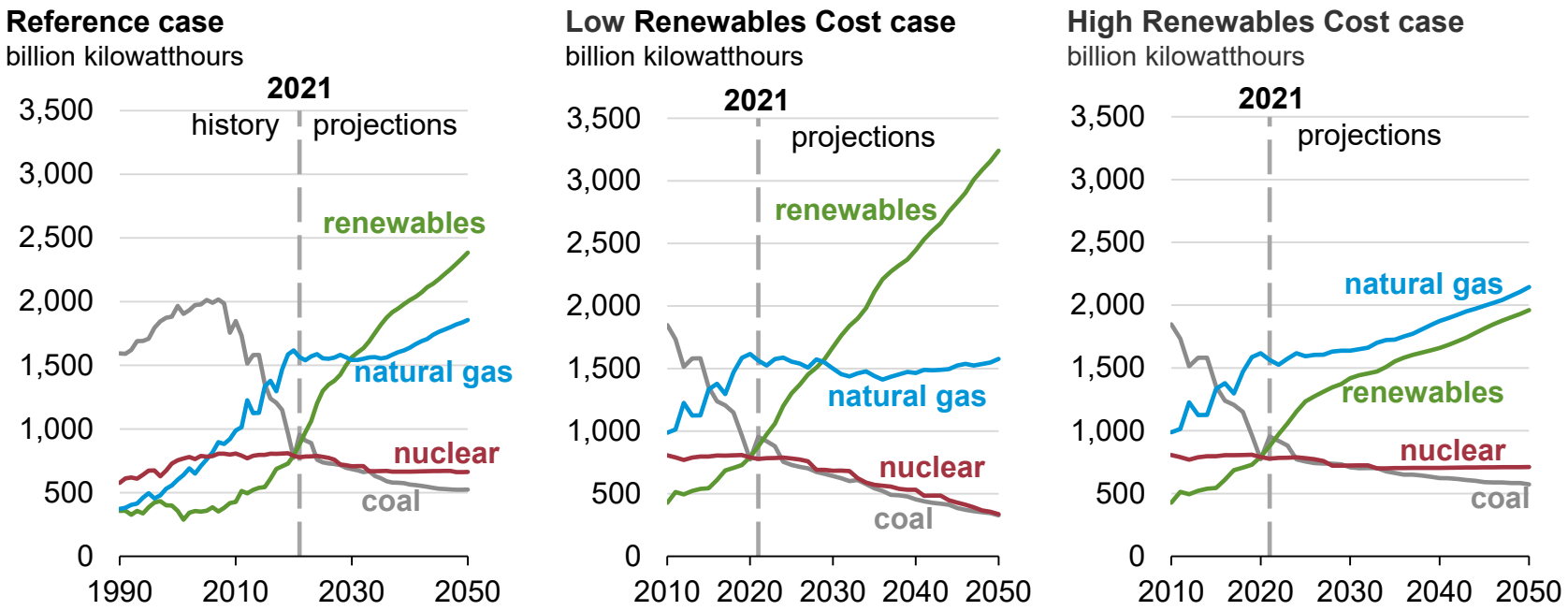
U.S. electricity generation, AEO2022 oil and gas supply cases



Note: Renewables category includes electricity generation from wind, solar, hydroelectric, geothermal, wood, and other biomass sources.

U.S. electricity generation levels from selected fuels and renewable sources

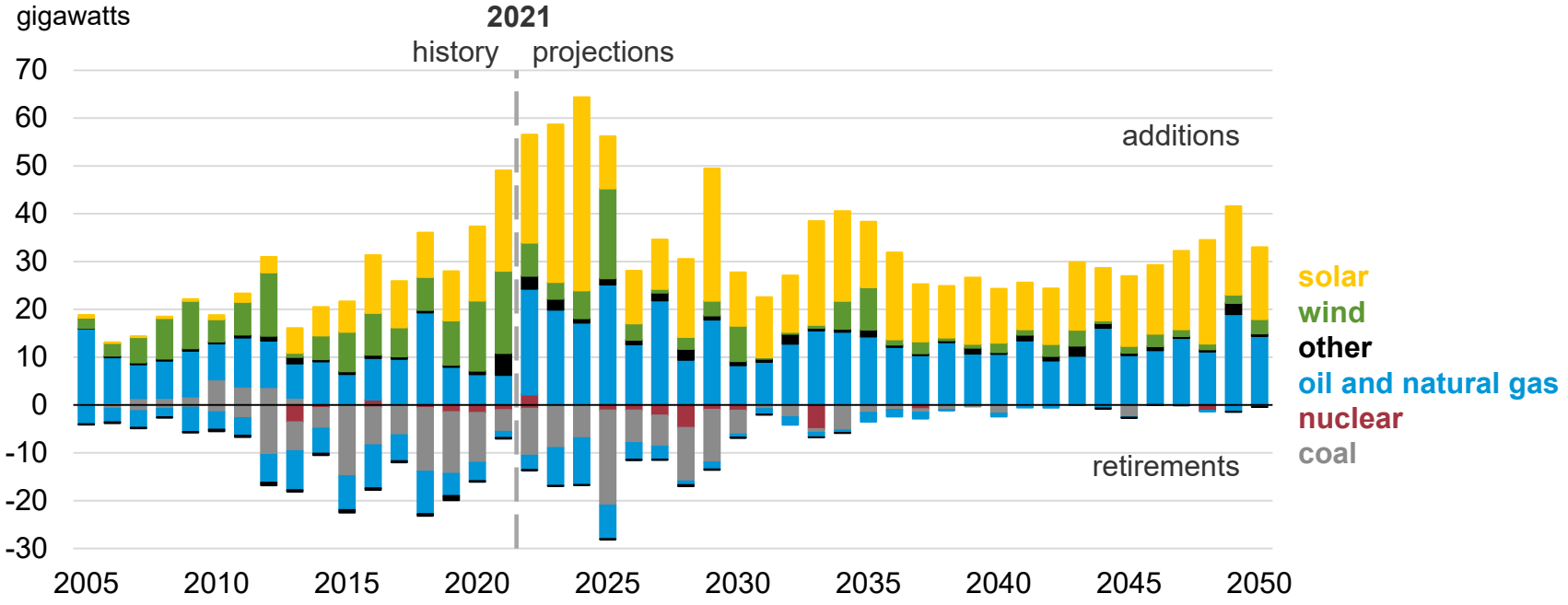
U.S. electricity generation, AEO2022 renewables cost cases



Note: Renewables category includes electricity generation from wind, solar, hydroelectric, geothermal, wood, and other biomass sources.

U.S. retiring and new generating capacity

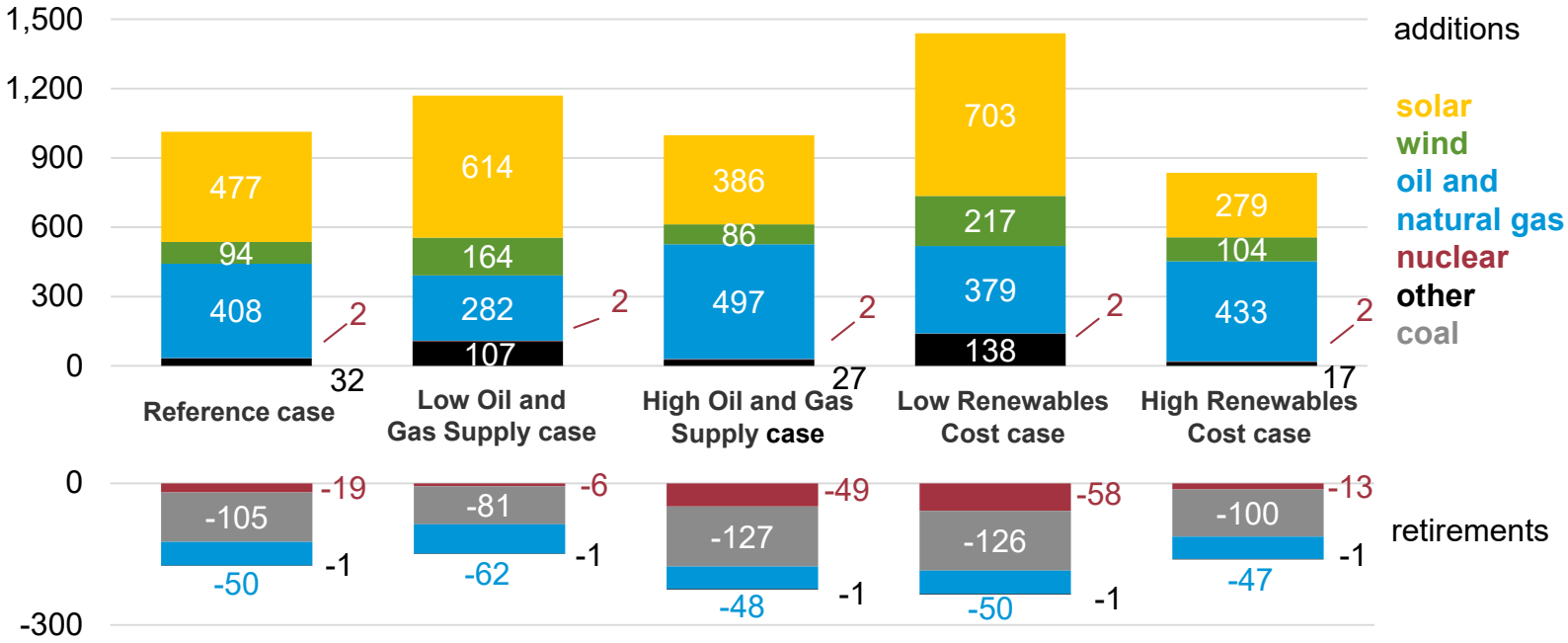
Annual electricity generating capacity additions and retirements
AEO2022 Reference case



Source: Form EIA-860M, *Monthly Update to the Annual Electric Generator Report*, August 2021

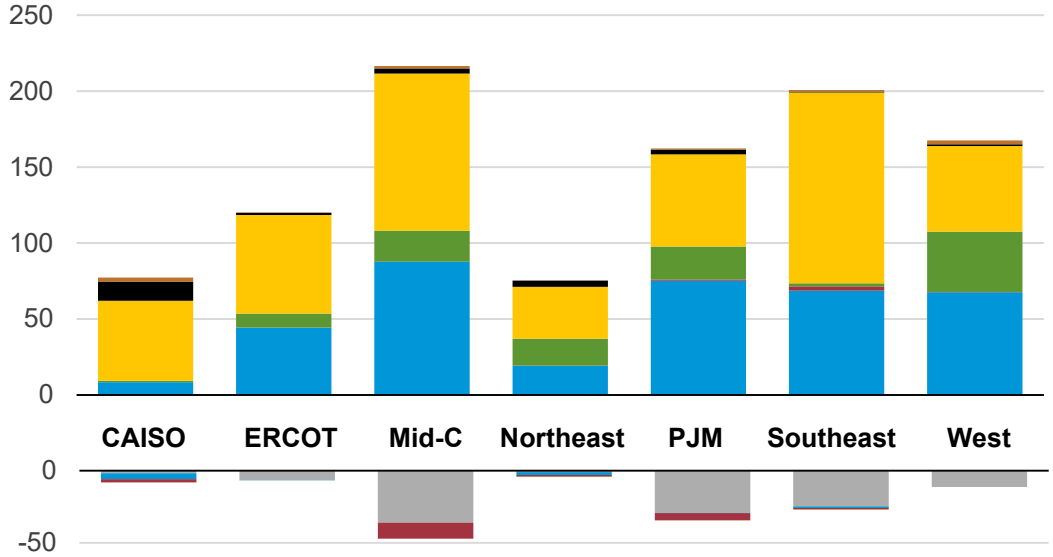
U.S. cumulative retiring and new generating capacity

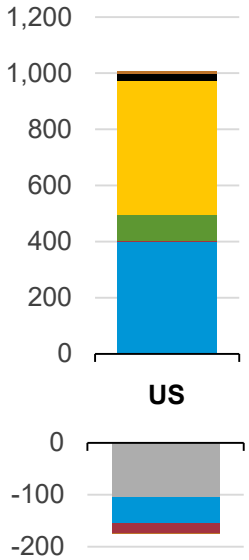
Cumulative electricity generating capacity additions and retirements (2022–2050)
AEO2022 selected cases
gigawatts

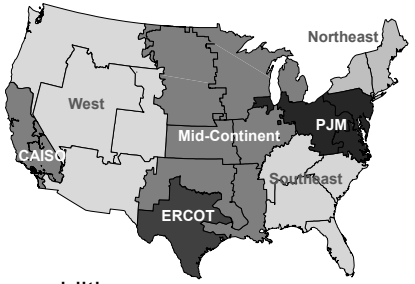


Regional cumulative capacity additions and retirements

Regional cumulative electricity generating capacity additions and retirements (2021–2050)
AEO2022 Reference case
gigawatts







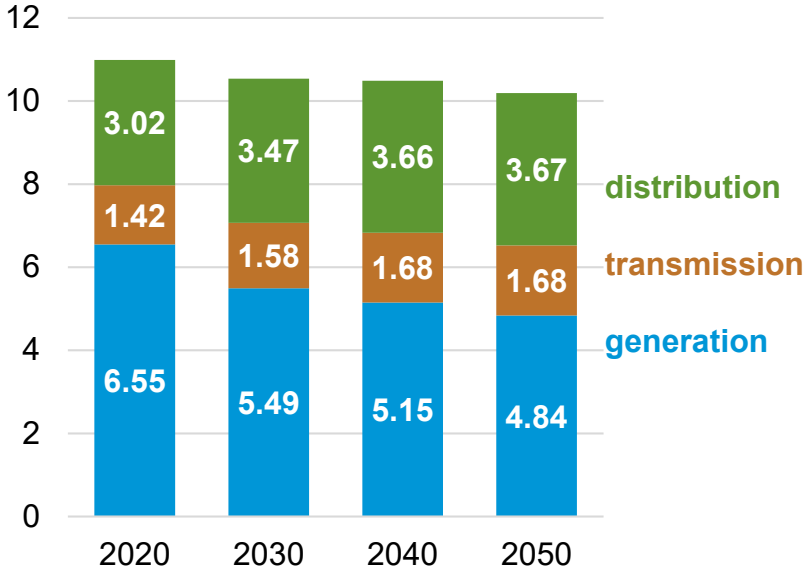
additions

other
diurnal storage
solar
wind
nuclear
oil & gas
coal

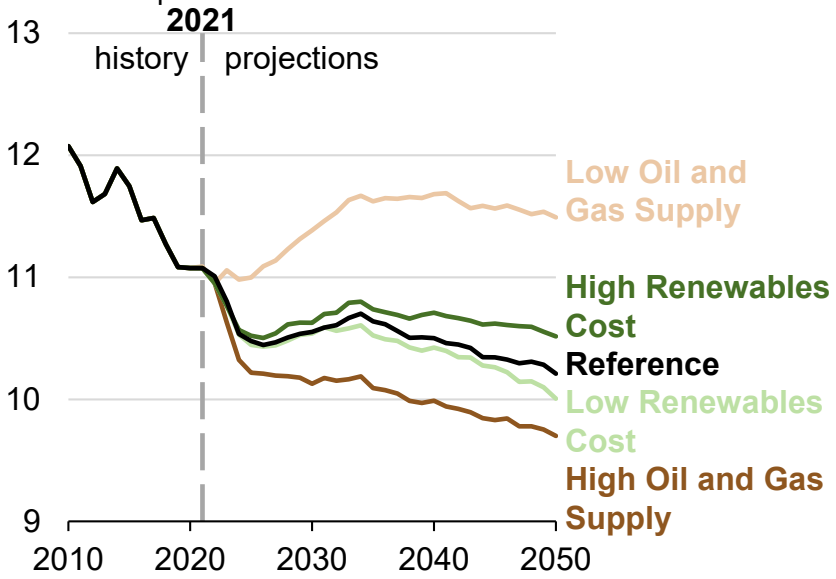
retirements

Electricity prices by components and long-term average electricity prices

Components of U.S. Electricity Prices
AEO2022 Reference case
2021 cents per kilowatthour

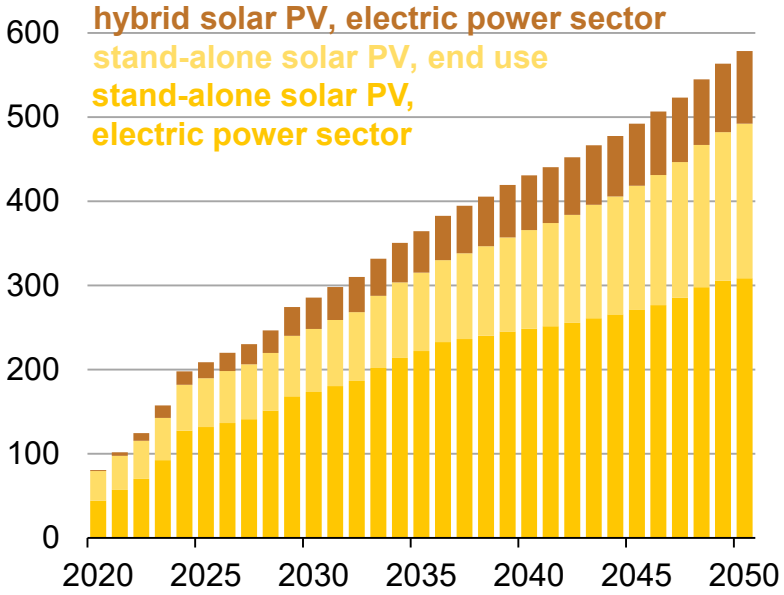


U.S. average electricity price
AEO2022 selected cases
2021 cents per kilowatthour

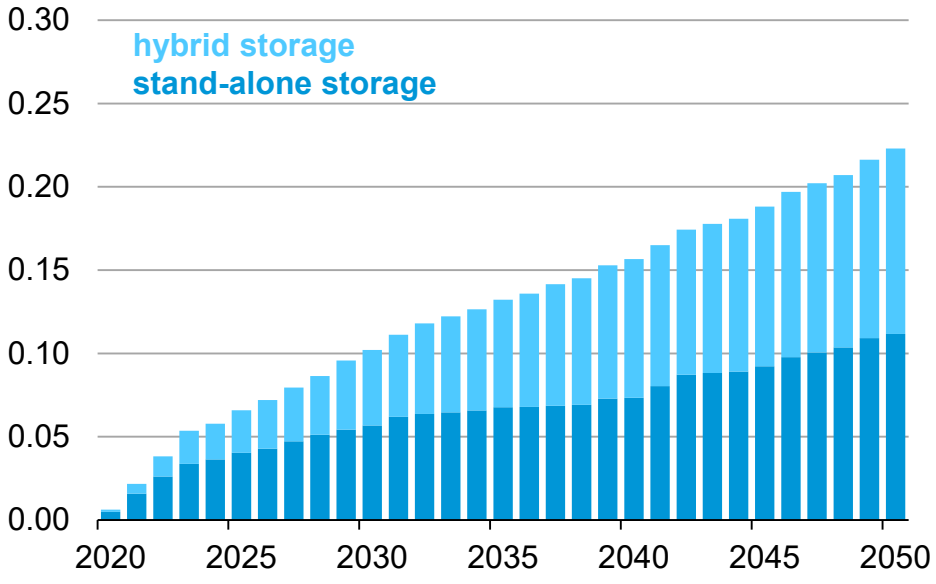


Hybrid versus stand-alone solar PV and energy storage systems

U.S. solar photovoltaic (PV) generating capacity, all sectors
AEO2022 Reference case
gigawatts

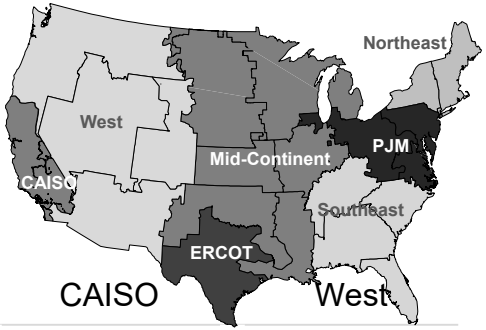


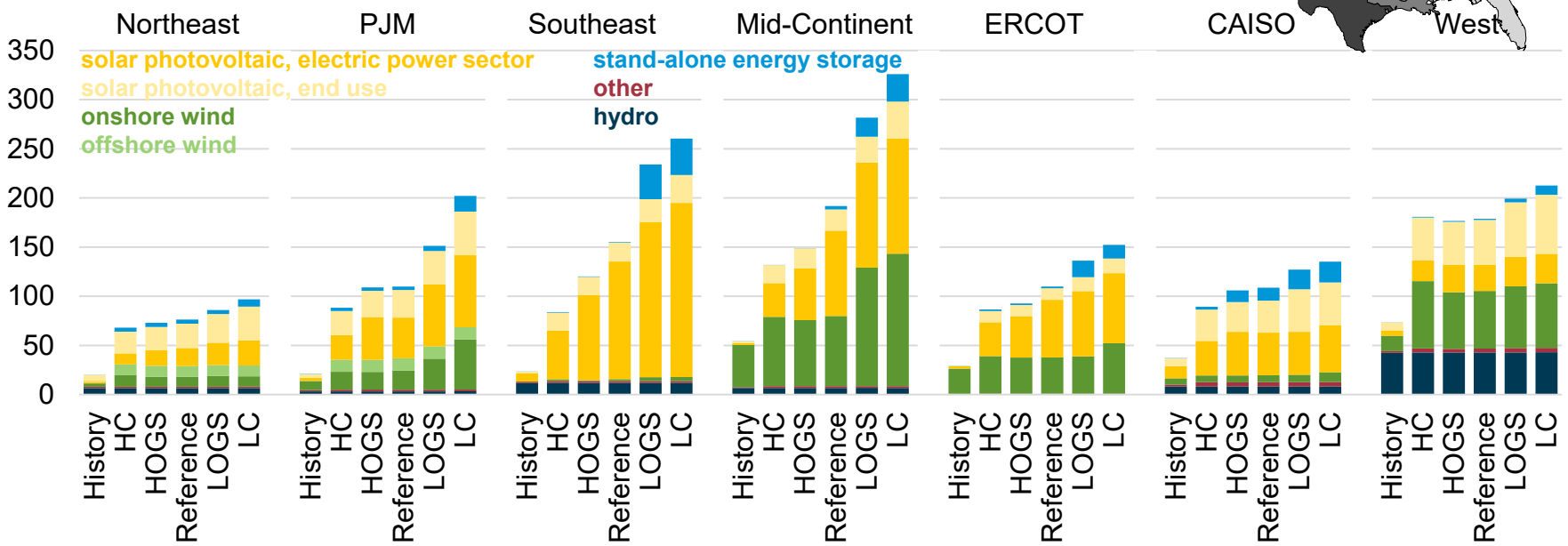
U.S. storage energy capacity, electric power sector
AEO2022 Reference case
billion kilowatthours



Renewable capacity by source and region

Total renewables capacity in all sectors, 2019 (history) and 2050
AEO2022 selected side cases
gigawatts



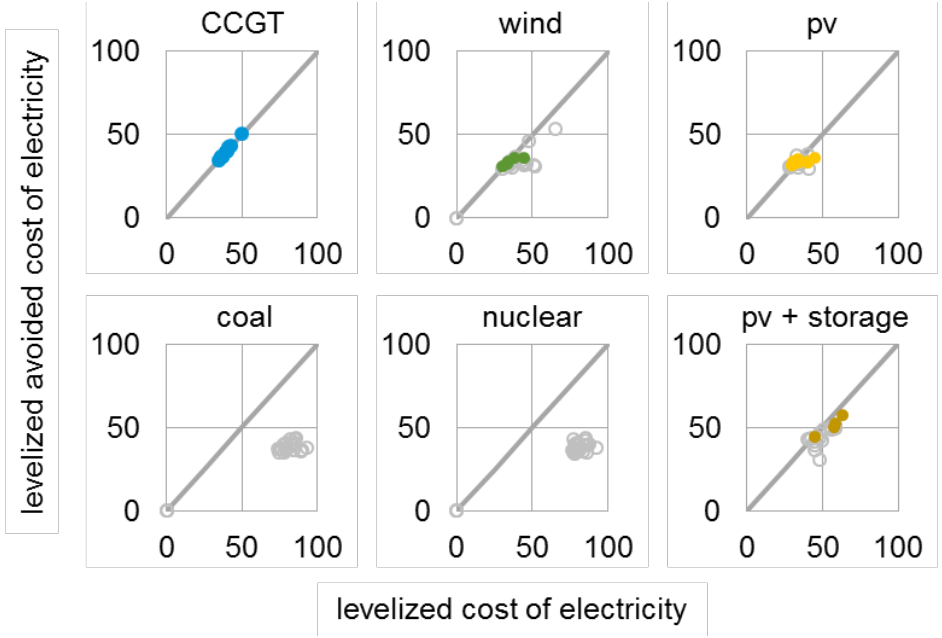


HC = High Renewable Cost; LC = Low Renewable Cost; HOGS = High Oil & Gas Supply; LOGS = Low Oil & Gas Supply; other = geothermal, biomass, municipal waste

Economic cost competitiveness of generating technologies

Levelized avoided cost of electricity (LACE) and levelized cost of electricity (LCOE) by technology, 2027 online year, AEO2022 Reference case

2021 dollars per megawatthour



- ● regions with built capacity
- ○ regions with no built capacity

Economically attractive builds are shown above the diagonal breakeven line for each technology.

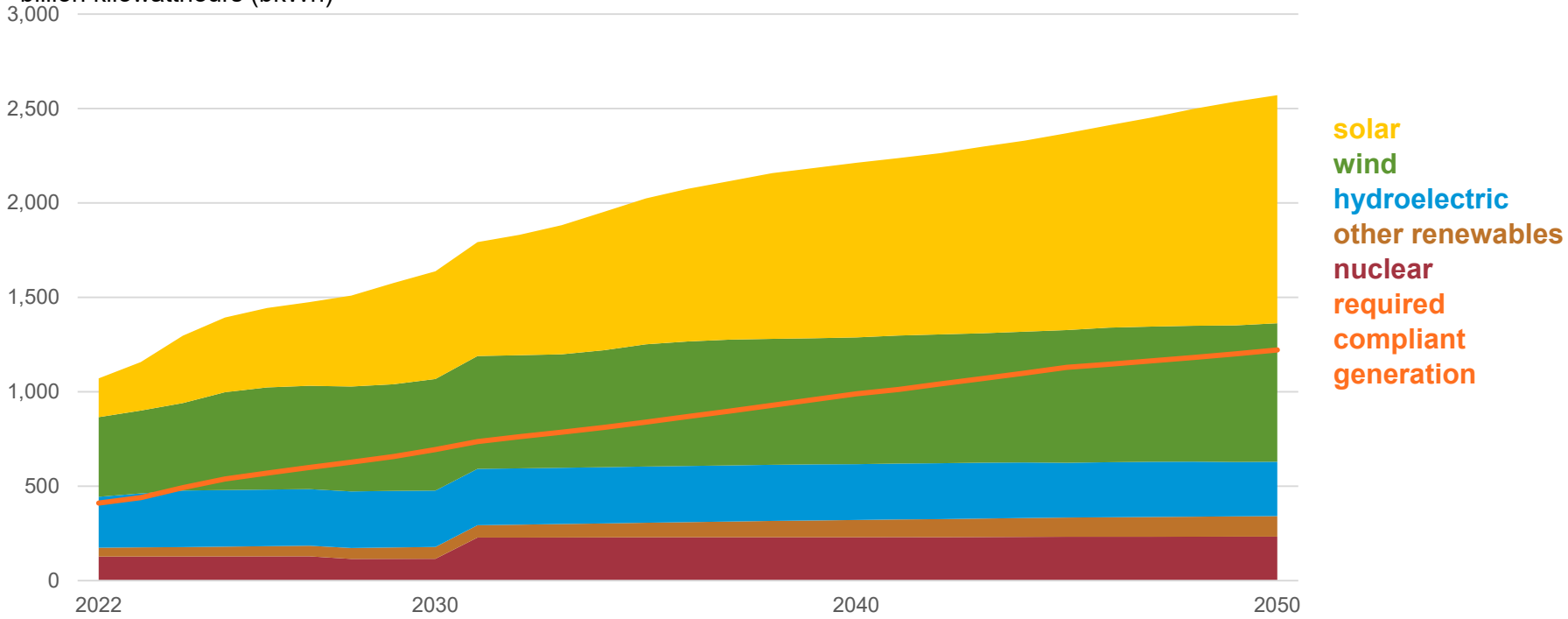
The solid, colored circles on the figure indicate that projects tend to be built in regions where revenue (LACE) exceeds costs (LCOE).

CCGT = natural gas combined cycle, PV = solar photovoltaic

U.S. renewable portfolio standards

Total qualifying carbon-free generation required for combined state renewable portfolio and projected total generation from technologies, 2022–2050

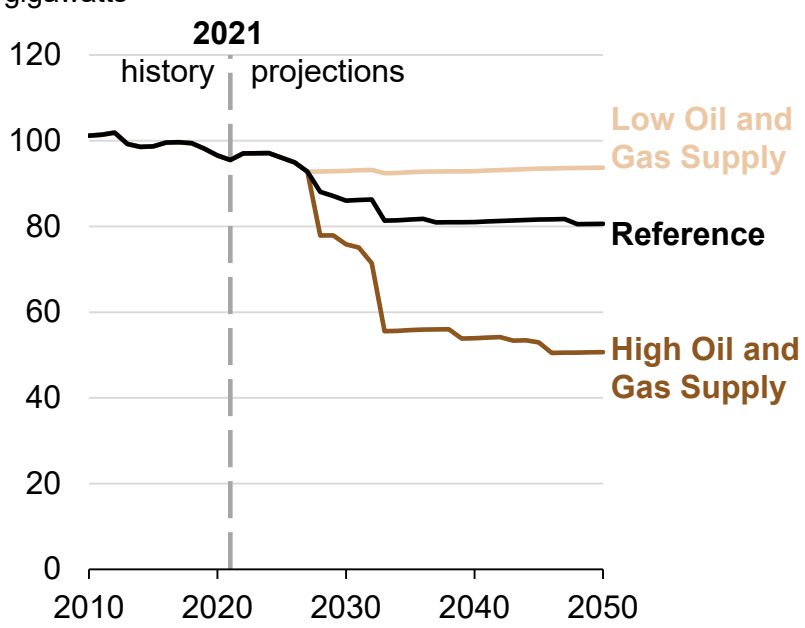
billion kilowatthours (bkWh)



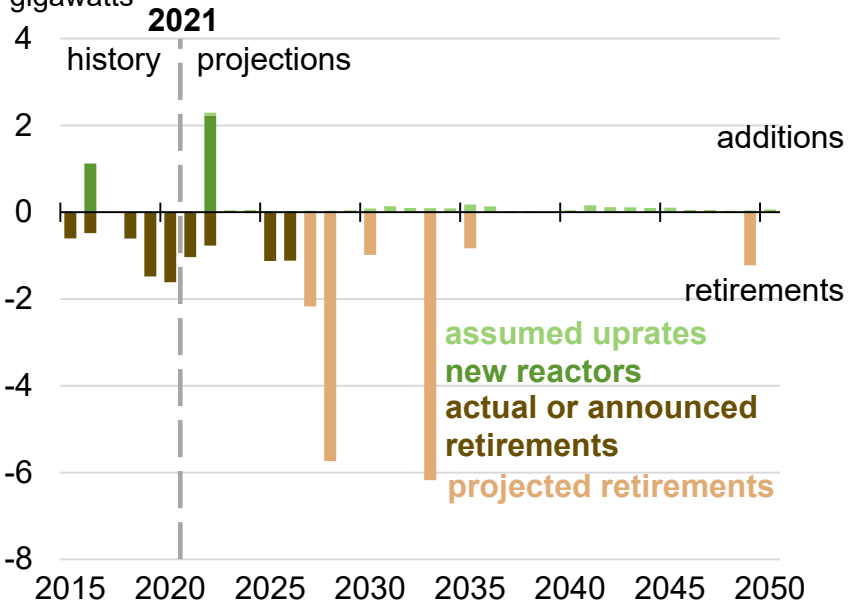
Note: Other renewables includes fuel cells, municipal solid waste, geothermal, wood and other biomass. Solar includes solar thermal and end-use solar. Other end-use sector renewables not included in totals

U.S. nuclear capacity and annual capacity changes

U.S. nuclear electricity generating capacity
AEO2022 oil and natural gas supply cases

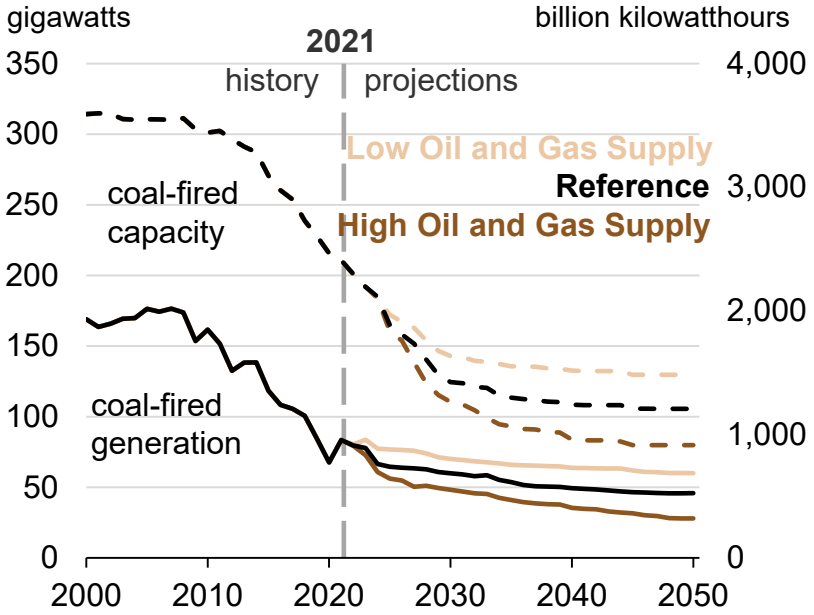


Year-over-year nuclear capacity changes
AEO2022 Reference case

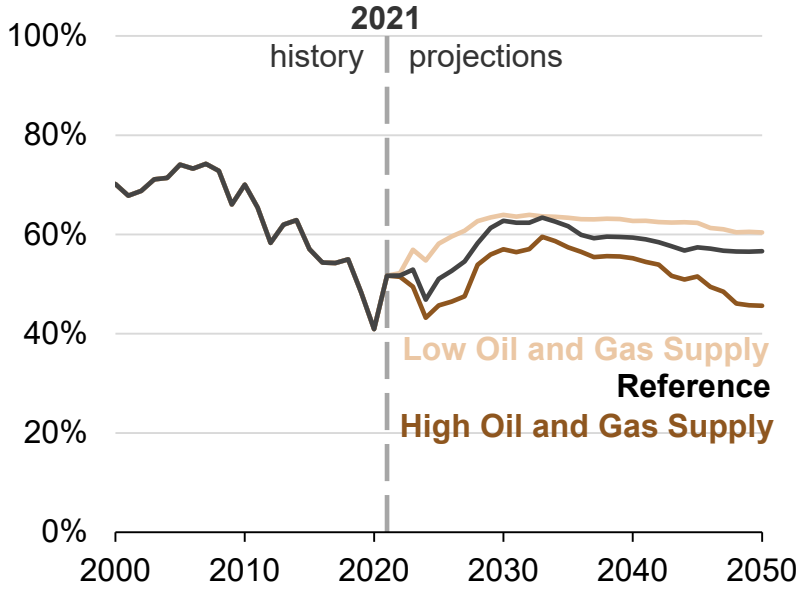


U.S. coal-fired generation, capacity, and capacity factors

U.S. electric generating capacity
U.S. electricity generation
AEO2022 oil and natural gas supply cases



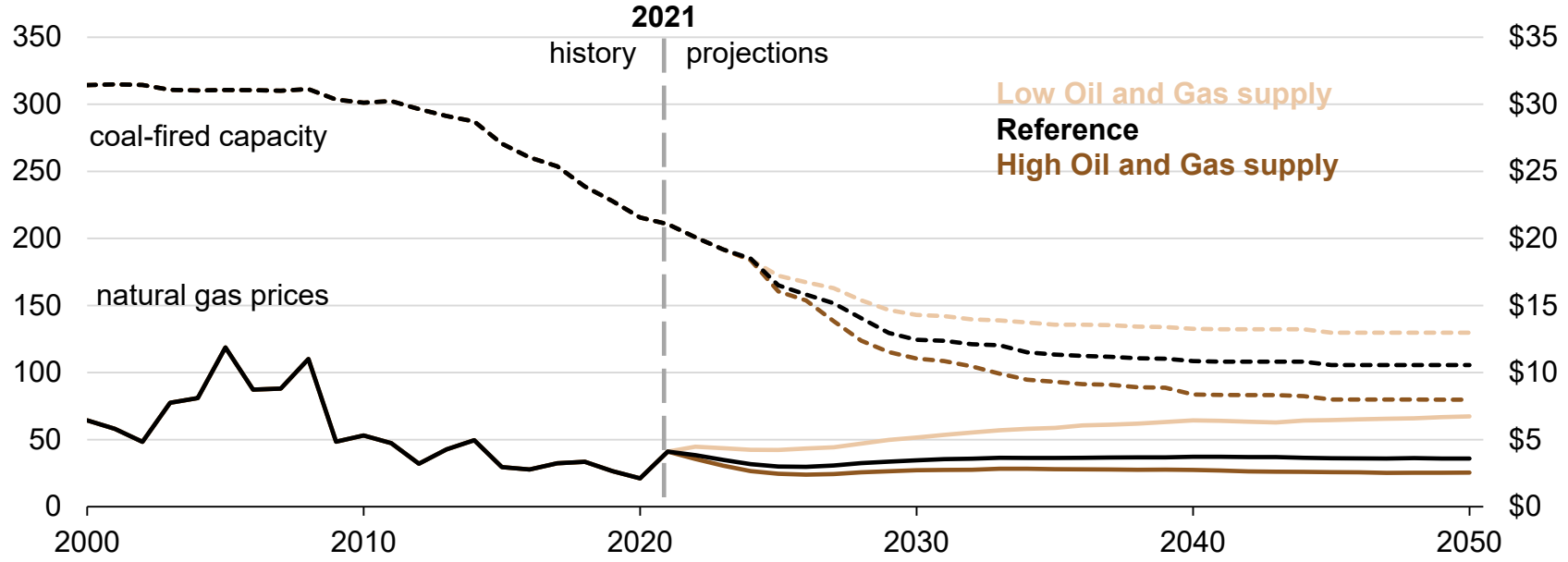
U.S. capacity factor for coal-fired generation
AEO2022 oil and natural gas supply cases



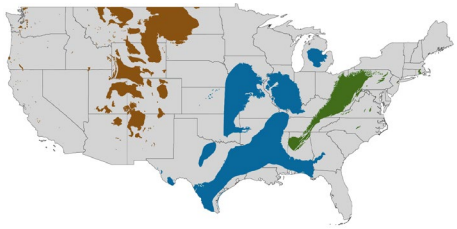
U.S. coal-fired generating capacity relative to natural gas prices

U.S. electric generating capacity
AEO2022 oil and gas supply cases
gigawatts

Average delivered natural gas prices to the electric power sector
2021 dollars per million British thermal units

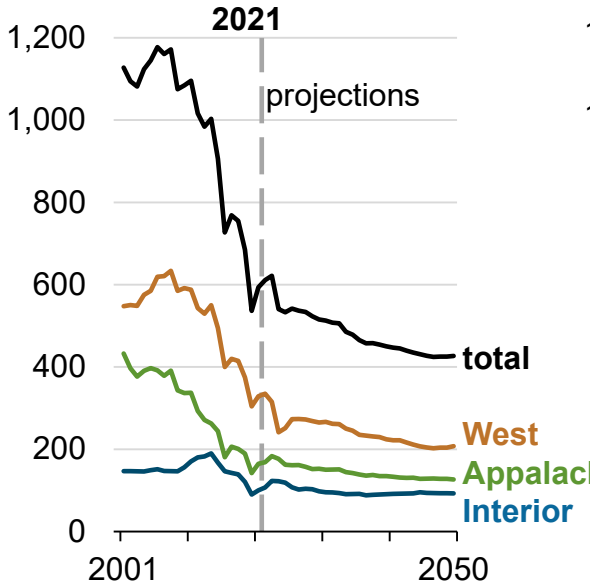


Coal production by U.S. region

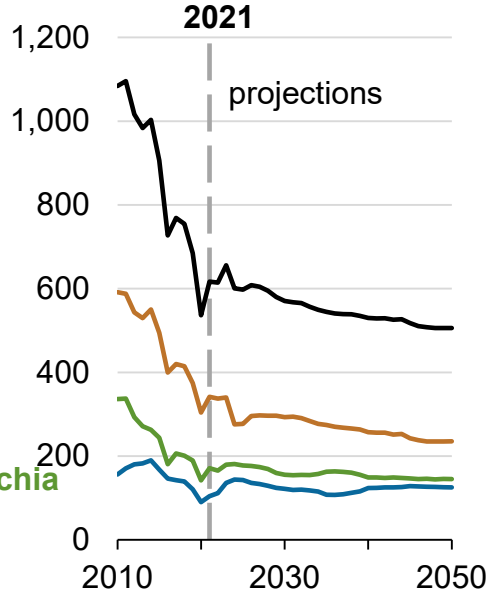


U.S. coal production by region, AEO2022 oil and gas supply cases

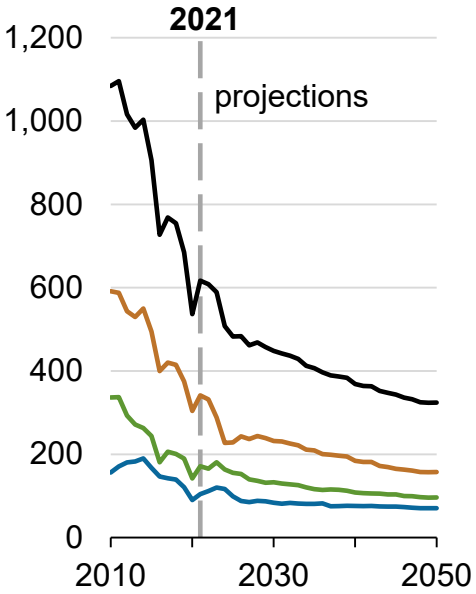
Reference case
million short tons



Low Oil and Gas Supply case
million short tons



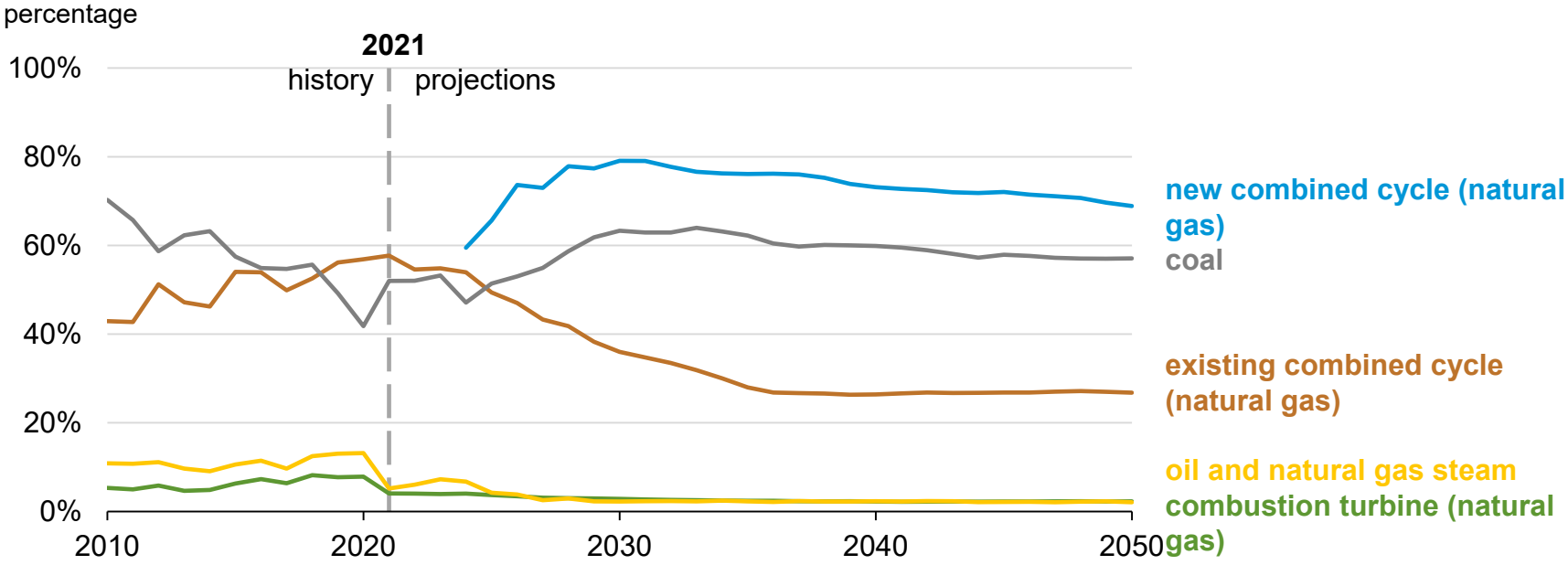
High Oil and Gas Supply case
million short tons



U.S. fossil fuel-fired plant capacity factors

Capacity factor for U.S. fossil fuel-fired plants

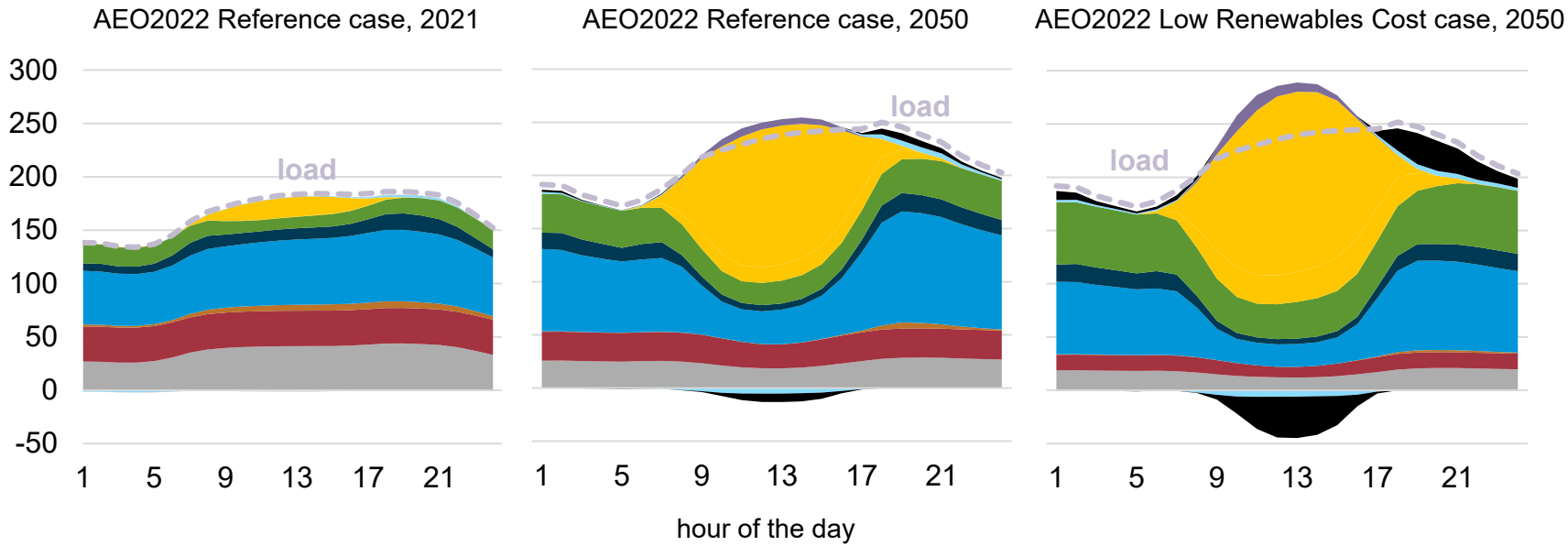
AEO2022 Reference case



Note: New combined-cycle (natural gas) plants are assumed to come online in 2023. New builds as shown are multi-shaft combined-cycle units. Existing combined cycle units include both multi-shaft and single-shaft; 12 gigawatts of new single-shaft combined-cycle units are included in existing.

U.S. electricity generation by source

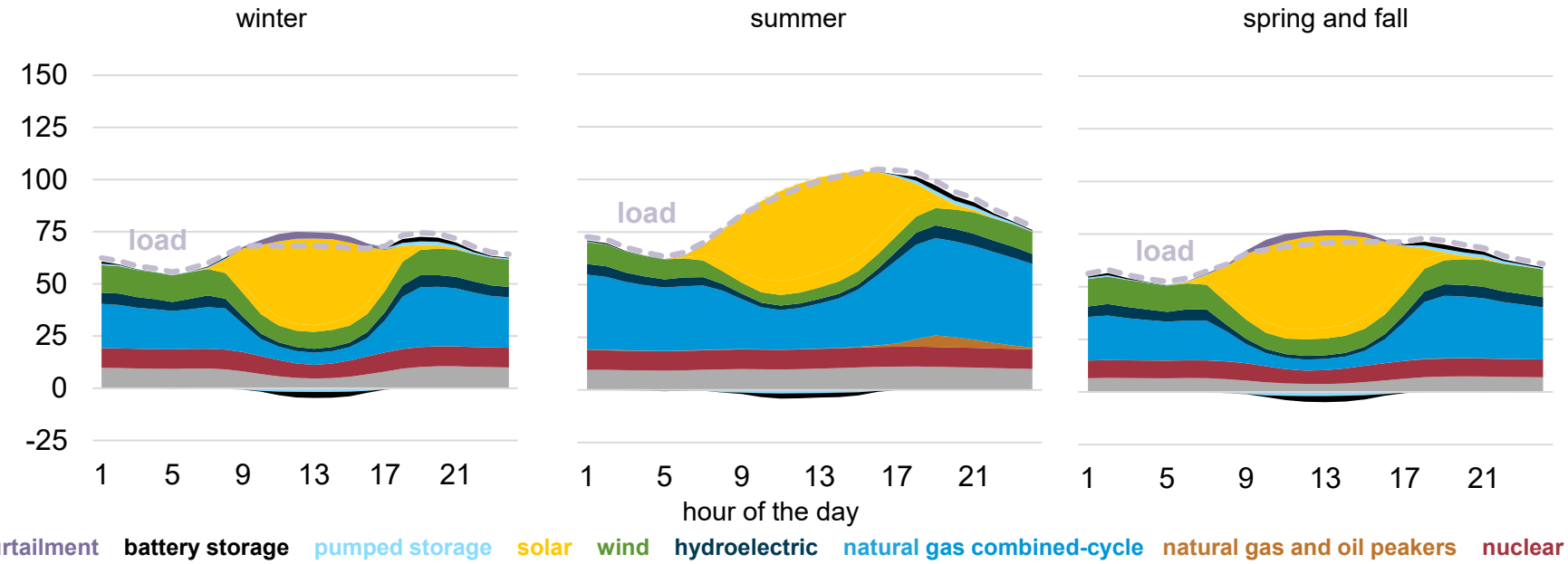
Hourly U.S. electricity generation and load by fuel for selected cases and representative years
billion kilowatthours



Note: Negative generation represents charging of energy storage technologies such as pumped hydro and battery storage. Hourly dispatch estimates are illustrative and are developed to determine curtailment and storage operations; final dispatch estimates are developed separately and may differ from total utilization as this figure shows. Solar includes both utility-scale and end-use photovoltaic electricity generation

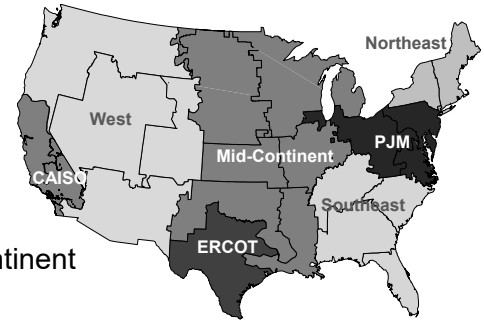
Seasonal U.S. electricity generation by source

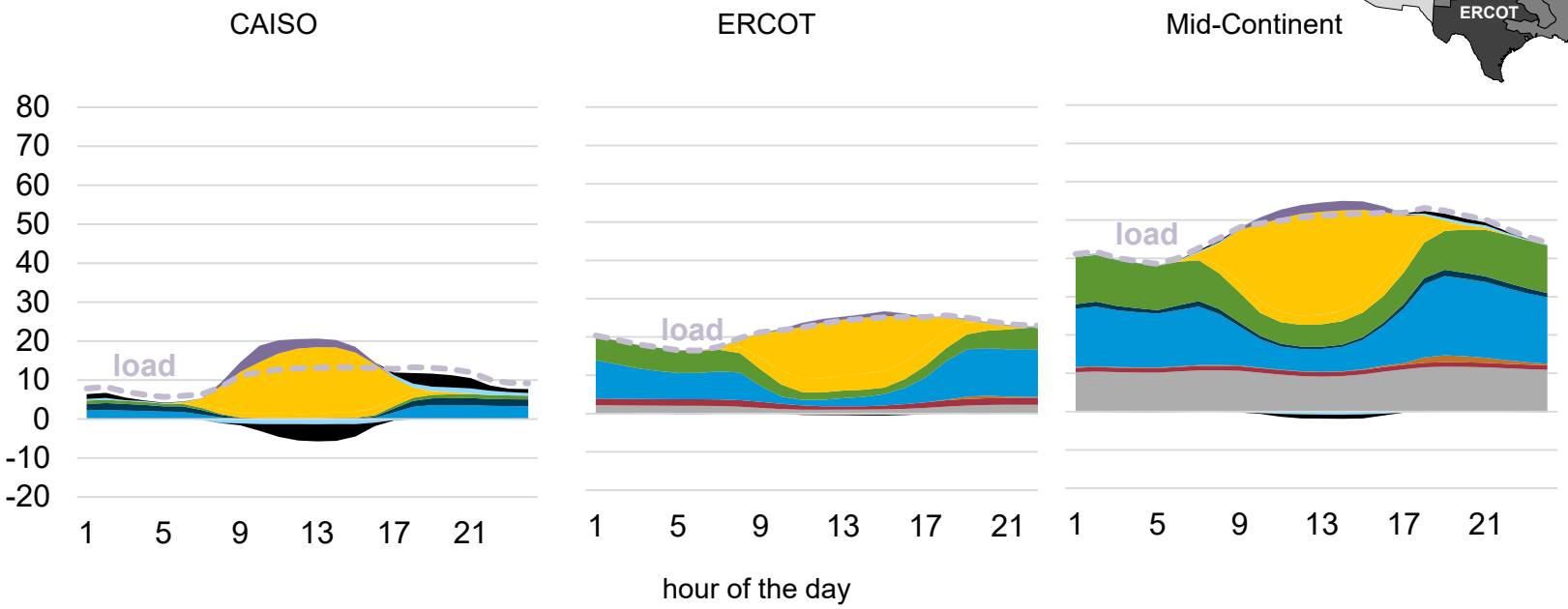
Hourly U.S. electricity generation and load by fuel type and season in 2050
AEO2022 Reference case
billion kilowatthours



Regional U.S. electricity generation by source

Hourly U.S. electricity generation and load by fuel type and region in 2050
AEO2022 Reference case
billion kilowatthours

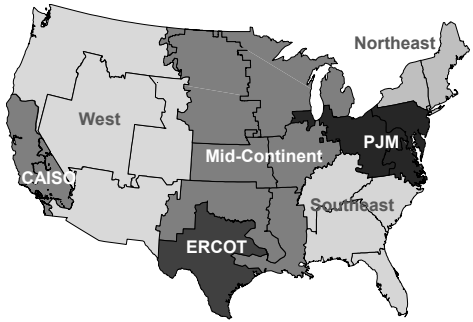


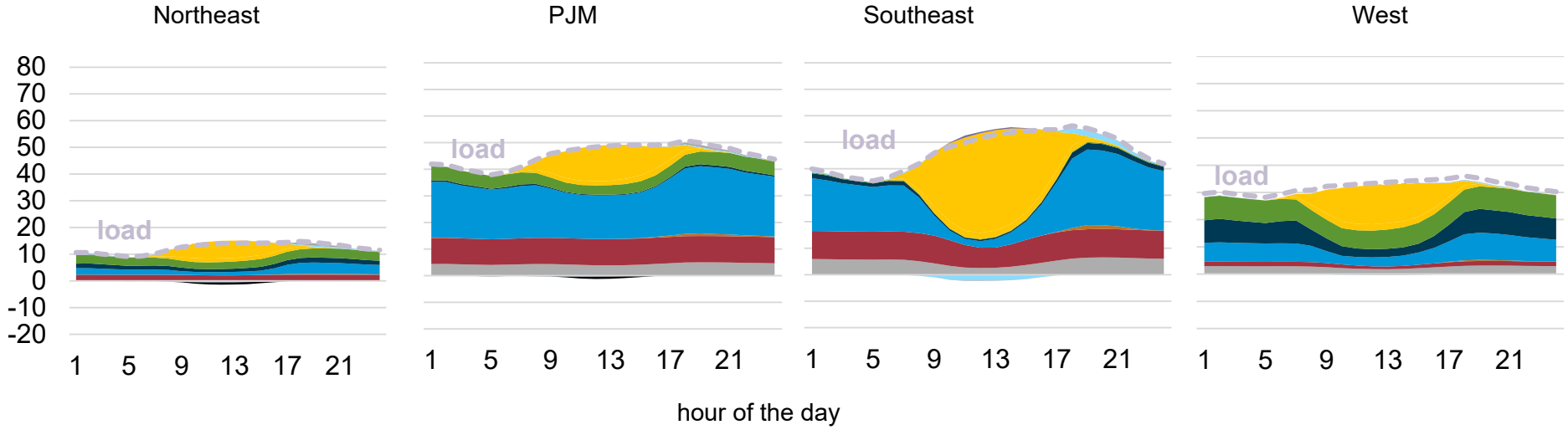


curtailment battery storage pumped storage solar wind hydroelectric natural gas combined-cycle natural gas and oil peakers nuclear coal

Regional U.S. electricity generation by source

Hourly U.S. electricity generation and load by fuel type and region in 2050
AEO2022 Reference case
billion kilowatthours

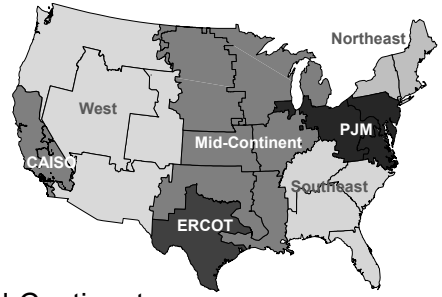


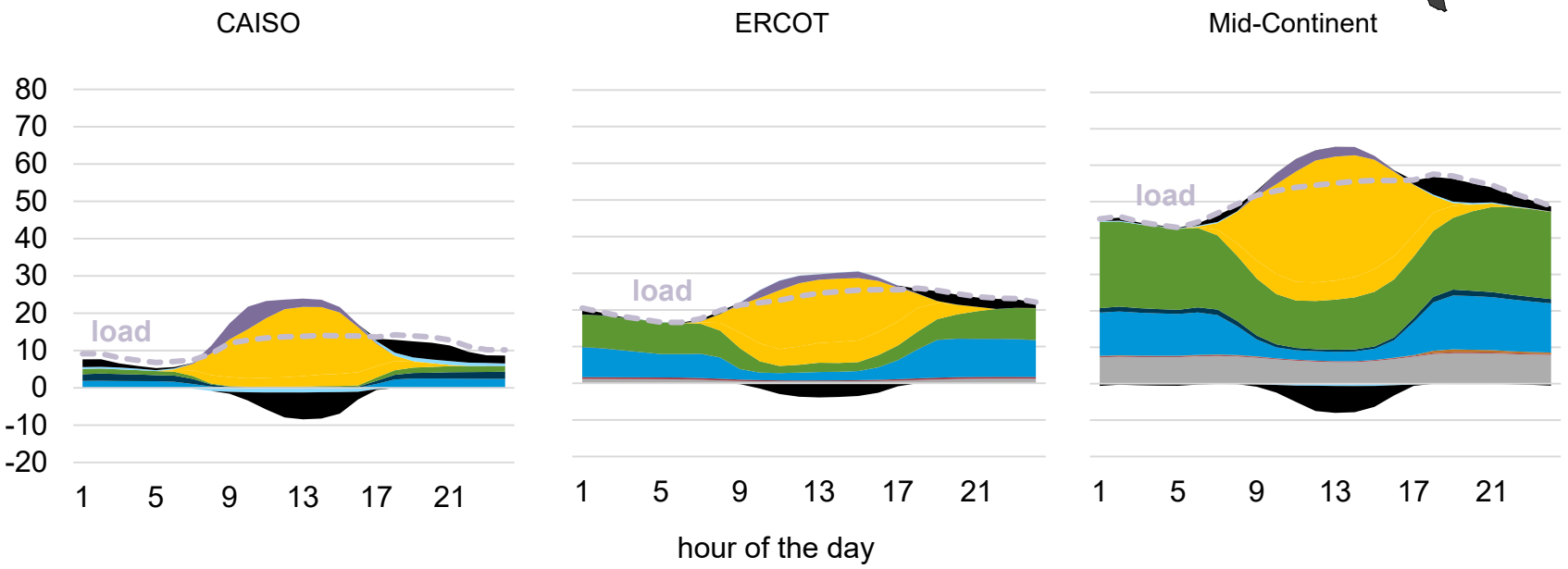


curtailment battery storage pumped storage solar wind hydroelectric natural gas combined-cycle natural gas and oil peakers nuclear coal

Regional U.S. electricity generation by source

Hourly U.S. electricity generation and load by fuel type and region in 2050
AEO2022 Low Renewables Cost case
billion kilowatthours





curtailment battery storage pumped storage solar wind hydroelectric gas combined-cycle natural gas and oil peakers nuclear coal

Regional U.S. electricity generation by source

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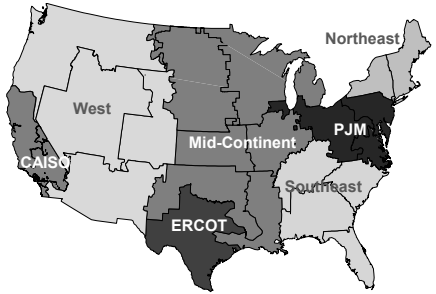
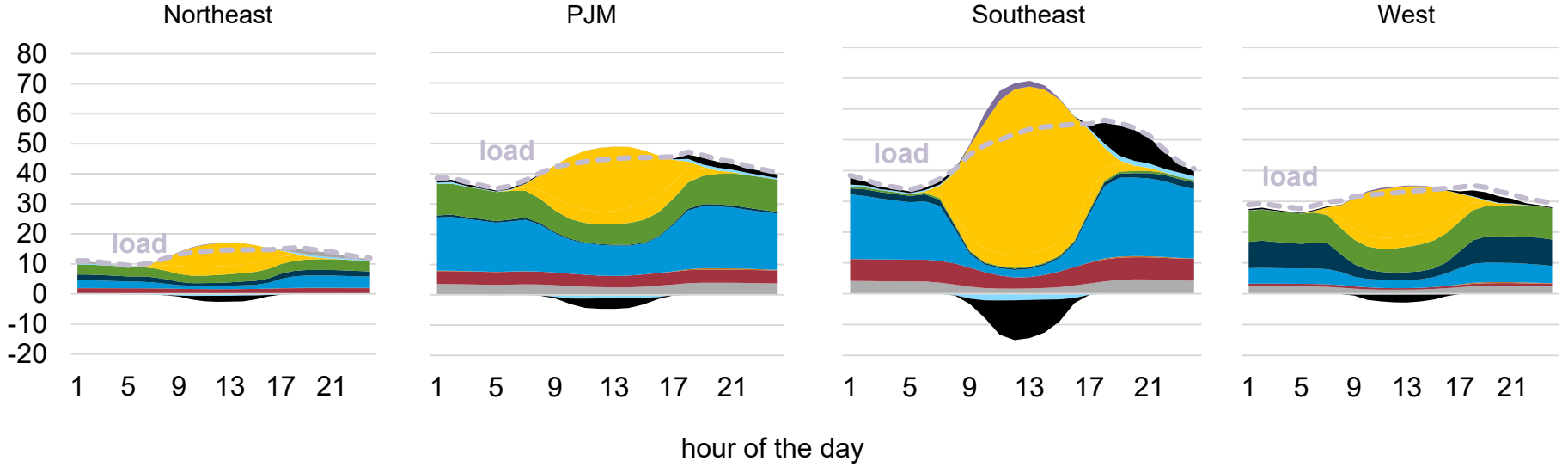
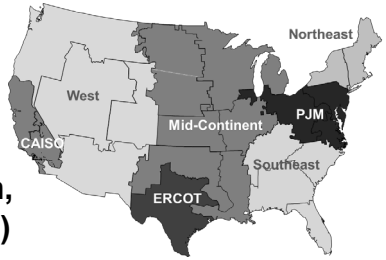
AEO2022 Low Renewables Cost case
billion kilowatthours





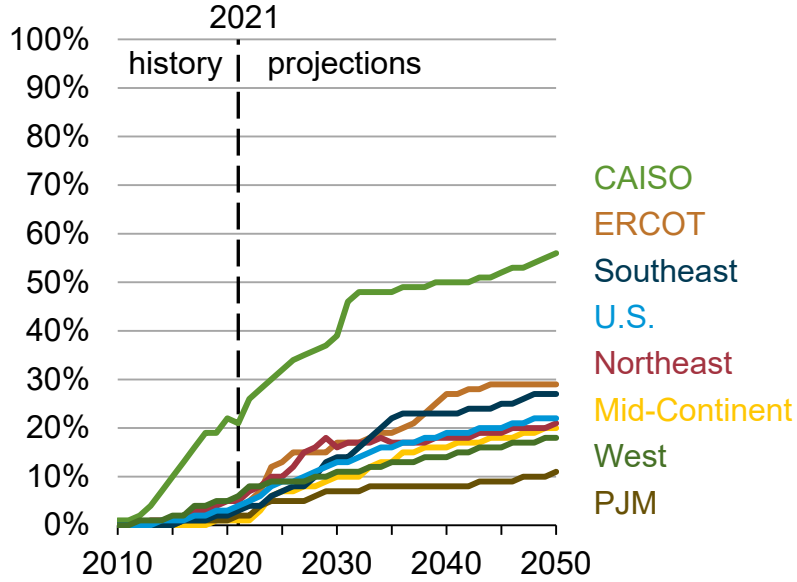
curtailment battery storage pumped storage solar wind hydroelectric natural gas combined-cycle natural gas and oil peakers nuclear coal

All-sector solar and wind penetration by region



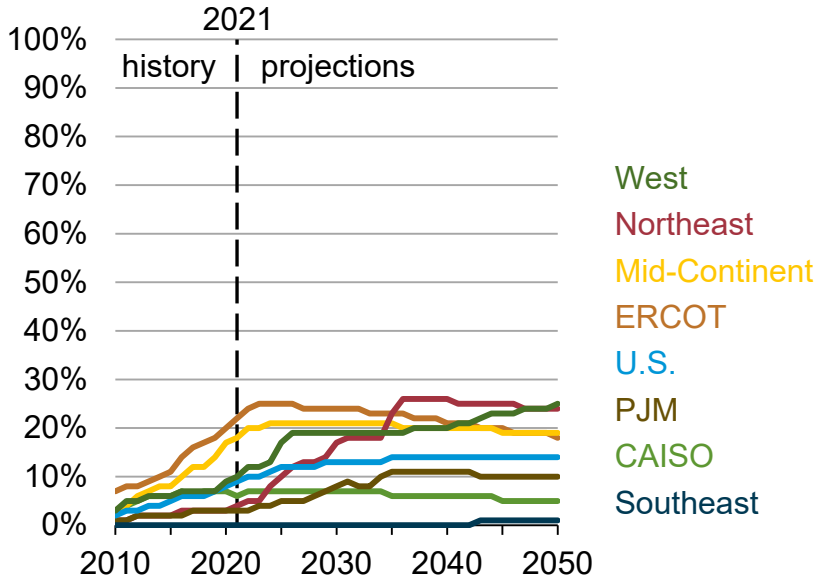
All-sector solar penetration by region, AEO2022 Reference case (2010–2050)

percent of total generation



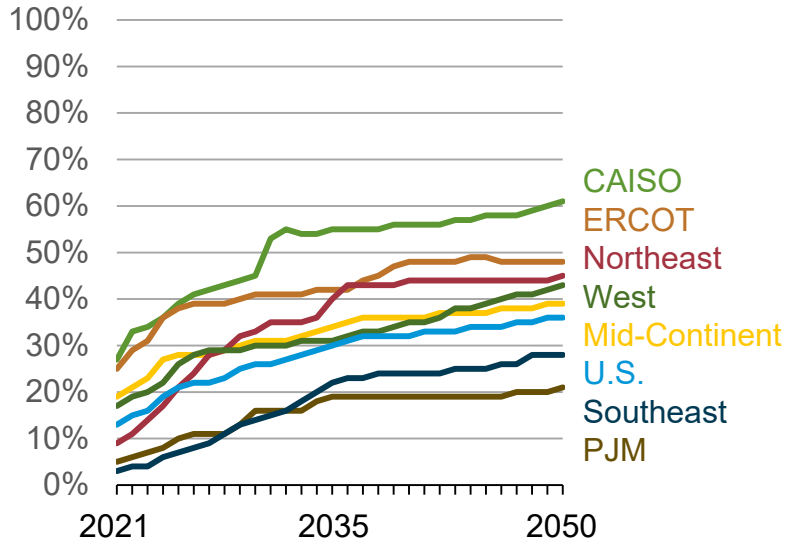
All-sector wind penetration by region, AEO2022 Reference case (2010–2050)

percent of total generation

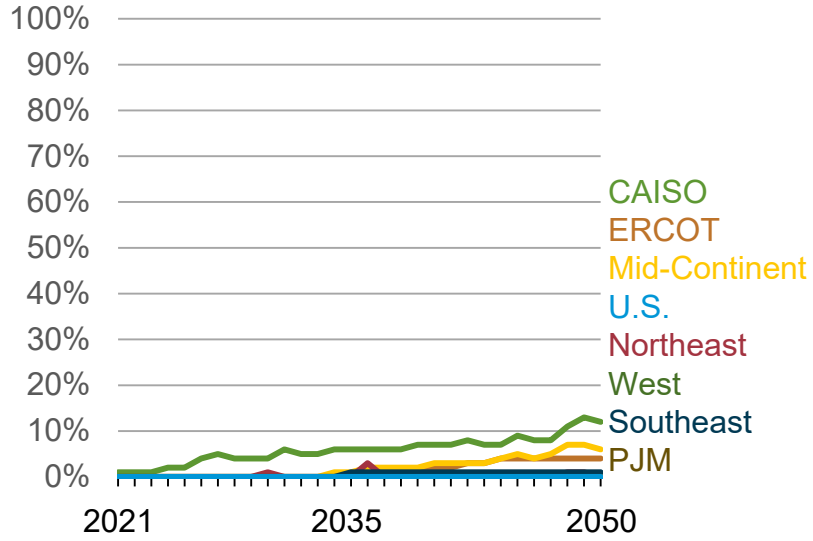


Solar and wind penetration and curtailment by selected regions

Solar and wind penetration by regions in AEO2022
Reference case, 2021-2050
percent of total generation

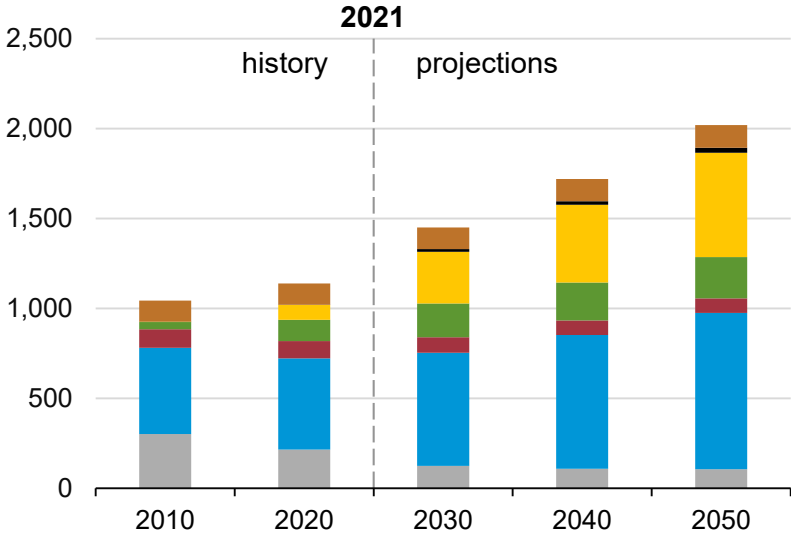


Solar and wind curtailment by regions in AEO2022
Reference case, 2021-2050
percent of total solar and wind generation

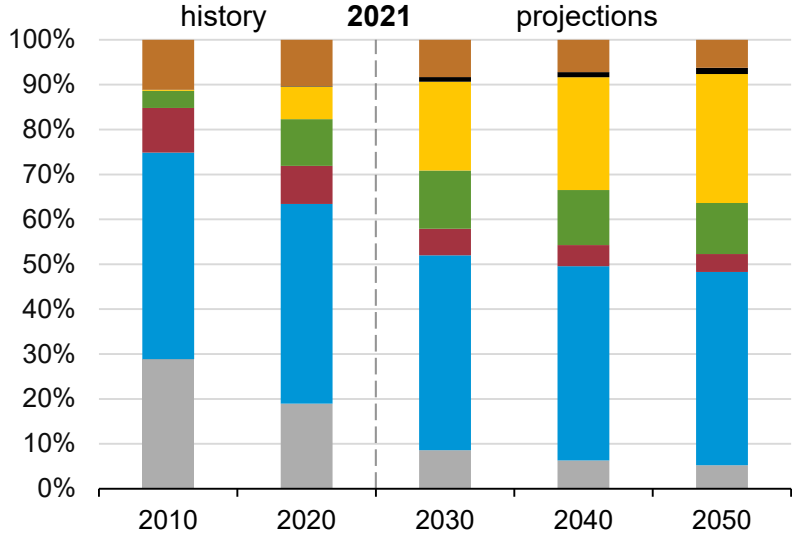


Installed electric generating capacity by source

Installed electric generating capacity by source
AEO2022 Reference case
gigawatts



Share of installed electric generating capacity
AEO2022 Reference case
percentage

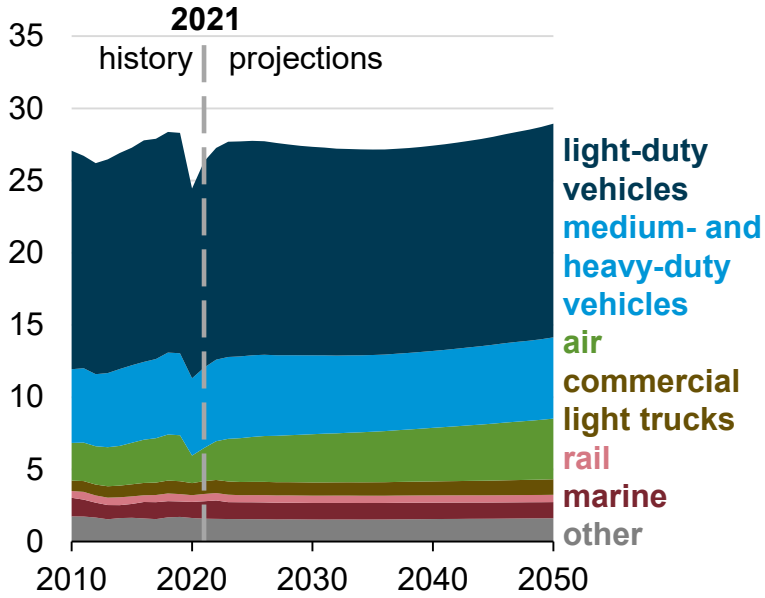


other | diurnal storage | solar | wind | nuclear | oil and natural gas | coal

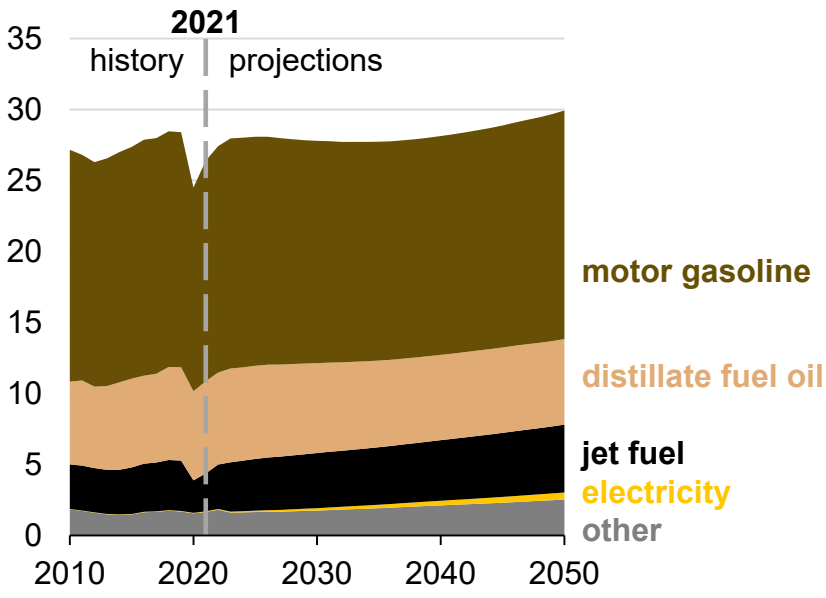
Transportation

Transportation sector energy consumption

Transportation sector consumption by mode
AEO2022 Reference case
quadrillion British thermal units



Transportation sector consumption by fuel
AEO2022 Reference case
quadrillion British thermal units

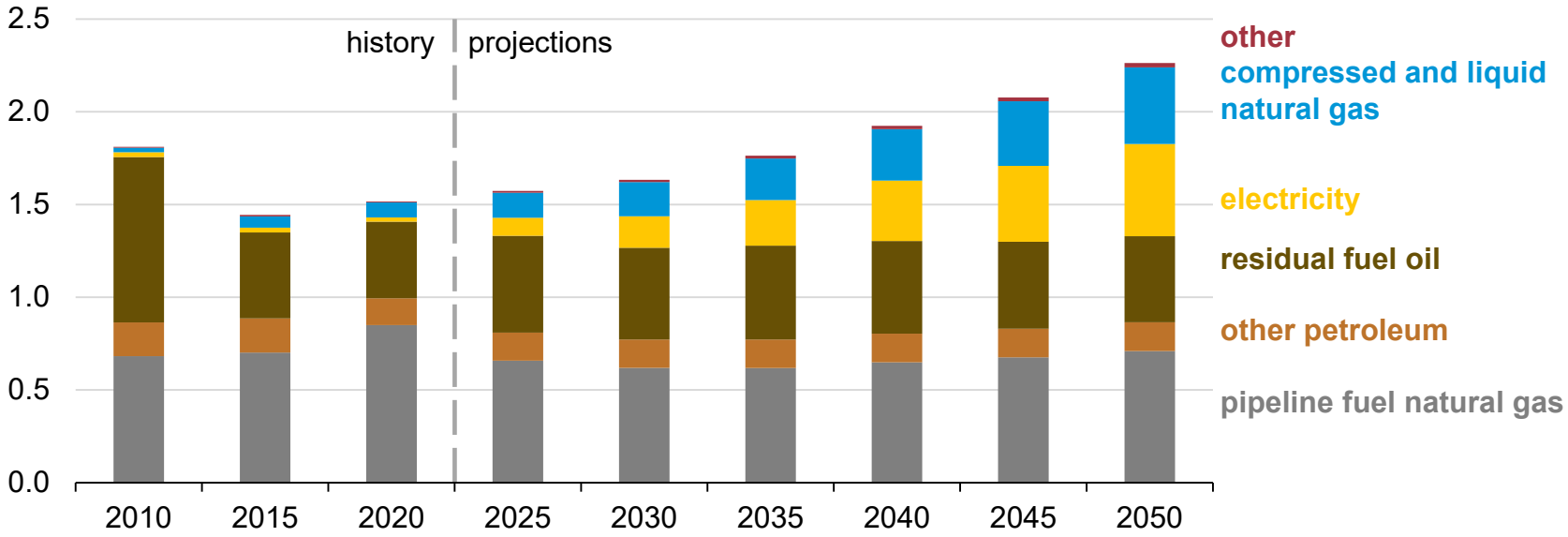


Transportation sector consumption of minor petroleum and alternative fuels

Transportation sector consumption of minor petroleum and alternative fuels

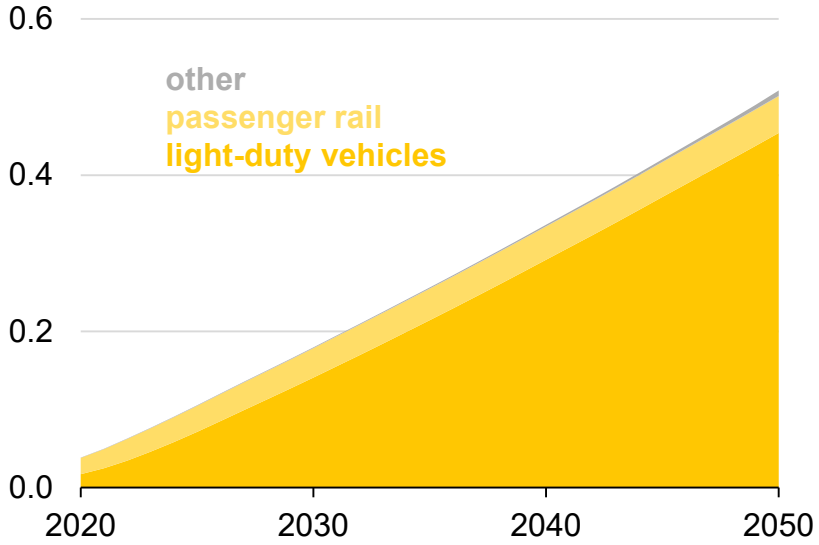
AEO2022 Reference case

quadrillion British thermal units

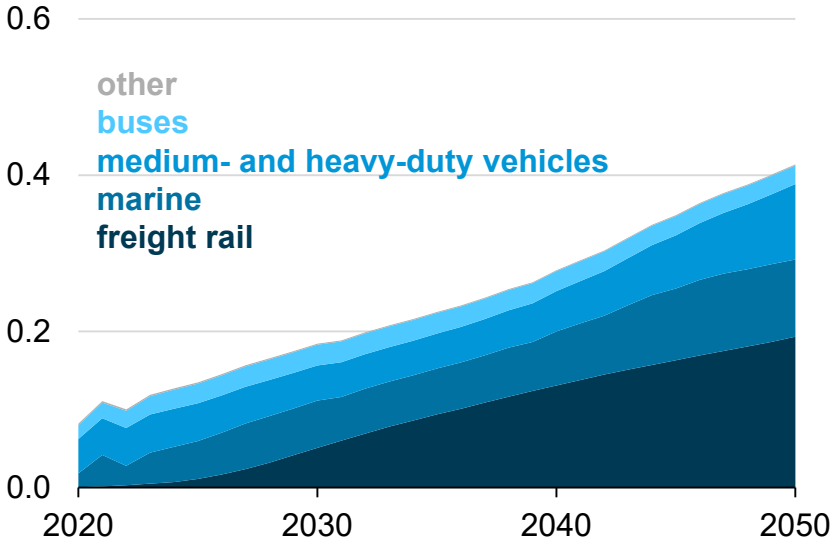


Transportation sector delivered electricity and natural gas

Delivered electricity by mode
AEO2022 Reference case
quadrillion British thermal units

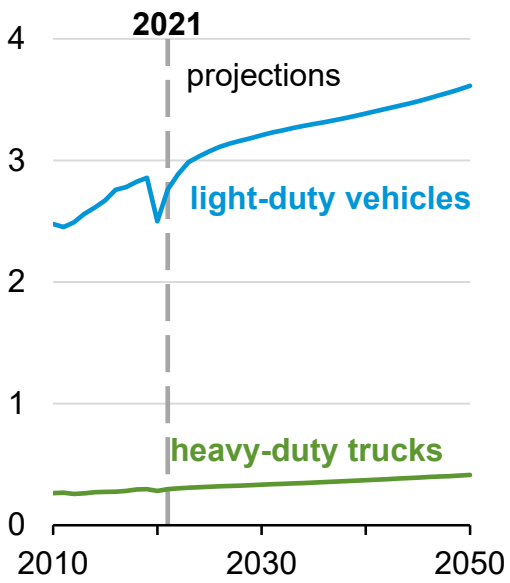


Delivered compressed and liquefied natural gas by mode
AEO2022 Reference case
quadrillion British thermal units

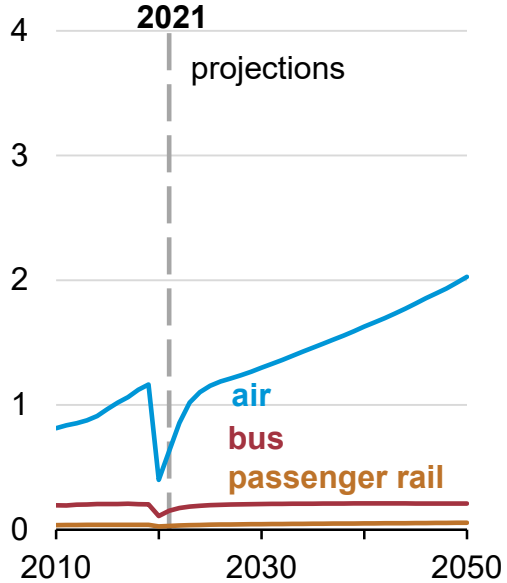


Passenger and freight travel by mode

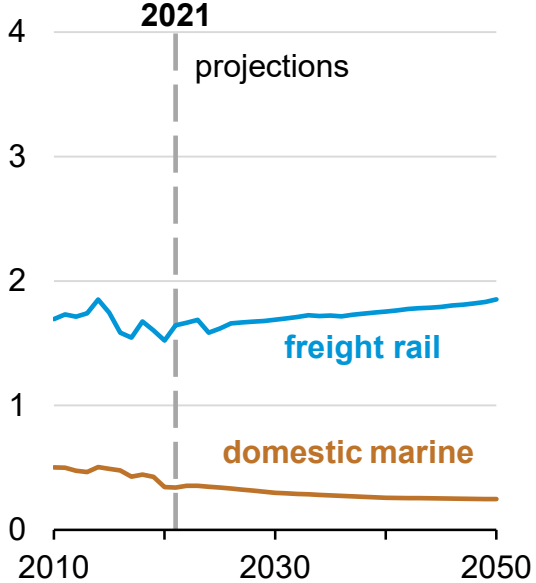
Vehicle travel
AEO2022 Reference case
trillion vehicle-miles



Passenger travel
AEO2022 Reference case
trillion revenue passenger-miles

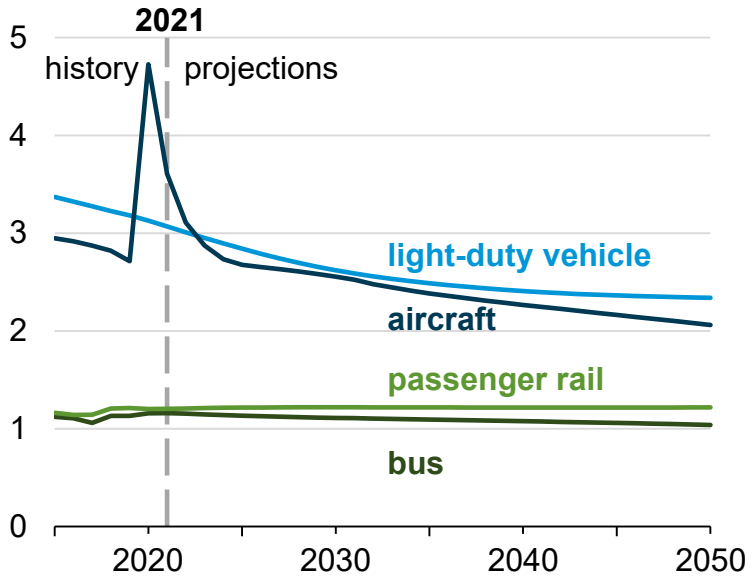


Rail and domestic shipping
AEO2022 Reference case
trillion ton-miles traveled

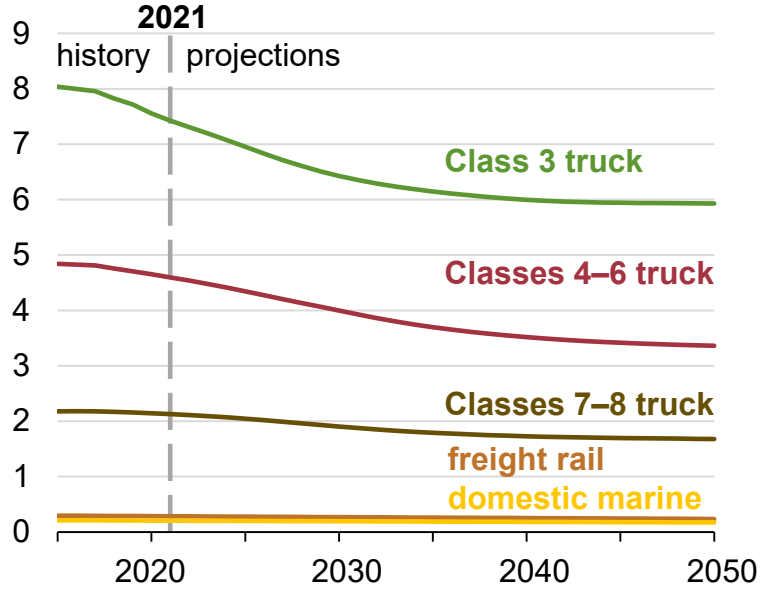


Energy intensity by transportation mode

Passenger travel energy intensity by mode
AEO2022 Reference case
thousand British thermal units per passenger-mile

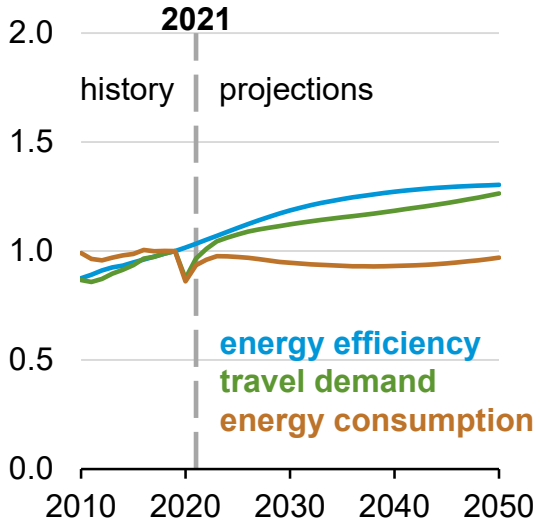


Freight travel energy intensity by mode
AEO2022 Reference case
thousand British thermal units per ton-mile

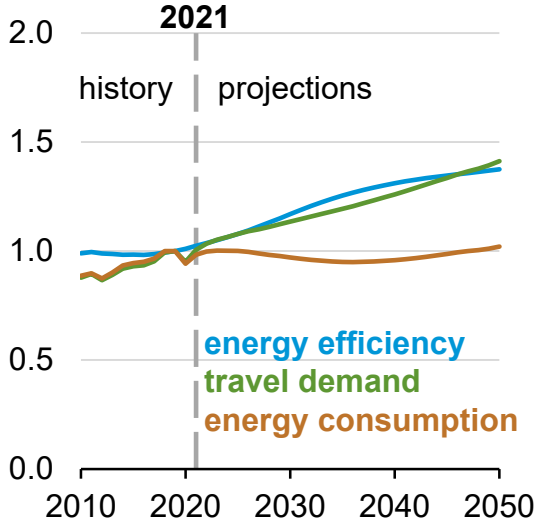


Indexed travel indicators and energy use by mode

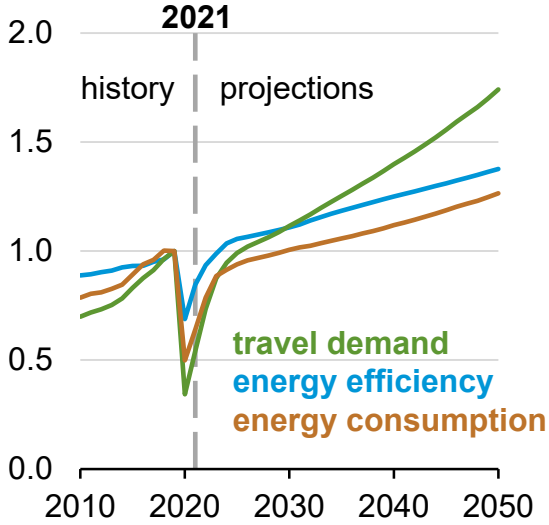
Indexed light-duty vehicle travel and energy use
AEO2022 Reference case
2019 = 1.0



Indexed freight and commercial truck travel and energy use
AEO2022 Reference case
2019 = 1.0



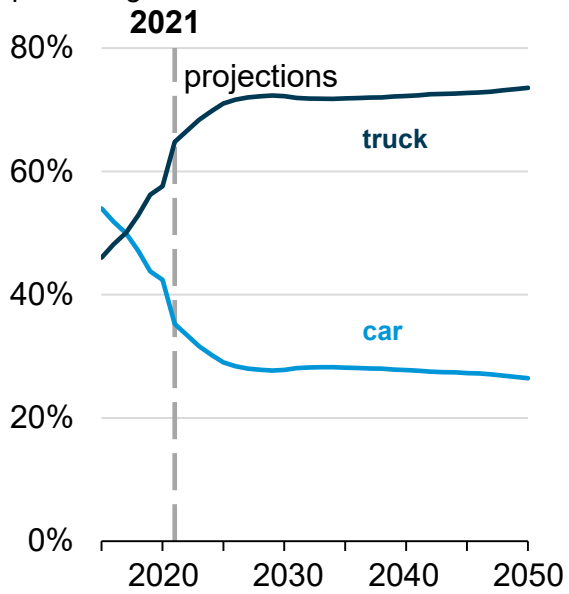
Indexed aircraft travel and energy use
AEO2022 Reference case
2019 = 1.0



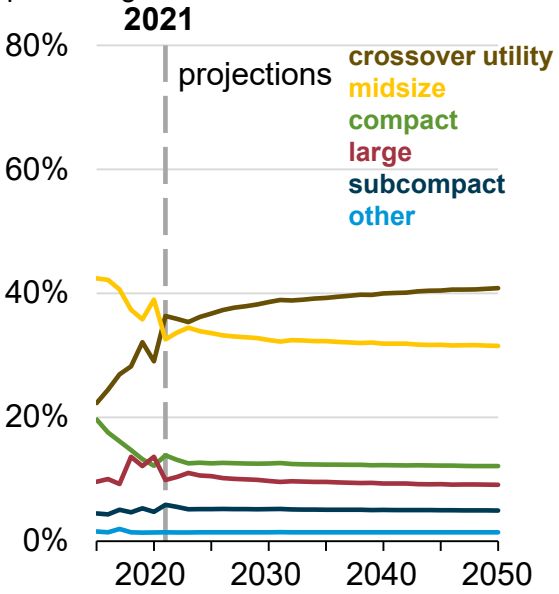
Note: Indexed freight and commercial truck energy efficiency is weighted by each vehicle type's relative share of energy consumption.

New light-duty vehicle sales by type

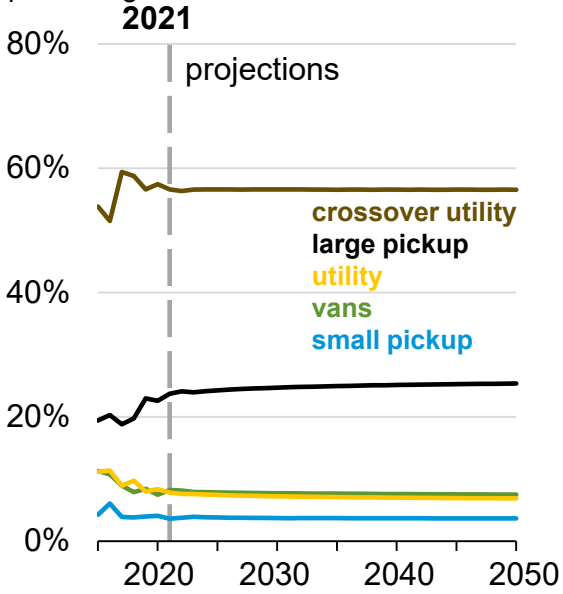
Light-duty vehicle sales
AEO2022 Reference case
percentage share



Car sales by size class
AEO2022 Reference case
percentage share

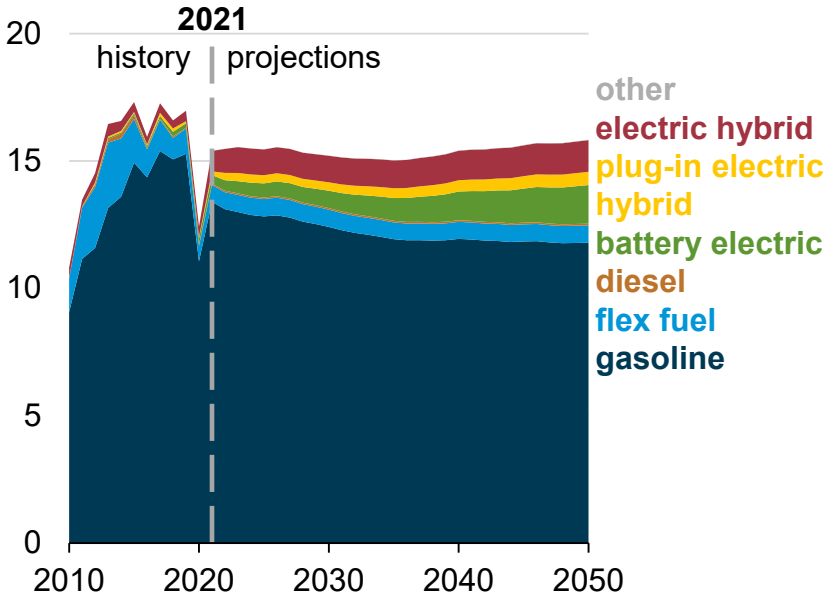


Light truck sales by size class
AEO2022 Reference case
percentage share

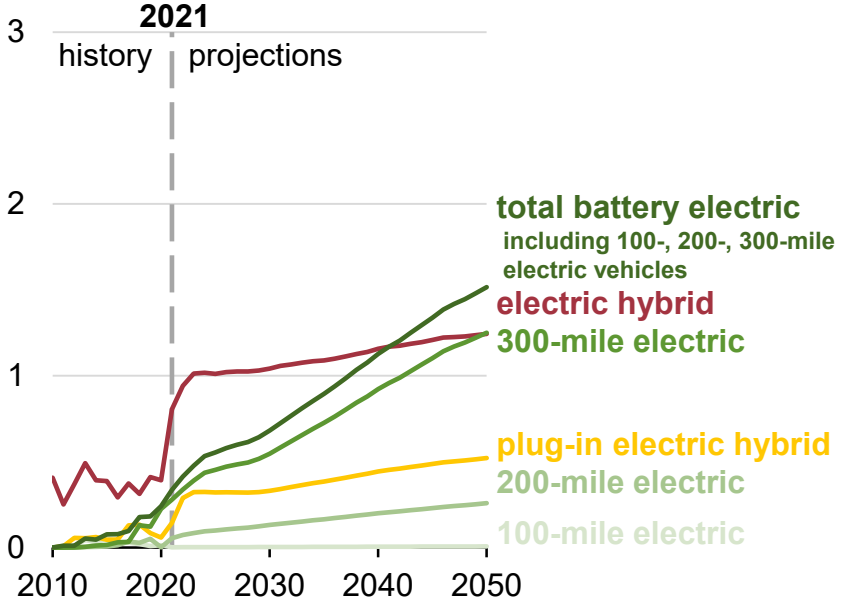


Light-duty vehicle sales by technology or fuel type

Light-duty vehicle sales by technology or fuel
AEO2022 Reference case
millions of vehicles

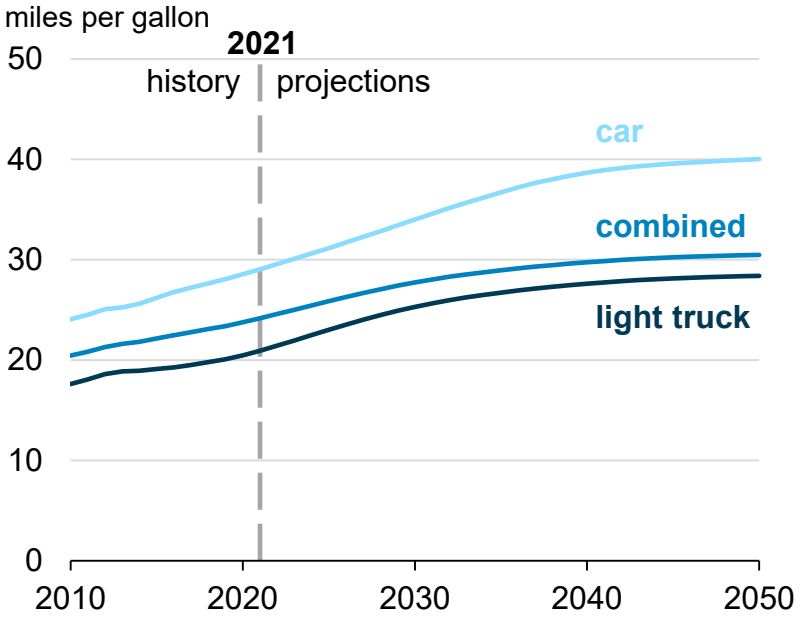


New vehicle sales of battery-powered vehicles
AEO2022 Reference case
millions of vehicles

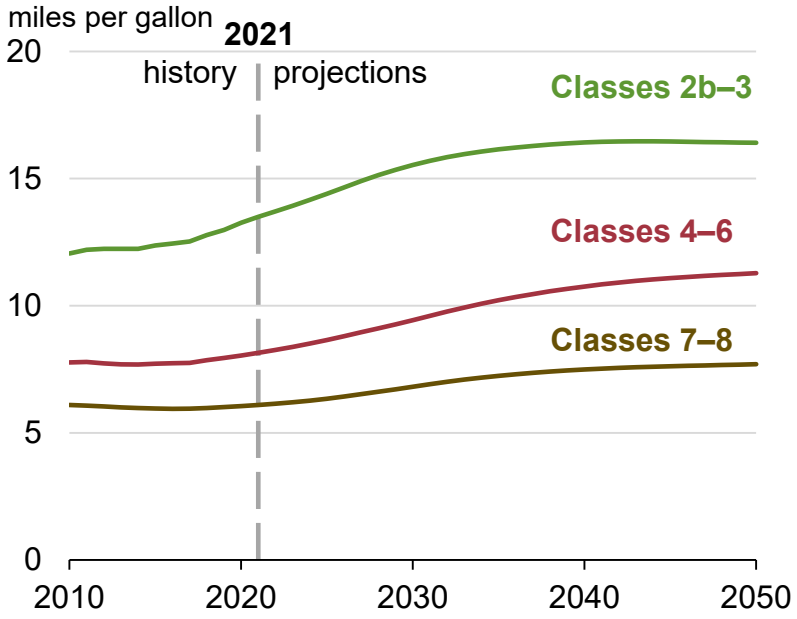


On-road vehicle fuel economy

Light-duty fuel economy by vehicle type
AEO2022 Reference case



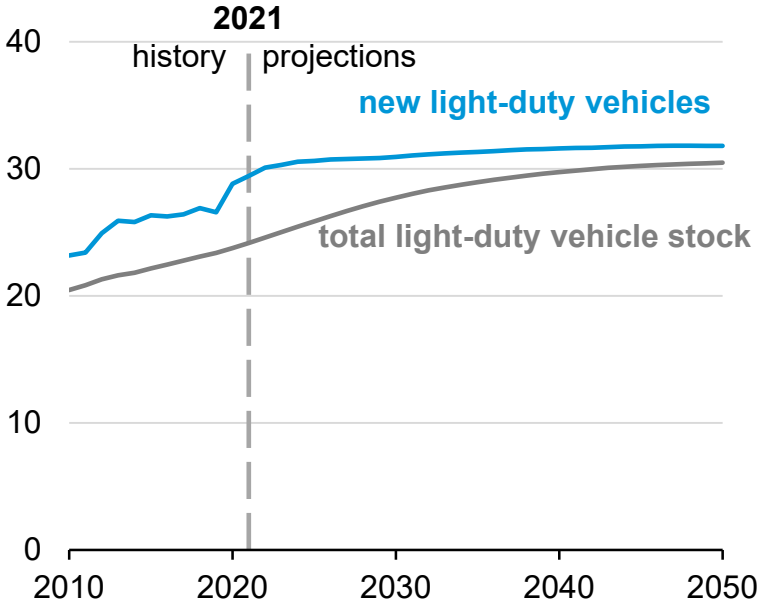
Heavy-duty fuel economy by class
AEO2022 Reference case



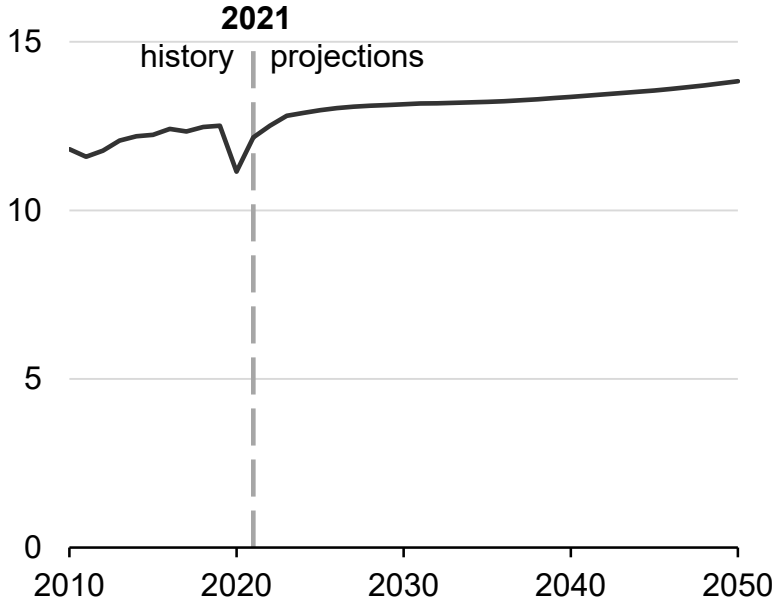
Note: Combined represents the average of light-duty vehicles.

Light-duty vehicle fuel economy and per capita travel

Light-duty vehicle average fuel economy
AEO2022 Reference case
miles per gallon



Light-duty vehicle miles traveled per licensed driver
AEO2022 Reference case
thousand miles

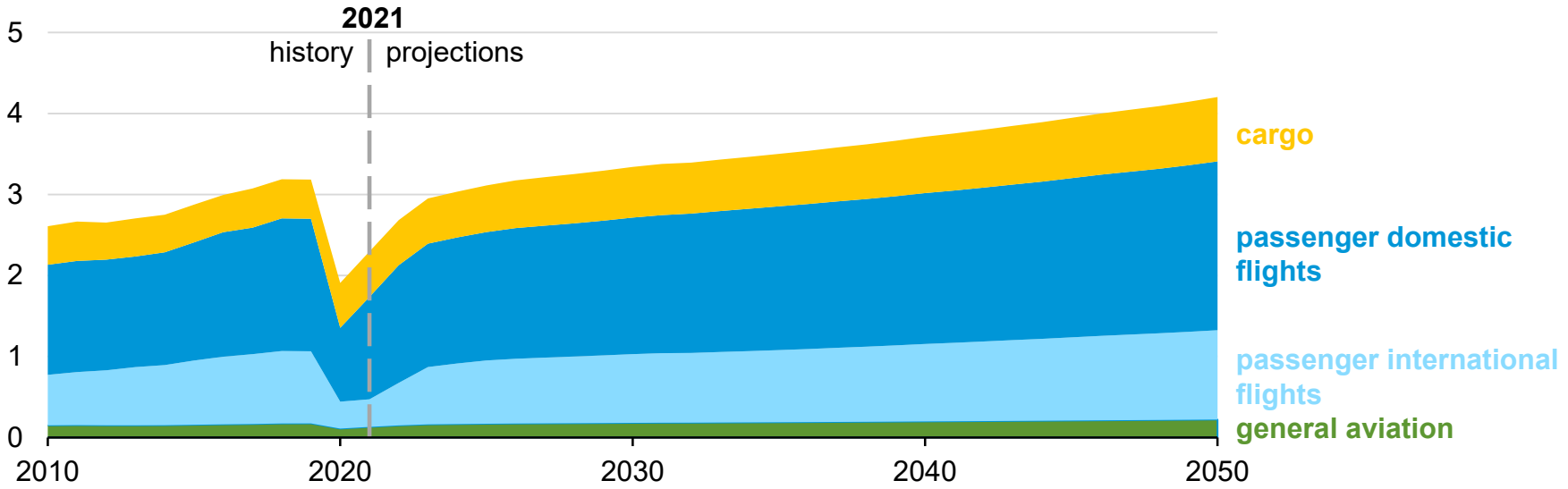


Air travel energy use by travel type

Energy use by air mode

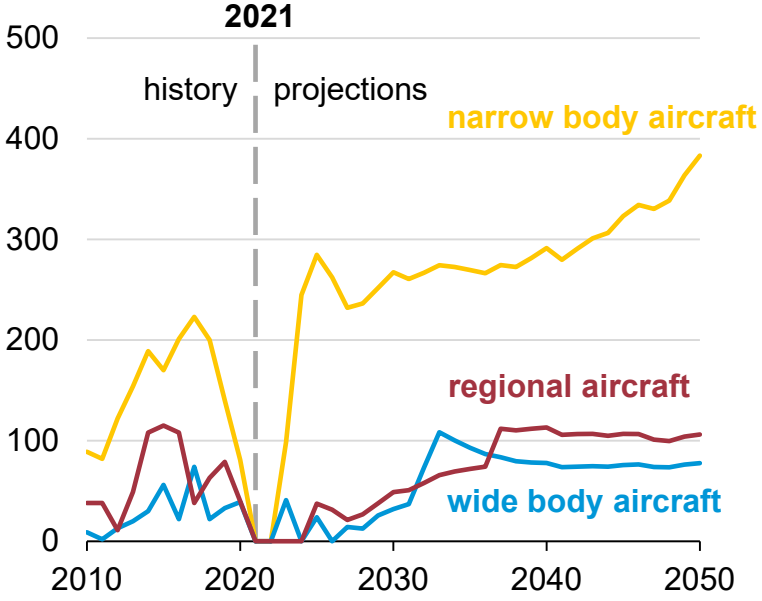
AEO2022 Reference case

quadrillion British thermal units

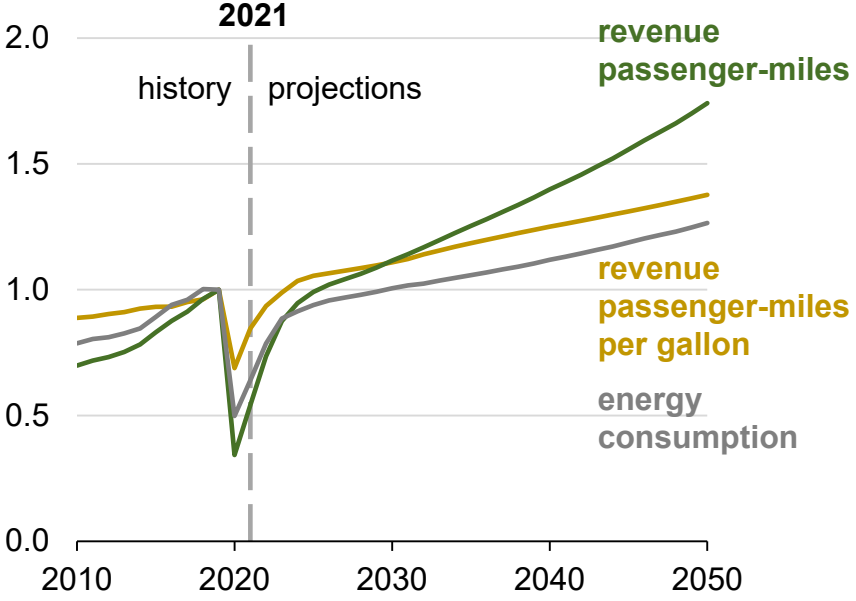


Passenger aircraft sales and jet fuel efficiency

U.S. passenger jet sales by body type
AEO2022 Reference case
individual aircraft sold



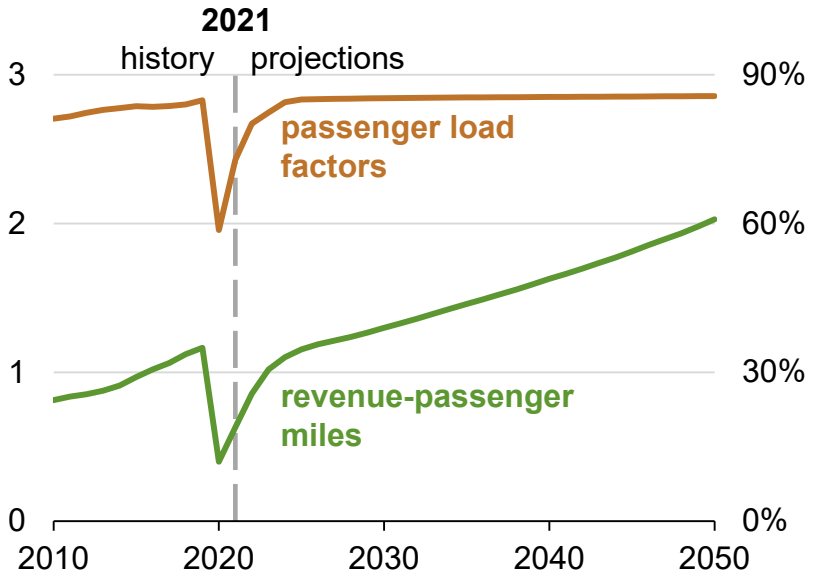
U.S. passenger jet fuel efficiency index
AEO2022 Reference case
2019 = 1.0



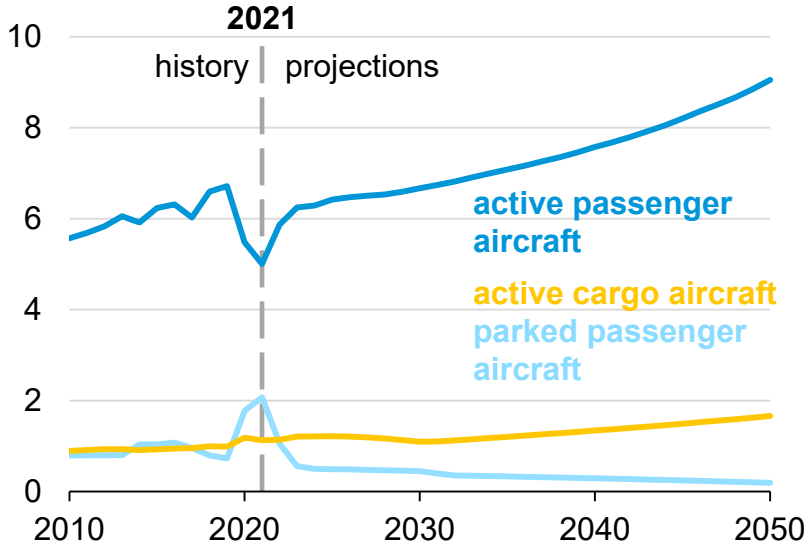
Passenger travel demand and aircraft stock

Revenue passenger-miles
AEO2022 Reference case
trillion passenger-miles

Average passenger load factors
percentage



Active versus parked passenger and cargo stock
AEO2022 Reference case
thousand aircraft



Note: Load factors are weighted by domestic and U.S.-originating or U.S.-bound flights' relative share of revenue passenger-miles.

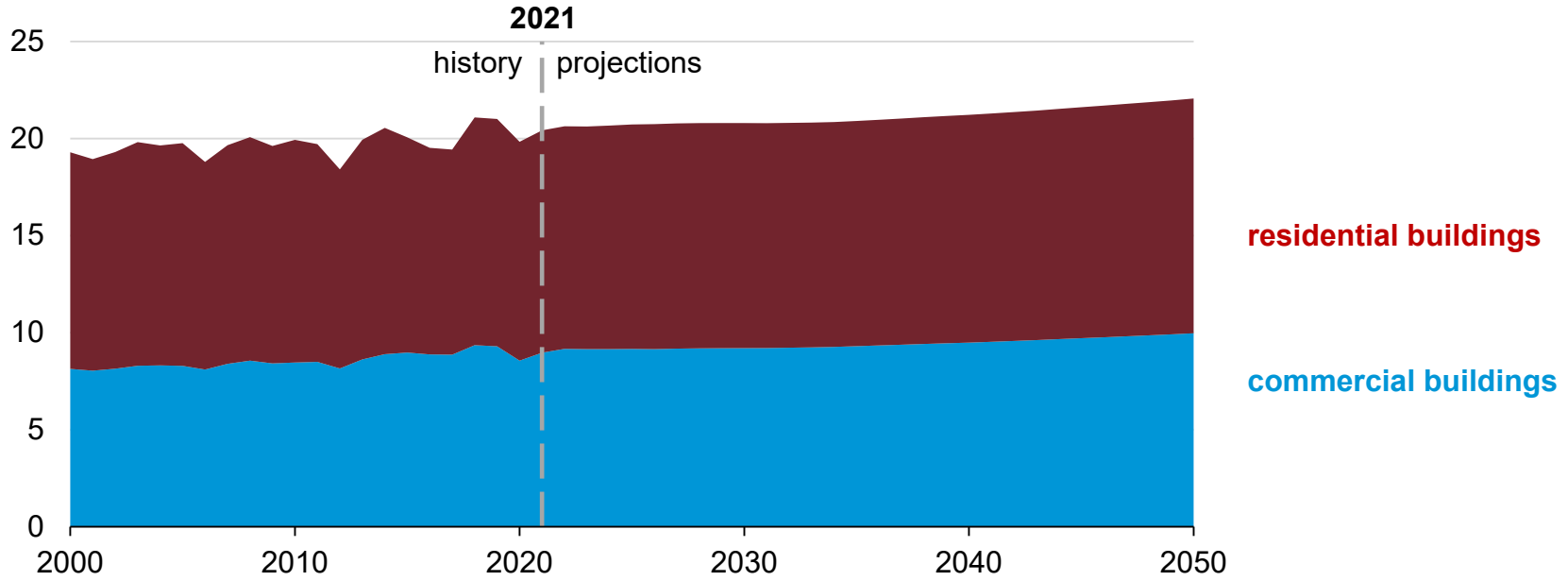
Buildings

Total buildings sector delivered energy consumption

Buildings delivered energy consumption

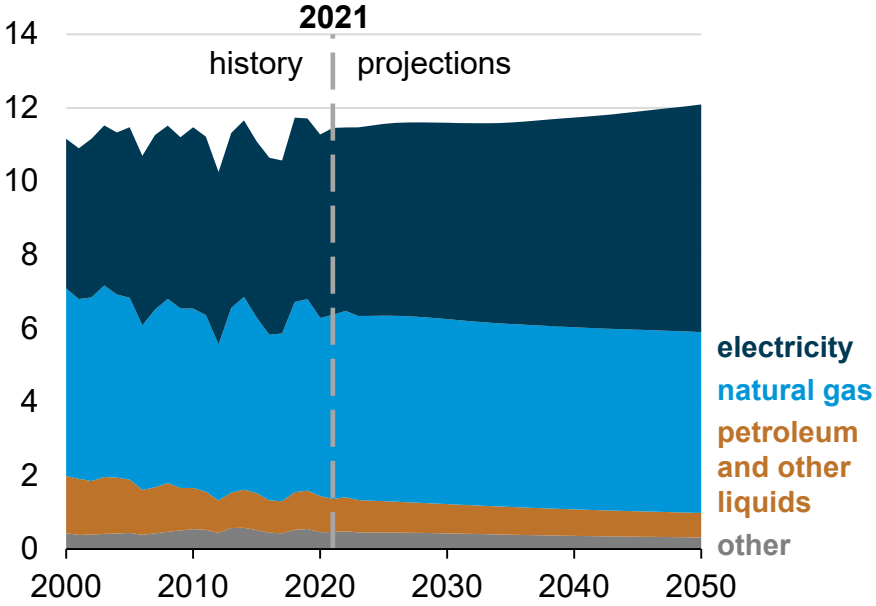
AEO2022 Reference case

quadrillion British thermal units

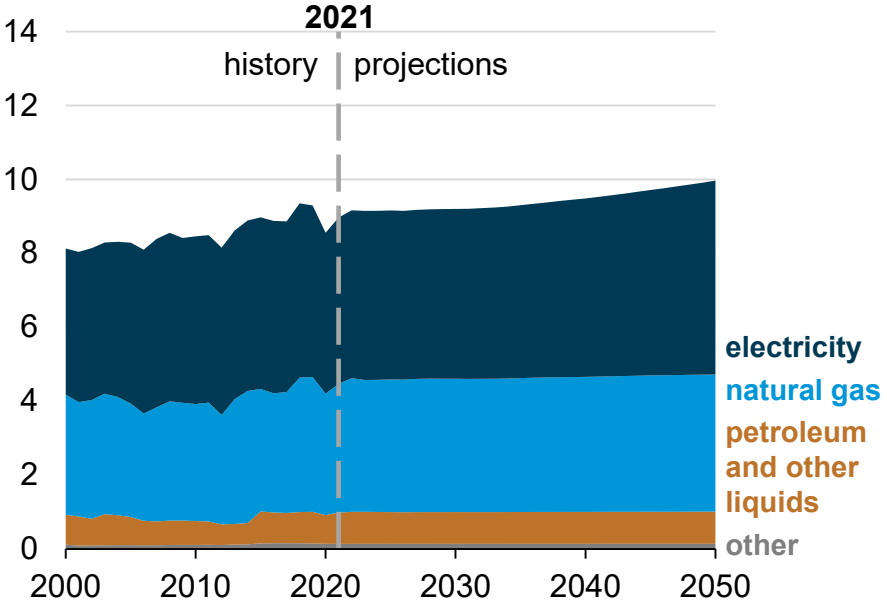


Residential and commercial buildings energy consumption

Residential sector delivered energy consumption
AEO2022 Reference case
quadrillion British thermal units



Commercial sector delivered energy consumption
AEO2022 Reference case
quadrillion British thermal units



Change in population and residential housing stocks

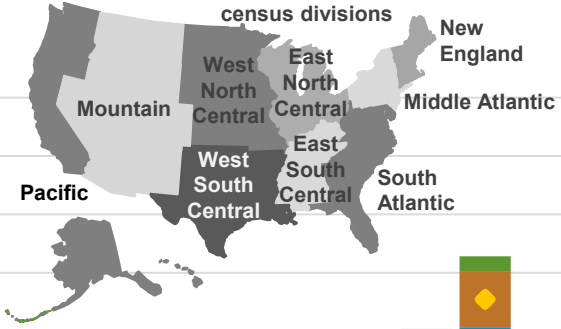
Residential housing unit and population changes by region and type in 2021 and 2050

AEO2022 Reference case

millions, residential housing units

population

millions, U.S. population

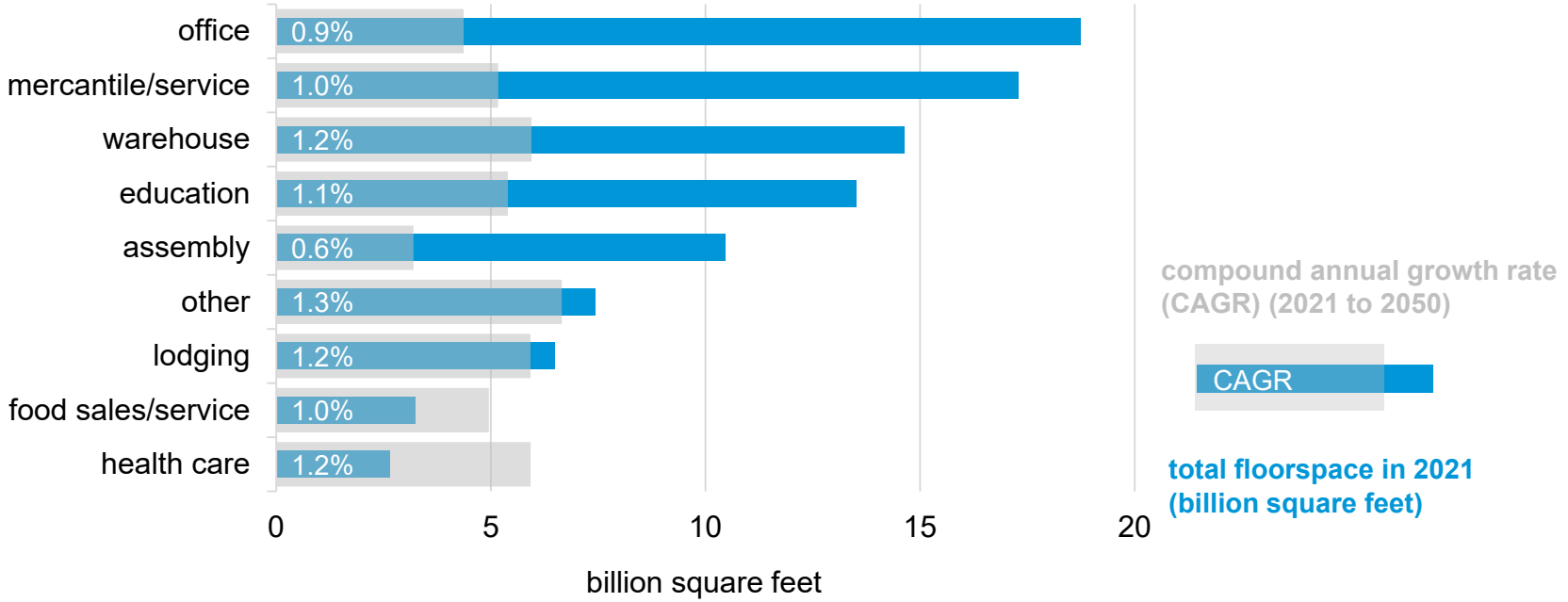


Commercial buildings floorspace growth

Commercial floorspace in 2021 and growth in floorspace from 2021 to 2050

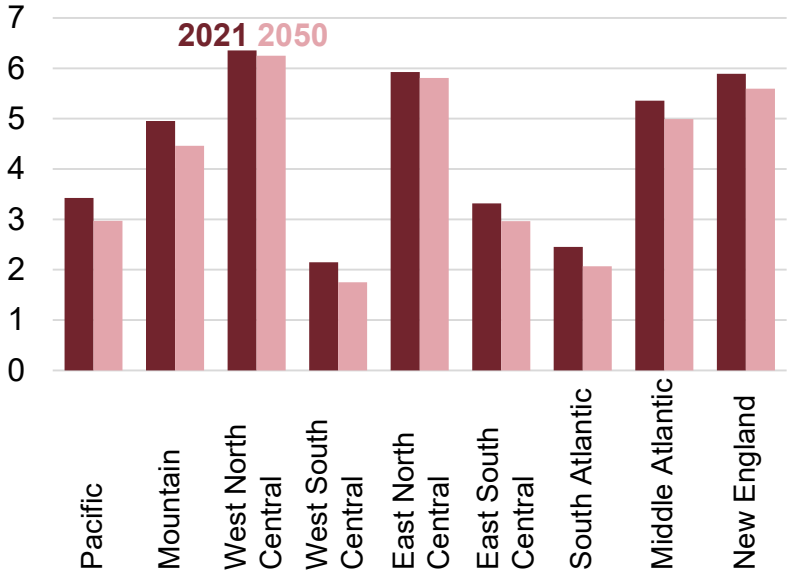
AEO2022 Reference case

percentage growth

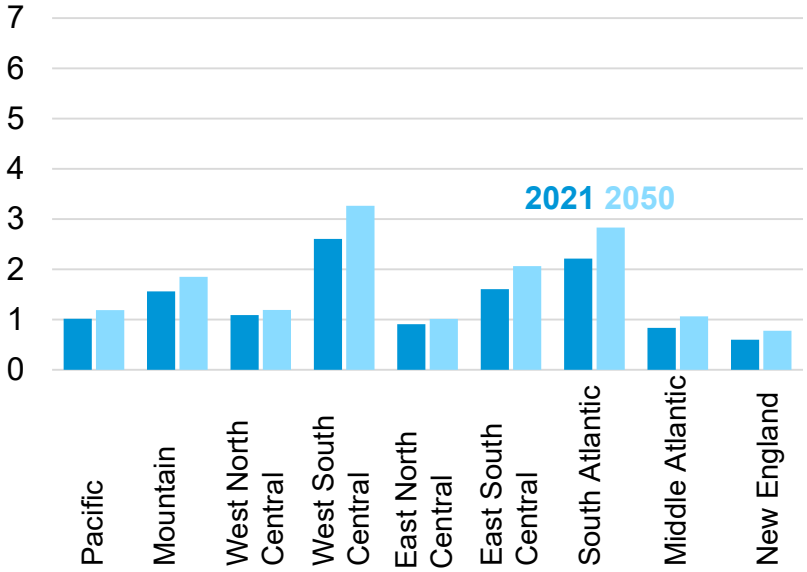


Population-weighted heating and cooling degree days

Population-weighted heating degree days by census division
AEO2022 Reference case
thousand degree days

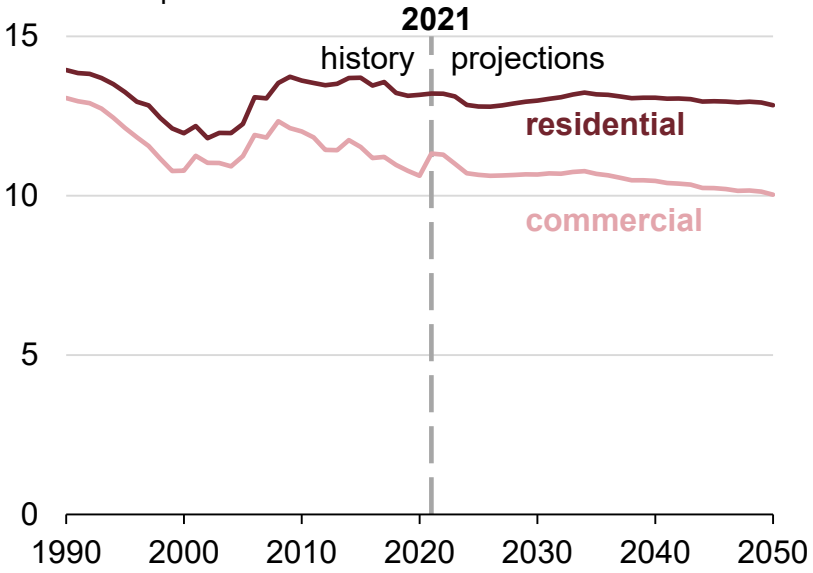


Population-weighted cooling degree days by census division
AEO2022 Reference case
thousand degree days

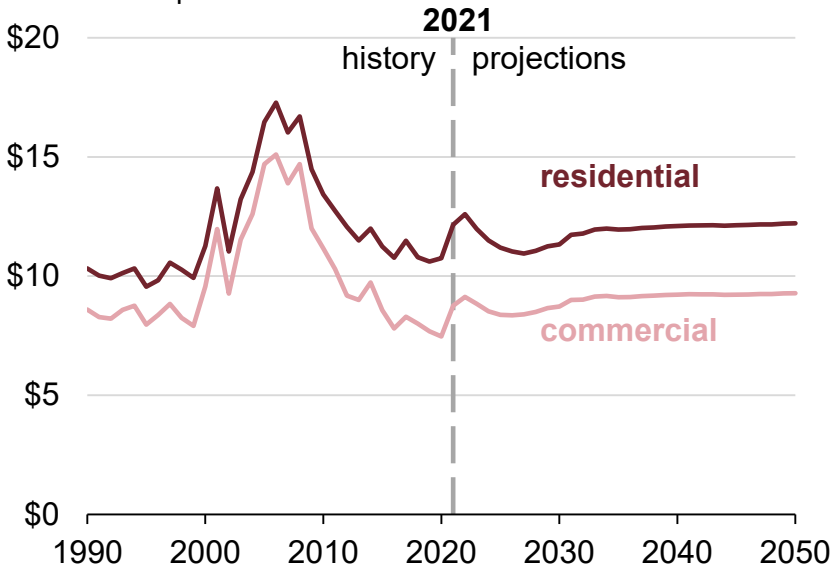


Residential and commercial electricity and natural gas prices

Electricity prices in the residential and commercial sectors
AEO2022 Reference case
2021 cents per kilowatthour

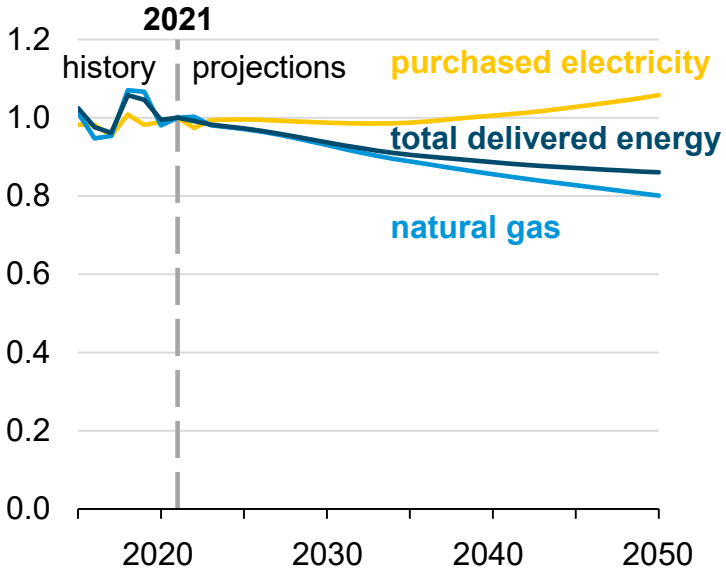


Natural gas prices in the residential and commercial sectors
AEO2022 Reference case
2021 dollars per thousand cubic feet

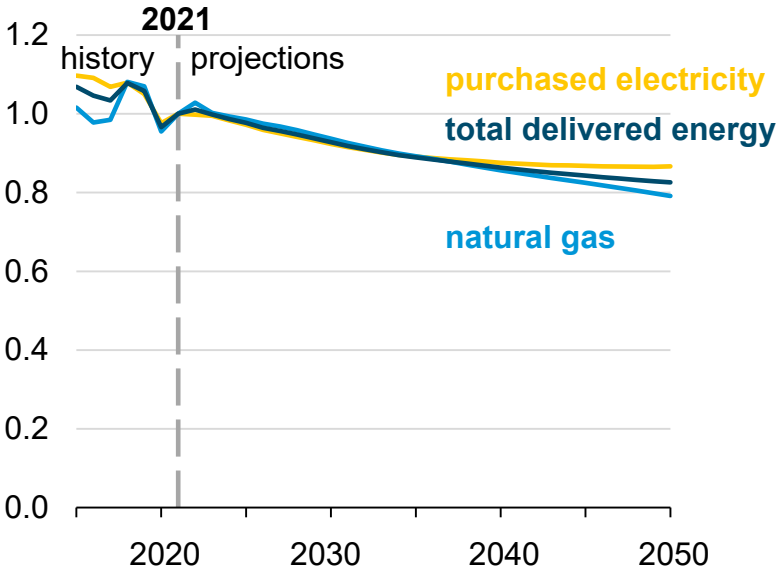


Residential and commercial energy intensity

Indexed residential delivered energy intensity
AEO2022 Reference case
indexed annual energy use per household
2021 = 1.0

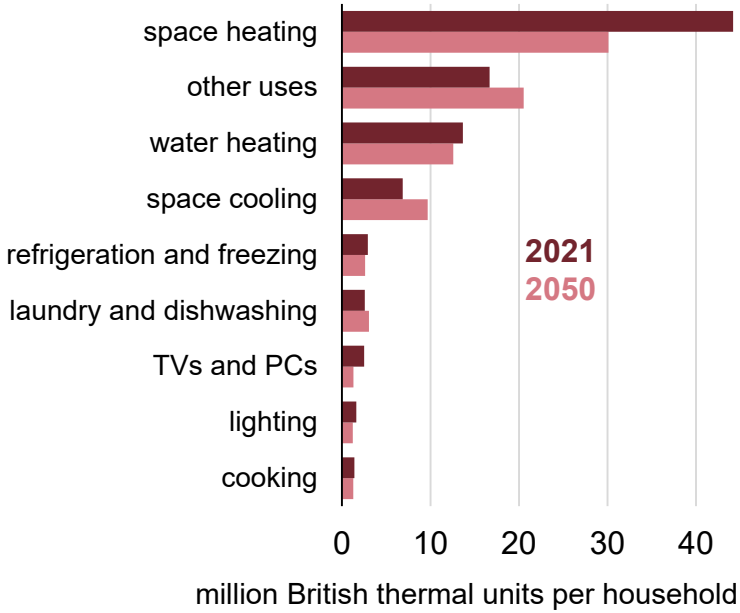


Indexed commercial delivered energy intensity
AEO2022 Reference case
indexed annual energy use per square foot
2021 = 1.0

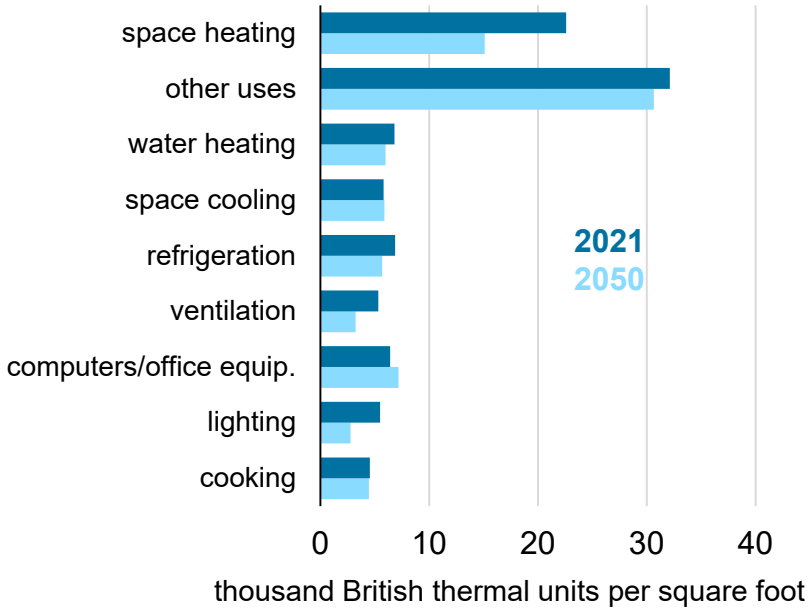


Residential and commercial overall energy intensity by end use

Residential energy intensity by end use
AEO2022 Reference case



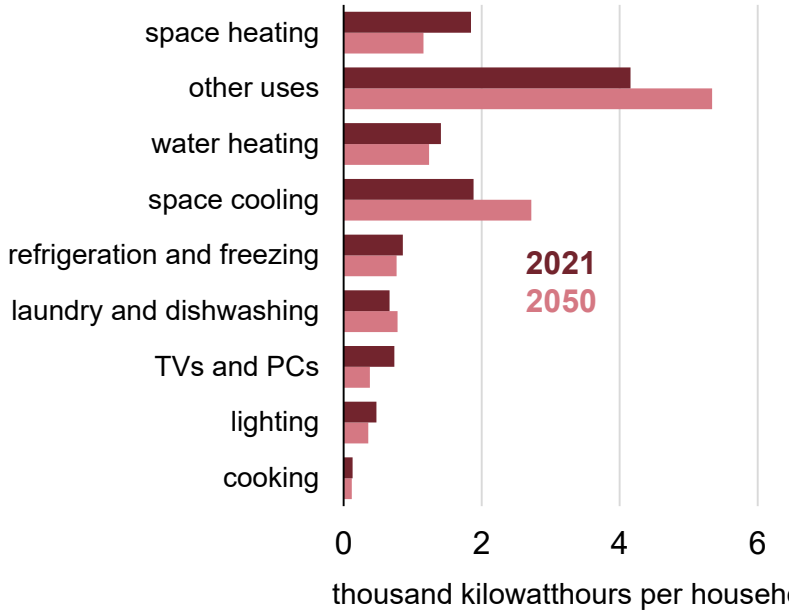
Commercial energy intensity by end use
AEO2022 Reference case



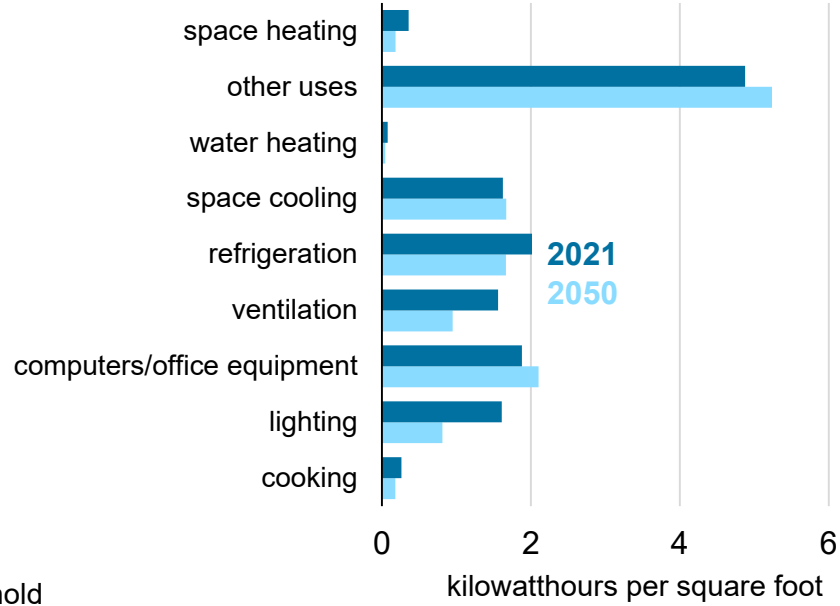
Note: Intensities reflect all energy sources consumed, including both purchased electricity and electricity produced onsite for own use.

Residential and commercial electricity intensity by end use

Residential electricity intensity by end use
AEO2022 Reference case



Commercial electricity intensity by end use
AEO2022 Reference case

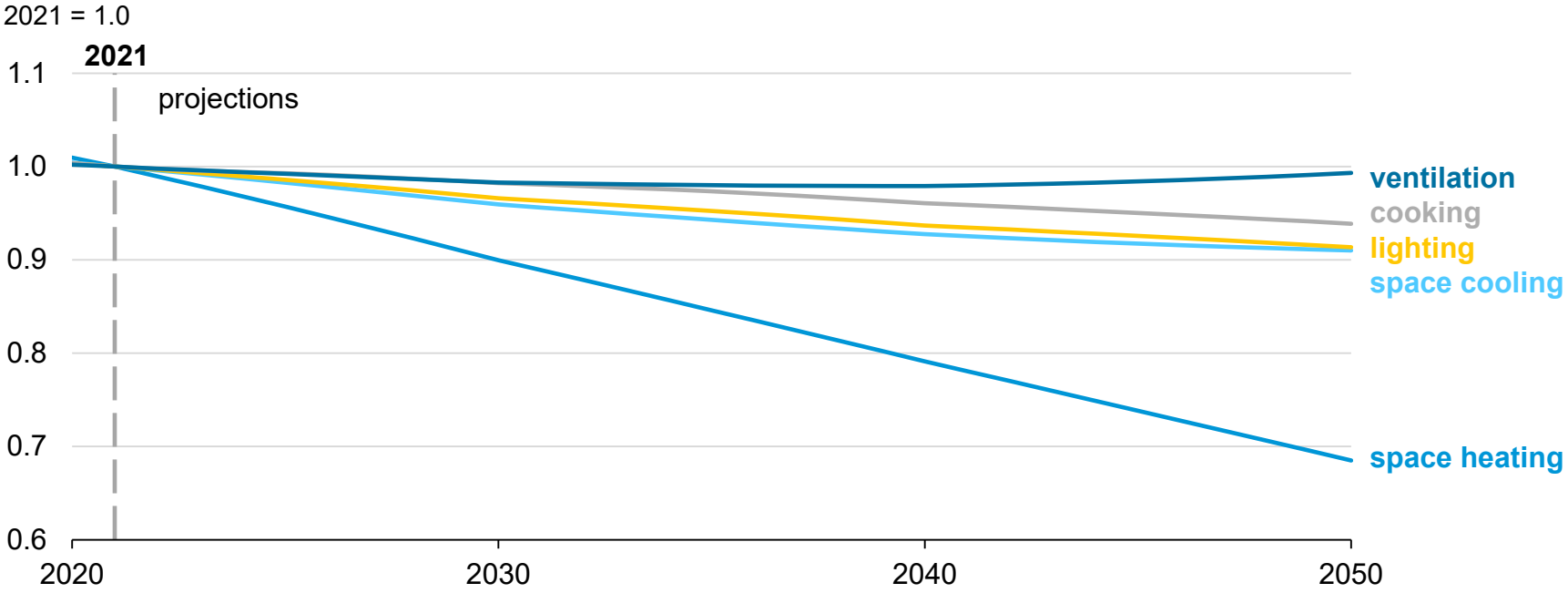


Note: Intensities reflect both purchased electricity and electricity produced onsite for own use.

Commercial building end-use intensities

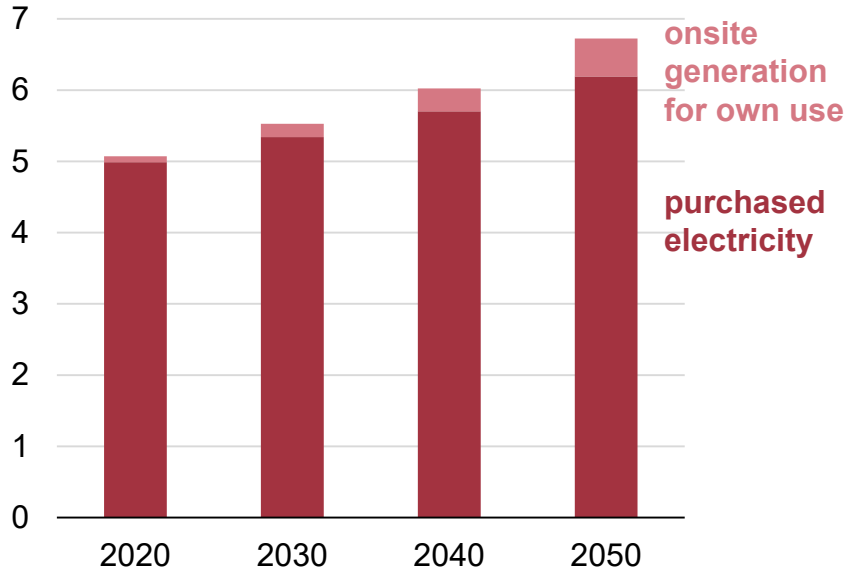
Indexed commercial service provided per square foot of floorspace

AEO2022 Reference case

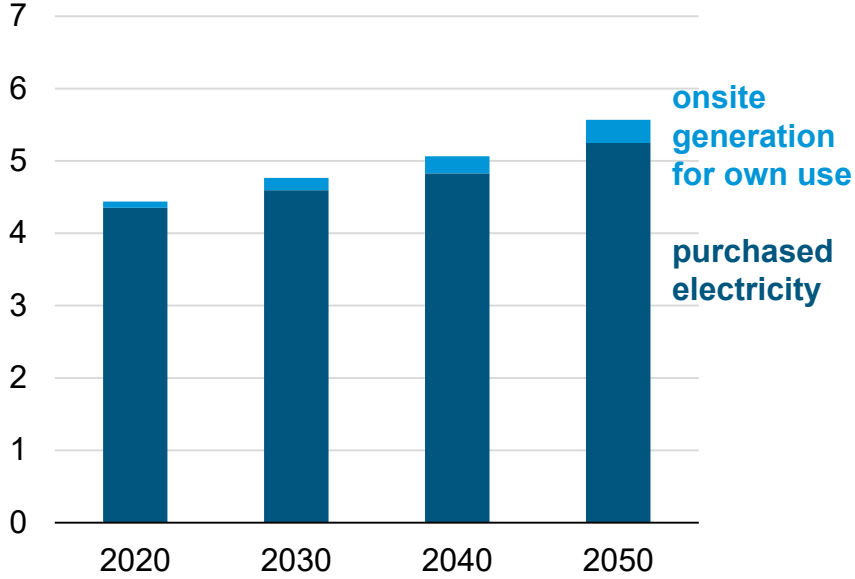


Residential and commercial onsite generation versus purchased electricity

Residential sector electricity consumption
AEO2022 Reference case
quadrillion British thermal units

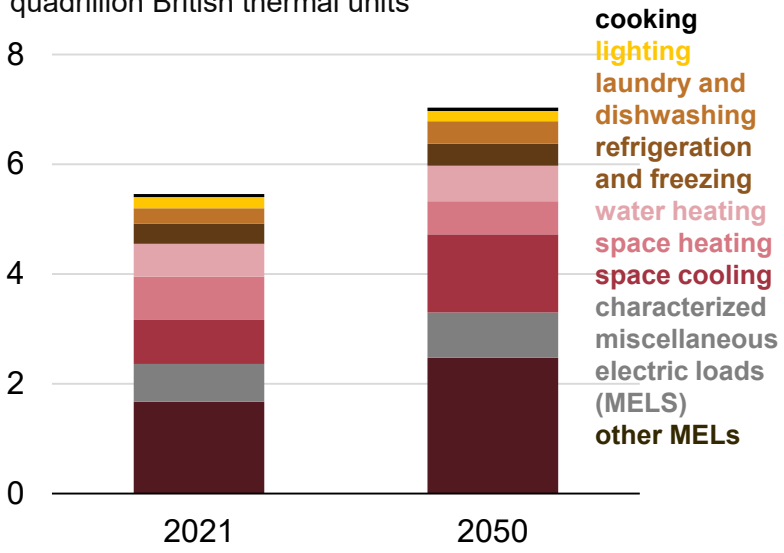


Commercial sector electricity consumption
AEO2022 Reference case
quadrillion British thermal units

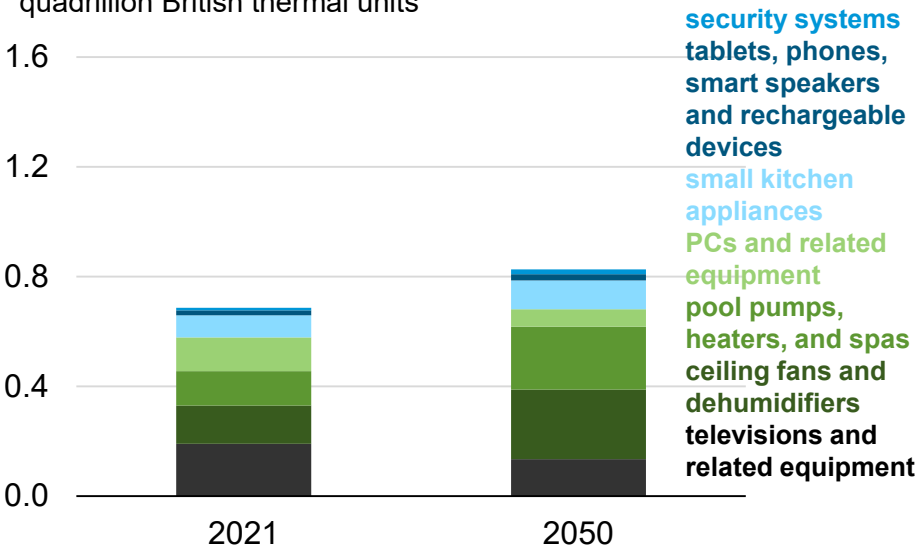


Residential electricity use and miscellaneous electrical loads

Electricity consumed to meet residential end-use demand
AEO2022 Reference case
quadrillion British thermal units



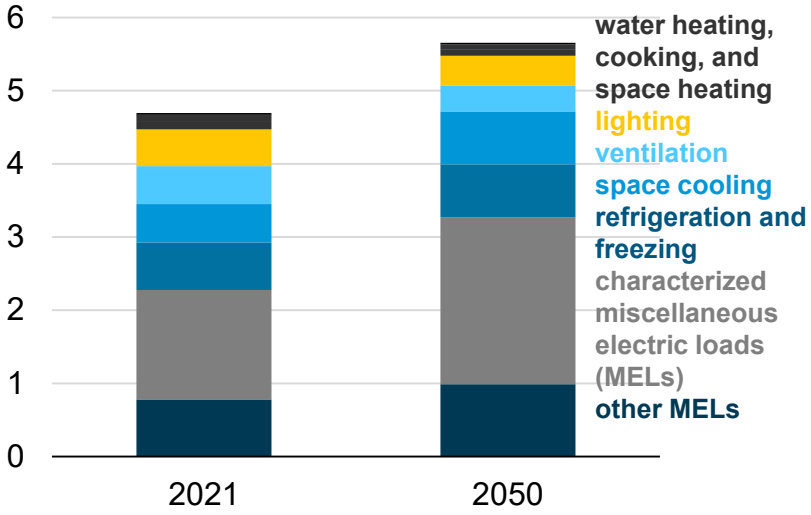
Characterized miscellaneous electric loads in the residential sector
AEO2022 Reference case
quadrillion British thermal units



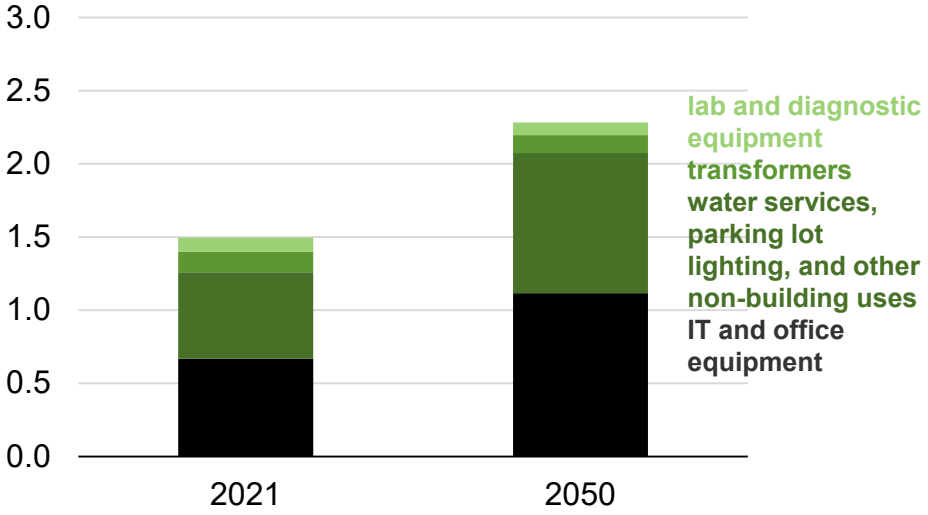
Note: The other MELs category includes aggregated energy use for end uses not explicitly characterized in the right-hand chart, as well as unspecified electricity consumption.

Commercial electricity use and miscellaneous electrical loads

Electricity consumed to meet commercial end-use demand
AEO2022 Reference case
quadrillion British thermal units



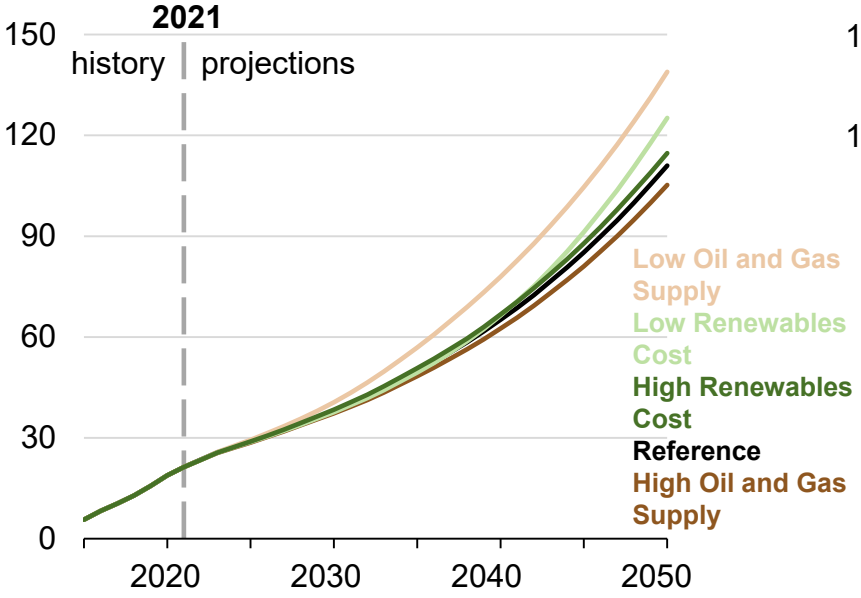
Characterized miscellaneous electric loads in the commercial sector
AEO2022 Reference case
quadrillion British thermal units



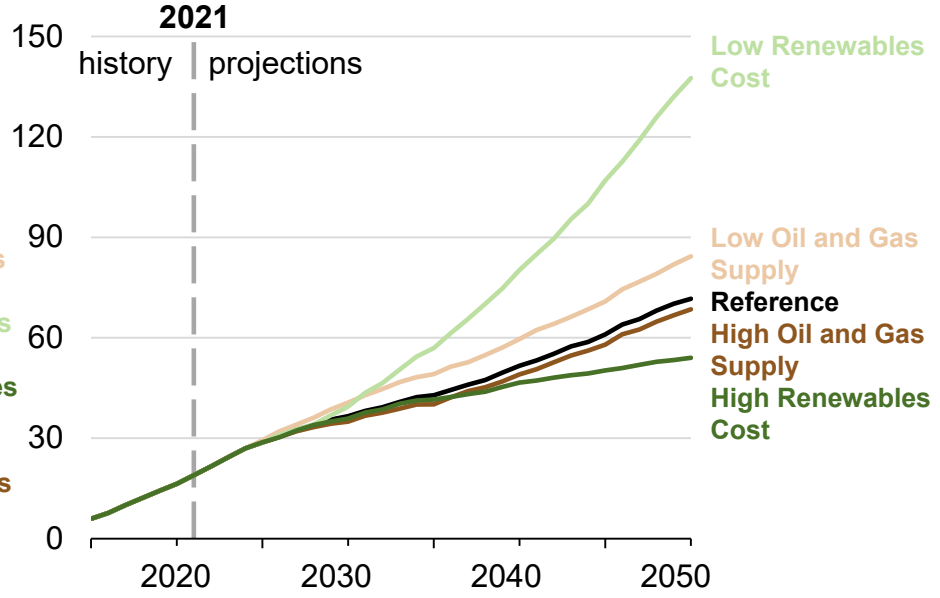
Note: The other MELs category includes aggregated energy use for end uses not explicitly characterized in the right-hand chart, as well as unspecified electricity consumption.

Residential and commercial solar photovoltaic generation capacity

Residential solar distributed generation capacity
AEO2022 Reference and side cases
gigawatts direct current

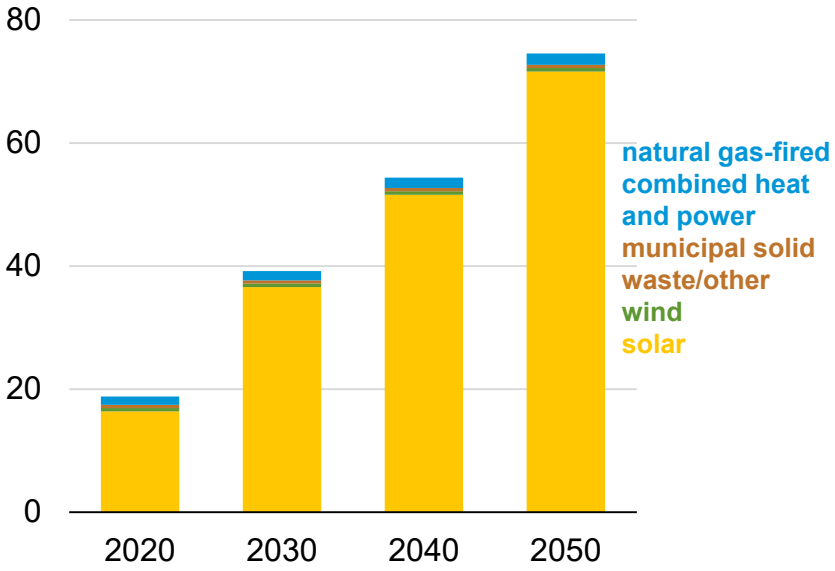


Commercial solar distributed generation capacity
AEO2022 Reference and side cases
gigawatts direct current

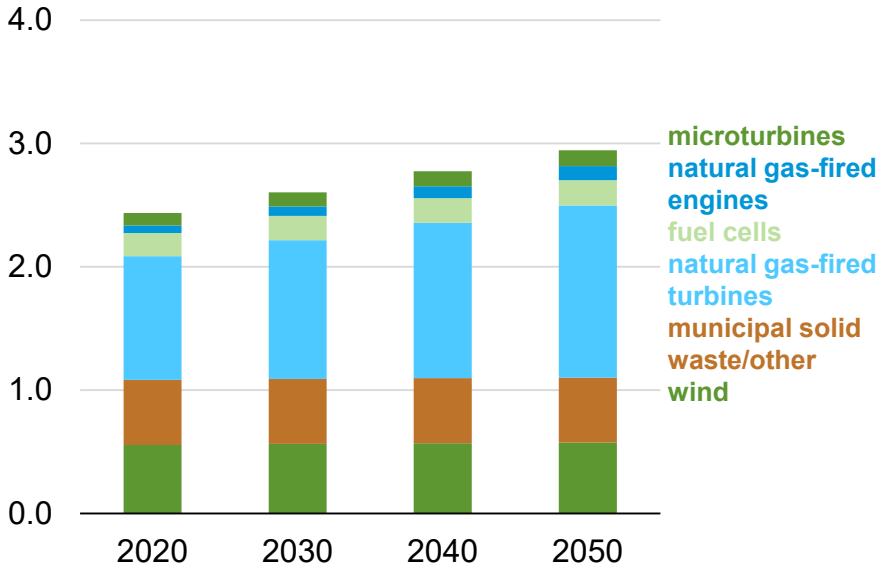


Commercial distributed generation capacity

Commercial distributed generation capacity
AEO2022 Reference case
gigawatts direct current

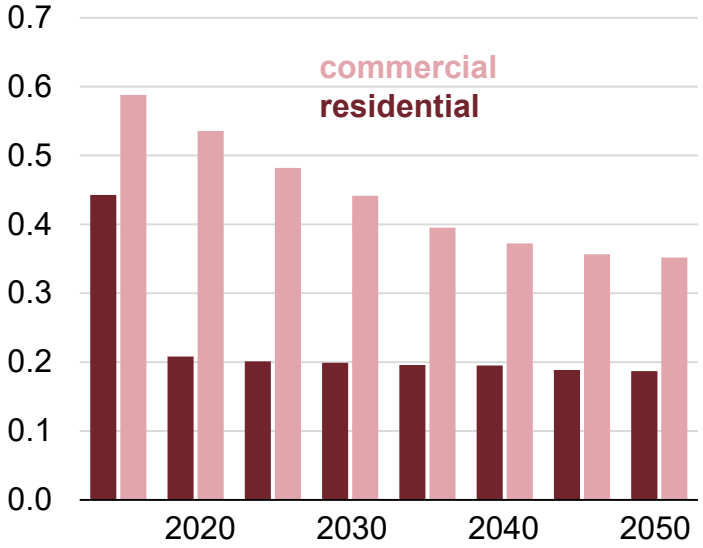


Commercial non-solar distributed generation capacity
AEO2022 Reference case
gigawatts direct current



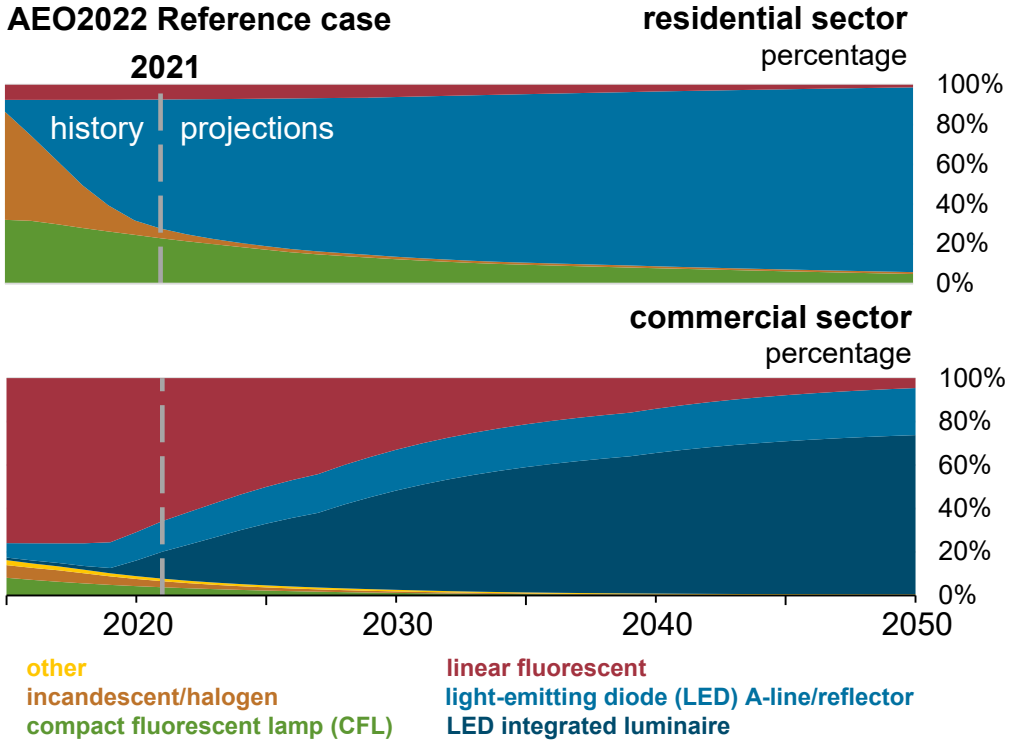
Residential and commercial lighting consumption and lighting shares

Electricity consumed to meet lighting demand
AEO2022 Reference case
quadrillion British thermal units



Note: Includes both purchased electricity and onsite generation for own use.

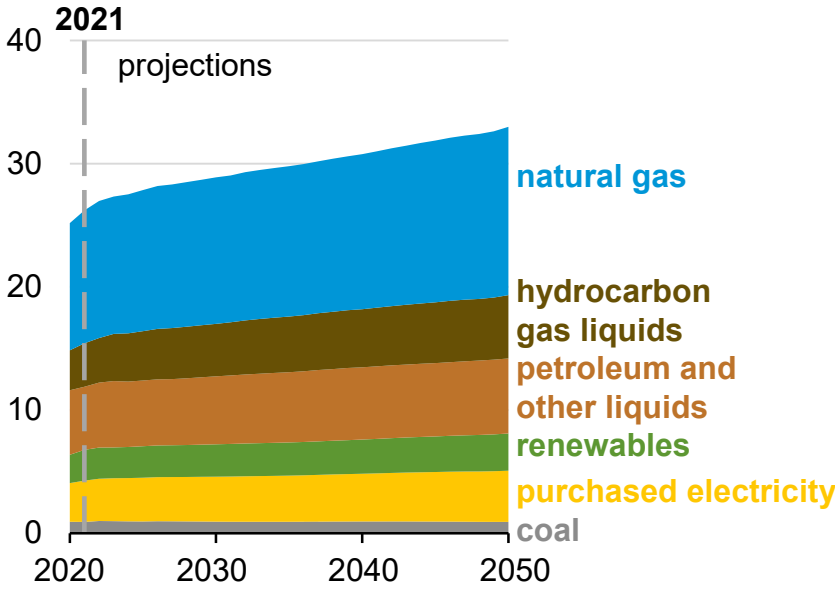
Lighting shares by type
AEO2022 Reference case



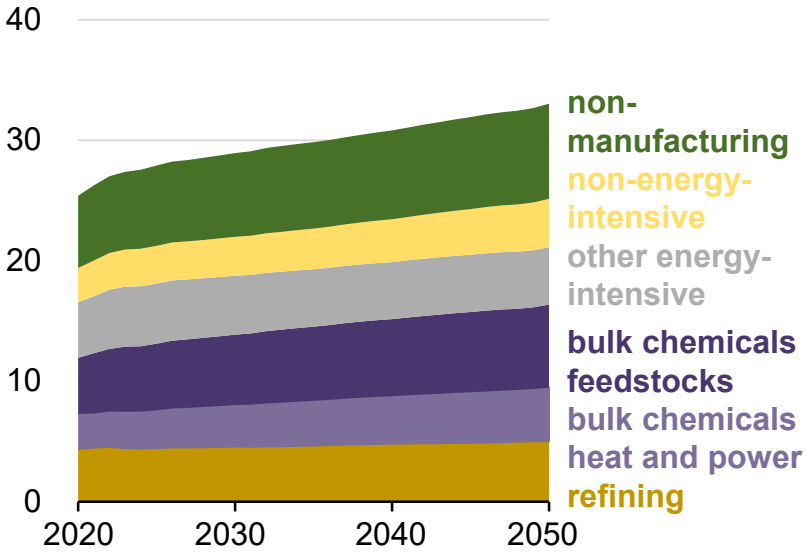
Industrial

Industrial sector energy consumption

Industrial energy consumption by fuel
AEO2022 Reference case
quadrillion British thermal units



Industrial energy consumption by subsector
AEO2022 Reference case
quadrillion British thermal units

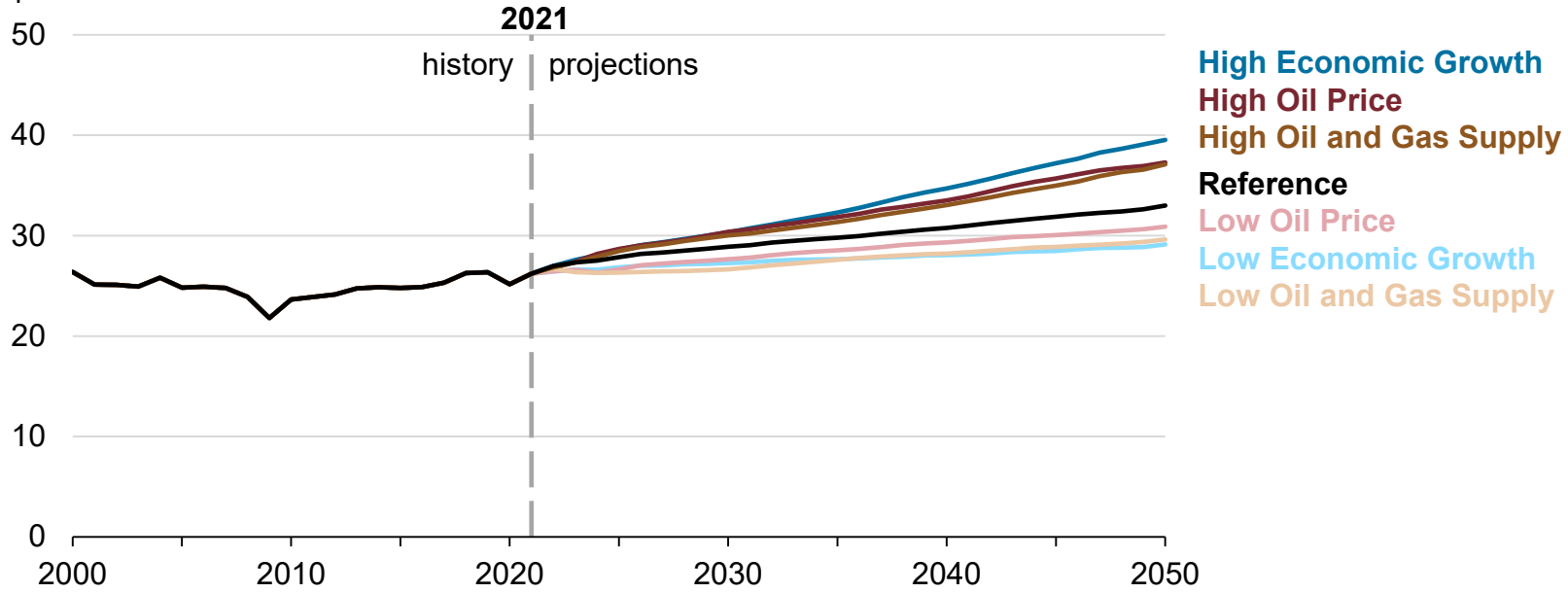


Industrial sector delivered energy consumption across cases

Industrial delivered energy consumption

AEO2022 selected side cases

quadrillion British thermal units

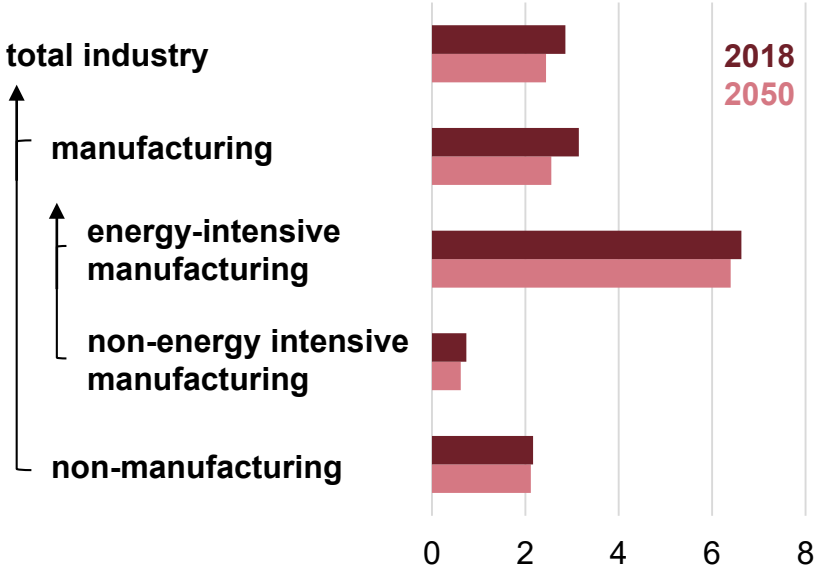


Industrial sector energy intensity

Energy intensity by subsector

AEO2022 Reference case

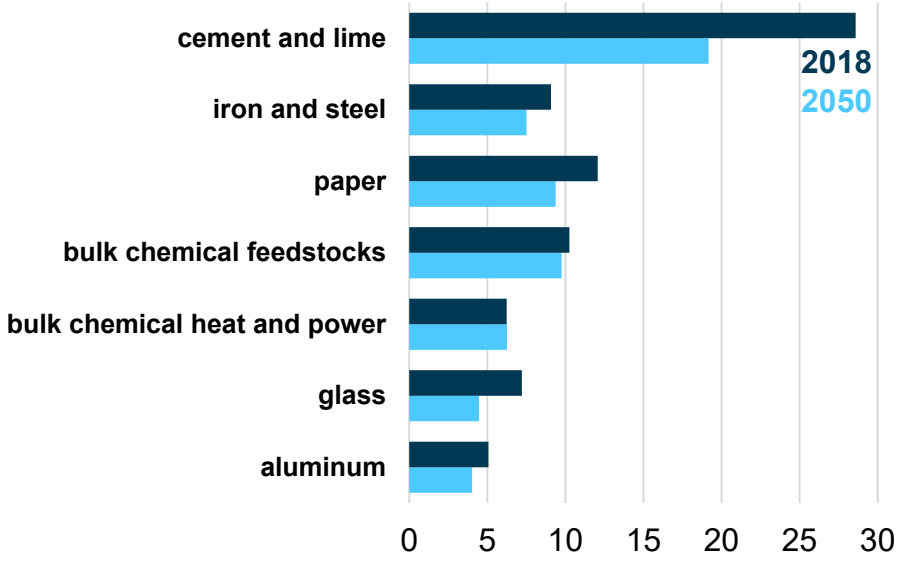
trillion British thermal units per billion 2012 dollar shipments



Energy-intensive manufacturing by industry

AEO2022 Reference case

trillion British thermal units per billion 2012 dollar shipments

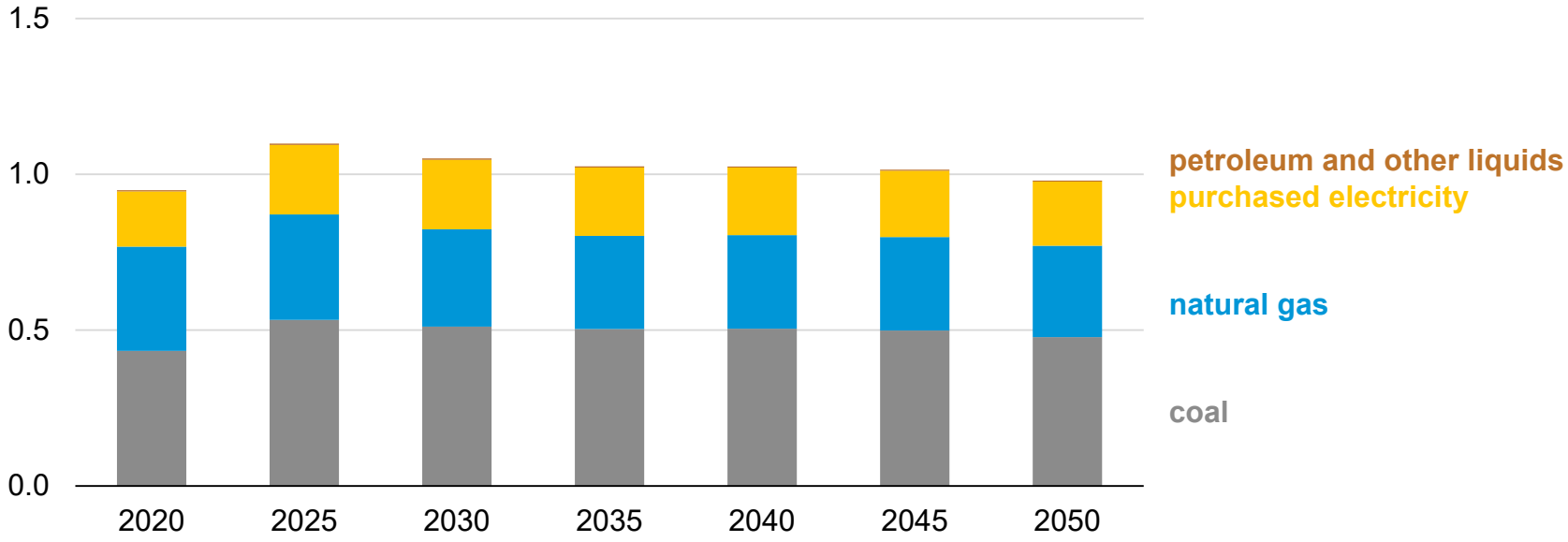


Iron and steel industry energy consumption by source

Iron and steel industry energy consumption by source

AEO2022 Reference case

quadrillion British thermal units

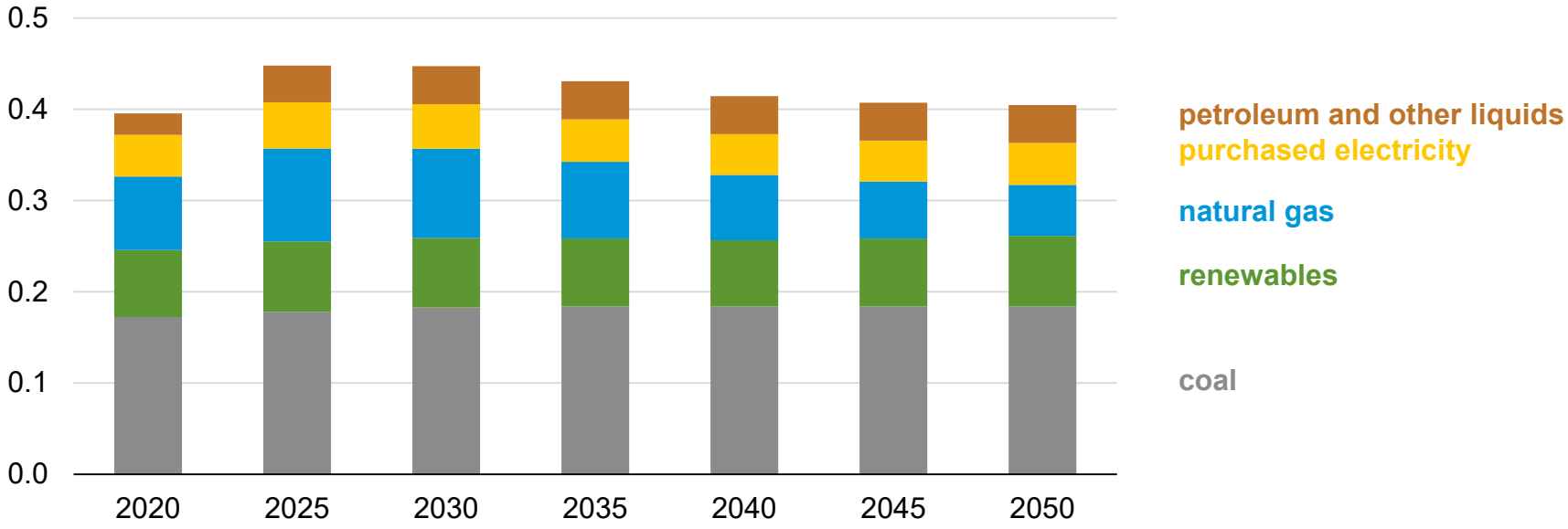


Cement and lime industry energy consumption by source

Cement and lime industry energy consumption by source

AEO2022 Reference case

quadrillion British thermal units

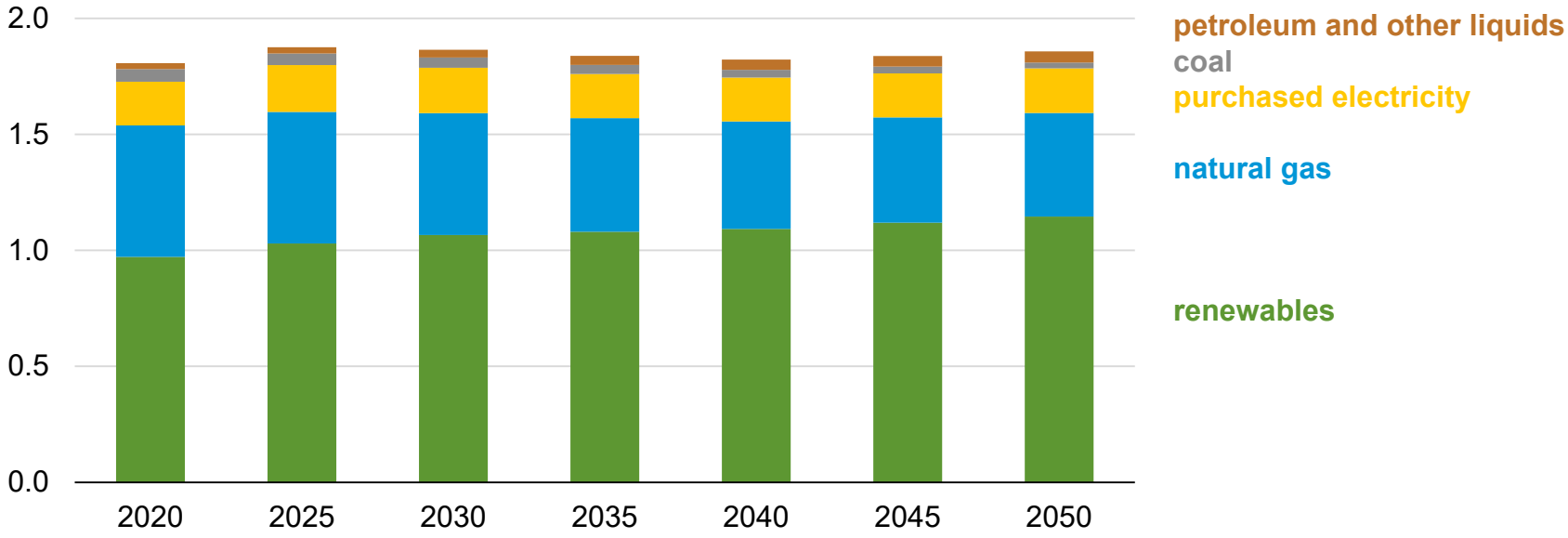


Pulp and paper industry energy consumption by source

Pulp and paper industry energy consumption by source

AEO2022 Reference case

quadrillion British thermal units

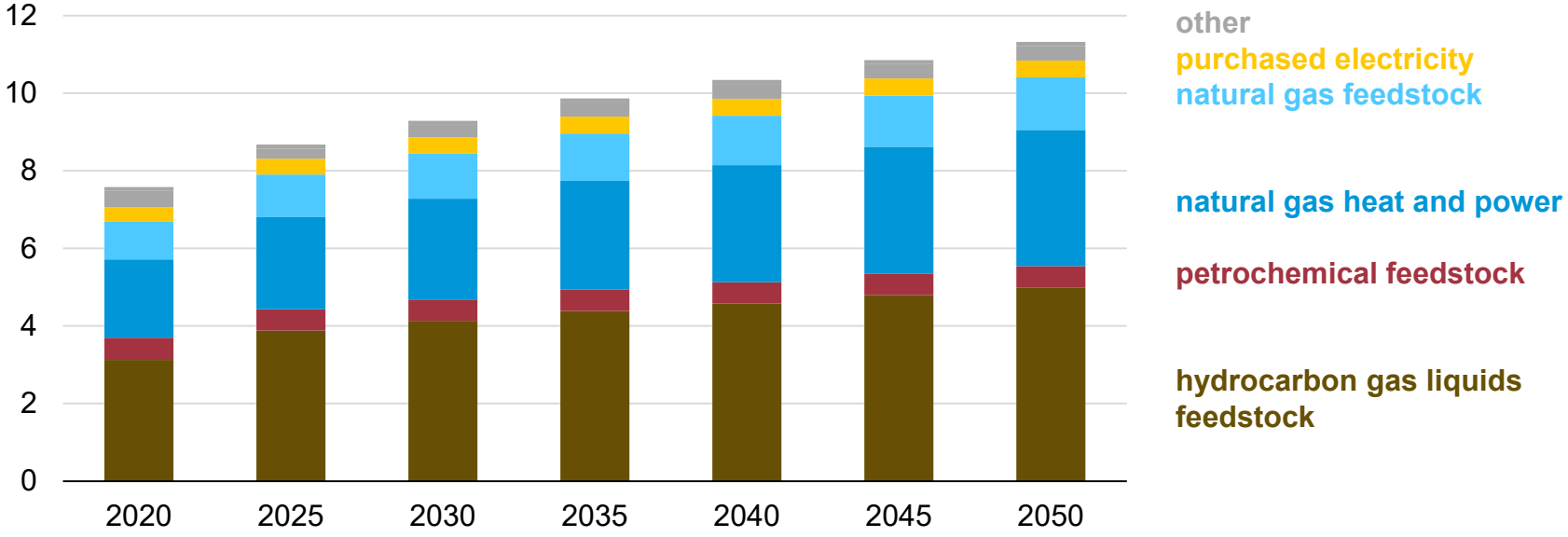


Bulk chemicals industry energy consumption by source

Bulk chemicals industry energy consumption by source

AEO2022 Reference case

quadrillion British thermal units



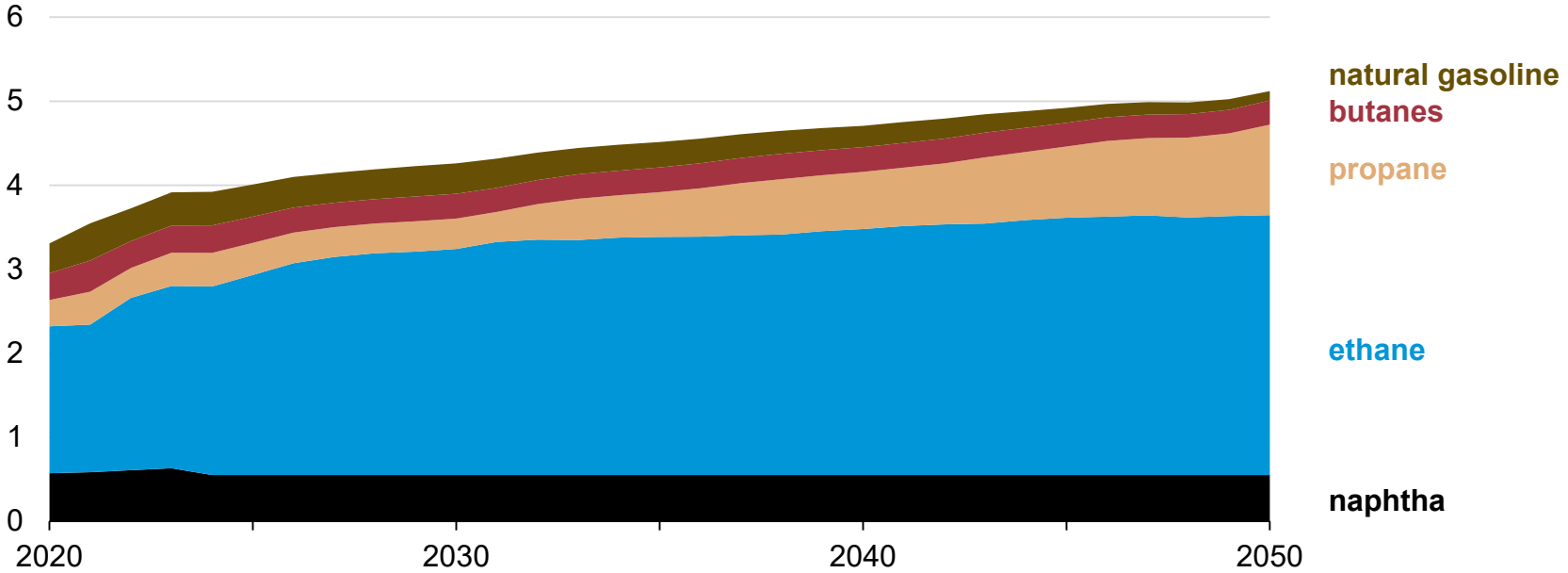
Note: Other includes coal, renewables, and other petroleum.

Hydrocarbon gas liquid and naphtha feedstocks consumed for chemical production

Hydrocarbon gas liquid (HGL) and naphtha chemical feedstocks

AEO2022 Reference case

quadrillion British thermal units



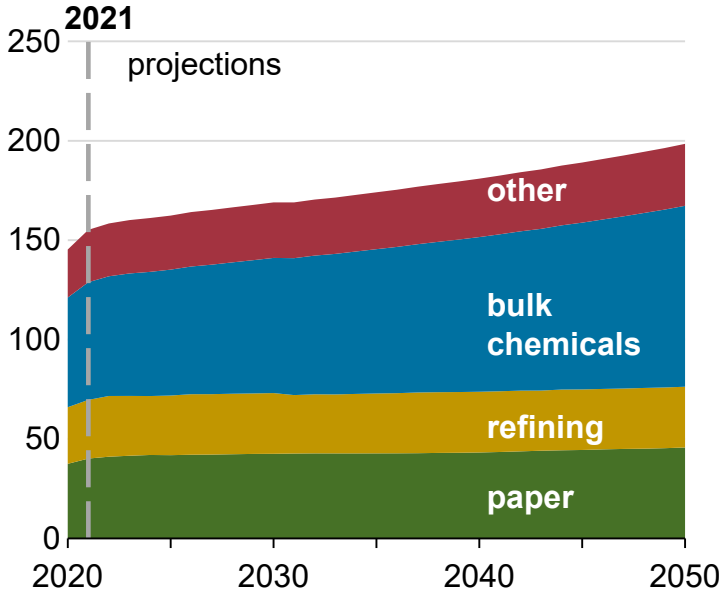
Note: Excludes propylene.

Industrial sector combined-heat-and-power (CHP) generation

CHP generation by industry

AEO2022 Reference case

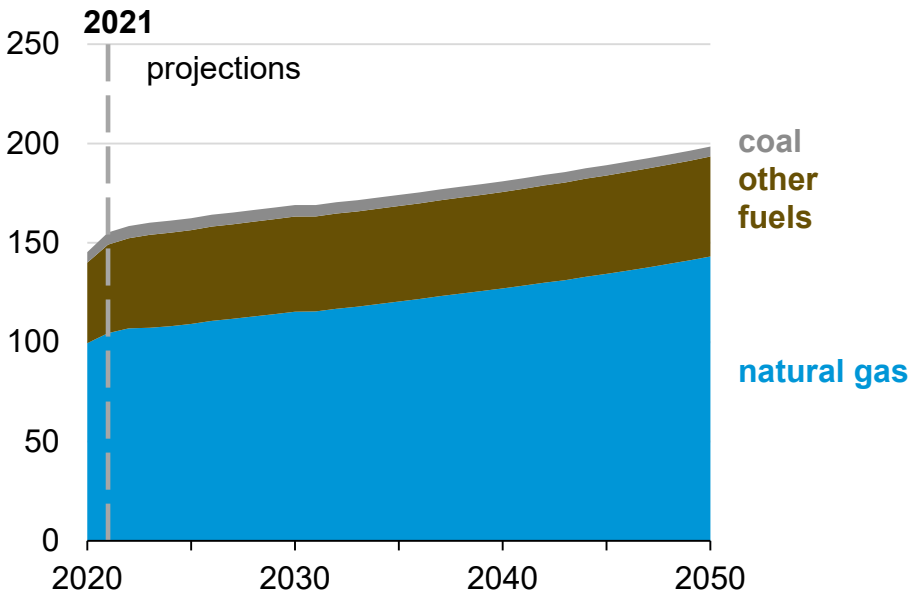
billion kilowatthours



CHP generation by fuel

AEO2022 Reference case

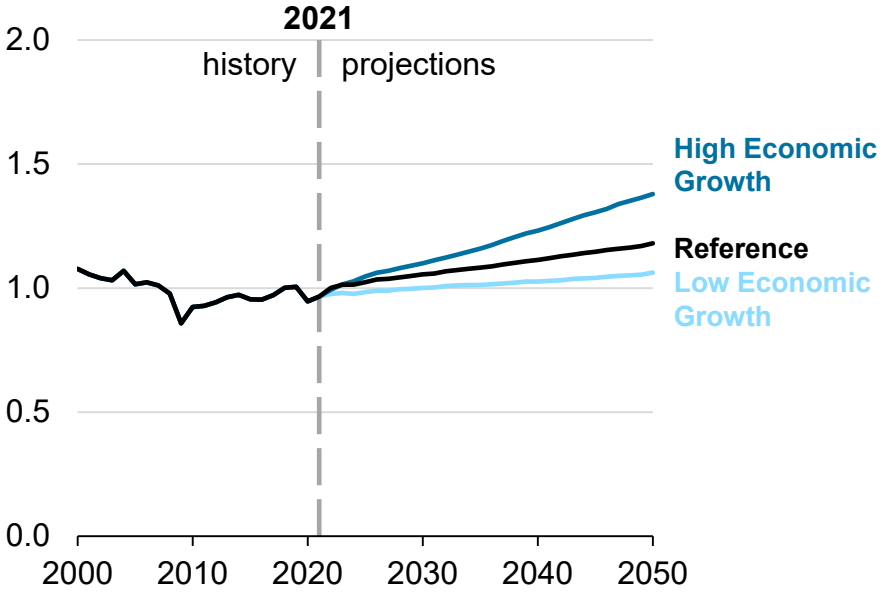
billion kilowatthours



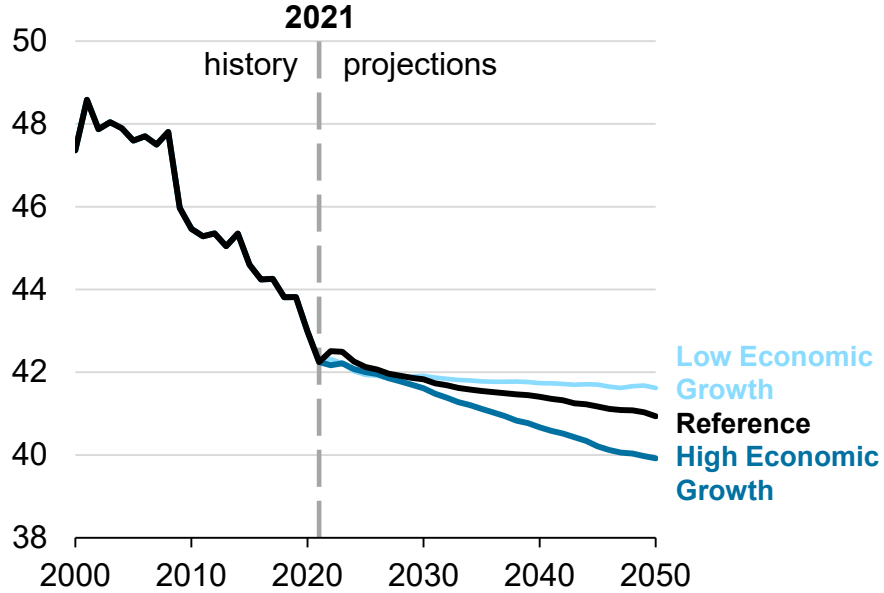
Note: Other fuels includes renewables and other petroleum.

Industrial sector CO_2 emissions and CO_2 intensity

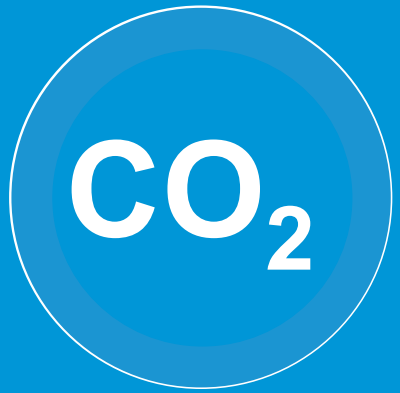
Industrial sector CO_2 emissions
AEO2022 economic growth cases
billion metric tons of CO_2



Industrial sector CO_2 intensity
AEO2022 Reference case
metric tons of CO_2 per billion British thermal units



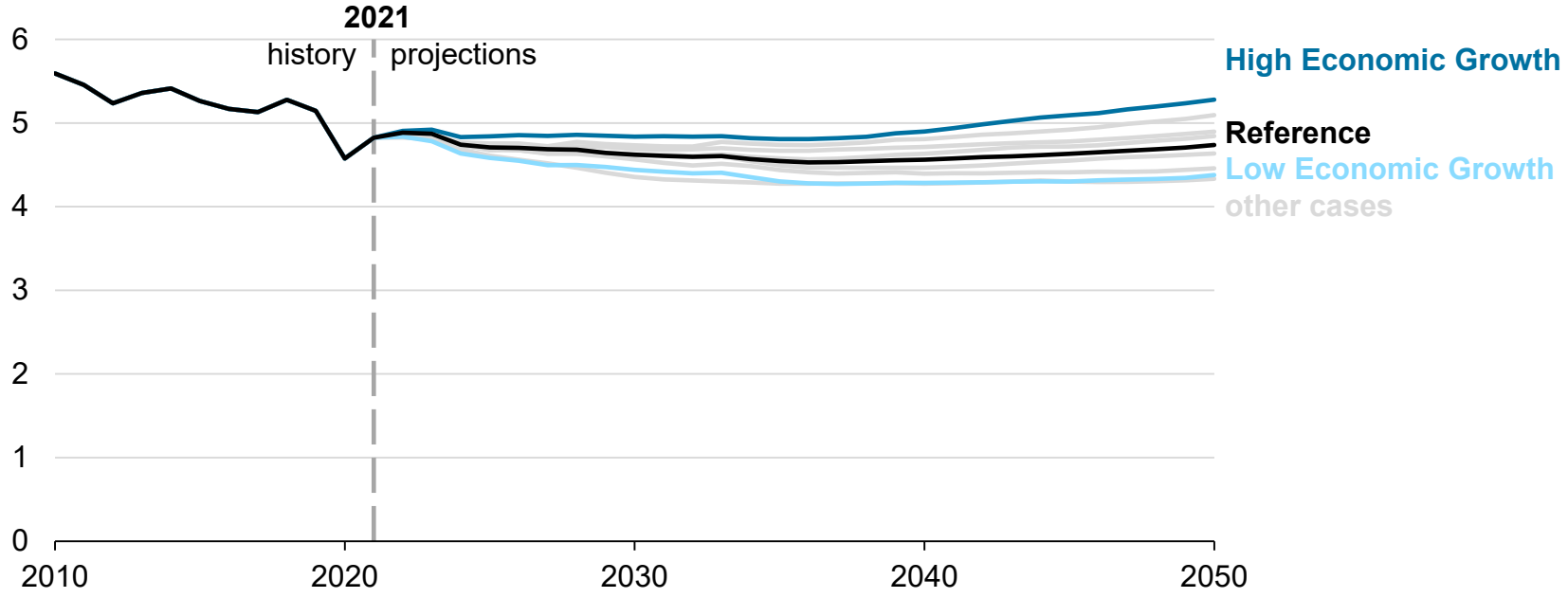
Note: Series does not include greenhouse gases other than CO_2. Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production. Series excludes power sector emissions.



Emissions

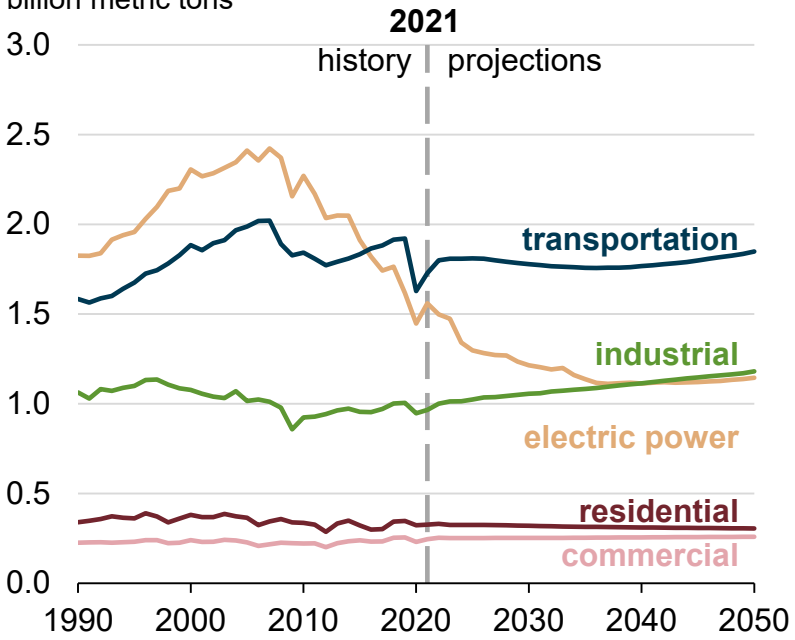
CO_2 emissions based on macroeconomic growth assumptions

U.S. energy-related CO_2 emissions
AEO2022 economic growth cases
billion metric tons

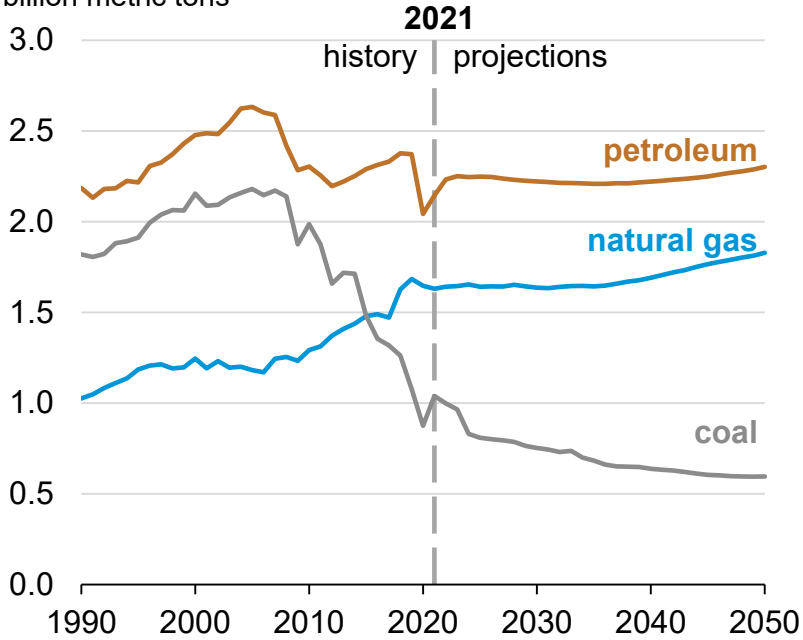


Energy-related CO_2 emissions by sector and fuel

Energy-related CO_2 emissions by sector
AEO2022 Reference case
billion metric tons



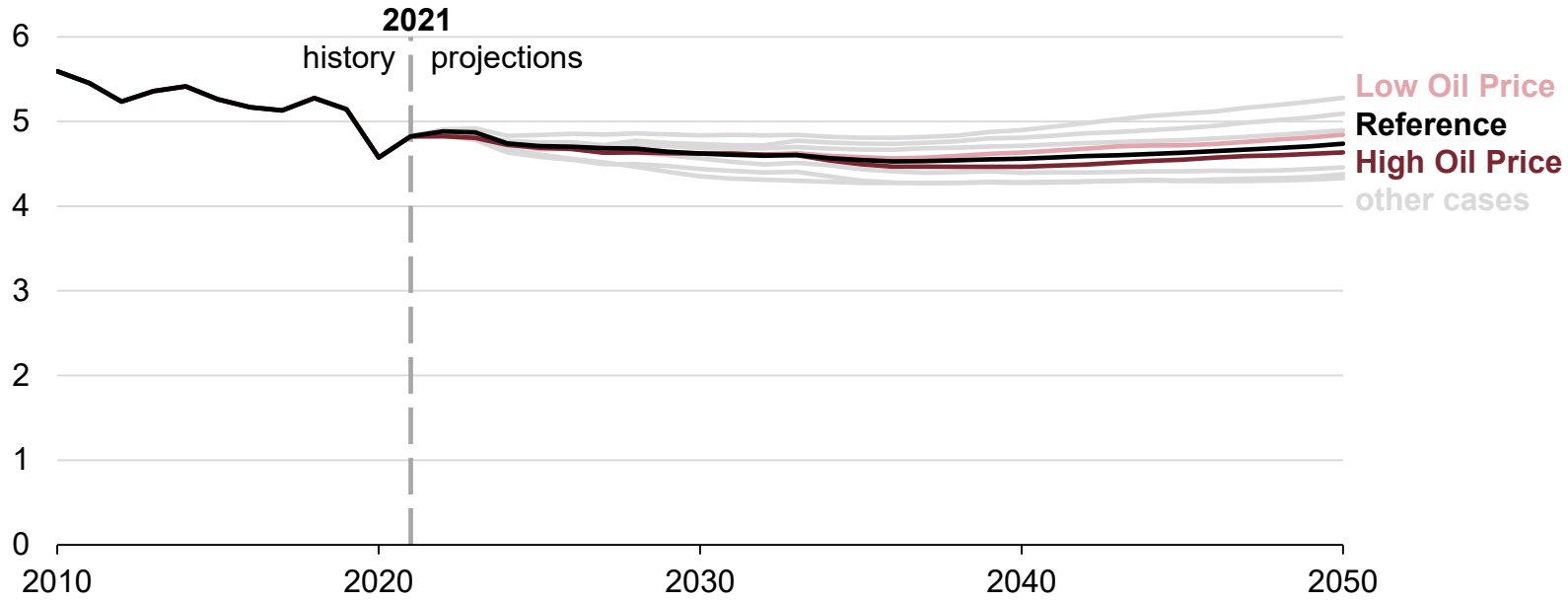
Energy-related CO_2 emissions by fuel
AEO2022 Reference case
billion metric tons



Note: Series does not include greenhouse gases other than CO_2. Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production.

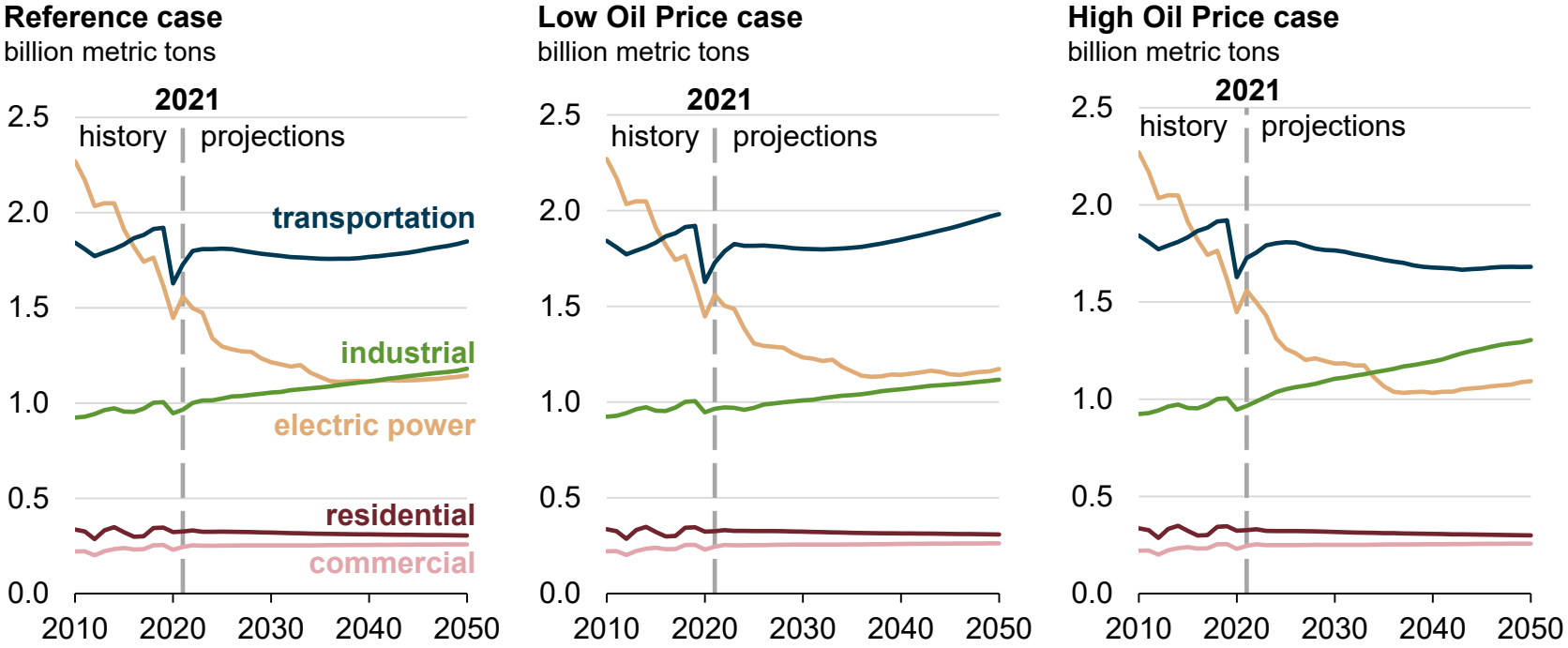
Energy-related CO_2 emissions based on oil price assumptions

U.S. energy-related CO_2 emissions
AEO2022 oil price cases
billion metric tons



Energy-related CO_2 emissions by sector based on oil price assumptions

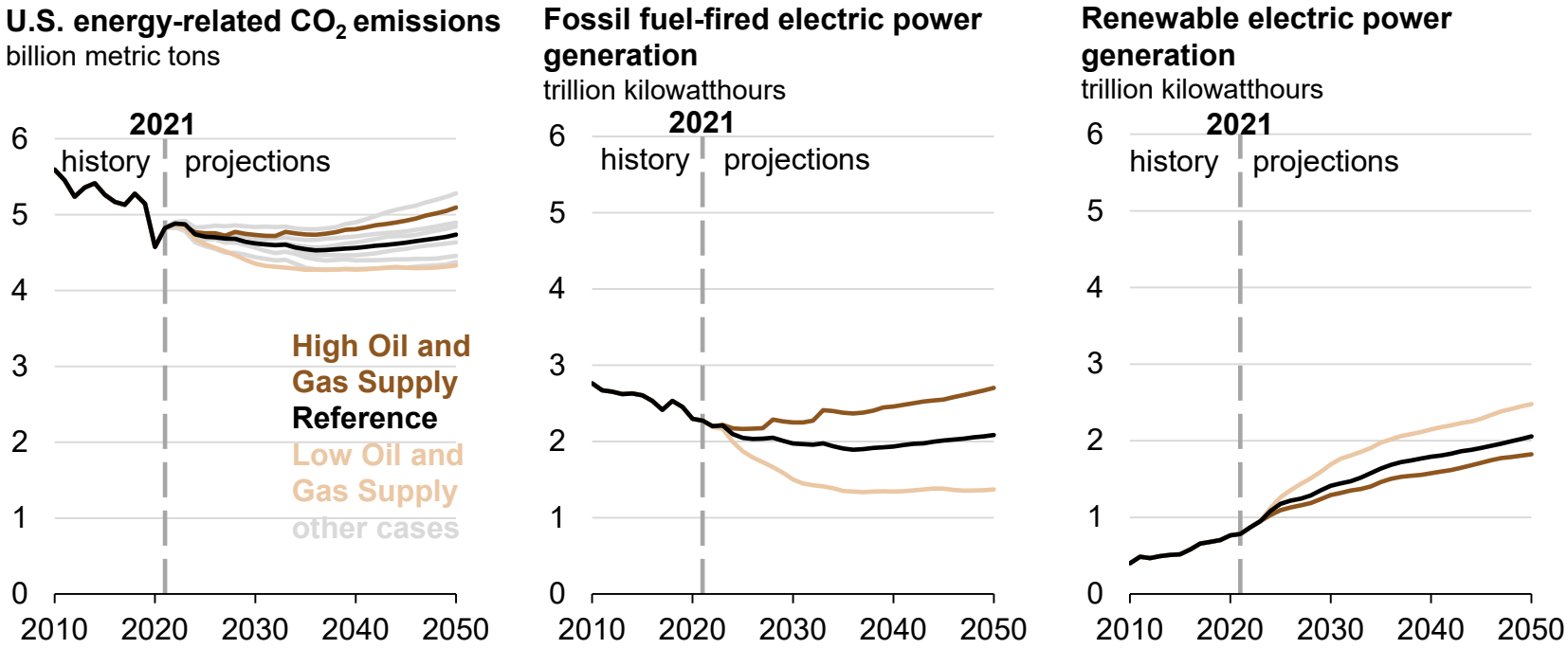
CO_2 emissions by sector, AEO2022 oil price cases



Note: Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production.

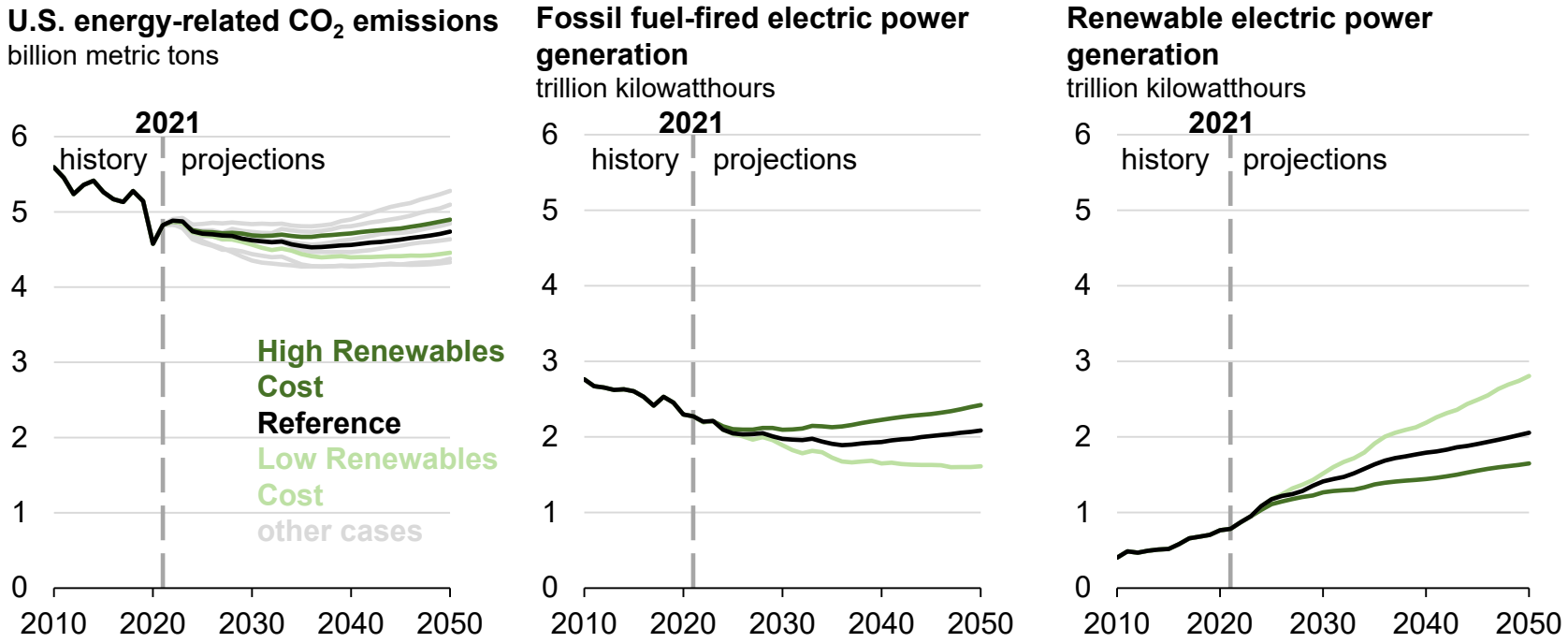
Electric power generation and energy-related CO_2 emissions based on oil and natural gas supply assumptions

CO_2 emissions and electric power generation, AEO2022 oil and natural gas supply cases



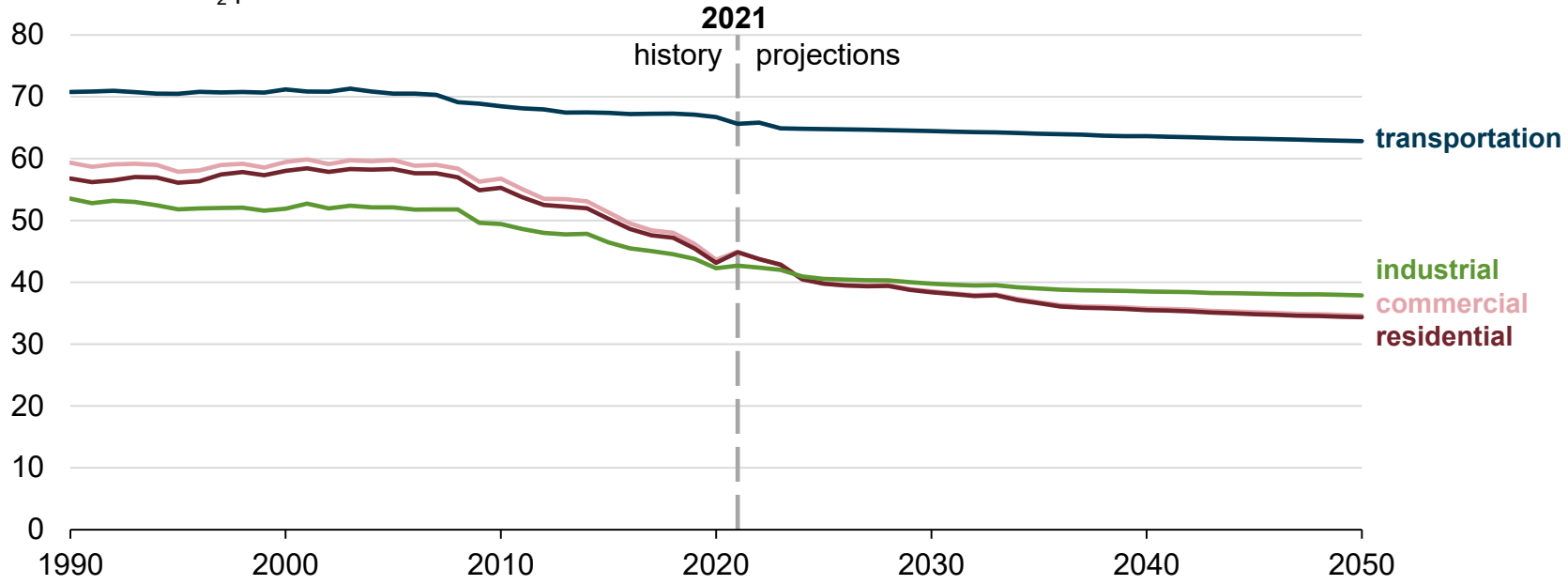
Electric power generation and energy-related CO_2 emissions based on renewable cost assumptions

CO_2 emissions and electric power generation, AEO2022 renewables cost cases



CO_2 intensity by sector

CO_2 intensity by end-use sector
AEO2022 Reference case
metric tons of CO_2 per billion British thermal unit



Note: Each end-use sector takes into account the carbon intensity of electric power. Industrial sector CO_2 emissions do not include process emissions, such as the emissions from cement clinker production.

References

Abbreviations

AEO = *Annual Energy Outlook*

Bcf/d = billion cubic feet per day

CAGR = compound annual growth rate

CAISO = California Independent System Operator

CCGT = natural gas combined cycle

CFL = compact fluorescent lamp

CHP = combined heat and power

CO2 = carbon dioxide

EIA = U.S. Energy Information Administration

ERCOT = Electric Reliability Council of Texas

GDP = gross domestic product

HC = High Renewable Cost case

HOGS = High Oil and Gas Supply case

LC = Low Renewable Cost case

LED = light-emitting diode

LNG = liquefied natural gas

LOGS = Low Oil and Gas Supply case

PJM = Pennsylvania-New Jersey-Maryland Interconnection

PV = photovoltaic

Tcf = trillion cubic feet

EIA Glossary | www.eia.gov/tools/glossary

Graph sources

Projected values are sourced from

> Projections: EIA, AEO2022 National Energy Modeling System (runs: ref2021.d011222a, highprice.d011222a, lowprice.d011222a, highmacro.d011622a, lowmacro.d011222a, highogs.d011222a, lowogs.d011222a, hirencst.d011322a, lorencst.d011222a)

EIA historical data are sourced from

- *Monthly Energy Review* (and supporting databases), October 2021
- Form EIA-860M, *Preliminary Monthly Electric Generator* Inventory, August 2021

For source information for specific graphs published in this document, contact annualenergyoutlook@eia.gov.

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U.S. Energy Information Administration homepage | www.eia.gov

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Today in Energy | www.eia.gov/todayinenergy

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