International Energy Module

The International Energy Module (IEM) of the National Energy Modeling System (NEMS) simulates the interaction between U.S. and global petroleum markets. The IEM uses assumptions of economic growth and expectations of future U.S. and world petroleum liquids production and consumption to estimate the effects of changes in the U.S. liquid fuels market on the international petroleum market. For each year of the projection period, the IEM computes the Brent crude oil price, provides a supply curve of world crude oil-like liquids, and provides supply curves for each foreign crude oil type considered. The IEM also provides, for each year of the projection period, endogenous assumptions for petroleum products for U.S. import and export.

The IEM computes changes in the Brent crude oil price in response to:

- The difference between projected U.S. total crude oil-like liquids production and the expected U.S. total crude oil-like liquids production at the current oil price (estimated using the current oil price and the exogenous U.S. total crude oil-like liquids supply curve for each year)

- The difference between projected U.S. total petroleum liquids consumption and the expected U.S. total petroleum liquids consumption at the current oil price (estimated using the current oil price and the exogenous U.S. total crude oil-like liquids demand curve)

Key Assumptions

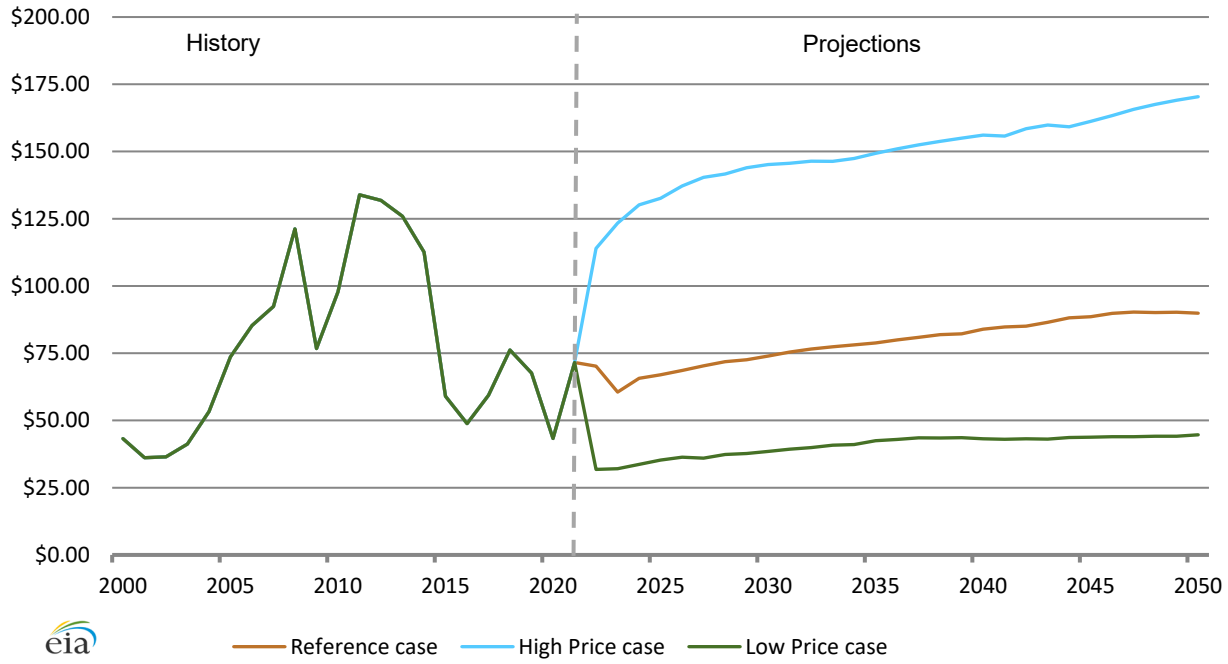
Annual Energy Outlook 2022 (AEO2022) considers a number of factors related to the uncertainty of future oil prices, including:

- Changes in worldwide demand for petroleum products
- OPEC investment and production decisions
- Non-OPEC petroleum liquid fuels supply
- Supplies of other liquid fuels
- The International Maritime Organization (IMO) convention that has limited the sulfur content of fuel oil to be used on ships since 2020

In the AEO2022 Reference case, oil prices drop from 2022 to 2023 in response to lower demand in 2022 from countries outside of the Organization for Economic Cooperation and Development (OECD). OECD oil demand rises to 2019 levels in 2023. Downward pressure from increased U.S. oil production keeps the Brent crude oil price lower than $72 per barrel (b) through 2028. Growth in demand from non-OECD countries, combined with a slow decrease in U.S. crude oil production, pushes the Brent crude oil price toward $90/b after 2045 (Figure 1). U.S. crude oil production increases until 2028 to 13.4 million barrels per day (b/d) and is 13.0 million b/d in 2050. U.S. net imports of crude oil increase to 4.5 million barrels (b/d) in 2023, followed by a decrease to 3.6 million barrels (b/d) in 2028 and end the projection period at 14.0 million barrels (b/d) in 2050.

Figure 1. Brent crude oil prices in three cases, 2000–2050

2021 dollars



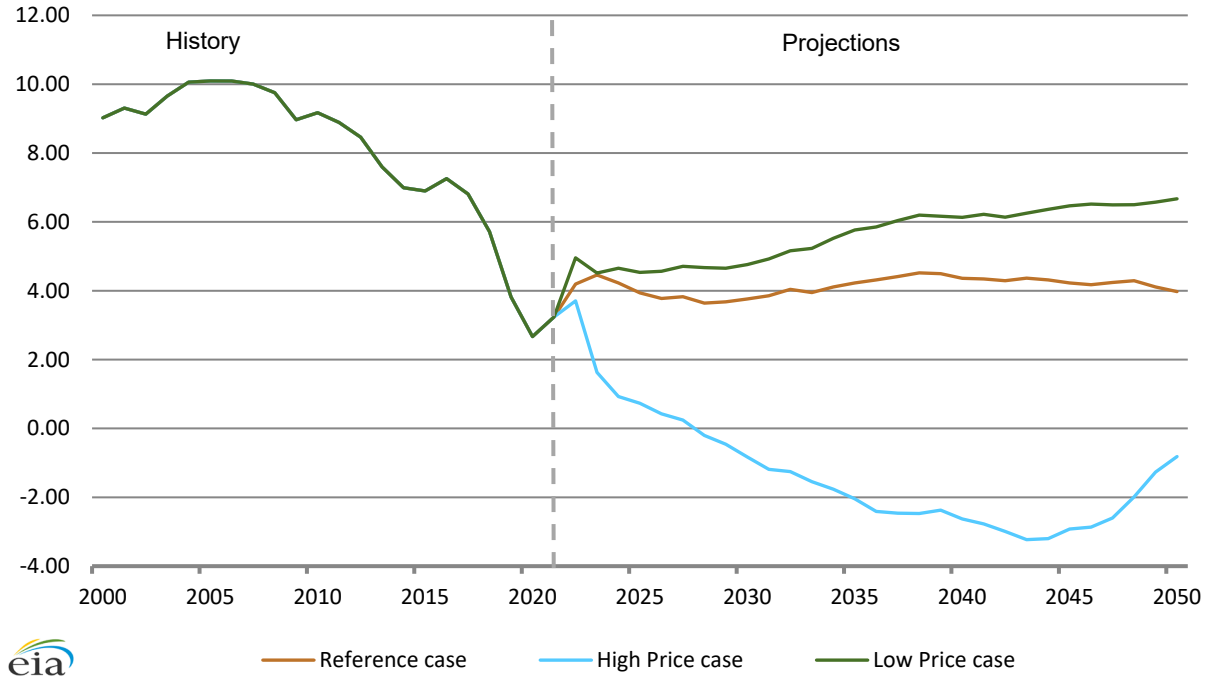
Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*, National Energy Modeling System, runs REF2022_rlx8.d121521b, HiGHPRICE.d122521a, LOWPRICE. d122421a

In the AEO2022 Low Oil Price case, the Brent crude oil price drops to $32/b in 2022, followed by a gradual increase to $45/b in 2050. This trend is the result of higher upstream investment by OPEC and lower global demand. U.S. production decreases in 2022, then increases to 11.4 million b/d in 2025, and then decreases to 8.9 million b/d in 2050. As a result, U.S. net imports of crude oil increase in 2022, then decrease to 4.5 million b/d in 2025, and then increase to 6.7 million b/d in 2050 (Figure 2).

In the AEO2022 High Oil Price case, the Brent crude oil price increases to $114/b in 2022 and $170/b in 2050. This trend is the result of significantly lower OPEC production, higher non-OECD demand for petroleum products, and more limited international supply of other liquid fuels than in the Reference case. As a result, U.S. production increases significantly through 2043, followed by a steady decrease through 2050. U.S. net imports of crude oil decline to the point that they become negative in 2028, indicating that gross exports exceed gross imports. Net imports continue to decline through 2043, continuing to fall below zero. This decline is followed by a steady increase to -0.8 million b/d in 2050 (Figure 2).

Figure 2. U.S. net crude oil imports in three cases, 2000–2050

million barrels per day



Source: U.S. Energy Information Administration, *Annual Energy Outlook 2022*, National Energy Modeling System, runs REF2022_rlx8.d121521b, HiGHPRICE.d122521a, LOWPRICE. d122421a