Independent Statistics and Analysis
U.S. Energy Information Administration

Short-Term Energy Outlook

STEO

March 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**	**$87**	**$85**
Retail gasoline price (dollars per gallon)	**$3.50**	**$3.50**	**$3.40**
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**	**$2.30**	**$2.90**
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%	15%	14%
Renewables	22%	24%	25%
Nuclear	19%	19%	19%
U.S. GDP (percentage change)	**2.5%**	**2.6%**	**1.7%**
U.S. CO_2 emissions (billion metric tons)	**4.8**	**4.8**	**4.7**

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

- **Global oil markets**. As a result of OPEC+ extending crude oil production cuts, we have reduced our forecast for global oil production growth in 2024. The lower growth contributes to significant global oil inventory declines in our forecast for the second quarter of 2024 (2Q24). Because of falling inventories, we now expect the Brent crude oil spot price will average $88 per barrel (b) in 2Q24, up $4/b from our February STEO, and we expect the Brent price will average $87/b this year.

- **U.S. retail gasoline prices.** We forecast the U.S. average retail gasoline price will average about $3.50 per gallon (gal) this year, almost 20 cents/gal higher on an annual average basis in 2024 compared with the February STEO, driven by higher crude oil prices. Although still lower than 2023 over the course of the year, we expect nominal gasoline prices from May through July will exceed prices for those same months in 2023.

- **Natural gas prices.** We expect the Henry Hub spot price to remain below $2.00 per million British thermal units (MMBtu) in 2Q24 as the winter heating season ends with natural gas inventories 37% above the five-year average. The Henry Hub spot price averaged $1.72/MMBtu in February (30% lower than in our February STEO), a record low adjusted for inflation. Low prices were partially driven by reduced natural gas consumption in the residential and commercial sectors this winter (November—March).

- **Natural gas production.** We forecast that U.S. dry natural gas production will remain unchanged in March from February at just under 104 billion cubic feet per day (Bcf/d). We expect lower natural

gas prices to cause slight declines in natural gas production the remainder of the year, and we do not expect that natural gas production will return to its December 2023 record of 106 Bcf/d during the forecast period. Forecast U.S. dry natural gas production averages 103 Bcf/d in 2024, down slightly from 2023. Production increases to 104 Bcf/d in 2025, driven by expected growth in associated natural gas production in the Permian Basin and growth in LNG export demand.

- **Electricity generation.** We expect utility-scale solar generation to provide 6% of U.S. electricity generation in 2024, up from 4% in 2023 and supported by a 36-gigawatt increase in solar generating capacity. By contrast, we expect coal to provide 15% of generation this year, down from 17% in 2023.

- **Macroeconomics.** Following the release of the Bureau of Economic Analysis's end-of-2023 advance estimate of GDP and based on updates to the S&P Global macroeconomic model, we have raised our forecast of U.S. GDP growth from our February STEO to 2.6% in 2024 and 1.7% in 2025.

Notable forecast changes

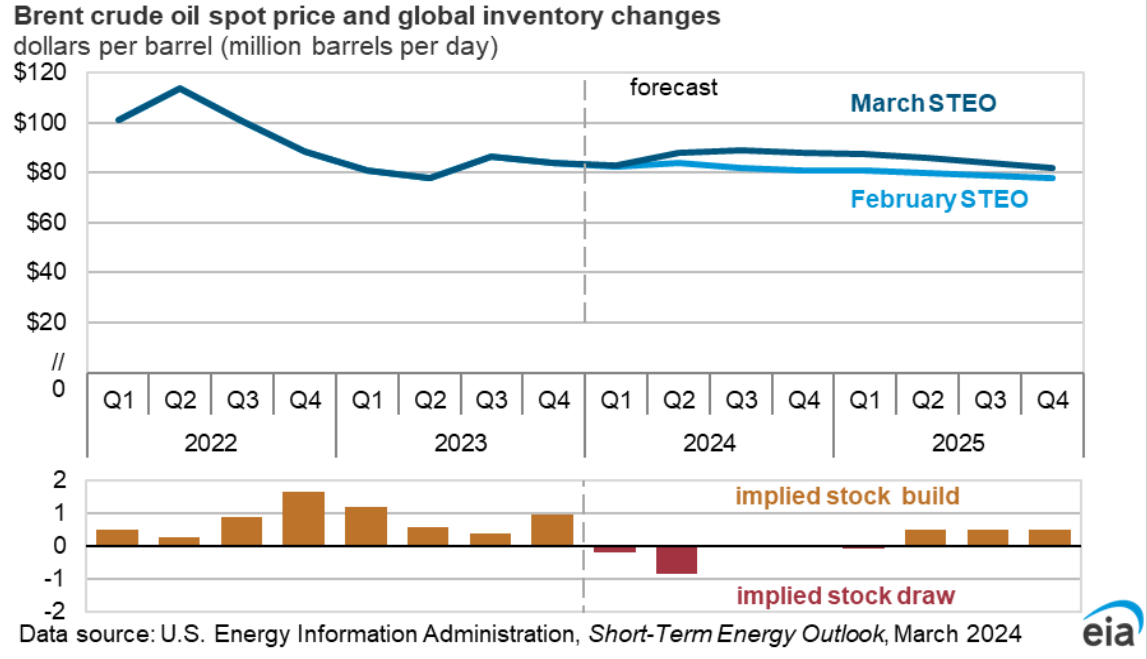
Current forecast: March 12, 2024; previous forecast: February 6, 2024	**2024**	**2025**
Global oil inventory change (million barrels per day)	**-0.3**	**0.4**
Previous forecast	-0.1	0.5
Change	-0.2	-0.1
Brent spot price (dollars per barrel)	**$87**	**$85**
Previous forecast	$82	$79
Percentage change	5.6%	6.7%
Retail gasoline price (dollars per gallon)	**$3.50**	**$3.40**
Previous forecast	$3.30	$3.30
Percentage change	5.0%	4.1%
Henry Hub spot price (dollars per million British thermal units)	**$2.30**	**$2.90**
Previous forecast	$2.70	$2.90
Percentage change	-14.4%	0.0%
Real gross domestic product (percentage)	**2.6%**	**1.7%**
Previous forecast	1.8%	1.6%
Percentage point change	0.8	0.2

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 $83 per barrel (b) in February, an increase of $3/b from January. Prices rose in February in part due to continuing uncertainty and increased risk around the attacks targeting commercial ships transiting the Red Sea shipping channel, as well as an anticipated extension to voluntary OPEC+ production cuts, which were officially announced on March 4. The OPEC+ voluntary production cuts are an extension of the existing production cuts that were announced on November 30, 2023 and are now extended through the second quarter of 2024 (2Q24). The announcement also included an additional voluntary production cut from Russia.



We expect that the extension of the OPEC+ production cuts will tighten global oil supplies in the near-term. The current OPEC+ agreement has two types of production cuts. The first cuts are officially stated production targets, and the second cuts are additional voluntary cuts pledged by some OPEC+ participants. Although our previous forecast had assumed that some of the OPEC+ members would maintain some voluntary cuts through 2Q24 in an effort to balance markets, this new announcement pledges the continuation of cuts for all of the members through the first half of 2024. Because some OPEC+ members are extending these voluntary production cuts and because Russia added new voluntary production cuts, we now expect oil markets to be much tighter in 2Q24 than we previously expected. We forecast global oil inventories will fall by 0.9 million barrels per day (b/d) in 2Q24; last month, we had expected inventories to remain relatively unchanged in 2Q24.

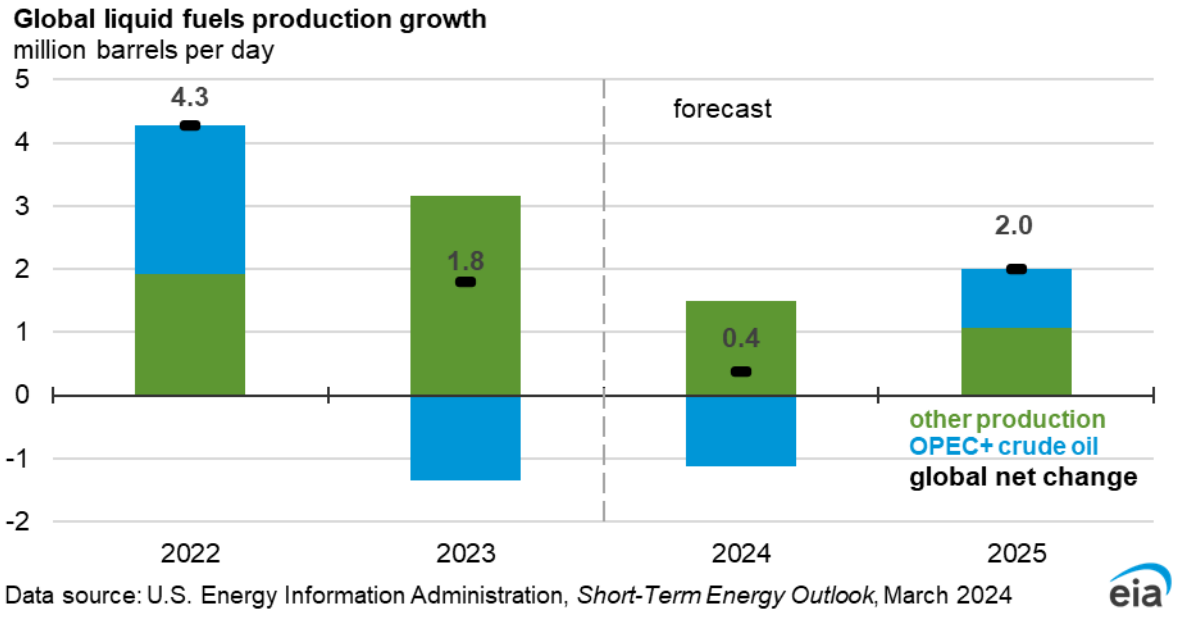
We expect that the tighter oil market balance during 2024 will keep the Brent price above current levels, averaging $88/b in 2Q24, $4/b higher than in last month's STEO. We expect it will remain relatively flat for the rest of the year before increasing inventories (when OPEC+ supply cuts are set to expire) start putting slight downward pressure on the price in 2025. We forecast that the Brent crude oil price will

decrease from an average of $88/b in January 2025 to an average of $82/b in December 2025, averaging $87/b in 2024 and $85/b in 2025.

Our forecast of global oil balances and their impact on our crude oil price forecast remain significantly uncertain. Although no oil production has been lost because of the attacks on commercial shipping traveling through the Red Sea, production could still be disrupted or some oil production in the Middle East could be shut in, which would likely cause oil prices to increase. It also remains to be seen how strictly the latest round of voluntary OPEC+ production cuts are adhered to, which has the potential to add additional oil supplies back on the market and lessen the expected tightness in near-term oil balances and the corresponding upward pressure on oil prices. In addition, we forecast global oil demand to grow by 1.4 million b/d in both 2024 and 2025. Higher or lower demand growth would affect global inventory levels and oil prices.

Global oil production

Following the incorporation of the new OPEC+ voluntary production cuts, we now expect that global liquid fuels production will increase by 0.4 million b/d in 2024, down from growth of 0.6 million b/d in last month's STEO and down from an increase of 1.8 million b/d in 2023. Although OPEC+ production cuts limit overall growth in 2024, production outside of OPEC+ grows by 1.5 million b/d, driven primarily by four countries in the Americas—the United States, Guyana, Brazil, and Canada. This growth counteracts the decline in crude oil product subject to the OPEC+ agreement, which falls by 1.1 million b/d in 2024. Global liquids fuel production increases by 2.0 million b/d in 2025 in our forecast, driven by an increase in OPEC+ crude oil production of 0.9 million b/d as existing OPEC+ production targets expire at the end of 2024, while production that is not subject to the OPEC+ agreement increases by an additional 1.1 million b/d.



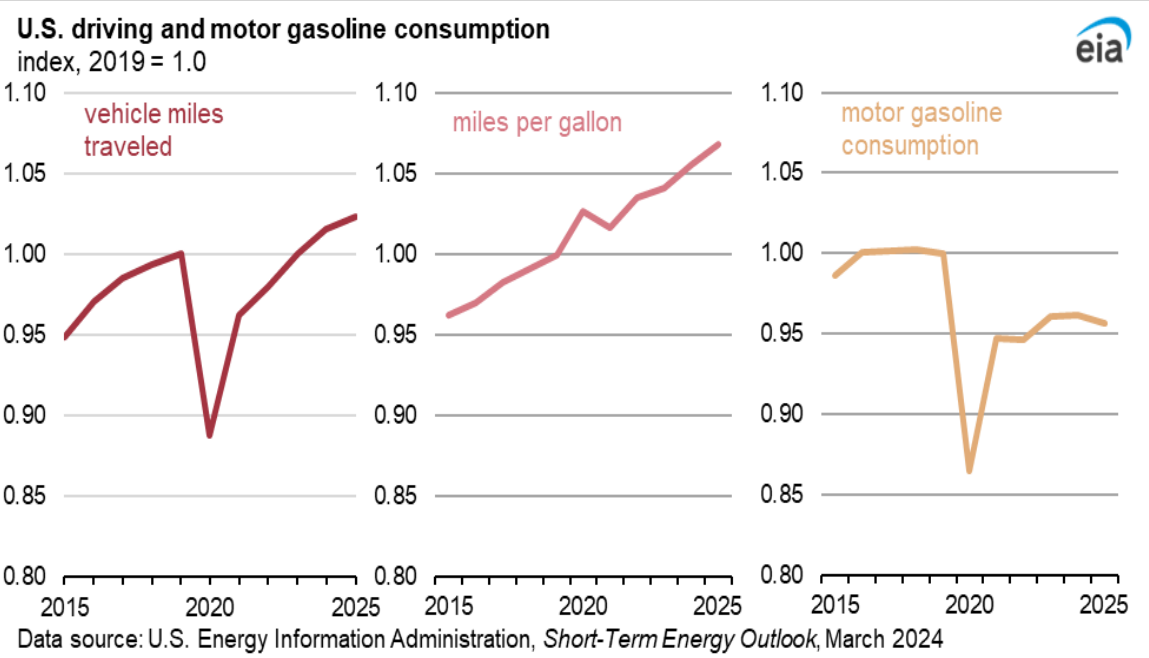
Petroleum Products

Driving Activity

We forecast driving activity—measured by vehicle miles traveled (VMT)—will increase to all-time highs in the United States during 2024 and 2025 as trends in population, employment, and economic growth increase. Our employment forecast is the main contributor to increased driving activity, and we have revised it up, by 1% or by 0.8 million jobs for 2024 compared with last month's STEO, based on forecasts from S&P Global. Despite our forecast of more driving, increased fleetwide vehicle fuel efficiency will keep motor gasoline consumption relatively flat through 2025.

In 2023, U.S. VMT slightly surpassed the pre-pandemic high set in 2019, at 8.9 billion miles per day. Despite the increase in driving, however, continued efficiency gains in recent years mean drivers are, on average, consuming less gasoline.

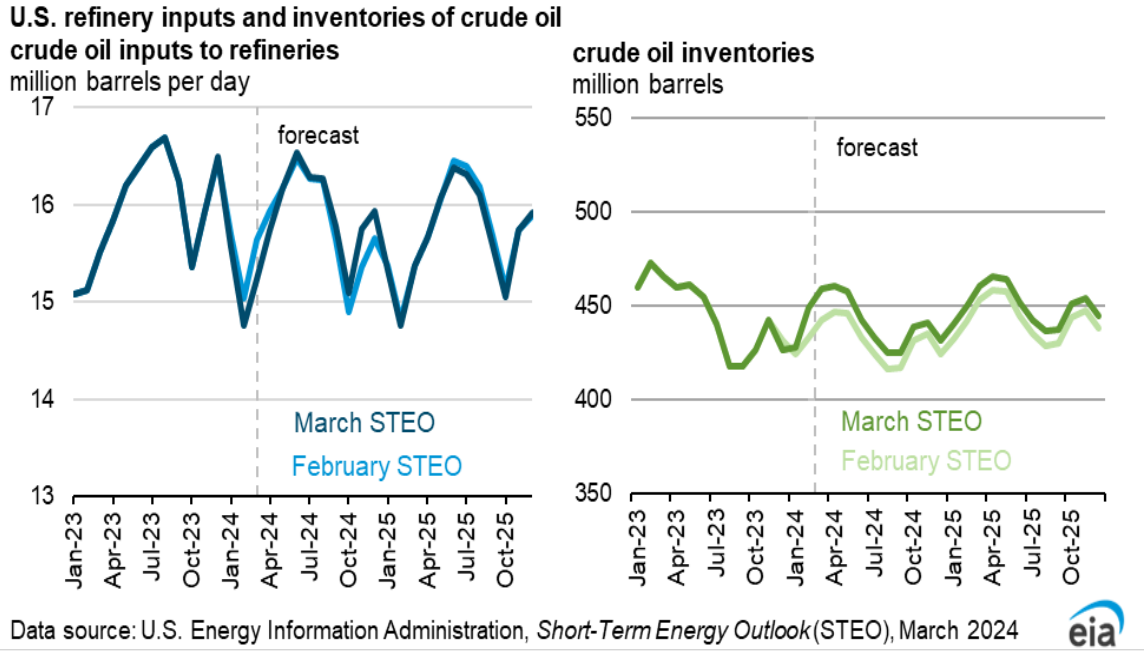
When indexed to 2019, we expect 2% more U.S. VMT in both 2024 and 2025 compared with 2019. We forecast average U.S. miles per gallon will grow even faster, with 5% more in 2024 than in 2019 and 2025 being 6% higher. Our consumption model captures trends in increasing average fuel efficiency, such as those related to increasing corporate average fuel economy standards and the increasing use of electric vehicles. As a result, U.S. motor gasoline consumption will be about 4% less in 2024 and 2025 than in 2019.



U.S. refinery operation and inventories

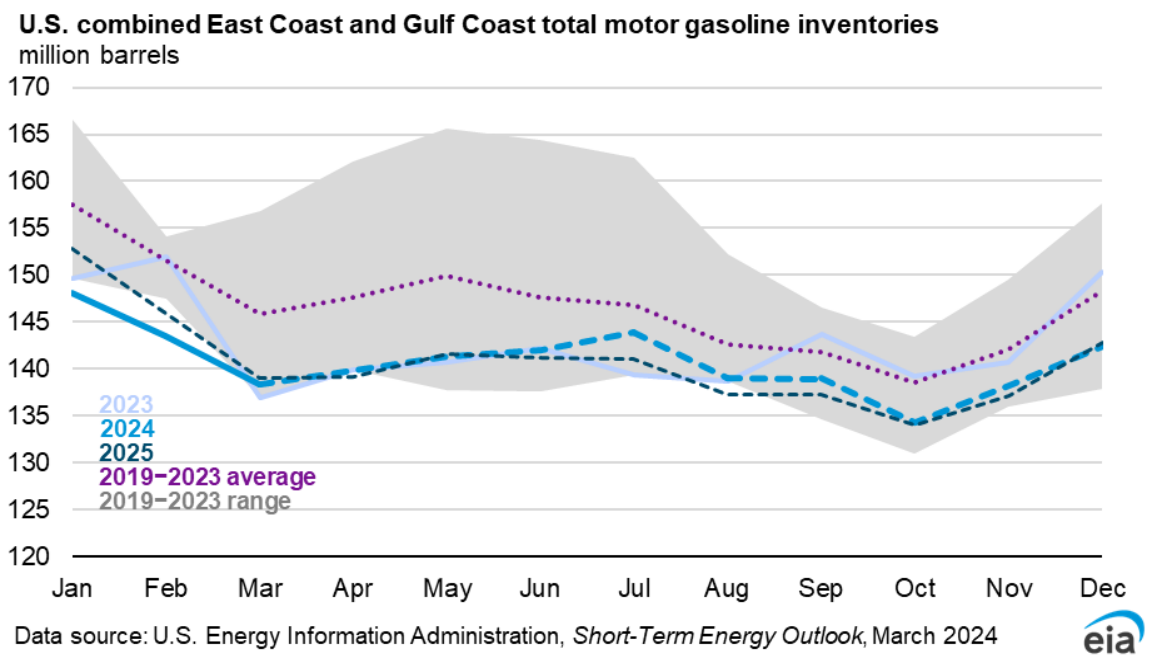
U.S. refinery inputs in late January and February 2024 decreased sharply in response to cold winter weather and planned refinery maintenance on the Gulf Coast, as well as a major unplanned outage in the Midwest. As a result, we estimate refinery utilization is about 2% lower on a monthly average basis in February and March compared with the February STEO, reducing crude oil inputs to refineries by

280,000 barrels per day (b/d) in February and by 420,000 b/d in March. We expect low refinery utilization to continue as the bp Whiting outage lingers alongside normal seasonal maintenance, reducing our forecast for crude oil inputs to refiners from the February STEO by 190,000 b/d in April before mostly returning to our last forecast by May.



Our expectation of less-than-expected crude oil inputs in our forecast increases U.S. commercial crude oil inventory builds. We estimate February crude oil inventories increased by 21 million barrels, compared with the forecast 9-million-barrel increase in our February STEO. We have also increased our expectation for end-of-month crude inventories in March by 16 million barrels compared with the previous STEO. We expect OPEC+ production restraint will contribute to more U.S. crude oil inventory draws later this year, however, bringing our forecast back toward what we expected in the February STEO going into summer 2024.

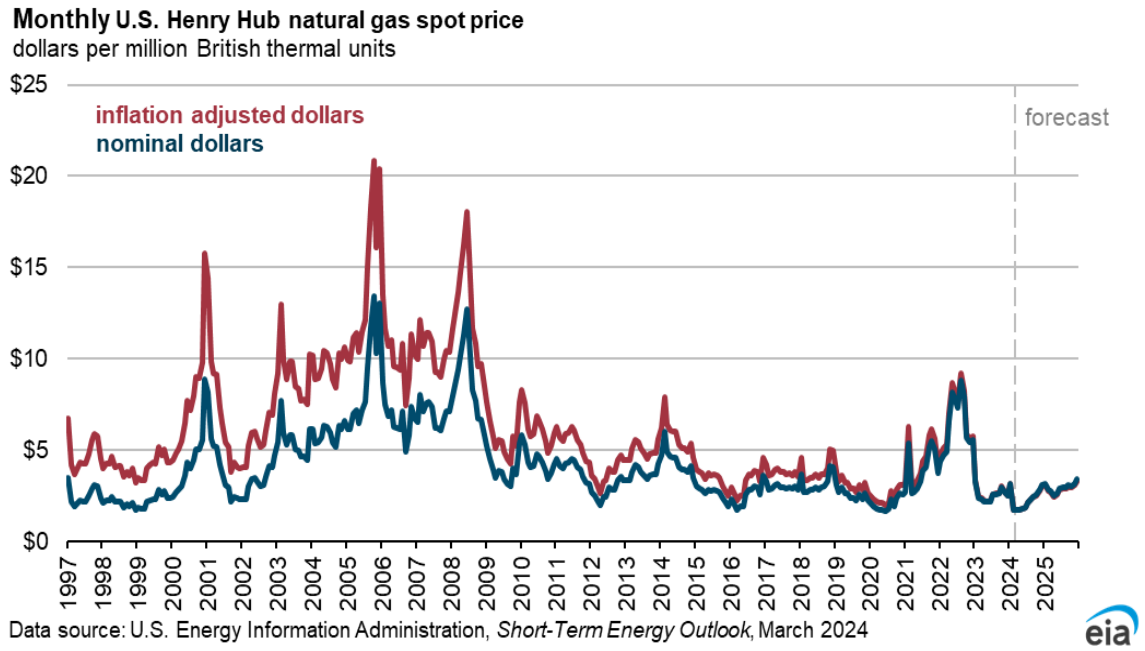
Refinery outages are also reducing motor gasoline production and inventories. We estimate combined East Coast and Gulf Coast inventories ended February about 5% below the five-year (2019–2023) average. The lower inventories in the East Coast and Gulf Coast have an outsized impact on total U.S. gasoline availability and prices because together they make up the largest gasoline producing and consuming region of the United States. We estimate U.S. retail gasoline prices in 2Q24 will average almost $3.60 per gallon (gal), up nearly 20 cents/gal from the February STEO. Lower inventories are driving the increases in gasoline crack spreads, while retail prices are also higher because of higher crude oil prices.



Natural Gas

Natural gas prices and storage

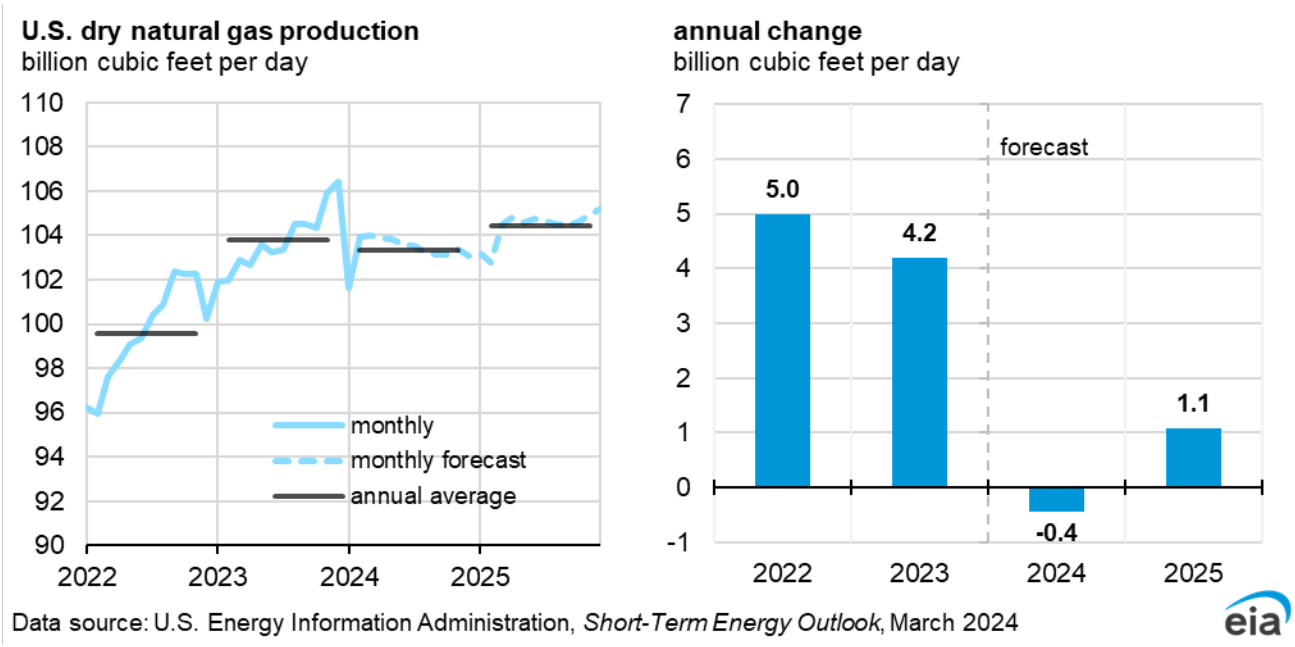
The U.S. benchmark Henry Hub natural gas spot price averaged an inflation-adjusted record-low of $1.72 per million British thermal units (MMBtu) in February. We forecast prices will stay under $2.00/MMBtu in the second quarter of 2024 (2Q24) because we expect natural gas inventories will remain high relative to the five-year average as the United States enters the shoulder season when there is typically less U.S. natural gas consumption than at other times of the year. In our March STEO, the annual average Henry Hub price for all of 2024 averages almost $2.30/MMBtu, 14% lower than in our February STEO.



This winter (November–March) has been mild throughout much of the United States, and the country has experienced 8% fewer heating degree days (HDDs) than the 10-year average. February was much milder than expected, with 9% fewer HDDs than forecast in last month's STEO. Because of the mild weather, we estimate combined residential and commercial sector consumption of natural gas this winter will be 3 billion cubic feet per day (Bcf/d), which is 9% less than the previous five-year winter average. Reduced natural gas consumption for space heating and increased U.S. dry natural gas production, which we estimate will be about 3 Bcf/d more this winter compared with last winter, have contributed to above-average inventories. We expect U.S. inventories of natural gas will total 2,270 Bcf at the end of the winter heating season on March 31, 37% above the previous five-year (2019–2023) average for March, contributing to historically low natural gas prices and to our expectation of low prices for the next several months.

Natural gas production

We estimate that U.S. dry natural gas production increased to almost 104 Bcf/d in February after declining in January to 102 Bcf/d because of weather-related outages. We expect production to continue to remain near that level in March and then decline slightly through the rest of the year, as some producers have announced production curtailments because of low prices. Dry natural gas production falls to 103 Bcf/d by December 2024 in our forecast and then averages 104 Bcf/d in 2025. We do not expect that natural gas production will return to its December 2023 record of 106 Bcf/d during the forecast period.



Although production declines slightly through the rest of 2024 because of low natural gas prices and a relatively stable rig count, production begins to increase in early 2025, mostly driven by natural gas prices that average almost $3/MMBtu in our forecast next year, as well as increased demand for liquefied natural gas (LNG) exports.

The continued strength in U.S. natural gas production will be key in determining how long the current inventory surplus to the five-year average and low prices persist. Because of low natural gas prices, some producers have announced curtailments in production or reductions in capital expenditures toward natural gas-directed activities in 2024. How soon curtailments affect the market is highly uncertain, and our price forecast is based on relatively high production entering the shoulder season when natural gas demand is lower than other times of the year. However, if there is less production than our forecast, the next few months are warmer than normal, and natural gas consumption for electric power generation increases more than our forecast, then inventories could fall below our forecast and prices could be higher.

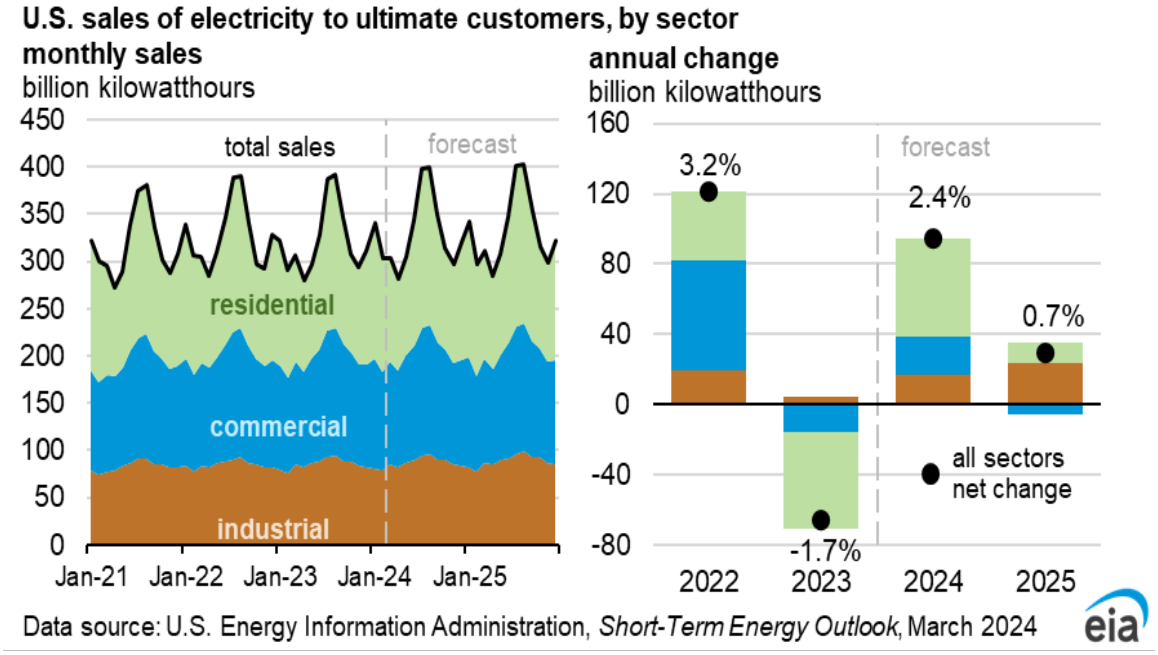
Most natural gas production in the United States comes from three regions: the Permian, the Haynesville, and Appalachia. In 2024, most production growth in our forecast comes from the Permian region in Texas and New Mexico, where most natural gas production is associated natural gas from crude oil production. Production in the Haynesville region is mostly flat in 2024 because of low natural gas prices and a relatively low rig count. Haynesville production increases in 2025 because of its proximity to new LNG export facilities. We expect production in the Appalachian Basin to be mostly flat in 2024 as natural gas pipeline capacity constraints restrain production.

Electricity, Coal, and Renewables

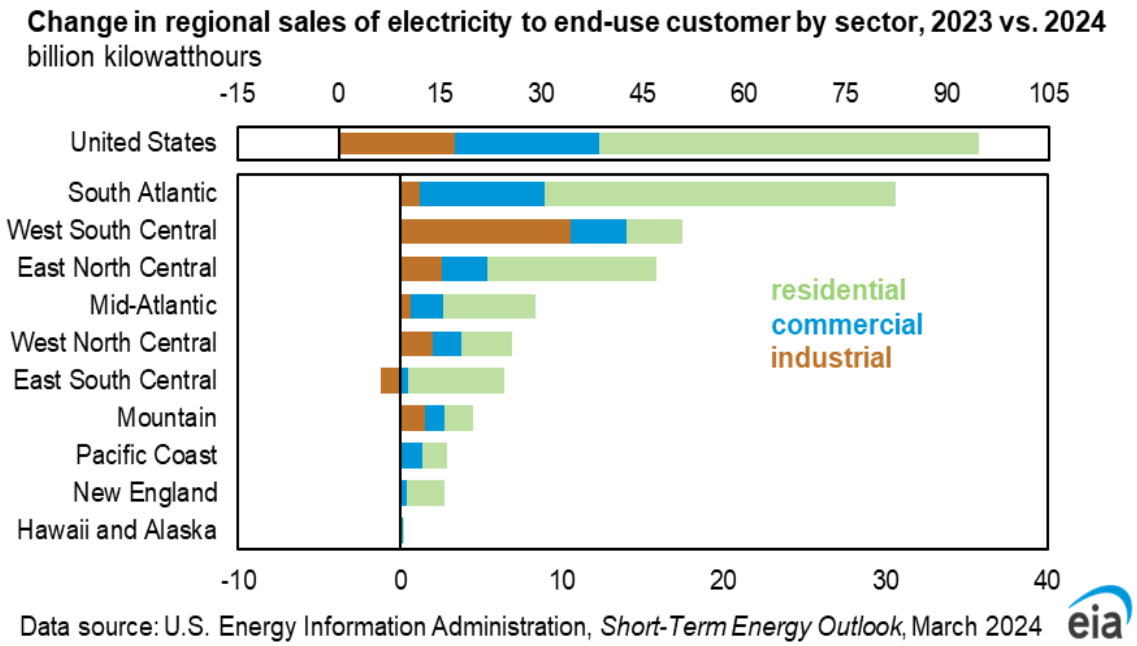
Electricity consumption

Sales of electricity to U.S. end-use customers in our forecast increases by 2% in 2024 and by 1% in 2025 after falling by 2% in 2023. We expect electricity consumption will grow in all major consuming sectors this year, but especially in the residential sector, which we expect will increase by 4%. Much of the forecast year-over-year growth in residential electricity occurs during the summer months of 2024. We expect a warmer summer with 7% more forecast cooling degree days in 2Q24 and 3Q24 than the same quarters in 2023.

The expected hotter summer this year also helps push up U.S. electricity consumption in the commercial sector. Improving macroeconomic conditions this year are likely to boost electricity sales to both the commercial and industrial sectors, by a combined 2%.



We expect the forecast weather trends for summer 2024 and winter 2024–25 will increase residential consumption in all regions of the United States compared with 2023. Sales of electricity to the residential and commercial sectors rise the most this year in the South Atlantic (6% and 2%, respectively). This region has the most electricity customer accounts, but it also has a large proportion of homes using electricity both for space heating and cooling. Industrial electricity consumption rises the most in the West South Central (up 4%), continuing a strong upward trend since the pandemic.



Electricity generation

New utility-scale solar generating capacity is driving our forecast for the strong increase in solar electricity generation in 2024 and 2025. The electric power sector added 19 gigawatts GW) of solar capacity in 2023 (an increase of 27%), and we expect 36 GW will be added in 2024 and another 35 GW will be added in 2025. With this new capacity, we expect solar will provide 6% of total U.S. electricity generation in 2024 and 7% in 2025, up from a share of 4% in 2023.

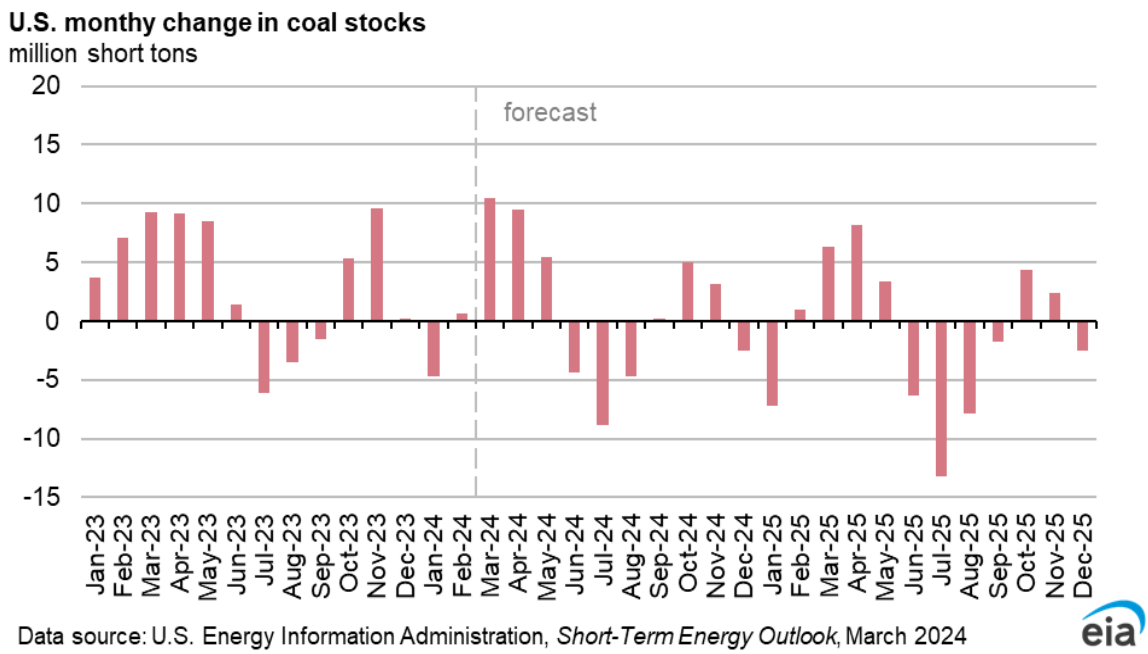
The increase in generation from renewable sources, particularly solar, is likely to reduce generation from fossil fuel sources. We expect the share of U.S. generation fueled by natural gas will fall from an average of 42% in 2023 to 41% in 2025, while the U.S. coal generation share falls from 17% last year to 14% by 2025. Low natural gas prices are not likely to lead to significantly more electricity generation fueled by natural gas because significant coal plant retirements over the past few years have left the most efficient coal plants still in operation, which we expect will mostly continue running even if natural gas prices are low. Nearly 20% of U.S. coal-fired generating capacity has been retired since 2020, the last time natural gas prices were as low as they are now, and the remaining coal fleet has been operating at historically low capacity factors.

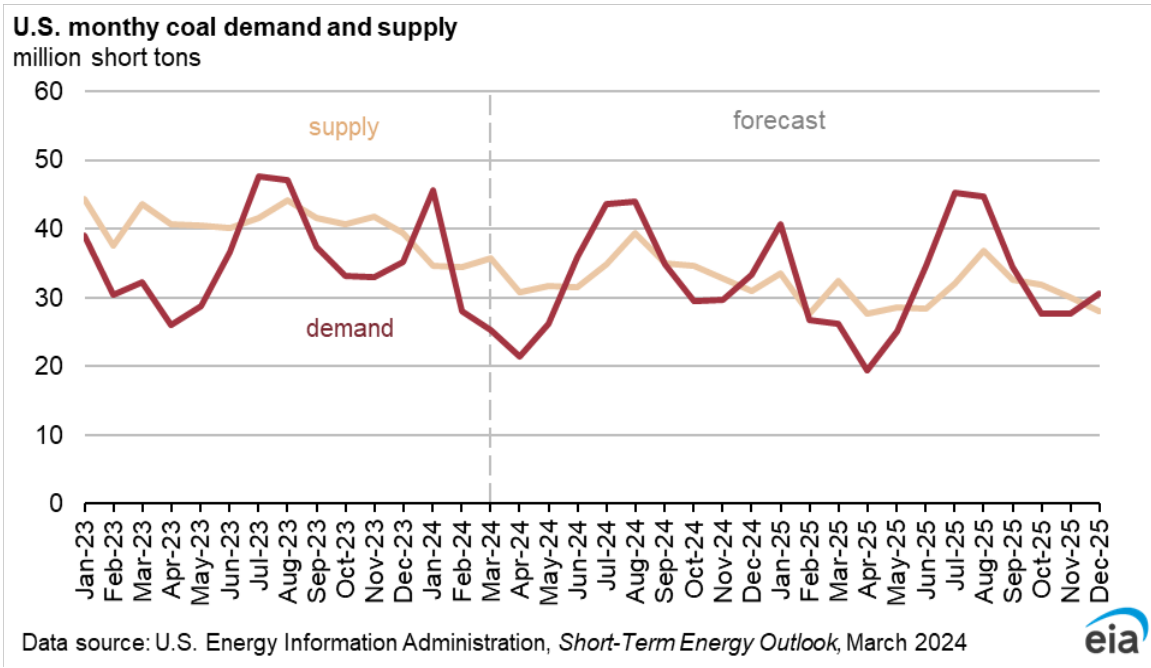
Coal markets

Coal stocks held by the electric power sector increased slightly in February after a 3% decline in January due to cold weather in the middle of the month that caused a brief spike in natural gas prices and increased coal use for power generation. We expect coal stocks to rise from 130 million short tons (MMst) in February to nearly 160 MMst in May. Although we expect natural gas prices to remain low in the summer months, we forecast a decline of 11% in coal stocks from May to September as electric power plants use coal to meet incremental demand for air conditioning during these months. Coal stocks will rise again in the fall, ending the year at almost 150 MMst, the most since mid-2016. We

expect stocks to remain at elevated levels in 2025, reaching about 160 MMst in May 2025 before declining to nearly 130 MMst in December 2025.

We forecast that coal exports will increase 1% in 2024 and a further 5% in 2025, as coal consumption by the U.S. electric power sector declines 7% in 2024 and a further 4% in 2025. As coal stocks remain high and domestic consumption declines, we expect coal production to fall 15% in 2024. We forecast a further 6% decline in coal production in 2025 as 11 GW of coal-generating capacity comes offline.

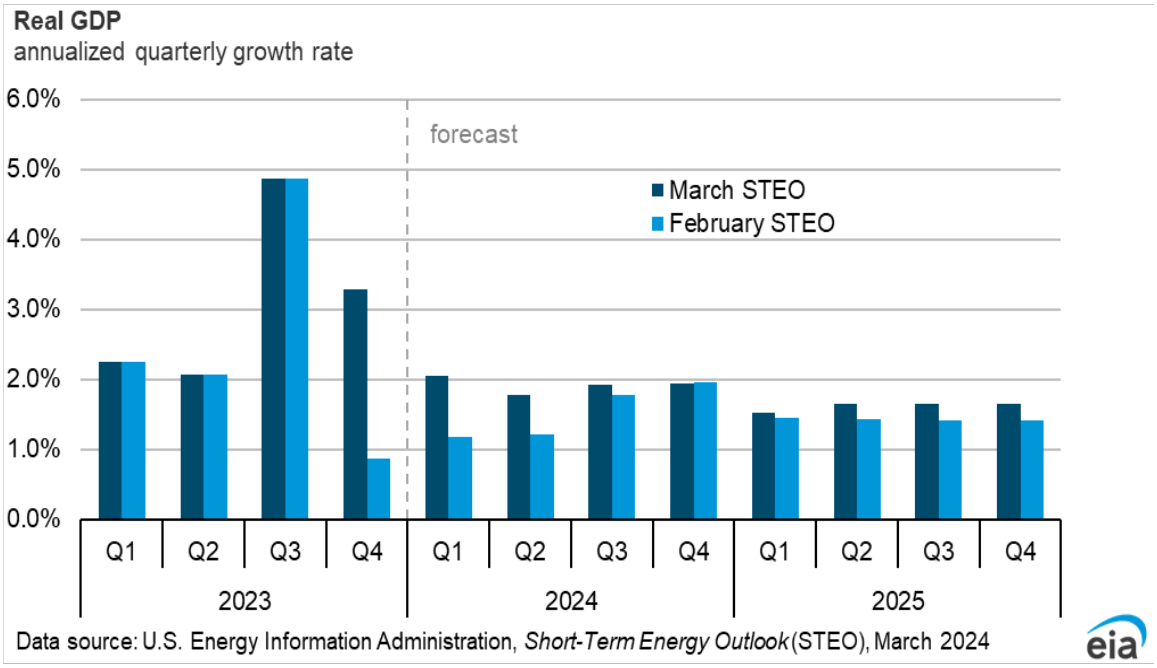




Economy, Weather, and CO_2

U.S. macroeconomics

Our forecast assumes real GDP will grow by 2.6% in 2024 and 1.7% in 2025 after upward revisions from last month's forecast of 0.8% in 2024 and 0.1% in 2025. The revisions were primarily driven by the Bureau of Economic Analysis's (BEA) advance estimate of GDP in the fourth quarter of 2023 (4Q23), which came in at 3.3%, higher than the 0.9% in our February STEO. The BEA released the second estimate for 4Q23 GDP growth after the macroeconomic forecast for this month's STEO was compiled, but it was almost unchanged from the advance estimate, coming in at 3.2%. The difference between the advance and second estimate does not materially change our economic outlook and still represents a significant upward revision compared to the February STEO. The strength in 4Q23 is expected to carry over to 2024. The most notable difference is to the composition of expenditures. We now assume consumer spending will make up a larger share of real GDP in 2024 and 2025. Consumer spending in 4Q23 was higher than we assumed last month, and growth in personal income and a strong labor market may support consumer spending growth in 2024. 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.

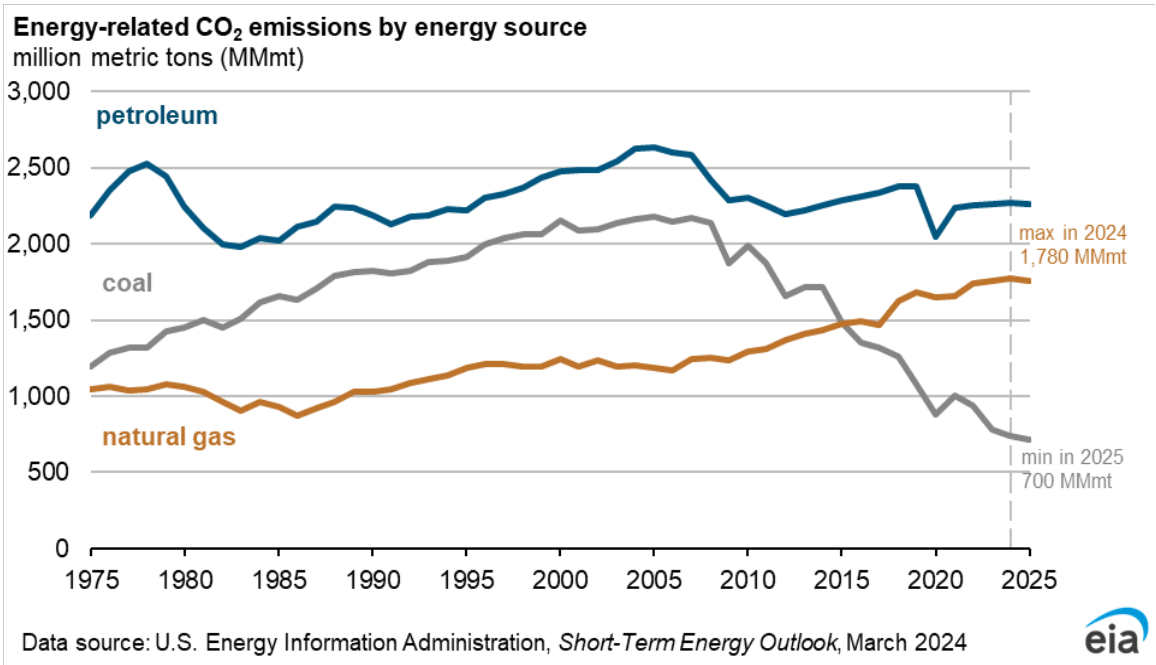


The outlooks for inflation and unemployment in the United States are mostly unchanged from last month. Inflation, measured as the year-over-year growth rate of the Consumer Price Index (CPI), declined from a peak of 9.0% in June 2022 to 3.1% in January 2024. Our forecast assumes that CPI inflation will continue to decline, falling to around 2.0% by 3Q24. Our forecast assumes the unemployment rate will remain flat at around 4.0%, through 4Q25.

Emissions

Total U.S. energy-related carbon dioxide (CO_2) emissions in our forecast remain mostly unchanged in 2024 as decreased CO_2 emissions from coal offset increased CO_2 emissions from natural gas. Forecast coal-related CO_2 emissions decline by 6% as a result of decreasing coal-fired electricity generation. Natural gas-related CO_2 emissions increase by 1% due to increasing natural gas-fired electricity generation and from higher consumption in the residential and commercial sectors. We expect CO_2 emissions to decrease by 1% in 2025 as coal- and natural gas-fired generation declines, offset by growth in renewable generation.

Although total energy-related CO_2 emissions are not expected to change much over the forecast horizon, some notable trends in CO_2 emissions exist by fuel. In particular, we forecast that U.S. CO_2 emissions from natural gas will reach an all-time high in 2024, and emissions from coal in 2024 and 2025 will be the least since EIA's data begin in 1973. These record emissions are consistent with trend of a steady rise in natural gas-related emissions and the steady fall of coal-related emissions, ongoing since 2008. Coal-fired power generation has decreased for several reasons, including as the growth in renewable generation and notable growth in hydraulic fracturing in the early 2000s, which reduced prices for natural gas and increased natural gas-fired generation.



Weather

We expect to end the relatively mild winter season (November 2023–March 2024) with almost 130 fewer HDDs than the previous winter season and more than 260 HDDs fewer than the 10-year winter average. Milder weather in February offset the cold front experienced across the United States in mid-January. Despite this winter's HDDs falling 8% below the 10-year winter average, overall, we expect almost 4,000 HDDs in 2024, 4% more than in 2023. We expect a warmer summer in 2024, with 7% more CDDs than last year during the second and third quarters.