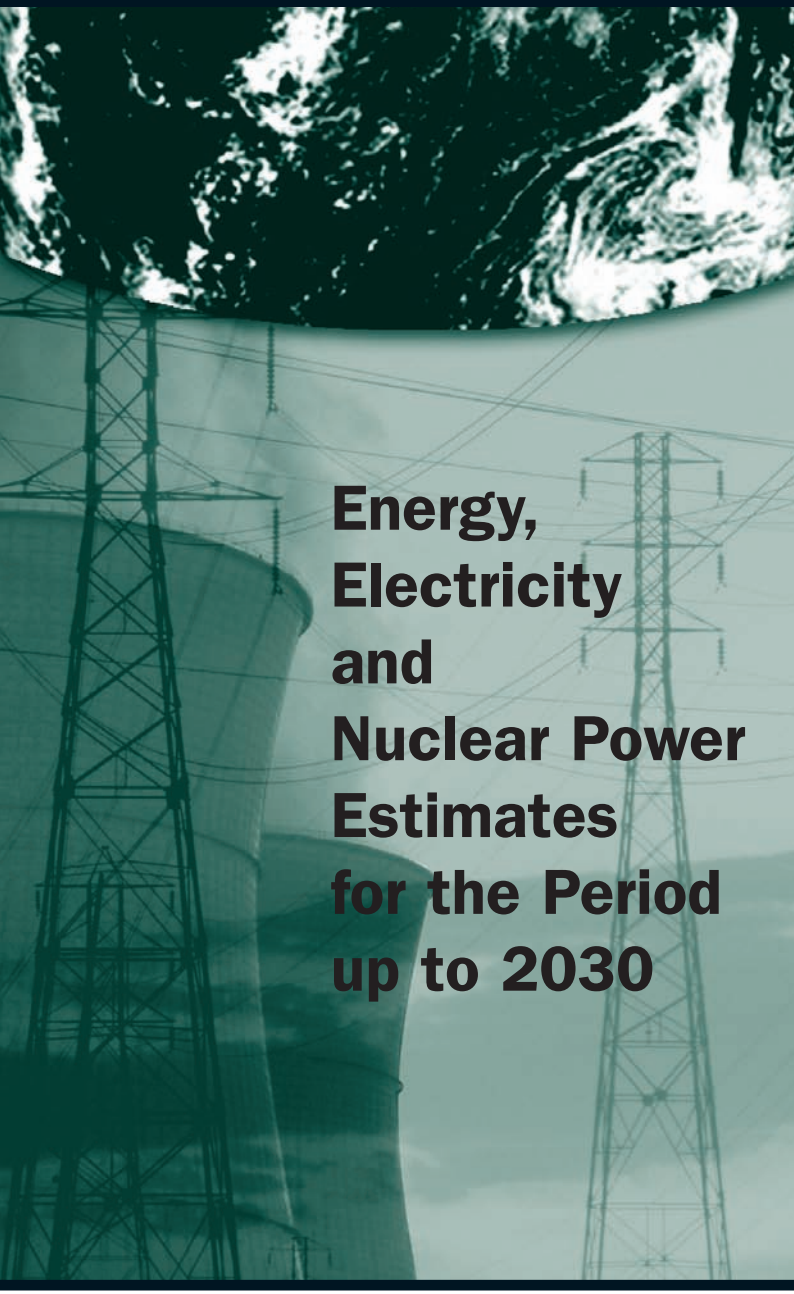
REFERENCE DATA SERIES No. 1 2008 Edition



Energy, Electricity and Nuclear Power Estimates for the Period up to 2030

IAEA
International Atomic Energy Agency

REFERENCE DATA SERIES No. 1

ENERGY, ELECTRICITY AND NUCLEAR POWER ESTIMATES FOR THE PERIOD UP TO 2030

2008 Edition

INTERNATIONAL ATOMIC ENERGY AGENCY
VIENNA, 2008

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INTRODUCTION

Reference Data Series No. 1 is an annual publication — currently in its twenty-eighth edition — containing estimates of energy, electricity and nuclear power trends up to the year 2030.

Nuclear data presented in Table 1 are based on actual statistical data collected by the IAEA's Power Reactor Information System (PRIS). Energy and electricity data for 2007, however, are estimated, since the latest available information from the Department of Economic and Social Affairs of the United Nations is for 2005. Population data originate from the World Population Prospects (2003 Revision), published by the Population Division of the UN Department of Economic and Social Affairs, and the 2005 values are estimates.

The future growth of energy, electricity and nuclear power up to the year 2030 is presented as low and high estimates in order to encompass the uncertainties associated with the future. These estimates should be viewed as very general growth trends whose validity must constantly be subjected to critical review.

The energy forecasts carried out in increasing numbers over the last years by international, national and private organizations are based on a multiplicity of different assumptions and different aggregating procedures, which make their comparison and synthesis very difficult. The basic differences refer to such fundamental input data as:

— World and regional scenarios of economic development;
— Correlation of economic growth and energy consumption;
— Assumptions on physical, economic and political constraints applying to energy production and consumption;
— Future prices of different energy sources.

The projections presented in this booklet are based on a compromise among:

— National projections supplied by each country for a recent OECD/NEA study;
— Indicators of development published by the World Bank in its World Development Indicators;
— Estimates of energy, electricity and nuclear power growth continuously carried out by the IAEA in the wake of recent global and regional projections made by other international organizations.

The nuclear generating capacity estimates presented in Table 3 are derived from a country by country 'bottom-up' approach. They are established by a group of experts participating each year in the IAEA's consultancy on Nuclear Capacity Projections and based upon a review of nuclear power projects and programmes in Member States.

The low and high estimates reflect contrasting but not extreme underlying assumptions on the different driving factors that have an impact on nuclear power deployment. These factors, and the ways they might evolve, vary from country to country. The estimates presented provide a plausible range of nuclear capacity growth by region and worldwide. They are not intended to be predictive nor to reflect the whole range of possible futures from the lowest to the highest feasible.

In the low estimates, the present barriers to nuclear power development are assumed to prevail in most countries during the coming three decades:

— Low economic and electricity demand growth rates in OECD countries;
— Public opposition to nuclear power, leading to policy decisions not to consider the nuclear option in spite of its competitive costs and potential contribution to reducing environmental impacts from electricity generation;
— Institutional and financing issues preventing the implementation of previously planned nuclear programmes, in particular in countries in transition and in developing countries;

— Inadequate mechanisms for nuclear technology transfer and nuclear project funding in developing countries.

The high estimates reflect a moderate revival of nuclear power development that could result in particular from a more comprehensive comparative assessment of the different options for electricity generation, integrating economic, social, health and environmental aspects. They are based upon a review of national nuclear power programmes, assessing their technical and economic feasibility. They assume that some policy measures would be taken to facilitate the implementation of these programmes, such as strengthening of international cooperation, enhanced technology adaptation and transfer, and establishment of innovative funding mechanisms. These estimates also take into account the global concern over climate change caused by the increasing concentration of greenhouse gases in the atmosphere, and the signing of the Kyoto Protocol.

The data on electricity produced by nuclear power plants is converted to joules based on the average efficiency of a nuclear power plant, i.e. 33 per cent; data on electricity generated by geothermal heat is converted to joules based on the average efficiency of a geothermal power plant, i.e. 10 per cent. The conversion to joules of electricity generated by hydropower or by the other non-thermal sources such as wind, tide, and solar is based on the energy content of the electricity generated (the equivalent of assuming a 100 per cent efficiency).

The total energy requirement has been calculated by summing the primary energy production, the net energy trade minus changes in international bunkers and domestic stocks.

The values shown in Table 9 refer to primary energy used for the generation of electricity. Owing to differences in conversion efficiencies, the percentage values are different from the shares of electricity generation presented in Tables 1 and 5.

Energy Units

1 MW(e) = 10^6 watts
1 GW(e) = 1000 MW(e) = 10^9 watts
1 GJ = 1 gigajoule = 10^9 joules
1 EJ = 1 exajoule = 10^{18} joules
1 EJ = 23.9 megatonnes of oil equivalent (MTOE)
1 TWh = 1 terawatt-hour = 10^9 kWh = 3.6×10^{-3} EJ

GROUPING OF COUNTRIES AND AREAS

The countries and geographical areas included in each grouping are listed below
(IAEA Member States are denoted by an asterisk)

North America

Canada*
United States of America*

Latin America

Anguilla
Antigua and Barbuda
Argentina*
Aruba
Bahamas
Barbados
Belize*
Bermuda
Bolivia*
Brazil*
Cayman Islands
Chile*
Colombia*
Costa Rica*
Cuba*
Dominica
Dominican Republic*
Ecuador*
El Salvador*
Grenada
Guadeloupe
Guatemala*
Guyana
Haiti*
Honduras*
Jamaica*
Martinique
Mexico*
Montserrat
Netherlands Antilles
Nicaragua*
Panama*
Paraguay*
Peru*
Puerto Rico
S.Georgia & S.Sandwich Islands
Saint Kitts and Nevis
Saint Lucia
Saint Pierre and Miquelon
Saint Vincent & the Grenadines
Suriname
Trinidad and Tobago
Turks and Caicos Islands
Uruguay*
Venezuela*

Western Europe

Andorra
Austria*
Belgium*
Cyprus*
Denmark*
Finland*
France*
Germany*
Gibraltar
Greece*
Greenland
Holy See*
Iceland*
Ireland*
Italy*
Liechtenstein*
Luxembourg*
Malta*
Monaco*
Netherlands*
Norway*
Portugal*
San Marino
Spain*
Svalbard and Jan Mayen Islands
Sweden*
Switzerland*
Turkey*
United Kingdom*

Eastern Europe

Albania*
Armenia*
Azerbaijan*
Belarus*
Bosnia and Herzegovina*
Bulgaria*
Croatia*
Czech Republic*
Estonia*
Georgia*
Hungary*
Kazakhstan*
Kyrgyzstan*
Latvia*
Lithuania*
Montenegro*
Poland*
Republic of Moldova*
Romania*
Russian Federation*
Serbia*
Slovakia*
Slovenia*
Tajikistan*
The Frmr.Yug.Rep. of Macedonia*
Turkmenistan
Ukraine*
Uzbekistan*

Africa

Algeria*
Angola*
Benin*
Botswana*
Burkina Faso*
Burundi*
Cameroon*
Cape Verde*
Central African Republic*
Chad*
Comoros
Congo*
Côte d'Ivoire*
Democratic Rep. of the Congo*
Djibouti
Egypt*
Equatorial Guinea
Eritrea*
Ethiopia*
Gabon*
Gambia
Ghana*
Guinea
Guinea-Bissau
Kenya*
Lesotho
Liberia*
Libyan Arab Jamahiriya*
Madagascar*
Malawi*
Mali*
Mauritania*
Mauritius*
Mayotte
Morocco*
Mozambique*
Namibia*
Niger*
Nigeria*
Reunion
Rwanda
Saint Helena
Sao Tome and Principe
Senegal*
Seychelles*
Sierra Leone*
Somalia
South Africa*
Sudan*
Swaziland
Togo*
Tunisia*
Uganda*
United Republic of Tanzania*
Western Sahara
Zambia*
Zimbabwe*

Middle East and South Asia

Afghanistan*
Bahrain*
Bangladesh*
Bhutan
British Indian Ocean Territory
Cocos (Keeling) Islands
French Southern Territories
Heard Island&McDonald Islands
India*
Iran, Islamic Republic of*
Iraq*
Israel*
Jordan*
Kuwait*
Lebanon*
Nepal*
Oman
Pakistan*
Qatar*
Saudi Arabia*
Sri Lanka*
Syrian Arab Republic*
T.T.U.T.J of T. Palestinian A.
United Arab Emirates*
Yemen*

South East Asia and the Pacific

Australia*
Brunei Darussalam
Cook Islands
Fiji
Indonesia*
Kiribati
Malaysia*
Maldives
Marshall Islands*
Micronesia (Fed. States of)
Myanmar*
New Zealand*
Niue
Norfolk Islands
Northern Mariana Islands
Palau*
Papua New Guinea
Pitcairn Islands
Samoa
Singapore*
Solomon Islands
Thailand*
Timor Leste
Tokelau
Tuvalu
US Minor Outlying Islands
Vanuatu
Wallis and Futuna Islands

Far East

Cambodia
China*
Dem. P.R. of Korea
Japan*
Korea, Republic of*
Lao P.D.R.
Macau, China
Mongolia*
Philippines*
Taiwan, China
Vietnam*

TABLE 1. NUCLEAR POWER REACTORS IN THE WORLD (end of 2007)

Group and Country	In Operation		Long-term Shut Down Reactors		Under Construction		Electricity Supplied by Nuclear Power Reactors in 2007	
	Number of Units	Total MW(e)	Number of Units	Total MW(e)	Number of Units	Total MW(e)	TWh	Percent of Total Electricity
North America								
Canada	18	12610	4	2726			88.2	14.7
United States of America	104	100582			1	1165	806.6	19.4
Latin America								
Argentina	2	935			1	692	6.7	6.2
Brazil	2	1795					11.7	2.8
Mexico	2	1360					9.9	4.6
Western Europe								
Belgium	7	5824					45.9	54.0
Finland	4	2696			1	1600	22.5	28.9
France	59	63260			1	1600	420.1	76.8
Germany	17	20430					133.2	27.3
Netherlands	1	482					4.0	4.1
Spain	8	7450					52.7	17.4
Sweden	10	9034					64.3	46.1
Switzerland	5	3220					26.5	40.0
United Kingdom	19	10222					57.5	15.1
Eastern Europe								
Armenia	1	376					2.3	43.5
Bulgaria	2	1906			2	1906	13.7	32.1
Czech Republic	6	3619					24.6	30.2
Hungary	4	1829					13.9	36.8

TABLE 1. NUCLEAR POWER REACTORS IN THE WORLD (end of 2007)

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	Number of Units	Total MW(e)	Number of Units	Total MW(e)	Number of Units	Total MW(e)	TWh	Percent of Total Electricity
Lithuania	1	1185					9.1	64.4
Romania	2	1305					7.1	13.0
Russian Federation	31	21743			6	3639	148.0	16.0
Slovakia	5	2034					14.2	54.3
Slovenia	1	666					5.4	41.6
Ukraine	15	13107			2	1900	87.2	48.1
Africa								
South Africa	2	1800					12.6	5.5
Middle East and South Asia								
India	17	3782			6	2910	15.8	2.5
Iran, Islamic Republic of					1	915		
Pakistan	2	425			1	300	2.3	2.3
Far East								
China	11	8572			5	4220	59.3	1.9
Japan	55	47587	1	246	1	866	267.3	27.5
Korea, Republic of	20	17451			3	2880	136.6	35.3
World Total (a)	439	372208	5	2972	33	27193	2608.2	14.2

Notes:

(a) Including the following data in Taiwan, China:

— 6 units in operation with total capacity of 4921 MW(e); 2 units under construction with total capacity of 2600 MW(e);

— 39.0 TWh of nuclear electricity generation, representing 19.3% of the total electricity generated.

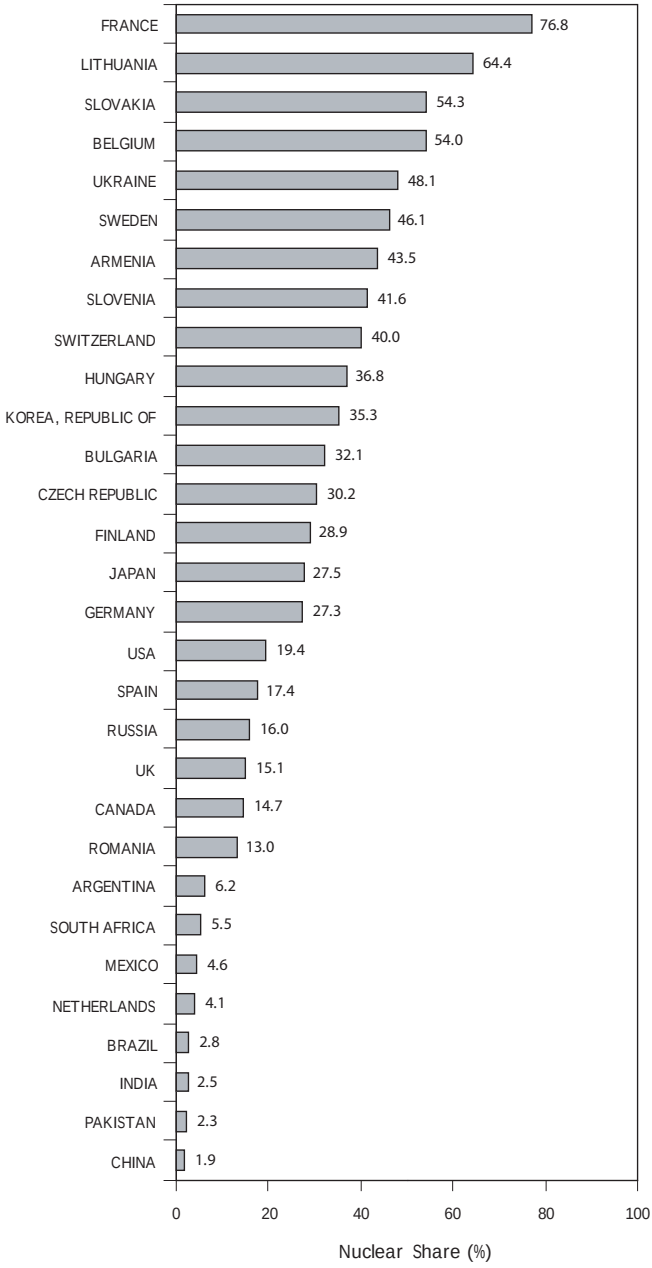


FIGURE 1. NUCLEAR SHARE OF TOTAL ELECTRICITY GENERATION IN 2007

Note: The nuclear share of electricity generation in Taiwan, China was 19.3%.

TABLE 2. NUMBER OF COUNTRIES WITH NUCLEAR POWER REACTORS IN OPERATION OR UNDER CONSTRUCTION (end of 2007)

Country Group	Number of Countries in Group	Countries with Nuclear Power Reactors			
		In Operation	Long-term Shut Down	Under Construction (1)	Total (2)
North America	2	2	1	1	2
Latin America	45	3		1	3
Western Europe	29	9		2	9
Eastern Europe	27	10		3	10
Africa	57	1			1
Middle East and South Asia	25	2		3	3
South East Asia and the Pacific	27				
Far East	11	3	1	3	3
World Total	223	30	2	13	31

Notes:
(1) May include countries having reactors already in operation.
(2) Total number of countries in each group that have nuclear power reactors in operation, or under construction.

TABLE 3. ESTIMATES OF TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY

Country Group	2007			2010 (*)			2020 (*)			2030 (*)		
	Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear		Total Elect. GW(e)	Nuclear	
		GW(e)	%		GW(e)	%		GW(e)	%		GW(e)	%
North America	1297	113.2	8.7	1319 1345	114 114	8.6 8.5	1424 1479	121 128	8.5 8.6	1562 1634	131 175	8.4 10.7
Latin America	292	4.1	1.4	308 327	4.1 4.1	1.3 1.3	380 487	6.9 7.9	1.8 1.6	470 726	9.6 20	2.0 2.8
Western Europe	773	122.6	15.9	795 814	120 121	15.1 14.9	880 951	92 129	10.5 13.6	983 1121	74 150	7.5 13.4
Eastern Europe	499	47.8	9.6	504 531	48 48	9.6 9.1	587 777	72 95	12.3 12.2	676 1073	81 119	12.0 11.1
Africa	112	1.8	1.6	118 129	1.8 1.8	1.5 1.4	153 209	3.1 4.5	2.0 2.1	199 331	4.5 14	2.2 4.3
Middle East and South Asia	295	4.2	1.4	318 332	8 10	2.4 3.0	411 495	13 24	3.0 4.9	529 719	16 41	3.0 5.8
South East Asia and the Pacific	170			186 194			241 299	 1.2	 0.4	306 446	1.2 7.4	0.4 1.7
Far East	1003	78.5	7.8	1060 1077	81 83	7.7 7.7	1471 1611	129 152	8.8 9.4	1931 2209	156 220	8.1 10.0
World Total Low Estimate	4441	372.2	8.4	4606	376	8.2	5547	437	7.9	6658	473	7.1
World Total High Estimate				4749	383	8.1	6309	542	8.6	8260	748	9.1

Note:
(*) Nuclear capacity estimates take into account the scheduled decommissioning of the older units at the end of their lifetime.

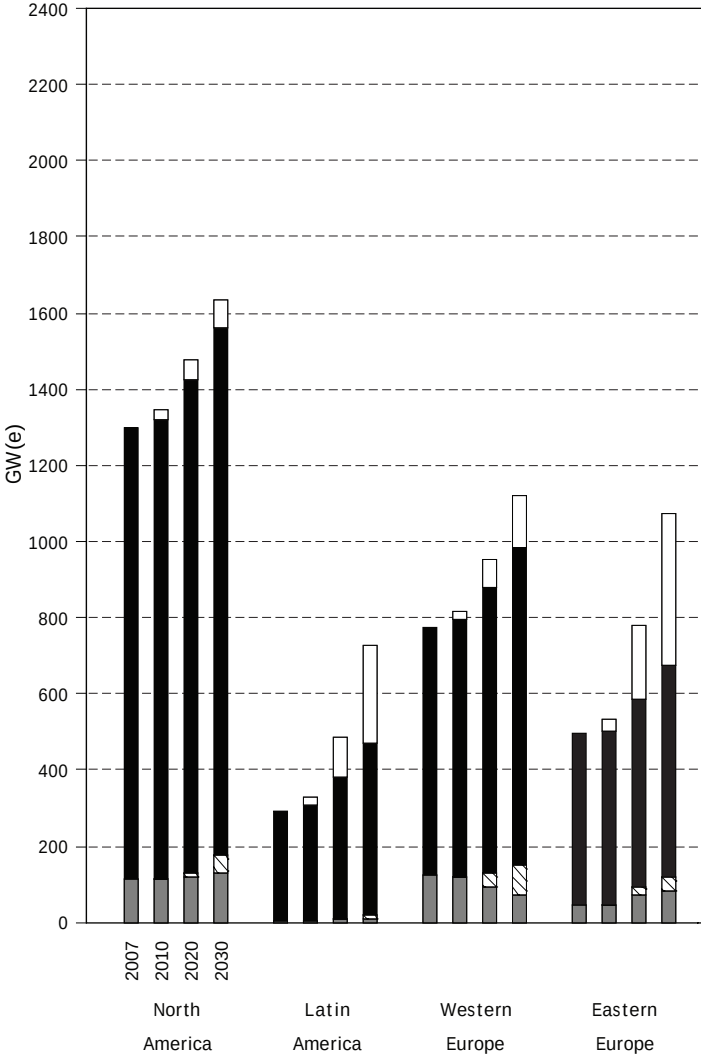


FIGURE 2. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY

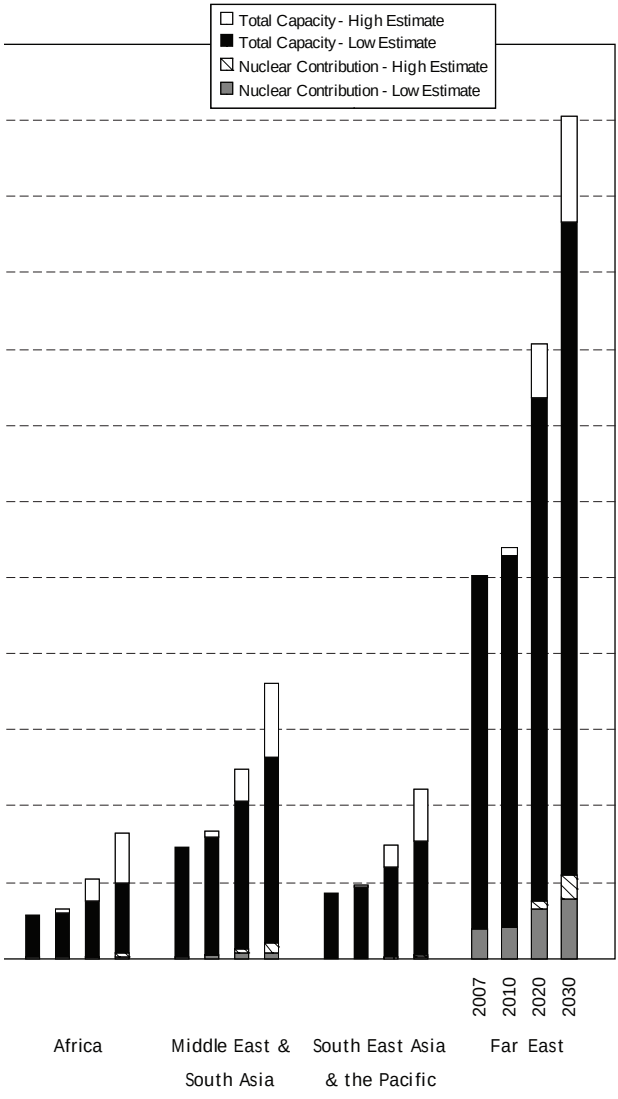

Total Capacity - High Estimate
Total Capacity - Low Estimate
Nuclear Contribution - High Estimate
Nuclear Contribution - Low Estimate
2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 4. ESTIMATES OF TOTAL ELECTRICITY GENERATION AND CONTRIBUTION BY NUCLEAR POWER (*)

Country Group	2007			2010			2020			2030		
	Total Elect. TWh	Nuclear		Total Elect. TWh	Nuclear		Total Elect. TWh	Nuclear		Total Elect. TWh	Nuclear	
		TWh	%		TWh	%		TWh	%		TWh	%
North America	4763	894.7	18.8	4827 4936	905 912	18.7 18.5	5357 5800	978 1030	18.3 17.8	5865 6818	1058 1407	18.0 20.6
Latin America	1230	28.3	2.3	1265 1321	30 30	2.4 2.3	1567 1847	52 59	3.3 3.2	1988 2755	73 156	3.7 5.6
Western Europe	3050	826.7	27.1	3192 3279	881 893	27.6 27.2	3519 4343	694 975	19.7 22.5	3850 5741	570 1157	14.8 20.2
Eastern Europe	1842	325.5	17.7	1928 2056	317 317	16.4 15.4	2415 3272	487 639	20.1 19.5	2910 5256	569 837	19.6 15.9
Africa	564	12.6	2.2	608 627	14 14	2.4 2.3	787 988	25 36	3.2 3.7	989 1547	37 118	3.7 7.6
Middle East and South Asia	1213	18.1	1.5	1282 1384	45 60	3.5 4.3	1753 2278	77 149	4.4 6.5	2309 3554	103 269	4.5 7.6
South East Asia and the Pacific	713			784 808			1043 1218	 7	 0.6	1335 1792	8 48	0.6 2.7
Far East	4994	502.2	10.1	5218 5329	556 568	10.7 10.7	7030 8038	894 1050	12.7 13.1	9121 11163	1104 1560	12.1 14.0
World Total Low Estimate	18368	2608.2	14.2	19103	2748	14.4	23470	3207	13.7	28366	3522	12.4
World Total High Estimate				19739	2794	14.2	27785	3946	14.2	38626	5551	14.4

(*) The nuclear generation data presented in this table and the nuclear capacity data presented in Table 3 cannot be used to calculate average annual capacity factors for nuclear plants, as Table 3 presents year-end capacity and not the effective capacity average over the year.

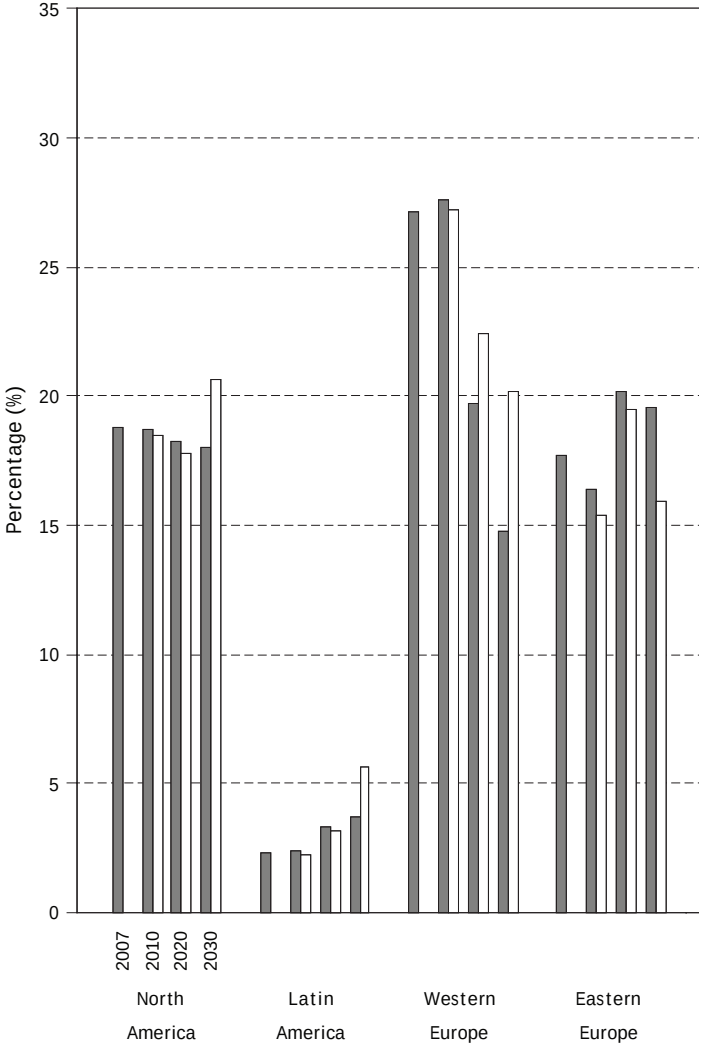


FIGURE 3. PERCENTAGE OF ELECTRICITY SUPPLIED BY NUCLEAR POWER

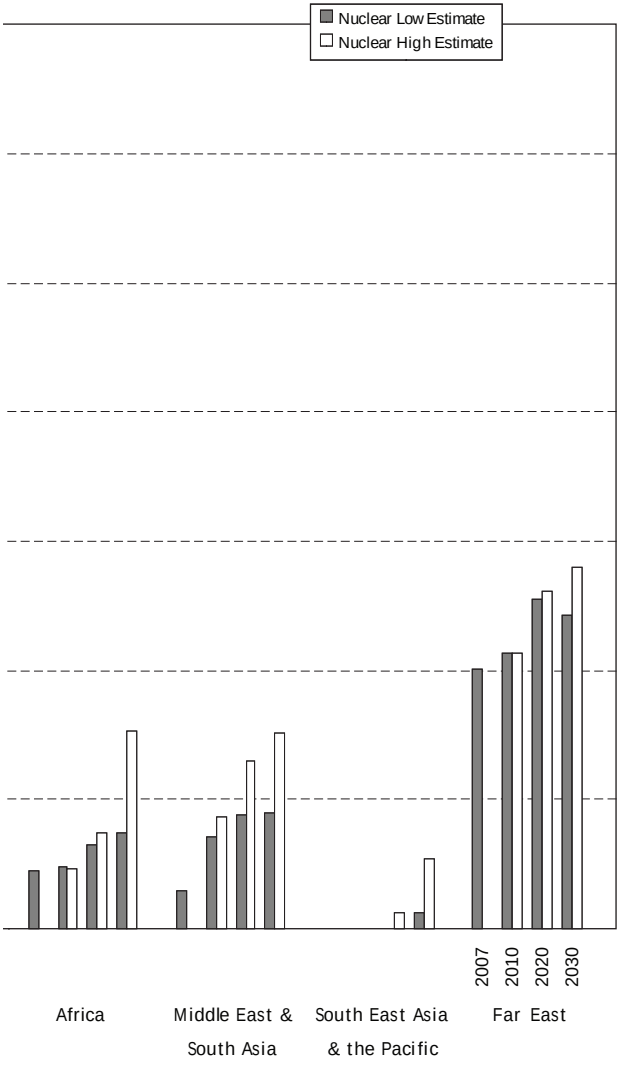

Nuclear Low Estimate
Nuclear High Estimate
2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 5. ESTIMATES OF TOTAL ENERGY REQUIREMENT (EJ), PERCENTAGE USED FOR ELECTRICITY GENERATION, AND PERCENTAGE SUPPLIED BY NUCLEAR ENERGY (*)

Country Group	2007			2010			2020			2030		
	Total Energy Requirement	% Used for Elect. Gen.	% Supplied by Nuclear	Total Energy Requirement	% Used for Elect. Gen.	% Supplied by Nuclear	Total Energy Requirement	% Used for Elect. Gen.	% Supplied by Nuclear	Total Energy Requirement	% Used for Elect. Gen.	% Supplied by Nuclear
North America	109.1	32.8	9.0	110	33	9.0	115	34	9.3	120	34	9.6
				113	33	8.8	127	34	8.8	143	36	10.8
Latin America	30.8	25.3	1.0	32	25	1.0	38	26	1.5	45	26	1.8
				33	26	1.0	43	26	1.5	57	27	3.0
Western Europe	70.0	40.2	12.9	70	40	13.6	72	41	10.5	73	41	8.5
				72	41	13.6	78	44	13.7	85	48	14.8
Eastern Europe	57.3	38.5	6.2	58	39	5.9	64	39	8.2	70	40	8.8
				60	39	5.8	73	43	9.6	87	46	10.5
Africa	27.4	21.8	0.5	29	22	0.5	35	22	0.8	41	23	1.0
				30	22	0.5	39	22	1.0	51	23	2.5
Middle East and South Asia	47.0	34.8	0.4	51	35	1.0	63	35	1.3	79	36	1.4
				52	35	1.3	71	37	2.3	98	38	3.0
South East Asia and the Pacific	25.3	28.5		27	29		33	29		41	30	0.2
				28	29		39	29	0.2	52	30	1.0
Far East	118.7	39.0	4.6	130	39	4.7	168	40	5.8	210	40	5.7
				131	40	4.7	184	42	6.2	253	44	6.7
World Total Low Estimate	485.6	34.9	5.9	507	35	5.9	588	36	5.9	679	36	5.7
World Total High Estimate				519	35	5.9	655	37	6.6	826	39	7.3

Note:
(*) Total energy requirement is estimated as production of primary energy plus net trade (import - export) minus international bunkers and stock changes.

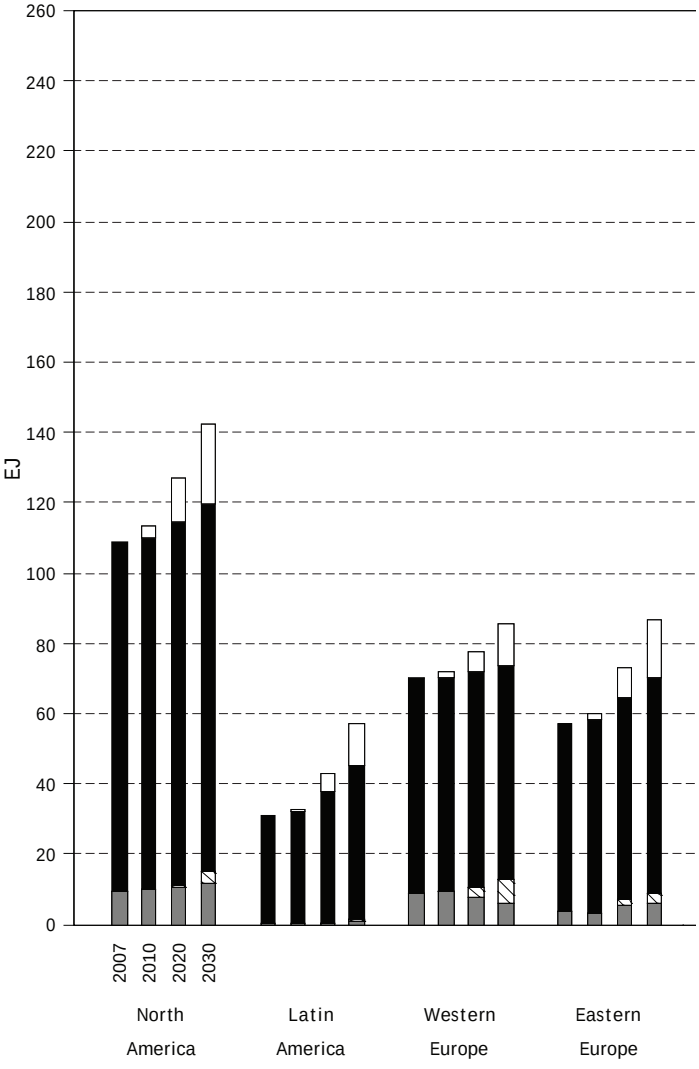


FIGURE 4. ESTIMATES OF TOTAL ENERGY REQUIREMENT

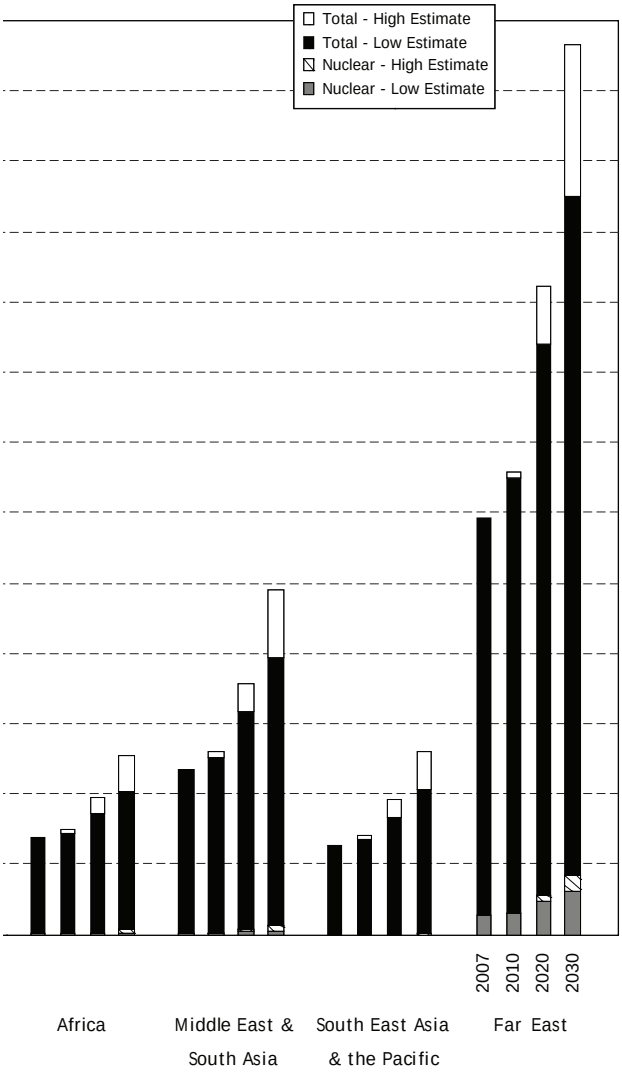

Total - High Estimate
Total - Low Estimate
Nuclear - High Estimate
Nuclear - Low Estimate
2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 6. TOTAL ENERGY REQUIREMENT (EJ) BY TYPE OF FUEL IN 2007 (*)

Country Group	Solids (a)	Liquids	Gases	Biomass (b)	Hydro	Nuclear	Renewables (c)	Total
North America	20.79	40.86	28.66	5.97	2.29	9.76	0.72	109.05
Latin America	1.33	14.62	7.37	4.28	2.54	0.31	0.37	30.82
Western Europe	10.67	24.38	19.19	4.13	1.83	9.02	0.80	70.02
Eastern Europe	11.78	11.32	28.24	1.42	1.14	3.55	-0.20	57.26
Africa	4.56	7.35	4.11	10.87	0.36	0.14	0.04	27.42
Middle East and South Asia	12.92	13.80	10.68	8.70	0.71	0.20	0.03	47.04
South East Asia and the Pacific	4.57	9.28	6.93	3.93	0.25		0.36	25.31
Far East	65.71	31.78	8.73	4.16	2.26	5.48	0.54	118.66
World Total	132.33	153.40	113.92	43.46	11.37	28.45	2.67	485.59

Notes:

(*) Total energy requirement is estimated as production of primary energy plus net trade (import - export) minus international bunkers and stock changes.

(a) Solids do not include commercial wood.

(b) The column headed 'Biomass' includes commercial wood, combustible renewables, waste and other biomass products.

(c) The column headed 'Renewables' includes geothermal, wind, solar, tide energy and net electricity trade.

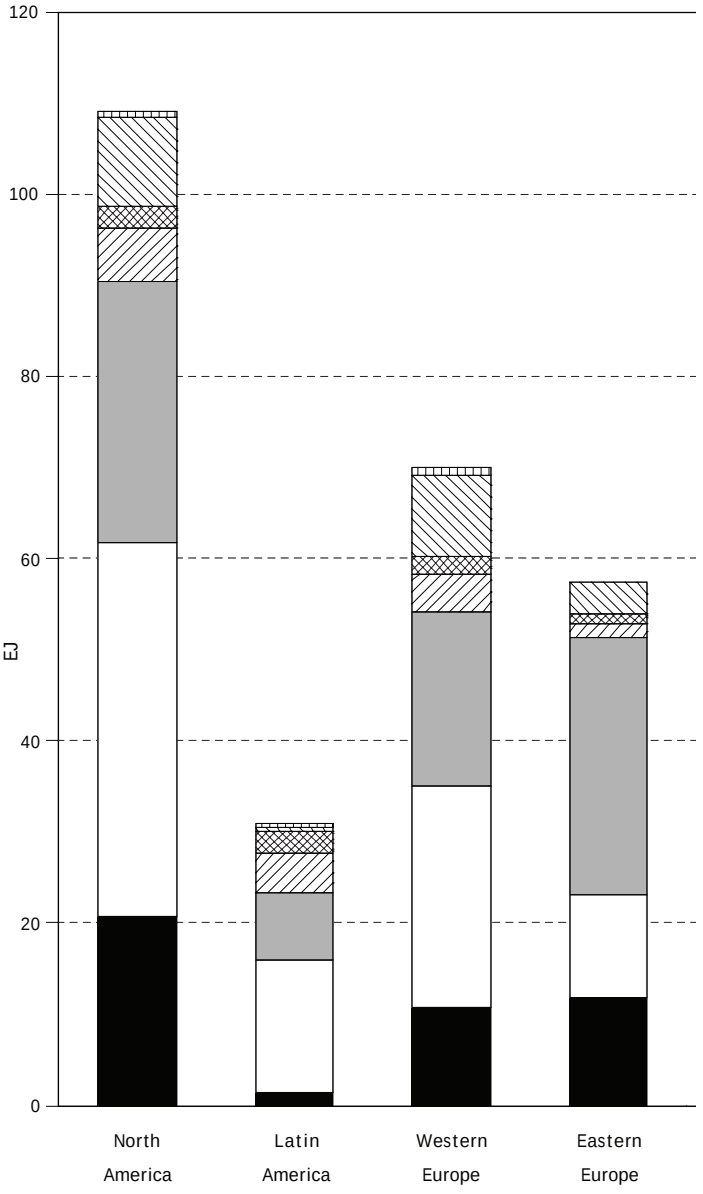
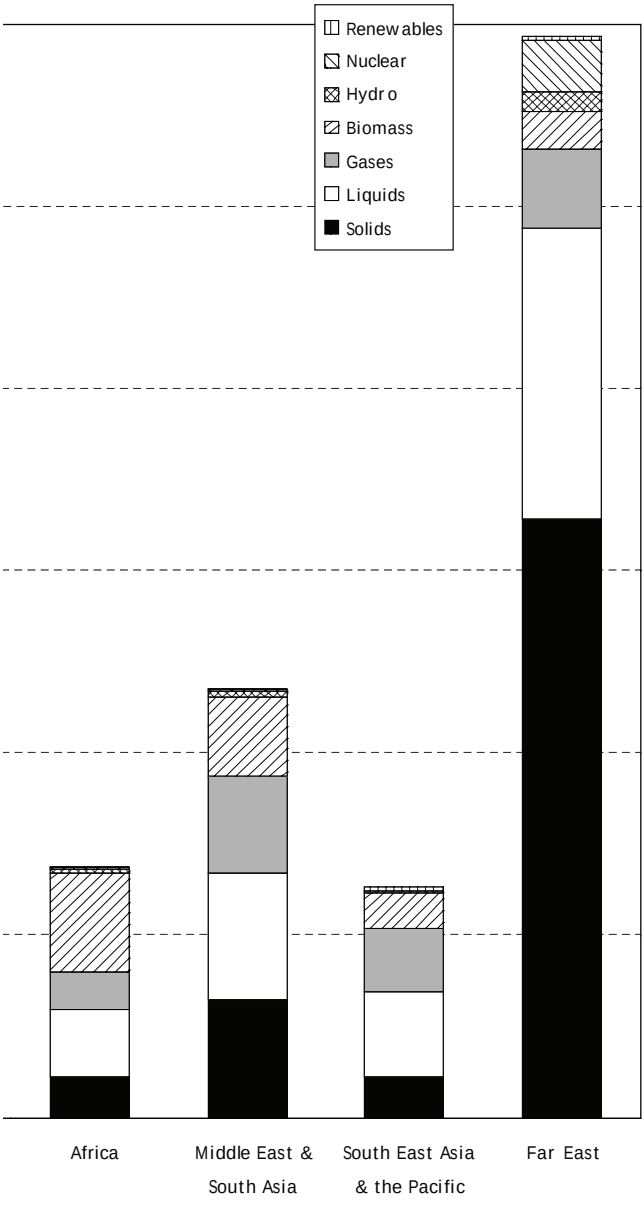


FIGURE 5. TOTAL ENERGY REQUIREMENT BY FUEL TYPE IN 2007


Renewables
Nuclear
Hydro
Biomass
Gases
Liquids
Solids
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

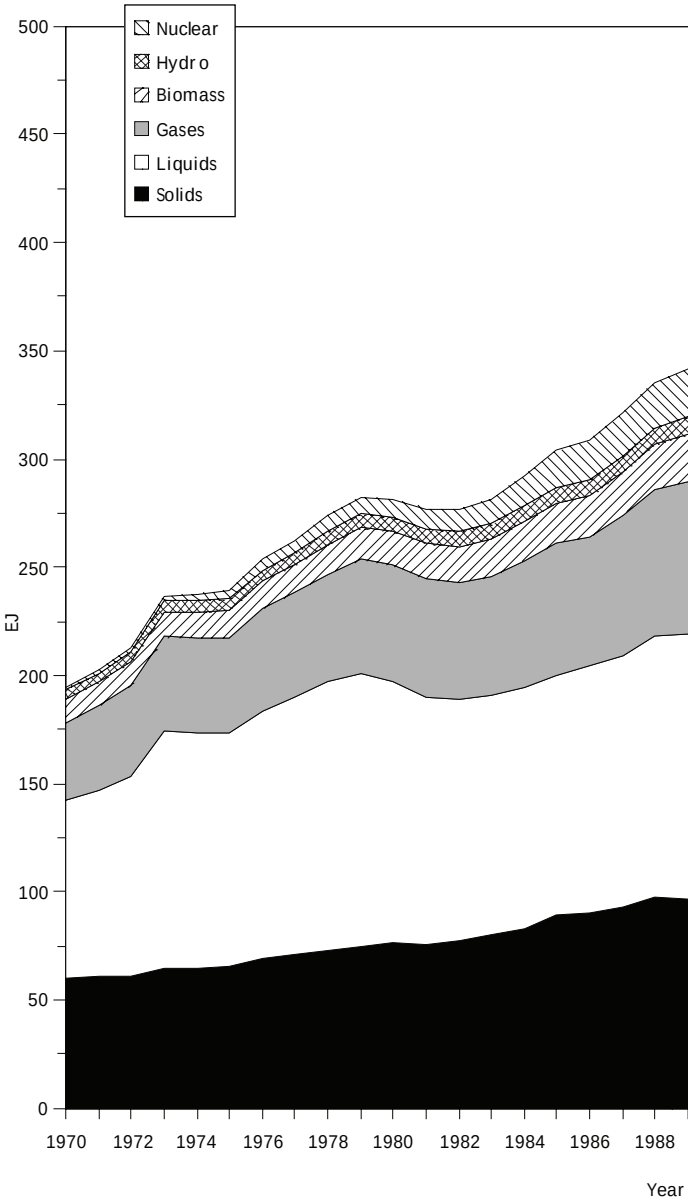


FIGURE 6. BREAKDOWN OF WORLD TOTAL ENERGY REQUIREMENT DURING THE PERIOD 1970 — 2007

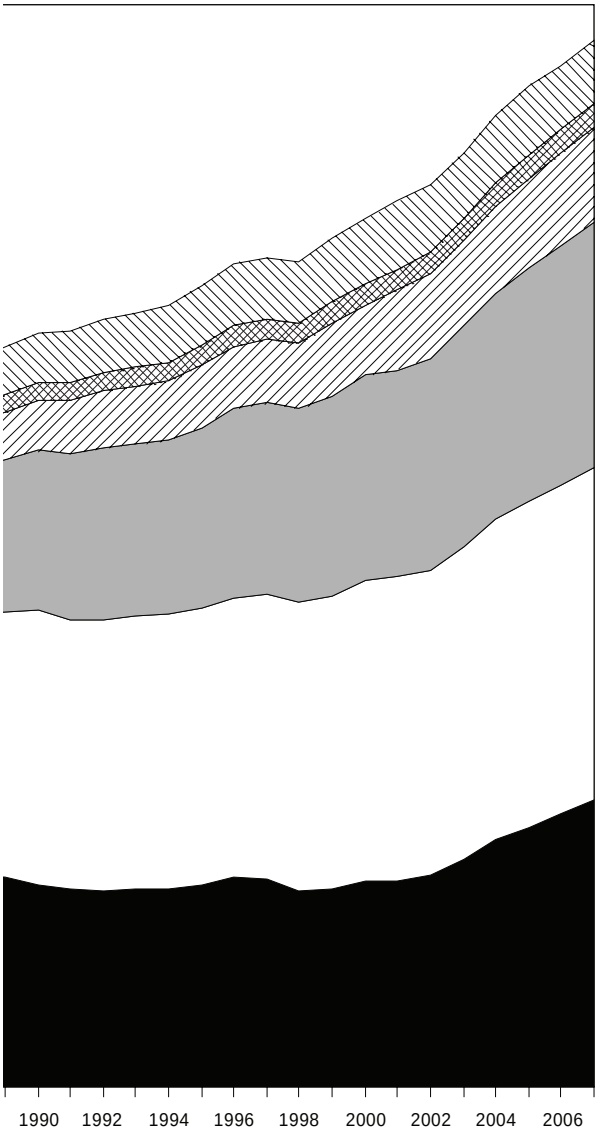

1990
1992
1994
1996
1998
2000
2002
2004
2006

TABLE 7. FUEL SHARES (%) OF ENERGY REQUIREMENT IN 2007 (*)

Country Group	Solids (a)	Liquids	Gases	Biomass (b)	Hydro	Nuclear	Renewables (c)	Total
North America	19.06	37.47	26.28	5.47	2.10	8.95	0.66	100.00
Latin America	4.32	47.44	23.92	13.89	8.23	1.00	1.20	100.00
Western Europe	15.24	34.82	27.40	5.89	2.62	12.88	1.14	100.00
Eastern Europe	20.57	19.77	49.33	2.48	2.00	6.20	-0.34	100.00
Africa	16.63	26.79	14.98	39.64	1.32	0.50	0.14	100.00
Middle East and South Asia	27.46	29.34	22.71	18.50	1.51	0.42	0.06	100.00
South East Asia and the Pacific	18.03	36.64	27.38	15.52	0.98		1.44	100.00
Far East	55.38	26.78	7.35	3.51	1.90	4.62	0.46	100.00
World Total	27.25	31.59	23.46	8.95	2.34	5.86	0.55	100.00

Notes:

(*) Total energy requirement is estimated as production of primary energy plus net trade (import - export) minus international bunkers and stock changes.

(a) Solids do not include commercial wood.

(b) The column headed 'Biomass' includes commercial wood, combustible renewables, waste and other biomass products.

(c) The column headed 'Renewables' includes geothermal, wind, solar, tide energy and net electricity trade.

TABLE 8. FUEL USE (EJ) FOR ELECTRICITY GENERATION BY TYPE OF FUEL IN 2007

Country Group	Thermal (a)	Hydro	Nuclear	Renewables (b)	Total
North America	22.96	2.29	9.76	0.72	35.72
Latin America	4.57	2.54	0.31	0.37	7.79
Western Europe	16.65	1.83	9.02	0.64	28.14
Eastern Europe	17.33	1.14	3.55	0.03	22.05
Africa	5.43	0.36	0.14	0.05	5.98
Middle East and South Asia	15.45	0.71	0.20	0.01	16.37
South East Asia and the Pacific	6.61	0.25		0.36	7.22
Far East	38.05	2.26	5.48	0.55	46.33
World Total	127.06	11.37	28.45	2.72	169.60

Notes:
(a) The column headed 'Thermal' is the total for solids, liquids, gases, biomass and waste.
(b) The column headed 'Renewables' includes geothermal, wind, solar and tide energy.

TABLE 9. PERCENTAGE CONTRIBUTION OF EACH FUEL TYPE TO ELECTRICITY GENERATION IN 2007

Country Group	Thermal (a)	Hydro	Nuclear	Renewables (b)	Total
North America	66.99	13.33	18.79	0.89	100.00
Latin America	39.53	57.29	2.30	0.88	100.00
Western Europe	52.96	16.64	27.11	3.29	100.00
Eastern Europe	65.02	17.24	17.67	0.06	100.00
Africa	79.52	17.81	2.23	0.43	100.00
Middle East and South Asia	81.79	16.15	1.48	0.58	100.00
South East Asia and the Pacific	88.72	9.63		1.65	100.00
Far East	77.05	12.54	10.06	0.35	100.00
World Total	67.57	17.18	14.19	1.05	100.00

Notes:
(a) The column headed 'Thermal' is the total for solids, liquids, gases, biomass and waste.
(b) The column headed 'Renewables' includes geothermal, wind, solar and tide energy.

TABLE 10. ESTIMATES OF POPULATION GROWTH BY REGION (*)

Country Group	2007		2010		2020		2030	
	Million Inhabitants	Growth Rate (%/a) 1997 — 2007	Million Inhabitants	Growth Rate (%/a) 2007 — 2010	Million Inhabitants	Growth Rate (%/a) 2010 — 2020	Million Inhabitants	Growth Rate (%/a) 2020 — 2030
North America	338	1.12	348	0.93	379	0.87	407	0.71
Latin America	573	1.44	595	1.23	659	1.04	711	0.76
Western Europe	471	0.43	475	0.27	484	0.19	488	0.09
Eastern Europe	404	-0.16	402	-0.19	393	-0.22	380	-0.35
Africa	926	2.13	984	2.05	1188	1.90	1398	1.64
Middle East and South Asia	1731	2.04	1816	1.62	2091	1.42	2325	1.07
South East Asia and the Pacific	415	1.49	428	1.09	469	0.91	500	0.64
Far East	1743	0.88	1778	0.67	1872	0.52	1914	0.22
World Total	6602	1.30	6827	1.12	7535	0.99	8123	0.75

(*) Projection figures are the arithmetic average between low and high estimates.

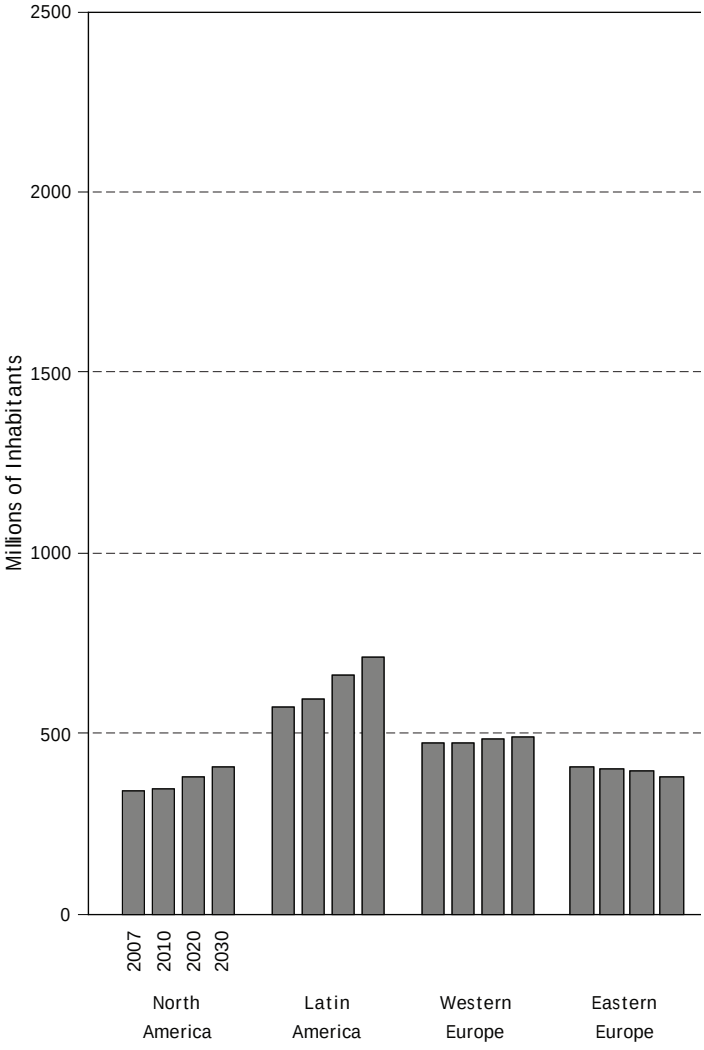


FIGURE 7. POPULATION ESTIMATES

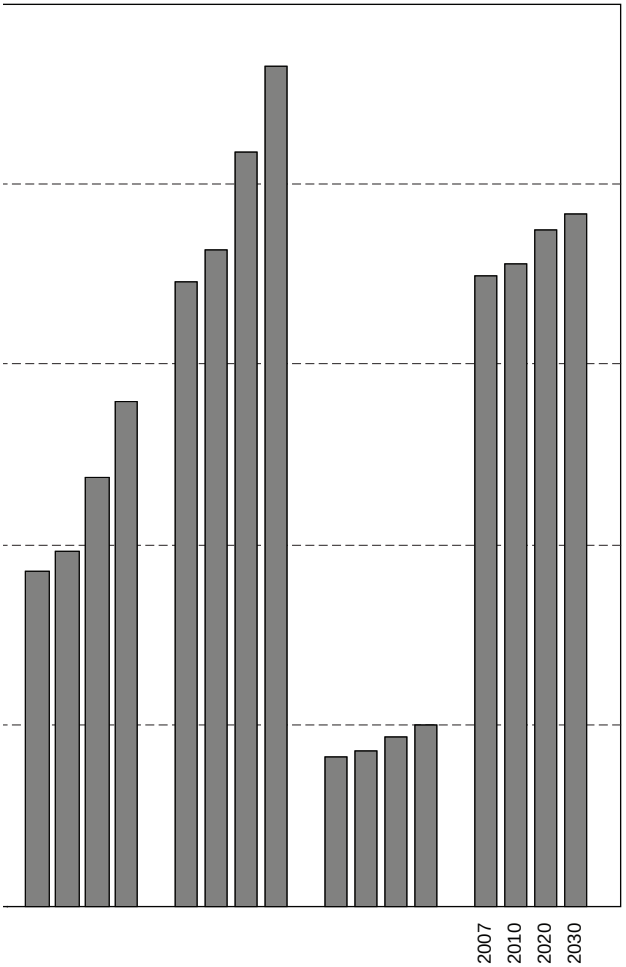

2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 11. ESTIMATES OF TOTAL ENERGY AND ELECTRICITY REQUIREMENT PER CAPITA

Country Group	2007		2010		2020		2030	
	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MWh/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MWh/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MWh/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MWh/cap)
North America	322	14.1	317 — 326	13.9 — 14.2	303 — 335	14.1 — 15.3	294 — 350	14.4 — 16.7
Latin America	54	2.1	54 — 55	2.1 — 2.2	58 — 65	2.4 — 2.8	64 — 80	2.8 — 3.9
Western Europe	149	6.5	148 — 151	6.7 — 6.9	149 — 161	7.3 — 9.0	150 — 175	7.9 — 11.8
Eastern Europe	142	4.6	145 — 149	4.8 — 5.1	164 — 185	6.1 — 8.3	185 — 228	7.7 — 13.8
Africa	30	0.6	29 — 30	0.6 — 0.6	29 — 33	0.7 — 0.8	29 — 37	0.7 — 1.1
Middle East and South Asia	27	0.7	28 — 29	0.7 — 0.8	30 — 34	0.8 — 1.1	34 — 42	1.0 — 1.5
South East Asia and the Pacific	61	1.7	63 — 66	1.8 — 1.9	71 — 82	2.2 — 2.6	83 — 104	2.7 — 3.6
Far East	68	2.9	73 — 74	2.9 — 3.0	90 — 99	3.8 — 4.3	110 — 132	4.8 — 5.8
World Average	74	2.8	74 — 76	2.8 — 2.9	78 — 87	3.1 — 3.7	84 — 102	3.5 — 4.8

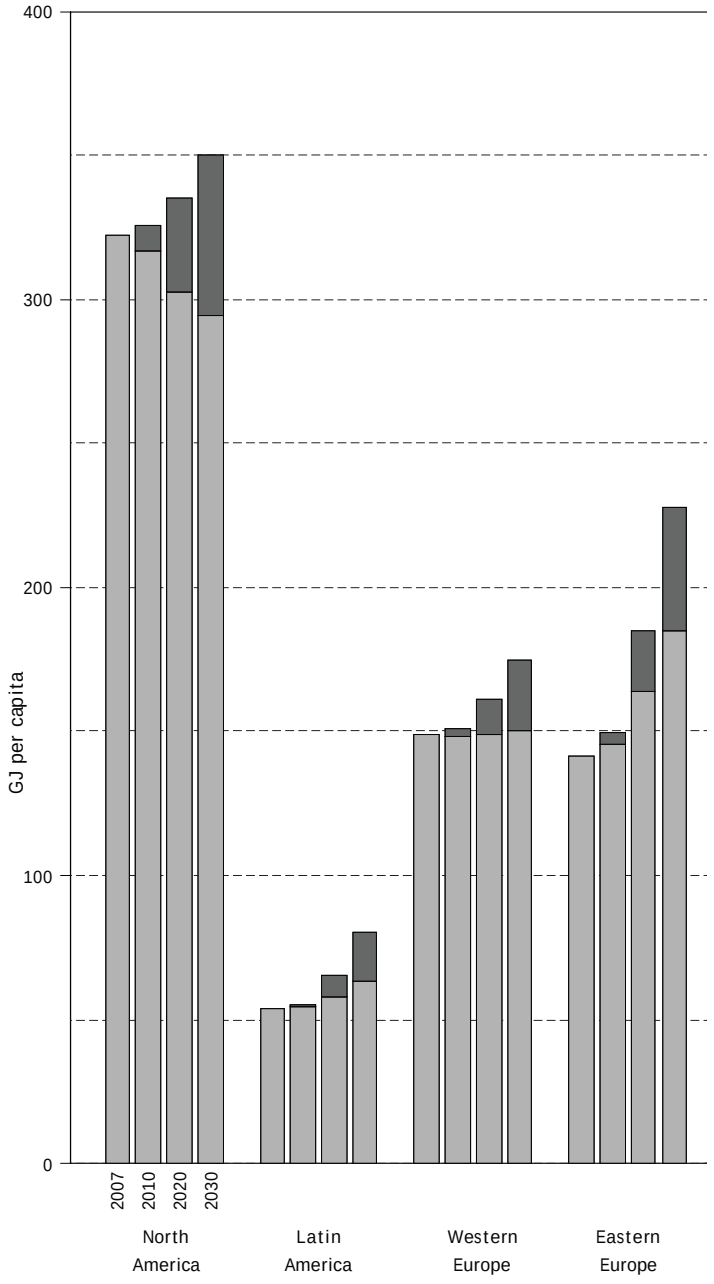
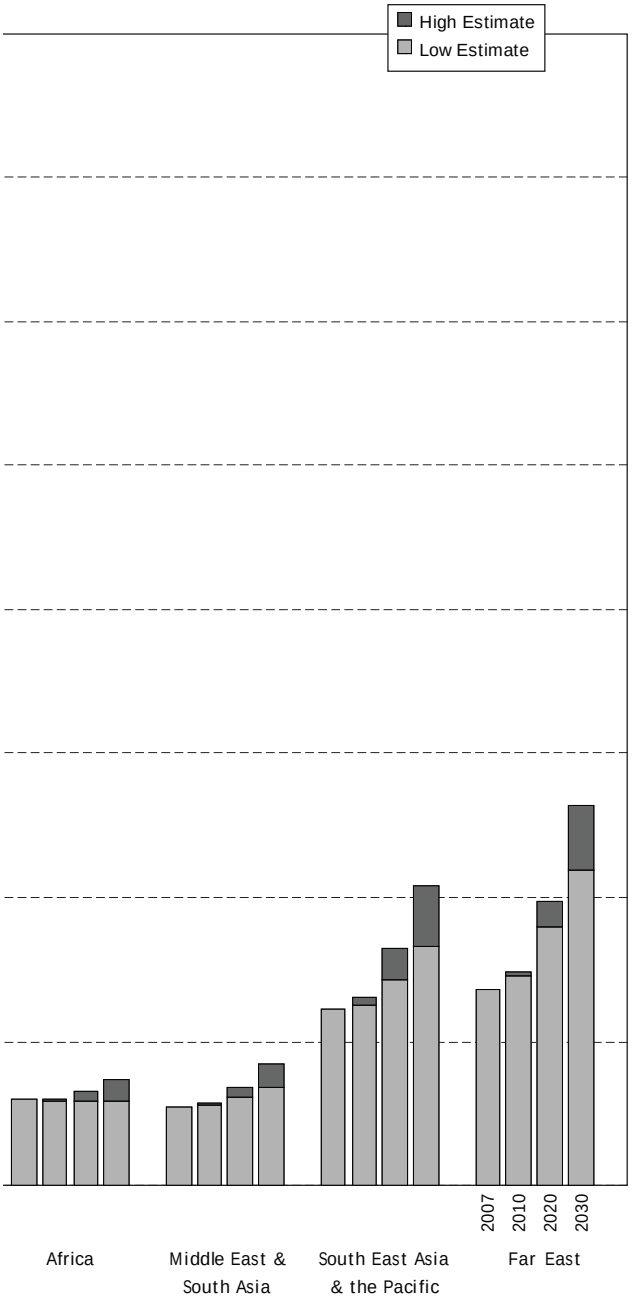


FIGURE 8. TOTAL ENERGY REQUIREMENT PER CAPITA


High Estimate
Low Estimate
2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

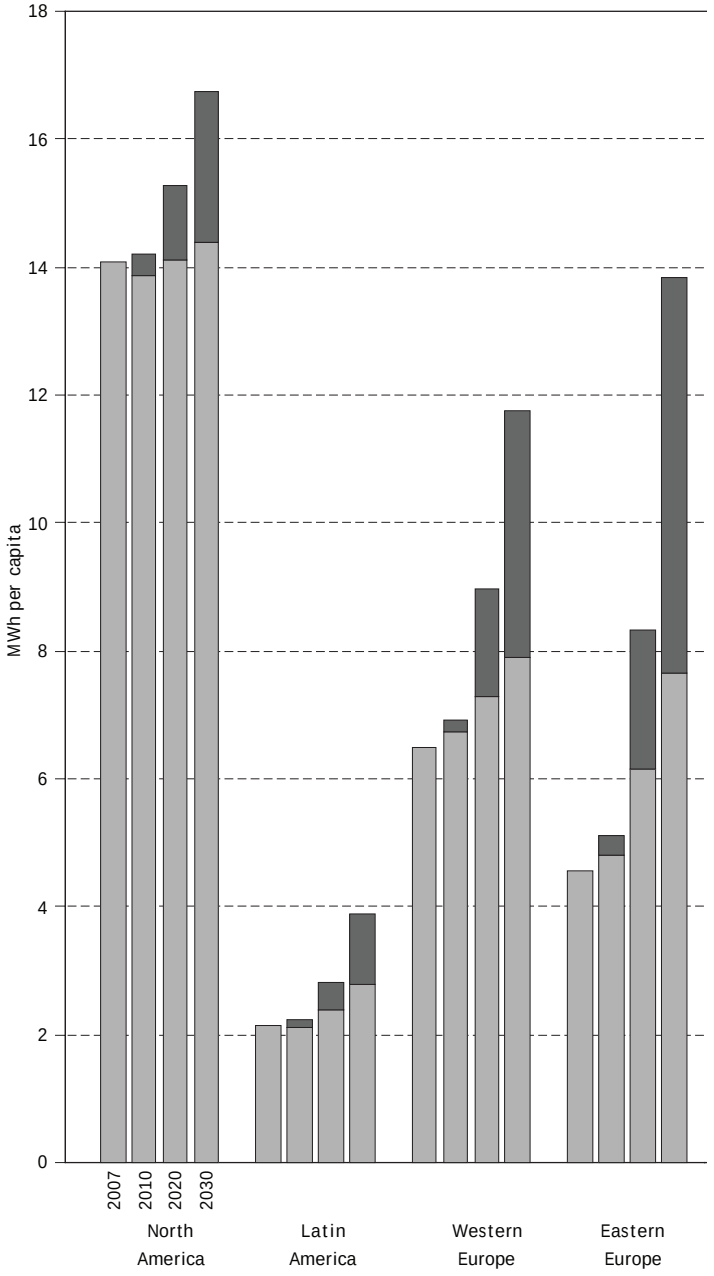


FIGURE 9. TOTAL ELECTRICITY REQUIREMENT PER CAPITA

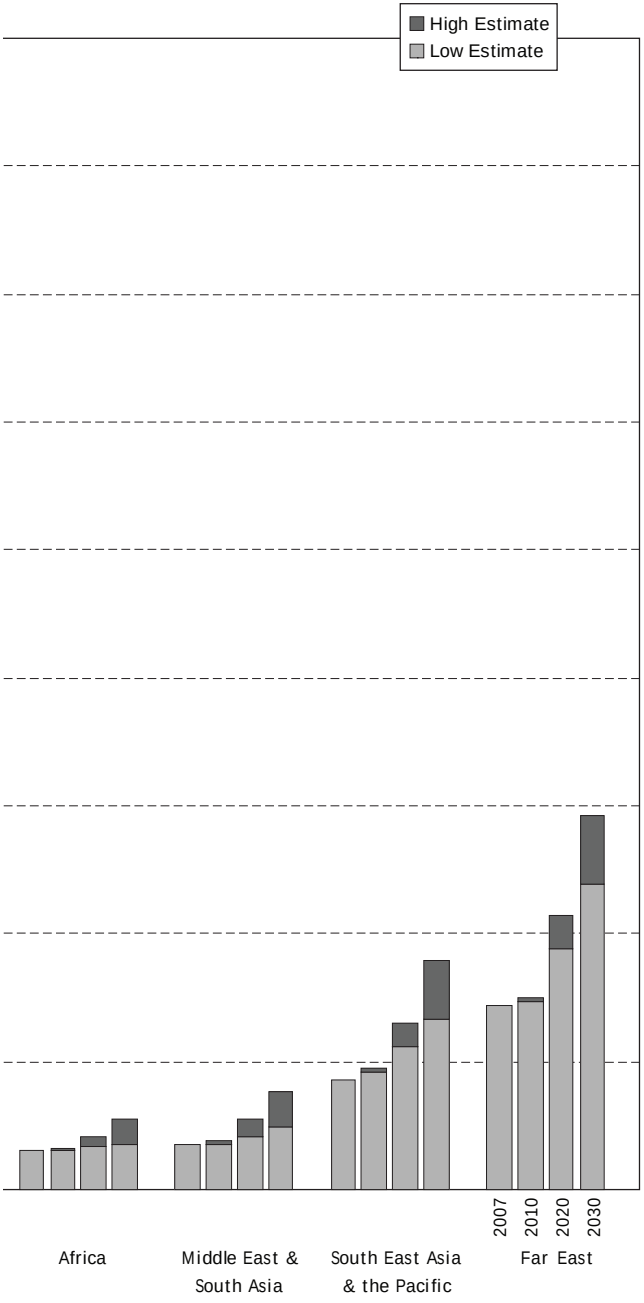

High Estimate
Low Estimate
2007
2010
2020
2030
Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 12. AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 1997—2007 (%)

Country Group	Population	Total Energy	Total Electricity	Nuclear Energy	Nuclear Capacity
North America	1.1	1.0	1.8	2.4	0.2
Latin America	1.4	2.2	3.6	3.1	3.6
Western Europe	0.4	1.0	1.8	-0.1	-0.4
Eastern Europe	-0.2	1.1	1.8	2.6	0.3
Africa	2.1	3.4	4.0	—	—
Middle East and South Asia	2.0	5.0	5.1	7.1	8.7
South East Asia and the Pacific	1.5	4.0	4.1		
Far East	0.9	4.4	7.0	1.4	2.6
World Average	1.3	2.5	3.4	1.4	0.6

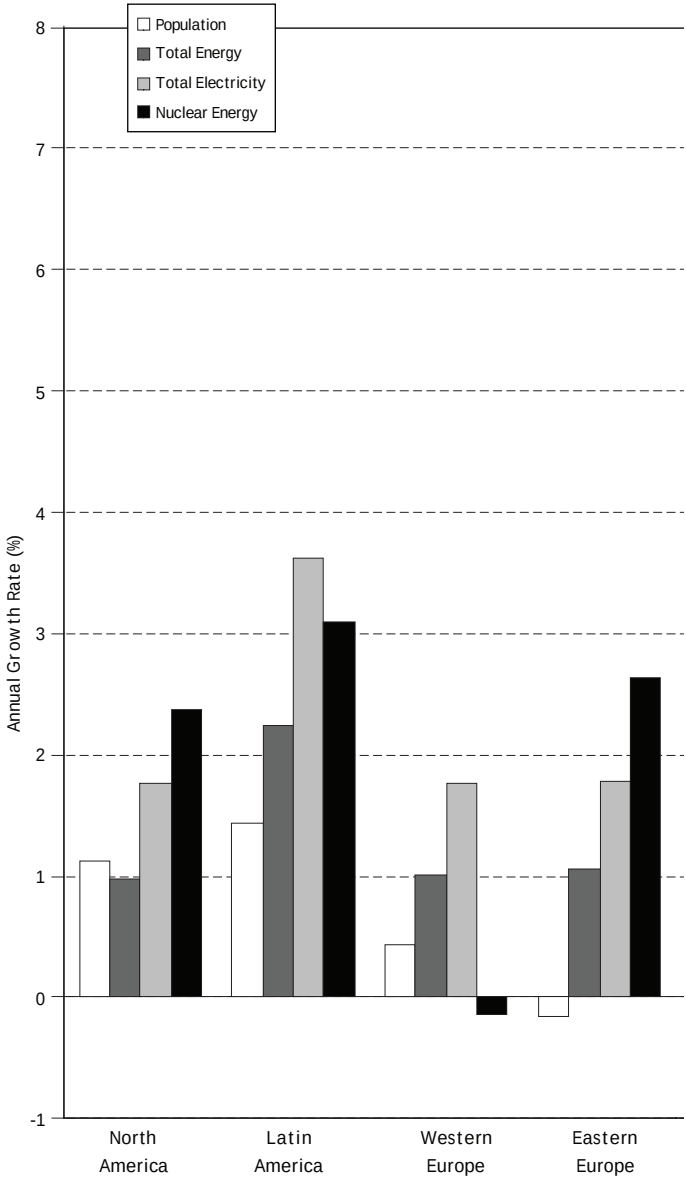


FIGURE 10. AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 1997 — 2007

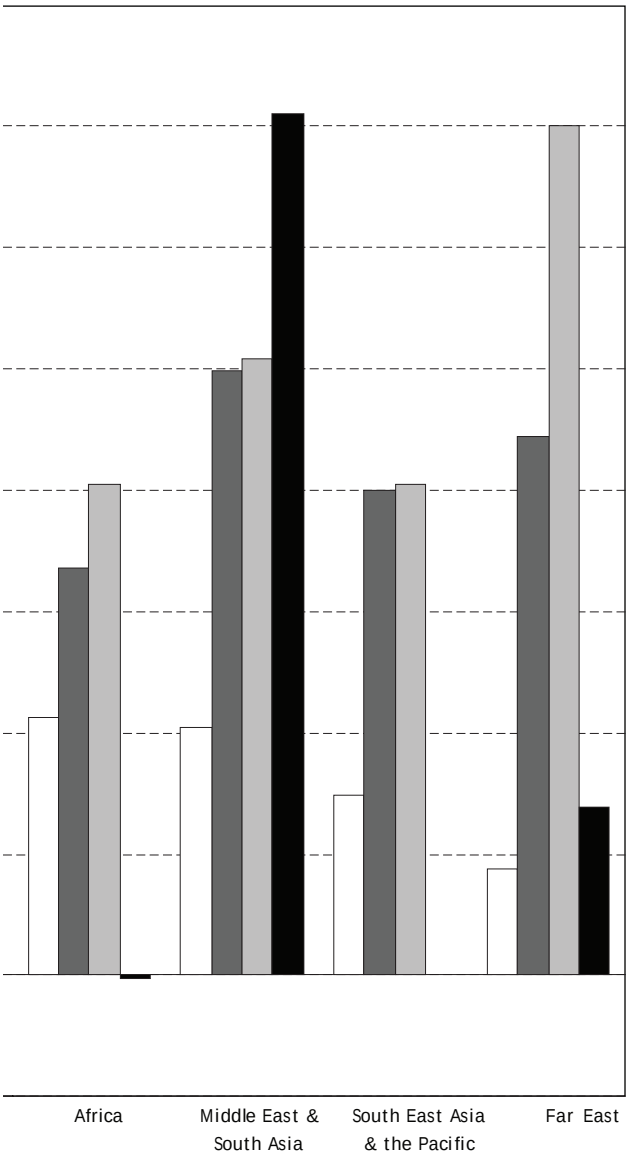

Africa
Middle East & South Asia
South East Asia & the Pacific
Far East

TABLE 13. ESTIMATES OF AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 2007—2030 (%)

Country Group	Population	Total Energy	Total Electricity	Nuclear Energy	Nuclear Capacity
North America	0.8	0.4 — 1.2	0.9 — 1.6	0.7 — 2.0	0.6 — 1.9
Latin America	0.9	1.7 — 2.7	2.1 — 3.6	4.2 — 7.7	3.8 — 7.2
Western Europe	0.2	0.2 — 0.9	1.0 — 2.8	-1.6 — 1.5	-2.2 — 0.9
Eastern Europe	-0.3	0.9 — 1.8	2.0 — 4.7	2.5 — 4.2	2.3 — 4.1
Africa	1.8	1.7 — 2.7	2.5 — 4.5	4.8 — 10.2	4.0 — 9.4
Middle East and South Asia	1.3	2.3 — 3.2	2.8 — 4.8	7.9 — 12.5	5.9 — 10.5
South East Asia and the Pacific	0.8	2.2 — 3.2	2.8 — 4.1		
Far East	0.4	2.5 — 3.3	2.7 — 3.6	3.5 — 5.1	3.0 — 4.6
World Average	0.9	1.5 — 2.3	1.9 — 3.3	1.3 — 3.3	1.0 — 3.1

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