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Preface from International Energy Outlook 2010

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This report presents international energy projections through 2035, prepared by the U.S. Energy Information Administration, including outlooks for major energy fuels and associated carbon dioxide emissions.

The *International Energy Outlook 2010 (IEO2010)* presents an assessment by the U.S. Energy Information Administration (EIA) of the outlook for international energy markets through 2035. U.S. projections appearing in *IEO2010* are consistent with those published in EIA's *Annual Energy Outlook 2010 (AEO2010)* in April 2010.

The *IEO2010* projections are based to the extent possible on U.S. and foreign laws, regulations, and standards in effect at the start of 2010. The potential impacts of pending or proposed legislation, regulations, and standards are not reflected in the projections, nor are the impacts of legislation for which the implementing mechanisms have not yet been announced. In addition, mechanisms whose implementation cannot be modeled given current capabilities or whose impacts on the energy sector are unclear are not included in *IEO2010*. For example, the European Union's Emissions Trading System, which includes non-carbon dioxide emissions and non-energy-related emissions, are not included in this analysis.

IEO2010 focuses exclusively on marketed energy. Non-marketed energy sources, which continue to play an important role in some developing countries, are not included in the estimates.

The *IEO2010* consumption projections are grouped according to Organization for Economic Cooperation and Development membership. (OECD includes all members of the organization as of March 1, 2010, throughout all time series included in this report. Chile became a member on May 7, 2010, but its membership is not reflected in *IEO2010*.) There are three basic groupings of OECD countries: North America (United States, Canada, and Mexico); OECD Europe; and OECD Asia (Japan, South Korea, and Australia/New Zealand). Non-OECD is divided into five separate regional subgroups: non-OECD Europe and Eurasia, non-OECD Asia, Africa, Middle East, and Central and South America. Russia is represented in non-OECD Europe and Eurasia; China and India are represented in non-OECD Asia; and Brazil is represented in Central and South America. In some instances, the *IEO2010* production models have different regional aggregations to reflect the important producer regions (for example, Middle East OPEC is a key region in the projections of liquid supplies). The complete regional definitions are listed in Appendix M.

The report begins with a review of world trends in energy demand and the major macroeconomic assumptions used in deriving the *IEO2010* projections, which—

Objectives of the *IEO2010* Projections

The projections in *IEO2010* are not statements of what will happen, but what might happen given the specific assumptions and methodologies used for any particular scenario. The Reference case projection is a business-as-usual trend estimate, given known technology and technological and demographic trends. EIA explores the impacts of alternative assumptions in other scenarios with different macroeconomic growth rates and world oil prices. The *IEO2010* cases generally assume that current laws and regulations are maintained throughout the projections. Thus, the projections provide policy-neutral baselines that can be used to analyze international energy markets.

While energy markets are complex, energy models are simplified representations of energy production and consumption, regulations, and producer and consumer behavior. Projections are highly dependent on the data, methodologies, model structures, and assumptions used in their development. Behavioral characteristics are indicative of real-world tendencies, rather than representations of specific outcomes.

Energy market projections are subject to much uncertainty. Many of the events that shape energy markets cannot be fully anticipated. In addition, future developments in technologies, demographics, and resources cannot be foreseen with certainty. Key uncertainties in the *IEO2010* projections for economic growth and oil prices are addressed through alternative cases.

EIA has endeavored to make these projections as impartial, reliable, and relevant as possible. They should, however, serve as an adjunct to, not a substitute for, a complete and focused analysis of public policy initiatives.

for the first time—extend to 2035. In addition to Reference case projections, High Economic Growth and Low Economic Growth cases were developed to consider the effects of higher and lower growth paths for economic activity than are assumed in the Reference case. *IEO2010* also includes a High Oil Price case and, alternatively, a Low Oil Price case. The resulting projections—and the uncertainty associated with international energy projections in general—are discussed in Chapter 1, “World Energy Demand and Economic Outlook.”

Projections for energy consumption and production by fuel—liquids (primarily petroleum), natural gas, and coal—are presented in Chapters 2, 3, and 4, along with reviews of the current status of each fuel on a worldwide basis. Chapter 5 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. Chapter 6 provides a discussion of industrial sector energy use. Chapter 7 includes a detailed look at the world’s transportation energy use. Finally, Chapter 8 discusses the outlook for global energy-related carbon dioxide emissions.

Appendix A contains summary tables for the *IEO2010* Reference case projections of world energy consumption, gross domestic product, energy consumption by fuel, carbon dioxide emissions, and regional population growth. Summary tables of projections for the High and Low Economic Growth cases are provided in Appendices B and C, respectively, and projections for the High and Low Oil Price cases are provided in Appendices D and E, respectively. Reference case projections of delivered energy consumption by end-use sector and region are presented in Appendix F. Appendix G contains

summary tables of projections for world liquids production in all cases. Appendix H contains summary tables of Reference case projections for installed electric power capacity by fuel and regional electricity generation. Appendix I contains summary tables for projections of world natural gas production in all cases. Appendix J includes a set of tables for each of the four Kaya Identity components. In Appendix K, a set of comparisons of projections from the International Energy Agency’s *World Energy Outlook 2009* with the *IEO2010* projections is presented. Comparisons of the *IEO2010* and *IEO2009* projections are also presented in Appendix K. Appendix L describes the models used to generate the *IEO2010* projections, and Appendix M defines the regional designations included in the report.

The *IEO2010* projections of world energy consumption were generated from EIA’s World Energy Projections Plus (WEPS+) modeling system. WEPS+ is used to build the Reference case energy projections, as well as alternative energy projections based on different assumptions for GDP growth and fossil fuel prices. The *IEO2010* projections of global natural gas production and trade were generated from EIA’s International Natural Gas Model (INGM), which estimates natural gas production, demand, and international trade by combining estimates of natural gas reserves, natural gas resources and resource extraction costs, energy demand, and transportation costs and capacity in order to estimate future production. The Generate World Oil Balance (GWOB) application is used to create a “bottom up” projection of world liquids supply—based on current production capacity, planned future additions to capacity, resource data, geopolitical factors, and oil prices—and to generate conventional crude oil production cases.