

Short-Term Energy Outlook

STEO

May 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 | \$88 | \$85 |
| Retail gasoline price (dollars per gallon) | \$3.50 | \$3.50 | \$3.50 |
| U.S. crude oil production (million barrels per day) | 12.9 | 13.2 | 13.7 |
| Natural gas price at Henry Hub (dollars per million British thermal units) | \$2.50 | \$2.20 | \$3.10 |
| U.S. liquefied natural gas gross exports (billion cubic feet per day) | 12 | 12 | 14 |
| Shares of U.S. electricity generation | | | |
| Natural gas | 42% | 42% | 41% |
| Coal | 17% | 16% | 14% |
| Renewables | 21% | 23% | 25% |
| Nuclear | 19% | 19% | 19% |
| U.S. GDP (percentage change) | 2.5% | 2.5% | 1.9% |
| U.S. CO₂ emissions (billion metric tons) | 4.8 | 4.8 | 4.7 |

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

- Global oil prices.** We expect voluntary OPEC+ crude oil production cuts and ongoing geopolitical risks will keep the Brent crude oil spot price near \$90 per barrel (b) for the remainder of 2024 before falling to an average of \$85/b in 2025 as global oil production growth picks up.
- Global oil production tables.** This month we are [publishing streamlined global oil data tables](#). These tables provide a more complete breakout of OPEC+ production data and provide a new breakout of world crude oil and other liquid fuels production.
- U.S. retail gasoline prices.** Across the United States, we forecast that retail gasoline prices will average near [\\$3.70 per gallon from April through September](#), which is similar to prices during the same period last year. Refinery operations are a source of uncertainty for gasoline markets this summer. An upcoming *Perspectives* supplement looks in more depth at the effect refinery operations could have on retail gasoline prices.
- Natural gas production.** We expect U.S. dry natural gas production to fall by 2% from the first quarter of 2024 (1Q24) to 2Q24 as a result of low natural gas prices. We expect 1% less natural gas will be produced in the United States in 2024 than last year before production increases by 2% in 2025 to a record of almost 105 billion cubic feet per day (Bcf/d).
- Natural gas consumption.** U.S. natural gas consumption in our forecast is mostly unchanged in 2024 compared with last year, averaging 89 Bcf/d. We expect that less consumption in the industrial

sector will offset increases in natural gas consumption in the electric power, residential, and commercial sectors.

- **Electricity generation.** Solar supplies most of our forecast growth in U.S. electricity generation this year. We expect total U.S. electricity generation will grow by 3% (114 billion kilowatthours) in 2024, and we forecast generation from utility-scale solar will contribute almost 60% of that increase. Among other renewable sources, wind contributes 19% of 2024 U.S. electricity generation growth, and [hydropower](#) contributes 13%.
- **Coal markets.** We have revised our estimate of U.S. coal exports in 2024 upwards by 4% compared with the April *Short-Term Energy Outlook* (STEO) due to more-than-expected metallurgical coal exports from the Appalachia region in February. We now expect U.S. coal exports in 2024 will be almost unchanged from 2023. However, we still expect coal production will decline by 14% in 2024 to about 500 million short tons and then fall by about 1% next year. But more coal exports in this STEO compared with last month's forecast mean the decline is less than we had forecast last month; we raised our forecast for U.S. coal production from last month by 3% in 2024 and by 6% in 2025.

Notable forecast changes

Current forecast: May 7, 2024; previous forecast: April 9, 2024

| | 2024 | 2025 |
|--|------------|------------|
| Coal exports (million short tons) | 99 | 106 |
| Previous forecast | 94 | 105 |
| Percentage change | 4.5% | 0.8% |
| Coal production (million short tons) | 499 | 494 |
| Previous forecast | 485 | 464 |
| Percentage change | 2.9% | 6.3% |
| Secondary coal inventories (million short tons) | 142 | 154 |
| Previous forecast | 138 | 128 |
| Percentage change | 2.4% | 20.9% |

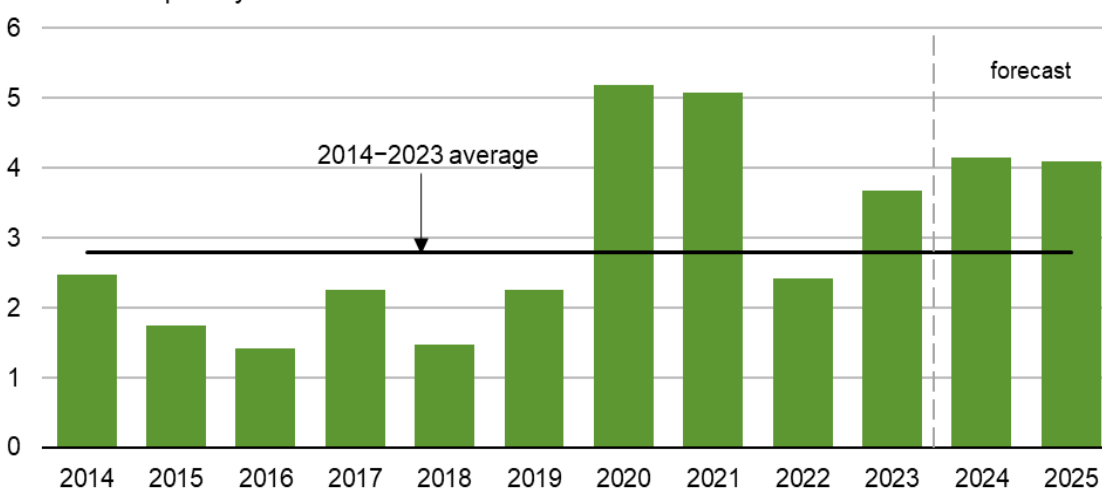
Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*

Global Oil Markets

Global oil prices and inventories

The spot price of Brent crude oil averaged \$90 per barrel (b) in April, up \$5/b from March and the fourth consecutive monthly increase. However, daily crude oil spot prices have since fallen, and the Brent spot price settled at \$84/b on May 2. Prices increased in April due to falling global oil inventories. Geopolitical tensions also supported crude oil prices amid conflict between Iran and Israel, which added uncertainty to already heightened tensions in the Middle East. Despite these tensions, crude oil price volatility has been subdued for much of this year by significant spare crude oil production capacity. If holders of spare production capacity choose to deploy it, supply can be available to the oil market in the event of any short-term supply disruption. We estimate OPEC spare production capacity will be around 4 million barrels per day (b/d) through 2025.

OPEC surplus crude oil production capacity
million barrels per day



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

Note: Black line represents 2014–2023 average (2.8 million barrels per day).



We assess that [voluntary OPEC+ production cuts](#) are reducing global oil inventories in the first half of 2024 (1H24). We estimate that global oil inventories are decreasing by an average of 0.3 million b/d in 1H24. We anticipate some OPEC+ producers will continue to limit production after current voluntary OPEC+ cuts expire at the end of June. Our expectation of ongoing production restraint leads to our forecast of a relatively balanced oil market in 2H24, which we expect will keep oil prices near \$90/b for the remainder of 2024, before stronger supply growth contributes to global oil inventory builds of 0.4 million b/d in 2025, causing prices to fall to an average of \$85/b next year. However, there remains significant uncertainty centered around ongoing developments in the Middle East, which have the potential to increase oil price volatility and lead to sharp increases in oil prices.

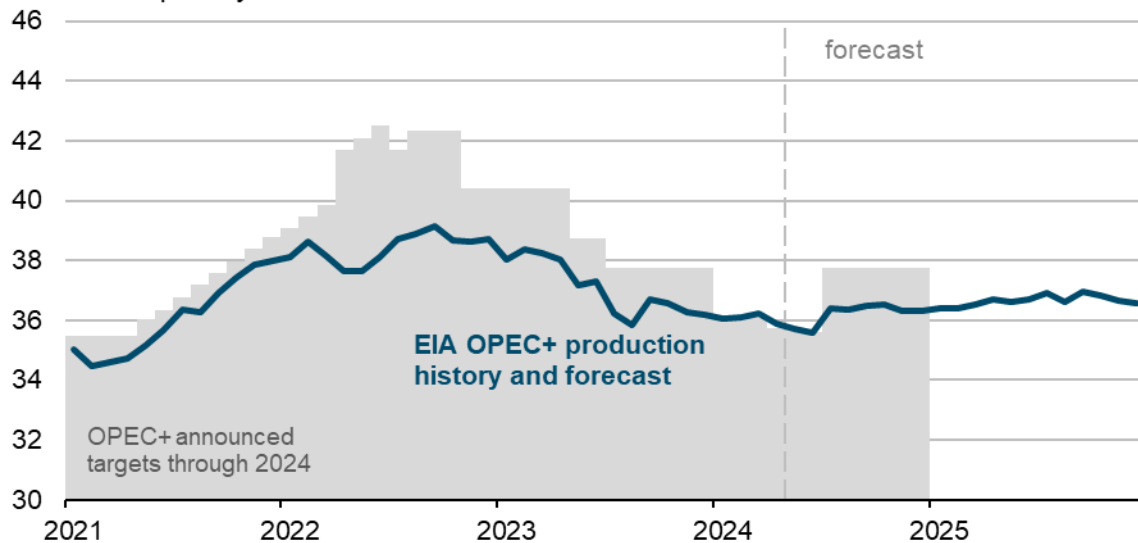
Global oil production

Beginning with this month's STEO, we will include new [streamlined global oil data tables](#). These tables provide a more complete breakout of OPEC+ production data and provide a new breakout of world

crude oil production that is separate from other liquid fuels production. We are also including liquid fuels and crude oil production breakouts for OPEC+ members. Given the large role OPEC+ plays in global oil markets, this new layout will allow stakeholders to more easily find relevant OPEC+ production data in our tables while also accurately summarizing the role that the OPEC+ agreement plays in our STEO forecast.

OPEC+ crude oil production and targets

million barrels per day



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



Based on our estimates, OPEC+ producers have largely adhered to the latest round of OPEC+ voluntary production cuts, which are set to expire at the end of June 2024. The production cuts removed approximately 2.2 million b/d of supply from the world oil market in 1Q24 and have tightened markets further in 2Q24 as additional voluntary production cuts from OPEC+ have taken effect. Many of the current OPEC+ voluntary production cuts are set to expire beginning in 2H24, but we assume some OPEC+ members will continue to voluntarily limit production to keep global oil supplies balanced and to prevent significant builds in global oil inventories. Although we assume some extension of voluntary cuts, we expect a gradual unwinding of the cuts leads to OPEC+ crude oil production increasing by 0.5 million b/d from 1H24 to 2H24, before increasing by an additional 0.5 million b/d on average in 2025.

The OPEC+ cuts are restraining world oil production growth this year, partly offsetting growth from outside of OPEC+. We expect that global production of petroleum and other liquid fuels will increase by 1.0 million b/d in 2024, slowing from growth of 1.8 million b/d in 2023. Although OPEC+ liquid fuels production decreases by 0.8 million b/d in 2024, production outside of OPEC+ increases by 1.8 million b/d, led by growth in the United States, Canada, Brazil, and Guyana.

In Canada, we expect the [startup of the Trans Mountain pipeline expansion \(TMX\)](#) on May 1 will alleviate existing distribution bottlenecks and allow for gradual increases in crude oil production. We forecast liquid fuels production will increase in Canada by 0.5 million b/d over the forecast period, which is more than 0.2 million b/d above our forecast in last month's STEO prior to the announcement of the pipeline's startup.

Global liquid fuels production increases by 1.9 million b/d in 2025 as the OPEC+ production cuts expire and production outside of OPEC+ continues to grow.

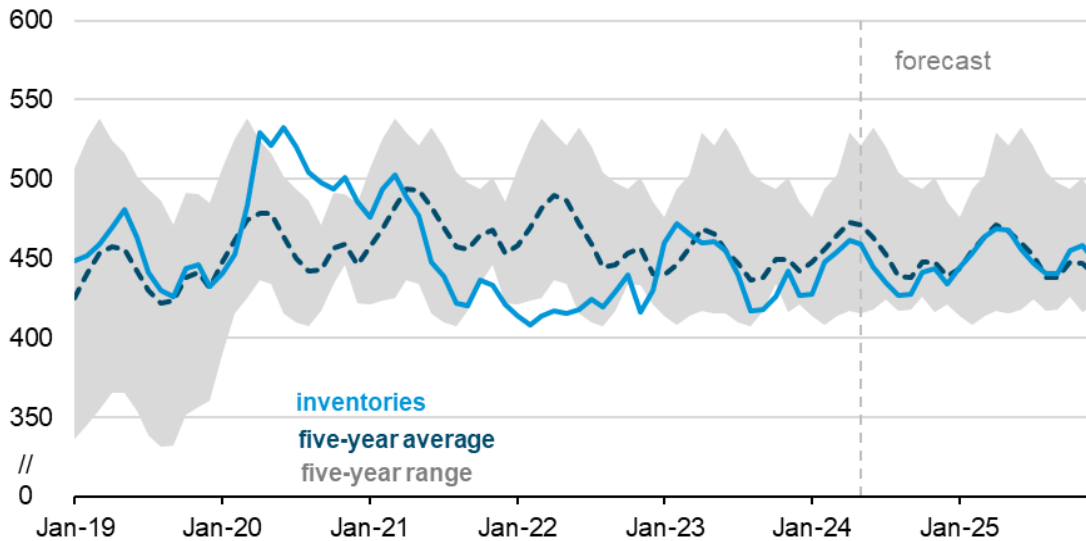
Petroleum Products

Crude oil inventories

We forecast that U.S. commercial crude oil inventories (inventories that exclude crude oil in the Strategic Petroleum Reserve) will fall near the bottom of the five-year (2019–23) range in July and August 2024 and then increase to near the 2020–24 average during the second half of 2025 (2H25).

U.S. commercial crude oil inventories

million barrels



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



At the end of April, U.S. commercial crude oil inventories were 461 million barrels. We forecast that U.S. commercial crude oil inventories will fall to below 430 million barrels in August, near the previous five-year low for that month. The decline in commercial crude oil inventories reflects our expectation of increasing U.S. refinery runs in the coming months. We forecast that refinery runs will increase from an average of 15.4 million b/d in 1Q24 to an average of 16.2 million b/d in 3Q24 contributing to a draw in inventories between the end of 1Q24 and the end of 3Q24. Our forecast of U.S. crude oil production growth over the same period does not increase inventories because we expect relatively tight global oil markets in the coming months will mean that additional production will either be exported due to strong global demand for U.S. crude oil or displace some existing crude oil imports. Despite the strong increase in runs between 1Q24 and 3Q24, we forecast that overall refinery runs in 2024 will average 15.9 million b/d, down slightly from 16.0 million b/d in 2023.

We forecast that U.S. commercial crude oil inventories will generally increase relative to the five-year average after August 2024, surpassing the average in October 2025. Rising crude oil inventories are driven by increasing U.S. crude oil production and decreasing U.S. refinery runs, along with loosening global oil market balances. We forecast that U.S. crude oil production will increase to an average of 13.7

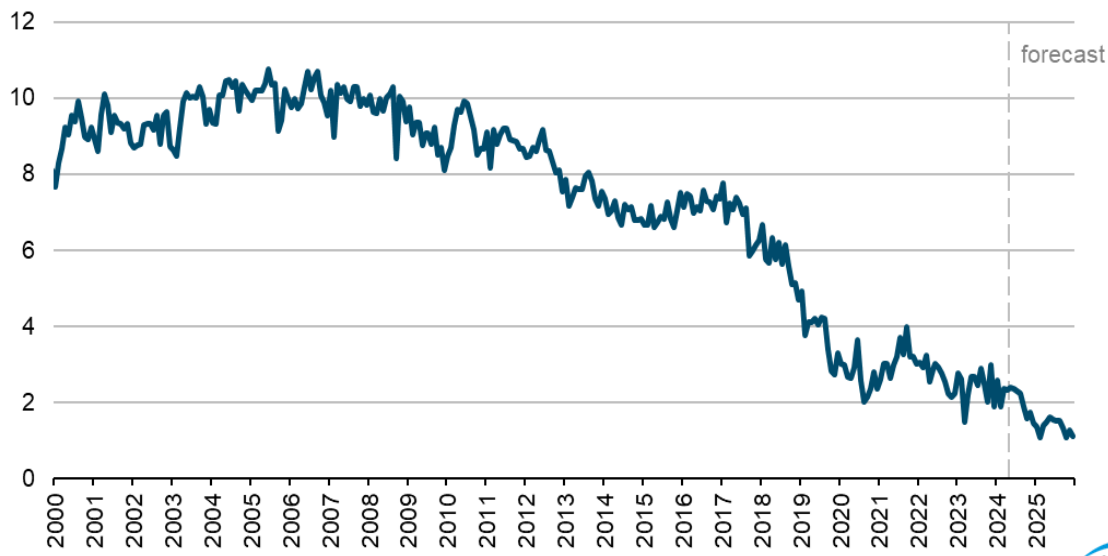
million b/d in 2025, surpassing the previous record of 12.9 million b/d set in 2023. We forecast that U.S. refinery runs will fall by 1%, averaging 15.8 million b/d in 2025, down from 16.0 million b/d in 2023.

Crude oil net imports

Increasing U.S. crude oil production and decreasing refinery runs will reduce net imports of crude oil (the difference between crude oil imports and crude oil exports) in late 2024 and in 2025. Crude oil net imports have been generally declining for many years, and we expect that trend to continue. The United States has imported less crude annually in most years since 2005, and U.S. crude oil exports have generally increased since December 2015, when the United States lifted restrictions on exporting crude. In the STEO, however, we forecast net crude oil imports and not gross exports and gross imports separately. We forecast that U.S. crude oil net imports will fall from 2.4 million b/d in 2023 to 2.1 million b/d in 2024 and then fall to 1.3 million b/d in 2025.

U.S. crude oil net imports

million barrels per day



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



An area of uncertainty for net crude oil imports is the effect of the [TMX pipeline](#), which began operations on May 1, 2024. Most of Canada’s crude oil exports go to the U.S. Midwest. We expect the startup of TMX will result in more of Canada’s crude oil being exported from Canada’s West Coast. This change could have two effects. First it could decrease imports from Canada to Midwest refiners. Second, crude oil imports from Canada to the U.S. West Coast could increase. However, the ultimate effect on U.S. crude oil trade from the TMX expansion will depend on demand for Canada’s crude oil from refiners globally relative to those in the United States and on the pace of crude oil production increases in Canada.

Natural Gas

Natural gas production

Low natural gas prices are reducing natural gas production in the United States. We expect U.S. dry natural gas production to fall by 2% from 1Q24 to 2Q24, with natural gas production in June averaging 102 billion cubic feet per day (Bcf/d), down 4% from the monthly record set in December 2023. Production is falling as some producers [have announced](#) curtailments because of low natural gas prices. In addition, a wide difference between the price of natural gas and petroleum products is encouraging producers to [extract higher-value hydrocarbon gas liquids \(HGLs\)](#) from the natural gas stream.

We expect dry natural gas production in the United States will be down 1% this year compared with last year before production rises by 2% in 2025 to a record of almost 105 Bcf/d. The increase in production next year is the result of our forecast of rising natural gas prices, which will create an incentive for more drilling in dry natural gas production regions. Increases in crude oil production in our forecast next year also result in more associated natural gas production. We expect the gap between natural gas and petroleum prices will narrow in 2025, which could keep more HGLs in the natural gas stream next year.

Natural gas consumption

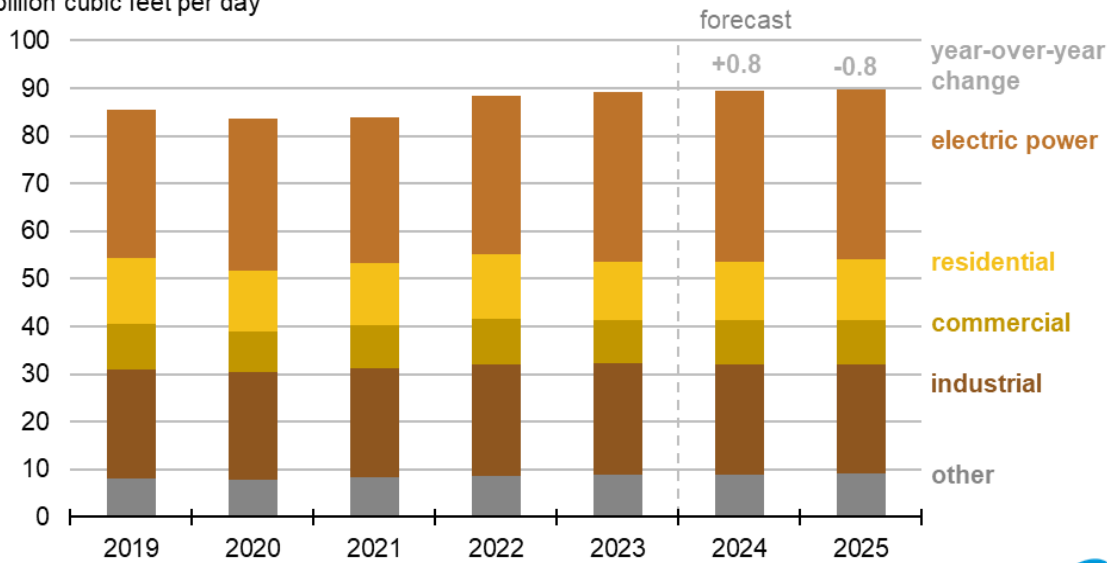
We forecast U.S. natural gas consumption in 2024 will be unchanged from last year, averaging 89 Bcf/d for the year. Small consumption increases in our forecast occur in the residential, commercial, and electric power sectors, and those increases are offset by a slight year-over-year decline in industrial sector consumption of natural gas.

In May 2024, we forecast natural gas consumption to average 72 Bcf/d, 3% less than in May 2023. The decrease from May 2023 mostly reflects our expectation of less natural gas used to generate electricity because of cooler temperatures and more generation from renewables. Less natural gas is typically consumed in May in the United States than in other months of the year because demand for space heating declines and demand for air conditioning brought on by warmer weather has yet to increase.

Following the year-over-year drop in natural gas consumption in May, we forecast relatively flat consumption through the end of next year. We forecast that U.S. natural gas consumption will average 88 Bcf/d in 2H24, about 1% more than in 2H23. The increase comes mostly from the residential and commercial sectors. We expect the sectors to consume 7% more because our forecast assumes that 4Q24 will be colder than 4Q23, which was very mild, increasing demand for space heating.

U.S. annual natural gas consumption by sector

billion cubic feet per day



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

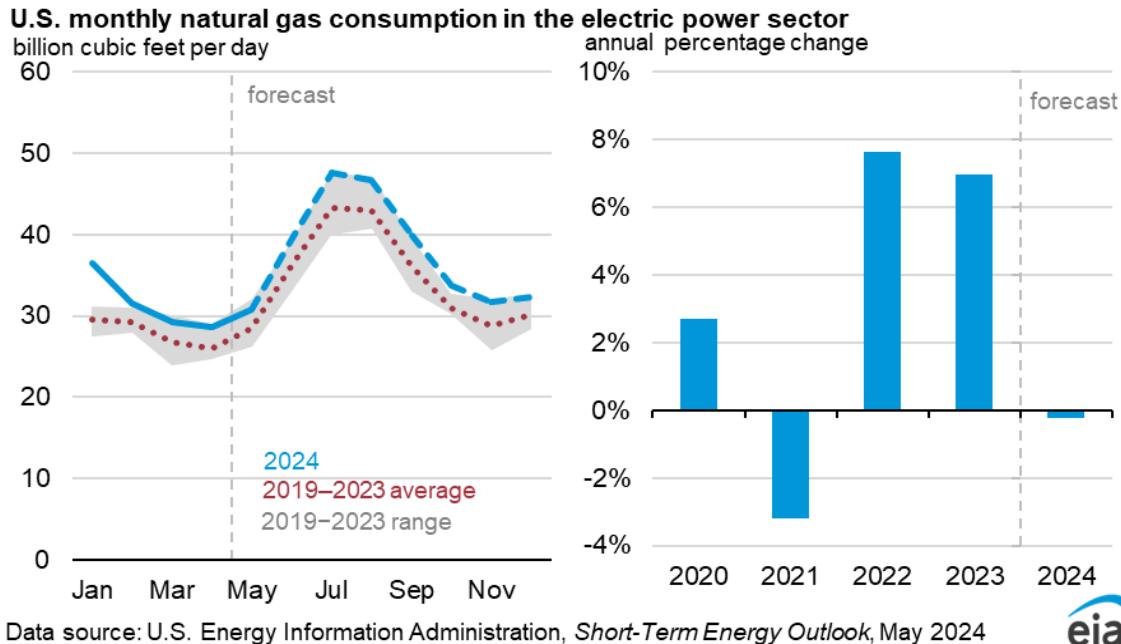


Natural gas consumption for electric power

The availability of [more electricity generation from renewable sources](#), particularly solar, in 2024 compared with 2023 is preventing growth in natural gas consumption beyond 2023 levels. Despite our expectation that 3% more electricity will be generated in the United States this summer (May–September) compared with last summer, we forecast that natural gas consumption in the electric power sector will be about the same as last summer, which saw the most power sector consumption on record. U.S. natural gas consumption for electricity generation typically peaks in the summer months as warm temperatures increase air-conditioning use.

Similar to last year, natural gas-fired electric power generation this summer is driven by both declines in coal-fired electricity generation due to [retirements](#) and more overall electricity generation because of warmer-than-normal temperatures in our forecast. We also expect low natural gas prices will encourage the dispatch of natural gas-fired power plants. These factors help keep U.S. natural gas consumption to generate electricity near last year’s record.

In the summer of 2025, we forecast natural gas consumed for electricity generation will again average about 41 Bcf/d, as trends toward growing electricity demand, less coal-fired generation, and more renewables generation continue.



Electricity, Coal, and Renewables

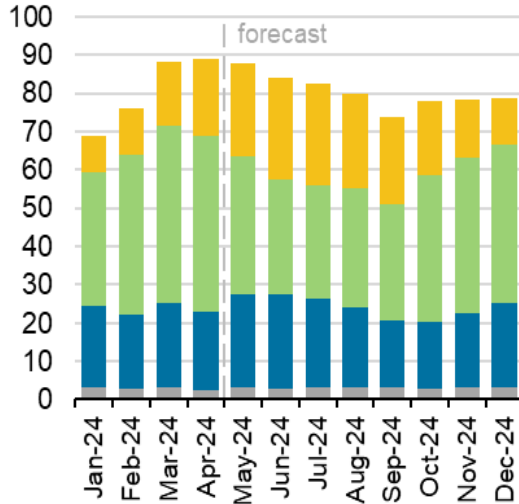
Electricity generation

U.S. electricity generation in our forecast grows in 2024 compared with last year because warmer weather drives air-conditioning demand, manufacturing activity increases, and large-scale data centers and computing facilities expand. We expect total U.S. generation will grow by 3%, or 114 billion kilowatthours (BkWh), in 2024 and by 1%, or 33 BkWh, in 2025. Renewable energy sources supply most of that growth.

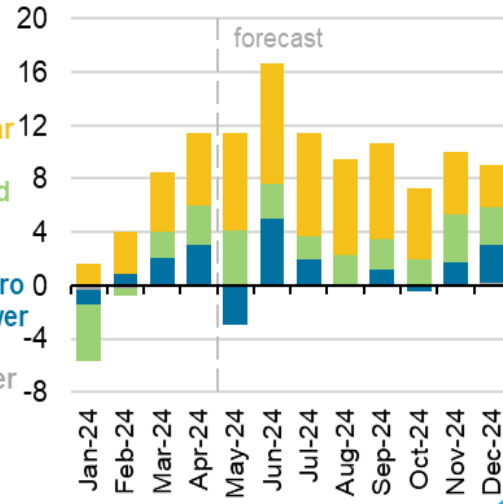
Utility-scale solar photovoltaic power plants generate 41% (66 BkWh) more electricity in 2024 in our forecast compared with 2023 as a result of 19 gigawatts (GW) of generating capacity that was added late last year and 37 GW of solar capacity scheduled to be added this year. The increase in solar generation will be especially pronounced in summer 2024 (June–September). We expect solar generation will increase a further 25% (58 BkWh) in 2025.

U.S. electric power sector renewable energy generation

monthly generation
billion kilowatthours



change from 2023
billion kilowatthours



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



Renewables have historically generated the most electricity in the spring when output from wind turbines peaks. We expect an increase of 5% (21 BkWh) from wind generation in 2024 with about 7 GW more generating capacity at the end of April than at the same time last year. However, [wind speeds in recent months](#) have been slower than normal. If this pattern continues, annual wind generation this year could be less than expected. Our forecast of wind generation grows 3% (14 BkWh) in 2025.

Hydropower output can vary greatly from year-to-year in the United States, and hydropower generation typically peaks during the water runoff season in late spring. On an annual basis, we forecast 6% (14 BkWh) more [U.S. hydropower](#) in 2024 than in 2023. Higher water supply in key areas of the Southeast and Northwest this year are the main driver of our forecast increase in hydropower generation. Most hydropower is generated in the western half of the country, but we expect that the Southeast will be the region with the largest increase in hydroelectric generation this year (up 10%). We expect U.S. hydropower will again grow by 6% in 2025, with growth centered in the Northwest.

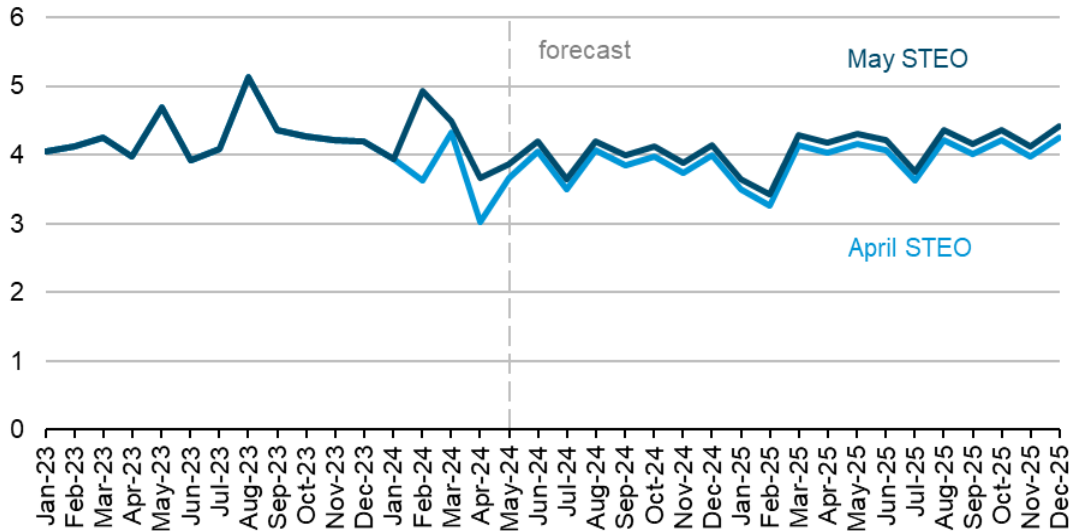
The increased generation from renewables is likely to constrain growth in generation from natural gas-fired power plants, even with relatively low natural gas prices in the forecast. We expect U.S. natural gas generation in 2024 will be relatively flat throughout the forecast period. Low natural gas prices and retirements of coal-fired capacity will continue to reduce U.S. coal generation, which we forecast will decline 4% (28 BkWh) in 2024 and 7% (48 BkWh) in 2025.

Coal markets

Data for metallurgical coal exports in February, which we receive with a two-month lag, were greater than we expected in the April STEO. The bulk of metallurgical coal is produced in Appalachia and roughly 20% of metallurgical coal exports flow through the Port of Baltimore. With February exports higher than we expected and efforts to clear the Port of Baltimore progressing, we expect metallurgical coal exports to total nearly 8 million short tons (MMst) in April and May, an increase of 13% from the April STEO,

when uncertainty surrounding the Port of Baltimore led us to expect a significant slowdown in metallurgical coal exports. As a result, we have lifted our estimate of total coal exports in April and May 2024 to 13 MMst, up 9% from the April STEO. We now forecast coal exports in 2024 to total 99 MMst, up 4% from the April STEO, and we expect exports to rise to 106 MMst in 2025.

U.S. metallurgical coal exports
million short tons

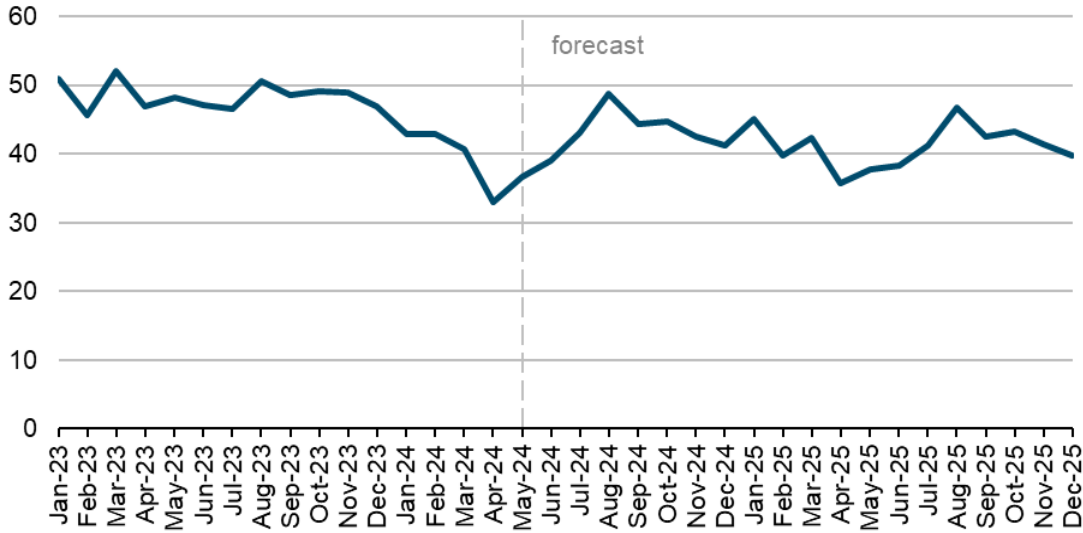


Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook* (STEO), May 2024



Coal production declined by 19% from March to April. Production fell as miners reduced activity because the coal industry was starting the shoulder season with increasing inventories. We expect production to increase in subsequent months, peaking at 49 MMst in August before declining through the end of the year. Our expectation of more coal exports than in last month’s STEO contributed to a 3% increase in our forecast for coal production in 2024. We now expect U.S. coal production will total about 500 MMst in 2024 and decline by about 1% to near 490 MMst next year.

U.S. coal production
million short tons



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



Economy, Weather, and CO₂

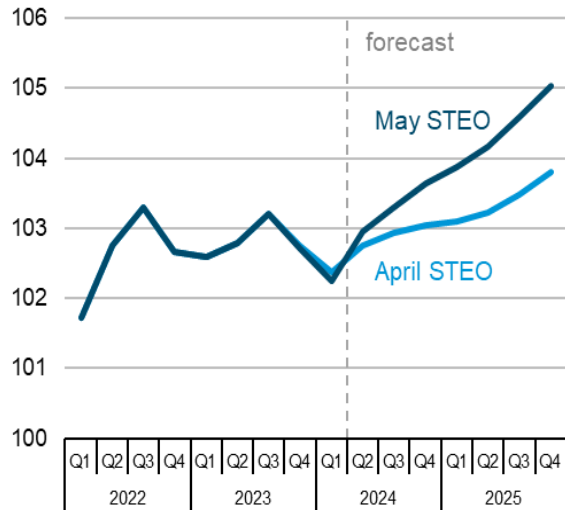
U.S. macroeconomics

Our forecast for May 2024 assumes real GDP will grow by 2.5% in 2024, unchanged from the forecast in April. The forecast for GDP growth was revised lower in 1Q24 but higher in 2H24 and beyond, resulting in the unchanged overall growth rate for 2024. We revised our assumption of annual GDP growth in 2025 higher by 0.3 percentage points to 1.9%.

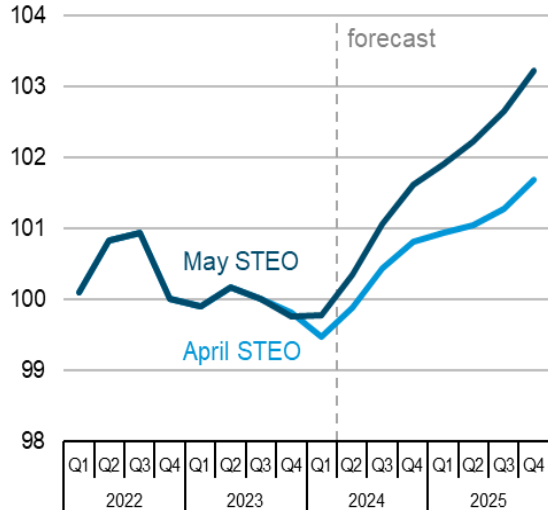
Our macroeconomic forecasts are based on S&P Global’s macroeconomic model. We incorporate energy price forecasts from STEO into the model to obtain the final macroeconomic assumptions.

This month’s forecast includes an upward revision to industrial and manufacturing production from last month’s STEO. The revision follows the release of the U.S. Bureau of Economic Analysis’s third estimate of 4Q23 GDP. The report showed value added from private-goods-producing industries increased 7.0%, led by both durable and non-durable goods manufacturing as well as construction. An increase in the forecast for industrial production increased our forecast for residual fuel oil consumption in 2025 compared with last month’s STEO. Residual fuel oil is used in a variety of industrial processes. An increase in manufacturing tends to increase demand for transporting goods by trucks and trains, and the forecast for more manufacturing production led us to increase our distillate fuel demand in 2025. We now expect U.S. distillate consumption to rise by 2% next year, up from our forecast of 1% last month.

Macroeconomic indicators
total industrial production
index, 2017=100



manufacturing production
index, 2017=100



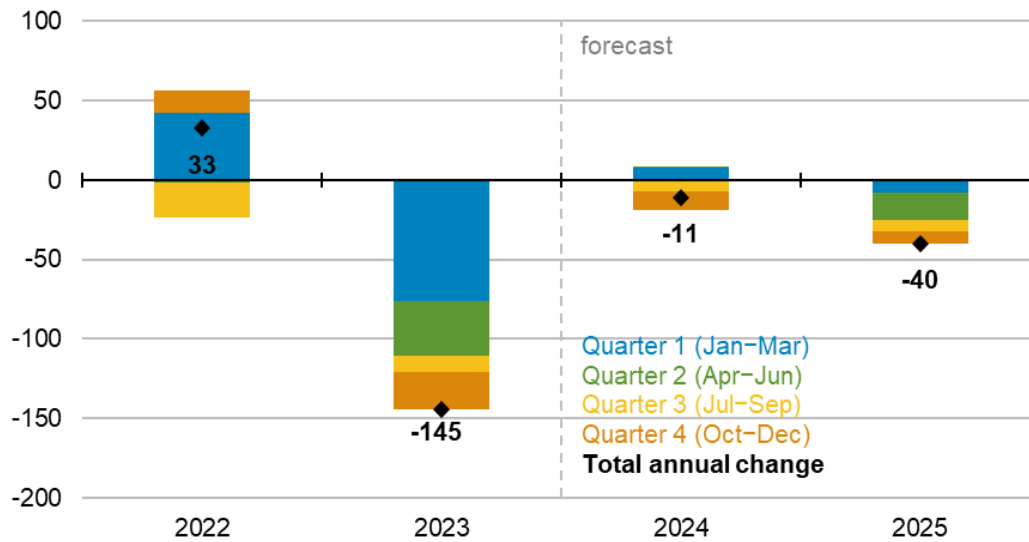
Data source: U.S. Energy Information Administration, *Short-Term Energy Outlook*(STEO), May 2024

Emissions

U.S. energy-related carbon dioxide (CO₂) emissions decrease year-over-year in almost every quarter during the forecast period, continuing [an ongoing downward trend](#), and leading to 1% fewer annual emissions in 2025 compared with 2023. Coal-related CO₂ emissions decline by 4% in 2024 as coal-fired electricity generation continues to fall. Natural gas emission rise by around 1% over the course of the year, mostly from increased natural-gas-fired power generation during 1Q24 and increased residential and commercial sector consumption in 4Q24. Petroleum emissions remain relatively unchanged in 2024.

U.S. CO₂ emissions in our forecast decline by 1% from 2024 to 2025. Small reductions in CO₂ emissions are mostly a result of continued changes in the electricity generation mix. Continued decreases in coal-fired generation reduce emissions in 2Q24 and 4Q24, and decreasing natural gas-fired generation reduces emissions in 3Q24.

Change in U.S. energy-related CO₂ emissions by quarter
million metric tons



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



Weather

Our forecast assumes the United States will experience a warmer summer (May–September) in 2024 than in 2023, averaging almost 440 [cooling degree days](#) (CDDs) in 2Q24, 21% more CDDs than in 2Q23. As a result, we expect 2024 to be hotter than it was last year with around 1,550 CDDs (5% more than in 2023). We expect the summer warming trend to continue into 2025 with about 1% more CDDs during 2Q25 through 3Q25 than during the same period in 2024. However, we expect next winter to be slightly cooler than last winter with the United States averaging 3,440 [heating degree days](#) in 4Q24 through 1Q25, 6% more than in the same period last winter.