



International Energy Module Assumptions

March 2023

The U.S. Energy Information Administration (EIA), the statistical and analytical agency within the U.S. Department of Energy (DOE), prepared this report. By law, our data, analyses, and forecasts are independent of approval by any other officer or employee of the U.S. Government. The views in this report do not represent those of DOE or any other federal agencies.

Table of Contents

International Energy Module	1
Key Assumptions	1

Table of Figures

Figure 1. Brent crude oil prices in three cases, 2000–2050.....	2
Figure 2. U.S. net crude oil imports in three cases, 2000–2050	3

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)

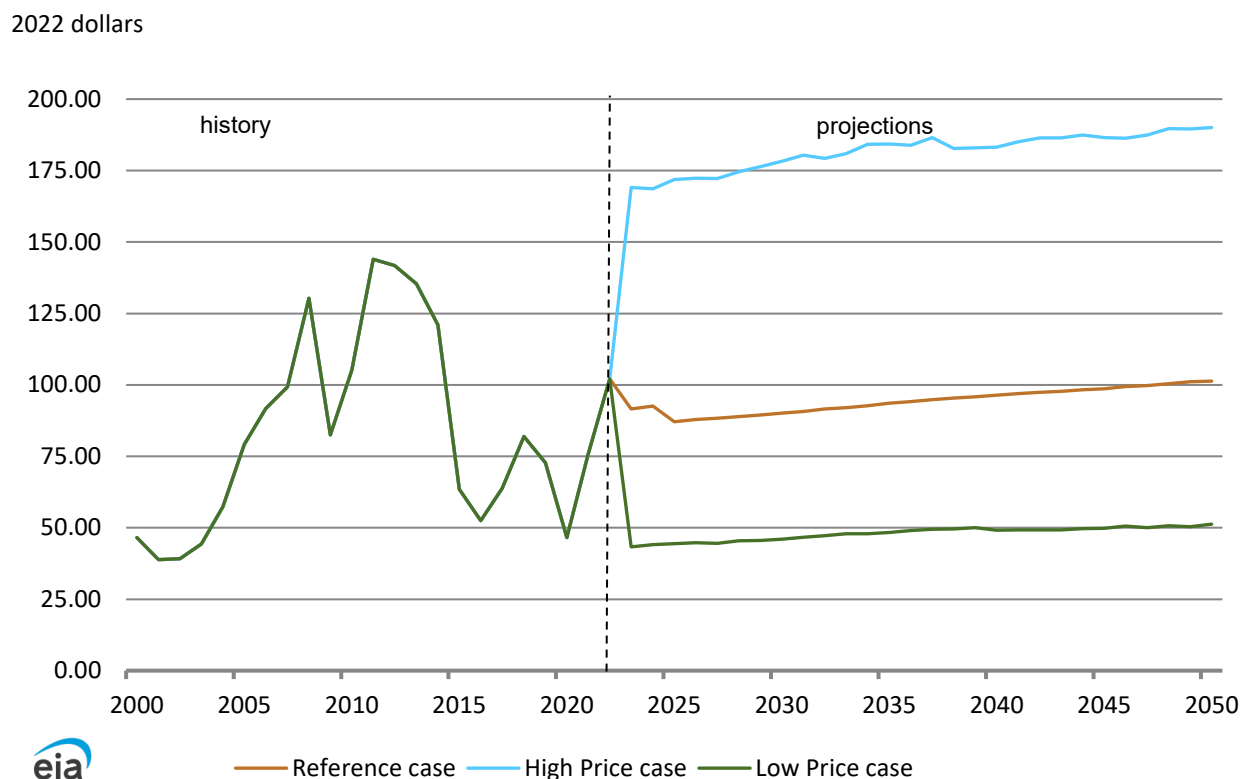
Key Assumptions

Annual Energy Outlook 2023 (AEO2023) 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 limits the sulfur content of fuel oil used on ships as of 2020

In the AEO2023 Reference case, oil prices drop from \$92 per barrel (b) in 2023 to \$87/b in 2025. Relatively constant U.S. crude oil production after 2028, combined with moderate growth in world crude oil demand, pushes the Brent crude oil price toward \$101/b by 2050 (Figure 1). U.S. crude oil production peaks in 2030 at 13.3 million barrels per day (b/d), dips slightly to 12.8 million b/d by 2041, and then increases slightly again to 13.2 million b/d by 2050. U.S. net imports of crude oil slowly increase to 4.2 million b/d in 2041, followed by a decrease to 3.7 million b/d by 2050 (Figure 2).

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

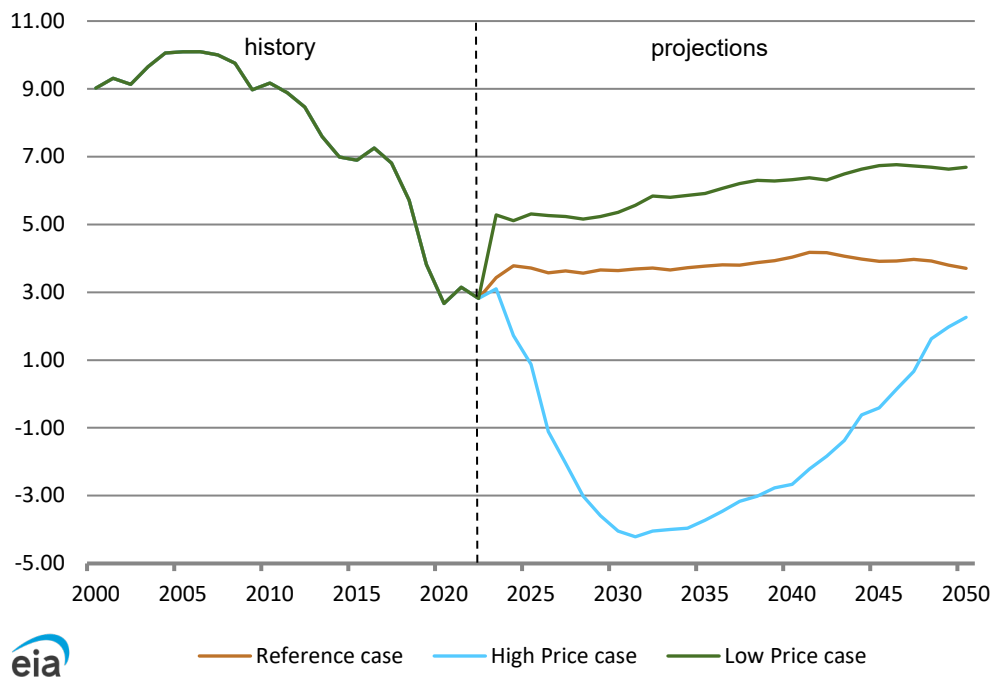


In the AEO2023 Low Oil Price case, the Brent crude oil price drops to \$43/b in 2023, followed by a gradual increase to \$51/b in 2050. This trend results from higher upstream investment by OPEC and lower global demand relative to the Reference case. U.S. production decreases to 10.4 million b/d in 2023, followed by a slower decrease to 7.9 million b/d by 2050. As a result, U.S. net imports of crude oil increase in 2023 to 5.3 million b/d, followed by a slower rate of increase to 6.7 million b/d by 2050 (Figure 2).

In the AEO2023 High Oil Price case, the Brent crude oil price increases to \$169/b in 2023 and \$190/b by 2050. This trend results from 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 2031 to 21.2 million b/d, followed by a steady decrease through 2050 to 14.6 million b/d. U.S. net imports of crude oil decline to a negative point in 2026, indicating that gross exports exceed gross imports. Net imports continue to decline through 2031. This decline is followed by a steady increase to 2.3 million b/d by 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 2023*, National Energy Modeling System runs REF2023.d020623a, HiHPRICE.d020623a, LOWPRICE. d020623a