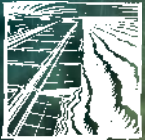




INTERNATIONAL ENERGY AGENCY



RENEWABLES IN GLOBAL ENERGY SUPPLY

An IEA Fact Sheet



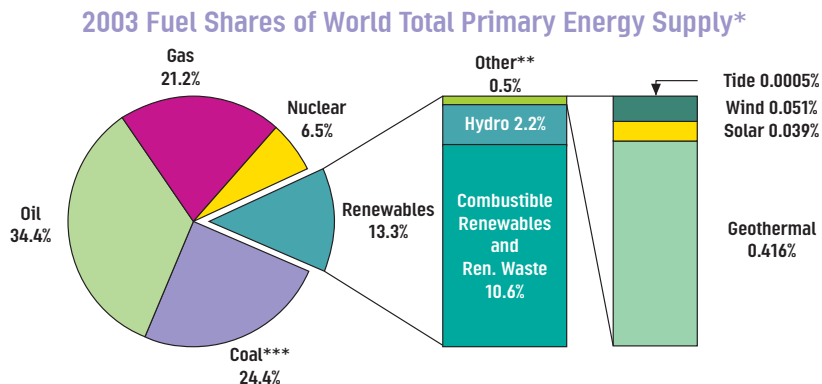
RENEWABLES IN GLOBAL ENERGY SUPPLY

An IEA Fact Sheet

Renewable energies are essential contributors to the energy supply portfolio as they contribute to world energy supply security, reducing dependency of fossil fuel resources, and provide greenhouse gases mitigating opportunities. Differences in definition and lack of adequate data complicated the discussion between participants on these key issues. The International Energy Agency believes that a fact sheet can be of use to all in order to facilitate the debate on the past, current and future place and role of renewables in total energy supply.

This pamphlet presents as objectively as possible the main elements of the current renewables energy situation. The definitions and coverage of national statistics vary between countries and organisations. In this leaflet, we define renewables to include combustible renewables and waste (CRW), hydro, geothermal, solar, wind, tide and wave energy (see definitions page 7).

The pie chart below represents the main fuels in the world total primary energy supply, with a disaggregation of the share of the main renewables categories. In 2003, renewables accounted for 13.3% of the 10 579 Mtoe of World Total Primary Energy Supply (TPES)*. Combustible renewables and waste (97% of which is biomass, both commercial and non-commercial) represented almost 80% of total renewables followed by hydro (16.2%).



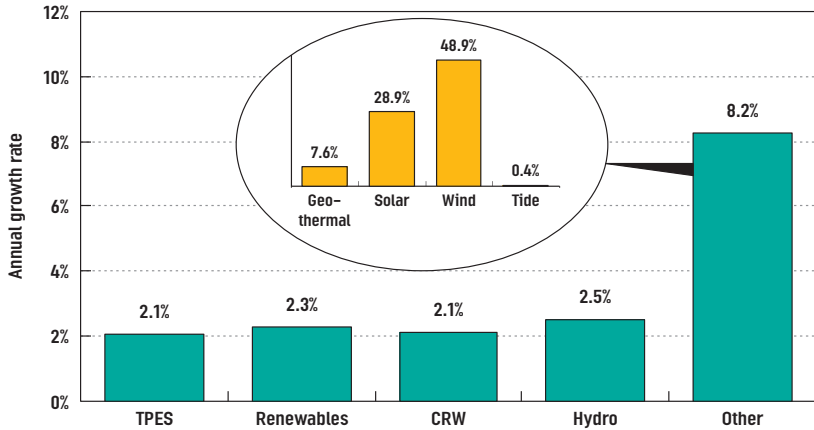
* TPES is calculated using the IEA conventions (physical energy content methodology). It includes international marine bunkers and excludes electricity/heat trade. The figures include both commercial and non-commercial energy.

** Geothermal, solar, wind, tide/wave/ocean.

*** Includes non-renewable waste.

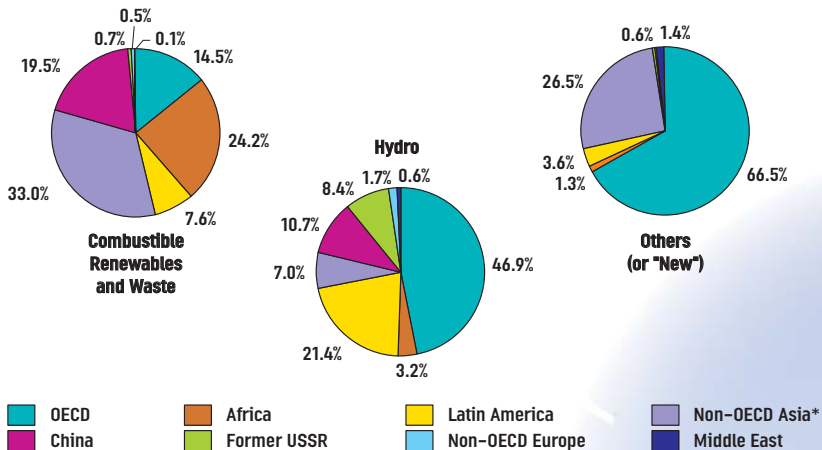
Source: IEA Energy Statistics

Annual Growth of Renewables Supply from 1971 to 2003



Total renewables supply experienced an annual growth of 2.3% over the last 33 years, marginally higher than the annual growth in TPES. However, the “other” category in the chart above (also referred to as “new” renewables and including geothermal, solar, wind, etc.) recorded a much higher annual growth of 8%. Due to a very low base in 1971 and to recent fast growing development, wind experienced the highest increase (+49% p.a.) followed by solar (+29% p.a.).

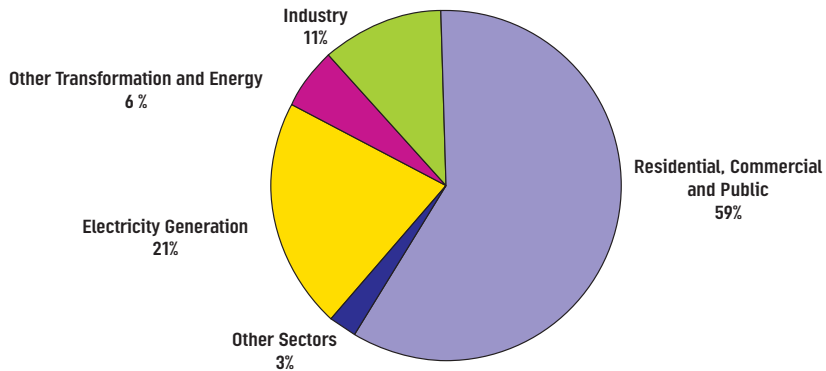
2003 Regional Shares of Renewables Supply



* Excluding China.

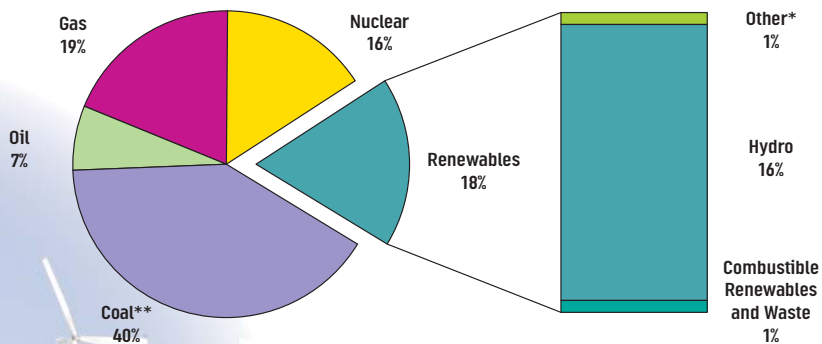
Due to the high share of biomass in total renewables, non-OECD regions like Asia, Africa and Latin America emerge as the main renewables users. The bulk of the consumption occurs in the residential sector for cooking and heating purposes. When looking at hydro and other (or “new”) renewables (solar, wind), OECD accounts for most of the use with, respectively, 47% and 67% in 2003.

2003 Global Sectorial Consumption of Renewables



Renewables are the third largest contributor to global electricity production. They accounted for 18% of production in 2003, after coal (40%) and natural gas (19%), but ahead of nuclear (16%), and oil (7%). Most of the electricity generated from renewables comes from hydro power plants (90%) followed by combustible renewables and waste (6%). Although fast growing, geothermal, solar and wind still accounted for less than 4% in 2003

2003 Renewables in Electricity Production



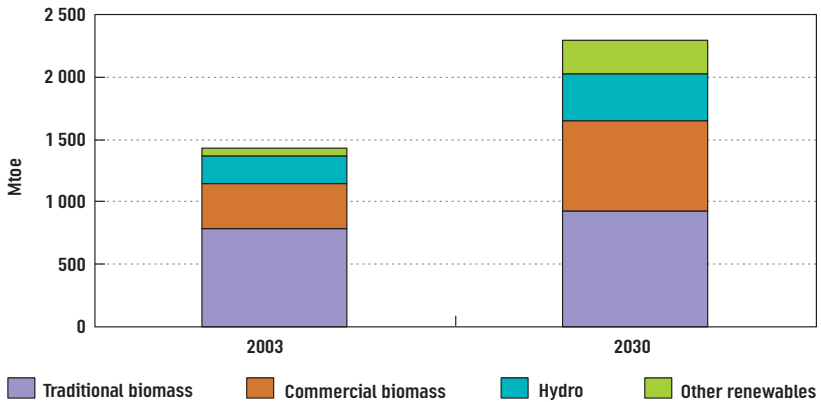
* Geothermal, solar, wind, tide/wave/ocean.

** Includes non-renewable waste.

Renewables Outlook*

Global Developments: In the Reference Scenario developed in the IEA's *World Energy Outlook 2005: Middle East and North Africa Insights (WEO 2005)* which assumes continuation of present government policies and no major breakthrough in technologies, renewable-energy supply will increase by 1.8% per year from over 1 400 Mtoe in 2003 to almost 2 300 Mtoe in 2030, a rise of more than 60%.

2003 – 2030 Renewables Supply by Energy Source



In this scenario, the share of renewables in global energy supply will remain largely unchanged at 14%. Traditional biomass currently accounts for 7% of world energy supply, but its share will fall as developing countries shift to modern forms of energy. World hydropower production will grow by 1.8% per year but its share will remain almost stable at around 2%. Other renewables (including geothermal, solar and wind) will increase most rapidly at 6.2% per year but because they start from a very low base (0.5% share in 2003) they will still be the smallest component of renewable energy in 2030 with a share of only 1.7% of global energy demand.

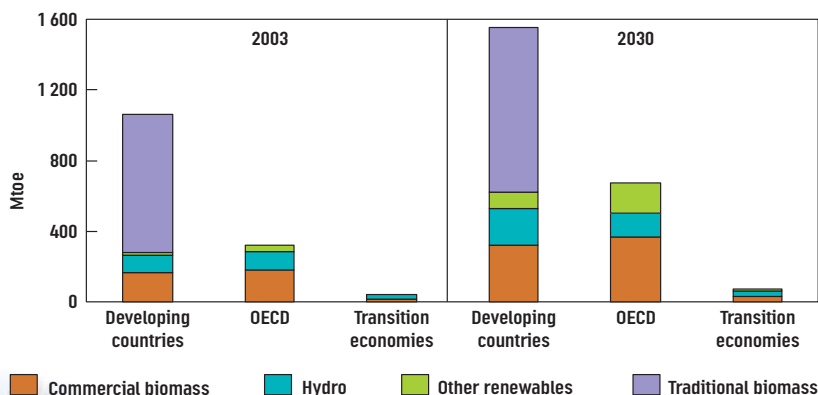
* The Reference Scenario and the Alternative Policy Scenario and other figures presented here are based on IEA's latest projections of the *World Energy Outlook 2004* and the *World Energy Outlook 2005: Middle East and North Africa Insights*.

Sectoral Developments: Renewables will continue to increase their market shares in the power generation mix. Overall they will account for 20% of world electricity generation in 2030, up from 18% today. While heating and cooking will remain the principal use for renewables – mostly in developing countries where three-quarters of renewables (especially traditional biomass) are consumed – the power sector will lead the increase in renewable energy consumption between 2003 and 2030. Its share of global renewable energy consumption is expected to rise from a quarter in 2003 to 38% by 2030.

Non-hydro renewables in electricity generation will triple, from 2% in 2003 to 6% in 2030. Of non-hydro renewables:

- *Wind power* will see the biggest increase in market share.
- *Biomass* used for electricity generation will triple between now and 2030.
- *Geothermal power* will grow at the same rate as biomass.
- *Solar, tidal and wave energy* will make more substantial contributions towards the end of the projection period.

World Renewable Energy Supply by Region



The largest increases in renewables will take place in OECD Europe, driven by strong government policies.

Since over a quarter of new power-generating capacity will be based on renewable energy, the cost of development is expected to be \$1.6 trillion (in year-2000 dollars), nearly 40% of power generation investment to 2030.

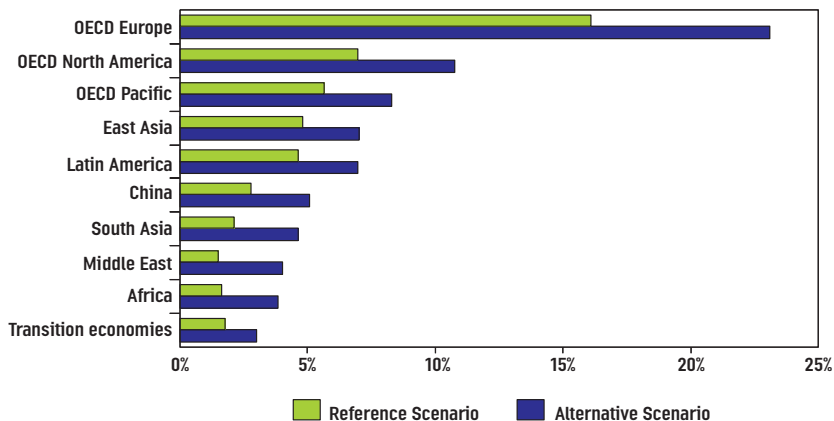
The share of biofuels in global road transportation was 0.6% in 2003. This share is expected to grow to 1.4% by 2030.



Alternative Policy Scenario: The Alternative Scenario developed in the *WEO 2005* assesses the impact on the global energy future if countries implement policies that they are presently considering or might reasonably be expected to implement up to 2030. Key measures include efforts to improve energy efficiency and to increase the use of renewables.

In the Alternative Scenario, hydroelectric generation in 2030 is 15%, slightly higher than the 13% projected in the Reference Scenario. The share of non-hydro renewables increase much more, from an aggregate 6% in 2030 in the Reference Scenario to 9% in the Alternative Scenario. The biggest increase takes place in OECD Europe, driven by the European Union's strong support for renewables. Electricity generation using non-hydro renewables is almost ten times higher in 2030 in the Alternative Scenario than in 2003, and more than a third higher than in the Reference Scenario.

Share of Non-Hydro Renewables in Electricity Generation in the Reference and Alternative Scenarios by Region, 2030



Under the Alternative Scenario, the share of biofuels in global road transport will reach 3.6% – more than twice the growth projected under the Reference Scenario and three times the level today.

Definitions

Renewables include the following categories:

Combustible Renewables and Waste* (CRW):

Solid Biomass: Covers organic, non-fossil material of biological origin which may be used as fuel for heat production or electricity generation.

Wood, Wood Waste, Other Solid Waste: Covers purpose-grown energy crops (poplar, willow etc.), a multitude of woody materials generated by an industrial process (wood/paper industry in particular) or provided directly by forestry and agriculture (firewood, wood chips, bark, sawdust, shavings, chips, black liquor etc.) as well as wastes such as straw, rice husks, nut shells, poultry litter, crushed grape dregs etc.

Charcoal: Covers the solid residue of the destructive distillation and pyrolysis of wood and other vegetal material.

Biogas: Gases composed principally of methane and carbon dioxide produced by anaerobic digestion of biomass and combusted to produce heat and/or power.

Liquid Biofuels: Bio-based liquid fuel from biomass transformation, mainly used in transportation applications.

Municipal Waste (renewables)*: Municipal waste energy comprises wastes produced by the residential, commercial and public services sectors and incinerated in specific installations to produce heat and/or power. The renewable energy portion is defined by the energy value of combusted biodegradable material.

Hydro Power: Potential and kinetic energy of water converted into electricity in hydroelectric plants. It includes large as well as small hydro, regardless of the size of the plants.

Geothermal Energy: Energy available as heat emitted from within the earth's crust, usually in the form of hot water or steam. It is exploited at suitable sites for electricity generation after transformation or directly as heat for district heating, agriculture, etc.

Solar Energy: Solar radiation exploited for hot water production and electricity generation. Does not account for passive solar energy for the direct heating, cooling and lighting of dwellings or other.

Wind Energy: Kinetic energy of wind exploited for electricity generation in wind turbines.

Tide/Wave/Ocean Energy: Mechanical energy derived from tidal movement, wave motion or ocean current and exploited for electricity generation.

* Some of the waste (the non-biodegradable part of the waste) is not considered renewables as such. However, proper breakdown between renewables and non-renewables is not always available.

Key Regional Renewables Indicators for 2003

	TPES*	Of which Renewables	Share of Renewables in TPES	Share of the main fuel categories in total renewables		
				Hydro	Geothermal, Solar, Wind, etc.	Combustible Renewables and Waste
	Mtoe	Mtoe	%	%	%	%
Africa	559	280	50.1	2.6	0.3	97.1
Latin America	464	135	29.2	35.9	1.4	62.6
Asia**	1,224	400	32.7	4.0	3.5	92.5
China***	1,426	243	17.1	10.0	0	90.0
Non-OECD Europe	103	10	9.4	40.8	0.7	58.5
Former USSR	962	27	2.9	69.7	1.1	29.2
Middle East	446	3	0.7	42.7	24.1	33.2
OECD	5,395	305	5.6	35.1	11.7	53.3
World	10,579	1,404	13.3	16.2	3.8	80.0

* Total Primary Energy supply calculated using the physical energy content methodology.

** Asia excludes China.

*** China includes People's Republic of China and Hong Kong, China.

A Few Words of Caution on the Use of Data on Renewables

Definitions

Statistical information on renewables varies from country to country and from organisation to organisation. Time horizon, subsidies or taxation, sustainability and environment are some elements which might lead to some differences in coverage for policy or practical reasons. For example, large hydro is sometimes excluded from renewables, while peat is sometimes included. The figures and data presented in this leaflet are based on the coverage and definitions given on page 6.

Data Quality

Data on biomass, more specifically on "non-commercial" biomass, are often available only from secondary sources, due to the difficulty countries have in accurately monitoring the supply and consumption of biomass. As a consequence, the quality and reliability of the data may be limited, which makes comparison between countries difficult. The data on remote solar and wind installations are also difficult for national administrations to collect.

Based on information collected from various sources worldwide, and with the words of caution on page 7, the following table gives an idea of the contribution of renewables (with and without combustible renewables and waste) to total primary energy supply for over 140 countries and regions.

Selected Renewables Indicators by Country for 2003

	TPES*	Share of Renewables in TPES		TPES*	Share of Renewables in TPES		
		A	B		A	B	
		Mtoe	%		%	Mtoe	%
Albania	2.1	28.2	21.4	Ecuador	9.1	13.9	6.8
Algeria	33.0	0.3	0.1	Egypt	52.4	4.8	2.2
Angola	9.1	67.5	1.2	El Salvador	4.5	53.4	21.3
Argentina	59.9	10.2	4.9	Eritrea	0.8	69.6	0.0
Armenia	2.0	8.6	8.5	Estonia	4.9	10.6	0.0
Australia	112.6	5.7	1.4	Ethiopia	20.5	92.2	1.0
Austria	33.2	19.8	9.8	Finland	37.6	20.9	2.2
Azerbaijan	12.3	1.8	1.7	France	271.3	6.0	2.0
Bahrain	7.2	0.0	0.0	Gabon	1.7	63.4	4.6
Bangladesh	21.7	37.4	0.4	Georgia	2.7	44.6	20.9
Belarus	25.8	3.7	0.0	Germany	347.1	3.2	1.1
Belgium	59.2	1.3	0.1	Ghana	8.5	70.5	3.9
Benin	2.3	68.6	0.0	Gibraltar	0.1	0.0	0.0
Bolivia	4.5	21.2	5.0	Greece	29.9	5.2	2.0
Bosnia and Herzegovina	4.5	14.6	10.4	Guatemala	7.3	56.3	2.9
Brazil	193.2	39.5	13.6	Haiti	2.2	74.8	1.0
Brunei	2.7	0.7	0.0	Honduras	3.6	46.1	5.2
Bulgaria	19.5	4.8	1.3	Hong Kong (China)	16.5	0.3	0.0
Cameroon	6.8	83.3	4.5	Hungary	26.3	3.4	0.4
Canada	260.6	15.6	11.2	Iceland	3.4	72.5	72.5
Chile	26.3	22.8	7.4	India	553.4	39.4	1.2
People's Rep. of China	1409.4	17.3	1.7	Indonesia	161.6	30.7	3.8
Chinese Taipei	98.6	1.3	0.6	Islamic Republic of Iran	136.4	1.3	0.7
Colombia	28.4	28.4	11.0	Iraq	25.8	0.2	0.1
Congo	1.0	65.0	2.9	Ireland	15.1	1.7	0.6
Democratic Rep. of Congo	15.9	96.9	3.4	Israel	20.6	3.4	3.4
Costa Rica	3.7	44.3	36.1	Italy	181.0	5.6	4.3
Cote d'Ivoire	6.6	68.1	2.4	Jamaica	4.1	11.5	0.2
Croatia	8.8	9.1	4.8	Japan	517.1	3.5	2.3
Cuba	11.2	22.3	0.1	Jordan	5.4	1.3	1.3
Cyprus	2.7	1.7	1.3	Kazakhstan	49.8	1.6	1.5
Czech Republic	44.1	2.6	0.3	Kenya	16.2	83.4	5.9
Denmark	20.8	12.1	2.4	Korea	205.3	0.6	0.2
Dominican Republic	8.0	19.4	1.3	DPR of Korea	19.9	10.2	5.1

A: Share of total renewables in TPES

B: Share of renewables **excluding combustible renewables and waste** in TPES

* Total Primary Energy Supply calculated using the physical energy content methodology.

Selected Renewables Indicators by Country for 2003 (cont.)

	TPES*	Share of Renewables in TPES	
		A	B
		Mtoe	%
Kuwait	22.9	0.0	0.0
Kyrgyzstan	2.7	42.2	42.0
Latvia	4.4	33.5	4.6
Lebanon	6.0	4.2	2.1
Libya	18.0	0.8	0.0
Lithuania	8.9	7.9	0.3
Luxembourg	4.3	1.0	0.2
FYR of Macedonia	2.7	11.1	4.7
Malaysia	56.7	5.5	0.9
Malta	0.9	0.0	0.0
Mexico	159.9	9.6	4.5
Republic of Moldova	3.3	2.0	0.2
Morocco	10.9	5.4	1.3
Mozambique	8.2	97.2	11.1
Myanmar	13.7	74.9	1.4
Namibia	1.3	24.4	9.9
Netherlands Antilles	1.6	0.0	0.0
Nepal	8.8	89.0	2.2
Netherlands	80.8	1.7	0.2
Nicaragua	3.1	58.2	8.3
Nigeria	97.8	80.1	0.7
Norway	23.3	45.0	38.9
New Zealand	17.4	27.9	23.1
Oman	12.5	0.0	0.0
Pakistan	69.3	40.6	3.3
Panama	2.6	26.4	9.3
Paraguay	4.0	166.0	111.6
Peru	12.0	32.4	13.7
Philippines	42.1	46.1	21.7
Poland	93.7	5.2	0.2
Portugal	25.8	16.5	5.8
Qatar	15.2	0.0	0.0
Romania	39.0	10.3	3.0
Russia	639.7	2.7	2.1
Saudi Arabia	130.8	0.0	0.0
Senegal	3.2	53.9	0.9
Singapore	22.4	0.0	0.0
Slovak Republic	18.5	3.4	1.7

	TPES*	Share of Renewables in TPES	
		A	B
		Mtoe	%
Slovenia	7.0	10.4	3.9
South Africa	118.6	11.2	0.1
Spain	136.1	6.8	3.4
Sri Lanka	8.1	53.0	3.5
Sudan	16.6	81.2	0.6
Sweden	51.5	25.4	9.0
Switzerland	27.1	15.3	11.6
Syria	17.9	1.4	1.3
Tajikistan	3.2	43.5	43.5
United Rep. of Tanzania	17.2	93.2	1.3
Thailand	88.8	17.2	0.7
Togo	2.6	72.1	0.8
Trinidad and Tobago	11.1	0.2	0.0
Tunisia	8.2	12.9	0.2
Turkey	79.0	12.7	5.4
Turkmenistan	17.2	0.0	0.0
Ukraine	132.6	0.8	0.6
United Arab Emirates	39.2	0.0	0.0
United Kingdom	232.0	1.3	0.2
United States	2280.8	4.2	1.5
Uruguay	2.5	46.1	29.1
Uzbekistan	52.3	1.0	1.0
Venezuela	54.2	10.6	9.6
Vietnam	44.3	56.6	3.7
Yemen	5.7	1.4	0.0
Serbia and Montenegro	16.2	10.2	5.2
Former Yugoslavia	39.2	10.5	5.4
Zambia	6.7	93.0	12.2
Zimbabwe	9.7	65.2	4.8
Africa	558.9	50.1	1.4
Latin America	463.9	29.2	10.9
Asia	1224.4	32.7	2.5
China	1425.9	17.1	1.7
Non-OECD Europe	103.5	9.4	3.9
Former USSR	961.7	2.9	2.0
Middle East	445.7	0.7	0.5
OECD	5394.7	5.6	2.6
World	10578.7	13.3	2.7

A: Share of total renewables in TPES

B: Share of renewables **excluding combustible renewables and waste** in TPES

* Total Primary Energy Supply calculated using the physical energy content methodology.



RENEWABLE ENERGY POLICIES AND MEASURES ON A GLOBAL SCALE

The Global Renewable Energy Policies and Measures Database is an initiative led by the International Energy Agency, and is being implemented in collaboration with the European Commission and the Johannesburg Renewable Energy Coalition.

The Database features over 100 countries and offers renewable energy market and policy information in one format in one location for countries that together represent almost total global renewables supply.

The Database is freely accessible online via the IEA web site. Visitors can search for information according to country, policy instrument, renewable energy technology, renewable energy target and other criteria.

This online searchable database is part of a continued effort by the International Energy Agency to contribute to the international dialogue on renewable energy by providing unbiased information and analysis for the use by decision-makers, policy experts, researchers and industry, as well the broader public.

The screenshot shows the homepage of the Global Renewable Energy Policies and Measures Database. At the top, it reads "The International Energy Agency" and "Global Renewable Energy Policies and Measures Database". The main content area features a world map with search options: "Search by country (click map)", "Search by policy type", "Search by renewable energy technology", "Countries with renewable energy targets", and "Technology market leaders". The footer includes logos for the European Commission, JREC, and contact information: "Contact Us | About the Database" and "Copyright © OECD/IEA 2005".

<http://renewables.iea.org>

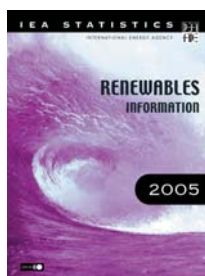
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Detailed historical data on renewables and other energy fuels are published in several annual IEA statistics books:



The IEA also publishes books on coal, electricity, gas and oil as well as on CO₂ Emissions from Fuel Combustion and on Energy Prices and Taxes. The full time series are available on CD Roms as well as on the internet.

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Renewables Information 2005 presents a detailed and comprehensive picture of developments for renewable and waste energy sources for each of the 30 OECD Member countries, encompassing energy indicators, generating capacity and heat production from renewable and waste sources, as well as production and consumption of renewable and waste products. It also includes a selection of indicators for over 100 non-OECD countries and regions.

This publication reviews the current status of the portfolio of renewable energy technologies and provides guidance on their mid- and long-term development. The study explores the options for the RD&D to achieve breakthroughs that will lead to large-scale markets and identifies what activities should take priority.



Moreover, the IEA publishes a wide range of information on renewables, including information on the most recent technology on renewables energy on its web site. The web site can be accessed at

www.iea.org

The image features a stylized globe with a grid overlay. The globe is rendered in a gradient of colors, transitioning from a warm orange-red on the left to a cool blue on the right. A network of thin, glowing lines is overlaid on the globe, representing a global network or data flow. The lines are colored in shades of blue and yellow, and they form a complex, interconnected web. The text 'WWW.IEA.ORG' is prominently displayed in the upper center of the globe, following the curve of the grid lines.

WWW.IEA.ORG