



*Independent Statistics & Analysis*  
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# International Energy Outlook 2021: Case Descriptions

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## Overview

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Economic growth and oil prices are two key areas of uncertainty in our long-term international energy projections. To illustrate some of these uncertainties, we run side cases to show how the model responds to changes in key input variables compared with the Reference case. This document describes the five core cases in the *International Energy Outlook 2021* (IEO2021):

- Reference
- High Economic Growth
- Low Economic Growth
- High Oil Price
- Low Oil Price

Results for all IEO2021 cases are available on the [IEO table browser](#).

## Reference Case

The IEO2021 Reference case includes modeled projections under assumptions that reflect current energy trends and relationships, existing laws and regulations, and select incremental economic and technological changes over time.

With the release of our IEO2021—our first IEO Reference case since September 2019—we analyzed how COVID-19 response measures as of spring 2021 affected global energy markets as well as the projected impact through 2050.

The IEO2021 Reference case includes existing laws and regulations as of spring 2021 and it reflects legislated energy sector policies that can be reasonably quantified in the World Energy Projection System (WEPS). More information on how we model climate policies is available in our companion article, *Climate Considerations in the International Energy Outlook (IEO2021)*.<sup>1</sup>

U.S. projections in the IEO2021 reflect the published projections in the *Annual Energy Outlook 2021* (AEO2021),<sup>2</sup> which assumes U.S. laws and regulations, current as of September 2020, remain unchanged.

Additional assumptions in our IEO2021 Reference case are in Table 1.

**Table 1. Macroeconomic growth rate and input world oil price assumptions in the IEO2021 Reference case**

Assumption	Reference case
Average annual global GDP growth rate, 2020–2050 average per year	2.8%
2050 world oil price, per barrel (2020 dollars)	\$95

<sup>1</sup> <https://www.eia.gov/outlooks/ieo/climate.php>

<sup>2</sup> <https://www.eia.gov/outlooks/aeo/>

## Macroeconomic Growth Cases

The High Economic Growth and Low Economic Growth cases were developed to reflect the uncertainty in projections of global economic growth. These cases show the effects of alternative economic growth assumptions that are higher or lower than the Reference case projection for different regions. In the economic growth cases, GDP growth rates are altered for regions based on their Organization for Economic Cooperation and Development (OECD) designation. Countries in—or regions that include countries in—the OECD are altered less to reflect the relative stability of countries in this organization. Table 2 shows the average annual growth rate of GDP from 2020 to 2050 for the two groups in the Reference case and Low and High Economic Growth side cases.

**Table 2. Macroeconomic growth rates in the IEO2021 Low Economic Growth, Reference, and High Economic Growth cases**

Average annual growth rate, 2020–2050	Low Economic Growth case	Reference case	High Economic Growth case
OECD	1.2%	1.7%	2.2%
Non-OECD	2.6%	3.6%	4.6%

## Oil Price Cases

Different expectations about long-term future oil prices can significantly affect the energy system. The IEO considers three cases (Reference, Low Oil Price, and High Oil Price) to assess the impacts of alternative views on the future course of oil prices. The initial assumptions for the world crude oil price in the IEO is drawn from our AEO2021, which projects spot prices for North Sea Brent crude oil, an international standard for light, sweet crude oil prices.

The Brent spot price path in the Reference case is based on a projection that both global oil supply and demand will increase in the projection period and that crude oil prices will also rise steadily across the projection period. The Low Oil Price and High Oil Price cases represent the high and low boundaries of a wide range of potential price paths, illustrating potential variation in global demand for and supply of petroleum and other liquid fuels.

The Low Oil Price case assumes conditions under which demand for global liquid fuels is lower and the availability of crude oil supply is higher than in the Reference case. The High Oil Price case assumes the opposite. Note that U.S. consumption and production match the AEO2021, where U.S. liquid fuels production and consumption respond only to changes in prices.

In the Low Oil Price case, we assume less economic growth,<sup>3</sup> especially in non-OECD countries, which leads to reduced demand for petroleum products. The Low Oil Price case also assumes more availability of resources and lower costs of production for both crude oil and other liquid fuels production technologies when compared with the Reference case. With lower demand and higher availability of supply, prices remain lower in the Low Oil Price case than in the Reference case.

In the High Oil Price case, these assumptions are reversed. Liquid fuels demand is higher as a result of more economic growth,<sup>4</sup> particularly in non-OECD countries, than in the Reference case. Liquid fuels supply is less available than in the Reference case because we assume lower resource estimates and lower global investment in the oil sector. Higher prices stimulate increased production of more costly resources, and they also lead to significant increases in production of renewable liquid fuels, gas-to-liquids, and coal-to-liquids compared with the Reference case.

Input prices to WEPS are listed in Table 3, and the full input price paths are in the Chart Library.

**Table 3. IEO2021 Brent oil prices in selected years in both oil price cases and the Reference case (2020 dollars per barrel)**

Case	2020	2050
High Oil Price case	\$41	\$176
Reference case	\$41	\$95
Low Oil Price case	\$41	\$45

<sup>3</sup> The Low Oil Price case uses the same macroeconomic assumptions that we used in the Low Economic Growth case.

<sup>4</sup> The High Oil Price case uses the same macroeconomic assumptions that we used in the High Economic Growth case.