

REFERENCE DATA SERIES No. 1
2014 Edition

Energy, Electricity and Nuclear Power Estimates for the Period up to 2050



IAEA

International Atomic Energy Agency

REFERENCE DATA SERIES No. 1

**ENERGY, ELECTRICITY AND
NUCLEAR POWER ESTIMATES
FOR THE PERIOD UP TO 2050**

2014 Edition

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ENERGY, ELECTRICITY AND
NUCLEAR POWER ESTIMATES
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Introduction

Reference Data Series No. 1 (RDS-1) is an annual publication — currently in its thirty-fourth edition — containing estimates of energy, electricity and nuclear power trends up to the year 2050.

RDS-1 starts with a summary of the situation of nuclear power in IAEA Member States as of the end of 2013. The data on nuclear power presented in Tables 1 and 2 are based on actual statistical data collected by the IAEA's Power Reactor Information System (PRIS). However, energy and electricity data for 2013 are estimated, as the latest information available from the United Nations Department of Economic and Social Affairs is for 2011. Population data originate from the World Population Prospects (2010 revision), published by the Population Division of the United Nations Department of Economic and Social Affairs. The 2013 values again are estimates.

As in previous editions, projections of future energy and electricity demand and the role of nuclear power are presented as low and high estimates encompassing the inherent uncertainties involved in projecting trends. The RDS-1 estimates should be viewed as very general growth trends whose validity must be constantly subjected to critical review.

Many international, national and private organizations routinely engage in energy demand and supply projections, including nuclear power. These projections are based on a multitude of different assumptions and aggregating procedures, making a straightforward comparison and synthesis very difficult. The basic differences relate to such fundamental input assumptions as:

- Economic growth;
- Correlation of economic growth and energy use;
- Technology performance and costs;
- Energy resource availability and future fuel prices;
- Energy policy and physical, environmental and economic constraints.

The projections presented in this publication are based on a compromise between:

- National projections supplied by each country for a recent OECD Nuclear Energy Agency study;

- Indicators of development published by the World Bank in its World Development Indicators;
- Global and regional energy, electricity and nuclear power projections made by other international organizations.

More specifically, the estimates of future nuclear generating capacity presented in Table 3 are derived using a country by country 'bottom up' approach. They are established by a group of experts participating in the IAEA's yearly consultancy on Nuclear Capacity Projections and are based upon a review of nuclear power projects and programmes in Member States. The experts consider all the operating reactors, possible licence renewals, planned shutdowns and plausible construction projects foreseen for the next several decades. They build the projections project by project by assessing the plausibility of each in light of, first, the low projection's assumptions and, second, the high projection's assumptions.

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.

The low case represents expectations about the future assuming that current market, technology and resource trends continue and there are few additional changes in laws, policies and regulations affecting nuclear power. Policy responses to the accident at the Fukushima Daiichi nuclear power plant, as understood in April 2014, are included in the projections. This case was explicitly designed to produce a 'conservative but plausible' set of projections. Additionally, the low case does not automatically assume that targets for nuclear power growth in a particular country will necessarily be achieved. These assumptions are relaxed in the high case.

The high case projections are much more ambitious, but still plausible and technically feasible. The high case assumes that current rates of economic and electricity

demand growth, especially in the Far East, continue. Changes in country policies toward climate change are also included in the high case.

Over the short term, the low price of natural gas and the impact of increasing capacities of subsidized intermittent renewable energy sources are expected to continue to have an impact on nuclear growth prospects in some regions of the developed world. These low natural gas prices are partly due to low demand as a result of macroeconomic conditions as well as technological advances. Moreover, the ongoing financial crisis continues to present challenges for capital intensive projects such as nuclear power. The assumption adopted by the expert group is that these challenges, in addition to the Fukushima Daiichi accident, continue to temporarily delay deployment of some nuclear power plants. In the longer run, the underlying fundamentals of population growth and demand for electricity in the developing world, as well as climate change and air quality concerns, security of energy supply and price volatility for other fuels continue to point to nuclear generating capacity playing an important role in the energy mix.

Most countries have finalized their nuclear safety reviews, undertaken after the Fukushima Daiichi accident, providing greater clarity with respect to nuclear power development. Nevertheless, challenges remain, given that policy responses to the Fukushima Daiichi accident are still evolving in some key regions. Once greater certainty about the policy and regulatory responses is established, these projections will be further refined.

Compared with the 2013 projections to 2030, the 2014 projections were reduced by 23 GW(e)¹ in the high case and 34 GW(e) in the low case. These reductions continue to reflect responses to the Fukushima Daiichi accident and the factors noted above, although the decline this year is slightly more than in 2013. Some of the effects of the Fukushima Daiichi accident include earlier than anticipated retirements, delayed or possibly cancelled new construction, and increased costs owing to changing

¹ The projections consist of both available capacity (currently supplying electricity to the grid) and installed nominal capacity (available, but not currently supplying electricity to the grid).

regulatory requirements in the high case projection. In addition, political and economic uncertainties have reduced low case projections in some regions. Nevertheless, interest in nuclear power remains strong in some regions, particularly in the developing world.

With respect to projections from 2030 to 2050, assumptions were made about the general rate of development and retirements. Given all the uncertainties, these estimates should be considered as suggestive of the actual outcomes.

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

Due to rounding, numbers presented throughout this publication may not add up precisely to the totals provided, and percentages may not precisely reflect the absolute figures.

Energy Units

1 MW(e) = 10^6 watts (electrical)

1 GW(e) = 1000 MW(e) = 10^9 watts (electrical)

1 GJ = 1 gigajoule = 10^9 joules

1 EJ = 1 exajoule = 10^{18} joules

1 EJ = 23.9 megatonnes of oil equivalent (Mtoe)

1 TW·h = 1 terawatt-hour = 10^9 kW·h = 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 Haiti*
Antigua and Barbuda Honduras*
Argentina* Jamaica*
Aruba Martinique
Bahamas* Mexico*
Barbados Montserrat
Belize* Netherlands Antilles
Bermuda Nicaragua*
Bolivia* Panama*
Brazil* Paraguay*
Cayman Islands Peru*
Chile* Puerto Rico
Colombia* S. Georgia & S. Sandwich Islands
Costa Rica* Saint Kitts and Nevis
Cuba* Saint Lucia
Dominica* Saint Pierre and Miquelon
Dominican Republic* Saint Vincent & the Grenadines
Ecuador* Suriname
El Salvador* Trinidad and Tobago*
Grenada Turks and Caicos Islands
Guadeloupe Uruguay*
Guatemala* Venezuela, Bolivarian Republic of*
Guyana

Western Europe

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

Eastern Europe

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

Africa

Algeria*
Angola*
Benin*
Botswana*
Burkina Faso*
Burundi*
Cameroon*
Cabo 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*
Libya*
Madagascar*
Malawi*
Mali*
Mauritania, Islamic Republic of*
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*	Kuwait*
Bahrain*	Lebanon*
Bangladesh*	Nepal*
Bhutan	Oman*
British Indian Ocean Territory	Pakistan*
Cocos (Keeling) Islands	Qatar*
French Southern Territories	Saudi Arabia*
Heard Island & McDonald Islands	Sri Lanka*
India*	Syrian Arab Republic*
Iran, Islamic Republic of*	T.T.U.T.J of T. Palestinian A.
Iraq*	United Arab Emirates*
Israel*	Yemen*
Jordan*	

South East Asia and the Pacific

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

Far East

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

TABLE 1. NUCLEAR POWER REACTORS IN THE WORLD (end of 2013)

Group and Country	In Operation		Long-term Shut Down Reactors		Under Construction		Electricity Supplied by Nuclear Power Reactors in 2013	
	Number of Units	Total MW(e)	Number of Units	Total MW(e)	Number of Units	Total MW(e)	TW-h	Percent of Total Electricity
North America								
Canada	19	13500					94.3	16.0
United States of America	100	99081			5	5633	790.2	19.4
Latin America								
Argentina	2	935			1	692	5.7	4.4
Brazil	2	1884			1	1245	13.8	2.8
Mexico	2	1330					11.4	4.6
Western Europe								
Belgium	7	5927					40.6	52.1
Finland	4	2752			1	1600	22.7	33.3
France	58	63130			1	1630	405.9	73.3
Germany	9	12068					92.1	15.4
Netherlands	1	482					2.7	2.8
Spain	7	7121	1	446			54.3	19.7
Sweden	10	9474					63.7	42.7
Switzerland	5	3308					25.0	36.4
United Kingdom	16	9243					64.1	18.3
Eastern Europe								
Armenia	1	375					2.2	29.2
Belarus					1	1109		
Bulgaria	2	1906					13.3	30.7
Czech Republic	6	3884					29.0	35.9

TABLE 1. NUCLEAR POWER REACTORS IN THE WORLD (end of 2013)

Group and Country	In Operation		Long-term Shut Down Reactors		Under Construction		Electricity Supplied by Nuclear Power Reactors in 2013	
	Number of Units	Total MW(e)	Number of Units	Total MW(e)	Number of Units	Total MW(e)	TW-h	Percent of Total Electricity
Hungary	4	1889					14.5	50.7
Romania	2	1300					10.7	19.8
Russian Federation	33	23643			10	8382	161.7	17.5
Slovakia	4	1815			2	880	14.6	51.7
Slovenia	1	688					5.0	33.6
Ukraine	15	13107			2	1900	78.2	43.6
Africa								
South Africa	2	1860					13.6	5.7
Middle East and South Asia								
India	21	5308			6	3907	30.0	3.5
Iran, Islamic Republic of	1	915					3.9	1.5
Pakistan	3	690			2	630	4.4	4.4
United Arab Emirates					2	2690		
Far East								
China	20	15977			29	28774	104.8	2.1
Japan	48	42388	1	246	2	1325	13.9	1.7
Korea, Republic of	23	20721			5	6370	132.5	27.6
World Total (*)	434	371733	2	692	72	69367	2358.6	11.0

Notes:

(*) Including the following data from Taiwan, China:

— 6 units in operation with total capacity of 5032 MW(e); 2 units under construction with total capacity of 2600 MW(e);

— 39.8 TW-h of nuclear electricity generation, representing 19.1% of the total electricity generated.

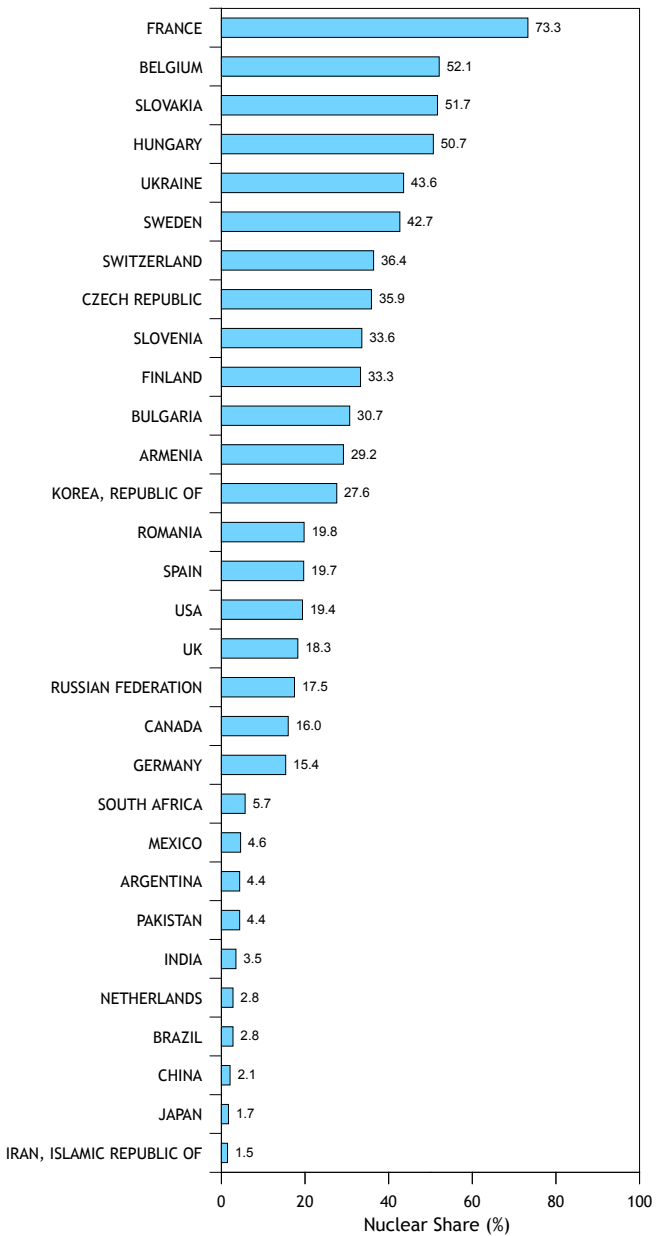


FIGURE 1. NUCLEAR SHARE OF TOTAL ELECTRICITY GENERATION IN 2013

Note: The nuclear share of electricity generation in Taiwan, China, was 19.1%.

TABLE 2. NUMBER OF COUNTRIES WITH NUCLEAR POWER REACTORS IN OPERATION OR UNDER CONSTRUCTION (end of 2013)

Country Group	Number of Countries in Group	Countries with Nuclear Power Reactors				Total (b)
		In Operation	Long-term Shut Down	Under Construction (a)	Total (a)	
North America	2	2		1	2	
Latin America	45	3		2	3	
Western Europe	29	9	1	2	9	
Eastern Europe	27	9		4	10	
Africa	57	1			1	
Middle East and South Asia	25	3		3	4	
South East Asia and the Pacific	29					
Far East	11	3	1	3	3	
World Total	225	30	2	15	32	

Notes:

(a) May include countries having reactors already in operation.

(b) 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	2013		2020 (a)		2030 (a)		2050 (a)(b)	
	Total Elect. GW(e)	Nuclear GW(e) %	Total Elect. GW(e)	Nuclear GW(e) %	Total Elect. GW(e)	Nuclear GW(e) %	Total Elect. GW(e)	Nuclear GW(e) %
North America	1210	112.6 9.3	1288 1314	111.9 118.7 8.7 9.0	1361 1530	92.4 138.9 6.8 9.1	1485 156.6 60.0 10.5	60.0 156.6 4.0 10.5
Latin America	351	4.1 1.2	455 537	4.5 5.8 1.0 1.1	978 1283	6.9 14.5 0.7 1.1	1881 58.9 13.0 3.1	13.0 58.9 0.7 3.1
Western Europe	905	113.5 12.5	1024 1059	100.5 112.4 9.8 10.6	1151 1391	68.3 119.9 5.9 8.6	1600 131.0 33.3 8.2	33.3 131.0 2.1 8.2
Eastern Europe	476	48.6 10.2	606 606	59.5 67.6 9.8 11.2	663 838	63.9 102.6 9.6 12.2	946 142.3 65.7 15.0	65.7 142.3 7.0 15.0
Africa	147	1.9 1.3	298 315	1.9 1.9 0.6 0.6	606 816	1.9 9.9 0.3 1.2	1989 42.4 7.0 2.1	7.0 42.4 0.4 2.1
Middle East and South Asia	546	6.9 1.3	650 945	12.0 17.4 1.8 1.8	1707 1868	28.2 54.5 1.7 2.9	5639 141.8 47.8 2.5	47.8 141.8 0.8 2.5
South East Asia and the Pacific	221		315 329		509 554	0.0 4.0 0.0 0.7	1320 20.0 5.0 1.5	5.0 20.0 0.4 1.5
Far East	1849	84.1 4.6	2353 2482	99.9 139.7 4.2 5.6	2983 3487	139.0 254.9 4.7 7.3	5442 398.7 181.0 7.3	181.0 398.7 3.3 7.3
World Total	5705	371.7 6.5	6989 7587	390.1 463.5 5.6 6.1	9958 11767	400.6 699.2 4.0 5.9	20302 1091.7 412.9 5.4	412.9 1091.7 2.0 5.4

Notes:

- (a) Nuclear capacity estimates take into account the scheduled retirement of the older units at the end of their lifetime.
(b) Projection figures for total electric generating capacities are the arithmetic average between the low and high estimates.

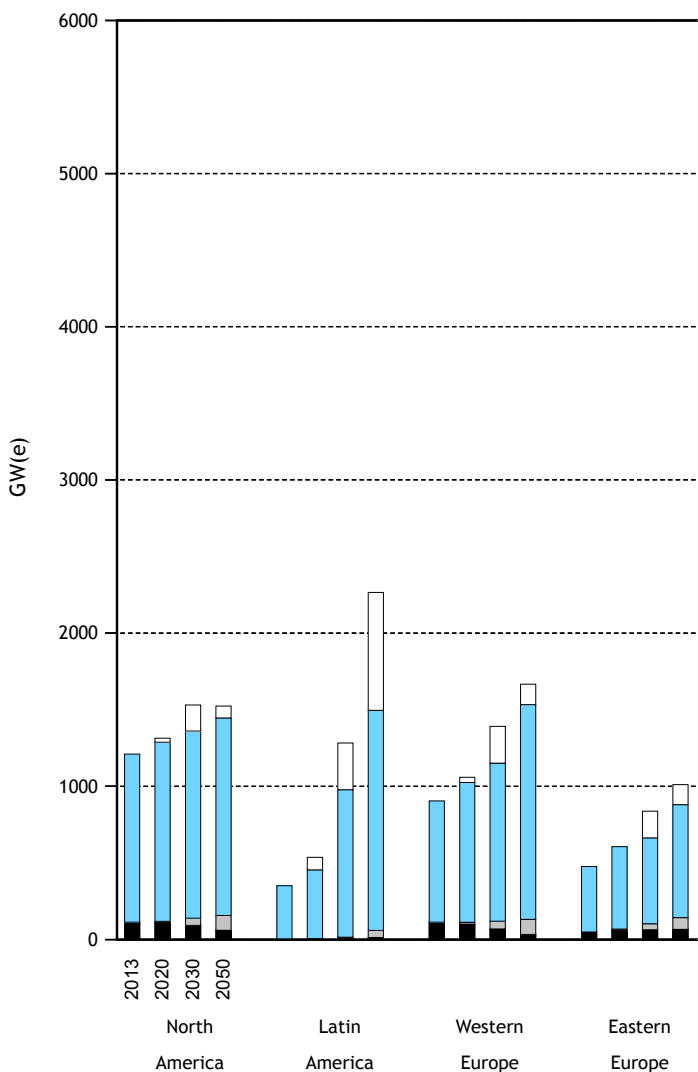


FIGURE 2. TOTAL AND NUCLEAR ELECTRICAL GENERATING CAPACITY

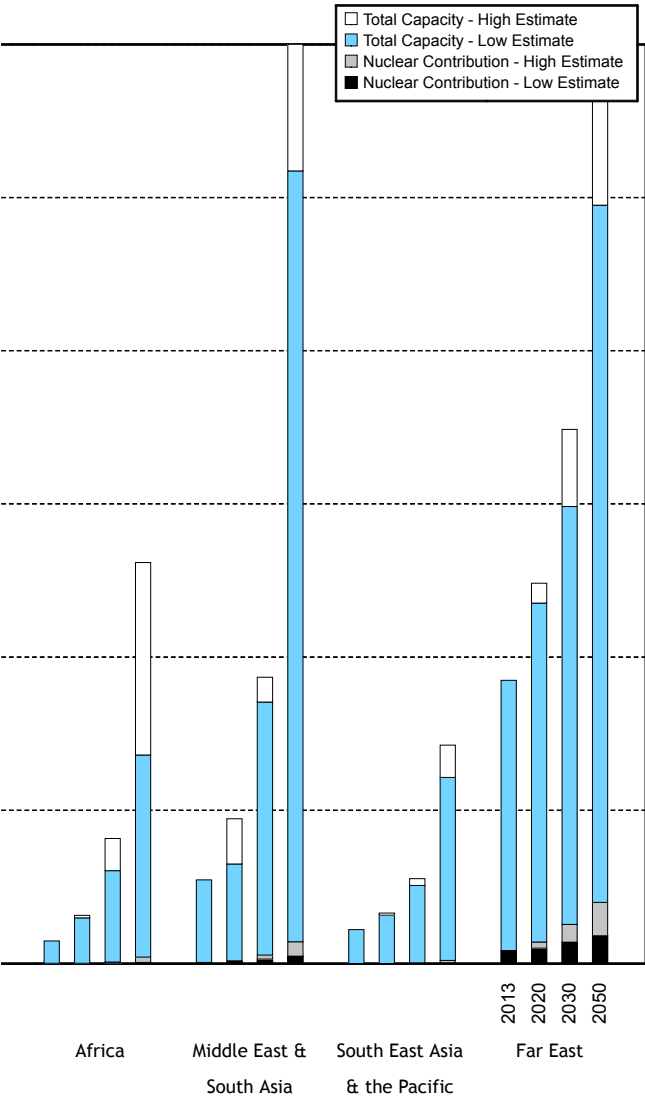


TABLE 4. ESTIMATES OF TOTAL ELECTRICITY GENERATION AND CONTRIBUTION BY NUCLEAR POWER (*)

Country Group	2013				2020				2030				2050 (a)					
	Total Elect.		Nuclear		Total Elect.		Nuclear		Total Elect.		Nuclear		Total Elect.		Nuclear			
	TW·h	%	TW·h	%	TW·h	%	TW·h	%	TW·h	%	TW·h	%	TW·h	%	TW·h	%		
North America	4663	19.0	884.5	19.0	4911	18.0	882	18.0	5151	14.1	729	14.1	5673	484	8.5	1262	22.2	
Latin America	1413	30.9	30.9	2.2	2001	1.7	34	2.1	3335	54	114	1.6	6831	105	1.5	474	6.9	
Western Europe	3183	771.1	24.2	3552	21.1	748	22.7	4028	538	13.4	538	20.0	5818	268	4.6	1056	18.2	
Eastern Europe	1868	329.2	17.6	2136	20.7	443	22.8	2524	504	20.0	809	26.6	3637	530	14.6	1147	31.5	
Africa	691	13.6	2.0	1058	1.3	14	1.2	2069	15	0.7	78	2.8	7417	56	0.8	342	4.6	
Middle East and South Asia	1993	38.3	1.9	2835	3.0	84	3.7	6245	223	3.6	430	6.4	21133	385	1.8	1143	5.4	
South East Asia and the Pacific	866			1113				1771	0	0.0	32	1.6	4640	40	0.9	161	3.5	
Far East	6688	291.0	4.4	8029	8.1	649	9.6	10586	1036	9.8	1825	13.6	21263	1459	6.9	3214	15.1	
World Total	21365	2358.6	11.0	25635	11.1	2854	12.1	35709	3099	8.7	5328	12.5	76412	3327	4.4	8799	11.5	
	High Estimate			27599		3330		42733										

Notes:

(*) 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.

(a) Projection figures for total electricity generation are the arithmetic average between the low and high estimates.

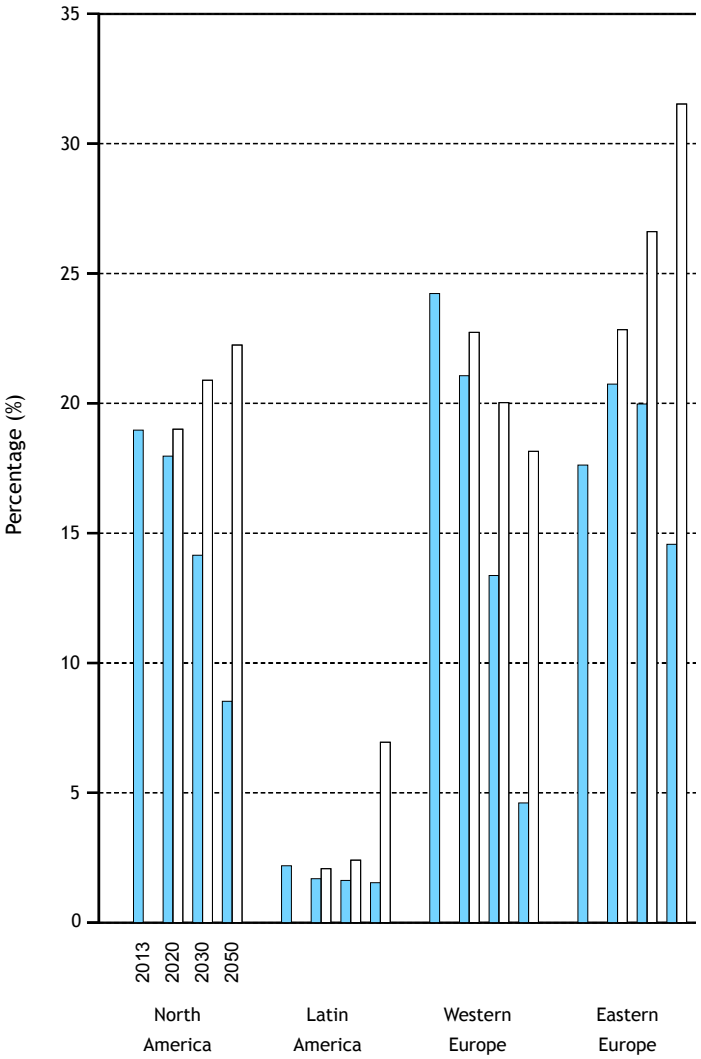


FIGURE 3. PERCENTAGE OF ELECTRICITY SUPPLIED BY NUCLEAR POWER

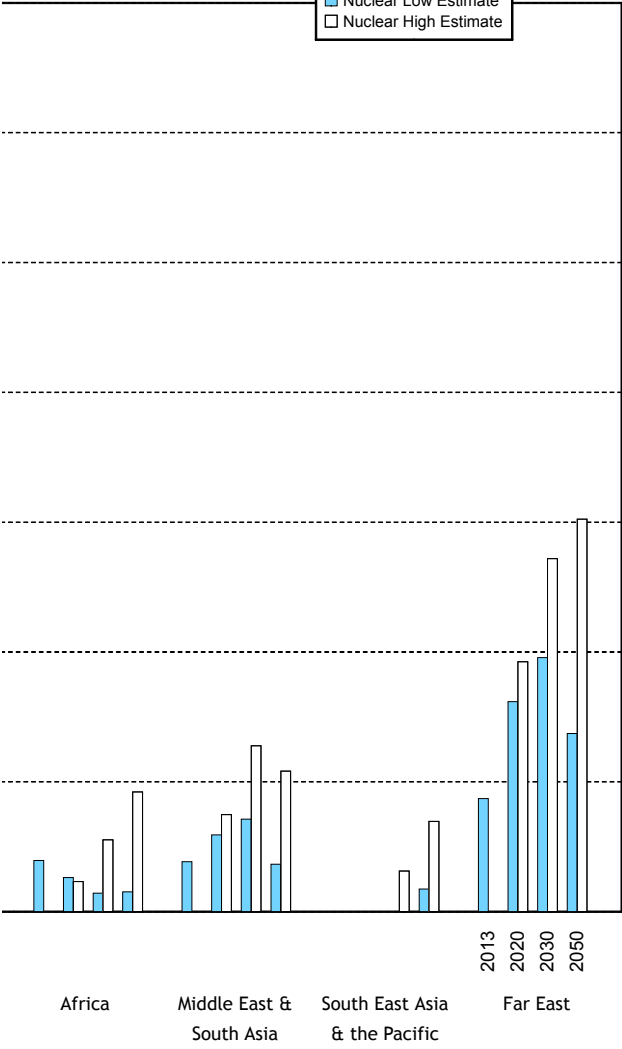
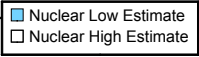


TABLE 5. ESTIMATES OF TOTAL ENERGY REQUIREMENT (EJ), PERCENTAGE USED FOR ELECTRICITY GENERATION, AND PERCENTAGE SUPPLIED BY NUCLEAR ENERGY (*)

Country Group	2013			2020			2030			2050 (a)		
	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	102.1	41.1	9.5	103 109	44 41	9.3 9.4	102 108	46 45	7.8 11.1	103	50	5.3 13.0
Latin America	34.8	25.6	1.0	48 51	27 28	0.8 0.9	61 83	36 38	1.0 1.5	104	43	1.3 4.2
Western Europe	64.8	38.7	13.0	71 73	39 40	11.5 12.5	79 86	38 43	7.4 11.9	93	47	3.3 11.6
Eastern Europe	56.7	38.5	6.3	63 66	41 41	7.7 8.4	65 78	47 47	8.5 11.4	89	50	7.1 13.0
Africa	28.4	22.4	0.5	34 37	33 35	0.4 0.4	53 90	42 34	0.3 0.9	190	42	0.5 1.5
Middle East and South Asia	69.2	33.5	0.6	89 103	34 36	1.0 1.3	151 170	44 45	1.6 2.8	463	51	1.0 2.4
South East Asia and the Pacific	25.7	32.4		30 31	36 35		40 41	43 47	0.0 0.8	97	46	0.5 1.7
Far East	169.4	40.9	1.9	191 206	40 42	3.7 4.6	242 305	42 42	4.7 6.5	415	49	4.3 7.5
World Total (b)	567.4	36.1	4.5	647 695	37 38	4.8 5.2	820 995	41 41	4.1 5.8	1616	46	2.5 5.4

Notes:

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

(a) Projection figures for total energy requirement and percentage used for electricity generation are the arithmetic average between the low and high estimates.

(b) World Total energy requirement includes international bunkers.

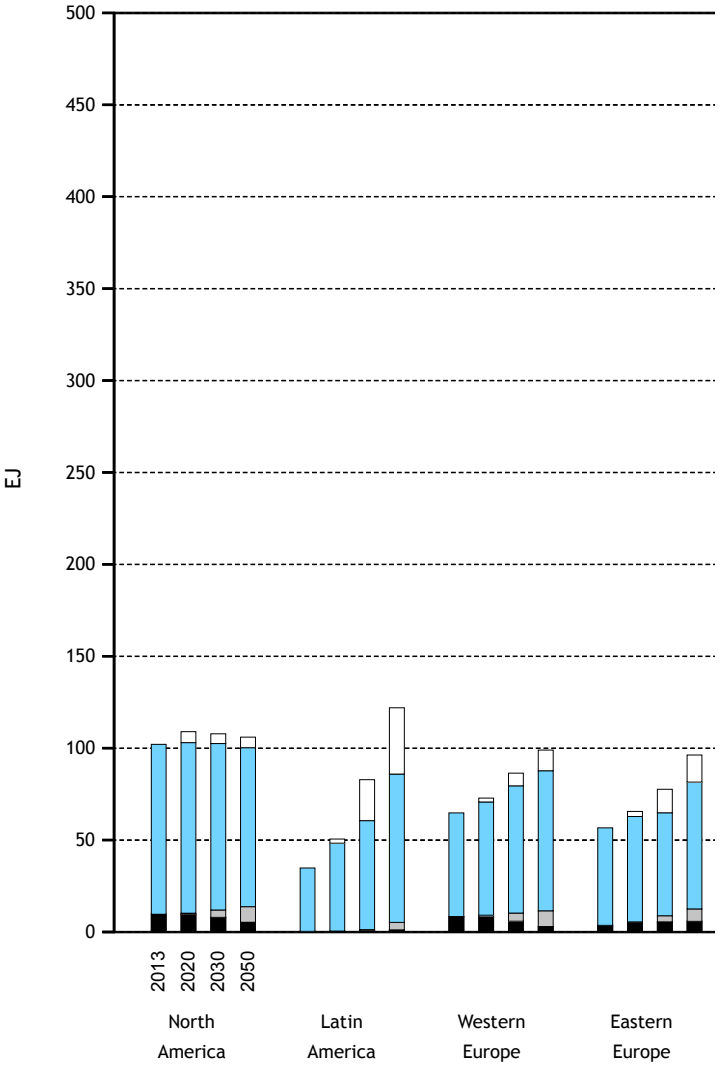


FIGURE 4. ESTIMATES OF TOTAL ENERGY REQUIREMENT

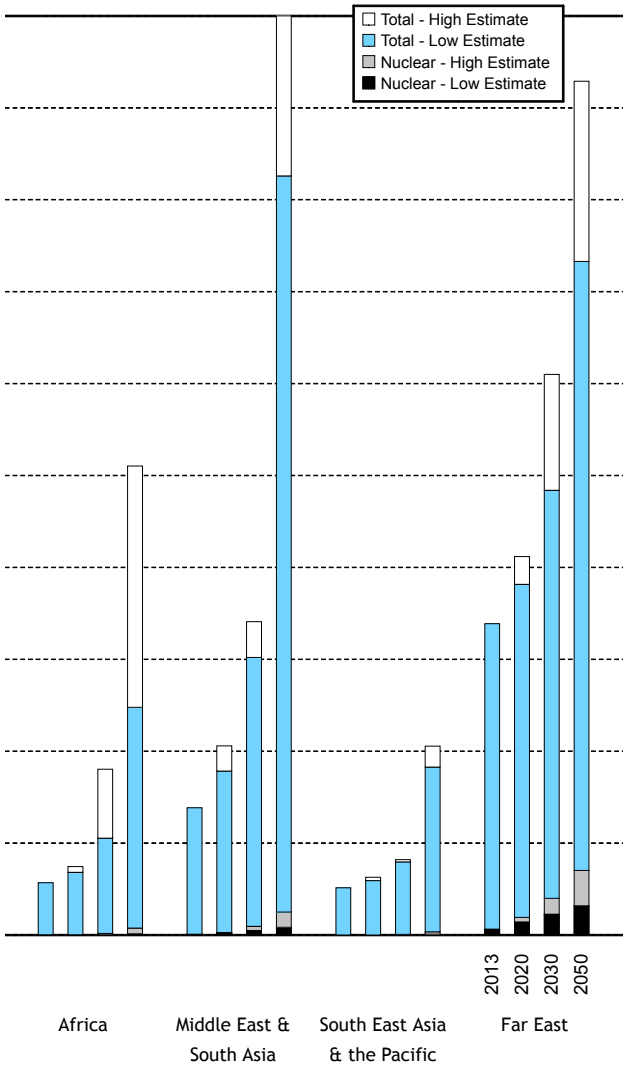


TABLE 6. TOTAL ENERGY REQUIREMENT (EJ) BY TYPE OF FUEL IN 2013 (*)

Country Group	Coal (a)	Oil (b)	Natural Gas (c)	Biofuels (d)	Hydro	Nuclear	Renewables (e)	Total
North America	19.19	36.05	29.10	4.53	2.38	9.65	1.18	102.08
Latin America	1.80	15.94	8.50	5.08	2.59	0.34	0.55	34.80
Western Europe	9.50	21.32	15.95	5.58	2.00	8.41	2.02	64.78
Eastern Europe	13.06	12.41	24.59	1.78	1.19	3.59	0.06	56.67
Africa	5.27	6.28	4.06	12.19	0.39	0.15	0.10	28.44
Middle East and South Asia	14.16	23.34	19.56	10.77	0.78	0.42	0.19	69.22
South East Asia and the Pacific	4.89	9.48	5.88	4.04	0.30		1.07	25.66
Far East	97.24	36.68	13.48	12.74	3.85	3.17	2.20	169.36
World Total (f)	165.11	177.84	121.10	56.71	13.48	25.73	7.38	567.35

Notes:

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

(a) The column headed 'Coal' includes coal, coal products, peat and peat products.

(b) The column headed 'Oil' includes crude oil, natural gas liquids (NGLs), oil products, oil shale and oil sands.

(c) The column headed 'Natural Gas' includes natural gas in all its forms, including liquid natural gas (LNG).

(d) The column headed 'Biofuels' includes commercial wood, charcoal, combustible renewables, waste and other energy products derived directly or indirectly from biomass.

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

(f) World Total energy requirement includes international bunkers.

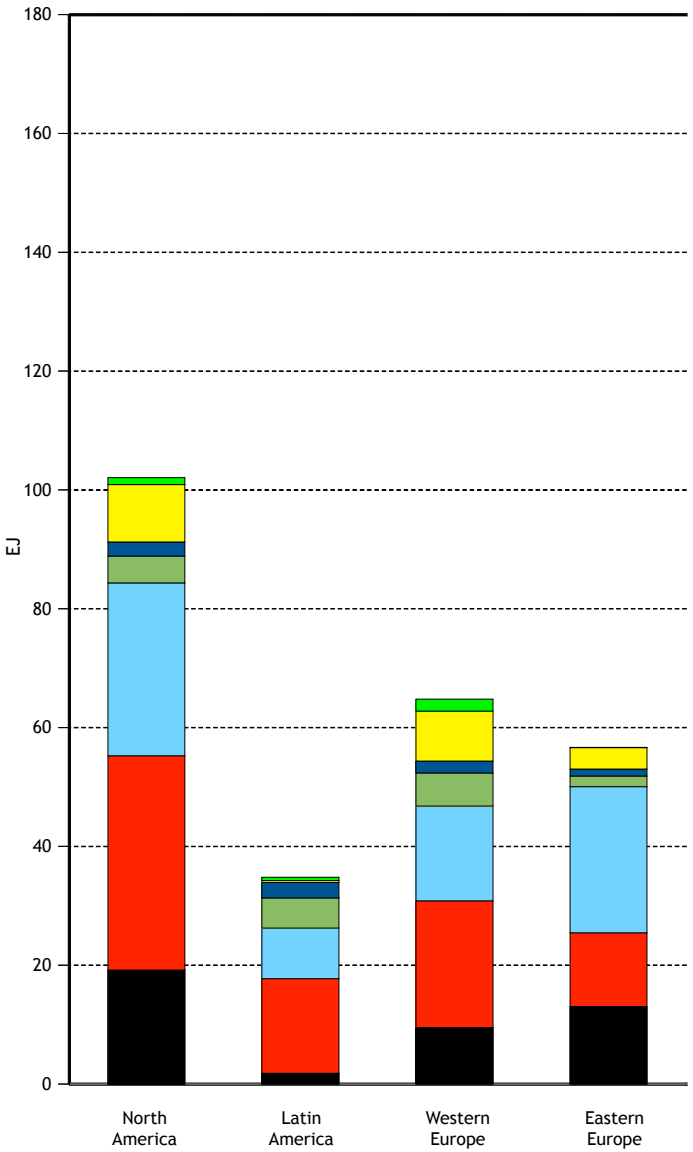
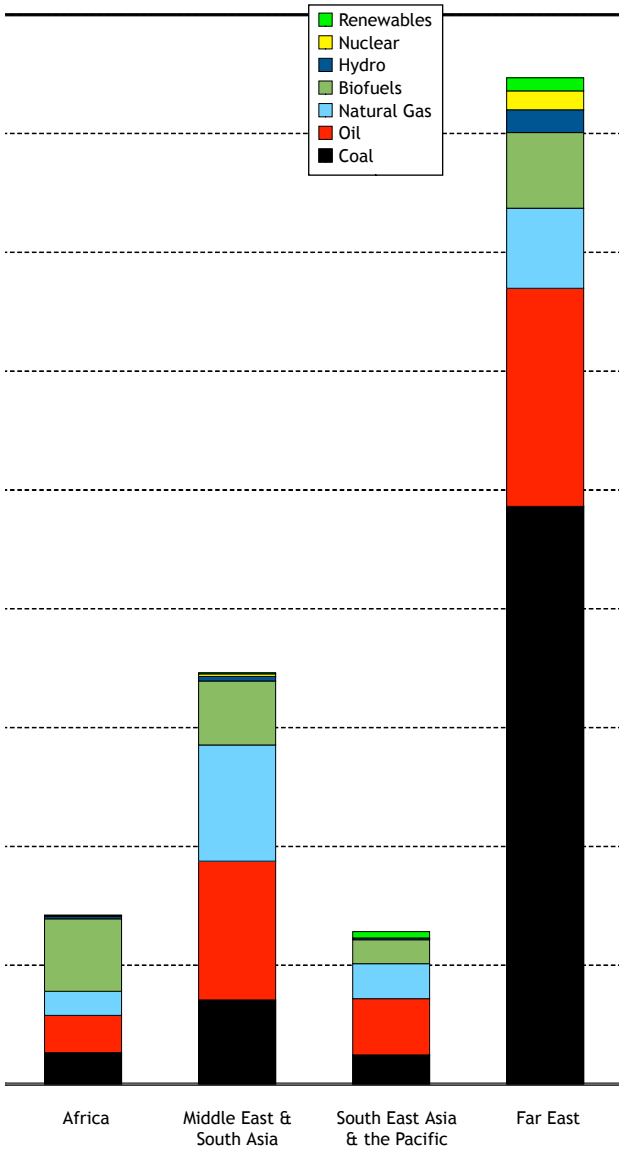


FIGURE 5. TOTAL ENERGY REQUIREMENT BY TYPE OF FUEL IN 2013



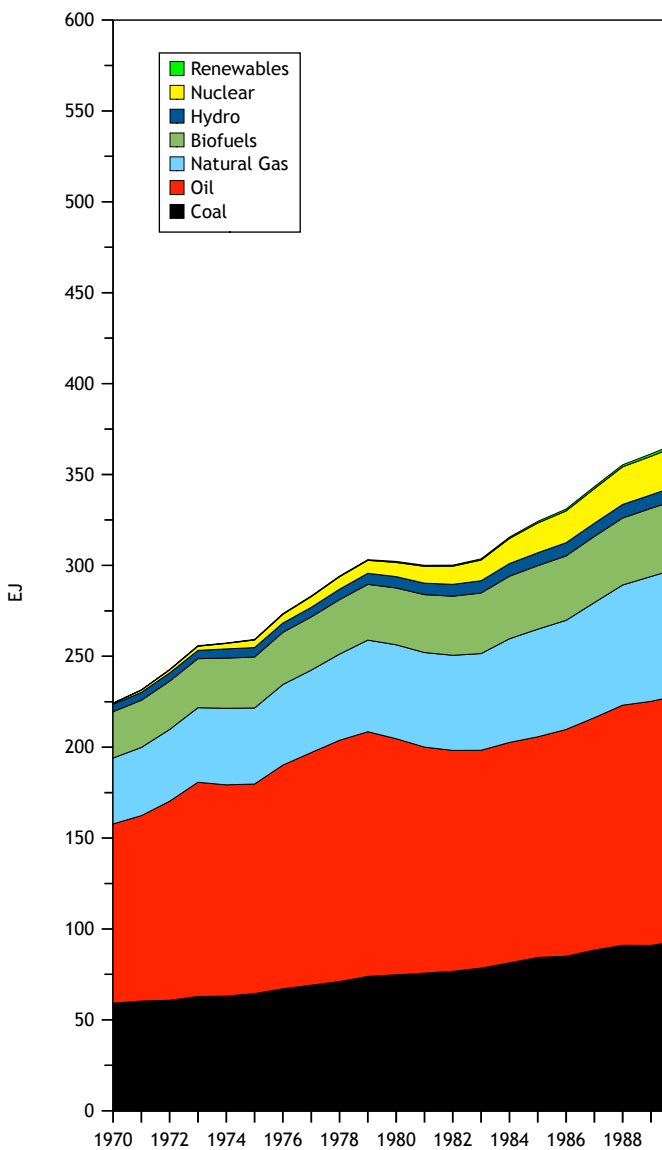
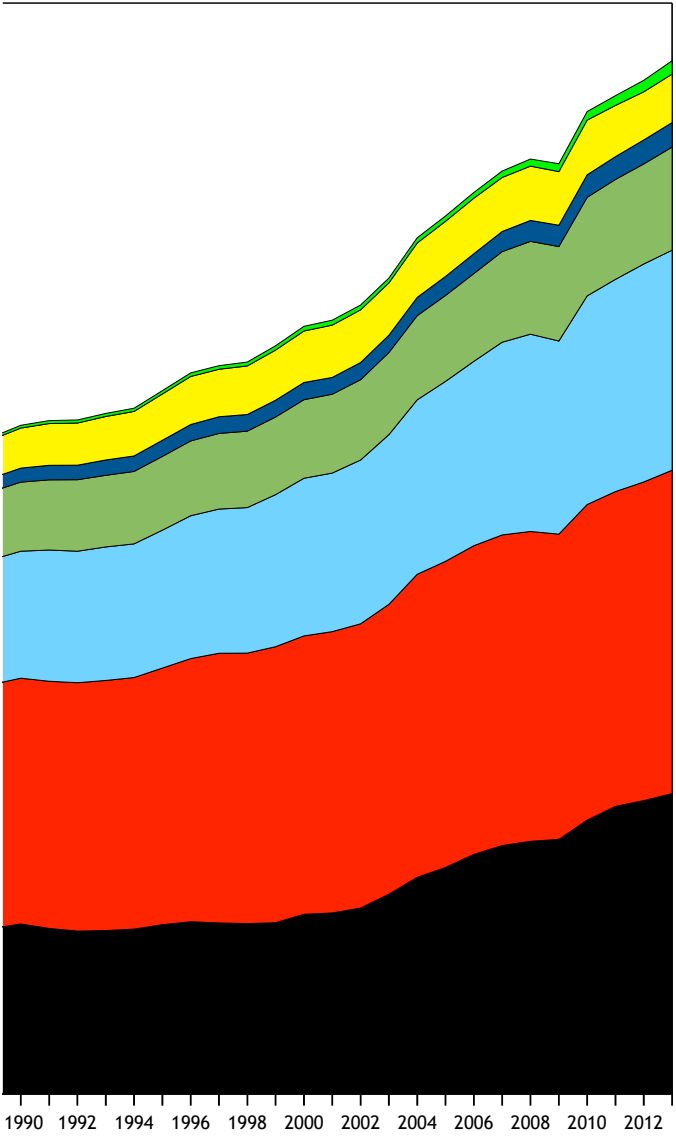


FIGURE 6. BREAKDOWN OF WORLD TOTAL ENERGY REQUIREMENT DURING THE PERIOD 1970–2013



Year

TABLE 7. FUEL SHARES (%) OF ENERGY REQUIREMENT IN 2013 (*)

Country Group	Coal (a)	Oil (b)	Natural Gas (c)	Biofuels (d)	Hydro	Nuclear	Renewables (e)	Total
North America	18.8	35.3	28.5	4.4	2.3	9.5	1.2	100.0
Latin America	5.2	45.8	24.4	14.6	7.4	1.0	1.6	100.0
Western Europe	14.7	32.9	24.6	8.6	3.1	13.0	3.1	100.0
Eastern Europe	23.0	21.9	43.5	3.1	2.1	6.3	0.1	100.0
Africa	18.5	22.1	14.3	42.8	1.4	0.5	0.4	100.0
Middle East and South Asia	20.4	33.7	28.3	15.6	1.1	0.6	0.3	100.0
South East Asia and the Pacific	19.1	36.9	22.9	15.7	1.2		4.2	100.0
Far East	57.4	21.6	8.0	7.5	2.3	1.9	1.3	100.0
World Total (f)	29.1	31.4	21.3	10.0	2.4	4.5	1.3	100.0

Notes:

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

(a) The column headed 'Coal' includes coal, coal products, peat and peat products.

(b) The column headed 'Oil' includes crude oil, natural gas liquids (NGLs), oil products, oil shale and oil sands.

(c) The column headed 'Natural Gas' includes natural gas in all its forms, including liquid natural gas (LNG).

(d) The column headed 'Biofuels' includes commercial wood, charcoal, combustible renewables, waste and other energy products derived directly or indirectly from biomass.

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

(f) World Total energy requirement includes international bunkers.

TABLE 8. FUEL USE (EJ) FOR ELECTRICITY GENERATION BY TYPE OF FUEL IN 2013

Country Group	Thermal (a)	Hydro	Nuclear	Renewables (b)	Total
North America	28.79	2.38	9.65	1.09	41.91
Latin America	5.49	2.59	0.34	0.49	8.91
Western Europe	12.84	2.00	8.41	1.81	25.07
Eastern Europe	16.99	1.19	3.59	0.06	21.82
Africa	5.74	0.39	0.15	0.09	6.37
Middle East and South Asia	21.82	0.78	0.42	0.18	23.19
South East Asia and the Pacific	7.00	0.30		1.02	8.31
Far East	60.22	3.85	3.17	2.02	69.27
World Total	158.88	13.48	25.73	6.77	204.85

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 2013

Country Group	Thermal (a)	Hydro	Nuclear	Renewables (b)	Total
North America	64.0	14.8	18.5	2.7	100.0
Latin America	42.7	54.3	2.1	0.9	100.0
Western Europe	49.5	18.6	24.7	7.2	100.0
Eastern Europe	65.5	15.4	18.8	0.3	100.0
Africa	80.4	16.9	1.8	0.9	100.0
Middle East and South Asia	87.3	9.6	1.9	1.2	100.0
South East Asia and the Pacific	88.9	8.8		2.3	100.0
Far East	78.0	16.2	4.6	1.2	100.0
World Total	68.5	17.8	11.3	2.4	100.0

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	2013		2020		2030		2050	
	Million Inhabitants	Growth Rate (%/a) 2000 – 2013	Million Inhabitants	Growth Rate (%/a) 2013 – 2020	Million Inhabitants	Growth Rate (%/a) 2020 – 2030	Million Inhabitants	Growth Rate (%/a) 2030 – 2050
North America	360	0.93	374	0.56	402	0.71	447	0.53
Latin America	607	0.98	652	1.03	702	0.73	751	0.34
Western Europe	491	0.45	504	0.37	515	0.21	520	0.05
Eastern Europe	391	-0.28	389	-0.07	381	-0.21	356	-0.34
Africa	1106	2.31	1278	2.09	1562	2.03	2192	1.71
Middle East and South Asia	1936	1.66	2119	1.30	2357	1.07	2679	0.64
South East Asia and the Pacific	438	0.90	488	1.55	526	0.75	564	0.35
Far East	1798	0.49	1852	0.42	1878	0.14	1798	-0.22
World Total	7127	1.52	7656	1.03	8323	0.84	9307	0.56

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

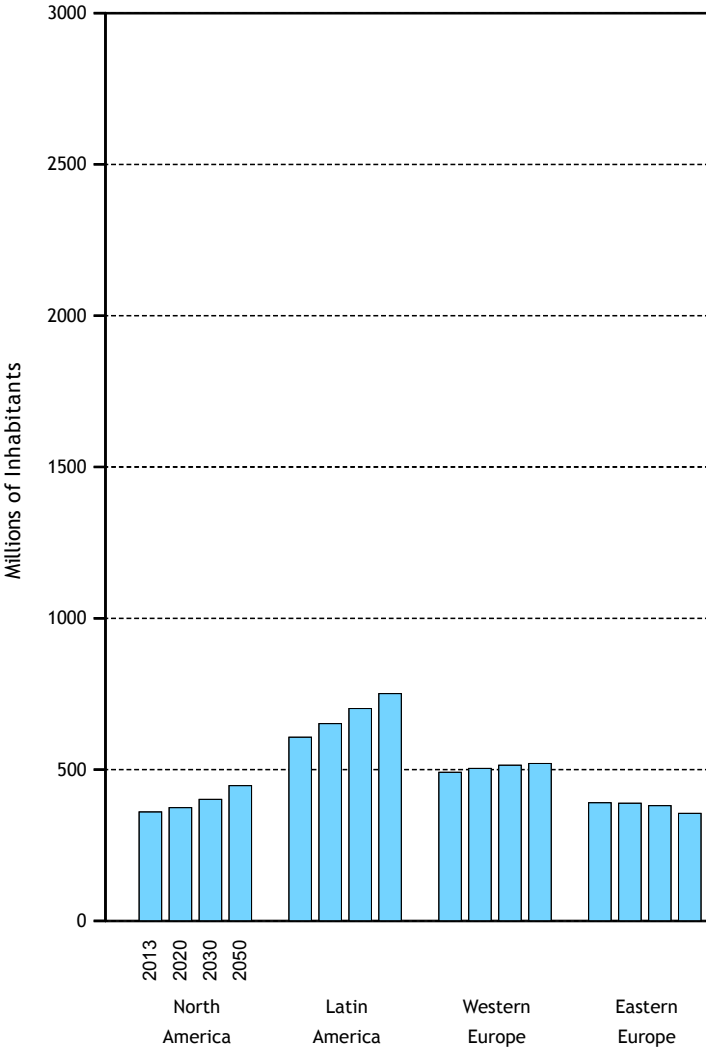


FIGURE 7. POPULATION ESTIMATES

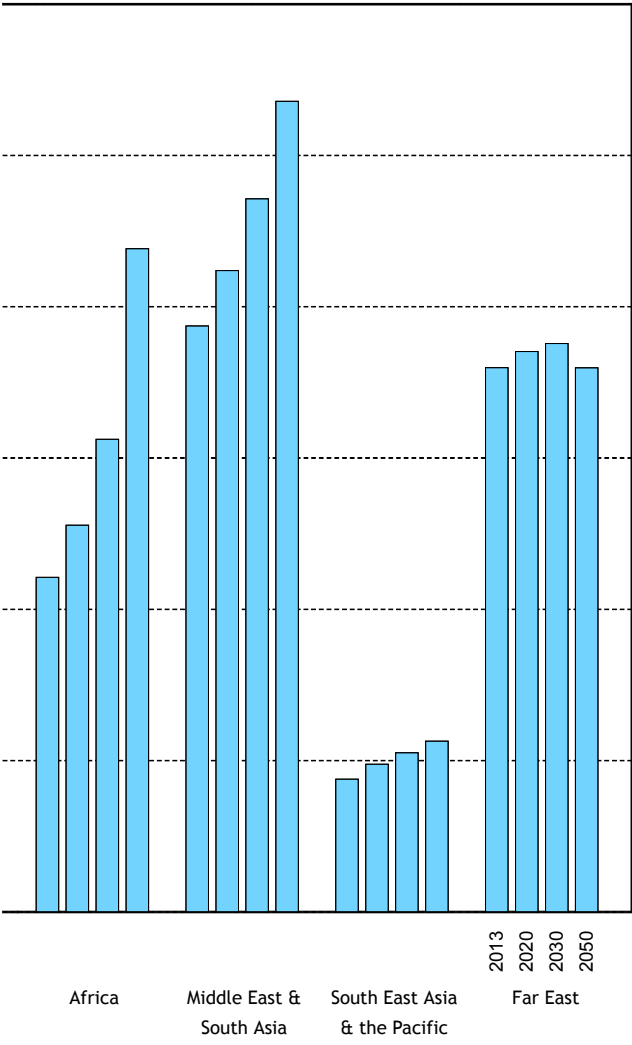


TABLE 11. ESTIMATES OF TOTAL ENERGY AND ELECTRICITY REQUIREMENT PER CAPITA

Country Group	2013		2020		2030		2050 (*)	
	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MW-h/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MW-h/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MW-h/cap)	Energy Requirement per Capita (GJ/cap)	Electricity Requirement per Capita (MW-h/cap)
North America	283	12.9	275 – 291	13.1 – 13.2	255 – 268	12.8 – 13.1	231 ± 6	12.7 ± 0.3
Latin America	57	2.3	74 – 78	3.1 – 3.2	86 – 118	4.8 – 6.8	138 ± 24	9.1 ± 1.8
Western Europe	132	6.5	140 – 145	7.1 – 7.3	154 – 168	7.8 – 9.2	179 ± 11	11.2 ± 1.1
Eastern Europe	145	4.8	162 – 169	5.5 – 5.7	170 – 204	6.6 – 8.0	250 ± 21	10.2 ± 1.1
Africa	26	0.6	27 – 29	0.8 – 0.9	34 – 58	1.3 – 1.8	86 ± 30	3.4 ± 1.2
Middle East and South Asia	36	1.0	42 – 49	1.3 – 1.5	64 – 72	2.7 – 2.9	173 ± 19	7.9 ± 0.6
South East Asia and the Pacific	59	2.0	61 – 64	2.3 – 2.3	75 – 78	3.4 – 3.8	172 ± 10	8.2 ± 0.8
Far East	94	3.7	103 – 111	4.3 – 4.9	129 – 162	5.6 – 7.1	231 ± 27	11.8 ± 1.6
World Average	77	3.0	82 – 88	3.3 – 3.6	95 – 116	4.3 – 5.1	167 ± 22	8.2 ± 1.1

Note:

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

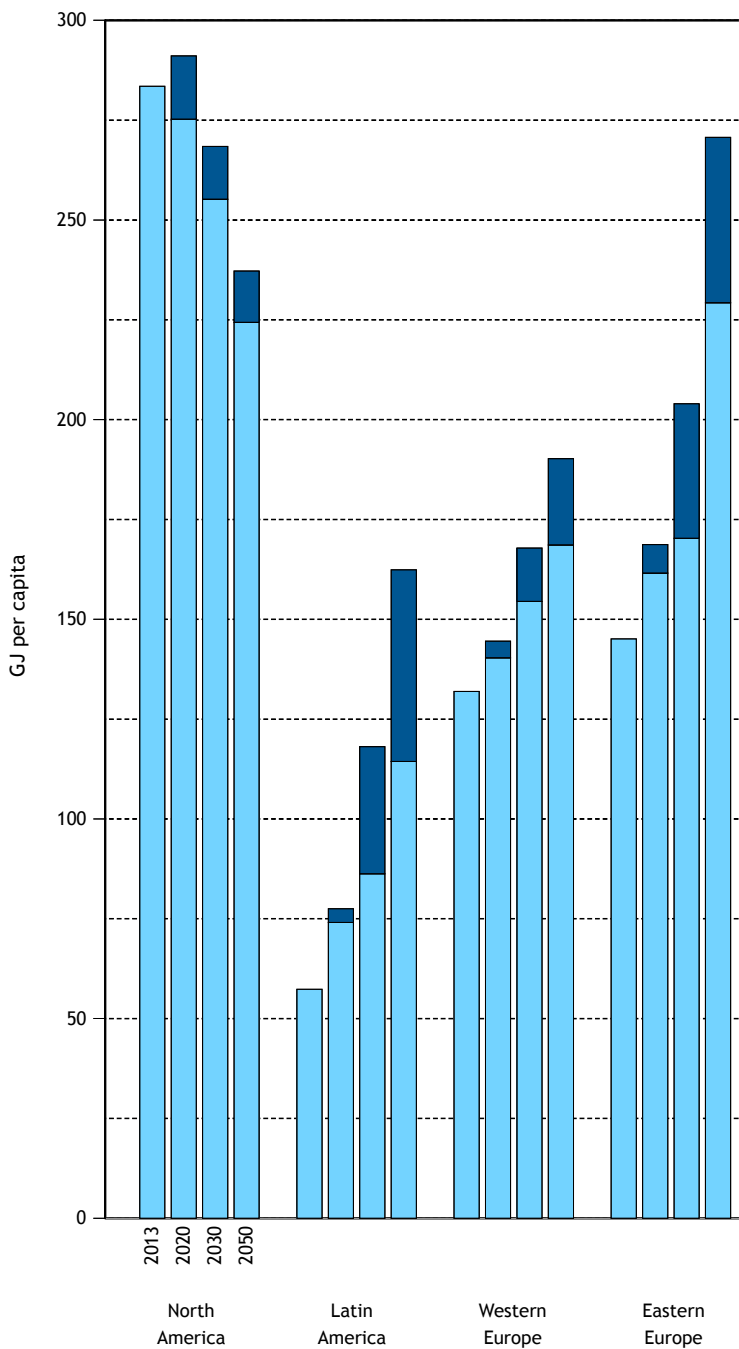
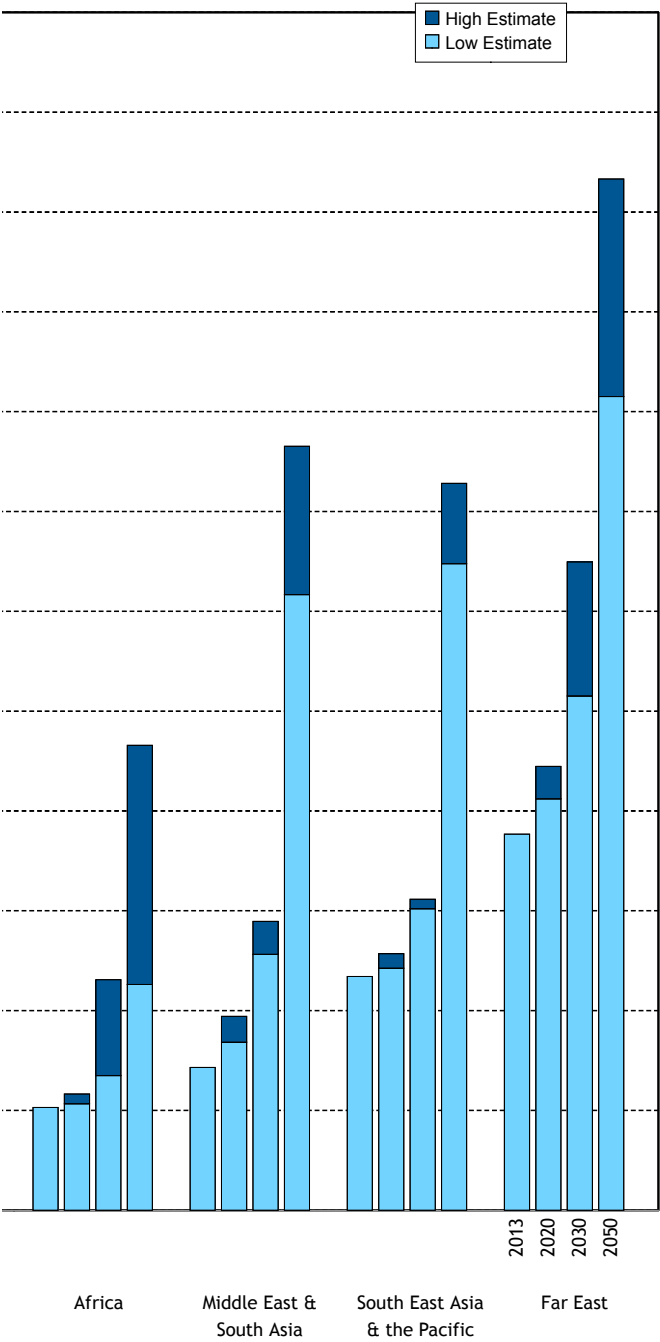


FIGURE 8. TOTAL ENERGY REQUIREMENT PER CAPITA



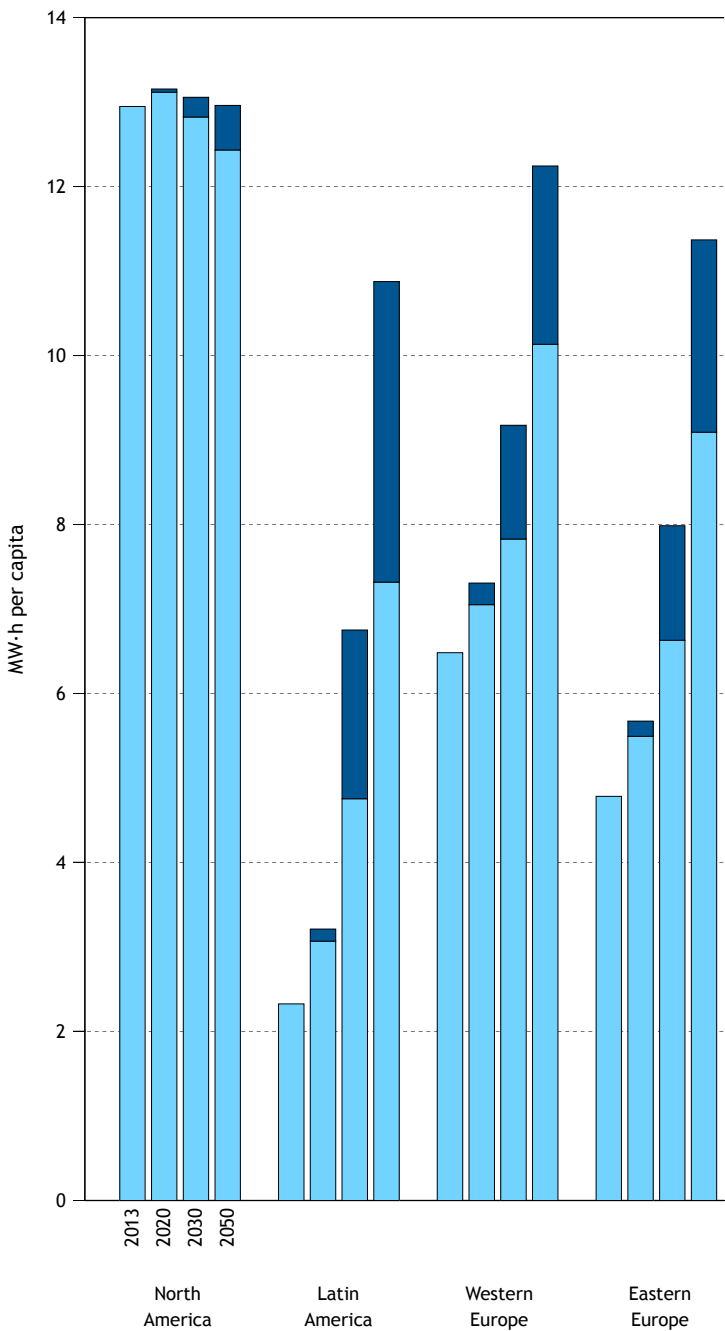


FIGURE 9. TOTAL ELECTRICITY REQUIREMENT PER CAPITA

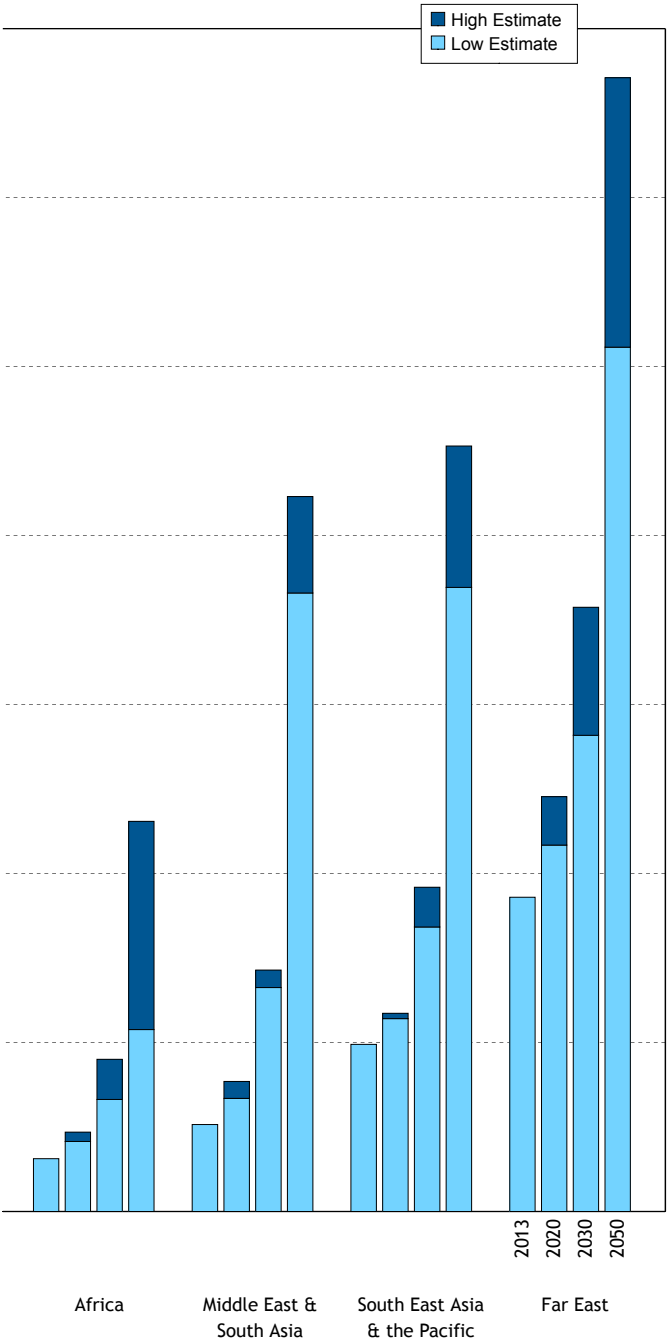


TABLE 12. AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 2003–2013 (%)

Country Group	Population	Total Energy	Total Electricity	Nuclear Energy	Nuclear Capacity
North America	1.1	-0.6	0.4	0.6	0.2
Latin America	1.1	2.1	3.2	0.0	0.0
Western Europe	0.5	-0.8	0.7	-1.3	-1.0
Eastern Europe	-0.4	0.2	1.0	0.6	0.4
Africa	2.7	1.9	3.5	0.7	0.0
Middle East and South Asia	2.0	3.7	5.0	7.7	8.8
South East Asia and the Pacific	1.0	2.0	3.8		
Far East	0.6	6.0	6.8	-3.9	1.7
World Average	1.3	2.4	3.0	-0.7	0.3

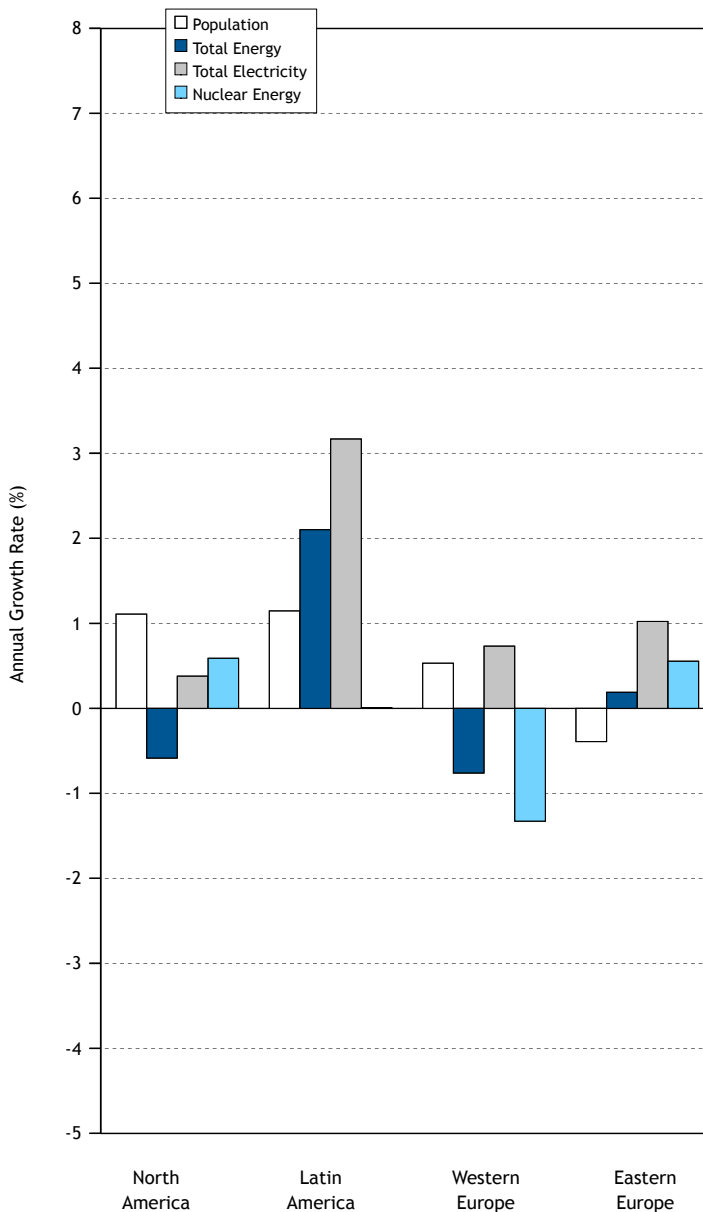


FIGURE 10. AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 2003–2013

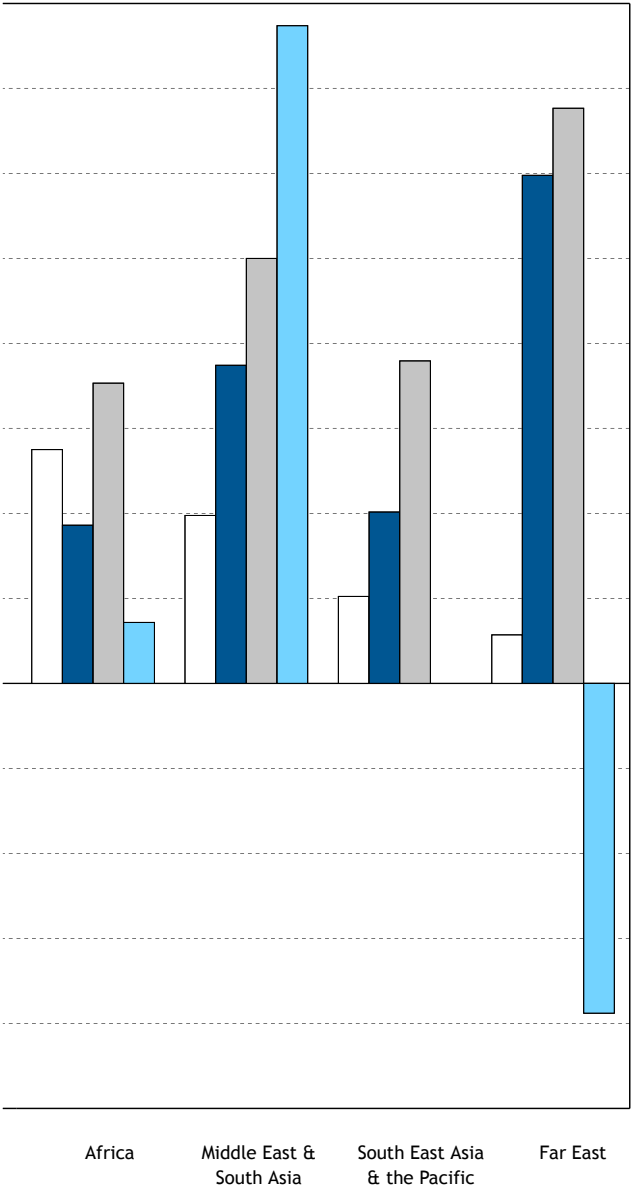


TABLE 13. ESTIMATES OF AVERAGE ANNUAL GROWTH RATES DURING THE PERIOD 2013–2030 (%)

Country Group	Population	Total Energy	Total Electricity	Nuclear Energy	Nuclear Capacity
North America	0.6	0.0 – 0.3	0.6 – 0.7	-1.1 – 1.3	-1.2 – 1.2
Latin America	0.9	3.3 – 5.2	5.2 – 7.4	3.4 – 8.0	3.0 – 7.6
Western Europe	0.3	1.2 – 1.7	1.4 – 2.3	-2.1 – 1.2	-2.9 – 0.3
Eastern Europe	-0.2	0.8 – 1.9	1.8 – 2.9	2.5 – 5.4	1.6 – 4.5
Africa	2.1	3.7 – 7.0	6.7 – 8.6	0.4 – 10.8	0.0 – 10.3
Middle East and South Asia	1.2	4.7 – 5.4	7.0 – 7.4	10.9 – 15.3	8.6 – 12.9
South East Asia and the Pacific	1.1	2.6 – 2.8	4.3 – 5.1		
Far East	0.3	2.1 – 3.5	2.7 – 4.2	7.8 – 11.4	3.0 – 6.7
World Average	0.9	2.2 – 3.3	3.1 – 4.2	1.6 – 4.9	0.4 – 3.8



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