



3.9 Sources of electricity

	Electricity production		Sources of electricity ^a									
	billion kwh		Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997
Albania	3.7	5.6	79.4	96.3	..	..	20.6	3.7	..	..	..	..
Algeria	7.1	21.7	3.6	0.3	..	..	12.2	3.6	84.1	96.1	..	..
Angola	0.7	1.1	88.1	90.7	..	..	11.9	9.3	..	..	..	..
Argentina	39.7	71.9	38.1	39.1	2.5	1.0	31.9	3.6	21.0	44.9	5.9	11.0
Armenia	13.0	6.0	12.0	23.1	..	..	54.8	2.1	..	48.2	33.2	26.6
Australia	95.2	182.6	13.6	9.2	73.3	80.1	5.4	1.3	7.3	7.6	..	..
Austria	41.6	55.5	69.1	64.8	7.0	11.8	14.0	5.0	9.2	15.5	..	..
Azerbaijan	15.0	16.8	7.3	9.0	..	..	92.7	72.8	..	18.1	..	..
Bangladesh	2.4	11.9	24.8	6.1	..	..	26.6	9.4	48.6	84.5	..	..
Belarus	34.1	26.1	0.1	0.1	..	..	99.9	14.8	..	85.1	..	..
Belgium	53.1	78.1	0.5	0.4	29.4	20.9	34.7	1.8	11.2	14.8	23.6	60.7
Benin	0.0	0.1	..	..	..	..	100.0	100.0	..	..	..	..
Bolivia	1.6	3.4	68.2	67.2	..	..	10.3	5.8	18.4	25.7	..	..
Bosnia and Herzegovina	..	2.2	..	64.5	..	35.5	..	..	..	..	..	..
Botswana	..	..	..	..	..	..	..	..	..	..	..	..
Brazil	139.4	307.3	92.5	90.8	2.0	1.8	3.8	3.2	..	0.4	..	1.0
Bulgaria	34.8	41.6	10.7	4.1	49.2	44.3	22.5	3.1	..	5.9	17.7	42.7
Burkina Faso	..	..	..	..	..	..	..	..	..	..	..	..
Burundi	..	..	..	..	..	..	..	..	..	..	..	..
Cambodia	..	..	..	..	..	..	..	..	..	..	..	..
Cameroon	1.5	3.1	93.9	98.8	..	..	6.1	1.2	..	..	..	..
Canada	373.3	575.0	67.3	61.1	16.0	17.4	3.7	2.4	2.5	4.1	10.2	14.4
Central African Republic	..	..	..	..	..	..	..	..	..	..	..	..
Chad	..	..	..	..	..	..	..	..	..	..	..	..
Chile	11.8	34.0	62.5	55.7	14.9	33.8	19.1	7.7	1.2	2.1	..	..
China	313.3	1,163.4	18.6	16.8	57.0	74.2	24.2	7.2	0.2	0.6	..	1.2
Hong Kong, China	12.6	28.9	..	..	..	98.9	..	1.1	..	..	..	..
Colombia	20.6	46.1	70.0	71.1	9.7	7.9	2.1	0.5	17.6	19.8	..	..
Congo, Dem. Rep.	4.4	6.0	95.5	97.8	..	..	4.5	2.2	..	..	..	..
Congo, Rep.	0.2	0.4	62.2	98.6	..	..	35.9	0.7	1.9	0.7	..	..
Costa Rica	2.2	5.6	95.2	85.9	..	..	4.8	3.1	..	..	..	..
Côte d'Ivoire	1.7	3.2	77.6	62.9	..	..	22.4	37.1	..	..	..	..
Croatia	..	9.7	..	54.7	..	5.3	..	27.9	..	12.1	..	..
Cuba	9.9	14.1	1.0	0.7	..	..	89.6	88.7	..	0.1	..	..
Czech Republic	52.7	64.2	4.6	2.6	84.8	74.0	9.6	1.0	1.1	1.4	..	19.5
Denmark	26.8	44.3	0.1	0.0	81.8	64.9	18.0	12.2	..	15.4	..	..
Dominican Republic	3.3	7.3	18.8	18.2	..	4.4	78.8	77.0	..	..	..	..
Ecuador	3.4	9.6	25.9	70.6	..	..	74.1	29.4	..	..	..	..
Egypt, Arab Rep.	18.9	57.7	51.8	20.8	..	..	27.7	35.2	20.5	44.0	..	..
El Salvador	1.5	3.6	63.7	32.8	..	..	2.7	46.8	..	..	..	..
Eritrea	..	..	..	..	..	..	..	..	..	..	..	..
Estonia	18.9	9.2	..	0.0	..	95.3	100.0	1.9	..	2.6	..	..
Ethiopia	0.7	1.3	70.2	87.3	..	..	27.6	4.9	..	..	..	..
Finland	40.7	69.2	25.1	17.7	42.6	28.3	10.8	2.0	4.2	10.0	17.2	30.2
France	256.9	498.9	26.9	12.5	27.2	5.2	18.9	1.5	2.7	1.0	23.8	79.3
Gabon	0.5	1.0	49.1	73.5	..	..	50.9	16.0	..	10.5	..	..
Gambia, The	..	..	..	..	..	..	..	..	..	..	..	..
Georgia	14.7	7.2	43.8	84.3	..	..	56.2	0.1	..	15.6	..	..
Germany	466.3	548.0	4.1	3.2	62.9	53.4	5.7	1.3	14.2	9.2	11.9	31.1
Ghana	5.3	6.2	99.2	99.9	..	..	0.8	0.1	..	..	..	..
Greece	22.7	43.3	15.0	9.0	44.8	70.7	40.1	19.2	..	0.8	..	..
Guatemala	1.8	4.9	12.9	76.8	..	..	70.3	18.7	..	..	..	..
Guinea
Guinea-Bissau
Haiti	0.3	0.6	70.1	32.0	26.1	64.8
Honduras	0.9	3.3	86.7	98.5	13.3	1.5



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	billion kwh		Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997
Hungary	23.9	35.4	0.5	0.6	53.5	29.8	12.6	15.3	33.5	14.8	..	39.5
India	119.3	463.4	39.0	16.1	49.9	73.1	7.7	2.6	0.8	6.0	2.5	2.2
Indonesia	8.4	74.8	16.0	8.0	..	30.7	84.0	30.0	..	27.8	..	..
Iran, Islamic Rep.	22.4	95.8	25.1	7.7	..	..	50.1	33.9	24.8	58.4	..	..
Iraq	11.4	29.6	6.1	2.0	..	..	93.9	98.0	..	..	..	..
Ireland	10.6	19.7	7.9	3.4	16.4	44.9	60.4	17.6	15.2	33.4	..	..
Israel	12.5	35.1	..	0.2	17.9	70.7	100.0	29.1	..	..	..	..
Italy	183.5	246.5	24.7	16.9	9.9	10.0	57.0	46.0	5.0	24.9	1.2	..
Jamaica	1.5	6.3	8.3	1.9	..	..	87.9	92.9	..	..	..	..
Japan	572.5	1,029.5	15.4	8.7	9.6	19.1	46.2	18.2	14.2	20.5	14.4	31.0
Jordan	1.1	6.3	..	0.4	..	..	100.0	87.2	..	12.5	..	..
Kazakhstan	61.5	52.0	9.3	12.5	..	72.0	90.7	7.3	..	8.2	..	..
Kenya	1.5	4.2	71.1	82.4	..	..	28.9	8.4	..	..	..	..
Korea, Dem. Rep.	..	..	..	..	..	..	..	..	..	..	..	..
Korea, Rep.	37.2	244.0	5.3	1.2	6.7	37.4	78.7	16.8	..	13.0	9.3	31.6
Kuwait	9.4	27.1	..	..	..	..	37.2	26.0	62.8	74.0	..	..
Kyrgyz Republic	9.2	12.6	53.1	89.1	..	6.6	46.9	4.3	..	..	..	..
Lao PDR	..	..	..	..	..	..	..	..	..	..	..	..
Latvia	4.7	4.5	64.9	65.6	..	2.3	35.1	5.3	..	26.8	..	..
Lebanon	2.8	8.5	30.9	10.6	..	..	69.1	89.4	..	..	..	..
Lesotho	..	..	..	..	..	..	..	..	..	..	..	..
Libya	4.8	18.2	..	..	..	..	100.0	100.0	..	..	..	..
Lithuania	11.7	14.4	4.0	2.1	..	..	96.0	10.9	..	3.5	..	83.6
Macedonia, FYR	..	..	..	..	..	..	..	..	..	..	..	..
Madagascar	..	..	..	..	..	..	..	..	..	..	..	..
Malawi	..	..	..	..	..	..	..	..	..	..	..	..
Malaysia	10.0	57.9	13.9	5.7	..	5.3	84.7	10.2	1.3	78.8	..	..
Mali	..	..	..	..	..	..	..	..	..	..	..	..
Mauritania	..	..	..	..	..	..	..	..	..	..	..	..
Mauritius	..	..	..	..	..	..	..	..	..	..	..	..
Mexico	67.0	175.0	25.2	15.1	0.0	10.0	57.9	54.3	15.5	11.5	..	6.0
Moldova	15.4	5.3	2.6	7.2	..	9.3	97.4	4.0	..	79.5	..	..
Mongolia	..	..	..	..	..	..	..	..	..	..	..	..
Morocco	5.2	13.1	28.9	15.7	19.5	45.0	51.6	39.3	..	..	..	..
Mozambique	0.5	1.0	65.2	78.7	17.5	..	17.3	21.1	..	0.2	..	..
Myanmar	1.5	4.2	53.5	39.4	2.0	..	31.3	12.2	13.2	48.5	..	..
Namibia	..	..	..	..	..	..	..	..	..	..	..	..
Nepal	0.2	1.2	82.3	90.5	..	..	17.7	9.5	..	..	..	..
Netherlands	64.8	86.7	..	0.1	13.7	30.0	38.4	4.2	39.8	58.3	6.5	2.8
New Zealand	22.6	36.8	83.6	63.2	1.9	5.5	0.2	0.0	7.5	23.7	..	..
Nicaragua	1.1	1.9	51.3	21.3	..	..	45.3	65.4	..	..	..	..
Niger	..	..	..	..	..	..	..	..	..	..	..	..
Nigeria	7.1	15.2	39.0	36.8	0.4	..	45.1	25.8	15.5	37.3	..	..
Norway	83.8	110.5	99.8	99.4	0.0	0.2	0.1	..	..	0.2	..	..
Oman	0.8	7.3	..	..	..	..	21.5	16.5	78.5	83.5	..	..
Pakistan	15.0	59.1	58.2	35.3	0.2	0.6	1.1	38.5	40.5	24.9	0.0	0.6
Panama	2.0	4.2	49.4	66.6	..	..	48.4	32.6	..	..	..	..
Papua New Guinea	..	..	..	..	..	..	..	..	..	..	..	..
Paraguay	0.8	50.6	80.0	99.7	..	..	13.4	0.1	..	..	..	..
Peru	10.0	18.0	69.8	73.6	..	..	27.4	20.7	1.7	1.8	..	..
Philippines	18.0	39.8	19.6	15.3	1.0	18.5	67.9	48.0	..	0.0	..	..
Poland	120.9	140.9	1.9	1.4	94.7	96.7	2.9	1.4	0.1	0.2	..	..
Portugal	15.2	34.1	52.7	38.4	2.3	38.2	42.9	19.8	..	0.3	..	..
Puerto Rico	..	..	..	..	..	..	..	..	..	..	..	..
Romania	67.5	57.1	18.7	30.6	31.4	30.2	9.6	12.0	38.2	17.6	..	9.4
Russian Federation	804.9	833.1	16.1	18.8	..	16.8	77.2	5.3	..	45.3	6.7	13.1



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	billion kwh		Hydropower %		Coal %		Oil %		Gas %		Nuclear power %	
	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997	1980	1997
Rwanda	..	..	..	..	..	..	..	..	..	..	..	..
Saudi Arabia	20.5	103.8	..	..	..	..	58.5	57.5	41.5	42.5	..	..
Senegal	0.6	1.3	..	..	..	..	100.0	93.9	..	6.1	..	..
Sierra Leone	..	..	..	..	..	..	..	..	..	..	..	..
Singapore	7.0	26.9	..	..	..	..	100.0	80.9	..	16.5	..	..
Slovak Republic	20.0	24.3	11.3	17.0	37.9	24.0	17.9	5.0	10.2	9.6	22.7	44.4
Slovenia	8.0	13.2	42.3	23.5	51.6	35.8	3.9	2.6	2.2	..	3.4	38.1
South Africa	99.0	207.7	1.0	1.0	99.0	92.9	..	..	..	..	..	6.1
Spain	109.2	185.8	27.1	18.6	30.0	34.3	35.2	7.2	2.7	8.8	4.7	29.8
Sri Lanka	1.7	5.1	88.7	67.0	..	..	11.3	33.0	..	..	..	..
Sudan	0.8	2.0	70.0	53.0	..	..	30.0	47.0	..	..	..	..
Sweden	96.3	149.4	61.1	46.2	0.2	1.9	10.4	2.1	..	0.5	27.5	46.8
Switzerland	48.2	61.6	68.1	55.3	0.1	0.0	1.0	0.3	0.6	1.4	29.8	41.2
Syrian Arab Republic	4.0	18.0	64.7	55.9	..	..	31.9	26.3	3.4	17.7	..	..
Tajikistan	13.6	14.0	93.4	98.8	..	..	6.6	..	..	1.3	..	..
Tanzania	0.8	1.9	86.4	74.9	..	..	13.6	25.1	..	..	..	..
Thailand	14.4	93.3	8.8	7.7	9.8	20.3	81.4	23.4	9.9	46.3	..	..
Togo	..	..	..	..	..	..	..	..	..	..	..	..
Trinidad and Tobago	2.0	5.0	..	..	..	..	2.3	..	96.5	99.3	..	..
Tunisia	2.9	8.0	0.8	0.6	..	..	64.5	15.7	34.7	83.7	..	..
Turkey	23.3	103.3	48.8	38.5	25.6	32.8	25.1	6.9	..	21.4	..	..
Turkmenistan	6.7	9.4	0.1	0.1	..	..	99.9	..	..	99.9	..	..
Uganda	..	..	..	..	..	..	..	..	..	..	..	..
Ukraine	236.0	177.8	5.7	5.5	..	27.6	88.3	4.3	..	17.9	6.0	44.7
United Arab Emirates	6.3	20.6	..	..	..	..	44.8	16.2	55.2	83.8	..	..
United Kingdom	284.1	343.9	1.4	1.2	73.2	34.8	11.7	2.3	0.7	31.3	13.0	28.5
United States	2,427.3	3,670.6	11.5	9.0	51.2	53.8	10.8	2.9	15.3	13.8	11.0	18.2
Uruguay	4.6	7.1	76.3	90.7	..	..	23.5	8.7	..	..	..	..
Uzbekistan	33.9	46.1	14.6	12.5	..	4.1	85.4	11.9	..	71.5	..	..
Venezuela, RB	36.9	74.9	39.6	76.3	..	..	14.5	2.7	45.9	21.0	..	..
Vietnam	3.6	19.2	41.8	84.5	39.9	..	18.3	10.7	0.4	4.8	..	..
West Bank and Gaza	..	..	..	..	..	..	..	..	..	..	..	..
Yemen, Rep.	0.5	2.4	..	..	..	..	100.0	100.0	..	..	..	..
Yugoslavia, FR (Serb./Mont.)	..	..	..	..	..	..	..	..	..	..	..	..
Zambia	9.5	8.0	98.8	99.5	0.7	0.5	0.5	0.0	..	..	..	..
Zimbabwe	4.5	7.3	88.3	24.4	11.7	75.6	..	..	..	..	..	..
World	8,192.7 s	1,3872.6 s	20.4 w	18.2 w	33.1 w	38.4 w	28.5 w	9.1 w	8.8 w	15.5 w	8.7 w	17.3 w
Low income	579.1	1,931.8	29.7	20.3	41.5	63.8	25.8	8.8	1.8	5.6	1.3	1.4
Excl. China & India	146.6	305.0	46.0	39.5	1.5	9.9	43.7	24.5	5.8	24.3	3.0	0.6
Middle income	2,211.2	3,545.2	20.3	24.3	15.1	24.4	55.5	14.6	4.8	25.1	3.8	10.5
Lower middle income	1,570.0	2,033.1	15.2	18.8	9.0	24.3	67.8	12.3	3.0	32.0	4.7	11.6
Upper middle income	641.1	1,512.2	32.8	31.7	30.2	24.7	25.4	17.7	9.3	15.9	1.6	9.0
Low & middle income	2,790.3	5,477.1	22.3	22.9	20.6	38.3	49.3	12.6	4.2	18.2	3.3	7.3
East Asia & Pacific	406.4	1,696.6	17.2	14.1	45.3	59.3	35.9	11.6	0.3	8.9	0.9	5.4
Europe & Central Asia	1,640.1	1,718.7	13.5	17.2	13.6	29.6	65.4	6.2	2.2	31.2	5.1	15.3
Latin America & Carib.	362.0	854.8	59.9	63.1	2.1	4.6	24.1	17.5	11.5	10.0	0.6	2.5
Middle East & N. Africa	104.0	395.1	20.5	8.4	1.0	1.5	52.2	47.6	26.3	42.5	..	..
South Asia	138.5	540.8	41.5	18.7	43.0	62.7	7.4	7.0	5.9	9.7	2.2	1.9
Sub-Saharan Africa	139.3	271.1	24.0	16.5	70.8	73.3	4.4	3.3	0.8	2.2	..	4.7
High income	5,402.4	8,395.6	19.5	15.1	39.6	38.4	17.7	6.9	11.3	13.8	11.5	23.8
Europe EMU	1,242.9	1,822.8	17.0	12.0	37.2	27.3	22.9	8.8	10.0	11.9	11.9	38.0

a. Shares may not sum to 100 percent because other sources of generated electricity (such as geothermal, solar, and wind) are not shown.



Sources of electricity 3.9

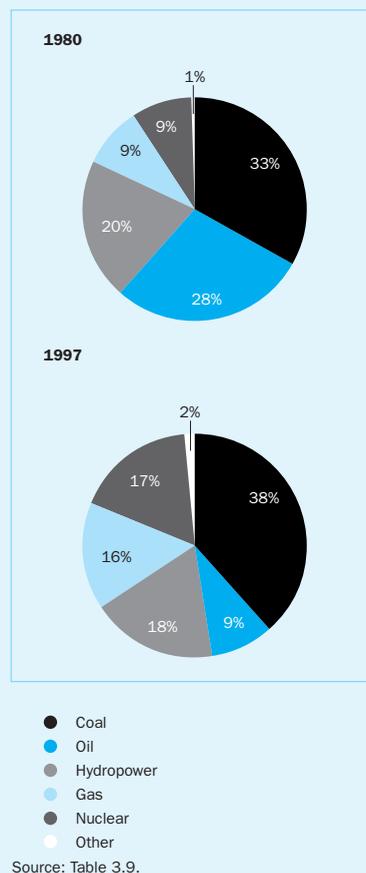
About the data

Use of energy in general, and access to electricity in particular, are important in improving people's standard of living. But electricity generation also can damage the environment. Whether such damage occurs depends largely on how electricity is generated. For example, burning coal releases twice as much carbon dioxide—a major contributor to global warming—as does burning an equivalent amount of natural gas (see *About the data* for table 3.8). Nuclear energy does not generate carbon dioxide emissions, but it produces other dangerous waste products. The table provides information on electricity production by source. Shares may not sum to 100 percent because some sources of generated electricity (such as geothermal, solar, and wind) are not shown.

The International Energy Agency (IEA) compiles data on energy inputs used to generate electricity. IEA data for non-OECD countries are based on national energy data adjusted to conform with annual questionnaires completed by OECD member governments. In addition, estimates are sometimes made to complete major aggregates from which key data are missing, and adjustments are made to compensate for differences in definitions. The IEA makes these estimates in consultation with national statistical offices, oil companies, electricity utilities, and national energy experts.

The IEA occasionally revises its time series to reflect political changes. Since 1990, for example, it has constructed energy statistics for countries of the former Soviet Union. In addition, energy statistics for other countries have undergone continuous changes in coverage or methodology as more detailed energy accounts have become available in recent years. Breaks in series are therefore unavoidable.

Figure 3.9

The world's electricity sources are shifting—but coal still dominates


Definitions

• **Electricity production** is measured at the terminals of all alternator sets in a station. In addition to hydropower, coal, oil, gas, and nuclear power generation, it covers generation by geothermal, solar, wind, and tide and wave energy, as well as that from combustible renewables and waste. Production includes the output of electricity plants designed to produce electricity only as well as that of combined heat and power plants. • **Sources of electricity** refer to the inputs used to generate electricity: hydropower, coal, oil, gas, and nuclear power. Hydropower refers to electricity produced by hydroelectric power plants, oil refers to crude oil and petroleum products, gas refers to natural gas but excludes natural gas liquids, and nuclear power refers to electricity produced by nuclear power plants.

Data sources

The data on electricity production are from the IEA's electronic files and its annual publications, *Energy Statistics and Balances of Non-OECD Countries*, *Energy Statistics of OECD Countries*, and *Energy Balances of OECD Countries*.