

# Global Renewable Energy Trends, Policies, and Scenarios

Dr. Eric Martinot

Senior Visiting Scholar, Tsinghua University, Beijing  
Senior Research Fellow, Worldwatch Institute  
Lead Author, REN21 Renewables Global Status Report\*

martinot@tsinghua.edu.cn  
www.martinot.info

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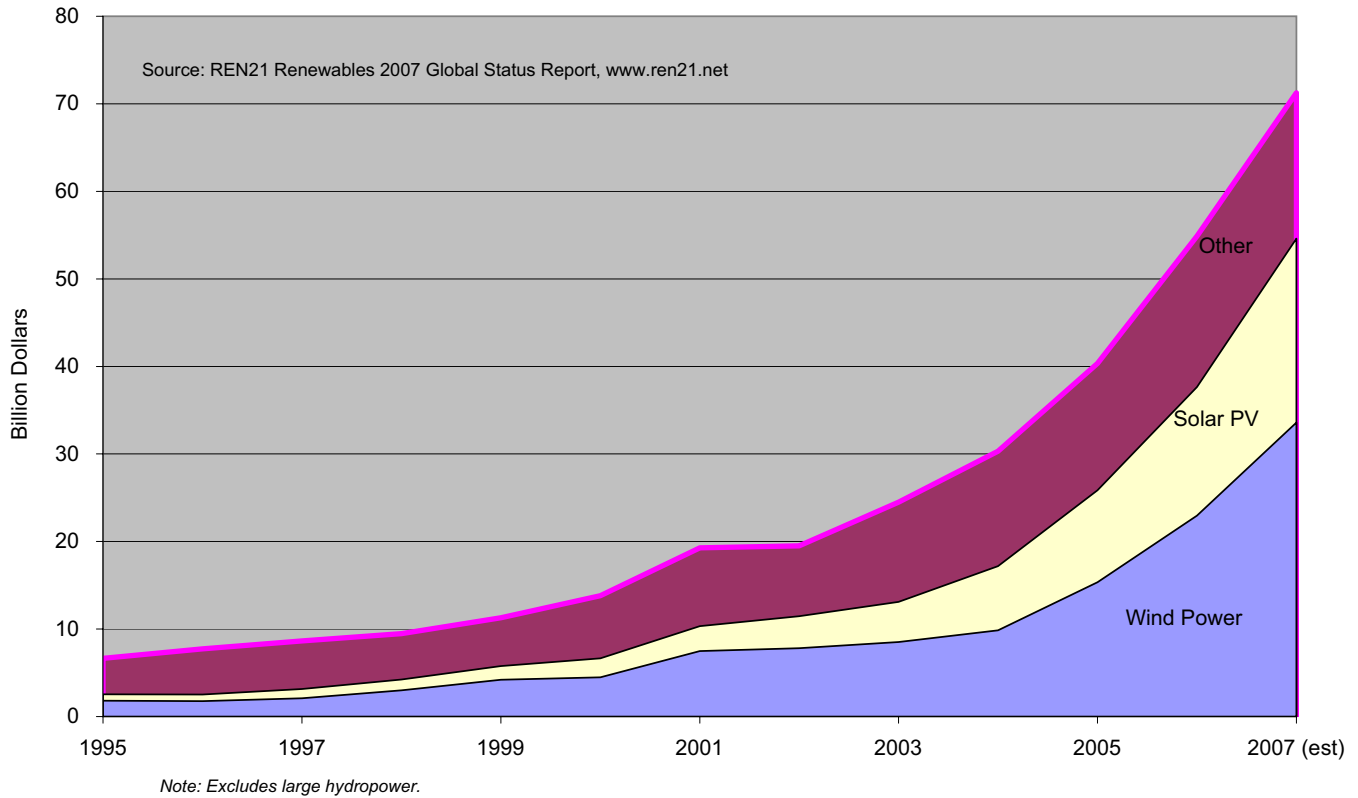
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<b>Selected Indicators</b>	<b>2005</b>	<b>↗</b>	<b>2006</b>	<b>↗</b>	<b>2007 (estimated)</b>
Investment in new renewable capacity (annual)	\$40	↗	55	↗	71 billion
Renewables power capacity (existing, excl. large hydro)	182	↗	207	↗	240 GW
Renewables power capacity (existing, incl. large hydro)	930	↗	970	↗	1,010 GW
Wind power capacity (existing)	59	↗	74	↗	95 GW
Grid-connected solar PV capacity (existing)	3.5	↗	5.1	↗	7.8 GW
Solar PV production (annual)	1.8	↗	2.5	↗	3.8 GW
Solar hot water capacity (existing)	88	↗	105	↗	128 GWth
Ethanol production (annual)	33	↗	39	↗	46 billion liters
Biodiesel production (annual)	3.9	↗	6	↗	8 billion liters
Countries with policy targets	52	↗			66
States/provinces/countries with feed-in policies	41	↗			46
States/provinces/countries with RPS policies	38	↗			44
States/provinces/countries with biofuels mandates	38	↗			53

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Figure 11. Annual Investment in New Renewable Energy Capacity, 1995–2007



## Investment Trends

- Germany (> \$14 billion), China (\$12 billion), and the United States (\$10 billion) were the investment leaders in new capacity in 2007, with Spain and Japan following.
- Wind power now dominates new capacity investment (~47% share), with solar PV second (~30%) and solar hot water third (~9%).
- In addition to \$71 billion in new renewable energy capacity in 2007, total investment flow reached well over \$100 billion if the following approximate flows are considered:
  - > \$10 billion in plant and equipment for solar PV manufacturing
  - > \$4 billion in plant and equipment for biofuels production
  - > \$16 billion in research and development (both public and private)
  - > \$15-20 billion for large hydro power
- Emerging markets are capturing increasing shares of investment flows for new capacity, manufacturing, and R&D, particularly Brazil, China, and India.

Figure 4. Wind Power, Existing World Capacity, 1995–2007

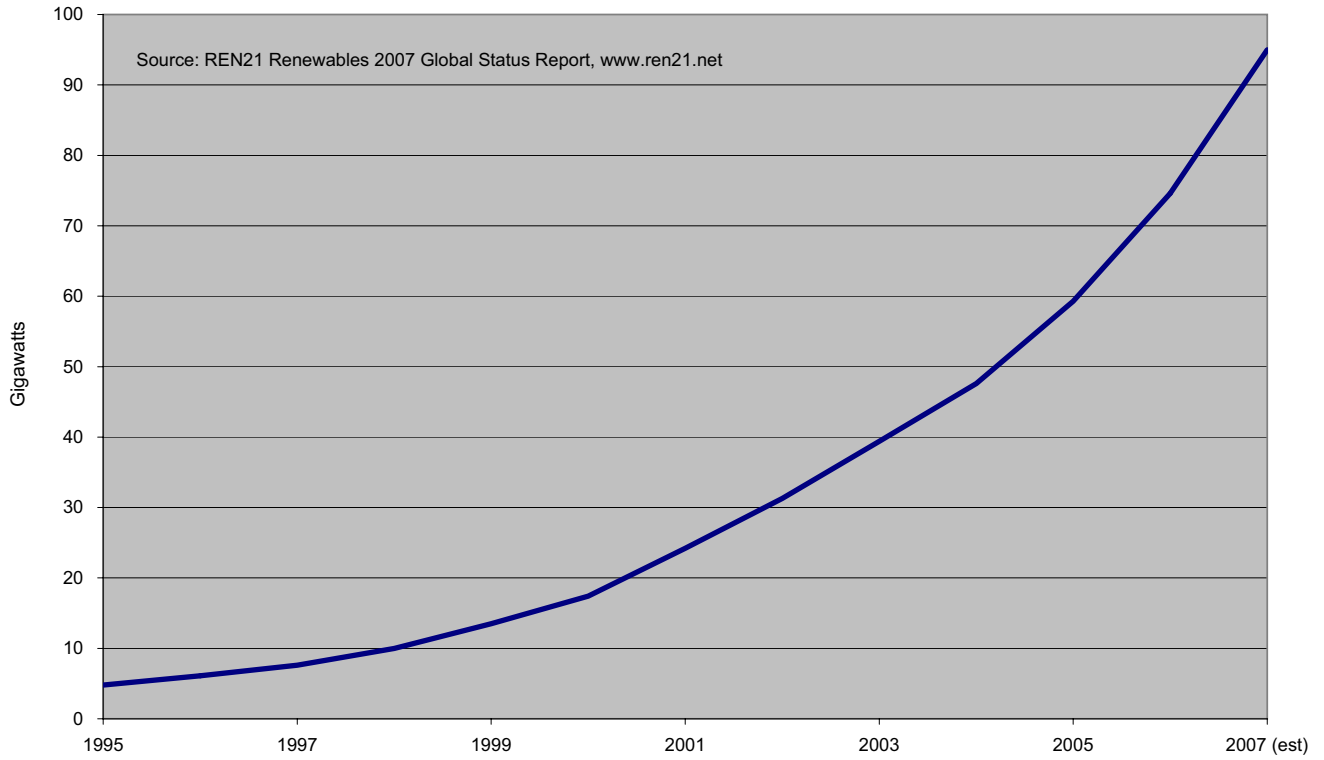


Figure 5. Wind Power Capacity, Top 10 Countries, 2006

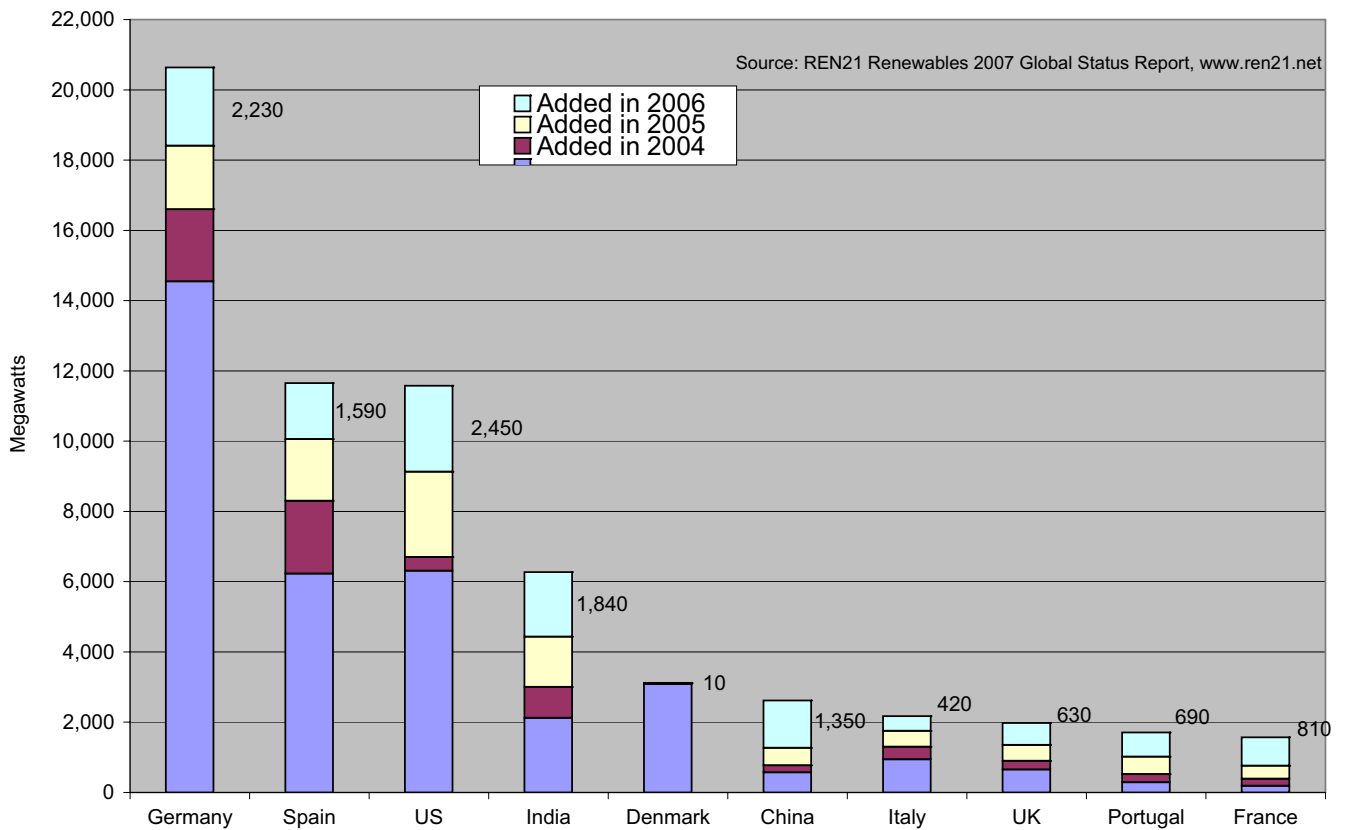


Figure 6. Solar PV, Existing World Capacity, 1995–2007

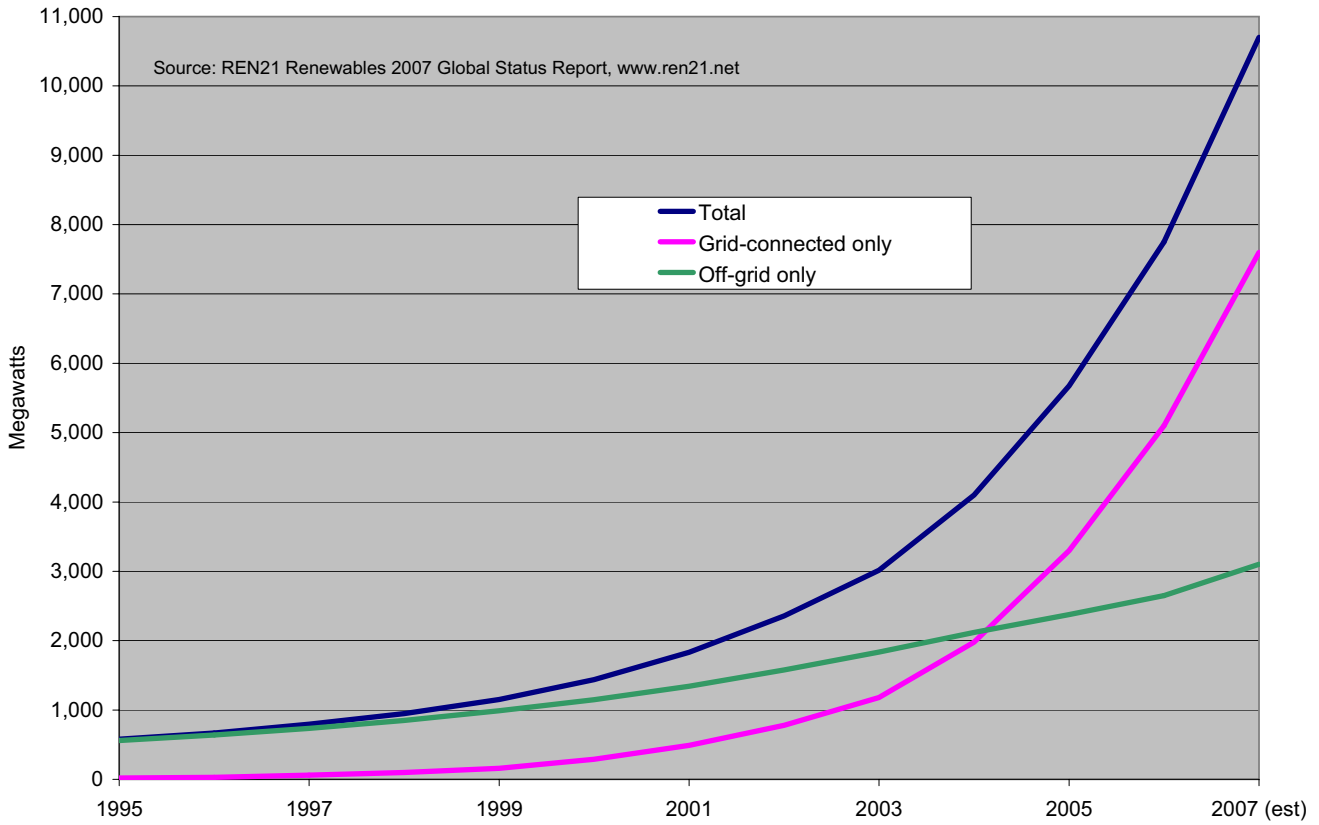
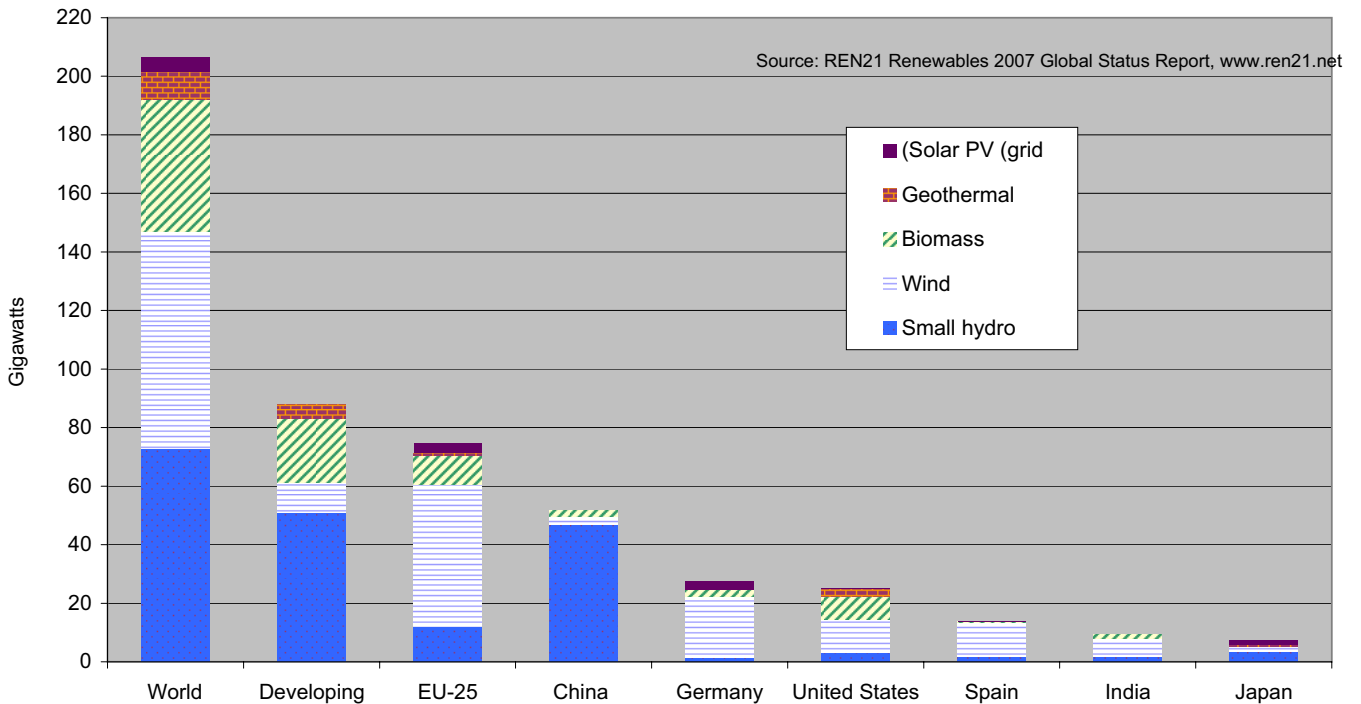
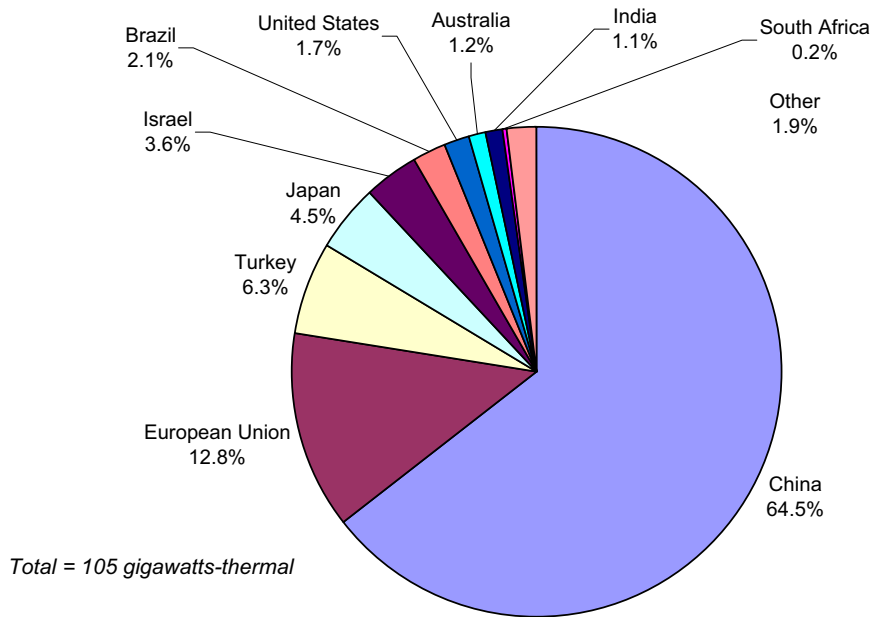


Figure 7. Renewable Power Capacities, Developing World, EU, and Top Six Countries, 2006



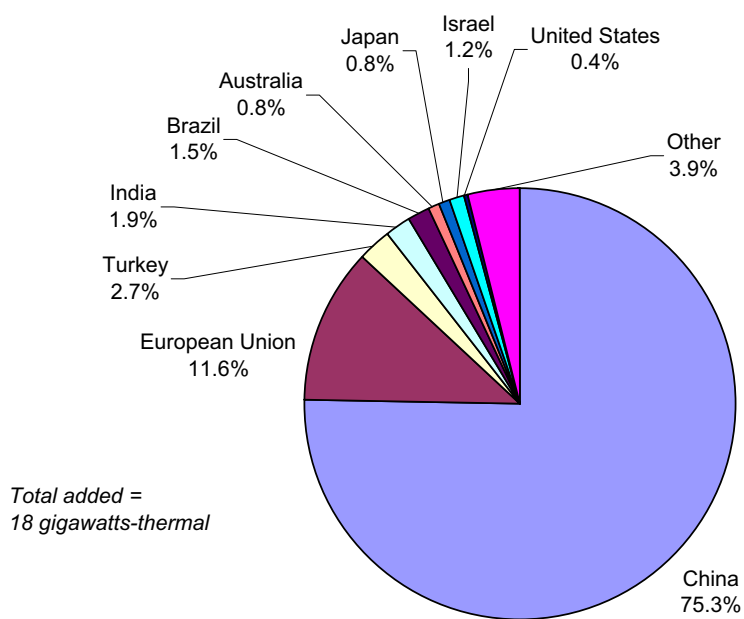
Note: Excludes large hydropower

**Figure 8. Share of Solar Hot Water/Heating Capacity Existing, Selected Countries, 2006**



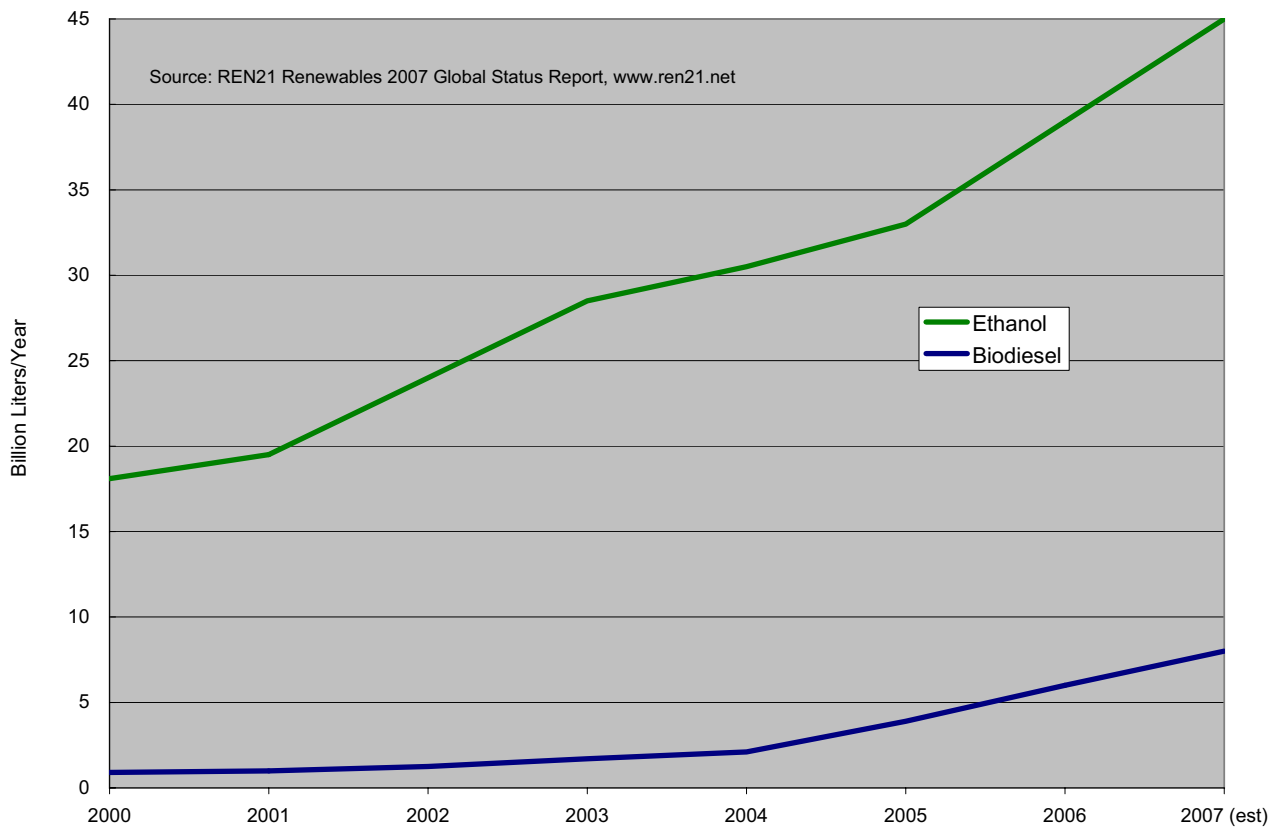
Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)

**Figure 9. Share of Solar Hot Water/Heating Capacity Added, Selected Countries, 2006**



Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)

Figure 10. Ethanol and Biodiesel Production, 2000–2007



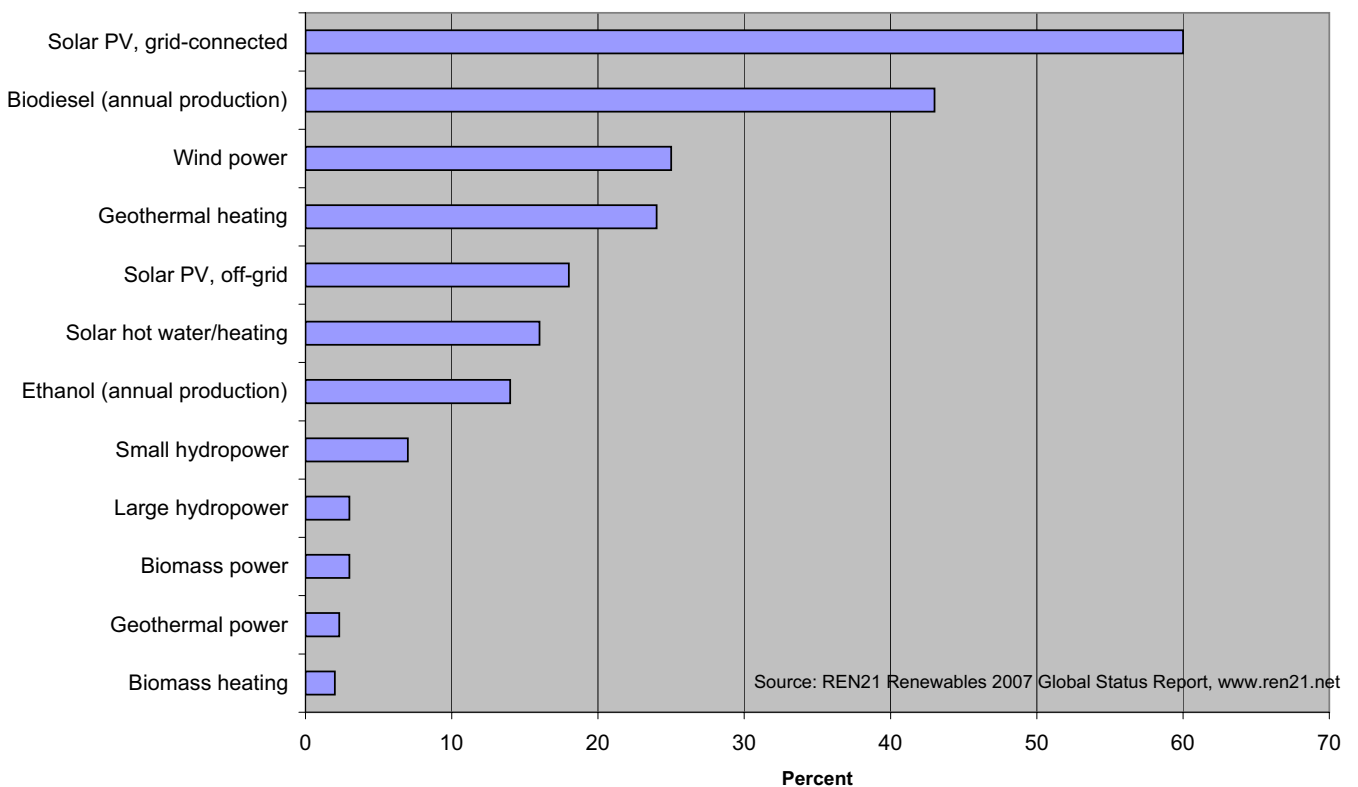
## Global Market Trends

- Renewable power capacity of about 240 GW in 2007 (ex. large hydro) represents almost 6% of total global power capacity (~4,300 GW) and the share is increasing.
- Over 70 countries now have wind power, and many developing countries have joined the trend recently, including Brazil, Egypt, Iran, Mexico, Morocco, and South Africa, all with added capacity in 2006.
- Offshore wind power grew significantly in 2006-2007, with several projects in the 100-300 MW range underway in Europe and the United States.
- Solar PV market growth is centered in Germany, Japan, Spain, Italy, South Korea, California, and New Jersey, but with the market now broadening to more countries and states (such as France).
- Rooftop solar collectors provide hot water to over 50 million households worldwide, most in China. China now represents 75% of global annual additions of solar hot water.
- Geothermal heat pumps are a rapidly growing market, with over 2 million heat pumps used in over 30 countries, mostly in Europe and the U.S.

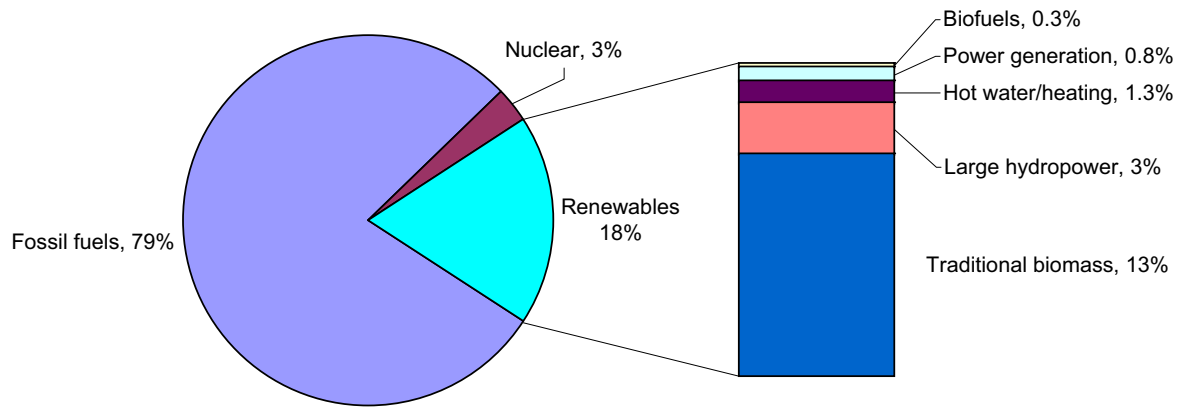
## Global Market Trends (continued)

- Biomass-fueled heating still provides five times as much heat worldwide than solar and geothermal combined, and continues to grow in northern Europe.
- The U.S. has become the dominant ethanol producer (corn-based), although Brazil has started an ambitious program to increase production by 50% by 2009 (sugar-based).
- Ethanol provided > 40 percent of all (non-diesel) motor vehicle fuel in Brazil in 2005.
- Biodiesel production has increased at 20-100% annual rates in recent years, particularly in Germany, France, Italy, Poland, and the United States.
- Almost half of world biodiesel production continued to be in Germany.
- The first group of commercial-scale solar thermal power plants since the 1980s started operation in 2006-2007, including in Nevada (USA) and Spain. Many more plants are now planned.

**Figure 3. Average Annual Growth Rates of Renewable Energy Capacity, 2002–2006**

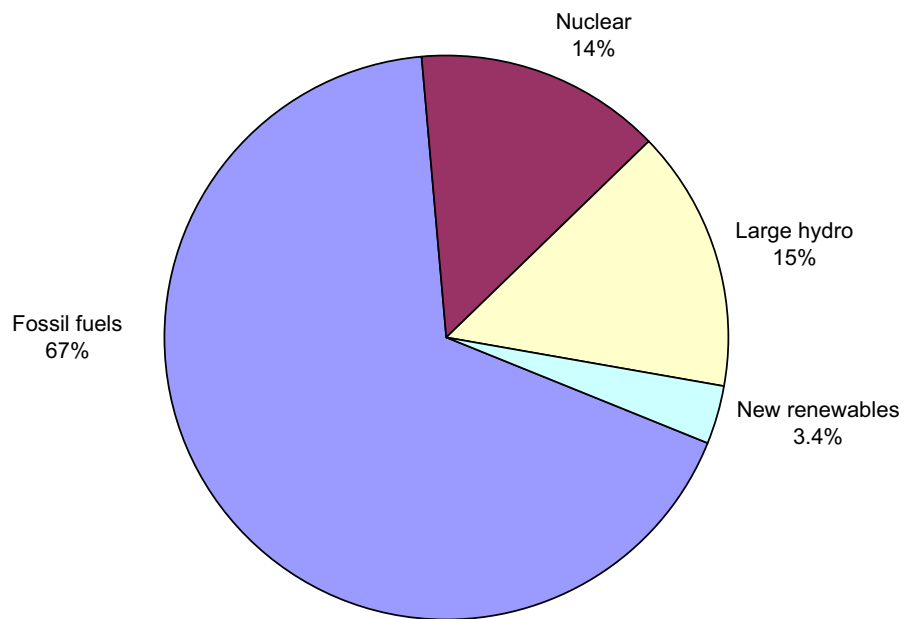


**Figure 1. Renewable Energy Share of Global Final Energy Consumption, 2006**



Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)

**Figure 2. Share of Global Electricity from Renewable Energy, 2006**



Source: REN21 Renewables 2007 Global Status Report, [www.ren21.net](http://www.ren21.net)



## Industry Trends

- The number of jobs worldwide in the renewable energy industry exceeds 2.4 million.
- Market capitalization exceeded \$100 billion in 2007 for the 135 publicly traded renewable energy companies, or divisions of major companies, that had a market capitalization greater than \$40 million each. This was an increase from 85 companies in 2005 with market capitalization of \$50 billion total.
- Big IPOs in 2005-2006 (including three with market capitalization greater than \$5 billion): Suntech (China), Suzlon (India), REC (Norway), and Q-cells (Germany).
- Recent IPOs are generating market capitalization above or near \$1 billion, including solar PV companies First Solar (US), Trina Solar (US), Centrosolar (Germany), and Renesola (UK), and U.S. biofuels producers VeraSun Energy and Pacific Ethanol.
- The wind industries in China and India continue to grow. By 2007 in China, there were 4 existing Chinese manufacturers, 6 major foreign subsidiary/JV manufacturers, and 40 other Chinese firms aspiring to produce turbines and developing prototypes.
- The wind power industry has experienced supply chain difficulties due to booming demand, putting unprecedented pressure on turbine component manufacturers.

## Industry Trends (continued)

- Solar PV production worldwide in 2007 is estimated at 3.5–3.8 GW, up from 2.5 GW in 2006 and 1.8 GW in 2005.
- Top solar PV manufacturers in 2006 were Sharp (Japan), Q-Cells (Germany), Kyocera (Japan), and Suntech (China).
- China is now the third largest producer of solar PV, behind Japan and Germany. Chinese solar PV cell production was just 65 MW in 2004, but manufacturing capacity grew to reach at least 1.5 GW by 2007.
- Considering all companies and announced expansion plans, solar PV manufacturing capacity in China will likely exceed 4 GW by 2010.
- New investment in ethanol production facilities could reach \$4–5 billion in 2007, with more than 85 plants under construction in the U.S. and Canada and a major program starting in Brazil that could increase national output by 50% by 2009.
- Serious commercial investment in cellulose-to-ethanol plants began during 2006/2007, with hundreds of millions of dollars flowing and plants under construction or already completed in the United States, Canada, the Netherlands, and Japan.

## Policy Landscape

- Policy targets exist in at least 66 countries worldwide, including 22 developing countries, all 27 EU countries, and many states/provinces in the US and Canada.
- At least 60 countries worldwide now have some type of renewable energy promotion policy, including 23 developing countries. Several more developing countries are actively engaged in enacting policies.
- At least 37 countries and 9 states/provinces have adopted feed-in policies, more than half of which have been enacted since 2002.
- At least 44 states, provinces, and countries have enacted renewable portfolio standards (RPS), half since 2003.
- Many countries continue to actively supplement, revise, and clarify targets and promotion policies, including feed-in tariffs and rules.
- Targets for biofuels as a share of transport energy exist in EU (5.75% by 2010 and 10% by 2020), France (10% by 2015), Belgium (5.75% by 2010), and Japan (5% by 2030).
- Mandates for blending biofuels into vehicle fuels have been enacted in at least 36 states/provinces and 17 countries. Most are 10-15% for ethanol and 2-5% for biodiesel.

## Policy Landscape (continued)

- US Renewable Fuels Standard requires 28 billion liters/year by 2012 (vs. 18 bly in 2006)
- Biofuels tax exemptions have been enacted in a growing number of countries during 2005-2007, including Argentina, France, Germany, Greece, Ireland, Italy, Lithuania, Slovenia, South Africa, Spain, Sweden, and UK. Many are for 100% tax exemptions.
- Solar PV policies continue to multiply, including:
  - feed-in tariffs in Europe (typical 38-55 eurocents/kWh for small installations in Belgium, Czech Republic, France, Germany, Greece, Italy, Spain); and at state/province levels, including Washington State (USA), Ontario (Canada), State of South Australia
  - national building code requirement in Spain for solar PV on new buildings
  - U.S. national tax credit (30%)
  - capital subsidies in several U.S. states (\$0.5-4/watt), Australia (A\$4/watt), Korea (70% subsidy), 300 Japanese municipalities, UK, and Sweden.
- Solar hot water tax credits and subsidies exist in many jurisdictions.
- There are more than 4 million green power consumers in Europe, US, Canada, Australia, and Japan, most of these in Europe.
- Municipalities around the world are also setting targets for future shares of renewable energy, CO<sub>2</sub>-reduction targets, and enacting policies for solar PV and solar hot water.

**Table 2. Renewable Energy Promotion Policies**

Country	Feed-in tariff	Renewable port-folio standard	Capital subsidies, grants, or rebates	Investment or other tax credits	Sales tax, energy tax, excise tax, or VAT reduction	Tradable renewable energy certificates	Energy production payments or tax credits	Net metering	Public investment, loans, or financing	Public competitive bidding
<b>Developed and transition countries</b>										
Australia		✓	✓			✓			✓	
Austria	✓		✓	✓		✓			✓	
Belgium		✓	✓		✓	✓				
Canada	(*)	(*)	✓		✓			(*)		(*)
Croatia	✓			✓					✓	
Cyprus	✓		✓							
Czech Republic	✓		✓	✓		✓				
Denmark	✓				✓	✓		✓	✓	✓
Estonia	✓				✓	✓				
Finland			✓		✓	✓	✓			
France	✓		✓	✓	✓	✓			✓	✓
Germany	✓		✓	✓	✓				✓	
Greece	✓		✓	✓						
Hungary	✓				✓				✓	
Ireland	✓		✓	✓		✓				✓
Italy	✓	✓	✓	✓		✓		✓		
Israel	✓					✓				
Japan	(*)	✓	✓			✓		✓	✓	
Korea	✓		✓	✓	✓				✓	
Latvia	✓								✓	✓
Lithuania	✓		✓	✓					✓	
Luxembourg	✓		✓	✓						
Malta	✓				✓					
Netherlands	✓			✓		✓	✓			
New Zealand			✓						✓	
Norway			✓	✓		✓				✓
Poland		✓	✓		✓				✓	✓
Portugal	✓		✓	✓	✓					
Romania					✓					
Russia			✓			✓				
Slovak Republic	✓			✓					✓	
Slovenia	✓								✓	
Spain	✓		✓	✓					✓	
Sweden		✓	✓	✓	✓	✓	✓			
Switzerland	✓									
United Kingdom		✓	✓		✓	✓				
United States	(*)	(*)	✓	✓	(*)	(*)	✓	(*)	(*)	(*)

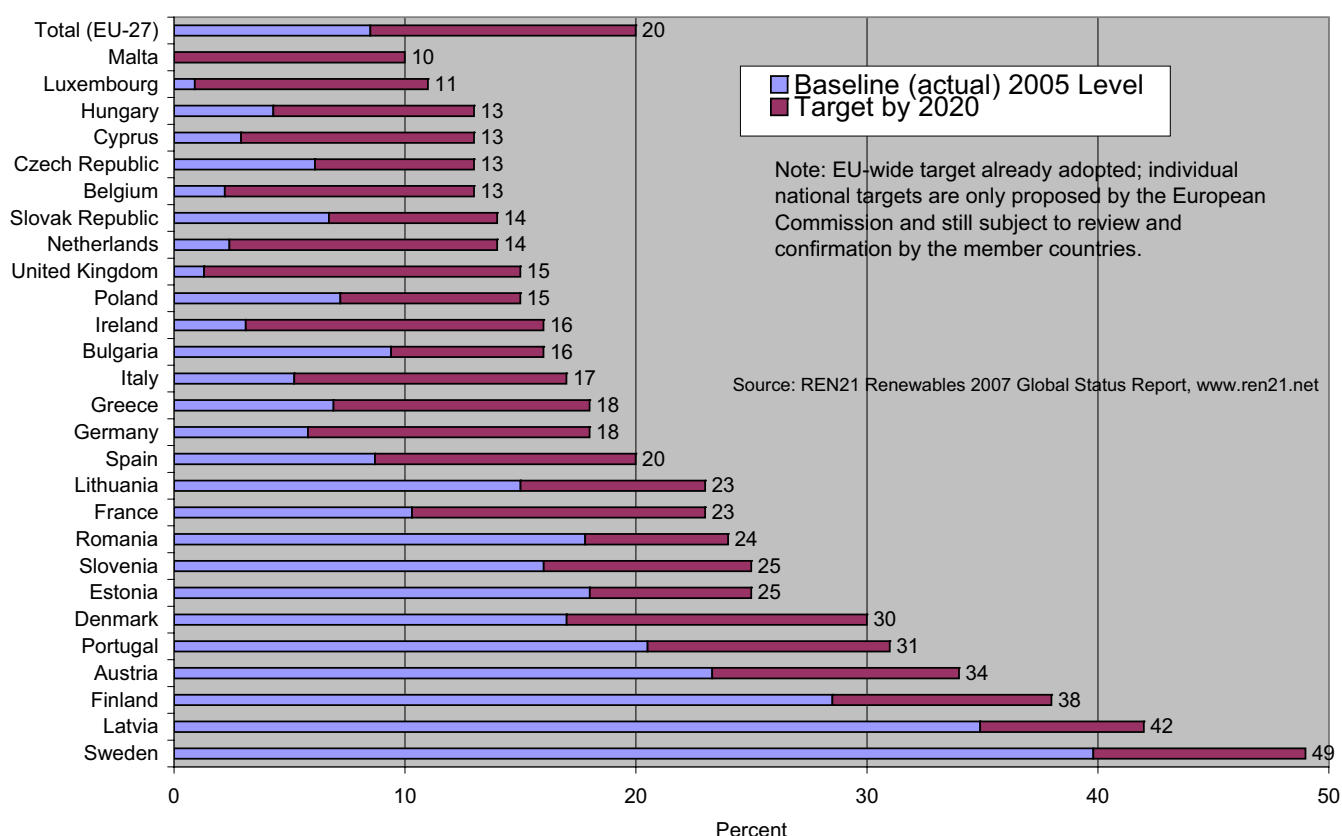
**Table R10. Cumulative Number of Countries/States/Provinces Enacting Feed-in Policies**

Year	Cumulative Number	Countries/States/Provinces Added That Year
1978	1	United States
1990	2	Germany
1991	3	Switzerland
1992	4	Italy
1993	6	Denmark, India
1994	8	Spain, Greece
1997	9	Sri Lanka
1998	10	Sweden
1999	13	Portugal, Norway, Slovenia
2000	13	—
2001	15	France, Latvia
2002	21	Algeria, Austria, Brazil, Czech Republic, Indonesia, Lithuania
2003	28	Cyprus, Estonia, Hungary, South Korea, Slovak Republic, Maharashtra (India)
2004	34	Italy, Israel, Nicaragua, Prince Edward Island (Canada), Andhra Pradesh and Madhya Pradesh (India)
2005	41	Karnataka, Uttaranchal, and Uttar Pradesh (India); China; Turkey; Ecuador; Ireland
2006	44	Ontario (Canada), Argentina, Thailand
2007	46	South Australia (Australia), Croatia

**Table R11. Cumulative Number of Countries/States/Provinces Enacting RPS Policies**

Year	Cumulative Number	Countries/States/Provinces Added
1983	1	Iowa (USA)
1994	2	Minnesota (USA)
1996	3	Arizona (USA)
1997	6	Maine, Massachusetts, Nevada (USA)
1998	9	Connecticut, Pennsylvania, Wisconsin (USA)
1999	12	New Jersey, Texas (USA); Italy
2000	13	New Mexico (USA)
2001	15	Flanders (Belgium); Australia
2002	18	California (USA); Wallonia (Belgium); United Kingdom
2003	19	Japan; Sweden; Maharashtra (India)
2004	34	Colorado, Hawaii, Maryland, New York, Rhode Island (USA); Nova Scotia, Ontario, Prince Edward Island (Canada); Andhra Pradesh, Karnataka, Madhya Pradesh, Orissa (India); Poland
2005	38	District of Columbia, Delaware, Montana (USA); Gujarat (India)
2006	39	Washington State (USA)
2007	44	Illinois, New Hampshire, North Carolina, Oregon (USA); China

**Figure 12. EU Renewable Energy Targets—Share of Final Energy by 2020**



**Table R7. Share of Primary and Final Energy from Renewables, Existing in 2006 and Targets**

Country/region	Primary energy (IEA method)		Final energy (EC method)	
	Existing share (2006)	Future target	Existing share (2005–06)	Future target
World	13%	—	18%	—
EU-25/EU-27	6.5%	12% by 2010	8.5%	20% by 2020
<b>Selected EU Countries</b>				
Austria	20%	—	23%	34% by 2020
Czech Republic	4.1%	8–10% by 2020	6.1%	13% by 2020
Denmark	15%	30% by 2025	17%	30% by 2020
France	6.0%	7% by 2010	10%	23% by 2020
Germany	5.6%	4% by 2010	5.8%	18% by 2020
Italy	6.5%	—	5.2%	17% by 2020
Latvia	36%	6% by 2010	35%	42% by 2020
Lithuania	8.8%	12% by 2010	15%	23% by 2020
Netherlands	2.7%	—	2.4%	14% by 2020
Poland	4.6%	14% by 2020	7.2%	15% by 2020
Spain	6.5%	12.1% by 2010	8.7%	20% by 2020
Sweden	28%	—	40%	49% by 2020
United Kingdom	1.7%	—	1.3%	15% by 2020
<b>Other Developed/OECD Countries</b>				
Canada	16%	—	20%	—
Japan	3.2%	—	3.2%	—
Korea	0.5%	5% by 2011	0.6%	—
Mexico	9.4%	—	9.3%	—
United States	4.8%	—	5.3%	—
<b>Developing Countries</b>				
Argentina	8.2%	—	—	—
Brazil	43%	—	—	—
China*	8%	15% by 2020	—	—
Egypt	4.2%	14% by 2020	—	—
India	31%	—	—	—
Indonesia	3%	15% by 2025	—	—
Jordan	1.1%	10% by 2020	—	—
Kenya	81%	—	—	—
Mali	—	15% by 2020	—	—
Morocco*	4.3%	10% by 2010	—	—
Senegal	40%	15% by 2025	—	—
South Africa	11%	—	—	—
Thailand*	4%	8% by 2011	—	—

**Table R8. Share of Electricity from Renewables, Existing in 2006 and Targets**

Country/region	Existing share (2006)	Future target	Country/region	Existing share (2006)	Future target
World	18%	—	<b>Other Developed/OECD Countries</b>		
EU-25	14%	21% by 2010	Australia	7.9%	—
<b>Selected EU Countries</b>			Canada	59%	—
Austria	62%	78% by 2010	Israel	—	5% by 2016
Belgium	2.8%	6.0% by 2010	Japan*	0.4%	1.63% by 2014
Czech Republic	4.2%	8.0% by 2010	Korea	1.0%	7% by 2010
Denmark	26%	29% by 2010	Mexico	16%	—
Finland	29%	31.5% by 2010	New Zealand	65%	90% by 2025
France	10.9%	21% by 2010	Switzerland	52%	—
Germany	11.5%	12.5% by 2010	United States	9.2%	—
Greece	13%	20.1% by 2010	<b>Developing Countries</b>		
Hungary	4.4%	3.6% by 2010	Argentina*	1.3%	8% by 2016
Ireland	10%	13.2% by 2010	Brazil*	5%	—
Italy	16%	25% by 2010	China	17%	—
Luxembourg	6.9%	5.7% by 2010	Egypt	15%	20% by 2020
Netherlands	8.2%	9.0% by 2010	India	4%	—
Poland	2.6%	7.5% by 2010	Malaysia	—	5% by 2005
Portugal	32%	45% by 2010	Morocco	10%	20% by 2012
Slovak Republic	14%	31% by 2010	Nigeria	—	7% by 2025
Spain	19%	29.4% by 2010	Pakistan	—	10% by 2015
Sweden	49%	60% by 2010	Thailand	7%	—
United Kingdom	4.1%	10% by 2010			

**Table R9. Other Renewable Energy Targets**

Country	Target(s)
Australia	9.5 TWh of electricity annually by 2010 (RPS)
Brazil	3.3 GW added by 2006 from wind, biomass, small hydro
Canada	3.5% to 15% of electricity in 4 provinces (RPS); other types of targets in 5 provinces
China	300 GW hydro, 30 GW wind, 30 GW biomass, 1.8 GW PV, 300 million square meters solar hot water by 2020
Croatia	400 MW by 2010, excluding large hydropower
Dominican Republic	500 MW wind power capacity by 2015
India	10% of added electric power capacity during 2003–2012 (expected 10 GW). 10.5 GW total wind power existing by 2012; other long-term goals to 2032
Italy	3 GW of solar PV by 2016
Iran	500 MW of electricity output by 2010
Korea	1.3 GW of grid-connected solar PV by 2011, including 100,000 solar homes
Mexico	4 GW added by 2014
Morocco	1 GW wind power by 2012 and 400,000 square meters solar hot water added by 2015
New Zealand	30 PJ of added capacity (including heat and transport fuels) by 2012
Norway	7 TWh from heat and wind by 2010
Philippines	4.7 GW total existing capacity by 2013
Singapore	50,000 square meters (~35 MWth) solar hot water by 2012
South Africa	10 TWh added final energy by 2013
Switzerland	3.5 TWh from electricity and heat by 2010
Spain	500 MW solar power by 2010
Tunisia	500,000 square meters solar hot water by 2009 and 300 MW added wind by 2011
Turkey	2% of electricity from wind by 2010
Uganda	100 MW small hydro and 45 GW geothermal by 2017; other rural electricity and productive-uses targets
United States	5% to 30% (typical) of electricity in 26 states and District of Columbia (RPS)

**China Renewable Energy Targets**

	2006 actual	2010 target	2020 target
Hydro power	130 GW	190 GW	300 GW
Wind power	2.6 GW	5 GW	30 GW
Biomass power	2.0 GW	5.5 GW	30 GW
Solar PV	0.08 GW	0.3 GW	1.8 GW
Solar hot water	100 million m <sup>2</sup>	150 million m <sup>2</sup>	300 million m <sup>2</sup>
Ethanol	1 million tons	2 million tons	10 million tons
Biodiesel	0.05 million tons	0.2 million tons	2 million tons
Biomass pellets	~ 0	1 million tons	50 million tons
Biogas and biomass gasification	8 million m <sup>3</sup> /year	19 billion m <sup>3</sup> /year	44 million m <sup>3</sup> /year
Share of primary energy	8%	10%	15%

**Table R12. Biofuels Blending Mandates**

Country	Mandate
Australia	E2 in New South Wales, increasing to E10 by 2011; E5 in Queensland by 2010
Argentina	E5 and B5 by 2010
Bolivia	B2.5 by 2007 and B20 by 2015
Brazil	E22 to E25 existing (slight variation over time); B2 by 2008 and B5 by 2013
Canada	E5 by 2010 and B2 by 2012; E7.5 in Saskatchewan and Manitoba; E5 by 2007 in Ontario
China	E10 in 9 provinces
Colombia	E10 existing; B5 by 2008
Dominican Republic	E15 and B2 by 2015
Germany	E2 and B4.4 by 2007; B5.75 by 2010
India	E10 in 13 states/territories
Italy	E1 and B1
Malaysia	B5 by 2008
New Zealand	3.4 percent total biofuels by 2012 (ethanol or biodiesel or combination)
Paraguay	B1 by 2007, B3 by 2008, and B5 by 2009
Peru	B5 and E7.8 by 2010 nationally; starting regionally by 2006 (ethanol) and 2008 (biodiesel)
Philippines	B1 and E5 by 2008; B2 and E10 by 2011
South Africa	E8-E10 and B2-B5 (proposed)
Thailand	E10 by 2007; 3 percent biodiesel share by 2011
United Kingdom	E2.5/B2.5 by 2008; E5/B5 by 2010
United States	Nationally, 130 billion liters/year by 2022 (36 billion gallons); E10 in Iowa, Hawaii, Missouri, and Montana; E20 in Minnesota; B5 in New Mexico; E2 and B2 in Louisiana and Washington State; Pennsylvania 3.4 billion liters/year biofuels by 2017 (0.9 billion gallons)
Uruguay	E5 by 2014; B2 from 2008-2011 and B5 by 2012

**Table 3. Selected Cities with Renewable Energy Goals and/or Policies**

City	Renewable energy goals	CO <sub>2</sub> reduction goals	Policies for solar hot water	Policies for solar PV	Urban planning, pilots, and other policies
Adelaide, Australia	✓	✓			✓
Austin (Texas), USA	✓	✓			✓
Barcelona, Spain			✓		
Berlin, Germany		✓	✓	✓	
Betim, Brazil		✓	✓		✓
Cape Town, South Africa	✓	✓			✓
Chicago, USA	✓				
Daegu, Korea	✓	✓			✓
Freiburg, Germany	✓	✓	✓	✓	✓
Gwangju, Korea	✓	✓			✓
The Hague, Netherlands		✓			
Leicester, UK	✓				✓
London, UK		✓			
Malmö, Sweden		✓			✓
Melbourne, Australia	✓	✓			✓
Mexico City, Mexico				✓	✓
Minneapolis, USA	✓				✓
Nagpur, India		✓	✓	✓	
New York, USA		✓		✓	✓
Oxford, UK	✓	✓	✓	✓	✓
Portland, United States	✓	✓	✓	✓	✓
Rizhao, China			✓	✓	
Salt Lake City, USA	✓	✓			✓
Santa Monica, USA	✓				✓
São Paulo, Brazil			✓		
Sapporo, Japan		✓			✓
Stockholm, Sweden	✓	✓			✓
Toronto, Canada		✓			
Tokyo, Japan	✓		✓	✓	✓
Townsville, Australia			✓	✓	
Vancouver, Canada		✓			
Växjö, Sweden	✓	✓	✓	✓	✓
Woking, UK	✓	✓	✓	✓	✓

## Selected Municipal Targets and Goals for Renewable Energy

City	Targets for renewable share of electricity	CO2 emissions reductions goals	Other targets/goals
Austin (TX), USA	30% by 2020	carbon-neutral by 2020	100% of own elec. use by 2012
Adelaide, Australia	15% by 2014	transport/buildings zero net emissions by 2010/12	2 MW of solar PV on residential and commercial buildings
Berlin, Germany		25% below 1990 by 2010	
Cape Town, South Africa	10% by 2020		10% of homes by 2010 with solar hot water
Chicago, USA			20% of own elec. use by 2006
Daegu, Korea			5% of energy by 2012
Freiburg, Germany	10% by 2010	25% below 1992 by 2010	
Gwangju, Korea		20% below 1990 by 2020	2% of energy by 2020
Leicester, UK			10% of energy by 2010 and 20% by 2020
London, UK		20% below 1990 by 2010	
Malmö, Sweden		25% below 1990 by 2012	
Melbourne		20% below 1996 by 2010	25% RE in buildings by 2010
New York, USA		7% below 1990 by 2012	
Oxford, UK			10% of homes by 2010 with solar hot water/PV
Portland (OR) USA		10% below 1990 by 2010	100% of own elec. use by 2010
Sacramento, USA	20% by 2011		
Salt Lake City, USA			10% of new building energy use
San Francisco, USA			1 MW/year added
Santa Monica, USA			100% of own use (current)
Sapporo, Japan		10% below 1990 by 2012	
Tokyo, Japan			20% of energy by 2020 (proposed); 5% of own use
Toronto, Canada		30% by 2020; 80% by 2050	
Vancouver, Canada		30% by 2020; 80% by 2050	

### Spain Solar Hot Water Ordinances

- Barcelona started in 2000 to require solar hot water in all new buildings and major renovations above a specific size (typically all commercial buildings and residential buildings of 16 or more households). In 2005, eliminated minimum size requirement.
- Barcelona requirement is for 60% of hot water energy to come from solar.
- Barcelona was followed by 70 municipalities and cities throughout Spain enacting similar ordinances
- March 2006: Spain enacted a national building ordinance requiring solar hot water and solar PV in new construction and renovation for larger buildings.
- National ordinance requires 30-70% of hot water energy from solar, depending on consumption level, geographical location, and back-up fuel.
- National ordinance applies to several types of buildings: shopping centers > 3,000 m<sup>2</sup>, warehouses > 10,000 m<sup>2</sup>; office buildings > 4,000 m<sup>2</sup>; hotels > 100 rooms; hospitals > 100 rooms; convention centers > 10,000 m<sup>2</sup>



## Renewables Global Status Report

- Report designed to compile existing factual information about markets, investments, and policies. No analysis, recommendations, or conclusions.
- 2005 report based on research, data, interviews, and review by over 100 contributors from around the world. Updated in 2006.
- 2007 report now available.
- Sponsored by the REN21 Renewable Energy Policy Network and German government. Worldwatch Institute and GTZ are producer and publisher. Eric Martinot is lead author and research director.
- German, Chinese, and Japanese translations available for 2005 and 2006 editions. These languages along with French and Spanish forthcoming for 2007 edition.
- Available for free download at [www.ren21.net](http://www.ren21.net).

**Table 2 Share of primary energy from renewables—policy targets and scenarios<sup>a</sup>**

Region/ country	2004 actual <sup>b</sup>	2010 policy targets <sup>c</sup>	2020 policy targets or scenarios <sup>d</sup>	Up to 2050 scenarios <sup>e</sup>
World	3.8% or 8.2% or 13.0% or 16.5%	—	5%–15% low/reference	10%–15% low/reference
			15%–20% medium	25%–30% medium
			25% high	40%–50% high
Europe (EU25)	6.5%	12%	10% reference/ carbon constrained	15%–20% reference (by 2030)/carbon constrained
			20% target	30%–40% policies (by 2030)
			23% revolution	50% revolution
United States	4.2%	—	7% reference	8% reference
			20% revolution	50% revolution
Japan	1.2% <sup>f</sup>	3% <sup>f</sup>	—	6% (2030) reference 17%/22% (2030) 25%/50% (2050) high/community

**Table 3 Share of electricity from renewables—policy targets and scenarios<sup>a</sup>**

Region/ country	2005 actual <sup>b</sup>	2010 policy targets	2020 scenarios or policy targets <sup>c</sup>	Up to 2050 scenarios <sup>d</sup>
World	19%	—	15%–20% low/reference	15%–25% low/reference
			20%–25% medium	30%–40% medium
			35%–40% high	50%–80% high
Europe <sup>e</sup> (EU25)	14%	21%	15%–20% reference	20%–25% reference (by 2030)
			25% carbon constrained	30% carbon constrained
			30% policies	45%–60% high (by 2030)
			35% revolution	70% revolution
United States <sup>f</sup>	8%	5%–30% state targets	5%–33% state targets	9%–11% reference 11%–15% alternative (by 2030)
			20% advanced and blueprint	50% high <sup>g</sup>
			30% revolution	80% revolution
Japan <sup>a</sup>	0.4% actual + 10% large hydro	1.35% target + large hydro	11% reference	11% (2030) reference 33%/41% (2030) high/community
				50% high

**A Renewable Energy Future for New Zealand:  
75–90% of Total Energy is Possible!**

Buildings:

- Solar hot water and space heating
- Biogas and biomass pellets for heating and cooking
- Efficient building design with passive solar architecture
- Advanced thermal storage
- Within 3–5 years: household-scale solar photovoltaic (PV) power

Electric power:

- Wind power combined with pumped hydro and other forms of storage (i.e. Vn Redox)
- Biogas for small-scale power generation?
- Biomass pellets for community-scale combined-heat-and-power plants?

Transportation:

- Urban electric vehicles with advanced batteries charged using intermittent wind/solar
- Vehicles integrated into “smart grids” and time-of-day metering and power rates
- Freight and intercity transport: natural gas, oil, hydrogen → highest value for fossil fuels!
- Ethanol from cellulose, if commercially proven