

# Preface

*This report presents international energy projections through 2025, prepared by the Energy Information Administration, including outlooks for major energy fuels and associated carbon dioxide emissions.*

The *International Energy Outlook 2005 (IEO2005)* presents an assessment by the Energy Information Administration (EIA) of the outlook for international energy markets through 2025. U.S. projections appearing in *IEO2005* are consistent with those published in EIA's *Annual Energy Outlook 2005 (AEO2005)*, which was prepared using the National Energy Modeling System (NEMS). Although the *IEO* typically uses the same reference case as the *AEO*, *IEO2005* has adopted the October futures case from *AEO2005* as its reference case for the United States. The October futures case, which has an assumption of higher world oil prices than the *AEO2005* reference case, now appears to be a more likely projection. The reference case prices will be reconsidered for the next *AEO*. Based on information available as of July 2005, the *AEO2006* reference case will likely reflect world oil prices higher than those in the *IEO2005* reference case.

*IEO2005* is provided as a service to energy managers and analysts, both in government and in the private sector. The projections are used by international agencies, Federal and State governments, trade associations, and other planners and decisionmakers. They are published pursuant to the Department of Energy Organization Act of 1977 (Public Law 95-91), Section 205(c).

The *IEO2005* projections are based on U.S. and foreign government laws in effect on March 1, 2005. The potential impacts of pending or proposed legislation, regulations, and standards are not reflected in the projections, nor are the impacts of legislation where the mechanisms for implementing the legislation have not yet been announced. For example, the *IEO2005* reference case forecast does not include the potential impacts of the Kyoto Protocol (which entered into force on February 16, 2005), because the treaty does not indicate the methods by which signatories will implement the Protocol. The Kyoto Protocol also does not address signatory obligations beyond the 2012 time frame, making it impossible in the context of a reference case projection for EIA to assess the impacts of the Protocol through 2025, the end of the *IEO2005* forecast horizon.

Projections in *IEO2005* are displayed according to three basic country groupings (see Appendix J for complete regional definitions). The mature market economies include projections for North America (United States,

Canada, and Mexico); Western Europe; and mature market Asia (Japan and Australia/New Zealand). The emerging economies are represented by four separate regional subgroups: emerging Asia, Africa, Middle East, and Central and South America. China, India, and South Korea are represented in emerging Asia, and Brazil is represented in Central and South America. The transitional economies include projections for Eastern Europe and the former Soviet Union (EE/FSU). Russia is represented in the FSU.

The report begins with a review of world trends in energy demand and the major macroeconomic assumptions used in deriving the *IEO2005* projections. The time frame for historical data begins with 1970 and extends to 2002, providing a 32-year historical view of energy demand, and the projections extend to 2025, providing a 23-year forecast period. High economic growth and low economic growth cases were developed to depict a set of alternative growth paths for the energy forecast. The two cases consider higher and lower growth paths for regional gross domestic product (GDP) than assumed in the reference case. The resulting projections—and the uncertainty associated with international energy projections in general—are discussed in Chapter 1, “World Energy and Economic Outlook.”

New to this report are regional projections of end-use energy consumption in the residential, commercial, industrial, and transportation sectors. Chapter 2 reviews worldwide forecasts for end-use sector energy consumption. Regional projections for energy consumption by fuel—petroleum, natural gas, and coal—are presented in Chapters 3, 4, and 5, along with reviews of the current status of each fuel on a worldwide basis. Chapter 6 discusses the projections for world electricity markets—including nuclear power, hydropower, and other commercial renewable energy resources—and presents forecasts of world installed generating capacity, which are new to this year's report. Finally, Chapter 7 discusses the outlook for global carbon dioxide emissions. With the entry into force of the Kyoto Protocol on February 16, 2005, this year's outlook includes a Kyoto Protocol scenario, which is also presented in Chapter 7.

Appendix A contains summary tables of the *IEO2005* reference case projections for world energy consumption, GDP, energy consumption by fuel, carbon dioxide

emissions, and regional population growth. The reference case projections of total foreign energy consumption and consumption of oil, natural gas, coal, and renewable energy were prepared using EIA's System for the Analysis of Global Energy Markets (SAGE), as were projections of net electricity consumption, energy consumed by fuel and region by end-use sector, and carbon dioxide emissions. In addition, the NEMS Coal Export Submodule was used to derive flows in international coal trade, presented in Chapter 5.

Summary tables of projections for the high and low economic growth cases are provided in Appendixes B and C, respectively, and reference projections of delivered energy consumption by end-use sector and region are presented in Appendix D. Appendix E contains

summary tables of projections for world oil production capacity and oil production in the reference case and in two alternative cases, the high and low world oil price cases. The projections in Appendix E were derived from the International Energy Module of NEMS. Appendix F contains summary tables of projections for nuclear capacity in four nuclear growth cases. Appendix G provides a summary of assumptions underlying the *IEO2005* Kyoto Protocol case. Appendix H includes a set of comparisons of alternative forecasts with the *IEO2005* projections, as well as comparisons of historical *IEO* forecasts with actual historical data. Comparisons of the *IEO2005* and *IEO2004* forecasts are also presented in Appendix H. Appendix I describes the SAGE model, and Appendix J defines the regional designations included in the report.

### Objectives of the *IEO2005* Projections

The projections in *IEO2005* are not statements of what will happen, but what might happen given the specific assumptions and methodologies used. These projections provide an objective, policy-neutral reference case that can be used to analyze international energy markets. As a policy-neutral data and analysis organization, EIA does not propose, advocate, or speculate on future legislative and regulatory changes. The projections are based on U.S. and foreign government laws effective as of March 1, 2005. Assuming fixed laws, even knowing that changes will occur, will naturally result in projections that differ from the final data.

Models are abstractions of energy production and consumption activities, regulatory activities, and producer and consumer behavior. The forecasts are highly dependent on the data, analytical methodologies, model structures, and specific assumptions used in their development. Trends depicted in the analysis are indicative of tendencies in the real world rather than representations of specific real-world outcomes. Even where trends are stable and well understood, the projections are subject to uncertainty. Many events that shape energy markets are random and cannot be anticipated, and assumptions concerning future technology characteristics, demographics, and resource availability cannot be known with certainty.