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## Chapter 2. Macroeconomic Activity Module

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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 the demand for energy. 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 publications, [Model Documentation Report: Macroeconomic Activity Module \(MAM\) of the National Energy Modeling System](#) (Washington, DC, May 2016).

### Key assumptions

The output of the U.S. economy, measured by GDP, is expected to increase by 2.1% per year between 2016 and 2050 in the Reference case. Two key factors help explain the growth in GDP: the growth rate of nonfarm employment and the rate of productivity change associated with employment. As Table 2.1 indicates, in the Reference case, real GDP grows by 2.3% per year from 2016-20, 2.1% from 2021-30, 2.1% from 2031 to 2040 and 1.9% from 2041-50. Both the High and Low Economic Growth cases differ by 0.5 percentage points compared with the Reference case from 2016 to 2050. Nonfarm employment shows higher growth from 2016-20 in the Reference case and then returns to its long-run trend growth of 0.7% from 2016-50. Both the High and Low Economic Growth cases differ by 0.2 percentage points compared with the Reference case from 2016 to 2050, reaching 0.9% and 0.5% 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 1.7% from 2016 to 2050, showing slower growth as compared to the 1.9% growth experienced from 1980 to 2016. Nominal business fixed investment as a share of nominal GDP is expected to grow over the projection. The resulting growth in the capital stock and the technology base of that capital stock helps sustain productivity growth of 1.7% from 2016 to 2050.

The U.S. Census Bureau's middle series population projection is used as a basis for population growth in AEO2017. Total population is expected to grow by 0.6% per year between 2016 and 2050, and the share of population over 65 is expected to increase over time. However, 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 2.1% GDP growth, there is an anticipated steady growth in labor productivity. The improvement in labor productivity reflects the positive effects of a growing capital stock as well as technological change over time. Nonfarm labor productivity growth is expected to remain between 1.2 and 1.9% throughout the projection period of 2016 to 2050.

**Table 2.1. Economic growth in gross domestic product, nonfarm employment and productivity**

<b>Assumptions</b>	<b>2016-2020</b>	<b>2021-2030</b>	<b>2031-2040</b>	<b>2041-2050</b>	<b>2016-2050</b>
<b>Real GDP (Billion Chain-weighted \$2009)</b>					
High Economic Growth	2.8%	2.5%	2.7%	2.4%	2.6%
Reference	2.3%	2.1%	2.1%	1.9%	2.1%
Low Economic Growth	1.5%	1.6%	1.7%	1.4%	1.6%
<b>Nonfarm Employment</b>					
High Economic Growth	1.4%	0.8%	0.9%	0.6%	0.9%
Reference	0.9%	0.8%	0.7%	0.4%	0.7%
Low Economic Growth	0.5%	0.6%	0.6%	0.3%	0.5%
<b>Productivity</b>					
High Economic Growth	2.0%	2.0%	2.1%	2.1%	2.0%
Reference	1.6%	1.6%	1.7%	1.7%	1.7%
Low Economic Growth	1.1%	1.2%	1.3%	1.3%	1.3%

Source: U.S. Energy Information Administration, AEO2017 National Energy Modeling system runs: AEO2017.d120816A, LM2017.d120816A, and HM2017.d120816A.

To reflect uncertainty in the projection of U.S. economic growth, the AEO2017 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. Due to the higher productivity gains, inflation and interest rates are lower than the Reference case. Investment, disposable income and industrial production are greater. Economic output is projected to increase by 2.6% per year between 2016 and 2050. 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 1.6% per year over the projection period.