



Short-Term Energy Outlook (STEO)

Highlights

- North Sea Brent crude oil prices averaged \$47/barrel (b) in August, a \$10/b decrease from July. This third consecutive monthly decrease in prices likely reflects concerns about lower economic growth in emerging markets, expectations of higher oil exports from Iran, and continuing growth in global inventories. Crude oil price volatility increased significantly, with Brent prices showing daily changes of more than 5% for four consecutive trading days from August 27 to September 1, the longest such stretch since December 2008.
- EIA forecasts that Brent crude oil prices will average \$54/b in 2015 and \$59/b in 2016, unchanged from last month's STEO. Forecast West Texas Intermediate (WTI) crude oil prices in 2015 and 2016 average \$5/b lower than the Brent price. The current values of futures and options contracts for December 2015 delivery ([Market Prices and Uncertainty Report](#)) suggest the market expects WTI prices to range from \$32/b to \$73/b (at the 95% confidence interval) in December 2015.
- U.S. regular gasoline monthly retail prices averaged \$2.64/gallon (gal) in August, a decrease of 16 cents/gal from July and 85 cents/gal lower than in August 2014. EIA expects monthly gasoline prices to decline from the August level to an average of \$2.11/gal during the fourth quarter of 2015. EIA forecasts U.S. regular gasoline retail prices to average \$2.38/gal in 2016.
- EIA estimates total U.S. crude oil production declined by 140,000 barrels per day (b/d) in August compared with July production. Crude oil production is forecast to continue decreasing through mid-2016 before growth resumes late in 2016. Projected U.S. crude oil production averages 9.2 million b/d in 2015 and 8.8 million b/d in 2016, which are both 0.1 million b/d lower than in the prior STEO.
- Natural gas working inventories were 3,193 billion cubic feet (Bcf) on August 28. This level was 18% higher than a year ago and 4% higher than the previous five-year average (2010-14) for this week. EIA projects inventories will close the injection season at the end of October at 3,840 Bcf, which would be the third-highest end-of-October level on record.

Global Petroleum and Other Liquids

Global liquids production continues to outpace consumption, leading to strong inventory builds throughout the forecast period. Global oil inventory builds in the second quarter of 2015 averaged 2.9 million b/d, compared with 1.9 million b/d in the first quarter. The pace of inventory builds is expected to slow in the second half of 2015, to roughly 1.8 million b/d. In 2016, inventory builds are forecast to slow to an average of 1.1 million b/d.

Global Petroleum and Other Liquids Consumption. EIA estimates that global consumption of petroleum and other liquids grew by 1.2 million b/d in 2014, averaging 92.4 million b/d for the year. EIA expects global consumption of petroleum and other liquids to grow by 1.2 million b/d in 2015 and by 1.3 million b/d in 2016. Growth in global consumption for 2016 was revised downward by almost 0.2 million b/d, compared with last month's forecast, as China and other Asian economies continue to show signs of weakness. World real gross domestic product (GDP) weighted for oil consumption increased by 2.8% in 2014, and is projected to grow by 2.3% in 2015 and by 2.9% in 2016.

Consumption of petroleum and other liquids in countries outside of the Organization for Economic Cooperation and Development (OECD) grew by 1.4 million b/d in 2014 and is projected to grow by 0.7 million b/d in 2015 and by 1.1 million b/d in 2016. Despite signs of slowing economic growth, China continues to be a driver of non-OECD oil consumption growth. China's growth in oil consumption is expected to average slightly less than 0.3 million b/d in 2015 and 2016, below the 0.4 million b/d growth in 2014. Also, Iran is expected to experience an uptick in economic activity and petroleum consumption in 2016, assuming implementation of the Joint Comprehensive Plan of Action (JCPOA) between Iran and the P5+1 that was announced on July 14.

After falling by 0.3 million b/d in 2014, OECD petroleum and other liquids consumption is expected to rise by 0.4 million b/d in 2015 and by 0.3 million b/d in 2016, reaching an average of 46.4 million b/d, the highest annual average level of OECD consumption since 2010. U.S. consumption is expected to grow by an average of 0.3 million b/d in 2015 and by 0.1 million b/d in 2016. Several European countries saw economic conditions improve as they emerged from recessions, which, combined with colder-than-normal weather early in 2015 across Europe, contributes to a projected 0.1 million b/d increase in consumption in OECD Europe in 2015.

Non-OPEC Petroleum and Other Liquids Supply. EIA estimates that petroleum and other liquids production in countries outside of the Organization of the Petroleum Exporting Countries (OPEC) grew by 2.4 million b/d in 2014, which mainly reflects production growth in the United States. EIA expects non-OPEC liquids production to grow by 1.4 million b/d in 2015, but to remain roughly flat in 2016, as declining U.S. production is offset by modest growth in other non-OPEC producers.

Non-OPEC production growth in 2015 is largely attributable to investments made when oil prices were higher. For example, the decisions to invest in the Golden Eagle, Peregrine, and Kinnoull fields in the United Kingdom's sector of the North Sea were made in the second half of

2011 when Brent crude prices were more than \$100/b. The three fields started producing at the end of 2014 and the beginning of 2015. Redirection of investment is also helping to maintain or raise production levels in non-OPEC countries. Some companies have cut back on investments in exploring for new fields, and some are directing a greater share of investments toward currently producing fields to maintain production levels and positive cash flow in the short term. However, this redirection of investment could contribute to lower production beyond the forecast period.

Production growth in Canada is expected to average 0.3 million b/d in both 2015 and 2016, driven by continued expansion in oil sands projects. Although some previously announced oil sands projects have been put on hold, the vast majority continue as planned, including Imperial Oil and Cenovus oil sands projects scheduled to come online by the end of 2016.

Unplanned supply disruptions among non-OPEC producers averaged 0.7 million b/d in August, slightly less than in the previous month.

OPEC Petroleum and Other Liquids Supply. EIA estimates that OPEC crude oil production averaged 30.1 million b/d in 2014, unchanged from 2013. Crude oil production declines in Libya, Angola, Algeria, and Kuwait offset [production growth in Iraq](#) and Iran. EIA forecasts OPEC crude oil production to increase by 0.8 million b/d in 2015 and remain relatively flat in 2016. Iraq is expected to be the largest contributor to OPEC production growth in 2015. In 2016, additional OPEC crude oil supply is expected to come from Iran, which is forecast to boost production if international sanctions targeting its oil sector are suspended.

On July 14, the [P5+1 and Iran announced an agreement](#) that could result in relief from United States and European Union nuclear-related sanctions (which include some oil-related sanctions). Sanctions relief is contingent on verification by the International Atomic Energy Agency that Iran has complied with key nuclear-related steps. The sanctions relief would put additional Iranian oil supplies on a global market that has already seen oil inventories increase significantly over the past year.

The JCPOA is currently undergoing a congressional review. As of the time of this writing, Congress had not voted on the agreement, but for the purposes of this STEO, EIA assumes sanctions relief could occur in mid-2016. If sanctions relief occurs, EIA forecasts Iranian crude oil supplies will increase by about 0.3 million b/d on average in 2016, with most of the growth occurring in the second half of the year. Much uncertainty remains as to the timing of sanctions relief. Iran produced 3.6 million b/d of crude oil in late 2011, before the recent round of sanctions was enacted. The sanctions forced Iran to shut in a substantial portion of its production, with production currently averaging about 2.8 million b/d. Iran's ability to bring online previously shut-in volumes and increase exports depends on several factors, including the current condition of oil fields and infrastructure that were shut in and the pace of sanctions relief.

Saudi Arabia and other OPEC member countries are not expected to reduce production to accommodate additional Iranian volumes, although some producers will see production declines

in the near term. For example, Saudi Arabia's production is expected to decline as seasonal power demand abates, reducing the use of crude oil to generate electricity. Also, there is considerable uncertainty regarding Iraq's ability to sustain its higher production and export levels, particularly in light of increased outages on the pipeline through Turkey to the port of Ceyhan that is connected to the Kurdistan Regional Government's independent pipeline.

OPEC noncrude liquids production, which averaged 6.3 million b/d in 2014, is expected to increase by 0.2 million b/d in 2015 and by 0.3 million b/d in 2016, led by production increases in Iran, Qatar, and Kuwait.

In August, unplanned crude oil supply disruptions among OPEC producers averaged 2.8 million b/d, nearly the same level as in the previous month. Kuwait and Saudi Arabia continue to have a total of 0.5 million b/d disrupted at the Wafra and Khafji fields in the Neutral Zone that straddles the two countries.

EIA expects OPEC surplus crude oil production capacity, which is concentrated in Saudi Arabia, to average 1.5 million b/d in 2015 and then increase to 2.0 million b/d in 2016, after averaging 2.0 million b/d in 2014. Surplus capacity is typically an indicator of market conditions, and surplus capacity lower than 2.5 million b/d indicates a relatively tight oil market, but the current and forecast levels of global inventory builds make the projected low surplus capacity level in 2015 less significant. EIA does not expect any Iranian spare capacity to be available throughout the forecast period despite increases in effective capacity, as Iran is expected to produce crude oil at the maximum available level through the end of 2016 if and when sanctions are lifted.

OECD Petroleum Inventories. EIA estimates that OECD commercial crude oil and other liquids inventories totaled 2.70 billion barrels at the end of 2014, equivalent to roughly 59 days of consumption. Forecast OECD inventories rise to 2.99 billion barrels at the end of 2015 and then to 3.11 billion barrels at the end of 2016.

Crude Oil Prices. Brent crude oil spot prices decreased by \$10/b in August to a monthly average of \$47/b, driven by continued growth in global liquids inventories and expectations of weakening global economic activity. Along with increasing volatility in global equity prices and exchange rates, crude oil price volatility increased significantly in August, reflecting uncertainty about potential lower economic and oil demand growth in emerging market countries. Volatility remained heightened at the end of August and into September, with Brent spot prices increasing from \$42/b on August 26 to \$52/b on August 31, before falling below \$50/b again on September 1. During this period, Brent prices showed daily changes of more than 5% for four consecutive trading days, the longest stretch of such high volatility since December 2008.

Continuing [increases in global liquids inventories](#) have put significant downward pressure on prices. Inventories rose by an estimated 2.4 million b/d through the first eight months of 2015, compared with an average build of 0.6 million b/d over the same period in 2014. Inventory builds are projected to moderate somewhat in the coming months, but are expected to remain high compared with previous years.

The monthly average WTI crude oil spot price fell to an average of \$43/b in August, down \$8/b from July. Crude oil inventories at Cushing, Oklahoma, despite being 4.9 million barrels lower than the record high of 62.2 million barrels on April 17, remain about 37 million barrels higher than at the same time last year. U.S. crude oil inventories remain elevated compared with historical levels, despite [strong U.S. refinery runs](#), which in recent weeks reached new highs of more than 17 million b/d.

EIA projects the Brent crude oil price will average \$54/b in 2015 and \$59/b in 2016, unchanged from August's STEO. WTI prices in both 2015 and 2016 are expected to average \$5/b less than the Brent crude oil price. EIA's updated projection remains subject to significant uncertainties as the oil market moves toward balance. During this period of price discovery, oil prices could continue to experience periods of heightened volatility. The oil market faces many uncertainties heading into 2016, including the pace and volume at which Iranian oil reenters the market, the strength of oil consumption growth, and the responsiveness of non-OPEC production to low oil prices. In the more immediate future, there is potential downward price pressure heading into the fourth quarter of 2015 if refinery runs drop by more than expected during the fall maintenance season.

The current values of futures and options contracts continue to suggest high uncertainty in the price outlook ([Market Prices and Uncertainty Report](#)). WTI futures contracts for December 2015 delivery, traded during the five-day period ending September 3, averaged \$48/b, while implied volatility averaged 47%. These levels established the lower and upper limits of the 95% confidence interval for the market's expectations of monthly average WTI prices in December 2015 at \$32/b and \$73/b, respectively. The 95% confidence interval for market expectations widens over time, with lower and upper limits of \$26/b and \$108/b for prices in December 2016. Last year at this time, WTI for December 2014 delivery averaged \$93/b, and implied volatility averaged 16%. The corresponding lower and upper limits of the 95% confidence interval were \$81/b and \$107/b.

U.S. Petroleum and Other Liquids

The most recent data from the U.S. Federal Highway Administration show Americans drove a record 1.54 trillion miles during the first half of 2015, compared with the previous high of 1.50 trillion miles driven in the first half of 2007, contributing to higher demand for gasoline in the United States.

Monthly data show gasoline consumption in the United States increased by 3% during the first half of 2015 compared with the first half of 2014. This growing domestic consumption and strong demand from abroad have contributed to high refinery wholesale gasoline margins (the difference between the wholesale price of gasoline and the price of Brent crude oil). U.S. average wholesale gasoline margins averaged 65 cents/gal in August, 31 cents/gal higher than in August 2014 and 34 cents/gal higher than the five-year average (2010-14) for August.

[Refinery outages in the Midwest](#) and on the West Coast have contributed to gasoline prices in those regions rising by more than the U.S. average over the past few months, and have resulted

in significant price volatility. In [Petroleum Administration for Defense District \(PADD\) 2](#) (Midwest), retail regular gasoline prices rose by 32 cents/gal during the week of August 17 to an average of \$2.79/gal, 7 cents/gal higher than the U.S. average, following a temporary unplanned refinery outage at BP's Whiting, Indiana, refinery. The outage at Whiting has since ended and PADD 2 retail gasoline prices fell to \$2.47/gal on August 31, 4 cents/gal below the U.S. average. After reaching a 2015 peak of \$3.60/gal on July 20, regular gasoline prices in PADD 5 (West Coast) have since fallen to \$3.16/gal as of August 31 but remain 65 cents/gal above the U.S. average as a result of tight gasoline supplies that reflect ongoing refinery outages in California.

In August, monthly average regional gasoline retail prices ranged from a low of \$2.31/gal in PADD 3 (Gulf Coast) to a high of \$3.33/gal in PADD 5. EIA expects gasoline prices to fall from their current levels, with the U.S. regular gasoline price averaging \$2.11/gal in the fourth quarter of 2015.

Liquid Fuels Consumption. Total U.S. liquid fuels consumption rose by an estimated 140,000 b/d (0.8%) in 2014. Total liquid fuels consumption is forecast to grow by 330,000 b/d (1.7%) in 2015 and by 130,000 b/d (0.7%) in 2016.

Motor gasoline consumption, which rose by 80,000 b/d in 2014, increases by a projected 210,000 b/d (2.3%) in 2015 as the effects of employment growth and lower gasoline prices outweigh increases in vehicle fleet efficiency. Gasoline consumption is forecast to remain flat in 2016, as a long-term trend toward vehicles that are more fuel efficient offsets the effect of continued economic growth on highway travel.

Consumption of distillate fuel, which includes diesel fuel and heating oil, is forecast to be relatively unchanged in 2015 and then increase by 60,000 b/d (1.5%) in 2016. The 2016 growth is driven by increasing manufacturing output, foreign trade, and marine fuel use.

Hydrocarbon gas liquids (HGL) consumption, which fell by 50,000 b/d (1.9%) in 2014, is projected to increase by 60,000 b/d in 2015 and by 80,000 b/d in 2016, as [new petrochemical plant capacity](#) increases the use of HGL as a feedstock. In addition, [new HGL export terminal capacity](#) contributes to an increase in HGL net exports from an average of 560,000 b/d in 2014 to 1.1 million b/d in 2016.

Liquid Fuels Supply. U.S. crude oil production is projected to increase from an average of 8.7 million b/d in 2014 to 9.2 million b/d in 2015 and then decrease to 8.8 million b/d in 2016. For both 2015 and 2016, the forecast is about 0.1 million b/d lower than in the August STEO. The decrease in the crude oil production forecast mostly reflects downward revisions to U.S. oil production estimates for the first half of 2015.

In late August, EIA released data from its first [survey-based reporting](#) of monthly crude oil production, which represents more than 90% of U.S. oil production. Based on these data, monthly national production estimates for January through May 2015 were revised downward by 40,000 b/d to 130,000 b/d. The largest revisions include decreases of crude oil production in Texas (ranging from about 100,000 b/d to 150,000 b/d) and increases in the federal Gulf of

Mexico (ranging from about 10,000 b/d to 50,000 b/d). EIA estimates U.S. crude oil production in June 2015 was 9.3 b/d, a decrease of 0.1 million b/d from the revised May 2015 figure.

Based on the revised data, U.S. crude oil production averaged 9.4 million b/d in the first half of 2015. This level is 0.2 million b/d higher than the average production during the fourth quarter of 2014, despite an almost 60% decline in the total U.S. oil-directed rig count since October 2014. Lower 48 onshore production began falling in April, but the decline was offset by production gains in the Gulf of Mexico that kept total production growth positive until May. Total U.S. production began declining in May, falling more than 0.2 million b/d from the April level.

EIA expects U.S. crude oil production declines to continue through August 2016, when total production is forecast to average 8.6 million b/d. Forecast production begins rising in late 2016, returning to an average of 9.0 million b/d in the fourth quarter. A total of 12 projects are scheduled to come online in the Gulf of Mexico in 2015 and 2016, pushing up production from an average of 1.4 million b/d in the fourth quarter of 2014 to more than 1.6 million b/d in the same period of 2016.

Expected crude oil production declines from May 2015 through mid-2016 are largely attributable to unattractive economic returns in some areas of both emerging and mature onshore oil production regions, as well as seasonal factors such as anticipated hurricane-related production disruptions in the Gulf of Mexico. Reductions in 2015 cash flows and capital expenditures have prompted companies to defer or redirect investment away from marginal exploration and research drilling to focus on core areas of major tight oil plays. Reduced investment has resulted in the lowest count of oil-directed rigs in nearly five years and in well completions that are significantly behind 2014 levels.

Oil prices, particularly in the second quarter of 2015, remained high enough to support continued development drilling in the core areas of the Bakken, Eagle Ford, Niobrara, and Permian basins, with July showing the first month-to-month increase in the oil-directed rig count since October 2014. However, WTI prices below \$60/b through the forecast period are anticipated to slow the rate of recovery in onshore drilling and well completion totals, despite continued increases in rig and well productivity and falling drilling and completion costs. The forecast remains sensitive to actual wellhead prices and rapidly changing drilling economics that vary across regions and operators.

While projected oil production in the Gulf of Mexico rises during the forecast period, Alaska oil production falls. Production in these areas is less sensitive to short-term price movements than onshore production in the Lower 48 states and reflects anticipated growth from new projects and declines from legacy fields.

HGL production at natural gas processing plants reached a record high of 3.31 million b/d in April 2015, and it is projected to average 3.27 million b/d in 2015 and 3.53 million b/d in 2016. EIA expects higher ethane recovery rates in 2016 following planned increases in petrochemical

plant feedstock demand. Export terminal expansions will allow for higher quantities of domestically produced ethane, propane, and butanes to reach the international market.

U.S. petroleum product gross exports continue to grow, up almost 0.5 million b/d (13%) in the first half of 2015 compared with the same period in 2014. More than half of the growth in liquid fuel exports came from HGL. The increase in refined product exports, combined with the growth in domestic liquid fuels consumption, contributed to U.S. refinery utilization averaging 90.6% during the first half of the year, up from 88.5% last year, and the highest rate for this period since 2005. Gross inputs to U.S. refineries exceeded 17 million b/d for six consecutive weeks in July and August, a level not previously reached or exceeded in any week since EIA began publishing the data in 1990.

Petroleum Product Prices. Rising crude oil prices, strong gasoline demand, and several refinery outages on the West Coast contributed to an increase in U.S. regular gasoline retail prices from a monthly average of \$2.47/gal in April to \$2.80/gal in June. Falling crude oil prices and narrowing wholesale gasoline margins have since contributed to prices declining in August to an average of \$2.64/gal. EIA expects monthly average prices to decline in the coming months as refineries continue to produce high levels of gasoline, as demand begins to decrease following the peak in the summer driving season, and as the market transitions to lower-cost winter-grade gasoline. EIA projects regular gasoline retail prices to average \$2.11/gal in the fourth quarter of 2015.

The U.S. regular gasoline retail price, which averaged \$3.36/gal in 2014, is projected to average \$2.41/gal in 2015 and \$2.38/gal in 2016. The 2015 forecast is unchanged from the August STEO, and the 2016 forecast is 2 cents/gal lower.

The diesel fuel retail price, which averaged \$3.83/gal in 2014, is projected to fall to an average of \$2.73/gal in 2015 and then rise to \$2.77/gal in 2016, which is 4 cents/gal lower than in the August's STEO.

Natural Gas

Total weekly natural gas storage injections from the beginning of the injection season through August 28 were 1,732 billion cubic feet (Bcf), compared with the five-year (2010-14) average of 1,420 for the same time period. However, 2015 injections have been 8% lower than last year's record injections of 1,887 for the same weeks. The largest injections occurred earlier in the injection season, with injections in recent weeks closer to the five-year average. Production growth has been the main driver of strong inventory builds this year.

Natural Gas Consumption. EIA's forecast of U.S. total natural gas consumption averages 76.5 Bcf/d in 2015 and 76.6 Bcf/d in 2016, compared with 73.5 Bcf/d in 2014. EIA projects natural gas consumption in the power sector to increase by 14.4% in 2015 and then decrease by 3.3% in 2016. Natural gas prices, which are expected to remain below \$3 per million British thermal units (MMBtu) through November, support increased use of natural gas for electricity generation in 2015. Industrial sector consumption increases by 0.9% in 2015 and by 6.4% in

2016, as new industrial projects, particularly in the fertilizer and chemicals sectors, come online late this year and next year, and as industrial consumers continue to take advantage of low natural gas prices. Natural gas consumption in the residential and commercial sectors is projected to decline in both 2015 and 2016.

Natural Gas Production and Trade. EIA expects that marketed natural gas production will increase by 4.2 Bcf/d (5.7%) and by 1.7 Bcf/d (2.2%) in 2015 and 2016, respectively. EIA expects moderate production growth through 2016, with increases in the Lower 48 states expected to more than offset continuing production declines in the Gulf of Mexico. Increases in drilling efficiency will continue to support growing natural gas production in the forecast despite relatively low natural gas prices. Most of the growth is expected to come from the Marcellus Shale as the backlog of uncompleted wells is reduced and as new pipelines come online to deliver Marcellus natural gas to markets in the Northeast.

Increases in domestic natural gas production are expected to reduce demand for natural gas imports from Canada and to support growth in exports to Mexico. Earlier this year, natural gas net imports fell to the lowest monthly level since 1987, averaging 2.3 Bcf/d in both May and June. EIA expects natural gas exports to Mexico, particularly from the Eagle Ford Shale in South Texas, to increase because of growing demand from Mexico's electric power sector coupled with flat natural gas production in Mexico.

EIA projects liquefied natural gas (LNG) gross exports will increase to an average of 0.79 Bcf/d in 2016, with the startup of a major LNG liquefaction plant in the Lower 48 states.

Natural Gas Inventories. On August 28, natural gas working inventories totaled 3,193 Bcf, 495 Bcf (18%) above the level at the same time in 2014 and 122 Bcf (4%) above the five-year average for that week. EIA projects end-of-October 2015 inventories will total 3,840 Bcf, which would be 43 Bcf above the five-year average.

Natural Gas Prices. The Henry Hub natural gas spot price averaged \$2.77/MMBtu in August, a decrease of 7 cents/MMBtu from the July price. The current STEO lowers the projection for prices slightly from last month's forecast; monthly average spot prices remain lower than \$3/MMBtu through November, and lower than \$4/MMBtu through the remainder of the forecast. The projected Henry Hub natural gas price averages \$2.84/MMBtu in 2015 and \$3.11/MMBtu in 2016.

Natural gas futures contracts for December 2015 delivery traded during the five-day period ending September 3 averaged \$2.91/MMBtu. Current options and futures prices imply that market participants place the lower and upper bounds for the 95% confidence interval for December 2015 contracts at \$2.08/MMBtu and \$4.06/MMBtu, respectively. At this time in 2014, the natural gas futures contract for December 2014 delivery averaged \$4.07 /MMBtu, and the corresponding lower and upper limits of the 95% confidence interval were \$3.09/MMBtu and \$5.35/MMBtu, respectively.

Coal

Coal Trade. Slower growth in world coal demand, lower international coal prices, and higher coal output in other coal-exporting countries have all led to a decline in U.S. coal exports. Lower mining costs, cheaper transportation costs, and favorable exchange rates will continue to provide an advantage to mines in other major coal-exporting countries compared with U.S. producers. Coal exports for the first half of 2015 are down 20% compared with the same period in 2014, and U.S. steam coal exports fell by 21%, or 4.1 million short tons (MMst). The 5.8 MMst of coal exports for June 2015 was the lowest monthly volume for coal exports since February 2010. EIA projects coal exports will fall by 18 MMst, to 80 MMst, in 2015, and then decrease by another 7 MMst (9%) in 2016. U.S. coal imports, which increased by more than 2 MMst in 2014 to 11 MMst, are expected to average near that level in 2015 and 2016.

Coal Consumption. EIA expects a 7% decrease in total coal consumption in 2015, with electric power sector consumption also falling by 7%. Lower natural gas prices are the key factor driving the decrease in coal consumption. Projected low natural gas prices (power sector natural gas prices are 27% lower in 2015 compared with 2014) make it more economical to run natural gas-fired generating units at higher utilization rates. The retirements of coal-fired power plants in response to the implementation of the [Mercury and Air Toxics Standards \(MATS\)](#) also reduces coal-fired capacity in the power sector in 2015, but because the retirements are occurring throughout 2015, the full effect will not be evident until 2016.

Projected rising electricity demand and higher natural gas prices next year are expected to contribute to higher utilization rates among the remaining coal-fired power plants. Even with continued implementation of MATS, which the U.S. Supreme Court recently sent back to the U.S. Court of Appeals for the D.C. Circuit for further review, coal consumption in the electric power sector is forecast to increase by 1.5% in 2016. Expected growth in renewable-based generation is one barrier to a larger rebound in coal-fired generation in 2016. Nonhydropower renewable-based electricity generation is expected to grow by 12% in 2016, with the largest growth occurring in the South (21%).

Coal Supply. Lower domestic coal consumption and exports, combined with a slight increase in coal imports, are projected to contribute to an 86 MMst (9%) decline in production in 2015. Coal production is expected to decrease in all coal-producing regions in 2015, with the largest decline (on a percentage basis) occurring in the Appalachian region. U.S. production is expected to decrease slightly (3 MMst) in 2016.

Electric power sector stockpiles were 168 MMst in June (the most recent month for which data are available), a 4% decrease from the level in May. This decrease in coal stockpiles from May to June follows the normal seasonal pattern, where coal stockpiles begin to decrease as the U.S. enters the summer months. Coal inventories in June 2015 were 35 MMst higher than in June 2014 when inventories were still recovering from the effects of colder-than-normal temperatures during the 2013-14 winter season.

Coal Prices. The annual average coal price to the electric power sector increased from \$2.34/MMBtu in 2013 to \$2.36/MMBtu in 2014. EIA expects the delivered coal price to average \$2.27/MMBtu in both 2015 and 2016.

Electricity

The electricity industry retired nearly 9,800 megawatts (MW) of conventional steam coal-fired generating capacity during the first six months of this year. These retirements represent 3.3% of the amount of operating steam coal capacity existing at the end of 2014. The states with the largest amount of retired coal capacity include Ohio (2,659 MW), Georgia (1,861 MW), and Kentucky (1,409 MW). The industry plans to retire an additional 3,133 MW of coal capacity this year and nearly 6,000 MW during 2016.

Electricity Consumption. Retail sales of electricity to the residential sector during the first six months of 2015 were 1.7% lower than residential sales during the first half of 2014, as winter and spring temperatures this year were milder than last year. EIA expects residential sales during the second half of 2015 will be 2.1% higher than the same period in 2014 because of comparatively warmer summer temperatures. Forecast residential sales of electricity decline by 0.6% in 2016. Projected retail sales of electricity to the commercial sector grow by 0.7% in 2015, while industrial sector electricity sales fall by 0.2%. EIA expects commercial and industrial sales in 2016 to grow by 1.3% and 1.2%, respectively.

Electricity Generation. While the retirement of some coal-fired capacity has contributed to the decline in coal-fired electricity generation over the past year, the relatively low cost of natural gas has been a more significant driver in coal's declining generation fuel share and the increase in the share generated by natural gas. During the first half of 2015, coal accounted for 34% of total generation compared with 40% during the same period last year, while natural gas accounted for 30%, up from 25% during the first half of 2014. For all of 2015, EIA expects the annual amount of coal generation will be 8.2% lower than in 2014, and the annual level of natural gas generation will rise by 14.5%. The forecast for coal generation increases slightly (1.4%) in 2016, and natural gas generation falls (3.0%) in response to projected higher natural gas fuel costs.

Electricity Retail Prices. The U.S. retail price of electricity to the residential sector is projected to average 12.7 cents per kilowatthour in 2015, which is 1.3% higher than the average price last year. The largest price increases are projected to be in New England, where residential electricity prices are forecast to increase by 10.8% in 2015, as electricity distribution companies recover higher generation and power purchase costs incurred during 2014. Wholesale power prices in New England have been relatively low this year, and EIA expects retail New England prices during the second half of 2015 will be lower than during the first half.

Renewables and Carbon Dioxide Emissions

Electricity and Heat Generation from Renewables. EIA expects total renewables used in the electric power sector will decrease by 3.5% in 2015. Conventional hydropower generation is

forecast to decrease by 10.4%, and nonhydropower renewable power generation is forecast to increase by 3.2%. The 2015 decrease in hydropower generation reflects the effects of the [California drought](#). Forecast generation from hydropower in the electric power sector increases by 9.2% in 2016.

EIA expects continued growth in utility-scale solar power generation, which is projected to average 89 gigawatthours per day (GWh/d) in 2016. Because the growth is from a small base, utility-scale solar power averages 0.8% of total U.S. electricity generation in 2016. Although solar growth has historically been concentrated in customer-sited distributed generation installations (rooftop panels), EIA expects utility-scale solar capacity will increase by more than 100% (11 GW) between the end of 2014 and the end of 2016, with 4.1 GW of new capacity being built in California. Other leading states in utility-scale solar capacity include North Carolina and Nevada, which, combined with California, account for almost 70% of the projected utility-scale capacity additions for 2015 and 2016.

Power plant developers have notified EIA of plans to construct 13 solar projects in Georgia (totaling 607 MW) with expected 2015 or 2016 in-service dates. Five of these new projects (166 MW) will be built on U.S. military bases. Georgia currently has 66 MW of utility-scale solar capacity. According to current law, projects coming online after the end of 2016 will see a federal investment tax credit of 10%, lower than the 30% investment tax credit available for projects that come online before the end of 2016. This impending decline in the tax credit provides a strong incentive for projects to enter service before the end of 2016.

Wind capacity, which grew by 8% in 2014, is forecast to increase by 12% in 2015 and by 13% in 2016. Because wind is starting from a much larger base than solar, even though the growth rate is lower, the absolute increase in wind capacity is twice that of solar: 18 GW of wind compared with 11 GW of utility-scale solar between 2014 and 2016.

Liquid Biofuels. On May 29, the U.S. Environmental Protection Agency (EPA) proposed a rule setting Renewable Fuel Standard (RFS) volumes for 2014 through 2016. Although these volumes could be modified before the final rule is issued, they are used in developing the current STEO. Ethanol production, which averaged 934,000 b/d in 2014, is forecast to average more than 950,000 b/d in both 2015 and 2016. Ethanol consumption, which averaged 877,000 b/d in 2014, is forecast to average slightly more than 900,000 b/d in both 2015 and 2016, resulting in an average 9.9% ethanol share of the total gasoline pool. EIA does not expect significant increases in E15 or E85 consumption over the forecast period. The proposed RFS targets could encourage imports of Brazilian sugarcane ethanol, [which were 3,000 b/d in 2014](#).

EIA expects the largest effect of the proposed RFS targets will be on biodiesel consumption, which contributes to meeting the biomass-based diesel, advanced biofuel, and total renewable fuel RFS targets. Biodiesel production averaged an estimated 81,000 b/d in 2014 and is forecast to average 92,000 b/d in 2015 and 98,000 b/d in 2016. Net imports of biomass-based diesel are also expected to increase from 15,000 b/d in 2014 to 23,000 b/d in 2015, and to 35,000 b/d in 2016. EIA expects that a combination of higher biomass-based diesel consumption, higher

consumption of domestic and imported ethanol, and banked Renewable Identification Numbers (RINs) will help meet the newly proposed RFS volumes through 2016.

Energy-Related Carbon Dioxide Emissions. EIA estimates that emissions grew by 1.0% in 2014. Emissions are projected to fall by 0.4% in 2015 and then rise by 0.6% in 2016. These forecasts are sensitive to both weather and economic assumptions. Monthly carbon dioxide emissions from the electric power sector were at a [27-year low](#) in April, which is typically the month with the lowest generation level each year.

U.S. Economic Assumptions

Recent Economic Indicators. The Bureau of Economic Analysis reported that [U.S. real GDP](#) increased at an annual rate of 3.7% in the second quarter of 2015, higher than the initial estimate of 2.3%. The increase in real GDP in the second quarter reflected positive contributions from personal consumption expenditures, exports, state and local government spending, nonresidential fixed investment, residential fixed investment, and private inventory investment.

EIA used the August 2015 version of the IHS macroeconomic model with EIA's energy price forecasts as model inputs to develop the economic projections in the STEO.

Production, Income, and Employment. Forecast real GDP growth reaches 2.1% in 2015 and rises to 2.5% in 2016. The GDP growth forecast is slightly below the forecast in the August STEO. Real disposable income grows by 3.5% in 2015, unchanged from the forecast last month, and by 2.7% in 2016. Total industrial production grows at 1.5% in 2015 and 1.6% in 2016. Projected growth in nonfarm employment averages 2.1% in 2015 and 1.4% in 2016.

Expenditures. Forecast growth in private real fixed investment averages 3.8% and 6.3% in 2015 and 2016, respectively, led by equipment in 2015 and 2016 and by equipment and structures in 2016. Real consumption expenditures grow faster than real GDP in 2015, at 3.0%, and 2016, at 2.8%. Durable goods expenditures drive consumption spending in both years. Export growth is 1.9% and 4.2% and import growth is 5.7% and 4.4% in 2015 and 2016, respectively. Total government expenditures rise 0.5% in 2015 and 0.7% in 2016.

This report was prepared by the U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy. By law, EIA's data, analyses, and forecasts are independent of approval by any other officer or employee of the United States Government. The views in this report therefore should not be construed as representing those of the U.S. Department of Energy or other federal agencies.