Renewables 2007 Global Status Report

A report of the REN21 Renewable Energy Policy Network (www.ren21.net)

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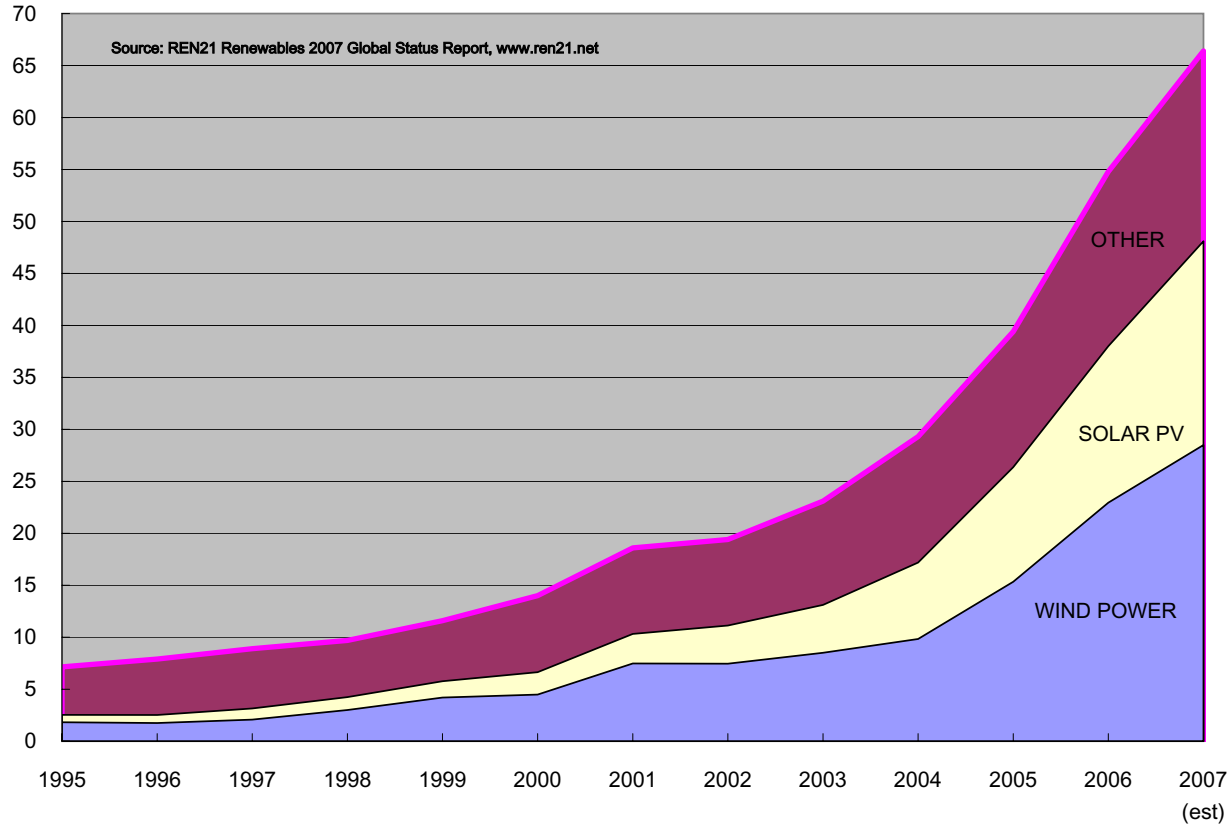
SELECTED INDICATORS	2005 →	2006 →	2007 (est)
Investment in new renewable capacity (annual)	$39 →	$55 →	$66 billion
Renewables power capacity (existing, exc. large hydro)	182 →	206 →	237 GW
Renewables power capacity (existing, incl. large hydro)	930 →	970 →	1010 GW
Wind power capacity (existing)	59 →	74 →	93 GW
Grid-connected solar PV capacity (existing)	3.4 →	5.0 →	7.8 GW
Solar PV production (annual)	1.8 →	2.5 →	3.8 GW
Solar hot water capacity (existing)	88 →	103 →	121 GWth
Ethanol production (annual)	33 →	38 →	44 billion liters
Biodiesel production (annual)	3.9 →	6 →	8 billion liters
Countries with policy targets	52 →		58
States/provinces/countries with feed-in policies	43 →		46
States/provinces/countries with RPS policies	38 →		44
States/provinces/countries with biofuels mandates	38 →		42

Figure 10: Annual Investment in New Renewable Energy Capacity
1995-2007 (billion USD, excluding large hydro)



Investment Trends

- Germany (> $12 billion) and China ($10 billion) were the investment leaders in new capacity in 2006, with the U.S. ($5 billion), Spain, and Japan following.
- Wind power now dominates new capacity investment (~43% share), with solar PV second (~30%) and solar hot water third (~10%).
- Subsidies (public and indirect/off-budget) are greater than $20 billion per year, a majority of which is for biofuels.
- In addition to $55 billion in new renewable energy capacity in 2006, total investment flow reached over $100 billion if the following approximate flows are considered:
  - $15-20 billion for large hydro power
  - $8 billion in plant and equipment for solar PV manufacturing ($10 b. est. 2007)
  - $2 billion in plant and equipment for biofuels production
  - $7 billion in venture capital and private equity investment
  - $10 billion in capital raised on public markets
  - $16 billion in research and development (both public and private)
- Emerging markets are capturing increasing shares of investment flows for new capacity, manufacturing, and R&D, particularly Brazil, China, and India.

Figure 1: Windpower Existing World Capacity, 1990-2007 (GW)

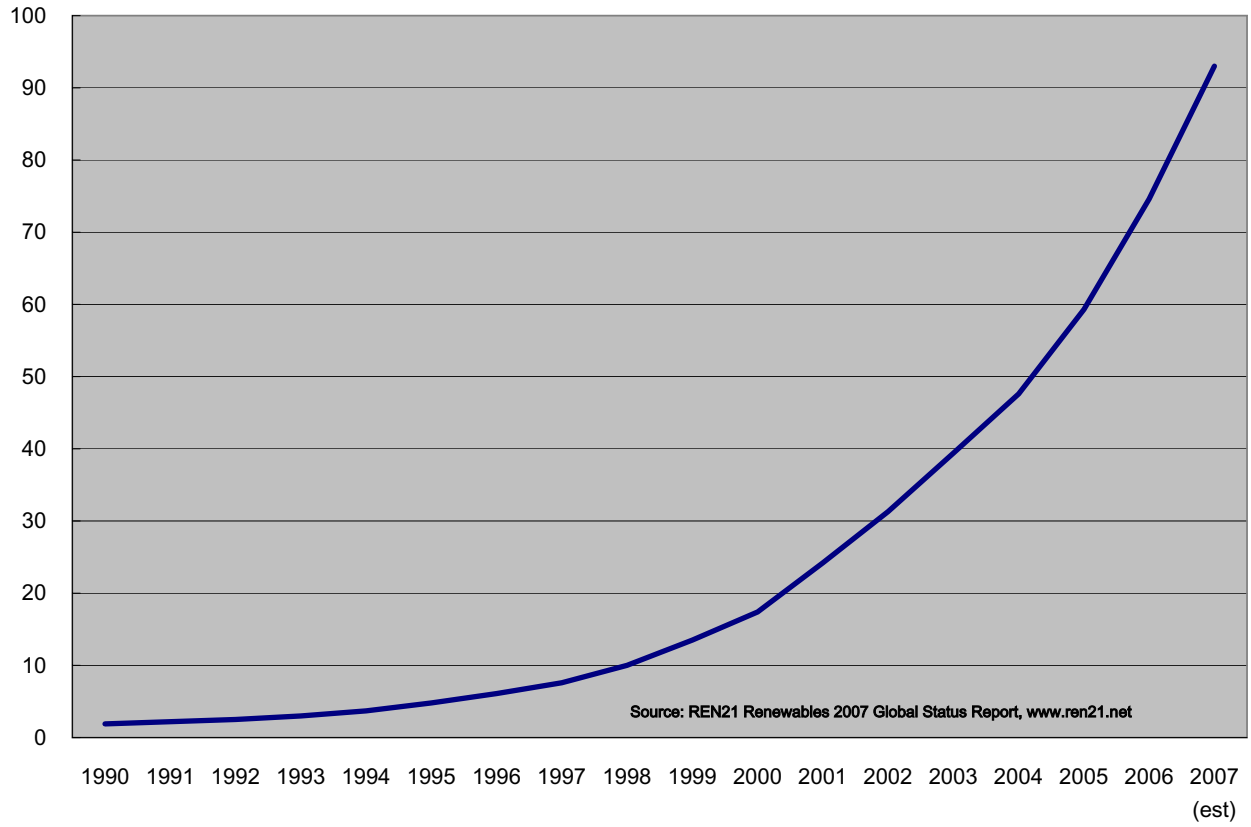


Figure 2: Wind Power Capacity, Top 10 Countries, 2006 (MW)

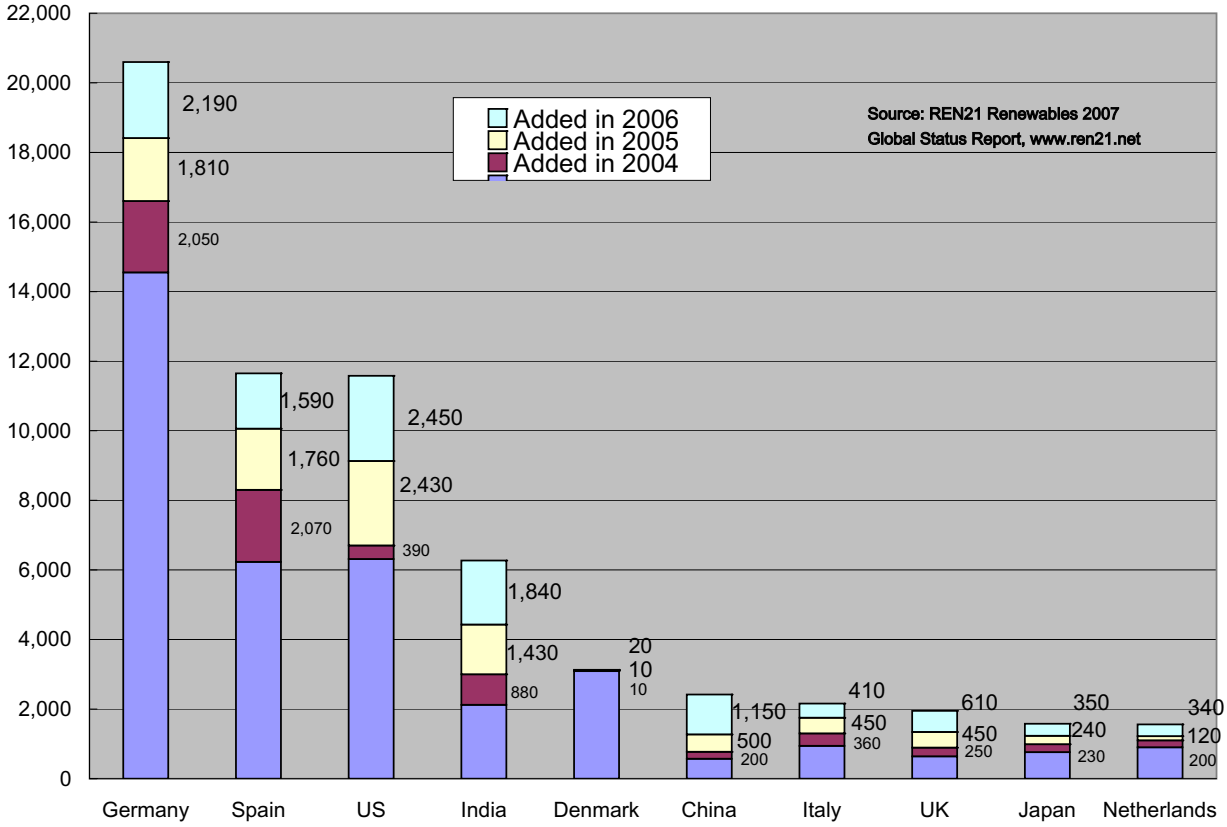


Figure 3: Solar PV, Existing World Capacity, 1990-2007 (MW)

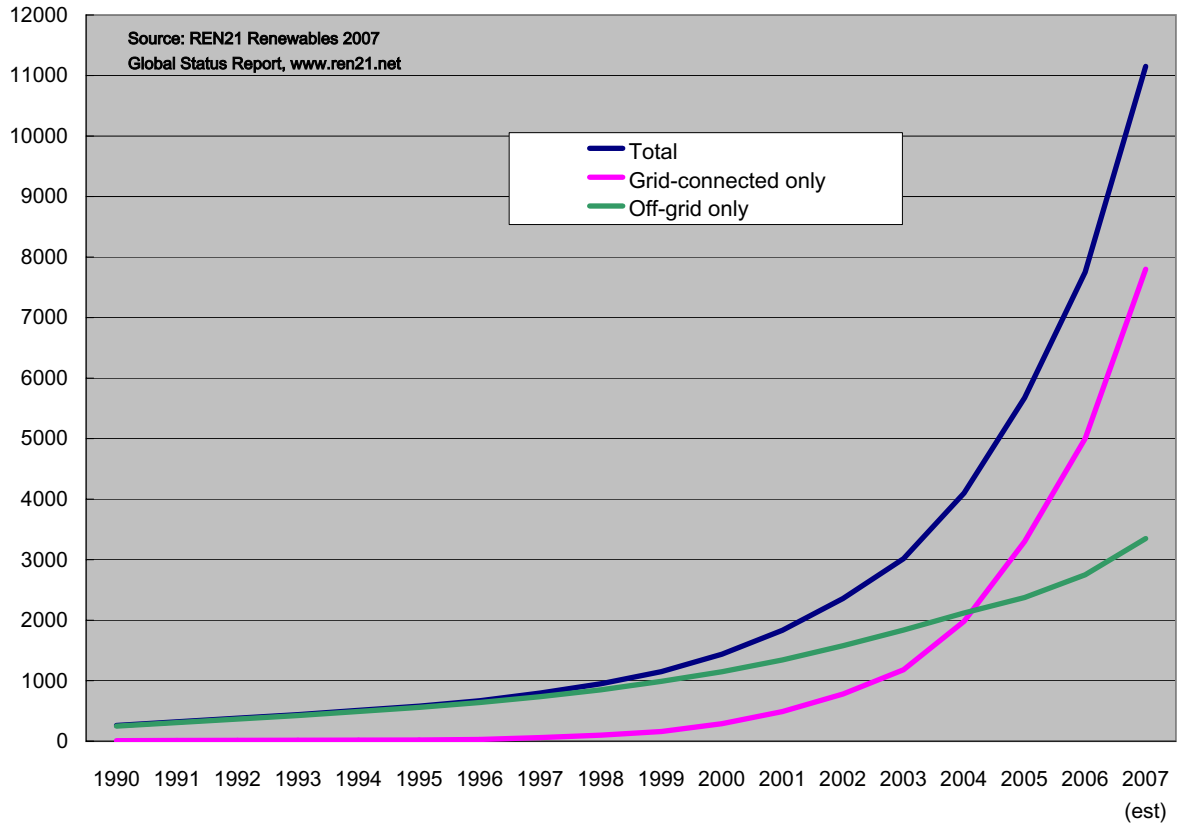


Figure 4: Solar PV Capacity (Grid-Tied), Top 6 Countries, 2006 (MW)

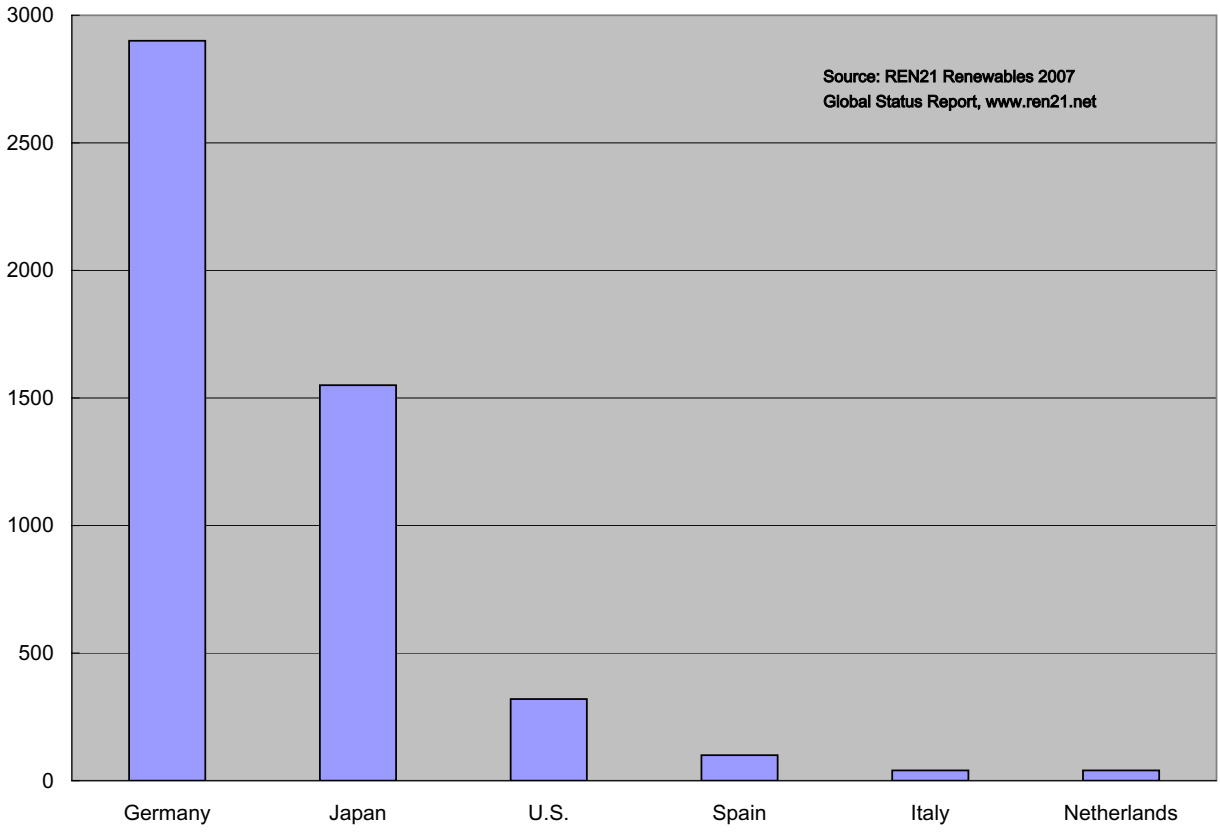
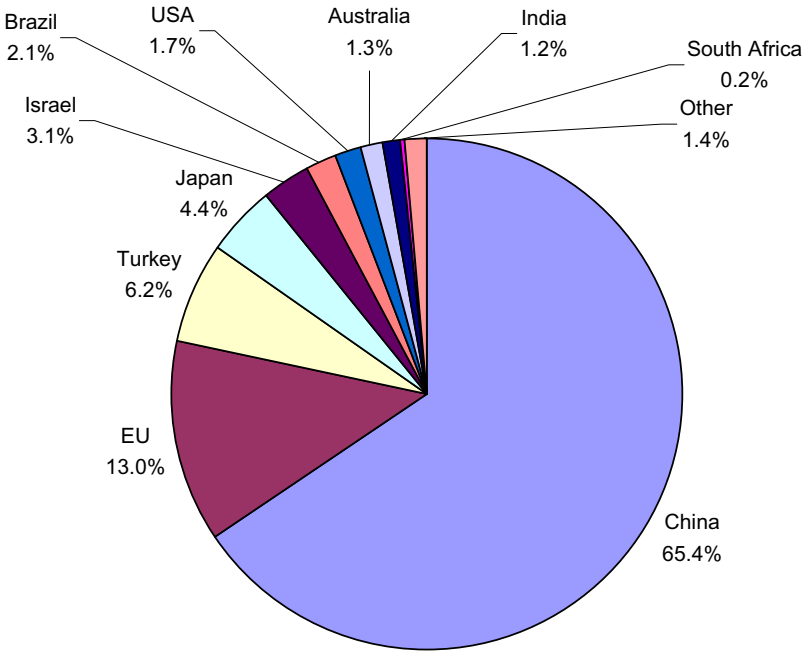
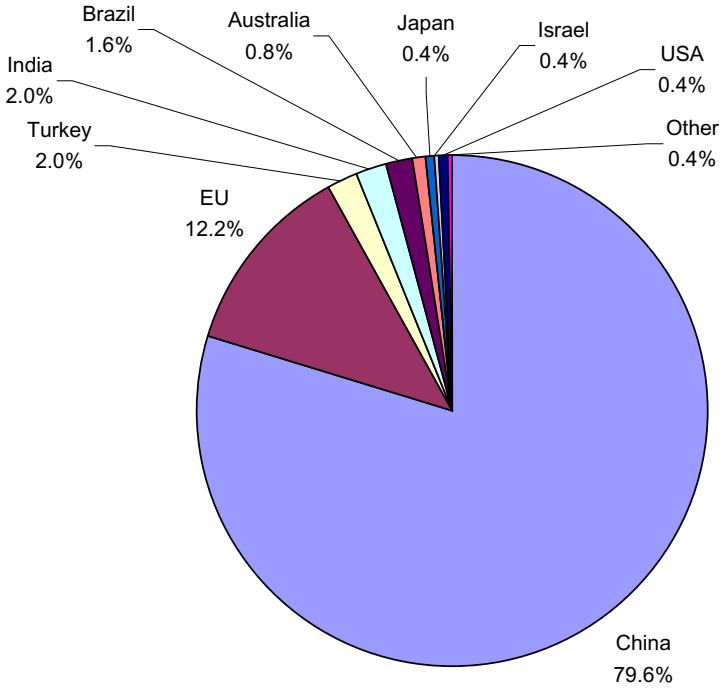


Figure 7: Solar Hot Water/Heating Capacity Existing in 2006
(Total = 104 GWth)



Source: REN21 Renewables 2007 Global Status Report, www.ren21.net

Figure 6: Solar Hot Water/Heating Capacity Added in 2006
(Added = 17 GWth)



Source: REN21 Renewables 2007 Global Status Report, www.ren21.net

Figure 8: Ethanol and Biodiesel Production, 2000-2007 (billion liters/year)

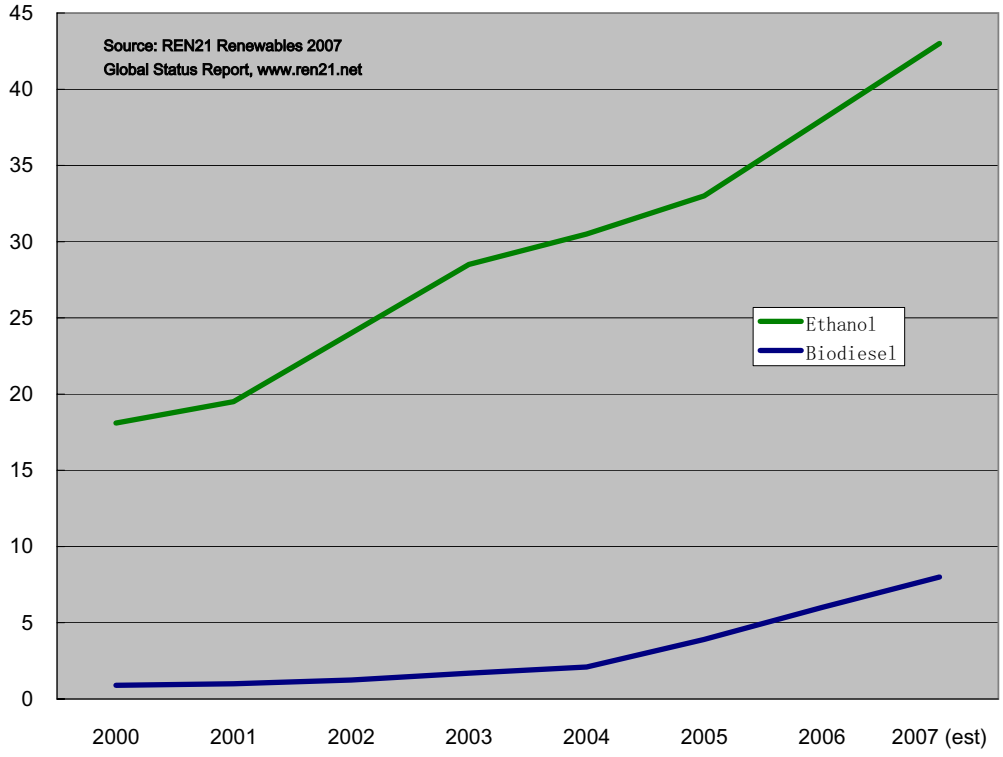


Figure 9: Ethanol Production, Top 6 Countries, 2006 (billion liters/year)

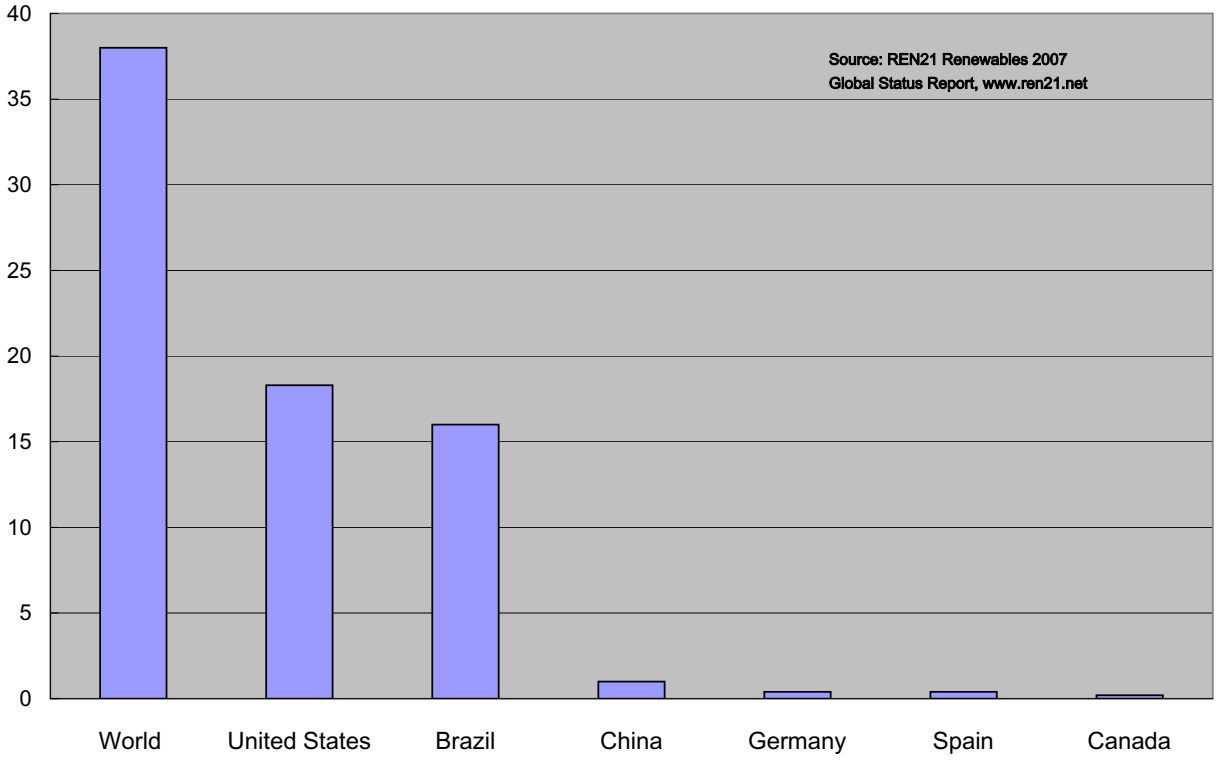
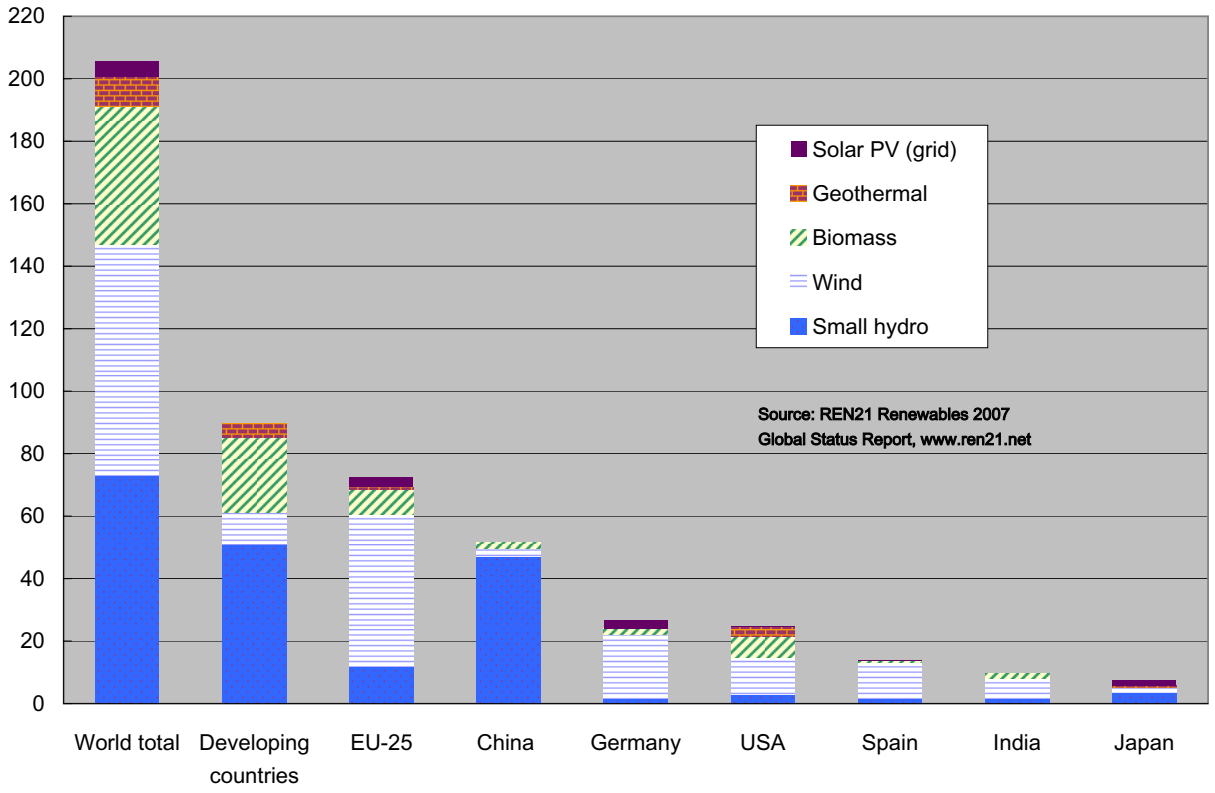


Figure 5: Renewable Power Capacities in 2006 (GW) for Developing Countries, EU, and Top Six Individual Countries (excluding large hydropower)



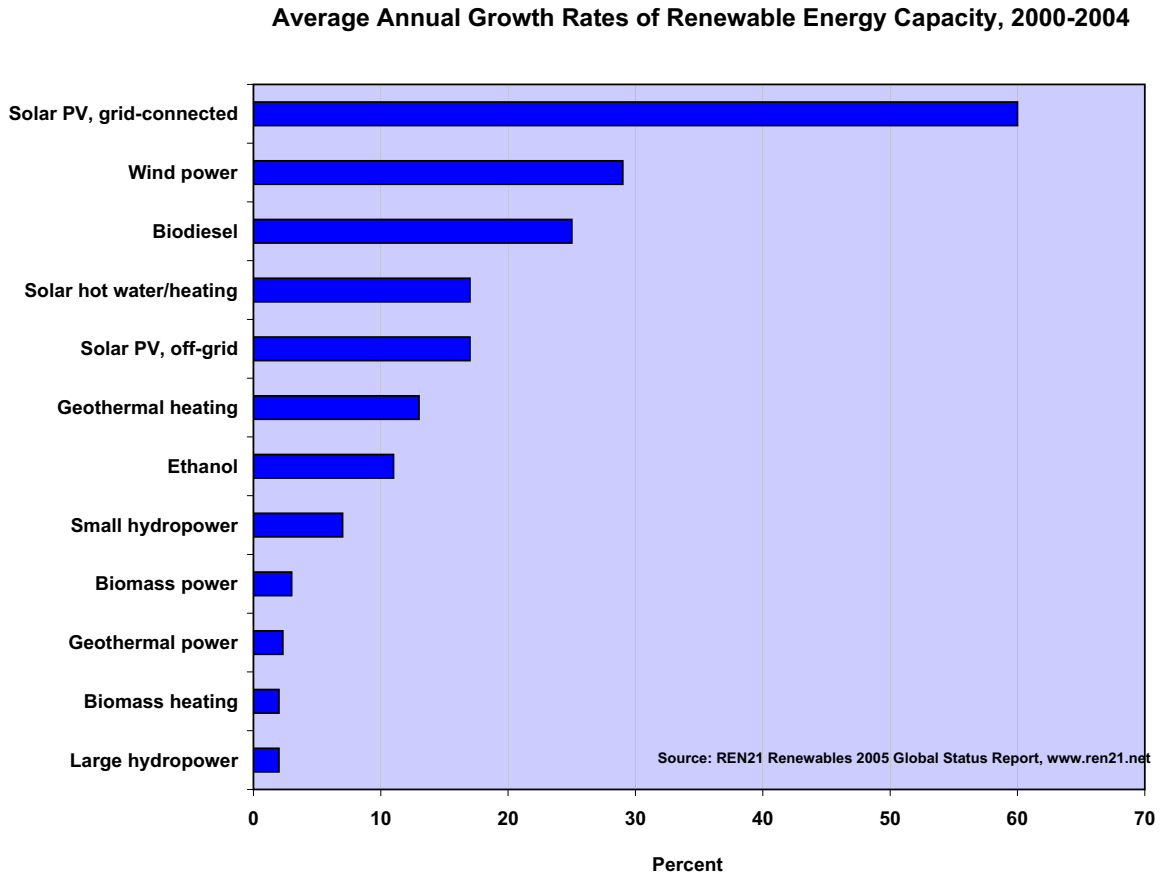
TOP FIVE COUNTRIES	#1	#2	#3	#4	#5
Annual amounts or capacity additions in 2006					
Annual investment	Germany	China	U.S.	Spain	Japan
Wind power	U.S.	Germany	India	Spain	China
Solar PV (grid-connected)	Germany	Japan	U.S.	Spain	South Korea
Solar hot water	China	Germany	India/Turkey		Austria/Brazil
Ethanol production	U.S.	Brazil	China	Germany/Spain	
Biodiesel production	Germany	U.S.	France/Italy		Czech Rep.
Existing capacity as of 2006					
Renewable power capacity	China	Germany	U.S.	Spain	India
Large hydro	U.S.	China	Brazil	Canada	Japan/Russia
Small hydro	China	Japan	U.S.	Italy	Brazil
Wind power	Germany	Spain/U.S.		India	Denmark
Biomass power	U.S.	Brazil	Philippines	Germany/Sweden/Finland	
Geothermal power	U.S.	Philippines	Mexico	Indonesia/Italy	
Solar PV (grid-connected)	Germany	Japan	U.S.	Spain	Netherlands/ Italy
Solar hot water	China	Turkey	Germany	Japan	Israel

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 80% 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 construction in 2006-2007, including in Nevada (USA) and Spain.



Industry Trends

- The number of jobs worldwide in the renewable energy industry exceeds 2.5 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 2006 was 2500 MW, up from 1800 MW in 2005 and 1200 MW in 2004.
- Top solar PV manufacturers in 2006 were Sharp (Japan), Q-Cells (Germany), Kyocera (Japan), and Suntech (China).
- Chinese solar PV cell production grew from 65 MW in 2004 to 200 MW in 2005 to 370 MW in 2006. Manufacturing capacity by end of 2007 will reach at least 1500 MW.
- Considering all companies and announced expansion plans, solar PV manufacturing capacity in China will likely exceed 4000 MW by 2010.
- New investment in ethanol production facilities could reach $3 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.
- The investment value of new ethanol production facilities under construction or announced through 2008 is more than $6 billion in Brazil, Canada, France, Spain, and the United States.

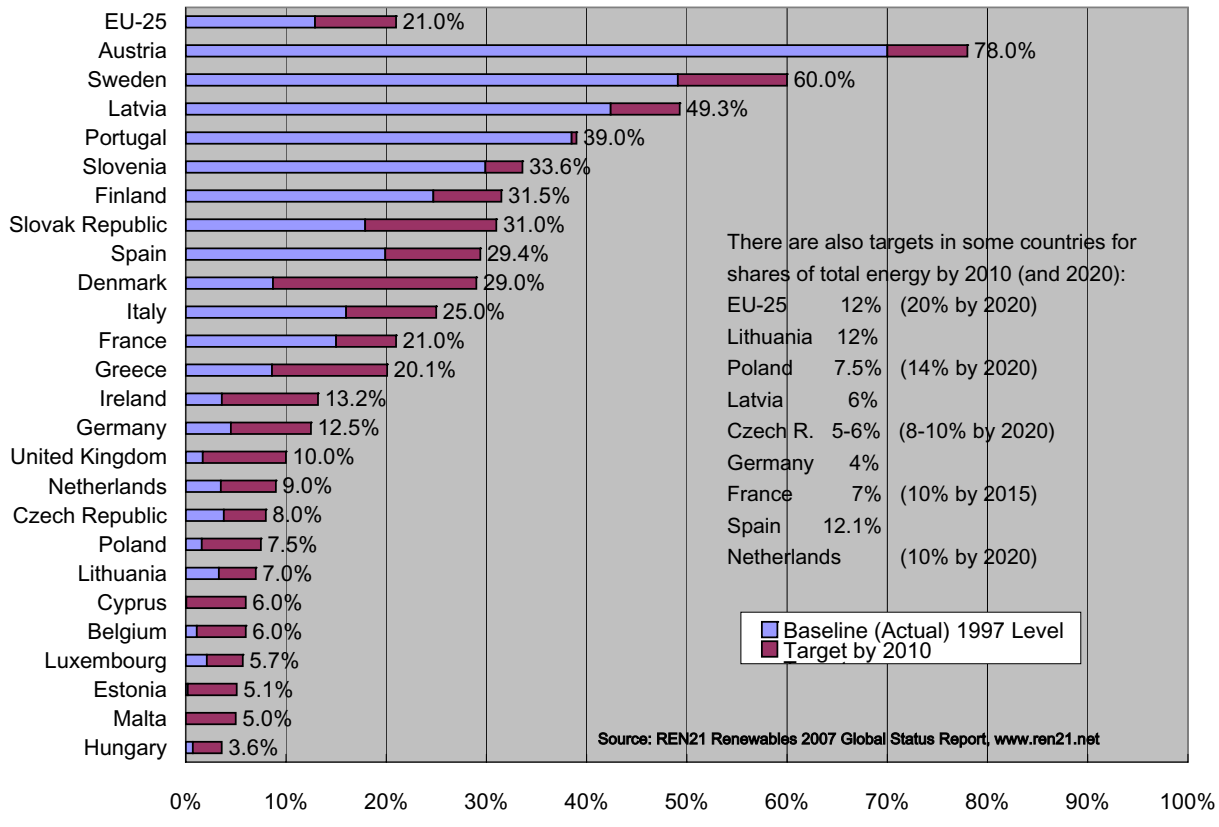
Policy Landscape

- Policy targets exist in at least 58 countries worldwide, including 13 developing countries, all 25 EU countries, and many states/provinces in the US and Canada.
- At least 56 countries worldwide now have some type of renewable energy promotion policy, including 21 developing countries. Several more developing countries are actively engaged in enacting policies.
- At least 36 countries and 10 states/provinces have adopted feed-in policies, more than half of which have been enacted since 2002.
- At least 38 states or provinces have enacted renewable portfolio standards (RPS), half since 2003. In addition, six countries have enacted national RPS policies since 2001.
- 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 30 states/provinces and 12 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 (estimated at 27,000 GWh in 2005).
- Municipalities around the world are also setting targets for future shares of renewable energy, CO_2-reduction targets, and enacting policies for solar PV and solar hot water.

Figure 11: EU Renewable Energy Targets -- Share of Electricity by 2010



Non-EU Countries with Renewable Energy Targets

Country	Target(s)
Argentina	8% of electricity by 2017 (excluding large hydro)
Australia	9.5 TWh of electricity annually by 2010.
Brazil	3.3 GW added by 2006 from wind, biomass, small hydro.
Canada	3.5-15% of electricity in 4 provinces (RPS); other targets in 6 provinces
China	15% of primary energy by 2020, including 300 GW hydro, 30 GW wind, 30 GW biomass, 1.8 GW solar PV
Croatia	6% of electricity by 2010
Dominican R.	500 MW wind power capacity by 2015.
Egypt	3% of electricity by 2010 and 20% by 2020
India	10% of added electric power capacity during 2003–2012 (expected 10 GW); 10,500 MW total wind power existing by 2012
Iran	500 MW of electricity output by 2010
Israel	2% of electricity by 2007; 5% of electricity by 2016
Japan	1.63% of electricity by 2014, excluding geothermal and large hydro (RPS)
Jordan	10% of energy by 2020
Korea	7% of electricity by 2010, including large hydro, and 1.3 GW of grid-connected solar PV by 2011, including 100,000 homes (0.3 GW)
Malaysia	5% of electricity by 2005
Mali	15% of energy by 2020

Non-EU Countries with Renewable Energy Targets (continued)

Mexico	Added 4000 MW by 2014
Morocco	600 MW wind power and 400,000 m2 solar hot water added by 2015 10% of energy and 20% of electricity by 2012 (under discussion)
New Zealand	30 PJ of added capacity (including heat and transport fuels) by 2012; and 90% of electricity by 2025
Nigeria	7% of electricity by 2025
Norway	7 TWh from heat and wind by 2010
Pakistan	10% of electricity by 2015
Philippines	4.7 GW total existing capacity by 2013
Senegal	15% of primary energy by 2025
Singapore	50,000 m^2 (~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
Syria	4% of primary energy
Thailand	8% of total primary energy by 2011 (excluding traditional rural biomass)
Tunisia	500,000 m2 SHW by 2009 and 300 MW added wind by 2011 [“delayed”?]
Turkey	2% of electricity from wind by 2010
Uganda	200 MW added by 2010
United States	5% to 30% (typical) of electricity in 26 states, including DC (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^2	150 million m^2	300 million m^2
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^3/year	19 billion m^3/year	44 million m^3/year
Share of primary energy	8%	10%	15%

Renewable Energy Promotion Policies

Country	Feed-in tariff	Renewable portfolio 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
Developed and transition countries										
Australia		X	X			X			X	
Austria	X		X	X		X				
Belgium		X	X		X	X		X		
Canada	(*)	(*)	X	X	X			(*)	X	(*)
Cyprus	X		X							
Czech R.	X		X	X	X	X		X		
Denmark	X				X	X		X		
Estonia	X				X					
Finland			X		X	X	X			
France	X		X	X	X	X			X	X
Germany	X		X	X	X				X	
Greece	X		X	X						
Hungary	X				X	X			X	
Ireland	X		X	X		X				X
Italy	X	X	X	X		X		X		
Israel	X									
Japan	(*)	X	X			X		X	X	
Korea	X		X		X					
Latvia	X								X	
Lithuania	X		X	X					X	
Luxembourg	X		X	X						
Malta	X				X					
Netherlands	X		X	X		X	X			
N. Zealand			X						X	
Norway			X	X		X				X
Poland		X	X		X				X	X
Portugal	X		X	X	X					
Romania					X					

Country	Feed-in tariff	Renewable portfolio 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
Slovak R.	X			X					X	
Slovenia	X									
Spain	X		X	X					X	
Sweden		X	X	X	X	X	X			
Switzerland	X									
U.K.		X	X		X	X				
U.S.	(*)	(*)	X	X	(*)	(*)	X	(*)	(*)	(*)
Developing countries										
Algeria	X			X	X	X				
Argentina	X		X	(*)			X			
Brazil	X								X	
Cambodia			X							
Chile			X							
China	X		X	X	X				X	X
Costa Rica	X									
Ecuador	X			X						
Guatemala				X	X					
Honduras				X	X					
India	(*)	(*)	X	X	X				X	X
Indonesia	X									
Mexico				X				X		
Morocco				X						
Nicaragua	X			X	X					
Panama							X			
Philippines				X	X				X	
Sri Lanka	X									
Thailand	X	X	X					X		
Tunisia			X	X						
Turkey	X		X							

(*) No national policy exists, but policy exists in one or more states or provinces.

Biofuels Blending Mandates

Country	**Mandate**
Argentina	E5 and B5 by 2010
Bolivia	B2.5 by 2007 and B20 by 2015
Brazil	E22 to E25 existing (varies over time); B2 by 2008 and B5 by 2013
Canada	E5 by 2010; B2 by 2012; E7.5 in Saskatchewan & Manitoba; E5 in Ontario
China	E10 in 9 provinces
Colombia	E10 existing; B10 by 2008
Dominican R.	E15 and B2 by 2015
Germany	E2 and B4.4 by 2007
India	E10 in 13 states/territories
Italy	E1 and B1
Malaysia	B5 by 2008
Paraguay	B1 by 2007, B3 by 2008, and B5 by 2009
Peru	E7.8 by 2010 for whole country; by 2006/2008 in 11 regions
Philippines	E10 and B1 (proposed)
South Africa	E8-E10 and B2-B2 (proposed)
Thailand	E10 by 2007
United States	E10 in Hawaii and Montana; 20% in Minnesota by 2013; B5 in New Mexico by 2012; B2 in Washington State

Selected Major Cities with Renewable Energy Goals and/or Policies

City	Renewable energy goals	CO_2 reduction goals	Policies for solar hot water	Policies for solar PV	Urban planning, pilots, or other policies
Adelaide, Australia	X	X			X
Austin (TX), USA	X	X			X
Barcelona, Spain	X	X	X	X	X
Berlin, Germany		X	X	X	
Betim, Brazil		X	X		X
Cape Town, South Africa	X	X			X
Daegu, Korea	X	X			X
Freiburg, Germany	X	X	X	X	X
Gwangju, Korea	X	X			X
The Hague, Netherlands		X			
Leicester, UK	X				X
London, UK		X			
Malmö, Sweden		X			X
Melbourne, Australia	X	X			X
Mexico City, Mexico				X	X
Minneapolis, USA	X				X
Nagpur, India		X	X	X	
New York, USA		X			
Oxford, UK	X	X	X	X	X
Portland (OR), USA	X	X	X	X	X
Rizhao, China			X	X	
Salt Lake City, USA	X	X			X
Sapporo, Japan		X			X
Toronto, Canada		X			
Tokyo, Japan	X		X	X	X
Vancouver, Canada		X			

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^2, warehouses > 10, 000 m^2; office buildings > 4,000 m^2; hotels > 100 rooms; hospitals > 100 rooms; convention centers > 10,000 m^2

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.
- 2006 Update shows statistics for 2005 and new policies and market trends.
- 2007 Report forthcoming in January 2008.
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