

Short-Term Energy Outlook

STEO

February 2024



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Short-Term Energy Outlook

Overview

U.S. energy market indicators	2023	2024	2025
Brent crude oil spot price (dollars per barrel)	\$82	\$82	\$79
Retail gasoline price (dollars per gallon)	\$3.52	\$3.31	\$3.31
U.S. crude oil production (million barrels per day)	12.93	13.10	13.49
Natural gas price at Henry Hub (dollars per million British thermal units)	\$2.54	\$2.65	\$2.94
U.S. liquefied natural gas gross exports (billion cubic feet per day)	11.8	12.1	14.4
Shares of U.S. electricity generation			
Natural gas	42%	42%	41%
Coal	17%	15%	14%
Renewables	22%	24%	26%
Nuclear	19%	19%	19%
U.S. GDP (percentage change)	2.4%	1.8%	1.6%
U.S. CO₂ emissions (billion metric tons)	4.78	4.79	4.72

Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2024

- Natural gas production.** Because of disruptions in mid-January related to cold weather across the central United States, we estimate that U.S. dry natural gas production fell from a [monthly record](#) of 106 billion cubic feet per day (Bcf/d) in December to 102 Bcf/d in January. The January average was 3 Bcf/d lower than we had forecast in last month's STEO. We forecast that U.S. natural gas production will increase in February and reach 105 Bcf/d by March as the weather-related disruptions subside and will stay close to that level for the rest of the year. Dry natural gas production averages 104 Bcf/d for all of 2024 in our forecast, almost 1 Bcf/d less than we forecast in last month's STEO. We expect production will increase in 2025 to average more than 106 Bcf/d.
- Natural gas consumption.** We estimate that more than 118 Bcf/d of natural gas was consumed in the United States in January, a new monthly record, driven by the electric power sector. Although our forecast assumes that the United States will see milder weather with 4% fewer [heating degree days](#) than is typical during February and March, we forecast that U.S. natural gas consumption will increase by 5% in the first quarter of 2024 (1Q24) compared with 1Q23, which was one of the warmest first quarters on record.
- Natural gas storage.** In January, increased natural gas consumption and reduced production resulted in a withdrawal of almost 920 Bcf from storage for the month, the third-most ever. However, because January began with 13% more natural gas in storage than average over the past five years, inventories remain above the five-year (2019–2023) average. We expect U.S. natural gas inventories in February and March will fall by less than the five-year average because of milder-

than-normal weather. We forecast inventories will end this winter heating season (November–March) at about 1,910 Bcf, which would be 15% more than the five-year average.

- **Natural gas prices.** The Henry Hub spot price averaged \$3.18 per million British thermal units (MMBtu) in January. However, spot prices were volatile, rising sharply to \$13.20/MMBtu on Friday January 12 in anticipation of severely cold weather for the coming weekend. After the weekend, prices quickly fell and continued to decrease until January 23, when the price hit the monthly low of \$2.15/MMBtu. We forecast that mild weather for the remainder of 1Q24 will keep the average Henry Hub spot price near \$2.40/MMBtu during February and March. But volatility could return if severely cold weather emerges, even for a short period.
- **Crude oil prices.** The Brent crude oil spot price increased in January, averaging \$80 per barrel (b) because of heightened uncertainty about global oil shipments as [attacks to vessels in the Red Sea intensified](#). Although we expect crude oil prices will rise into the mid-\$80/b range in the coming months, we expect downward price pressures will emerge in 2Q24 as global oil inventories generally increase through the rest of our forecast. However, ongoing risks of supply disruptions in the Middle East create the potential for crude oil prices to be higher than our forecast.
- **U.S. crude oil production.** We estimate that U.S. crude oil production reached an all-time high in December of more than 13.3 million barrels per day (b/d). However, crude oil production fell to 12.6 million b/d in January because of shut-ins related to cold weather. We forecast production will return to almost 13.3 million b/d in February but then decrease slightly through the middle of 2024 and will not exceed the December 2023 record until February 2025.
- **Electricity generation.** Generation from renewable sources will likely grow in every region of the United States in 2024, driven by our forecast of a 36-gigawatt increase in solar generating capacity. We forecast U.S. solar generation will rise by 43% in 2024 and wind generation will rise by 6%. However, we revised our forecast generation from renewable sources down slightly in 2025 from last month's STEO because of lower reported [capacity additions from generators](#) in recent months. That factor, along with slightly more total generation in 2025, increased our forecast of coal-fired electricity generation in 2025 in this month's outlook.

Notable forecast changes

Current forecast: February 6, 2024; previous forecast: January 9, 2024

	2024	2025
U.S. coal-fired power generation (billion kilowatthours)	614	570
Previous forecast	609	548
Percentage change	0.9%	4.2%
U.S. coal production (million short tons)	470	456
Previous forecast	489	429
Percentage change	-4.0%	6.3%

Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*

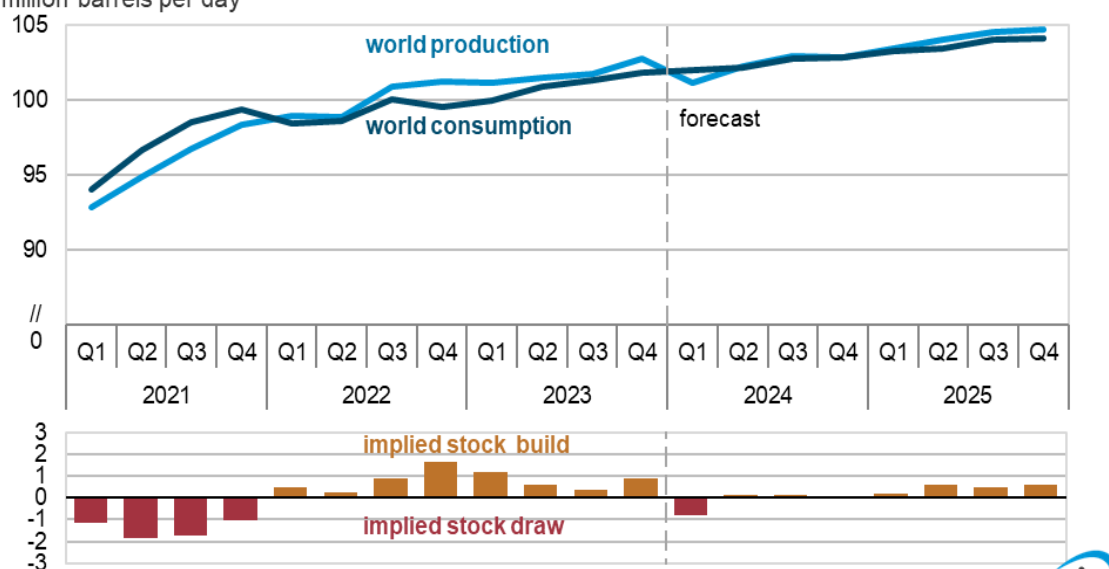
Global Oil Markets

Global oil prices and inventories

The Brent crude oil spot price averaged \$80 per barrel (b) in January, an increase of \$2/b from December, the first monthly increase in the crude oil price since September 2023. Prices rose primarily because of heightened uncertainty about global oil shipments as attacks to vessels around the [critical Red Sea shipping channel](#) intensified. The Red Sea is more critical to the flexibility of global oil trade than in years past following Russia's full-scale invasion of Ukraine. These attacks have increased both transit times and shipping costs for oil, limiting the flexibility of the oil market to adjust to any future supply disruptions. The attacks also add a risk premium to prices due to the potential that oil production in the Middle East could be shut in during the forecast period, although no oil production has been lost as of February 6.

World liquid fuels production and consumption balance

million barrels per day



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2024



The impact of the Red Sea attacks on oil prices has been limited because of prolonged global oil inventory accumulation during 2022 and 2023 and the lack of disruptions to oil production. Our current assessment is that global oil inventories increased by 0.8 million barrels per day (b/d) on average from October 2023, the month before the Red Sea attacks began, through January 2024 and by an average of 0.7 million b/d for all of 2023.

We expect that OPEC+ production cuts will lead to global oil inventory withdrawals during February and March, resulting in an average draw of 0.8 million b/d in 1Q24, which we expect will put upward pressure on oil prices in the coming months. After a period of relatively balanced markets during the rest of 2024, we forecast the market will gradually return to moderate inventory builds in 2025 as slowing growth in oil demand is again outpaced by increasing oil production growth. We forecast that global oil inventories will increase by an average of 0.1 million b/d in the final three quarters of 2024 and by an average of almost 0.5 million b/d in 2025.

We expect that the falling inventories in 1Q24 will increase oil prices into the mid-\$80/b range, before slight downward price pressures emerge through the remainder of our forecast. We forecast the Brent crude oil price will average \$81/b in December 2024 and fall to \$78/b by December 2025.

Global oil production and consumption

We expect that global production of liquid fuels will increase by 0.6 million b/d in 2024, slowing from the increase of almost 1.8 million b/d in 2023. In our forecast, global growth in liquid fuels production is led by non-OPEC supply, which increases by almost 0.8 million b/d, offsetting an OPEC production decline of 0.2 million b/d. Global liquids fuel production increases by almost 1.9 million b/d in 2025 in our forecast. The expiration of [existing OPEC+ production targets](#) at the end of 2024 contributes to our forecast that OPEC will increase crude oil production by 0.7 million next year. However, we expect the increase will be limited because Saudi Arabia and other OPEC+ countries will maintain some level of cuts in an attempt to balance markets. Our forecast for non-OPEC production growth averages 1.2 million b/d in 2025, led by the United States, Canada, Brazil, and Guyana.

We forecast that global consumption of liquid fuels will increase by 1.4 million b/d in 2024 and 1.3 million b/d in 2025. Most of the expected liquid fuels demand growth is in non-OECD Asia, led by China and India, which we expect will increase consumption by a combined 0.6 million b/d in 2024 and 0.5 million b/d in 2025. In OECD countries, liquid fuels consumption stays relatively flat in 2024 and 2025.

Petroleum Products

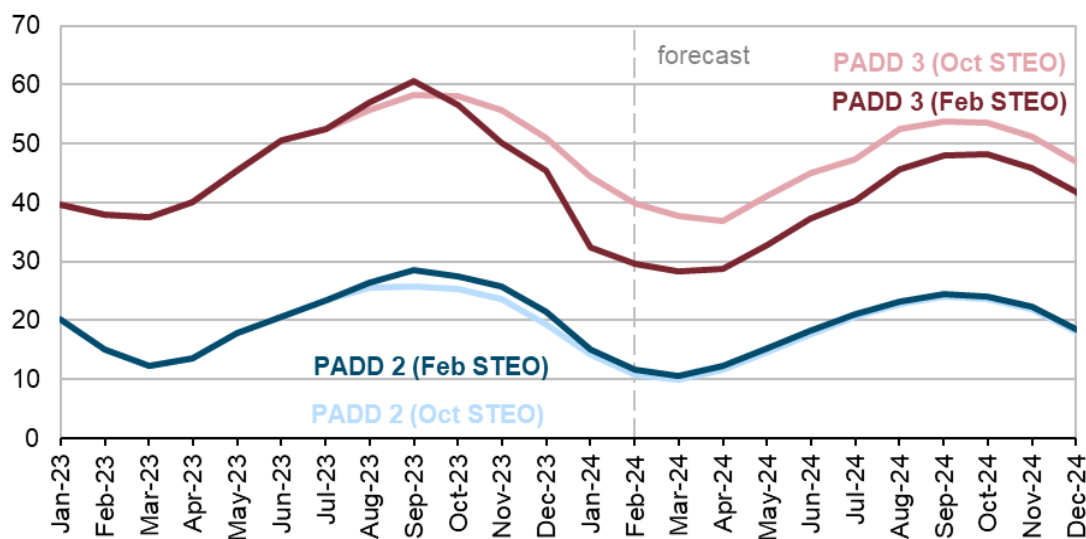
U.S. propane stocks and prices

A cold weather snap in mid-January increased propane consumption—particularly in the Midwest ([PADD 2](#)), where it is most widely used for home heating—and resulted in stock withdrawals that were more than the five-year average. Despite the significant withdrawal from stocks, our forecast for Midwest propane stocks at the end of this winter (March 2024) is up slightly from our October 2023 forecast, when we issued our [Winter Fuels Outlook](#). Stocks increased more than we had expected for September 2023, with Midwest [propane stocks](#) increasing to a seven-year high before the start of winter. Increased starting stocks and our expectation for milder-than-normal weather in February and March lead us to forecast end-of-winter Midwest propane stocks at 11 million barrels, up almost 1 million barrels from our original forecast from October 2023.

Withdrawals from propane stocks on the U.S. Gulf Coast (PADD 3) were also very high in January because of strong overseas demand rather than weather. Based on data from our [Weekly Petroleum Status Report](#), we estimate that January propane exports averaged 1.7 million barrels per day (b/d). If realized, that would set the [record for propane exports](#) in January. Demand for U.S. propane overseas remains high because the commodity is used as a feedstock in petrochemicals as well as a heating fuel. Although delays at the [Panama Canal](#) are increasing shipping times and costs for liquified petroleum gas (LPG) carriers, these issues have so far not affected U.S. propane exports, the bulk of which come from the U.S. Gulf Coast. We now expect Gulf Coast stocks to end March at 28 million barrels, down by more than 9 million barrels from our October 2023 forecast.

U.S. monthly propane inventories

million barrels



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook* (STEO), February 2024 

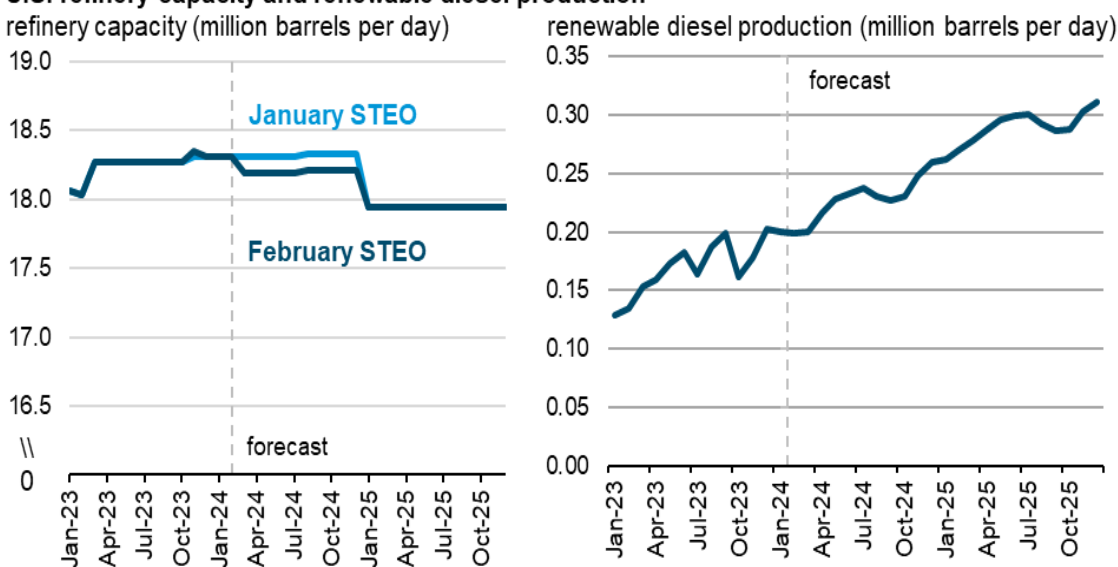
The combined effects of increased consumption from cold weather and record exports increased spot prices by more than we had previously forecast. In the October 2023 STEO, we forecast the Mont Belvieu, Texas, propane spot price would average 75 cents per gallon (gal) in January. The actual price averaged 78 cents/gal. We expect that lower inventories this year will keep propane prices higher than in 2023 for the rest of the year. The Mont Belvieu spot price in our forecast averages close to 80 cents/gal from 2Q24 through 4Q24, up from less than 70 cents/gal during that period last year.

U.S. refinery capacity

We are reducing our U.S. crude oil refining capacity forecast by 120,000 b/d beginning in March 2024, [following reports](#) that Phillips 66 will permanently stop processing crude oil in February at its Rodeo facility near San Francisco, California. Phillips 66 plans to fully convert the facility to renewable fuels production. We originally forecast the conversion would be finalized at the end of 2024. According to [Phillips 66](#), the refinery produced around 60,000 b/d of distillate fuel and around 65,000 b/d of motor gasoline before the conversion. After conversion, the plant will produce around 50,000 b/d of renewable diesel, almost replacing the lost petroleum diesel the refinery produced. The Rodeo refinery is of average size compared with others in California and currently runs a combination of domestically produced crude oils and imported crude oil, mostly from Saudi Arabia and Canada.

We expect U.S. renewable diesel production to increase because of the Phillips 66 Rodeo conversion and other scheduled capacity expansions in the next two years. We forecast U.S. renewable diesel production will average 230,000 b/d in 2024 and 290,000 b/d in 2025, both about 30% annual increases.

U.S. refinery capacity and renewable diesel production



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook* (STE0), February 2024



Natural Gas

Natural gas consumption

We estimate that 118 billion cubic feet per day (Bcf/d) of natural gas was consumed in the United States in January, the most in any month on record. Residential and commercial natural gas consumption in January averaged an estimated 46 Bcf/d, 4 Bcf/d more than January 2023. [A mass of cold air covering much of the United States](#) for several days in mid-January increased space heating demand across the country. According to data from S&P Global Commodity Insights, the cold weather led to [record-high daily natural gas consumption on January 16](#). In addition, natural gas consumed for electricity generation increased by 5 Bcf/d in January compared with a year earlier, establishing a new January record of almost 37 Bcf/d. Despite the cold snap that briefly increased natural gas prices, the Henry Hub spot price stayed below \$3 per million British thermal units (MMBtu) for most of January, which increased use of natural gas for electricity generation.

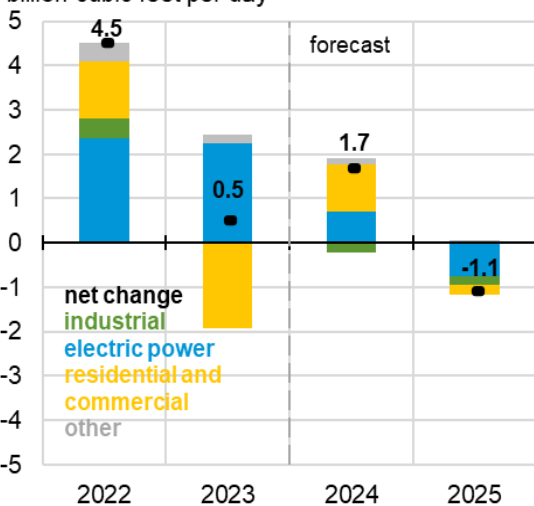
We forecast consumption of natural gas in the U.S. residential and commercial sectors will increase slightly in 2024, averaging 22 Bcf/d for the year. Residential and commercial sector natural gas consumption is highest in winter months due to increased space heating demand.

In February and March 2024, we forecast less natural gas consumption than average as a result of milder weather represented by 4% fewer [heating degree days](#) (HDDs) than the prior 10-year (2014–2023) average for those two months. However, winter storms could significantly affect consumption. In addition, natural gas exports are likely to decrease in February compared with January due to a partial outage at the Freeport LNG facility that began toward the end of January and that [Freeport expects will last about a month](#).

U.S. natural gas consumption components of annual change

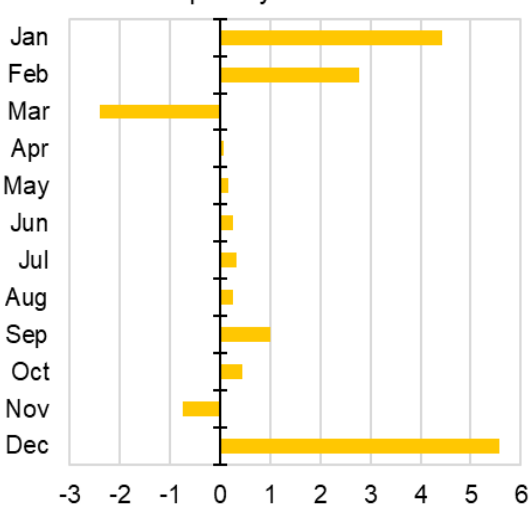
All sectors

billion cubic feet per day



Residential and commercial (2024 vs. 2023)

billion cubic feet per day



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2024

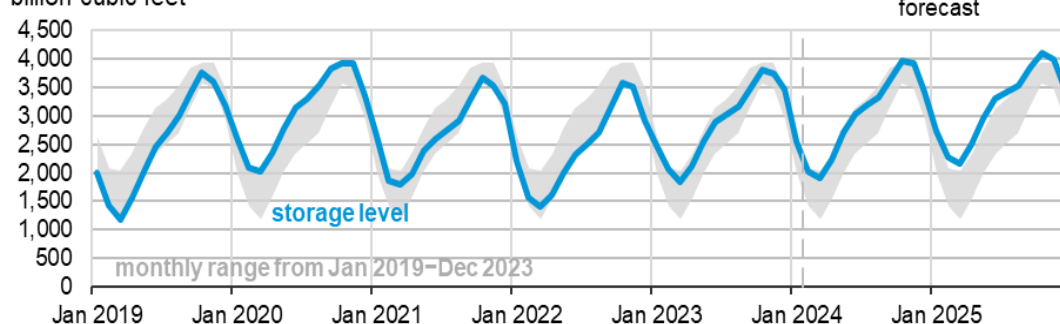
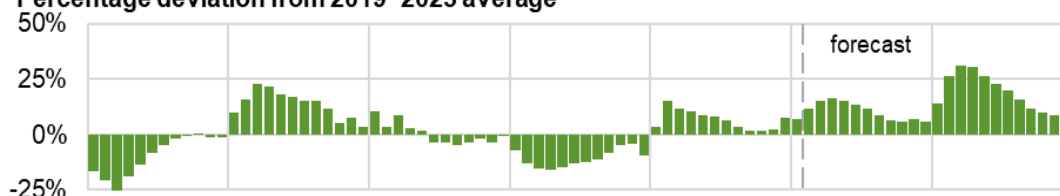


Natural gas storage

We forecast U.S. natural gas inventories will decrease to 1,910 billion cubic feet (Bcf) by the end of this winter heating season (November–March), which would still be 15% above the previous five-year average. According to our [Weekly Natural Gas Storage Report](#), the third-largest U.S. storage withdrawal on record occurred during the week ending January 19 as a result of cold weather that increased natural gas demand across the country at the same time as a drop in natural gas production. Although the large weekly withdrawal reduced the natural gas storage surplus to the five-year (2019–2023) average, we estimate that inventories still ended January 7% above the five-year average. We forecast that mild weather during February and March will reduce natural gas consumption and increase natural gas production and that storage inventories will remain above the five-year average at the end of the winter heating season.

U.S. working natural gas in storage

billion cubic feet

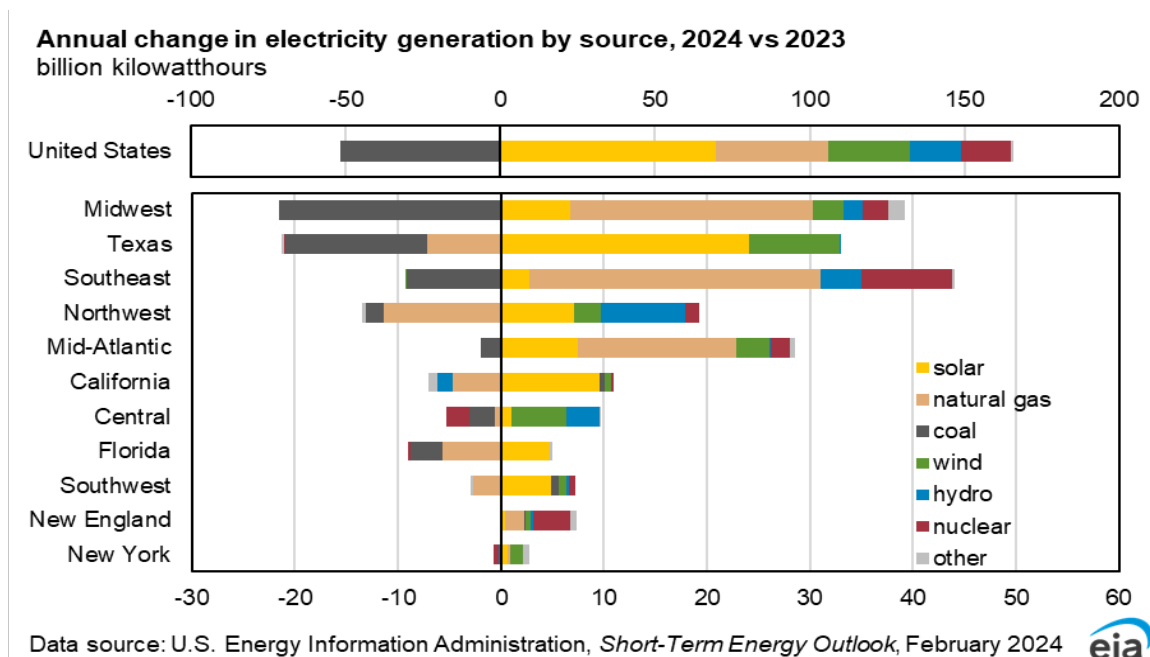
**Percentage deviation from 2019–2023 average**Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2024

Electricity, Coal, and Renewables

Electricity generation

The mix of energy sources used for generating electricity in the United States is evolving, with a steady shift to renewable energy resources and away from fossil fuels. We expect that solar power will account for the most growth in electricity generation in 2024, driven by a 36-gigawatt increase in solar generating capacity. In our forecast, the U.S. electric power sector generates 43% more electricity from solar in 2024 than in 2023, an increase of 70 billion kilowatthours (BkWh). We forecast U.S. wind generation will grow by 6% (26 BkWh), following a slight drop in 2023 due to lower average wind speeds, mostly in the Midwest. U.S. hydropower generation grows by 7% in 2024 (17 BkWh) in our forecast due to slightly higher water supply levels, particularly in the Northwest, compared to last year.

The strong growth in renewable generation in 2024 results in slower growth or declines in electricity generation from fossil fuel sources in our forecast. We expect U.S. natural gas generation will grow by 2% (37 BkWh) this year, compared with growth of 7% (109 BkWh) in 2023. Generation from coal-fired power plants is likely to continue falling, with a forecast decline of 8% (52 BkWh) in 2024.



Generation from renewable sources will likely grow in every region of the United States as a result of [new generating capacity](#) scheduled to come on line this year. We expect solar and wind power will grow the most in the portion of Texas that is part of the electric grid managed by the Electric Reliability Council of Texas (ERCOT). Forecast solar generation in ERCOT grows by 90% in 2024 (24 BkWh) and wind generation by 8% (9 BkWh).

We expect U.S. coal generation to continue to decline as generation from natural gas remains competitive, some coal plants retire, and more renewable energy sources come online. In 2024, we forecast coal generation in ERCOT to fall 23% (14 BkWh) as solar generation increases. Forecast natural gas generation falls in ERCOT by 4% (7 BkWh) this year with more renewable energy generation.

Coal generation also falls by 22 BkWh in the Midwest in 2024, the largest coal decline among the regions, and by 9 BkWh in the Southeast. Decreased coal generation in the Midwest is offset by an increase of 24 BkWh in generation from natural gas-fired power plants taking advantage of continued low fuel costs. We expect nuclear generation in the Southeast region to rise by 9 BkWh this year as the new Unit 3 reactor opened at the [Vogtle power plant in the second half of 2023](#). Our forecast current assumed that Unit 4 would come online at the end of 1Q24. However, [recent reports indicate](#) that it will likely begin operations in 2Q24.

Coal markets

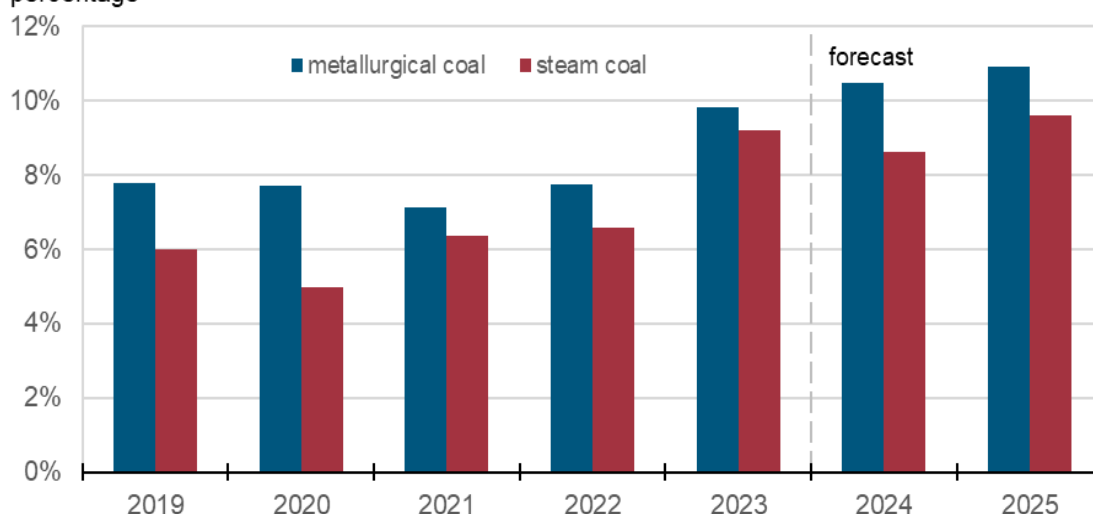
U.S. coal consumption increased by almost 50% in the electric power sector in January 2024 from December 2023, as cold temperatures covered a wide swath of the country in the middle of the month. Despite the increase in January, on an annual basis we forecast that coal consumption by the power sector will fall by 7% in 2024 and then will decline by 6% in 2025 as new solar and wind generating capacity comes online and as 11 gigawatts of coal-fired plant generating capacity is retired as scheduled. Although coal consumption declines through the forecast, the 6% forecast decline in 2025 is less than

the 8% decline we were expecting in last month's STEO. The slower decline reflects our expectation of slightly more electricity generation in 2025 and slightly fewer renewable capacity additions compared with last month's forecast. We expect coal production to decrease 19% in 2024 as domestic consumption of coal falls and inventories decline. Coal production in the forecast falls by a further 3% in 2025.

As domestic consumption falls, [foreign consumption](#) of U.S. coal will make up a [larger share of the disposition of U.S. coal](#) in 2025 even though we expect exports of U.S. coal to fall 7% to 95 million short tons (MMst) in 2024 and then remain near that level in 2025. Exports as a share of the total disposition of U.S. coal rise to 20% by 2025 from 14% in 2022 and 19% in 2023.

U.S. coal exports per total coal disposition

percentage



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*, February 2024

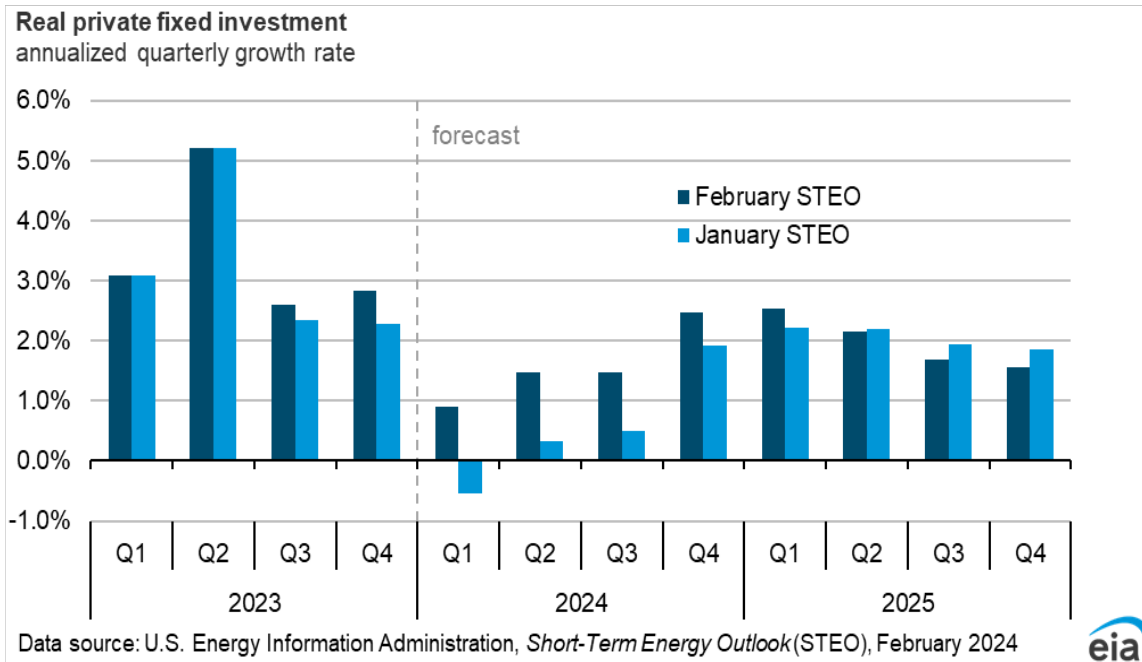
Note: Total coal disposition = domestic coal consumption plus coal exports.



Economy, Weather, and CO₂

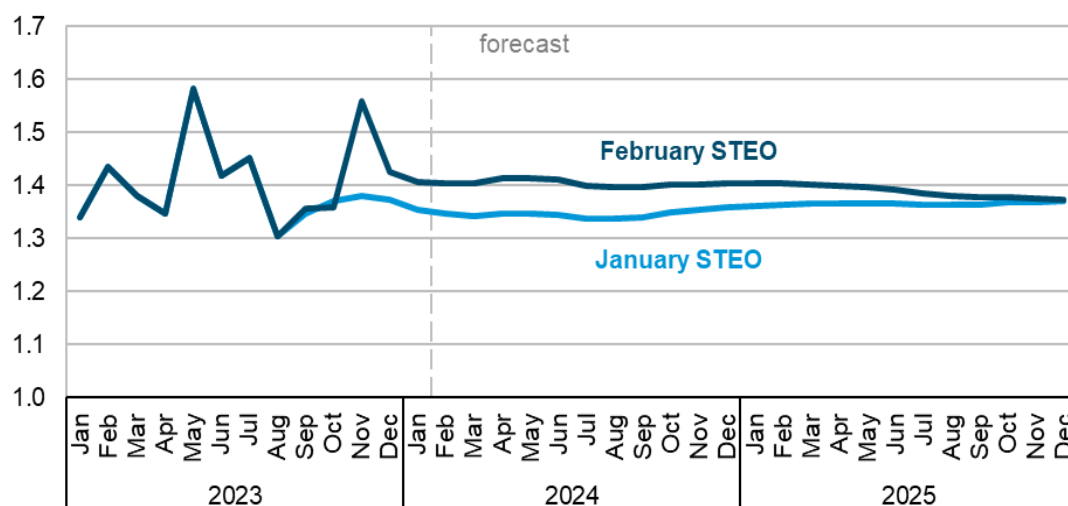
U.S. macroeconomics

Our forecast assumes U.S. real GDP will grow by 1.8% in 2024 and 1.6% in 2025 after upward revisions of 0.2% in 2024 and 0.3% in 2025 compared with last month's forecast. The revision primarily reflects an increase in growth in real private fixed investment, which we now assume will grow by 2.0% in 2024, outpacing GDP growth. Our U.S. macroeconomic forecasts are based on S&P Global's macroeconomic model. We incorporate STEO energy price forecasts into the model to obtain the final macroeconomic assumptions.



The upward revision to economic growth follows the December meeting of the Federal Open Market Committee (FOMC) of the U.S. Federal Reserve. In that meeting, the FOMC announced that it would keep the target for the federal funds rate at its current level, easing expected financial conditions in 2024. The macroeconomic forecast used in this STEO was compiled before the most recent FOMC meeting concluded on January 31, but at that meeting the FOMC largely confirmed its stance from the December meeting that there is little chance of rate increases in the near future. The effect is evident in the forecast for privately owned [housing starts](#). Compared with last month's forecast, there are an additional 600,000 housing starts in 2024 and 230,000 in 2025. Housing construction consumes energy, and additional housing starts increase demand for petroleum products, particularly asphalt and road oil, which in turn increases total petroleum demand.

U.S. housing starts millions



Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook* (STEO), February 2024

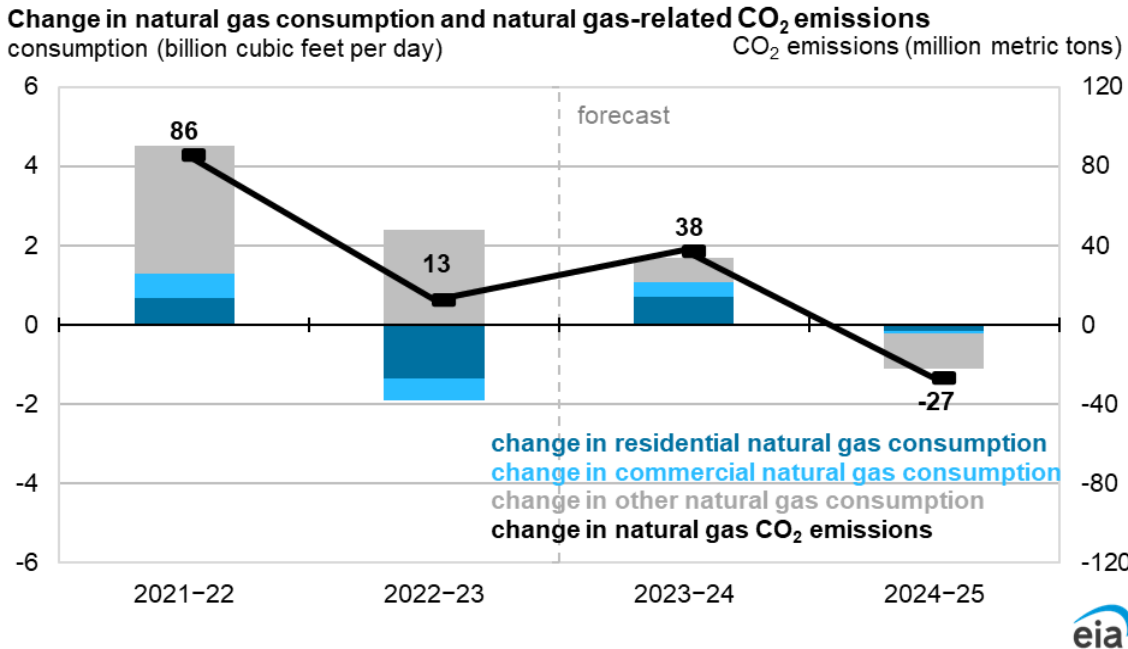


Inflation, measured as the year-over-year growth rate of the Consumer Price Index (CPI), declined from a peak of 9.0% in June 2022 to 3.3% in December 2023. Our forecast assumes that CPI inflation will continue to decline, falling to 2.0% by the fourth quarter of 2024 (4Q24). Our forecast assumes the unemployment rate will remain flat at just below 4.0% through 4Q25. Higher-than-anticipated inflation or deterioration in the labor market could affect the outlook for interest rates and energy consumption and are a source of uncertainty in our forecast.

Emissions

Total U.S. energy-related carbon dioxide (CO₂) emissions in our forecast remain unchanged in 2024, with decreasing CO₂ emissions from coal offsetting increased CO₂ emissions from natural gas. Coal-related CO₂ emissions decline by 5% in 2024 because of decreasing coal-fired electricity generation. Natural gas-related CO₂ emissions in our forecast increase by 2%, mostly from increased consumption in the residential and commercial sectors. Between 2024 and 2025, we forecast CO₂ emissions decrease by 1% as both natural gas and coal-fired generation decline as result of the addition of electricity generating capacity from renewable sources.

Along with the addition of renewable generating capacity, weather is one of the primary drivers influencing energy-related CO₂ emissions in our forecast for 2024 and 2025. This factor is particularly true for the residential and commercial sectors, where weather changes space heating and cooling demand in buildings. Demand for space heating in our forecast, and consequently natural gas-related CO₂ emissions, increase in 2024 as a result of relatively colder forecast temperatures, indicated by an 7% increase in HDDs. Natural gas emissions decrease in 2025 as milder weather, indicated by 2% fewer HDDs, decreases demand for space heating.



Weather

Following a warmer start to the winter season (November–March), the United States experienced a relatively normal January. Despite the cold snap in the middle of the month, there were almost 850 HDDs in January, similar to the 10-year average, but nearly 20% more than in January 2023. The cold weather experienced in mid-January increased our forecast by 140 (7%) more HDDs in 1Q24 compared with 1Q23. Overall, we expect a cooler 2024 in the United States, with almost 4,000 HDDs, up 7% from 2023.