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 real GDP, is a key factor in how energy demand grows. Associated economic factors, such as interest rates and disposable income, strongly influence various elements of supply and demand for energy. At the same time, this module also reflects reactions to energy markets by the aggregate economy, such as a slowdown in economic growth resulting from increasing energy prices. Our publication, *Model Documentation Report: Macroeconomic Activity Module (MAM) of the National Energy Modeling System*, describes the module.

Key assumptions

We expect the U.S. economy, measured by GDP, to increase by 2.2% per year from 2021 to 2050 in the Reference case. The growth rate of nonfarm employment and the rate of productivity change associated with employment help determine the rate of GDP growth. In the Reference case, real GDP grows by:

- 2.6% from 2021 to 2030
- 2.1% from 2031 to 2040
- 2.0% from 2041 to 2050

The High Economic Growth case grows 0.5% faster than the Reference case from 2021 to 2050; the Low Economic Growth case grows 0.4% slower. Nonfarm employment shows higher growth from 2021 to 2030 in the Reference case and then returns to its long-term growth trend of 0.4% from 2031 to 2050. Growth in nonfarm employment in the High Economic Growth case is more than in the Reference case by 0.2% from 2021 to 2050, reaching 0.8%. In the Low Economic Growth case, nonfarm employment is less than in the Reference case by 0.1% from 2021 to 2050, reaching 0.5%. In the Reference case, productivity (measured as output per hour in nonfarm business) grows by 1.9% from 2021 to 2050, compared with the 2.0% growth from 1989 to 2020. We expect nominal business-fixed investment as a share of nominal GDP to grow in the very near term but then decline from 2026 to 2050. Additions to the capital stock and the technology base of that capital stock help sustain productivity growth of 1.9% from 2021 to 2050 in the Reference case.

Table 1. Economic growth in GDP, nonfarm employment, and productivity

Assumptions	2021–2030	2031–2040	2041–2050	2021–2050
Real GDP (billion chain-weighted 2012$)				
High Economic Growth	3.3%	2.5%	2.4%	2.7%
Reference	2.6%	2.1%	2.0%	2.2%
Low Economic Growth	2.1%	1.7%	1.7%	1.8%
Nonfarm employment				
High Economic Growth	1.6%	0.5%	0.5%	0.8%
Reference	1.0%	0.4%	0.4%	0.6%
Low Economic Growth	0.6%	0.5%	0.5%	0.5%
Productivity				
High Economic Growth	2.4%	2.5%	2.3%	2.4%
Reference	2.0%	2.0%	1.8%	1.9%

Assumptions	2021–2030	2031–2040	2041–2050	2021–2050
Low Economic Growth	1.5%	1.4%	1.4%	1.4%

Source: U.S. Energy Information Administration, AEO2022 National Energy Modeling System, runs: ref2022.d011222a, lowmacro.d011222a, and highmacro.d011622a

Note: Minor discrepancies with published data are a result of independent rounding.

The U.S. Census Bureau's middle series population projection is the basis for population growth in AEO2022. The series projects the total U.S. population will grow by 0.4% per year from 2021 to 2050 in the Reference case. It also projects that the share of the population older than age 65 will increase over time and that this group's share of the labor force will also increase in the projection period.

We anticipate steady growth in labor productivity leads to the Reference case's long-term 2.2% GDP growth. The improvement in labor productivity reflects the positive effects of a growing capital stock as well as technological change over time. We expect annual growth for nonfarm labor productivity to remain between 1.1% and 2.0% throughout the projection period.

To reflect uncertainty in the Reference case projection of U.S. economic growth, AEO2022 uses the 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, investment, capital stock, and productivity growth rates than the Reference case. Higher productivity helps reduce the cost of production, which is passed on to consumers as lower prices. Lower prices, in turn, promote higher demand, greater output, and more employment. We project economic output in the High Economic Growth case to increase by 2.7% per year from 2021 to 2050. The Low Economic Growth case assumes lower population, labor force, investment, capital stock, and productivity gains that result in higher production costs and consumer prices and lower output and employment. In the Low Economic Growth case, we expect economic output to increase by 1.8% per year during the projection period.