

## Macroeconomic Activity Module

The Macroeconomic Activity Module (MAM) represents interactions between the U.S. economy and energy markets. How fast the economy grows, as measured by growth in gross domestic product (GDP), is a key determinant of growth in energy demand. Associated economic factors, such as interest rates and disposable income, strongly influence various elements of the supply and demand for energy. At the same time, reactions to energy markets by the aggregate economy, such as a slowdown in economic growth resulting from increasing energy prices, are also reflected in this module. A detailed description of the MAM is provided in the EIA publication, *Model Documentation Report: Macroeconomic Activity Module (MAM) of the National Energy Modeling System* (Washington, DC, May 2016).

### Key assumptions

The U.S. economy, measured by GDP, is expected to increase by 1.9% per year from 2018–50 in the Reference case. The growth rate of nonfarm employment and the rate of productivity change associated with employment determine the rate of GDP growth. As Table 1 shows, in the Reference case, real GDP grows by 2.5% per year from 2018–20, 1.8% from 2021–30, 1.9% from 2031–40 and 1.8% from 2041–50. The High Economic Growth case grows 0.5 percentage points faster compared with the Reference case from 2018–50; the Low Economic Growth case grows 0.5 percentage points slower. Nonfarm employment shows higher growth from 2018–20 in the Reference case and then returns to its long-run trend growth of 0.6% from 2018–50. Both the High and Low Economic Growth cases differ by 0.2 percentage points compared with the Reference case from 2018–50, reaching 0.8% and 0.4% in the High Economic Growth and Low Economic Growth cases, respectively. In the Reference case, productivity (measured as output per hour in nonfarm business) grows by 1.5% from 2018–50, compared with the 1.8% growth experienced from 1980–2018. Nominal business fixed investment as a share of nominal GDP is expected to grow during the projection period. The resulting growth in the capital stock and the technology base of that capital stock helps sustain productivity growth of 1.5% from 2018–50.

**Table 1. Economic growth in gross domestic product, nonfarm employment, and productivity**

Assumptions	2018–2020	2021–2030	2031–2040	2041–2050	2018–2050
Real GDP (Billion Chain-weighted \$2009)					
High Economic Growth	3.3%	2.2%	2.4%	2.4%	2.4%
Reference	2.5%	1.8%	1.9%	1.8%	1.9%
Low Economic Growth	1.8%	1.3%	1.5%	1.4%	1.4%
Nonfarm Employment					
High Economic Growth	1.6%	0.6%	0.8%	0.8%	0.8%
Reference	1.0%	0.5%	0.6%	0.6%	0.6%
Low Economic Growth	0.5%	0.2%	0.6%	0.5%	0.4%
Productivity					
High Economic Growth	1.9%	2.0%	1.9%	1.8%	1.9%
Reference	1.4%	1.7%	1.4%	1.4%	1.5%
Low Economic Growth	1.0%	1.2%	1.0%	1.0%	1.1%

Source: U.S. Energy Information Administration, AEO2019 National Energy Modeling System runs: ref2019.d111618a, lowmacro.d111618a, and highmacro.d111618a.

The U.S. Census Bureau's middle series population projection is the basis for population growth in AEO2019. Total U.S. population is expected to grow by 0.5% per year from 2018–50, and the share of population over age 65 is expected to increase over time. The share of the labor force in the population over 65 is also projected to increase in the projection period.

To achieve the Reference case's long-run 1.9% GDP growth, steady growth in labor productivity is anticipated. The improvement in labor productivity reflects the positive effects of a growing capital stock as well as technological change over time. Nonfarm labor productivity annual growth is expected to remain between 1.3% and 1.7% throughout the projection period of 2018–50.

To reflect uncertainty in the projection of U.S. economic growth, AEO2019 uses High and Low Economic Growth cases to project the possible impacts of alternative economic growth assumptions on energy markets. The High Economic Growth case incorporates higher population, labor force, and productivity growth rates than the Reference case. Because of the higher productivity gains, inflation and interest rates are lower than in the Reference case. Investment, disposable income, and industrial production are greater. Economic output in the High Economic Growth case is projected to increase by 2.4% per year from 2018–50. The Low Economic Growth case assumes lower population, labor force, and productivity gains, with resulting higher prices and interest rates and lower industrial output growth. In the Low Economic Growth case, economic output is expected to increase by 1.4% per year during the projection period.