

International Energy Module

The NEMS International Energy Module (IEM) simulates the interaction between U.S. and global petroleum markets. It uses assumptions of economic growth and expectations of future U.S. and world crude-like liquids production and consumption, to estimate the effects of changes in U.S. liquid fuels markets on the international petroleum markets. For each year of the forecast, the NEMS IEM computes world oil prices, provides a supply curve of world crude-like liquids, generates a worldwide oil supply/demand balance with regional detail, and computes quantities of crude oil and light and heavy petroleum products imported into the United States by export region.

Changes in the world oil price (WOP), which is defined as the price of light, low sulfur crude oil delivered to Cushing, Oklahoma (Petroleum Allocation Defense District 2) are computed in response to:

1. The difference between projected U.S. total crude-like liquids production and the expected U.S. total crude-like liquids production at the current WOP (estimated using the current WOP and the exogenous U.S. total crude-like liquids supply curve for each year).

and

2. The difference between projected U.S. total crude-like liquids consumption and the expected U.S. total crude-like liquids consumption at the current WOP (estimated using the current WOP and the exogenous U.S. total crude-like liquids demand curve).

Key Assumptions

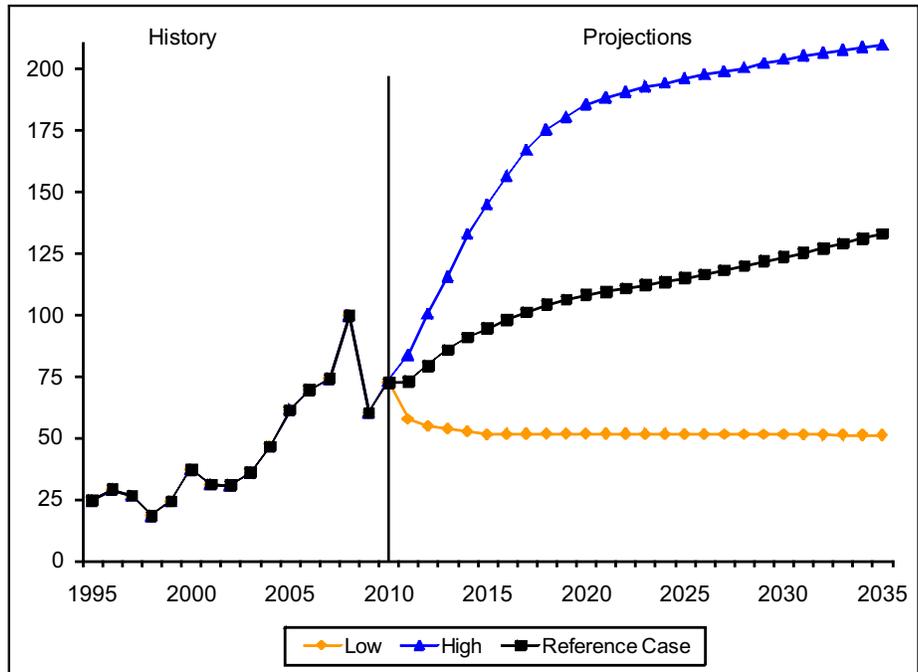
The level of oil production by countries in the Organization of Petroleum Exporting Countries (OPEC) is a key factor influencing the world oil price projections incorporated into AEO2010. Non-OPEC production, worldwide regional economic growth rates and the associated regional demand for oil are additional factors affecting the world oil price.

The world oil price is defined as the annual average price of low-sulfur, light crude oil delivered in PADD2. For the low, reference, and high oil price cases, the world oil price reaches \$51, \$133 and \$210 per barrel in 2035, respectively, in 2008 dollars. The reference case assumes that OPEC producers will continue to demonstrate a disciplined production approach. The low oil price case reflects a market where all oil production becomes more competitive and plentiful. The high oil price case could result from a more cohesive and market-assertive OPEC that reduces overall production volumes while resource rich non-OPEC producers restrict economic access to their oil reserves. The three price scenarios are shown in Figure 2.

OPEC oil production in the reference case is assumed to increase throughout the projection (Figure 3), at a rate that enables the organization to maintain an approximately constant market share over the projection period. OPEC is assumed to be an important source of additional production because its member nations hold a major portion of the world's total reserves—exceeding 940 billion barrels, about 70 percent of the world's estimated total, at the beginning of 2009.[1] Despite investment from foreign sources, Iraq's oil production is not assumed to maintain steady growth until after 2015 as infrastructure limitations as well as security and legislative issues are assumed to slow development for the next five years.

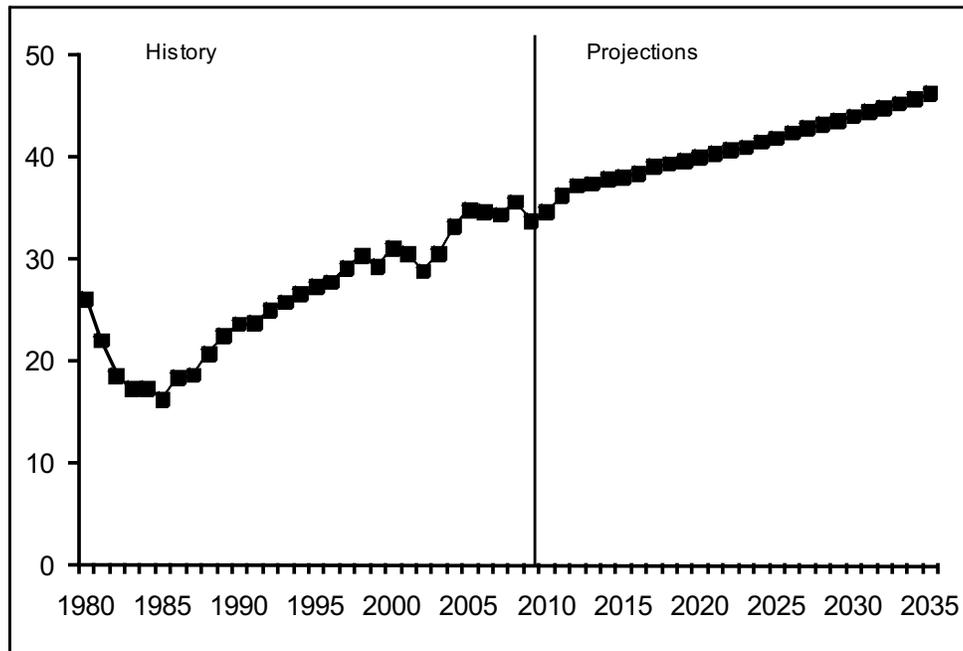
Non-U.S., non-OPEC oil production projections in the AEO2010 are developed in two-stages. Projections of liquids production before 2015 are based largely on a project-by-project assessment of major fields including volumes and expected schedules, with consideration given to the decline rates of active projects, planned exploration and development activity, and country-specific geopolitical situations and fiscal regimes. Incremental production estimates from existing and new fields after 2015 are estimated based on country specific consideration of economics and ultimate technical recoverable resource estimates. The non-OPEC production path for the reference case is shown in Figure 4.

Figure 2. World Oil Prices in Three Cases, 1995-2035
2008 Dollars per Barrel



Source: AEO2010 National Energy Modeling System runs AEO2010R.D111809A, LP2010.D011910A, and HP2010.D011910A.

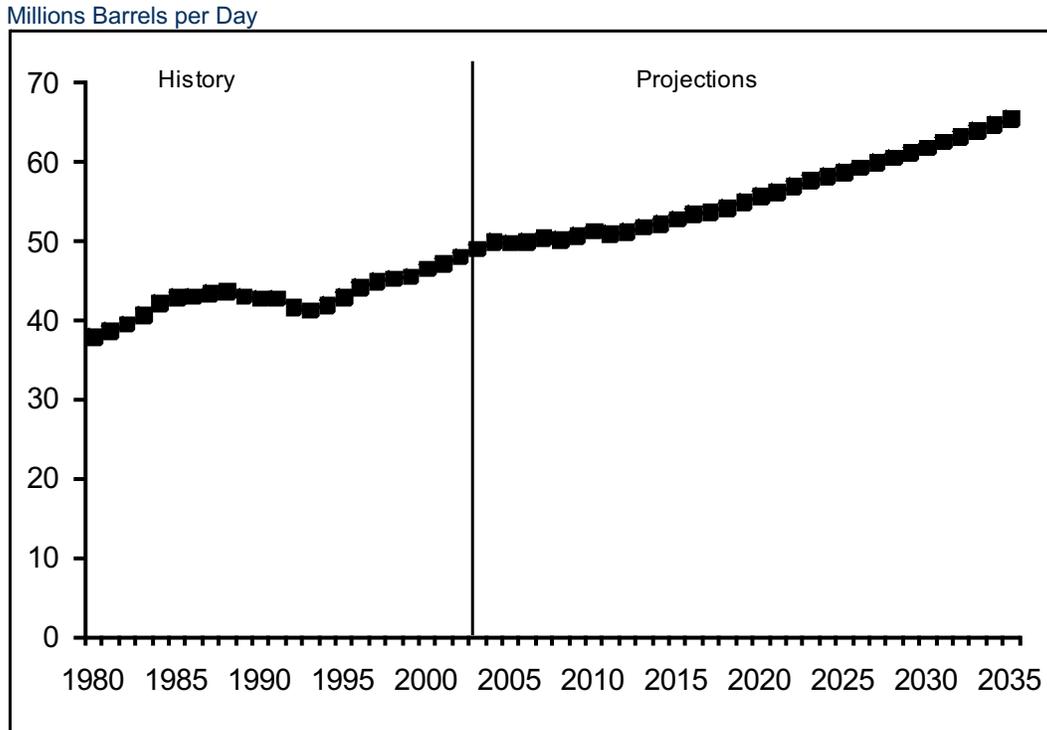
Figure 3. OPEC Total Liquids Production in the Reference Case, 1995-2035
Millions Barrels per Day



OPEC = Organization of Petroleum Exporting Countries.

Source: Energy Information Administration. AEO2010 National Energy Modeling System run AEO2010R.D111809A.

Figure 4. Non-OPEC Total Liquids Production in the Reference Case, 1995-2030



OPEC = Organization of Petroleum Exporting Countries.

Source: Energy Information Administration. AEO2010 National Energy Modeling System run AEO2010R.D111809A.

The non-U.S. oil production projections in the AEO2010 are limited by country-level assumptions regarding technical recoverable oil resources. Inputs to these resource estimates include the USGS World Petroleum Assessment of 2000 and oil reserves published in the Oil and Gas Journal by PennWell Publishing Company, a summary of which is shown in Table 3.1.

The reference case growth rates for GDP for various regions in the world are shown in Table 3.2. Except for the United States, the GDP growth rate assumptions for non U.S. country/regions are taken from HIS Global Insight, Inc., Global detailed forecast (November 23, 2009).

The values for growth in total liquids demand in the International Energy Module, which depend upon the oil price levels as well as GDP growth rates, are shown in Table 3.3 for the reference case by regions.

Table 3.1. Worldwide Oil Reserves as of January 1, 2009
(Billion Barrels)

Region	Proved Oil Reserves
Western Hemisphere	332.6
Western Europe	12.7
Asia-Pacific	34.0
Eastern Europe and F.S.U.	99.9
Middle East	746.0
Africa	117.1
Total World	1342.2
Total OPEC	940.0

Source: PennWell Corporation, Oil and Gas Journal, Vol 106. 48 (Dec 22, 2008).

Table 3.2. Average Annual Real Gross Domestic Product Rates, 2007-2035 (2005 Purchasing Power Parity Weights and Prices)

Region	Average Annual Percentage Change
OECD	2.0
OECD North America	2.4
OECD Europe	1.7
OECD Asia	1.3
Non-OECD	4.4
Non-OECD Europe and Eurasia	2.5
Non-OECD Asia	5.1
Middle East	4.0
Africa	3.9
Central and South America	3.4
Total World	3.2

Source: For the U.S., Energy Information Administration, National Energy Modeling System run AEO2010r.D111809A; for other countries, Global Insight, Inc., Global Detailed forecast (November 23 2009)

Table 3.3. Average Annual Growth Rates for Total Liquids Demand in the Reference Case, 2007-2035
(Percent per Year)

Region	Oil Demand Growth
OECD	0.09%
OECD North America	0.31%
OECD Europe	-0.17%
OECD Asia	-0.11%
Non-OECD	1.84%
Non-OECD Europe and Eurasia	0.16%
Non-OECD Asia	2.47%
Middle East	2.08%
Africa	0.83%
Central and South America	1.15%
Total World	0.94%

Source: Energy Information Administration, AEO2010 National Energy Modeling System run: AEO2010r.D111809A; and IEO2010 World Energy Projection System Plus (2010).

Notes and Sources

[1] PennWell Corporation, Oil and Gas Journal, Vol. 106.48 (December 22, 2008).

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