

Appendix I

Comparisons With International Energy Agency and *IEO2006* Projections

Comparisons with IEA's *World Energy Outlook 2006*

The International Energy Agency (IEA) provides projections comparable with those in *IEO2007* in its *World Energy Outlook 2006*. Because IEA releases projections only for the years 2015 and 2030, two time periods are compared here—2004 to 2015 and 2015 to 2030.

In the 2004 to 2015 projection period, both *IEO2007* and IEA expect world energy demand to increase by an average of 2.1 percent per year (Table I1). Not surprisingly, both outlooks project much faster growth in energy demand among the non-OECD nations than in the OECD, with non-OECD energy use growing three times as rapidly. There are, however, some regional differences. IEA's expectations for demand growth in OECD Asia, for instance, are much higher than those in *IEO2007*, and the projected 1.4-percent annual growth rate projected by IEA for the region exceeds the 1.3-percent rate in the *IEO2007* high economic growth case.

In the non-OECD regions, both outlooks have similar projections for growth in Europe and Eurasia. *IEO2007* projects 1.6-percent average annual growth in energy use between 2004 and 2015, and IEA projects 1.4-percent

annual growth. IEA projects much slower growth than *IEO2007* over the 2004 to 2015 period for China and other non-OECD Asia, as well as for Africa and Central and South America. In each case, IEA's projected growth rates are lower than those in the *IEO2007* low economic growth case. On the other hand, IEA's projected 4.2-percent annual growth in Middle Eastern energy use over the same period is much higher than the projection of 3.1 percent per year in the *IEO2007* reference case and, in fact, exceeds the projected growth rate in the *IEO2007* high macroeconomic growth case.

In the later years of the projections, *IEO2007* and IEA generally agree, with worldwide energy demand growing by 1.5 percent per year between 2015 and 2030 in the *IEO2007* reference case and by 1.3 percent per year in the IEA projection (Table I2). Both outlooks anticipate similar regional growth over the 2015 to 2030 period. The largest regional difference between the two projections—and the only instance in which IEA regional growth projections fall outside the range defined by the *IEO2007* low and high macroeconomic growth cases—is for China. IEA anticipates that China's energy demand growth will slow to 2.0 percent per year for the final 15 years of the outlook, whereas the *IEO2007* reference case expects that China will maintain a 2.7-percent annual growth rate in energy demand through the end of the

Table I1. Comparison of *IEO2007* and IEA World Energy Consumption Growth Rates by Region, 2004-2015
(Average Annual Percent Growth)

Region	<i>IEO2007</i>			IEA
	Low Growth	Reference	High Growth	
OECD	0.6	0.9	1.2	1.2
North America	0.9	1.2	1.5	1.3
United States	0.7	1.0	1.3	1.2
Europe	0.3	0.5	0.8	0.8
Asia	0.7	1.0	1.3	1.4
Non-OECD	2.9	3.2	3.6	3.0
Europe and Eurasia	1.2	1.6	2.0	1.4
China	4.2	4.5	4.9	4.0
Other Non-OECD Asia	3.0	3.3	3.6	2.8
Middle East	2.7	3.1	3.4	4.2
Africa	2.8	3.1	3.4	2.1
Central and South America . . .	2.8	3.1	3.4	2.4
Total World	1.8	2.1	2.4	2.1

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). IEA: International Energy Agency, *World Energy Outlook 2006* (Paris, France, November 2006), pp. 492-527.

projection period. The IEA growth projection for energy use in China from 2015 to 2030 is lower than the *IEO2007* low macroeconomic growth case projection.

The projections vary not only with respect to levels of total energy demand but also with respect to the mix of primary energy inputs. In the 2004 to 2015 period, IEA expects slightly higher growth in fossil fuel use and slower growth in the use of non-fossil fuels than does *IEO2007* (Table I3). For both renewables and nuclear power consumption, the growth rates projected by IEA are slower than those in the *IEO2007* low economic growth case. For renewables, the differences may be explained by the fact that IEA renewables projections include estimates for traditional, non-marketed biomass and the *IEO2007* projections do not. Traditional biomass is a substantial portion of the renewable energy base and is not expected, in most regions, to expand as nations

migrate away from non-marketed to commercial energy use over the projection period—in contrast to hydroelectric power and other marketed renewable energy sources captured in the *IEO2007* projection.

For nuclear power, there are only small differences in projected growth rates between the *IEO2007* high macroeconomic growth and reference cases and no difference between the reference case and the low macroeconomic growth case. This is because the projections include only a limited number of plants, which are already planned or under construction, with expected completion dates before 2015 that analysts largely agree are achievable.

For the period from 2015 to 2030, *IEO2007* and IEA are largely in agreement. The only exception is nuclear power, for which the IEA growth projection falls below

Table I2. Comparison of *IEO2007* and IEA World Energy Consumption Growth Rates by Region, 2015-2030
(Average Annual Percent Growth)

Region	<i>IEO2007</i>			IEA
	Low Growth	Reference	High Growth	
OECD	0.4	0.8	1.2	0.6
North America	0.6	1.1	1.5	0.8
United States	0.6	1.0	1.5	0.7
Europe	-0.1	0.3	0.6	0.4
Asia	0.4	0.8	1.2	0.6
Non-OECD	1.6	2.1	2.6	1.8
Europe and Eurasia	0.6	1.2	1.7	0.8
China	2.3	2.7	3.2	2.0
Other Non-OECD Asia	1.9	2.4	2.9	2.1
Middle East	1.3	1.7	2.2	2.1
Africa	1.3	1.8	2.2	1.8
Central and South America	1.4	1.8	2.3	2.0
Total World	1.1	1.5	2.0	1.3

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). *IEA*: International Energy Agency, *World Energy Outlook 2006* (Paris, France, November 2006), pp. 492-527.

Table I3. Comparison of *IEO2007* and IEA World Energy Consumption Growth Rates by Fuel, 2004-2015
(Average Annual Percent Growth)

Fuel	<i>IEO2007</i>			IEA
	Low Growth	Reference	High Growth	
Liquids	1.2	1.5	1.9	1.7
Natural Gas	2.0	2.4	2.7	2.5
Coal	2.2	2.6	2.9	2.7
Nuclear	1.5	1.5	1.6	1.2
Renewable/Other	2.1	2.3	2.6	2.0
Total	1.8	2.1	2.4	2.1

Note: In the IEA projections, Renewable/Other includes traditional biomass.

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). *IEA*: International Energy Agency, *World Energy Outlook 2006* (Paris, France, November 2006), pp. 492-527.

that in the *IEO2007* low macroeconomic growth case (Table I4). IEA projects that nuclear power expansion will slow from the annual growth rate of 1.2 percent projected for relative to the 2004 to 2015 period to 0.4 percent for the 2015 to 2030 period. *IEO2007* projects increases in world nuclear power use averaging 1.3 percent per year from 2015 to 2030, compared with 1.5 percent per year from 2004 to 2015.

Comparisons With *IEO2006*

The *IEO2007* outlook for total energy consumption in 2015 is largely the same as the outlook in *IEO2006*. In *IEO2007* total marketed energy consumption in 2015 is projected to be 559 quadrillion Btu, as compared with 563 quadrillion Btu in *IEO2006* (Table I5). There are, however, some regional differences between the two *IEOs*. In *IEO2007*, total energy consumption for the OECD region in 2030 is about 5 quadrillion Btu lower than was projected in *IEO2006*. Most (3 quadrillion Btu) of the difference is attributed to lower demand in North America (largely, the United States), where the projection for average annual GDP growth from 2003 to 2015 is 0.2 percentage points lower in *IEO2007* than was projected in *IEO2006*.

For the non-OECD region, the largest differences between the projections for 2015 in *IEO2007* and *IEO2006* are found in two regions—China and non-OECD Europe and Eurasia. In *IEO2007*, China’s projected total energy use in 2015 is 5 quadrillion Btu higher than projected in *IEO2006*. *IEO2007* assumes much more rapid economic growth for China between 2003 and 2015 than was assumed in *IEO2006*—8.1 percent per year versus 7.0 percent per year. A 10-percent increase in China’s GDP between 2003 and 2004 helped to spur a 20-percent increase in its energy use, a development that was not anticipated in the *IEO2006* projection, which was based on historical data series that ended in 2003.

For non-OECD Europe and Eurasia, the *IEO2007* reference case projects total energy consumption in 2015 that is 4 quadrillion Btu lower than projected in *IEO2006*. Nearly all of the difference resulted from a reassessment of energy demand in the region’s industrial sector. For example, in the *IEO2006* reference case, demand for electric power in the industrial sector was projected to increase by an average of 4.3 percent per year from 2003 to 2015; in *IEO2007*, the corresponding projection is for a more moderate growth rate of 2.4 percent per year. EIA believes that the lower rate is more consistent with the annual increases seen in the region’s industrial electricity consumption since 1998 (when industrial sector electricity use stopped declining after the fall of the Soviet Union and began to recover), which have averaged about 2.5 percent per year.²⁰

The near-term differences between the *IEO2007* and *IEO2006* projections are carried through to 2030. The *IEO2007* reference case projection for total energy use worldwide in 2030 is 20 quadrillion Btu (about 3 percent) lower than the *IEO2006* projection. Again, the largest regional differences between the 2030 projections are for China and non-OECD Europe and Eurasia. In the *IEO2007* reference case, China’s GDP is projected to increase at an average rate of 6.6 percent per year between 2003 and 2030, 0.6 percentage points higher than the GDP growth rate projected for China in *IEO2006*. As a result, the reference case projection for China’s total energy use in 2030 is 6 quadrillion Btu (5 percent) higher in *IEO2007* than was projected in *IEO2006*. For non-OECD Europe and Eurasia, total projected energy consumption in 2030 is 7 quadrillion Btu lower in *IEO2007* than it was in *IEO2006*, largely as a result of EIA’s reassessment of the potential for growth in the industrial sector.

Along with regional differences between the *IEO2007* and *IEO2006* projections, there are some differences

Table I4. Comparison of *IEO2007* and IEA World Energy Consumption Growth Rates by Fuel, 2015-2030
(Average Annual Percent Growth)

Fuel	<i>IEO2007</i>			IEA
	Low Growth	Reference	High Growth	
Liquids	0.8	1.3	1.7	1.1
Natural Gas	1.1	1.6	2.1	1.7
Coal	1.3	1.8	2.3	1.3
Nuclear	1.2	1.3	1.5	0.4
Renewable/Other	1.1	1.4	1.7	1.7
Total	1.1	1.5	2.0	1.3

Note: In the IEA projections, Renewable/Other includes traditional biomass.

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). IEA: International Energy Agency, *World Energy Outlook 2006* (Paris, France, November 2006), pp. 492-527.

²⁰International Energy Agency, *Energy Balances in Non-OECD Countries* (Paris, France, 2006), web site <http://data.iea.org>.

between the two projections in the mix of energy resources expected to be consumed (Table I6). The projections for worldwide consumption of petroleum and other liquids consumption are virtually the same throughout the projections, but there are pronounced differences in the other fuel outlooks. In *IEO2007*, the potential for nuclear power is viewed with more optimism than it was in *IEO2006*. As a result, the projection for nuclear power consumption in 2015 is 5 percent higher in *IEO2007* than in *IEO2006*, and the difference between the two projections increases to 14 percent in 2030.

With the higher projection for nuclear power in the *IEO2007* reference case, projections for consumption of

natural gas and renewables in the electric power sector are lower throughout the period from 2004 to 2030. The impact on renewable energy sources is larger: total renewable energy use is 12 percent lower in 2015 and 14 percent lower in 2030 in the *IEO2007* projections than in *IEO2006*. The difference is somewhat inflated, however, because consumption of biofuels in the *IEO2007* projections is included with petroleum and other liquids consumption, whereas it was included with renewable energy consumption in *IEO2006*. Removing the transportation biofuels portion of renewable energy consumption from the *IEO2006* projections reduces the difference to about 10 percent in both 2015 and 2030.

Table 15. Comparison of *IEO2007* and *IEO2006* Total World Energy Consumption, Reference Case, 2015 and 2030
(Quadrillion Btu)

Region	2015		2030		Change in <i>IEO2007</i>	
	<i>IEO2007</i>	<i>IEO2006</i>	<i>IEO2007</i>	<i>IEO2006</i>	2015	2030
OECD	265	270	298	309	-5	-11
North America	137	140	162	166	-3	-5
United States	112	114	131	134	-2	-3
Europe	86	87	89	95	-1	-5
Asia	42	43	47	48	-1	-1
Non-OECD	294	293	404	413	1	-9
Europe and Eurasia	59	63	72	79	-3	-7
China	97	92	145	139	5	6
India	22	23	32	33	-1	-1
Other Non-OECD Asia	36	35	50	52	1	-2
Middle East	29	28	38	38	1	0
Africa	19	20	25	27	-1	-2
Central and South America	31	32	41	46	-1	-4
Total World	559	563	702	722	-4	-20

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). *IEO2006*: EIA, *International Energy Outlook 2006*, DOE/EIA-0484(2006) (Washington, DC, June 2006), Table A1, p. 83.

Table 16. Comparison of *IEO2007* and *IEO2006* World Energy Consumption by Fuel, Reference Case, 2015 and 2030
(Quadrillion Btu)

Fuel	2015		2030		Change in <i>IEO2007</i>	
	<i>IEO2007</i>	<i>IEO2006</i>	<i>IEO2007</i>	<i>IEO2006</i>	2015	2030
Liquids	198	199	239	239	-2	0
Natural Gas	134	140	170	190	-6	-19
Coal	152	144	199	196	7	4
Nuclear	33	31	40	35	2	5
Renewable/Other	43	48	53	61	-5	-8
Total	559	563	702	722	-4	-20

Sources: *IEO2007*: Energy Information Administration (EIA), System for the Analysis of Global Energy Markets (2007). *IEO2006*: EIA, *International Energy Outlook 2006*, DOE/EIA-0484(2006) (Washington, DC, June 2006), Table A2, pp. 84-85.