

Renewables Global Status Report for 2006

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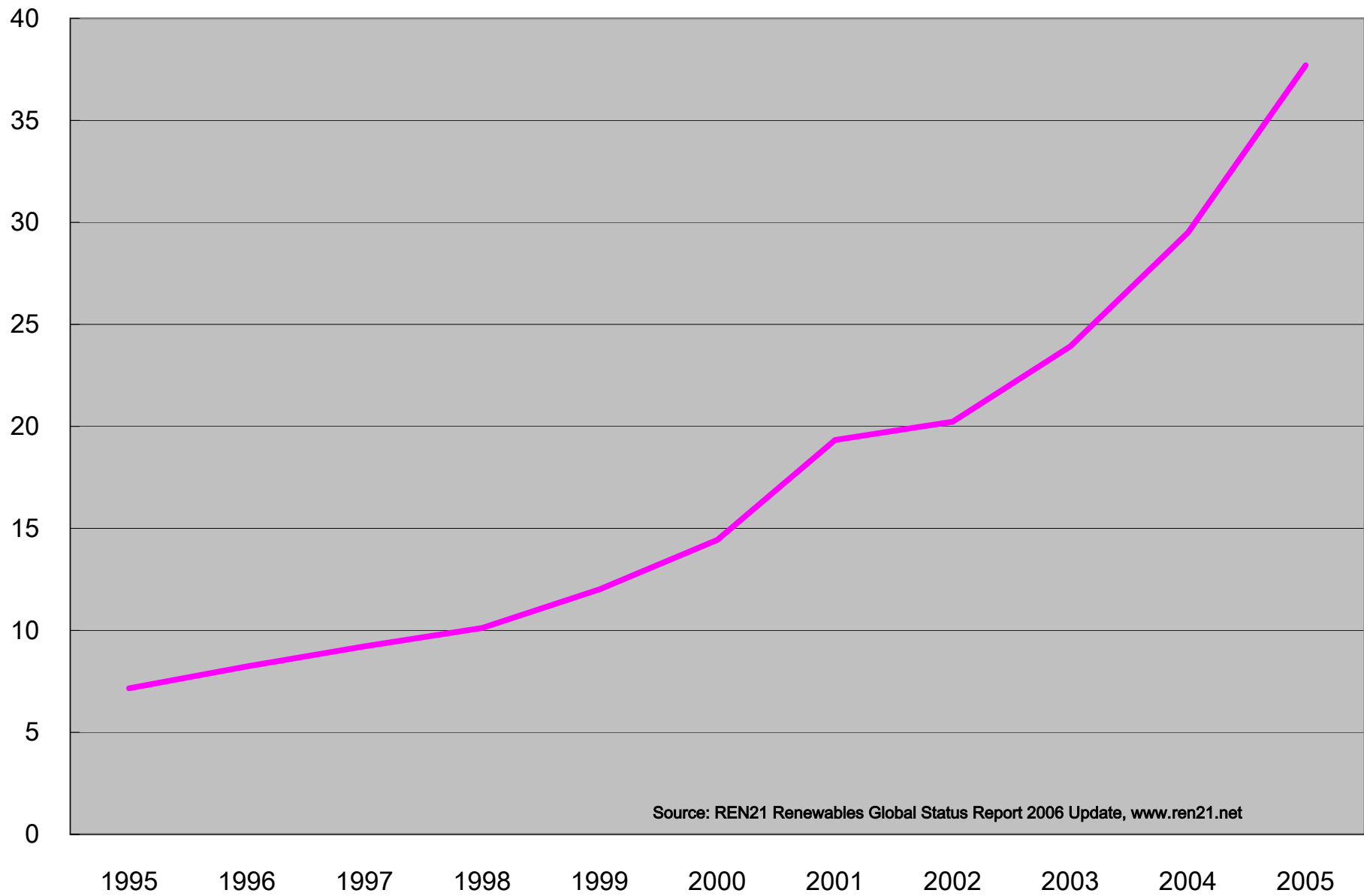
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Report Outline

1. Investment Flows
2. Global Market Overview
3. Industry Trends
4. Policy Landscape
5. Rural (Off-Grid) Renewable Energy

Figure 9: Annual Investment in Renewable Energy 1995-2005 (billion dollars)



Investment Flows

- About \$38 billion was invested in renewable energy capacity worldwide in 2005, up from \$30 billion in 2004. Large hydropower investment was an additional \$15–20 billion.
- An additional \$6 billion was invested by the solar PV industry in new manufacturing plant and equipment (expected to be \$8-9 billion in 2006), and an additional \$1 billion was invested by the biofuels industries in new biofuels production plants.
- Large commercial banks are starting to notice renewable energy, and several are adding renewable energy investments to their lending portfolios.
- Major investments and acquisitions have been made in recent years by leading global companies, such as GE, Siemens, Shell, BP, Sanyo, and Sharp.
- \$500 million per year for renewable energy goes to developing countries from KfW, World Bank, GEF, and many other donors and programs.
- Government support for renewable energy was on the order of \$10 billion in 2004 for the United States and Europe, including budget funds and policy support.
- US and Europe provide more than \$700 million per year for research and development.

Global Market Overview – Power Generation

- Renewable power capacity totals 182 GW worldwide (excluding large hydropower), up from 160 GW in 2004. This is more than 4% of total global power capacity (4100 GW).
- Developing countries account for 44%, with 80 GW.
- China has the largest installed capacity of any single country, with 42 GW, followed by Germany, the United States, Spain, India, and Japan.
- The fastest growing energy technology in the world is grid-connected solar photovoltaic (PV), growing by 60% per year from 2000–2004. Most of this covers 600,000 rooftops in Japan, Germany, and the US.
- Wind power grew by 28% in 2005, led by the U.S., Germany, and Spain.

Figure 4: Renewable Power Capacities in 2005 (GW) for Developing Countries, EU, and Top Six Individual Countries (excluding large hydropower)

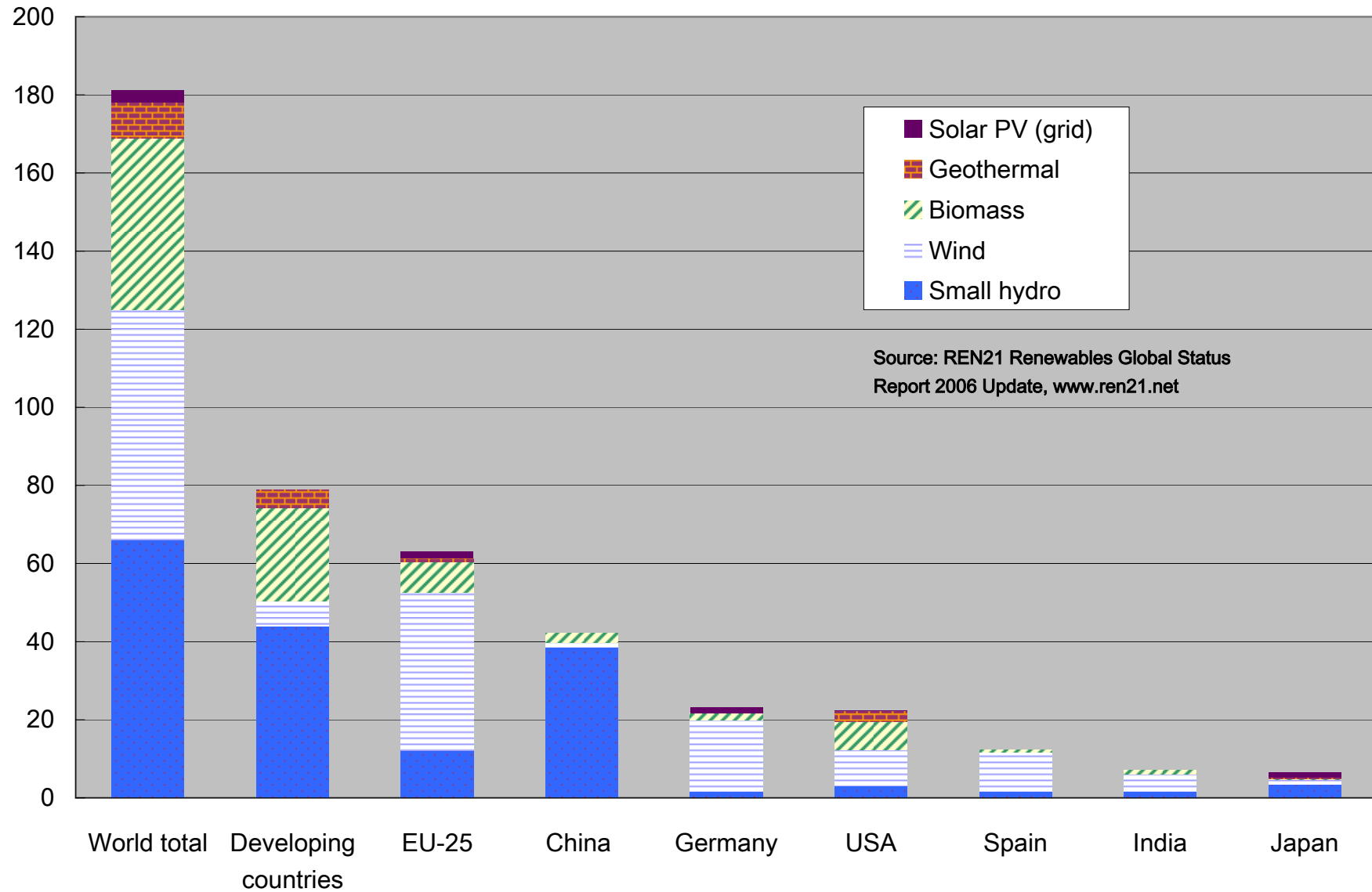


Figure 2: Windpower Existing World Capacity, 1990-2005 (GW)

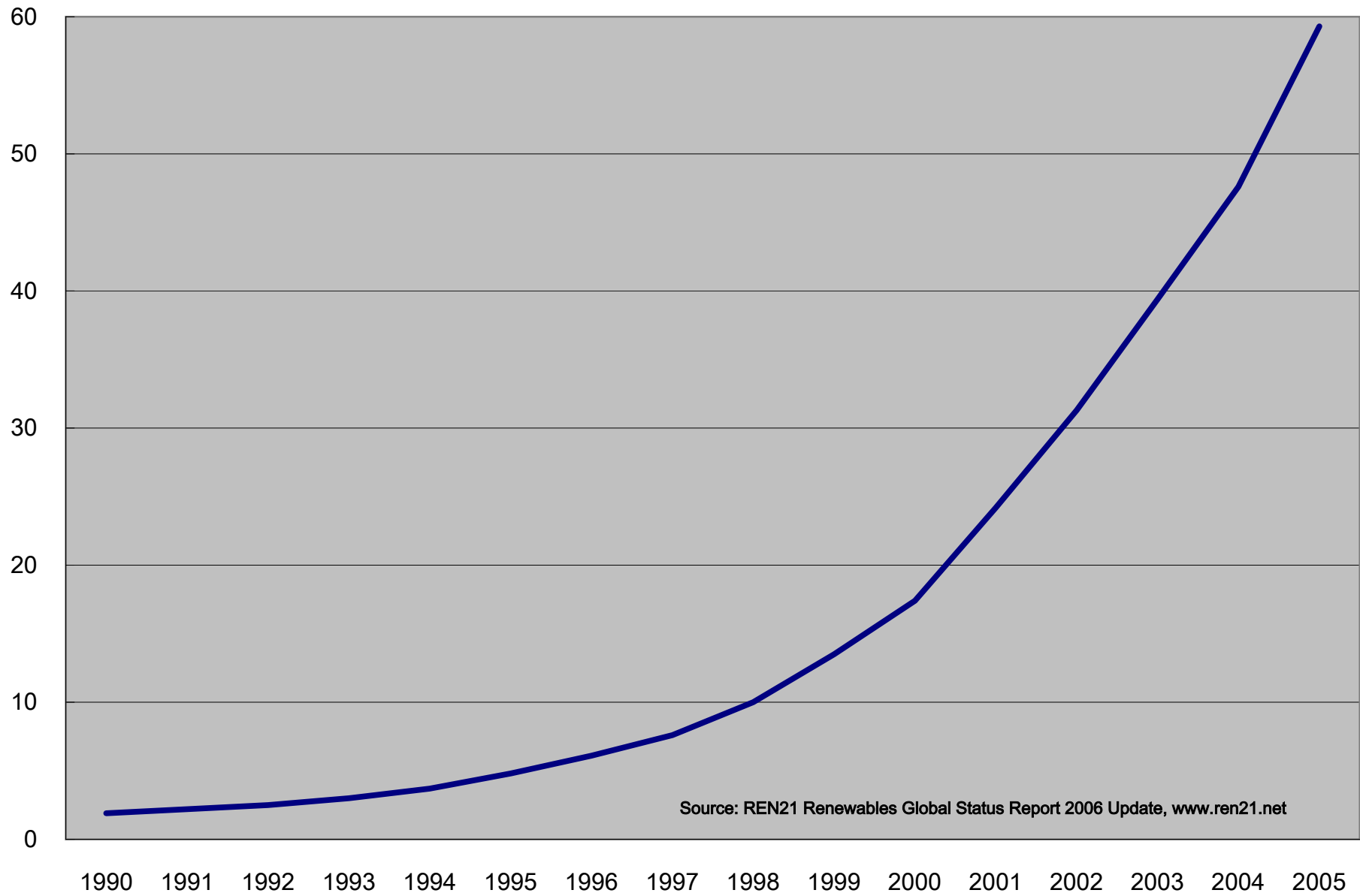


Figure 3: Wind Power Capacity, Top 10 Countries, 2005 (MW)

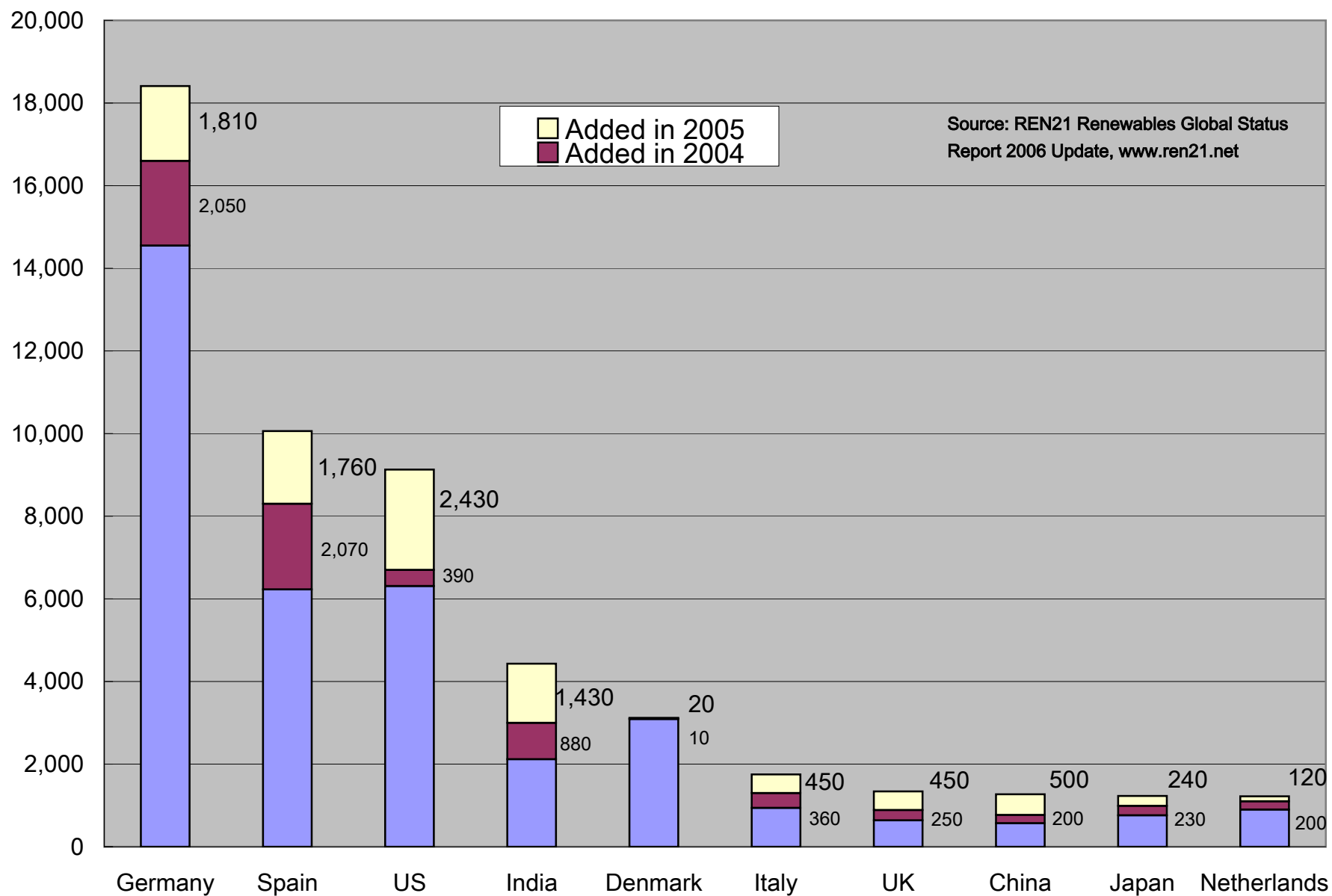
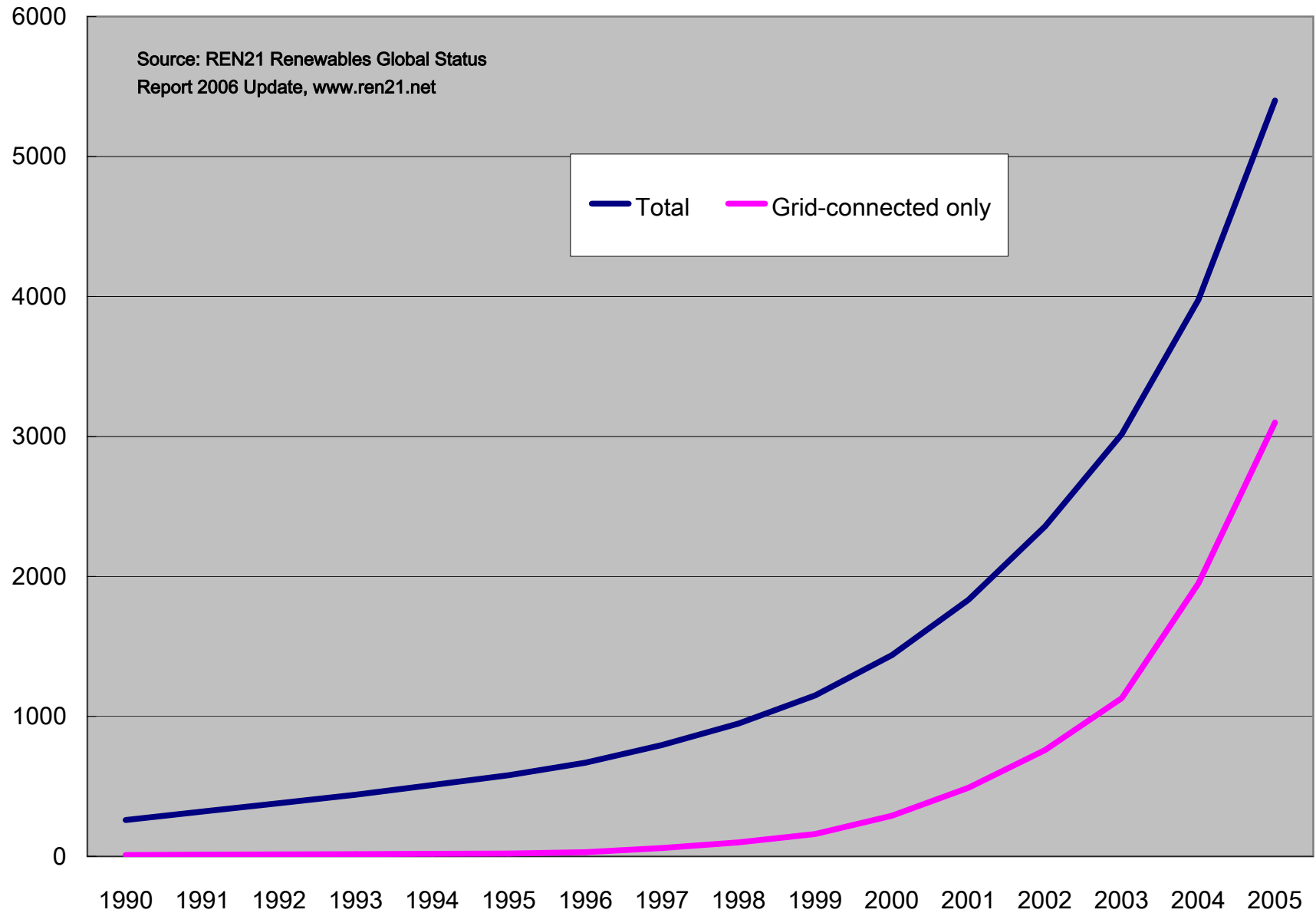


Figure 1: Solar PV, Existing World Capacity, 1990-2005 (MW)



Global Market Overview – Hot Water/Heating

- Rooftop solar collectors provide hot water to nearly 45 million households worldwide, most of these in China. China represents 80% of the 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.
- Biomass-fueled heating provides five times more heat worldwide than solar and geothermal combined.

Figure 6: Solar Hot Water/Heating Capacity Existing in 2005 (Total = 88 GWth)

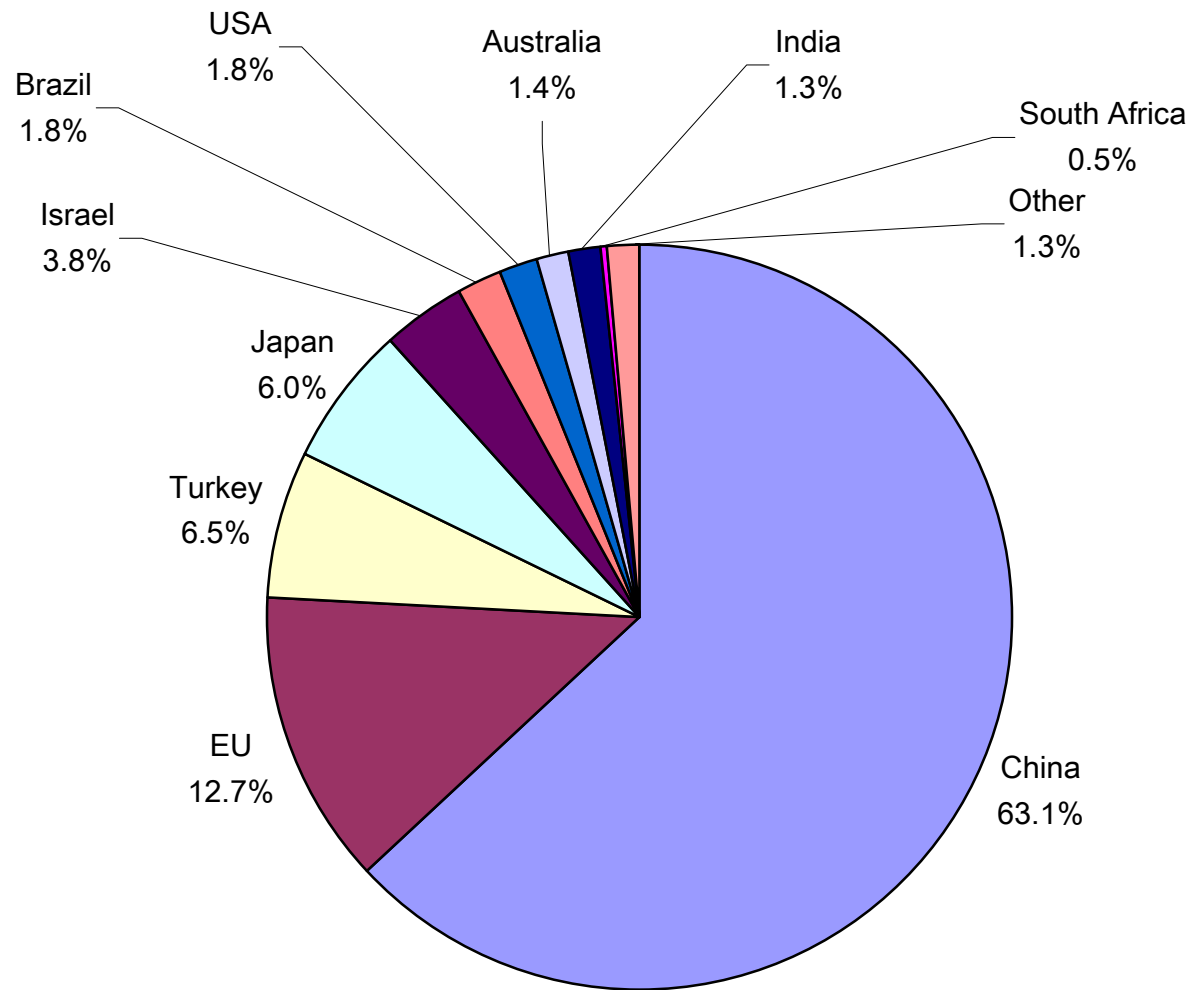
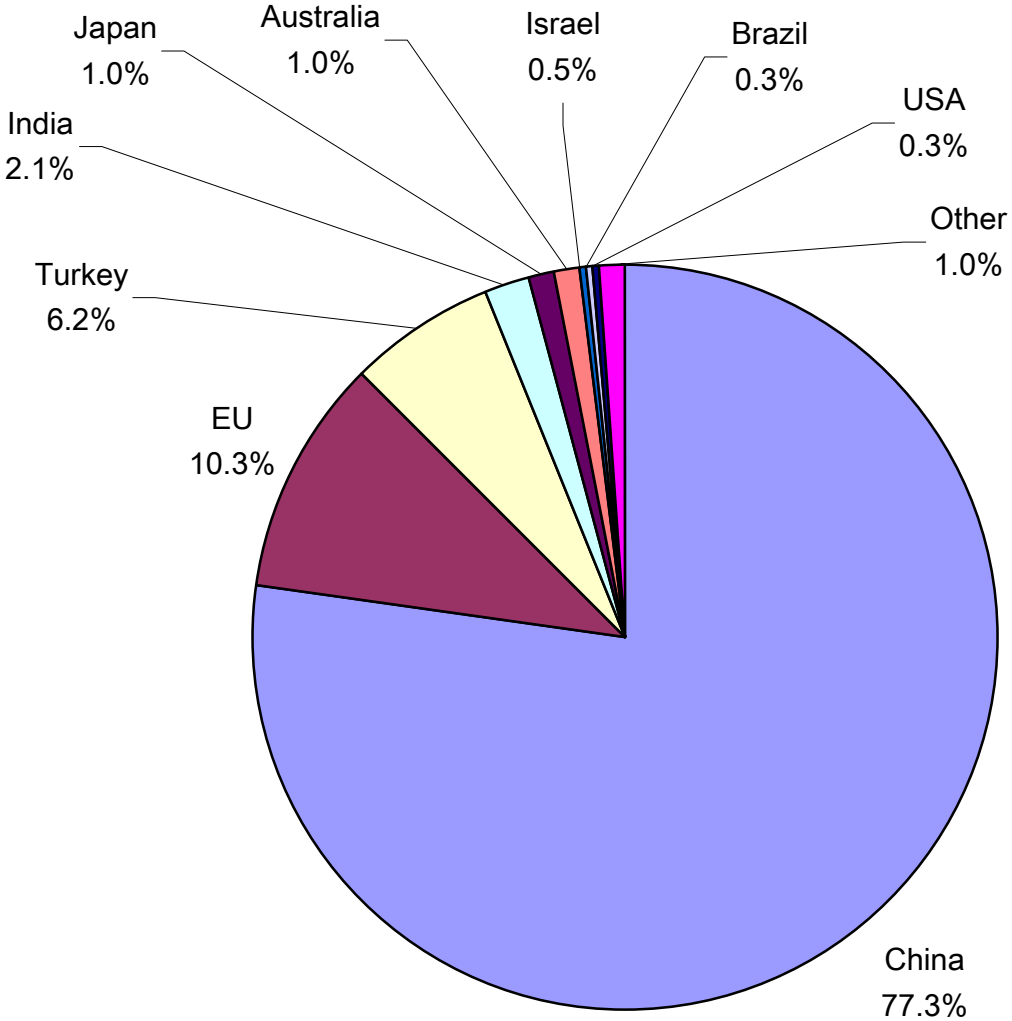


Figure 5: Solar Hot Water/Heating Capacity Added in 2005 (Added = 13 GWth)



Source: REN21 Renewables Global Status Report 2006 Update, www.ren21.net

Global Market Overview – Biofuels

- Production of ethanol was 33 billion liters in 2005, up from 30.5 billion liters in 2004.
- Production of biodiesel was 3.9 billion liters in 2005, up from 2.1 billion liters in 2004.
- Together, annual biofuels production compares to about 3 percent of the 1,300 billion liters of gasoline consumed globally.
- Ethanol provided 41 percent of all (non-diesel) motor vehicle fuel consumed in Brazil in 2005.
- Ethanol was being blended with 30 percent of all gasoline sold in the United States.
- New investment in ethanol production facilities could reach \$2 billion in 2006, with more than 45 plants under construction in the U.S. and Canada and a major program starting in Brazil that could increase 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, and the U.S.

Figure 8: Fuel Ethanol Production, 2000 and 2005 (billion liters/year)

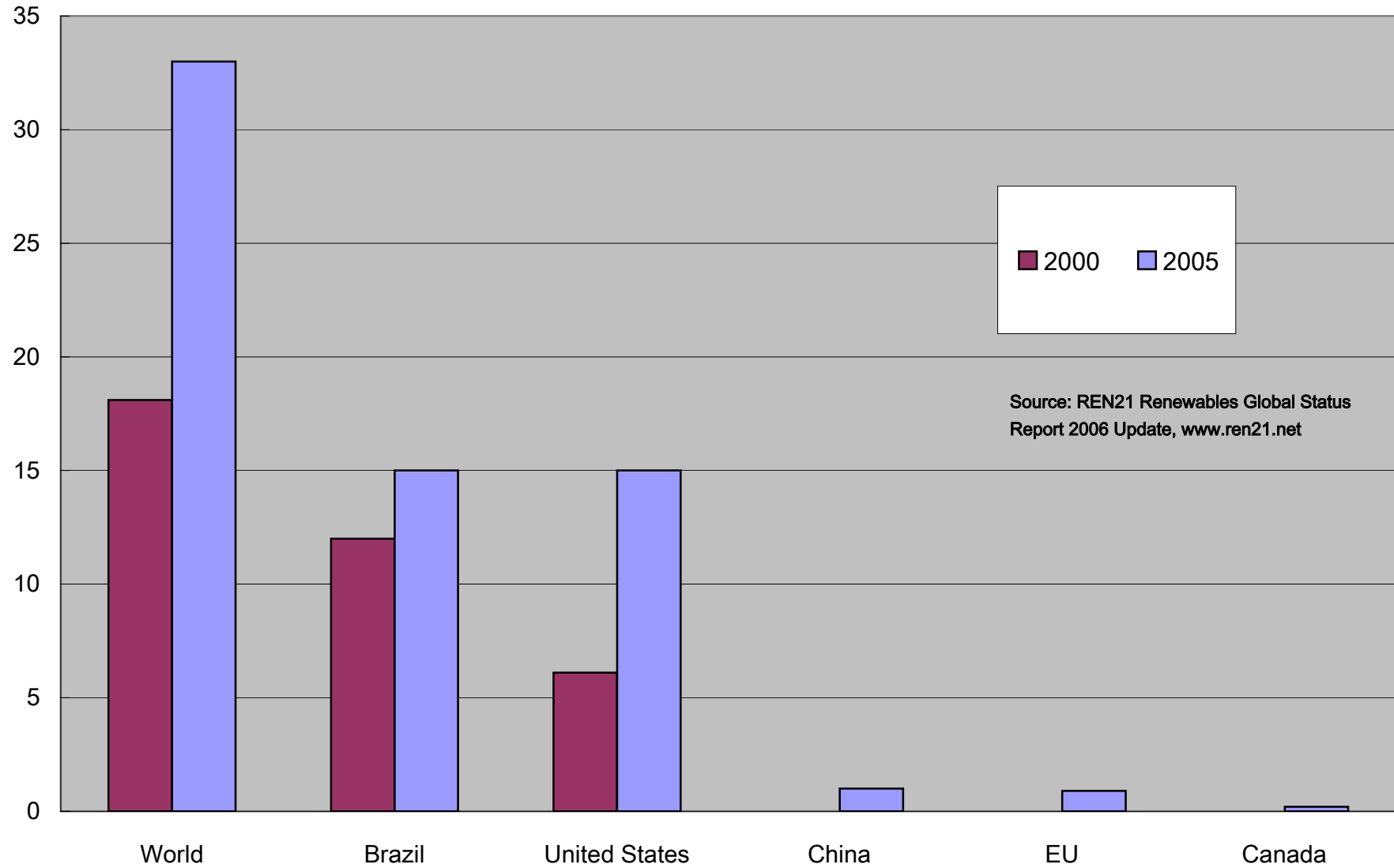
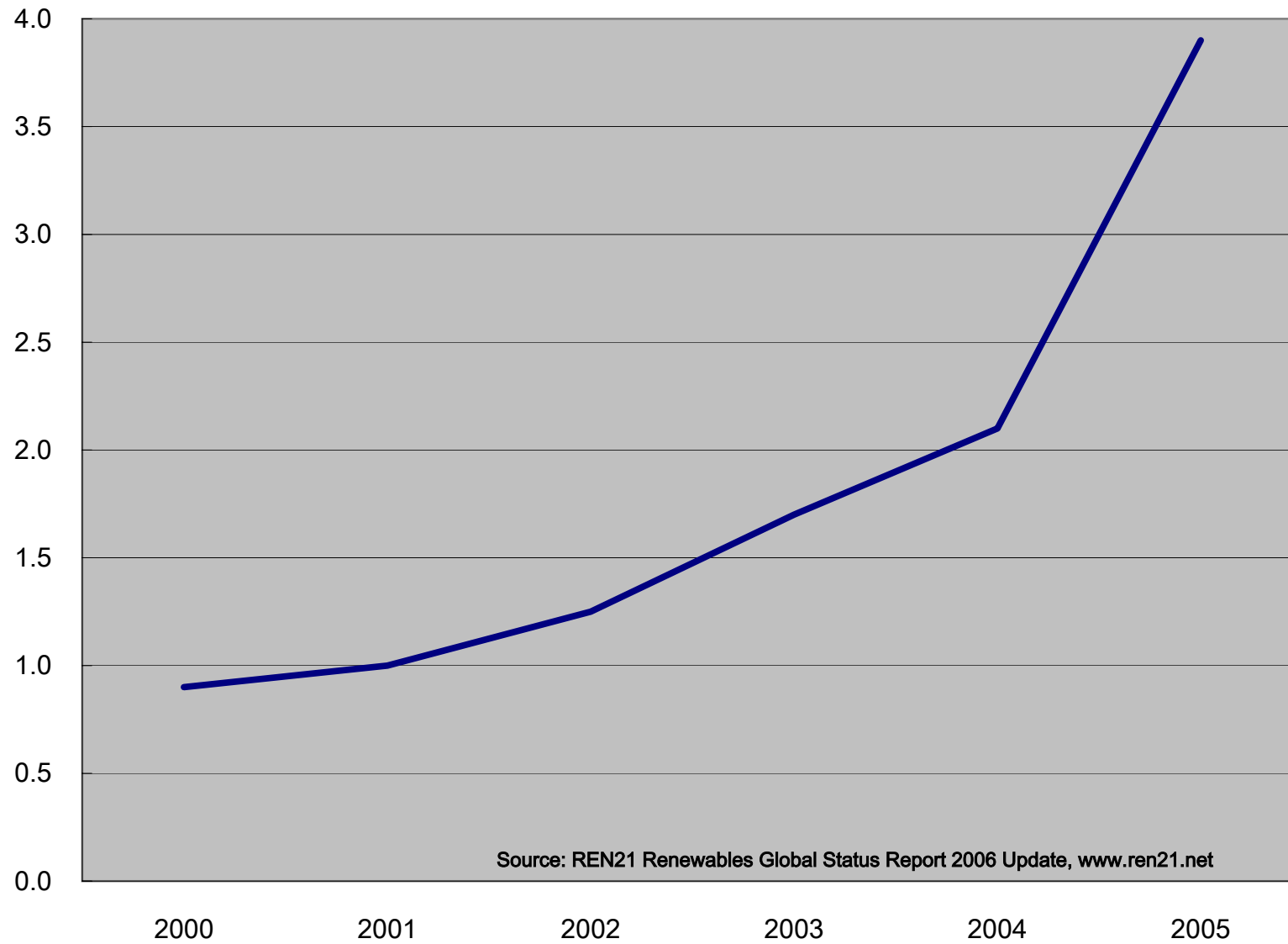
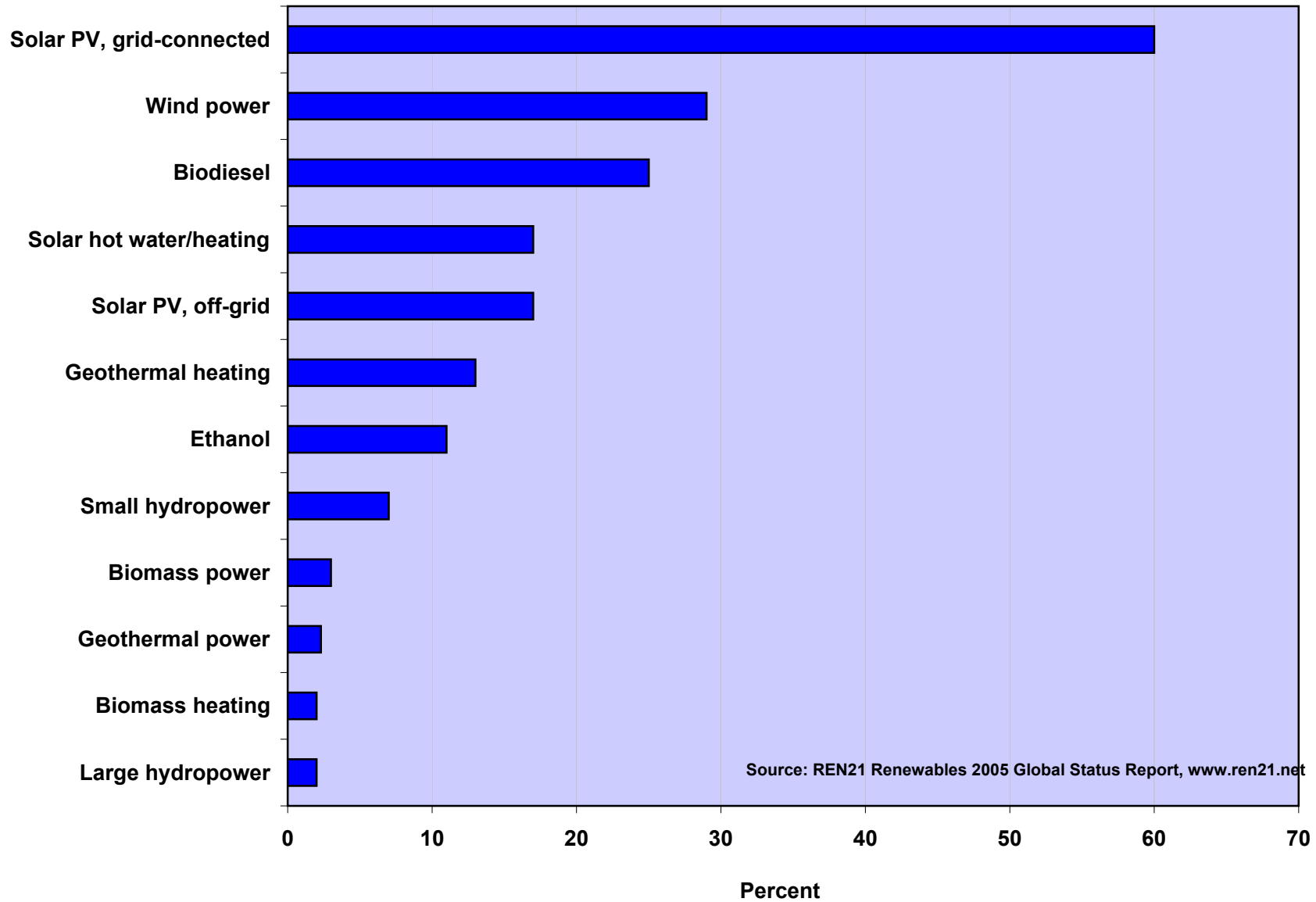


Figure 7: Biodiesel Production, 2000-2005 (billion liters/year)



Average Annual Growth Rates of Renewable Energy Capacity, 2000-2004



Industry Trends

- Market capitalization exceeded \$50 billion in 2006 for the 85 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 60 companies in 2004 with market capitalization of \$25 billion total.
- Four big IPOs in 2005-2006, three with market capitalization greater than \$5 billion after IPO: Suntech (China), Suzlon (India), REC (Norway), and Q-cells (Germany).
- Over 1.7 million jobs in the renewable energy industry worldwide.
- Solar PV industry produced 1700 MW in 2005, up from 1150 MW in 2004, led by Japan (830 MW), followed by Europe (470 MW), China (200 MW), and the US (150 MW).
- Wind industry expanded production internationally, with new manufacturing facilities in China by Nordex, Gamesa, Acciona, Suzlon, GE Energy.
- Ethanol industry expanded significantly in U.S. and Europe.
- Biodiesel industry could double production capacity in 2006, mostly in U.S. and Europe.

Policy Landscape

- At least 48 countries worldwide now have some type of renewable energy promotion policy, including 14 developing countries.
- At least 32 countries and 9 states/provinces have adopted feed-in policies, more than half of which have been enacted since 2002.
- At least 32 states or provinces have enacted renewable portfolio standards (RPS), half since 2003. Six countries have enacted national RPS policies since 2001.
- Policy targets exist in at least 49 countries worldwide, including 13 developing countries, all 25 EU countries, and many states/provinces in the US and Canada.
- There are more than 4.5 million green power consumers in Europe, US, Canada, Australia, and Japan (Europe 3.9 million, US 500,000, Australia 70,000, Japan 60,000, and Canada 10,000).
- Municipalities around the world are also setting targets for future shares of renewable energy. Some cities have established CO₂-reduction targets.

Figure 10: EU Renewable Energy Targets -- Share of Electricity by 2010

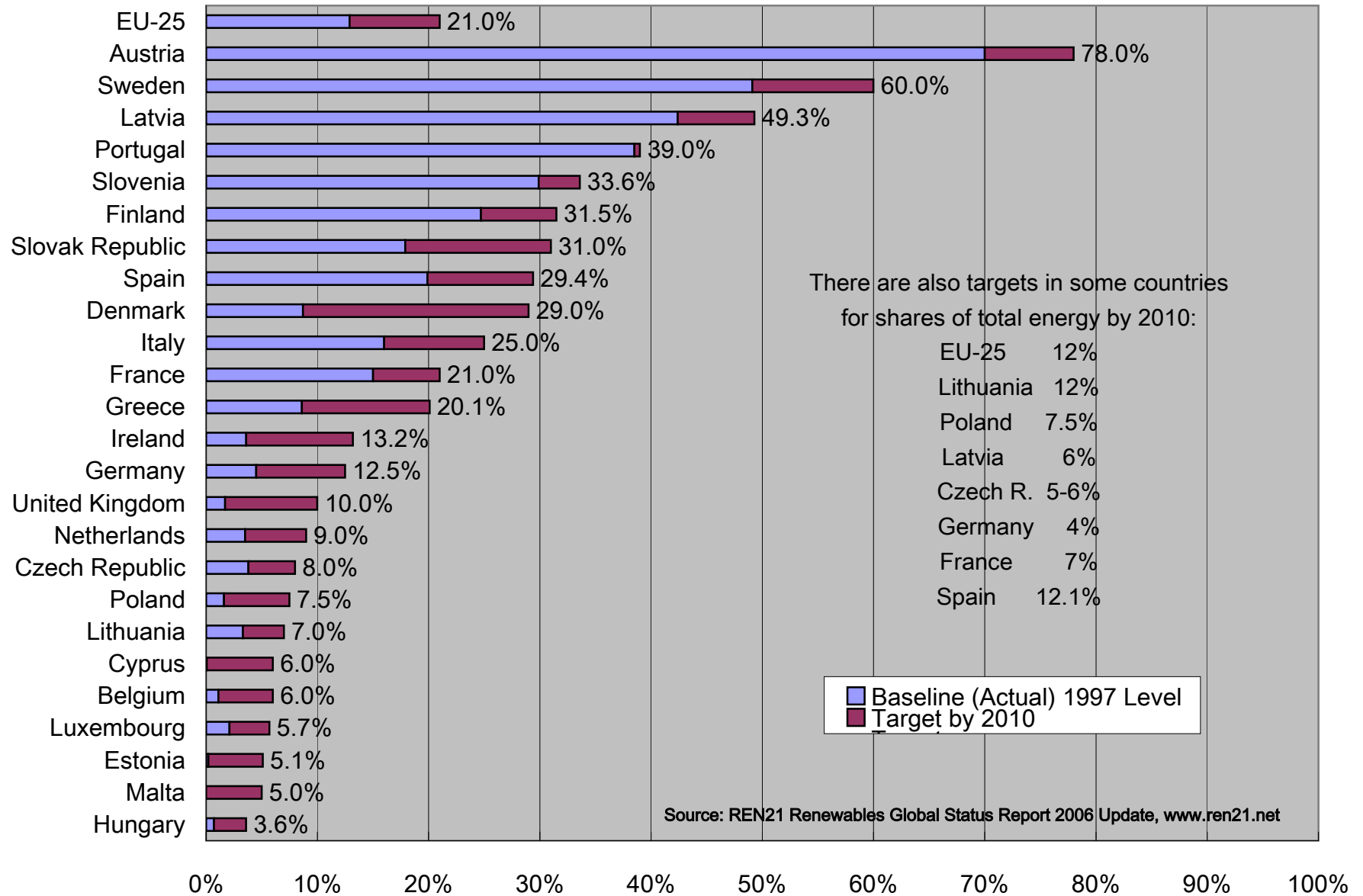


Table 3. Non-EU Countries with Renewable Energy Targets

Country	Target(s)
Australia	9.5 TWh of electricity annually by 2010
Brazil	3.3 GW added by 2006 from wind, biomass, small hydro
Canada	3.5% to 15% of electricity in 4 provinces; other types of targets in 6 provinces
China	10% of electric power capacity by 2010 (expected 60 GW); 5% of primary energy by 2010 and 10% of primary energy by 2020
Dominican Rep.	500 MW wind power capacity by 2015
Egypt	3% of electricity by 2010
India	10% of added electric power capacity during 2003-2012 (expected/planned)
Israel	2% of electricity by 2007; 5% of electricity by 2016
Japan	1.35% of electricity by 2010, excluding geothermal and large hydro (RPS)
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
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 m ² (~35 MWth) of solar thermal systems by 2012
South Africa	10 TWh added final energy by 2013
Switzerland	3.5 TWh from electricity and heat by 2010
Thailand	8% of total primary energy by 2011 (excluding traditional rural biomass)
United States	5% to 30% of electricity in 18 states (including DC)

China Renewable Energy Targets

	2005	2010	2020
Hydro power	115 GW	180 GW	300 GW
Wind power	1.3 GW	5 GW	30 GW
Biomass power	2.0 GW	5.5 GW	30 GW
Solar PV	0.07 GW	0.3 GW	1.8 GW
Solar hot water	80 million m ²	150 million m ²	300 million m ²
Ethanol	800,000 million tons	2 million tons	10 million tons
Biodiesel	50,000 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 (including large hydro)	7.5%	10%	16%
Share of power capacity (excluding large hydro)	8.2%	10%	20%
Rural energy	Small hydro for 1 million households and solar PV and wind for 1 million households by 2010		

Renewable Energy Promotion Policies

Country	Feed-in tariff	Renewable portfolio standard	Capital subsidies, grants, or Rebates	Investment excise, or other tax credits	Sales tax, energy tax, VAT reduction	Tradable renewable energy certificates	Energy production payments/ tax credits	Net Metering	Public investment, loans, or financing	Public competitive bidding
Developed and transition countries (34)										
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 Republic	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	
.....and 23 other developed and transition countries										
Developing countries (14)										
Argentina			X				X			
Brazil	X								X	
Cambodia			X							
China	X		X	X	X				X	X
Costa Rica	X									
Guatemala				X	X					
India	(*)	(*)	X	X	X				X	X
Indonesia	X									
Mexico				X				X		
Nicaragua	X			X						
Philippines				X	X				X	
Sri Lanka	X									
Thailand	X	X	X					X		
Turkey	X		X							

Figure 11: Cumulative Number of Countries/States/Provinces Enacting Feed-in Policies

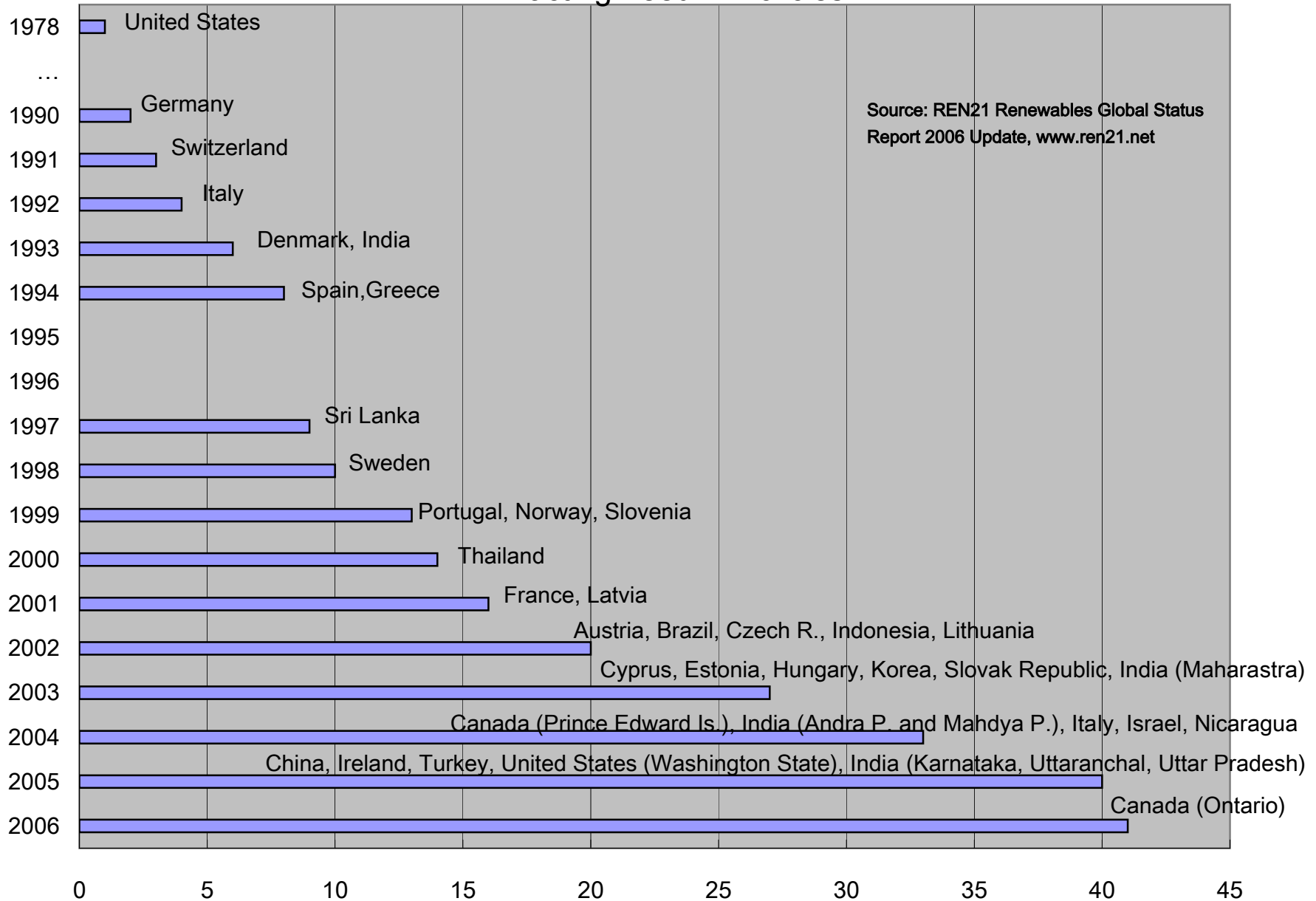
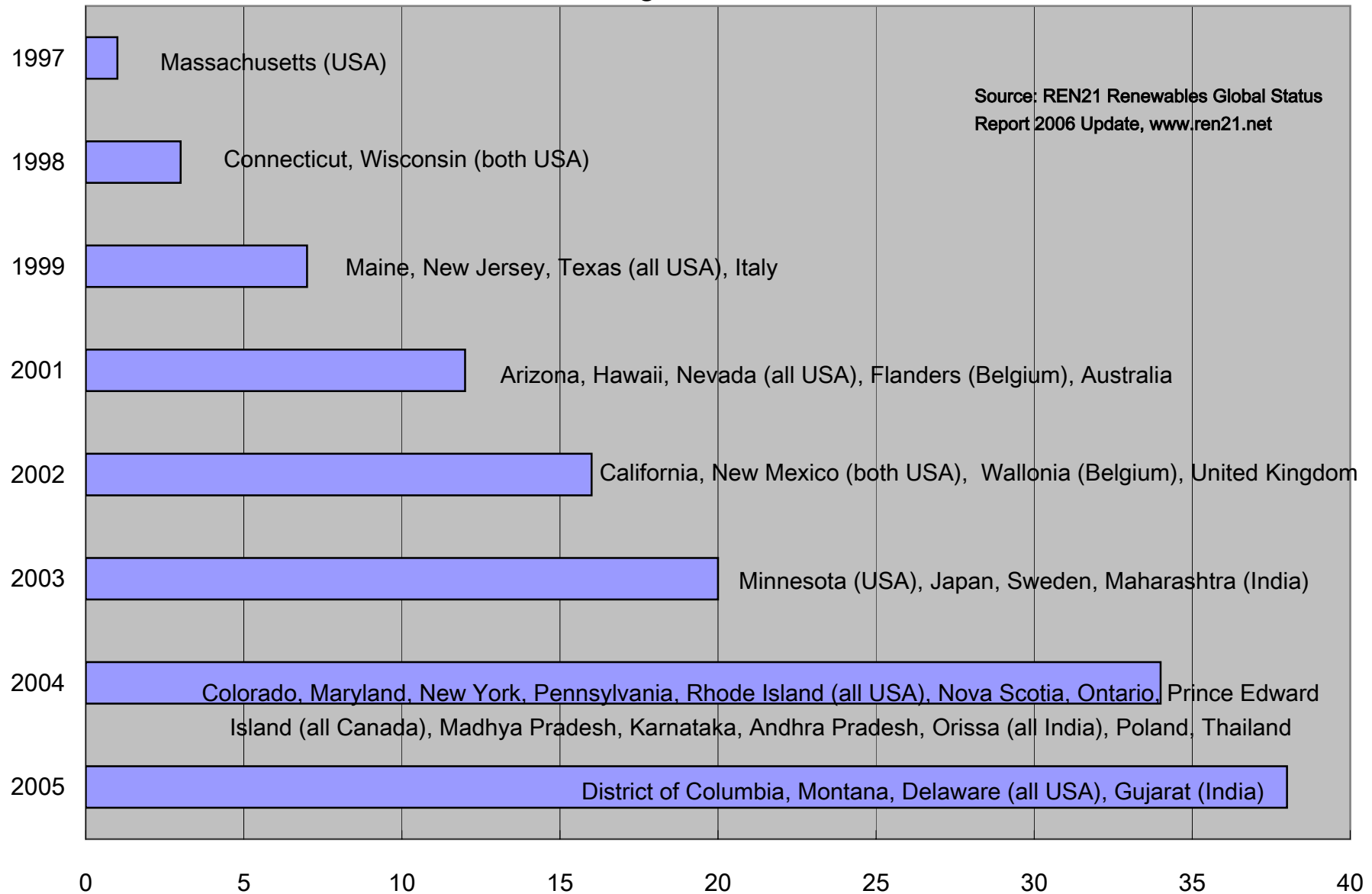


Figure 12: Cumulative Number of States/Provinces/Countries Enacting RPS Policies



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

Policy Landscape – Biofuels Policies

- In 2005-2006, several countries dramatically stepped up targets and mandates for biofuels.
- Mandates for blending biofuels into vehicle fuels have been enacted in at least 30 states/provinces and 8 countries worldwide. Most are 10-15% for ethanol and 2-5% for biodiesel.
- Fuel tax exemptions exist in at least 8 EU countries, most enacted during 2005-2006, including France, Germany, Greece, Ireland, Italy, Spain, Sweden, UK. Most are 100% tax exemptions.
- Tax credit for ethanol and biodiesel producers in the US (~12-15 cents/liter).
- Brazil has been the world leader in promoting biofuels. All gasoline must be blended with ethanol and gas stations sell both pure ethanol and ethanol blends.

Selected Biofuels Targets and Mandates

	Target (share of transport energy)	Blending Mandate
Belgium	5.75% by 2010	
Brazil		B2 by 2008; E25 currently
Canada (Ontario)		E5 by 2007
Canada (Saskatchewan)		E7
China (cities in 9 provinces)		E10 in 9 provinces
Colombia (large cities)		E10
Dominican Republic		E15 and B2 by 2015
EU (2003 directive)	5.75% by 2010	
EU (proposed)	8% by 2015	
France	5.75% by 2008, 10% by 2015	
Germany		E2 and B4.4 by 2007
India (13 states/territories)		E10
Malaysia		B5 by 2008
Philippines (proposed)		
Thailand		E10 by 2007
US (Hawaii, Minn., Montana)		E10
US (Washington State)		B2

Selected Major Cities with Renewable Energy Goals and/or Policies

City	Renewable energy goals	CO₂ reduction goals	Policies for solar hot water	Policies for solar PV	Urban planning, pilots
Adelaide, Australia	X	X			X
Barcelona, Spain	X	X	X	X	X
Cape Town, South Africa	X	X			X
Chicago, USA	X				
Daegu, Korea	X	X			X
Freiburg, Germany	X	X		X	X
Göteborg, Sweden					X
Gwangju, Korea	X	X			X
The Hague, Netherlands		X			
London, UK		X			
Minneapolis, USA	X				X
Oxford, UK	X	X	X	X	X
Portland, USA	X	X	X	X	X
Qingdao, China					X
Santa Monica, USA					X
Sapporo, Japan		X			X
Toronto, Canada		X			
Tokyo, Japan	X				
Vancouver, Canada		X			

Municipal Renewable Energy Targets

City	RE share of municipal electricity consumption	RE share of total city electricity consumption	Other targets
Adelaide, Australia		15% by 2014	
Cape Town, South Africa		10% by 2020	10% of homes by 2010 with solar hot water
Chicago	20% by 2006		
Daegu, Korea			5% of energy by 2012
Freiburg Germany		10% by 2010 4% currently	
Gwangju, Korea			2% of energy by 2020
Minneapolis	10% currently		
Oxford, UK			10% of homes by 2010 with solar hot water/PV
Portland (OR)	100% by 2010		
Sacramento (CA)		20% by 2011	
San Diego	23% currently		
San Francisco			1 MW/year added
Santa Monica (CA)	100% currently		
Tokyo			20% of energy by 2020

Municipal CO2 Reduction Targets

City	CO2 emissions reduction target
Adelaide, Australia	“zero net emissions” by 2010 in transport and by 2012 in buildings
Freiburg, Germany	25% below 1992 levels by 2010
Gwangju, Korea	20% below 1990 levels by 2020
The Hague, Netherlands	city government "CO2 neutral" by 2006 entire city "CO2 neutral" in long term
London	20% below 1990 levels by 2010
New York City	7% below 1990 levels by 2012
Portland (OR)	10% below 1990 levels by 2010
Sapporo, Japan	10% below 1990 levels by 2012
Vancouver BC	20% below 1990 levels by 2012

Table 8: Common Existing Applications of Renewable Energy in Rural (Off-Grid) Areas

Energy services	Renewable energy applications	Conventional alternatives
Cooking (homes, commercial stoves and ovens)	<ul style="list-style-type: none">● biomass direct combustion (fuel wood, crop wastes, forest wastes, dung, charcoal, and other forms)● biogas from household-scale digester● solar cookers	LPG, kerosene
Lighting and other small electric needs (homes, schools, street lighting, telecomm, hand tools, vaccine storage)	<ul style="list-style-type: none">● hydropower (pico-scale, micro-scale, small-scale)● biogas from household-scale digester● small-scale biomass gasifier with gas engine● village-scale mini-grids and solar/wind hybrid systems● solar home systems	Candles, kerosene, batteries, central battery recharging, diesel generators
Process motive power (small industry)	<ul style="list-style-type: none">● small hydro with electric motor● biomass power generation and electric motor● biomass gasification with gas engine	Diesel generators
Water pumping (agriculture & drinking)	<ul style="list-style-type: none">● mechanical wind pumps● solar PV pumps	Diesel pumps
Heating and cooling (crop drying and other agricultural processing, hot water)	<ul style="list-style-type: none">● biomass direct combustion● biogas from small- and medium-scale digesters● solar crop dryers● solar water heaters● ice making for food preservation	LPG, kerosene, diesel generators

Renewables Global Status Report

- Report designed to compile existing factual information about markets, investments, and policies. No analysis, recommendations, or conclusions.
- Original 2005 report based on research, data, interviews, and review by over 100 contributors from around the world, from February to September 2005.
- 2006 Update shows statistics for 2005 and shows new policies and market trends.
- 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.
- Available for download at www.ren21.net and www.martinot.info