

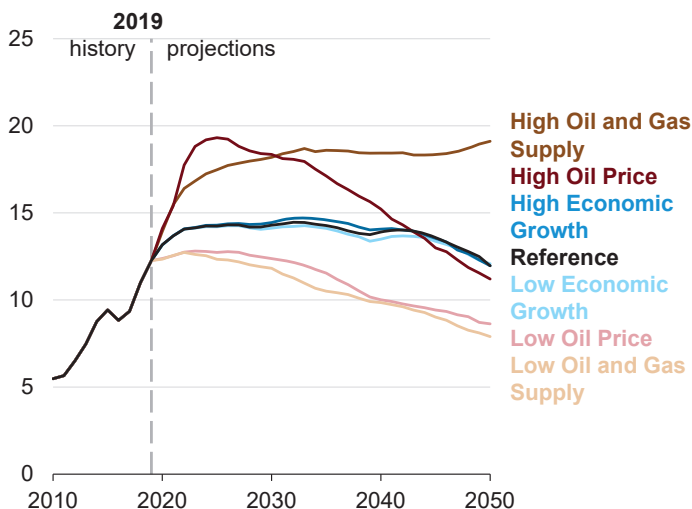


Petroleum and other liquids

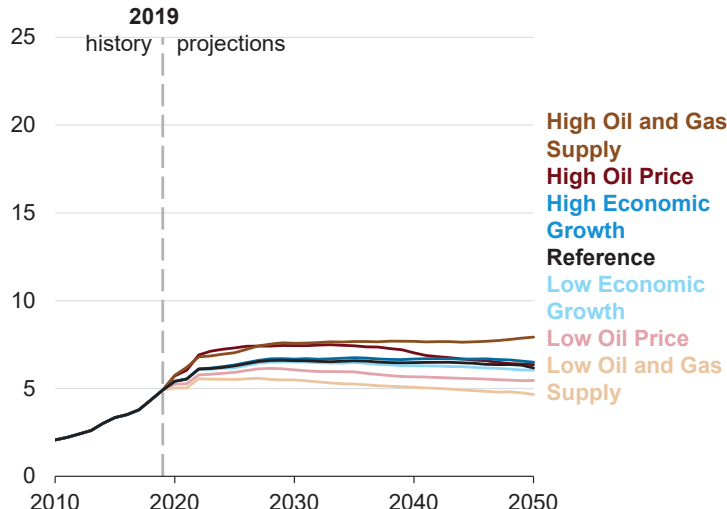
Growth in production of U.S. crude oil and natural gas plant liquids generally continues through 2025, mainly as a result of the continued development of tight oil resources. During the same period, domestic consumption falls, making the United States a net exporter of liquid fuels in the AEO2020 Reference case and in many of the side cases.

Production of U.S. crude oil and natural gas plant liquids continues to grow through 2025 in the AEO2020 Reference case—

AEO2020 U.S. crude oil production
million barrels per day



AEO2020 U.S. natural gas plant liquids production
million barrels per day



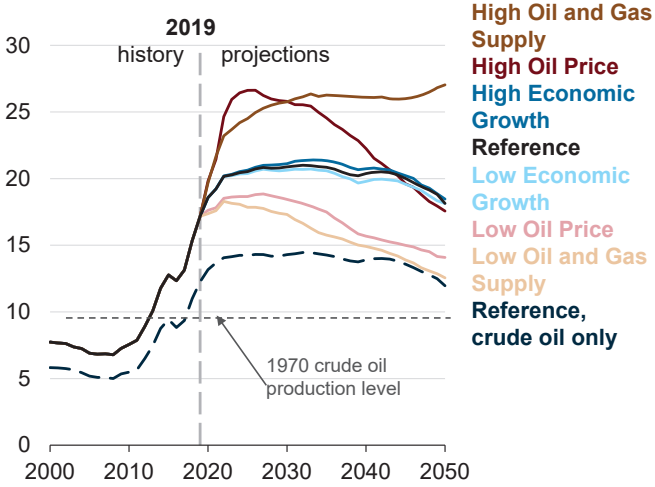
—and natural gas plant liquids comprise nearly one-third of cumulative U.S. liquids production during the projection period

- In the AEO2020 Reference case, U.S. crude oil production reaches 14.0 million barrels per day (b/d) by 2022 and remains near this level through 2045 as tight oil development moves into less productive areas and well productivity declines.
- The continued development of tight oil and shale gas resources in the AEO2020 Reference case supports growth in natural gas plant liquids (NGPL) production, which reaches 6.6 million b/d by 2028. NGPLs are light hydrocarbons predominantly found in natural gas wells and are diverted from the natural gas stream by natural gas processing plants. These hydrocarbons include ethane, propane, normal butane, isobutane, and natural gasoline.
- In the AEO2020 Reference case, NGPL production grows by 26% during the projection period as a result of demand increases by the global petrochemical industry. Most NGPL production growth in the AEO2020 Reference case occurs before 2025 as producers focus on natural gas plant liquids-rich plays, where NGPL-to-gas ratios are highest and increased demand spurs greater ethane recovery.
- In the AEO2020 cases, NGPL production is sensitive to changes in resource and technology assumptions, as well as oil price assumptions. In the High Oil and Gas Supply case, which has faster rates of technological improvement, higher recovery estimates, and additional tight oil and shale gas resources, NGPL production grows by 61% during the projection period. In the High Oil Price case, high crude oil prices lead to more drilling in the near term, but cost increases and fewer easily accessible resources decrease production of crude oil and NGPLs later in the forecast period.

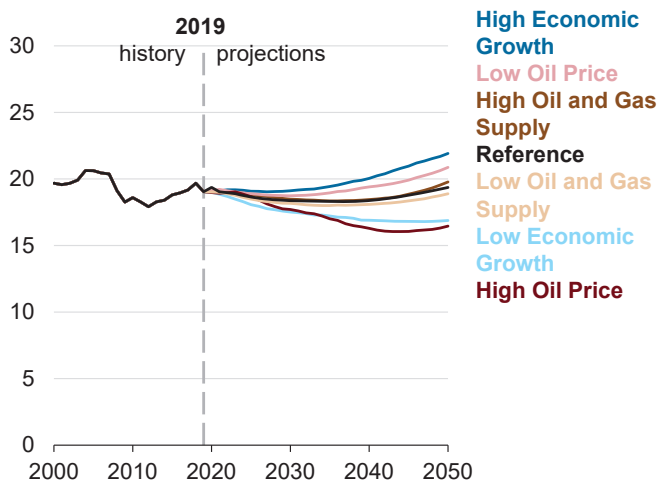


Although production continues to grow through 2025, consumption of petroleum and other liquids remains lower than its 2004 peak level through 2050 in most cases

AEO2020 U.S. crude oil and natural gas plant liquids production
million barrels per day



AEO2020 petroleum and other liquids consumption
million barrels per day

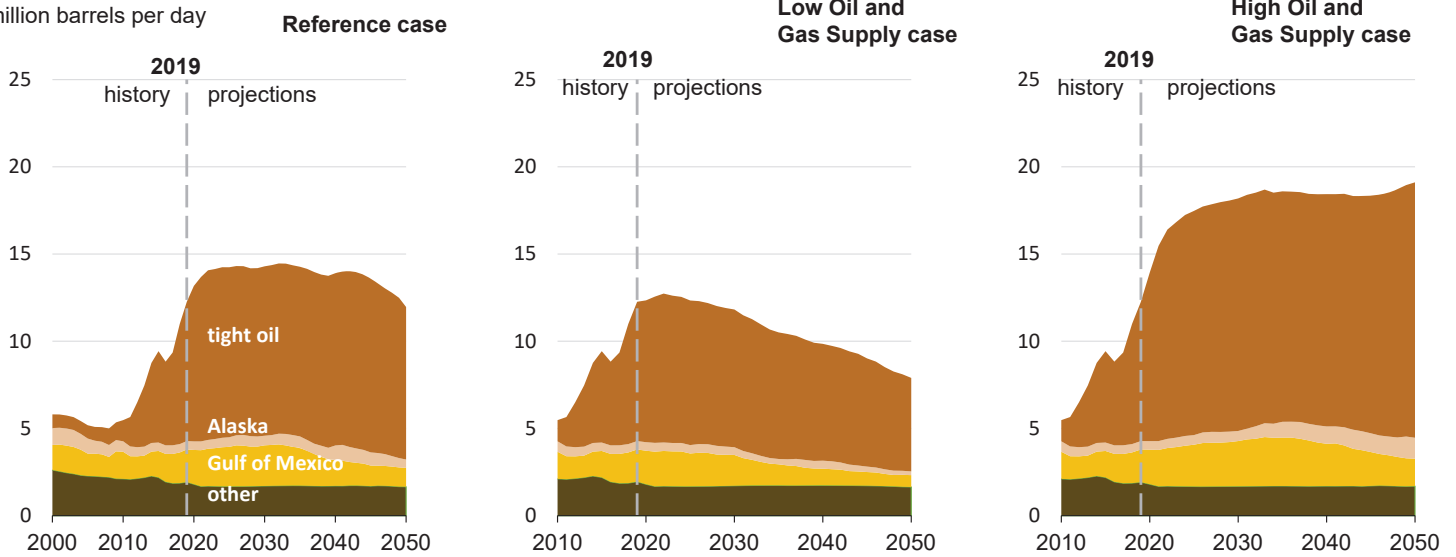




Tight oil development drives U.S. crude oil production during the AEO2020 projection period—

AEO2020 crude oil production

million barrels per day



—which is consistent across all AEO2020 side cases

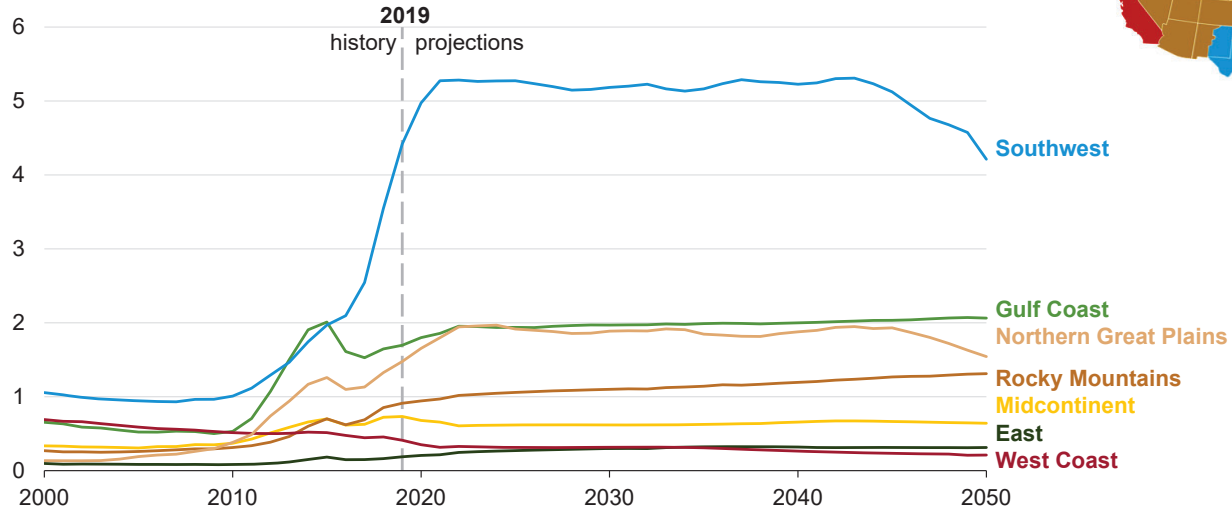
- Onshore tight oil development in the Lower 48 states continues to be the main driver of total U.S. crude oil production, accounting for about 70% of cumulative domestic production in the AEO2020 Reference case during the projection period.
- In the AEO2020 Reference case, deepwater discoveries of oil and natural gas resources in the Gulf of Mexico lead offshore production in the Lower 48 states to reach a record 2.4 million b/d in 2026. Many of these discoveries occurred during exploration that took place before 2015, when oil prices were higher than \$100 per barrel, and they are being developed as oil prices rise. Offshore production increases through 2035 before generally declining through 2050 as a result of new discoveries only partially offsetting declines in legacy fields.
- Alaska crude oil production generally increases through 2041, driven primarily by the development of fields in the National Petroleum Reserve–Alaska (NPR-A) before 2030, and after 2030, by the development of fields in the 1002 Section of the Arctic National Wildlife Refuge (ANWR). Exploration and development of fields in ANWR is not economical in the Low Oil Price case.



The Southwest region leads onshore crude oil production in the United States in the AEO2020 Reference case

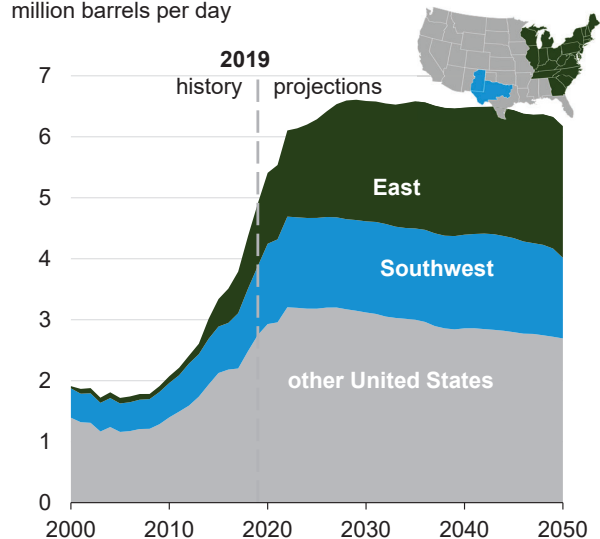
Onshore crude oil production in the Lower 48 states (AEO2020 Reference case)

million barrels per day

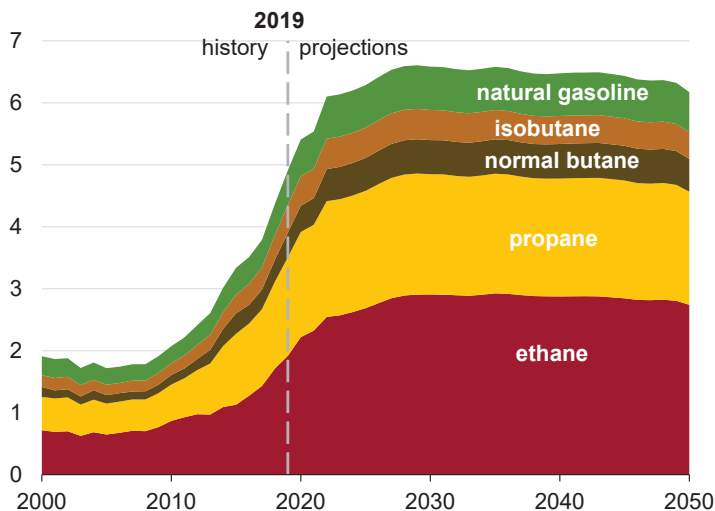


The East and Southwest regions lead production of natural gas plant liquids in the AEO2020 Reference case—

U.S. natural gas plant liquids production by region (Reference case)
million barrels per day



U.S. natural gas plant liquids production by type (Reference case)
million barrels per day



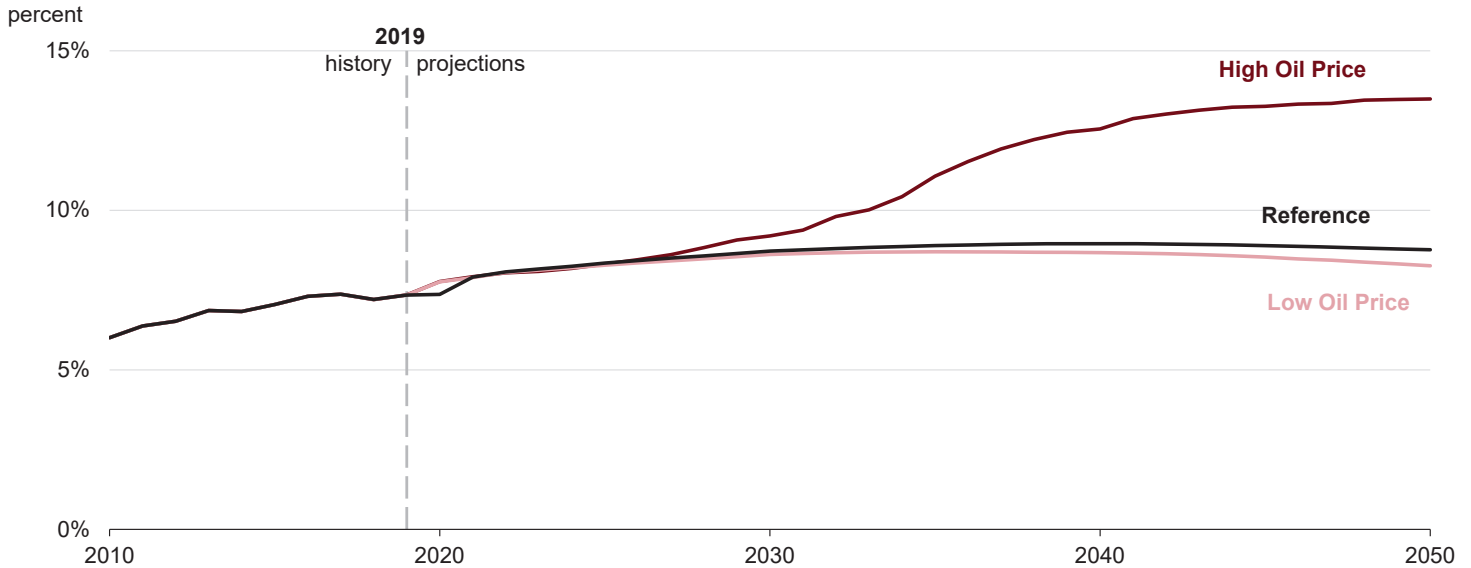
—as development focuses on tight plays with low production costs and easy access to markets

- NGPL production in the AEO2020 Reference case increases during the next 10 years in the East (Marcellus and Utica plays) and Southwest (Permian plays) regions because the development of crude oil and natural gas resources is driven in part by the increased economic favorability of coproducing these products. By 2050, the Southwest and East regions account for nearly 60% of total U.S. NGPL production.
- NGPLs are used in many different ways in the United States. Ethane is used almost exclusively for petrochemicals. About 40% of propane is used for petrochemicals, and the remainder is used for heating, grain drying, and transportation. About 60% of butanes and natural gasoline is used for blending with motor gasoline and fuel ethanol, and the remainder is used for petrochemicals and solvents.
- The shares of NGPL components in the AEO2020 Reference case are relatively stable during the entire projection period. Ethane and propane contribute about 44% and 30%, respectively, to the total volume.



Biofuels as a percentage of gasoline, diesel, and jet fuel consumption increase in the AEO2020 Reference case projection—

AEO2020 projected biofuel percentage of gasoline, distillate, and jet fuel consumption



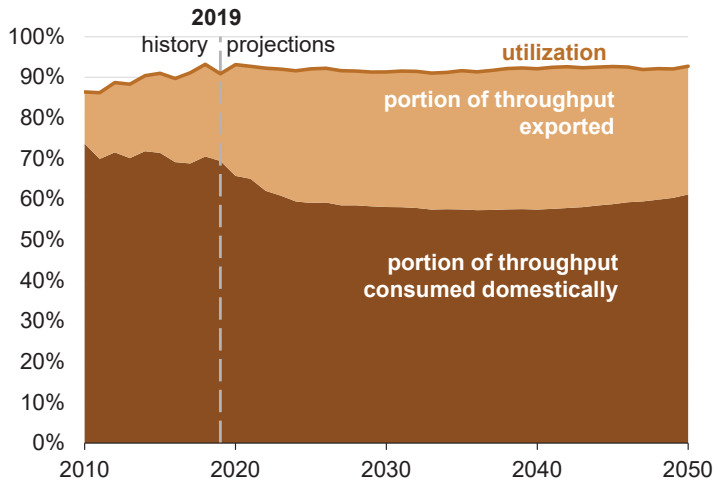
—and biofuels adoption accelerates in the AEO2020 High Oil Price case as biofuels become more competitive

- EIA projects that the percentage of biofuels (ethanol, biodiesel, renewable diesel, and biobutanol) blended into U.S. gasoline, diesel, and jet fuel in the AEO2020 Reference case will increase from 7.3% in 2019 to peak at 9.0% in 2040.
- The share of biofuels consumed in the United States rises more in the AEO2020 High Oil Price case as higher prices for gasoline, diesel, and jet fuel make biofuels more competitive. In that case, the biofuels share rises to 13.5% in 2050.
- In the AEO2020 Low Oil Price case, the share of biofuels consumed in the United States is relatively unchanged compared with the Reference Case because of federal and state regulations. Regulations such as the Renewable Fuel Standard and Low Carbon Fuel Standard support biofuels consumption when prices of petroleum-based product are low and biofuels are less competitive.

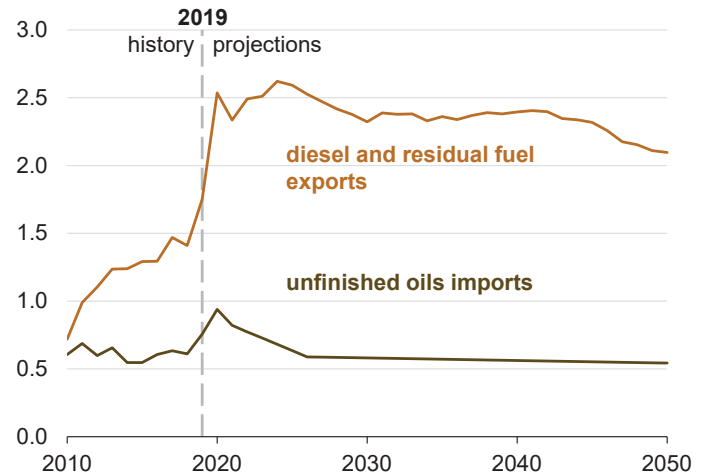


Utilization of U.S. refineries remains near recent levels throughout the projection period in the Reference case as U.S. refineries remain competitive in the global market—

U.S. refinery utilization (Reference case)
percent



U.S. diesel and residual fuel exports and unfinished oils imports (Reference case)
million barrels per day

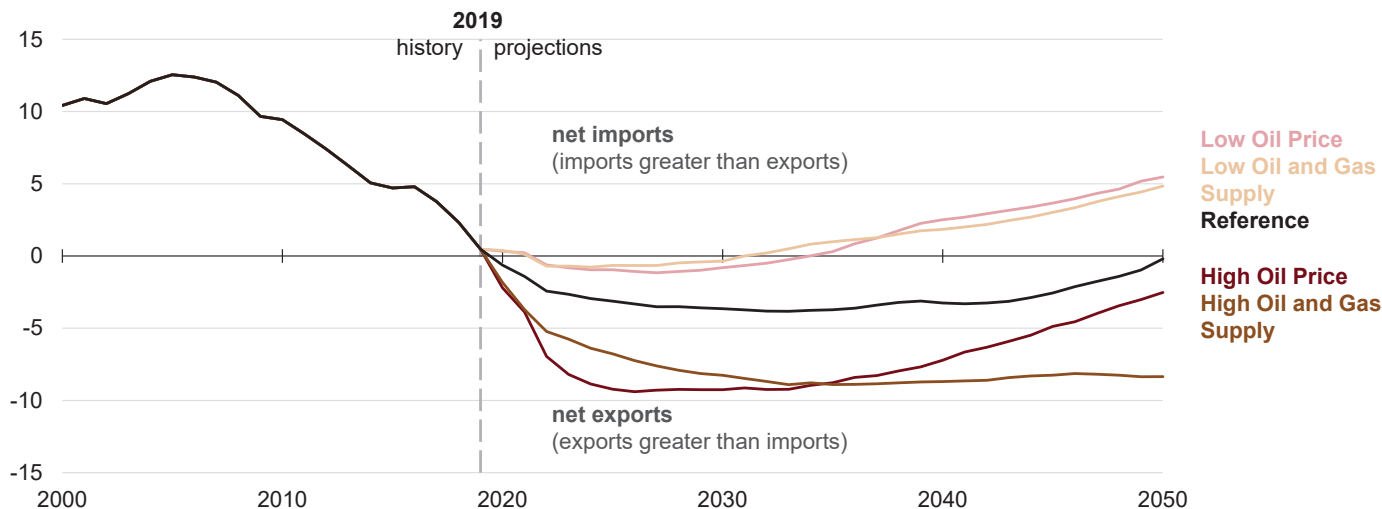


—and U.S. exports of low-sulfur diesel and residual fuel oil increase in 2020 as a result of international sulfur emissions regulations on the marine sector

- The share of U.S. refinery throughput that is exported increases in the AEO2020 Reference case as domestic consumption of refined products decreases, leaving more petroleum product available to export from 2020 to 2041. The trend reverses after 2041 when domestic consumption (especially of gasoline) gradually increases.
- The global competitiveness of the U.S. refining sector and the ability of the United States to increase exports as domestic consumption falls keep domestic refinery utilization near recent levels, between 90% and 93%, during the projection period in the Reference case.
- Imports of unfinished oils peak in 2020 as U.S. refineries take advantage of the increased discount of the heavy, high-sulfur residual fuel oil available on the global market. Exports of diesel and residual fuel (especially low-sulfur residual fuel) increase to 2.5 million barrels per day in 2020 because U.S. refineries are well-positioned to supply some of the increase in global demand for low-sulfur fuels as a result of the International Maritime Organization's new limits on sulfur content in marine fuels.

In the AEO2020 Reference case, the United States exports more petroleum on a volume basis than it imports from 2020 to 2050—

AEO2020 U.S. petroleum and other liquids trade
million barrels per day



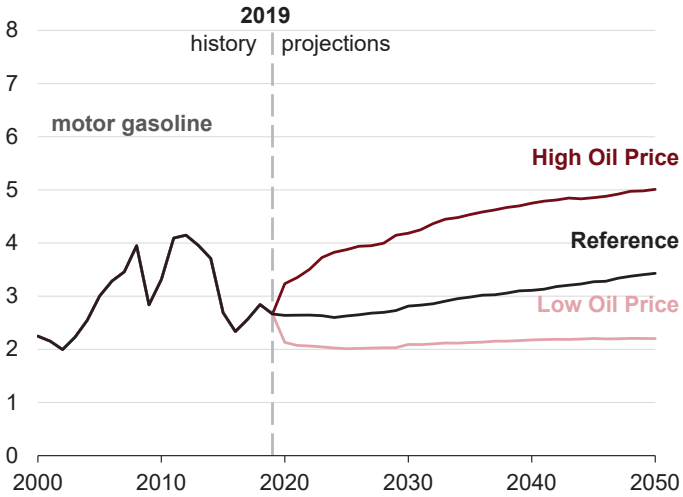
—but side case results vary significantly as shifts in U.S. domestic petroleum consumption and crude oil production drive changes to net imports

- In the AEO2020, strong production growth and decreasing domestic demand drive the United States to export higher volumes of crude oil and liquid fuels than it imports, resulting in growing levels of net exports from 2020 to 2033.
- In the AEO2020 Reference case, net exports of U.S. petroleum and other liquids peak at more than 3.8 million barrels per day (b/d) in the early 2030s before gradually declining as domestic consumption rises. The United States continues to export more petroleum and other liquids than it imports. Net exports of petroleum and other liquids reach 0.2 million b/d in 2050 as domestic consumption slowly increases but remains 1.2 million b/d below the peak levels recorded in 2004.
- Additional resources and higher levels of technological improvement in the AEO2020 High Oil and Gas Supply case result in more U.S. crude oil production and exports; net exports reach a high of 8.9 million b/d in the mid-2030s. Projected net exports reach a high of 9.6 million b/d in the mid-2020s in the High Oil Price case as a result of higher prices that support more domestic production.
- In the AEO2020 Low Oil Price case, by the mid-2020s, the United States exports 1.1 million b/d more than it imports before rising consumption leads the United States to become a net importer, importing 5.5 million b/d more than it exports in 2050.
- All AEO2020 cases except the Low Oil and Gas Supply and Low Oil Price cases project that the United States will export more petroleum and other liquids than it imports through 2050.



Prices for gasoline and diesel fuel rise throughout the Reference case projection period and primarily follow the price of crude oil in the High Oil Price and Low Oil Price cases

AEO2020 retail prices of motor gasoline
2019 dollars per gallon



AEO2020 retail prices of diesel
2019 dollars per gallon

