U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

2010 Renewable Energy Data Book

Acknowledgments

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Key Findings

- Although renewable energy (excluding hydropower) is a relatively small portion of total energy supply both globally and in the United States, the installed **global renewable energy capacity has more than quadrupled between 2000 and 2010**.

- Including hydropower, **renewable energy represents nearly 12% of total installed capacity and more than 10% of total generation in the United States in 2010**. Installed renewable energy capacity (including hydropower) is more than 137 gigawatts (GW). Not including hydropower, 2010 renewable electricity installed capacity has reached about 59 GW in the United States.

- In 2010 in the United States, wind and solar photovoltaics (PV) were two of the fastest growing generation technologies. **In 2010, cumulative wind capacity increased by 15% and cumulative solar PV capacity grew 71% from the previous year**.

- Worldwide, wind energy is one of the fastest growing renewable energy technologies—**between 2000 and 2010, wind energy generation worldwide increased by a factor of 11**. The United States experienced even more dramatic growth, as installed wind energy capacity increased by a factor of nearly 16 between 2000 and 2010.

- In the United States, renewable energy has been capturing a growing percentage of new capacity additions during the past few years. **In 2010, renewable energy accounted for more than 25% of all new electrical capacity installations in the United States**—a large change from 2004 when all renewable energy captured only 2% of new capacity additions.

- Since 2006, the United States has been the world's leading ethanol producer. **Between 2000 and 2010, production of corn ethanol increased by a factor of 8**. Use of ethanol in the United States has also grown substantially, and it accounts for 9.4% of all gasoline and gasoline blends consumed, up from 1% in 2000.

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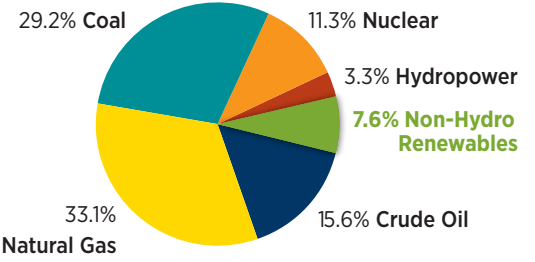
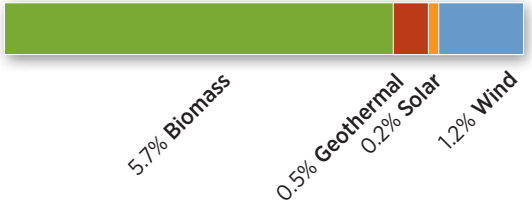
I. U.S. Energy Background Information

U.S. Energy Production and Consumption (2010)

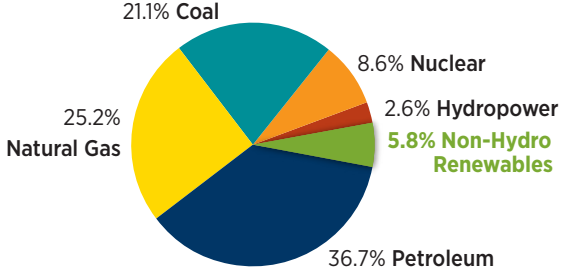
U.S. Energy Production (2010): 74.9 Quadrillion Btu



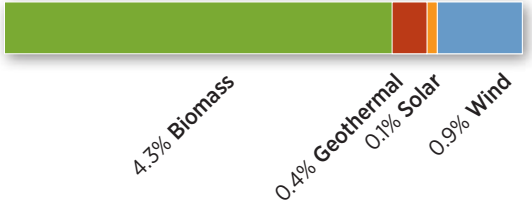
U.S. Non-Hydro Renewable Energy Production: 5.2 Quadrillion Btu



U.S. Energy Consumption (2010): 98.0 Quadrillion Btu



U.S. Non-Hydro Renewable Energy Consumption: 5.7 Quadrillion Btu



Source: EIA; full references are provided starting on p. 123.

Note: Because hydropower is considered a conventional source of energy, it is accounted for separate from other new renewable sources of energy. Energy consumption is higher than energy production due to oil imports.

U.S. Energy Production by Energy Source (%) 2000–2010

I

	Coal	Natural Gas*	Crude Oil	Nuclear	Hydropower	Non-Hydro Renewables	Total Production (Quadrillion Btu)
2000	31.8%	31.2%	17.3%	11.0%	3.9%	4.8%	71.5
2001	32.8%	31.6%	17.1%	11.2%	3.1%	4.3%	71.9
2002	32.0%	31.0%	17.1%	11.5%	3.8%	4.5%	70.9
2003	31.5%	31.3%	17.1%	11.3%	4.0%	4.7%	70.2
2004	32.5%	30.6%	16.4%	11.7%	3.8%	5.0%	70.4
2005	33.3%	30.0%	15.8%	11.7%	3.9%	5.3%	69.6
2006	33.5%	30.1%	15.2%	11.6%	4.0%	5.5%	71.0
2007	32.8%	31.0%	15.0%	11.8%	3.4%	5.9%	71.6
2008	32.5%	31.5%	14.3%	11.5%	3.4%	6.6%	73.3
2009	29.7%	32.5%	15.6%	11.5%	3.7%	7.0%	72.8
2010	29.2%	33.1%	15.6%	11.3%	3.3%	7.6%	74.9

Source: EIA

* Includes natural gas plant liquids.

Note: Annual totals may not equal 100% due to rounding.

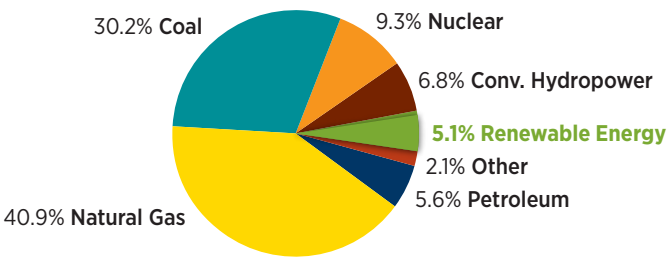
U.S. Energy Consumption by Energy Source (%) 2000–2010

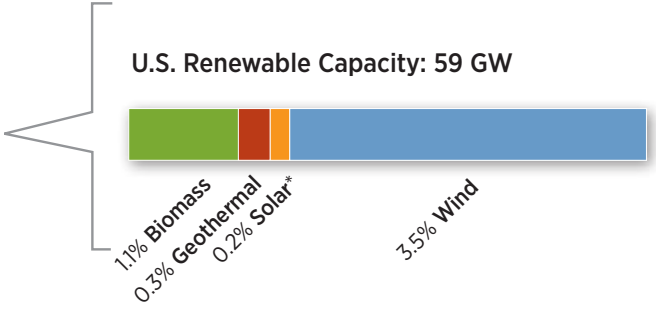
	Coal	Natural Gas	Petroleum	Nuclear	Hydropower	Non-Hydro Renewables	Total Consumption (Quadrillion Btu)
2000	22.8%	24.1%	38.7%	7.9%	2.8%	3.5%	98.9
2001	22.8%	23.7%	39.7%	8.3%	2.3%	3.2%	96.3
2002	22.4%	24.1%	39.1%	8.3%	2.7%	3.3%	97.8
2003	22.8%	23.3%	39.6%	8.1%	2.9%	3.4%	98.1
2004	22.4%	22.9%	40.2%	8.2%	2.7%	3.6%	100.2
2005	22.7%	22.5%	40.2%	8.1%	2.7%	3.7%	100.4
2006	22.5%	22.3%	40.1%	8.2%	2.9%	4.0%	99.7
2007	22.4%	23.3%	39.2%	8.3%	2.4%	4.2%	101.5
2008	22.5%	24.0%	37.5%	8.5%	2.5%	4.9%	99.4
2009	20.8%	24.7%	37.4%	8.8%	2.8%	5.4%	94.6
2010	21.1%	25.2%	36.7%	8.6%	2.6%	5.8%	98.0

Source: EIA

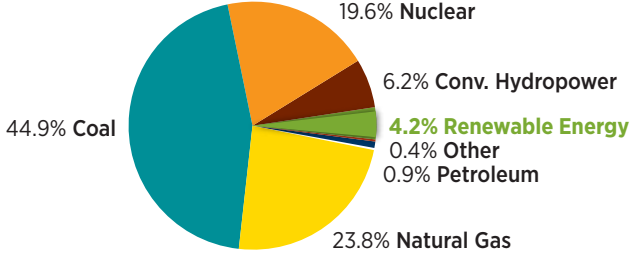
U.S. Nameplate Capacity and Generation (2010)

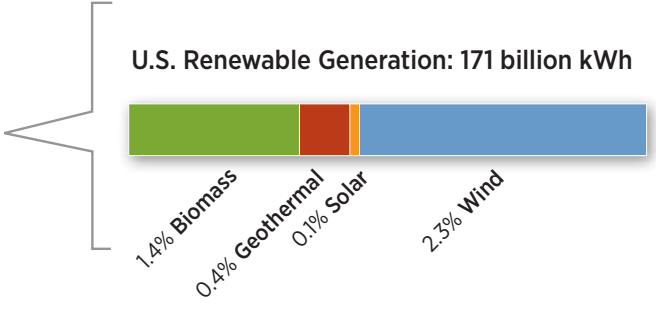
U.S. Electric Nameplate Capacity (2010): 1,148 GW





U.S. Electric Net Generation (2010): 4,123 billion kWh





Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Other includes: pumped storage, batteries, chemicals, hydrogen, pitch, purchased steam, sulfur, tire-derived fuels, and miscellaneous technologies.

* On-grid capacity only.

U.S. Electric-Generating Capacity by Source (%) 2000–2010

	Coal	Petroleum	Natural Gas	Other Gases	Nuclear	Hydro	Renew-ables	Hydro Pumped Storage	Other	Total Capacity (GW)
2000	38.8%	7.9%	28.0%	0.3%	12.1%	8.9%	1.9%	2.2%	0.1%	867
2001	36.9%	8.0%	30.9%	0.2%	11.5%	8.4%	2.0%	2.1%	0.1%	914
2002	34.5%	6.8%	35.9%	0.2%	10.7%	7.9%	1.9%	2.0%	0.1%	980
2003	32.5%	6.5%	39.1%	0.2%	10.2%	7.5%	2.0%	1.9%	0.1%	1,032
2004	31.9%	6.2%	40.3%	0.2%	10.1%	7.3%	2.0%	1.9%	0.1%	1,050
2005	31.5%	6.1%	40.9%	0.2%	9.9%	7.2%	2.2%	1.8%	0.1%	1,068
2006	31.2%	6.0%	41.2%	0.2%	9.8%	7.2%	2.5%	1.8%	0.1%	1,076
2007	30.9%	5.7%	41.3%	0.2%	9.7%	7.1%	3.0%	1.9%	0.1%	1,088
2008	30.5%	5.6%	41.4%	0.2%	9.6%	7.0%	3.8%	1.8%	0.1%	1,104
2009	30.2%	5.6%	40.9%	0.2%	9.5%	6.9%	4.7%	1.8%	0.1%	1,123
2010	30.2%	5.6%	40.9%	0.2%	9.3%	6.8%	5.1%	1.8%	0.1%	1,148

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

U.S. Electricity Generation by Source (%) 2000–2010

I

	Coal	Petroleum Liquids	Petroleum Coke	Natural Gas	Other Gases	Nuclear	Hydro	Renew-ables	Hydro Pumped Storage	Other	Total Generation (million kWh)
2000	51.7%	2.7%	0.2%	15.8%	0.4%	19.8%	7.2%	2.1%	-0.1%	0.1%	3,802,416
2001	50.9%	3.1%	0.3%	17.1%	0.2%	20.6%	5.8%	1.9%	-0.2%	0.3%	3,736,922
2002	50.1%	2.0%	0.4%	17.9%	0.3%	20.2%	6.9%	2.1%	-0.2%	0.4%	3,858,755
2003	50.8%	2.6%	0.4%	16.7%	0.4%	19.7%	7.1%	2.1%	-0.2%	0.4%	3,883,580
2004	49.8%	2.5%	0.5%	17.9%	0.4%	19.9%	6.8%	2.1%	-0.2%	0.4%	3,970,535
2005	49.6%	2.5%	0.6%	18.8%	0.3%	19.3%	6.7%	2.2%	-0.2%	0.3%	4,055,900
2006	49.0%	1.1%	0.5%	20.1%	0.3%	19.4%	7.1%	2.4%	-0.2%	0.3%	4,065,404
2007	48.5%	1.2%	0.4%	21.6%	0.3%	19.4%	6.0%	2.6%	-0.2%	0.3%	4,157,852
2008	48.2%	0.8%	0.3%	21.4%	0.3%	19.6%	6.2%	3.1%	-0.2%	0.3%	4,120,731
2009	44.4%	0.7%	0.3%	23.3%	0.3%	20.2%	6.9%	3.7%	-0.1%	0.3%	3,952,271
2010	44.9%	0.6%	0.3%	23.8%	0.3%	19.6%	6.2%	4.2%	-0.1%	0.3%	4,123,235

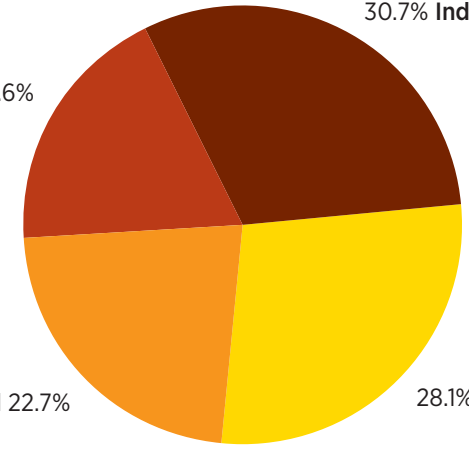
Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Note: Electricity generation from hydro pumped storage is negative because more electricity is consumed than generated by these plants.

U.S. Energy Consumption by Sector (2010)

U.S. Energy Consumption in 2010 was 98,010 Trillion BTUs

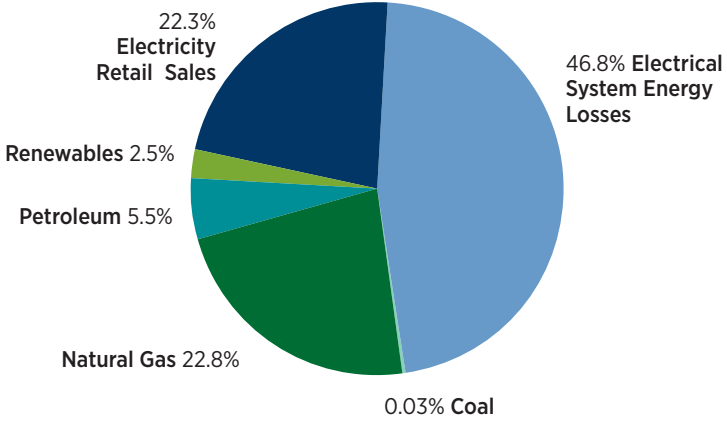
U.S. Buildings represent 41.3% of energy use.



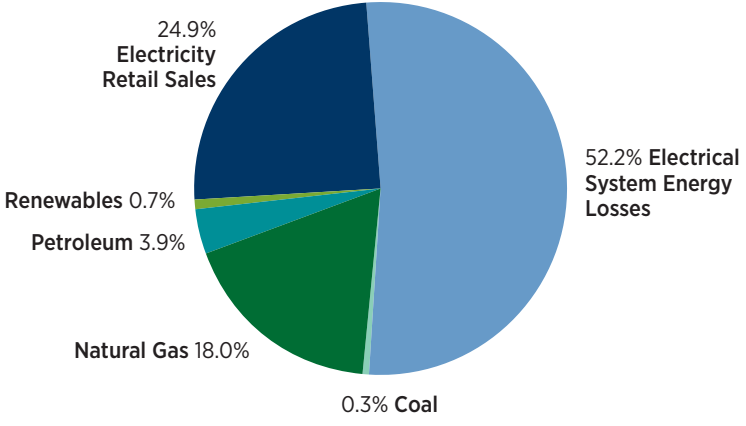
Source: EIA

U.S. Energy Consumption – Residential and Commercial (2010)

Residential Energy Consumption
(22,201 Trillion Btu) – 2010



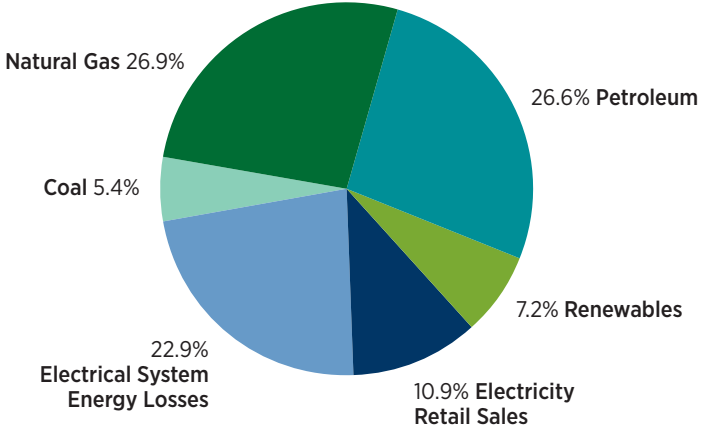
Commercial Energy Consumption
(18,241 Trillion Btu) – 2010



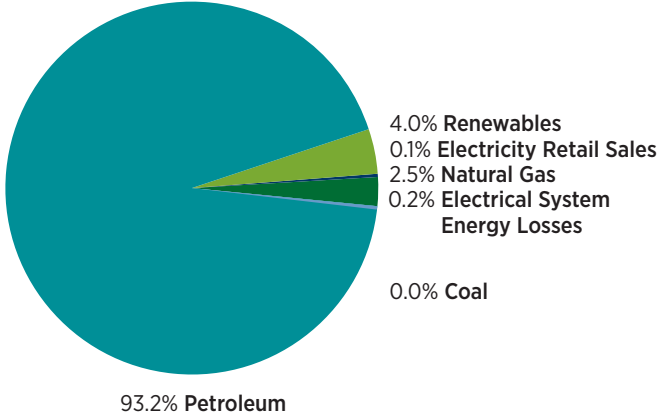
Source: EIA

U.S. Energy Consumption – Industrial and Transportation (2010)

Industrial Energy Consumption
(30,096 Trillion Btu) – 2010



Transportation Energy Consumption
(27,507 Trillion Btu) – 2010



Source: EIA

II. Renewable Electricity in the U.S.

Renewable Electricity in the U.S.: Summary

- Since 2000, renewable electricity installations in the United States (excluding hydropower) have more than tripled, and in 2010 represent **59 GW of installed U.S. capacity**.

- Renewable electricity (excluding hydropower) has grown at a compounded annual average of nearly **14% per year from 2000–2010**.

- Although it is a growing part of U.S. energy supply, renewable electricity (excluding hydropower) in 2010 still represents a small percentage of overall installed electricity capacity (5.1%) and generation (4.2%) in the United States.

- Wind, CSP and solar PV are the fastest growing renewable energy sectors. **In 2010 in the U.S., wind capacity installations increased by nearly 15%, solar PV grew over 71% and CSP grew by 18% from the previous year**.

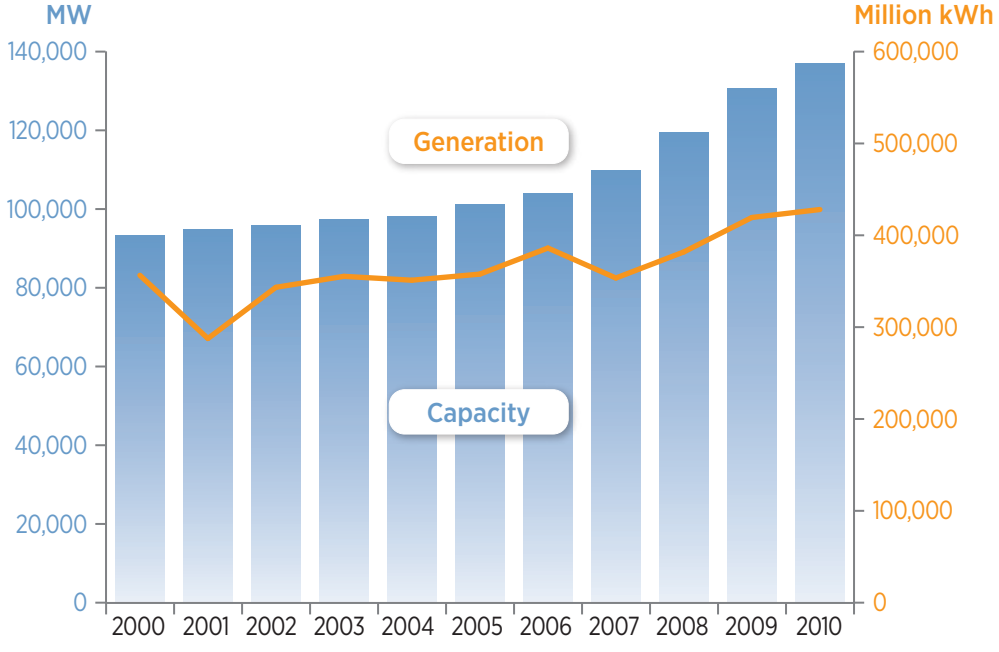
II

- In 2010, **biomass** produced about **33% of total renewable electricity generation** (excluding hydropower), **wind produced 55%**, **solar** (PV and CSP) **produced 3%** and **geothermal produced 9% in the U.S.**

- **Wind energy** accounted for about **81% of annual installed U.S. renewable electricity capacity** in 2010 (excluding hydropower).

- Electricity generation from biomass, geothermal, and hydropower have remained relatively stable since 2000.

Capacity and Generation: All Renewables *(including hydropower)*

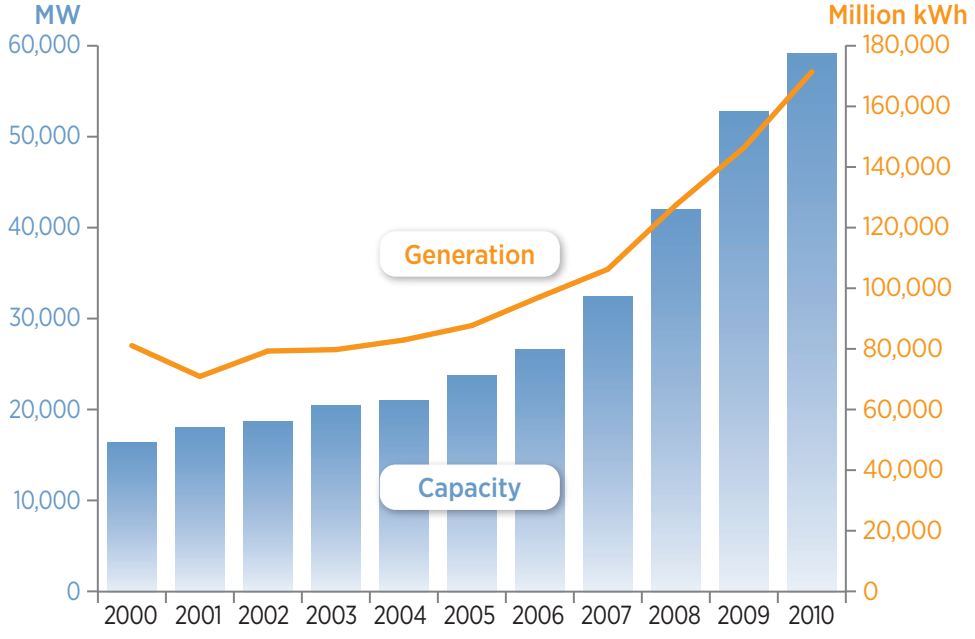


	Total Nameplate Capacity (MW)	Total Generation (Million kWh)
2000	**93,370**	**356,789**
2001	**94,943**	**288,009**
2002	**95,804**	**343,740**
2003	**97,478**	**355,689**
2004	**98,195**	**351,465**
2005	**101,113**	**358,129**
2006	**104,072**	**386,474**
2007	**109,845**	**353,854**
2008	**119,640**	**382,276**
2009	**130,678**	**419,765**
2010	**137,013**	**428,402**

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Capacity and Generation: Renewables *(excluding hydropower)*

II

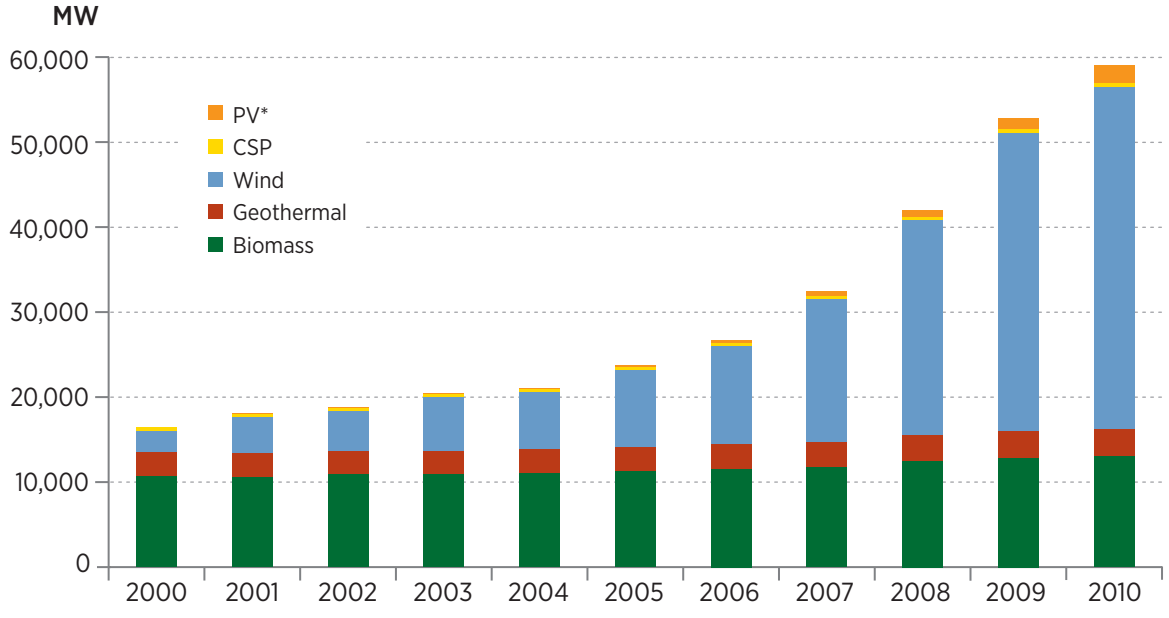


	Total Nameplate Capacity (MW)	Total Generation (Million kWh)
2000	**16,424**	**81,216**
2001	**18,032**	**71,048**
2002	**18,757**	**79,411**
2003	**20,458**	**79,880**
2004	**21,065**	**83,048**
2005	**23,759**	**87,808**
2006	**26,653**	**97,228**
2007	**32,413**	**106,344**
2008	**42,000**	**127,445**
2009	**52,768**	**146,310**
2010	**59,082**	**171,350**

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Renewable Electricity Generating Capacity by Source
(excluding hydropower)

II



Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

* Includes on-grid capacity only.

Renewable Electricity Nameplate Capacity Added (MW) and Percent Annual Change from Previous Year

II

	Solar PV	CSP	Wind	Geothermal	Biomass	Total Capacity Added (w/o Hydropower)	% Annual Change in Growth from Previous Year
2000	18	0	66	59	(323)	**(180)**	-128%
2001	11	0	1,697	0	(100)	**1,608**	+994%
2002	23	0	411	0	291	**725**	-55%
2003	45	0	1,667	0	(11)	**1,701**	+135%
2004	58	0	372	0	177	**607**	-64%
2005	79	0	2,396	30	189	**2,694**	+344%
2006	105	1	2,454	3	331	**2,894**	+7%
2007	169	64	5,237	106	185	**5,760**	+99%
2008	311	(0)	8,425	104	747	**9,586**	+66%
2009	438	11	9,922	46	351	**10,768**	+12%
2010	896	78	5,113	15	218	**6,319**	-41%

- annual decrease | annual increase +

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Renewable Electricity Nameplate Capacity (MW) and Percent Cumulative Increase from Previous Year

	Hydro	Solar PV*	CSP	Wind	Geothermal	Biomass	Total (without Hydropower)	Total U.S.
2000	**76,946** 0%	**85** 26.9%	**354** 0%	**2,578** 2.6%	**2,798** 2.2%	**10,676** 2.6%	**16,424** -1.1%	93,370 -0.3%
2001	**76,911** 0%	**112** 31.7%	**354** 0%	**4,275** 65.8%	**2,798** 0%	**10,576** 0.9%	**18,032** 9.8%	94,943 1.7%
2002	**77,047** 0.2%	**156** 39.2%	**354** 0%	**4,686** 9.6%	**2,798** 0%	**10,867** 2.8%	**18,757** 4.0%	95,804 0.9%
2003	**77,020** 0%	**226** 44.8%	**354** 0%	**6,353** 35.6%	**2,798** 0%	**10,856** 0.1%	**20,458** 9.1%	97,478 1.7%
2004	**77,130** 0.1%	**312** 38%	**354** 0%	**6,725** 5.9%	**2,798** 0%	**11,033** 1.6%	**21,065** 3.0%	98,195 0.7%
2005	**77,354** 0.3%	**424** 35.8%	**354** 0%	**9,121** 35.6%	**2,828** 1.1%	**11,222** 1.7%	**23,759** 12.8%	101,113 3.0%
2006	**77,419** 0.1%	**566** 33.4%	**355** 0.3%	**11,575** 26.9%	**2,831** 0.1%	**11,553** 2.9%	**26,653** 12.2%	104,072 2.9%
2007	**77,432** 0%	**771** 36.2%	**419** 18%	**16,812** 45.2%	**2,937** 3.7%	**11,738** 1.6%	**32,413** 21.6%	109,845 5.5%
2008	**77,640** 0.3%	**1,106** 43.5%	**419** 0%	**25,237** 50.1%	**3,040** 3.5%	**12,485** 6.4%	**42,000** 29.6%	119,640 8.9%
2009	**77,910** 0.3%	**1,677** 51.6%	**431** 2.9%	**35,159** 39.3%	**3,087** 1.5%	**12,727** 1.9%	**52,768** 25.6%	130,678 9.2%
2010	**77,931** 0%	**2,153** 71.3%	**507** 18.0%	**40,267** 14.5%	**3,102** 0.5%	**13,053** 1.7%	**59,082** 12.0%	137,013 4.8%

- annual decrease annual increase +

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

* Includes on- and off-grid capacity.

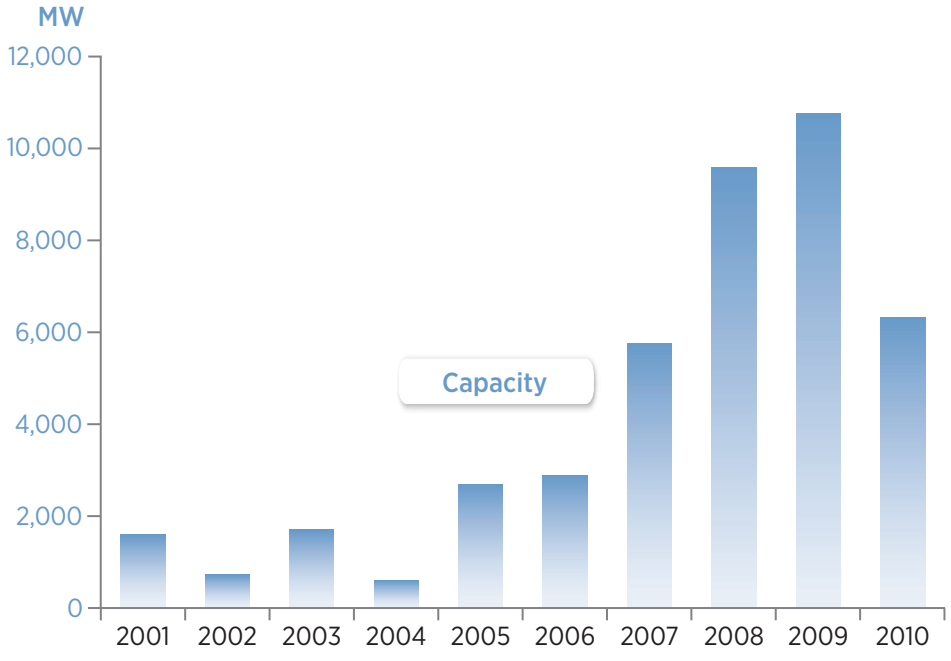
Renewable Electricity Nameplate Capacity as a Percent of Total Electricity Generating Capacity

II

	Hydro	Solar PV	CSP	Wind	Geothermal	Biomass	Renewables w/o Hydro	All Renewables
2000	8.9%	0.0%	0.0%	0.3%	0.3%	1.2%	1.9%	10.8%
2001	8.4%	0.0%	0.0%	0.5%	0.3%	1.2%	2.0%	10.4%
2002	7.9%	0.0%	0.0%	0.5%	0.3%	1.1%	1.9%	9.8%
2003	7.5%	0.0%	0.0%	0.6%	0.3%	1.1%	2.0%	9.4%
2004	7.3%	0.0%	0.0%	0.6%	0.3%	1.1%	2.0%	9.4%
2005	7.2%	0.0%	0.0%	0.9%	0.3%	1.1%	2.2%	9.5%
2006	7.2%	0.1%	0.0%	1.1%	0.3%	1.1%	2.5%	9.7%
2007	7.1%	0.1%	0.0%	1.5%	0.3%	1.1%	3.0%	10.1%
2008	7.0%	0.1%	0.0%	2.3%	0.3%	1.1%	3.8%	10.8%
2009	6.9%	0.1%	0.0%	3.1%	0.3%	1.1%	4.7%	11.6%
2010	6.8%	0.2%	0.0%	3.5%	0.3%	1.1%	5.1%	11.9%

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Annual Installed Renewable Electric Capacity Growth *(excluding hydropower)*

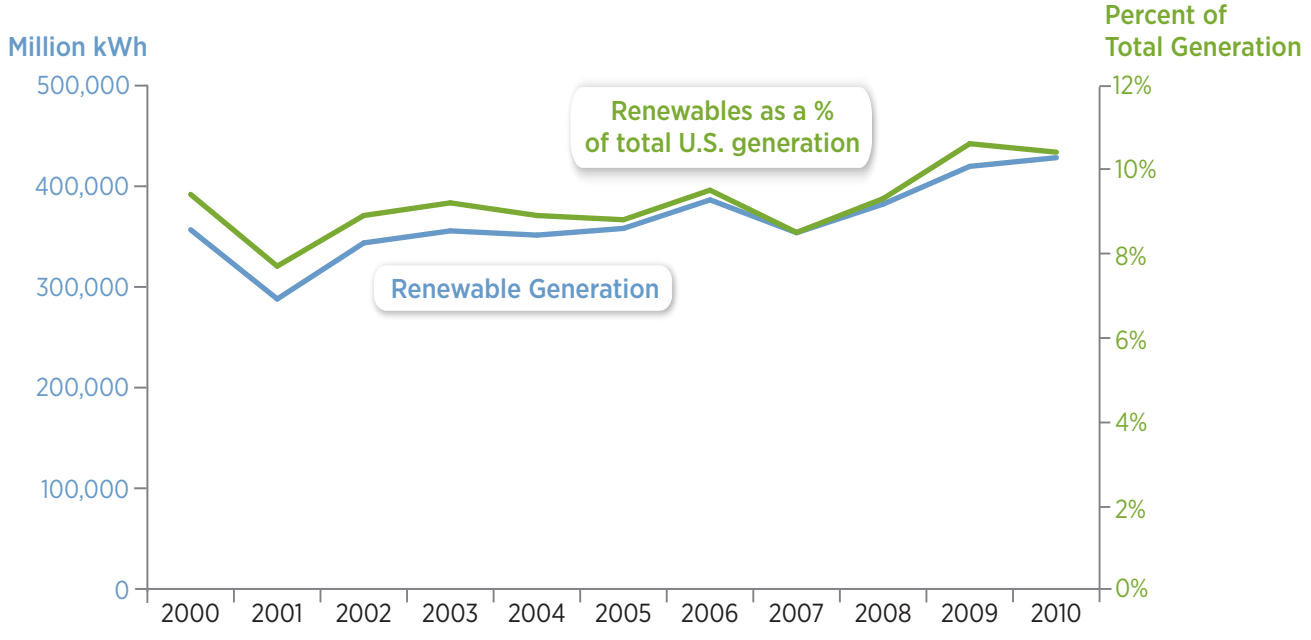


	Compounded Annual Growth Rate (CAGR) (2000–2010)
Wind	**31.6%**
Solar PV	**61.3%**
CSP	**3.7%**
Biomass	**2.0%**
Geothermal	**1.0%**
Renewables (excl. Hydro)	**13.7%**

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

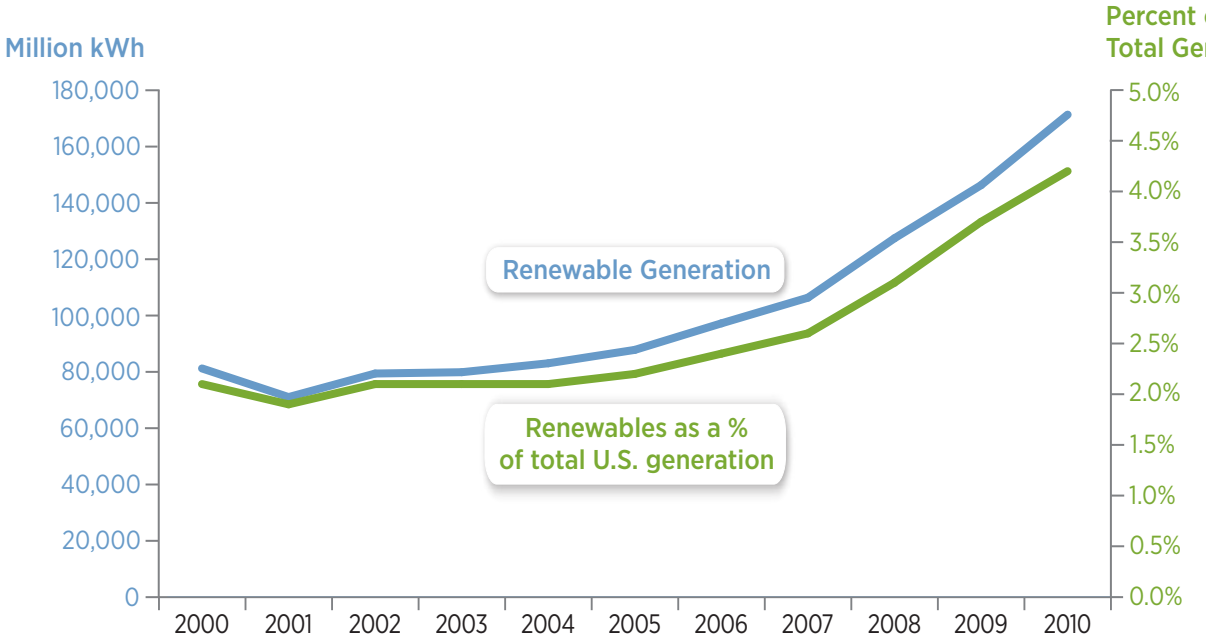
U.S. Renewable Electricity Generation *(including hydropower)*

II



Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

U.S. Renewable Electricity Generation *(excluding hydropower)*

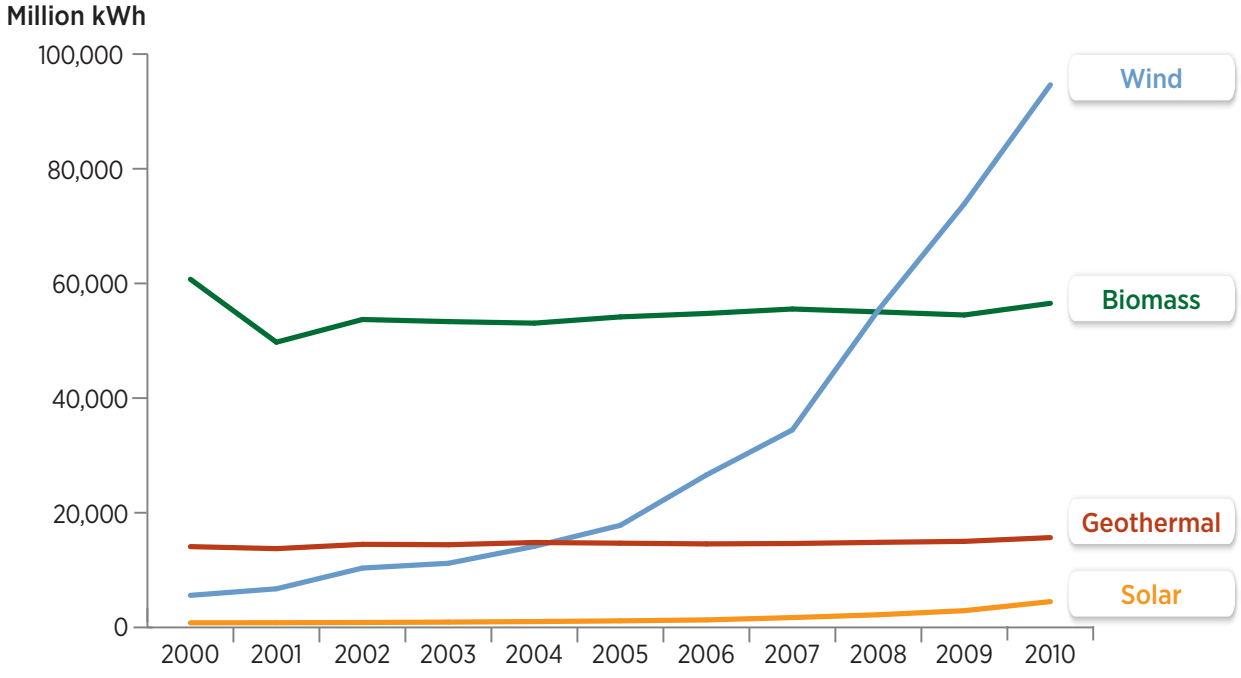


Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Note: The generation decrease from 2000 to 2001, in part, reflects an EIA classification change. Beginning with 2001 data, non-biogenic municipal solid waste (MSW) and tire-derived fuels were reclassified as non-renewable energy sources (previously considered waste biopower).

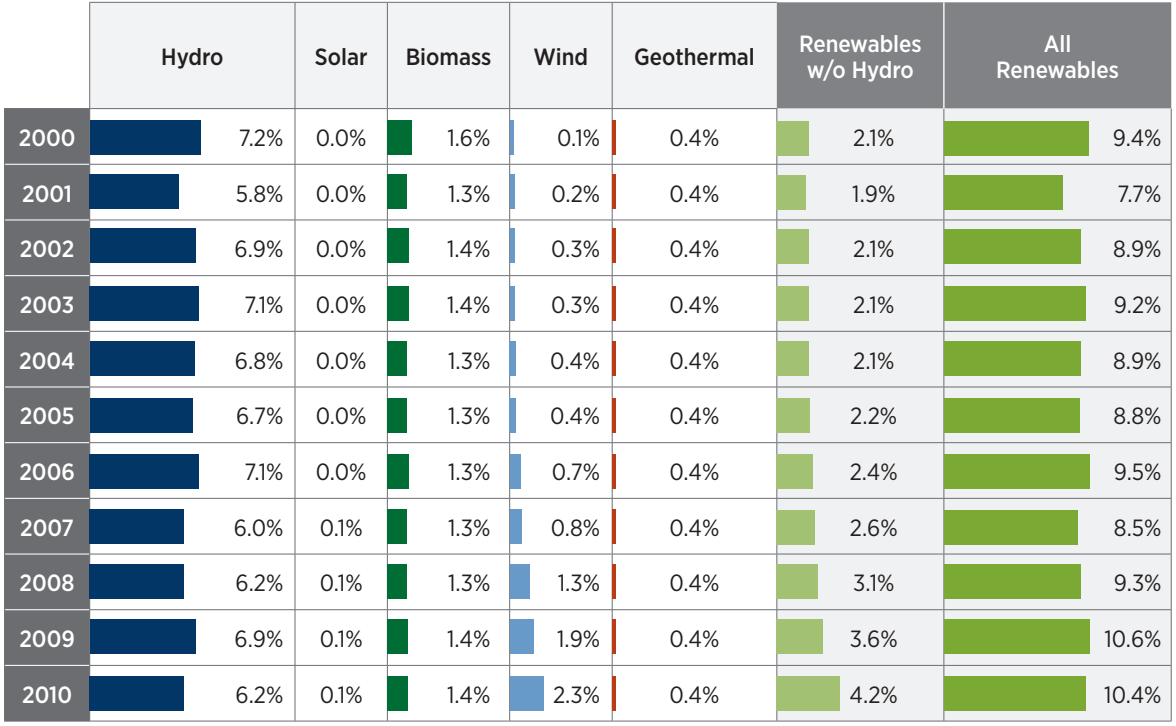
U.S. Renewable Generation by Technology *(excluding hydropower)*

II



Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Renewable Electricity as a Percent of Total Generation



	Hydro	Solar	Biomass	Wind	Geothermal	Renewables w/o Hydro	All Renewables
2000	7.2%	0.0%	1.6%	0.1%	0.4%	2.1%	9.4%
2001	5.8%	0.0%	1.3%	0.2%	0.4%	1.9%	7.7%
2002	6.9%	0.0%	1.4%	0.3%	0.4%	2.1%	8.9%
2003	7.1%	0.0%	1.4%	0.3%	0.4%	2.1%	9.2%
2004	6.8%	0.0%	1.3%	0.4%	0.4%	2.1%	8.9%
2005	6.7%	0.0%	1.3%	0.4%	0.4%	2.2%	8.8%
2006	7.1%	0.0%	1.3%	0.7%	0.4%	2.4%	9.5%
2007	6.0%	0.1%	1.3%	0.8%	0.4%	2.6%	8.5%
2008	6.2%	0.1%	1.3%	1.3%	0.4%	3.1%	9.3%
2009	6.9%	0.1%	1.4%	1.9%	0.4%	3.6%	10.6%
2010	6.2%	0.1%	1.4%	2.3%	0.4%	4.2%	10.4%

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

Renewable Electricity Generation (Million kWh) and Percent Cumulative Increase from Previous Year

II

	Hydropower	Solar	Wind	Geothermal	Biomass	All Renewables	Renewables without Hydropower
2000	**275,573** -13.8%	**804** 8.3%	**5,593** 24.6%	**14,093** -5.0%	**60,726** 1.9%	356,789 -10.6%	**81,216** 2.0%
2001	**216,961** -21.3%	**822** 2.2%	**6,737** 20.5%	**13,741** -2.5%	**49,748** -18.1%	288,009 -19.3%	**71,048** -12.5%
2002	**264,329** 21.8%	**857** 4.3%	**10,354** 53.7%	**14,491** 5.5%	**53,709** 8.0%	343,740 19.4%	**79,411** 11.7%
2003	**275,806** 4.3%	**929** 8.4%	**11,187** 8.0%	**14,424** -0.5%	**53,340** -0.7%	355,686 3.5%	**79,880** 0.6%
2004	**268,417** -2.7%	**1,020** 9.8%	**14,144** 26.4%	**14,811** 2.7%	**53,073** -0.5%	351,465 -1.2%	**83,048** 4.0%
2005	**270,321** 0.7%	**1,145** 12.2%	**17,811** 25.9%	**14,692** -0.8%	**54,160** 2.0%	358,129 1.9%	**87,808** 5.7%
2006	**289,246** 7.0%	**1,312** 14.6%	**26,589** 49.3%	**14,568** -0.8%	**54,759** 1.1%	386,474 7.9%	**97,228** 10.7%
2007	**247,510** -14.4%	**1,718** 31.0%	**34,450** 29.6%	**14,637** 0.5%	**55,539** 1.4%	353,854 -8.4%	**106,344** 9.4%
2008	**254,831** 3.0%	**2,208** 28.5%	**55,363** 60.7%	**14,840** 1.4%	**55,034** -0.9%	382,276 8.0%	**127,445** 19.8%
2009	**273,455** 7.3%	**2,922** 32.4%	**73,886** 33.5%	**15,009** 1.1%	**54,493** -1.0%	419,765 9.8%	**146,310** 14.8%
2010	**257,052** -6.0%	4,505 54.2%	**94,647** 28.1%	**15,666** 4.4%	**56,532** 3.7%	428,402 2.1%	**171,350** 17.1%

- annual decrease | annual increase +

Sources: EIA, AWEA, GEA, LBNL, SEIA/GTM, Larry Sherwood/IREC

State Renewable Energy Information: Summary

- In 2010, **Texas had the most installed renewable electric capacity (excluding hydropower)** of any U.S. state.

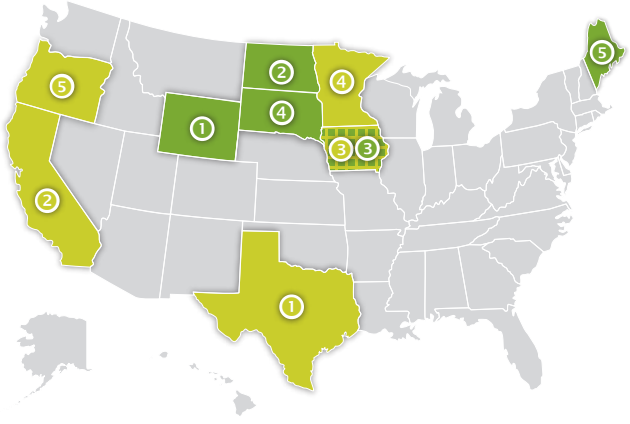
- **Washington is the leader** in installed renewable energy capacity when including hydropower.

- In 2008, **Texas became the national leader** in wind power development, and in 2010 has over 10 GW of wind capacity installed.

- A combination of **state incentives and renewable portfolio standards** for renewable energy and renewable resource development has driven renewable growth in some states.

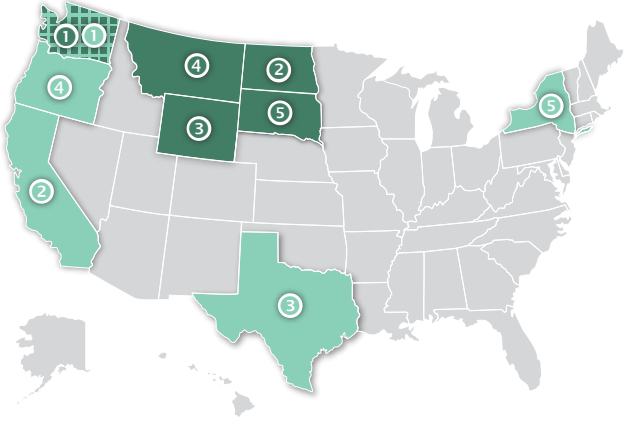
Top States for Renewable Electricity Installed Nameplate Capacity (2010)

II



Total Renewables *(excluding hydropower)*
1 Texas
2 California
3 Iowa
4 Minnesota
5 Oregon

Per Capita Renewables *(excluding hydropower)*
1 Wyoming
2 North Dakota
3 Iowa
4 South Dakota
5 Maine

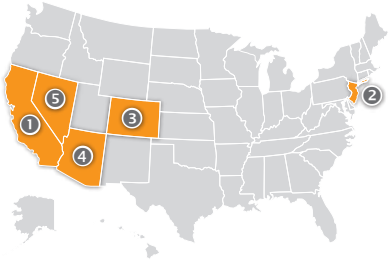


Total Renewables *(including hydropower)*
1 Washington
2 California
3 Texas
4 Oregon
5 New York

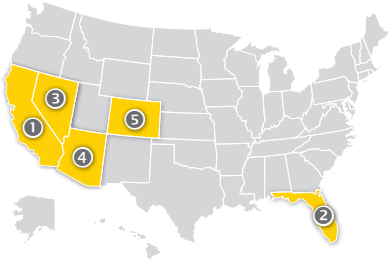
Per Capita Renewables *(including hydropower)*
1 Washington
2 North Dakota
3 Wyoming
4 Montana
5 South Dakota

Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC, U.S. Census

Top States for Renewable Electricity Installed Nameplate Capacity (2010)

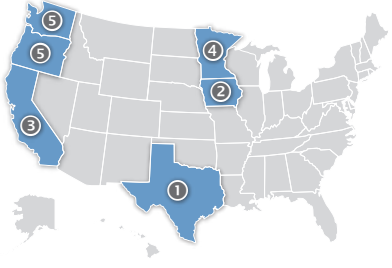


Solar PV
1 California
2 New Jersey
3 Colorado
4 Arizona
5 Nevada

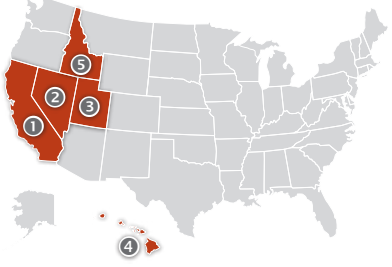


CSP
1 California
2 Florida
3 Nevada
4 Arizona
5 Colorado

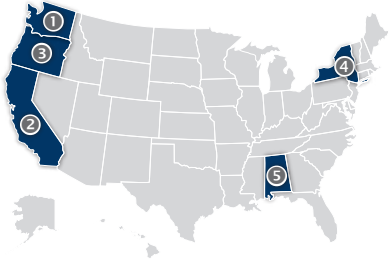
Biomass
1 California
2 Florida
3 Maine
4 Virginia
5 Georgia



Wind
1 Texas
2 Iowa
3 California
4 Minnesota
5 Oregon/ Washington



Geothermal
1 California
2 Nevada
3 Utah
4 Hawaii
5 Idaho



Hydropower
1 Washington
2 California
3 Oregon
4 New York
5 Alabama

Sources: EIA, LBNL, GEA, Larry Sherwood/IREC, SEIA/GTM

Renewables 2010 Installed Nameplate Capacity (MW)
NORTHEAST

II

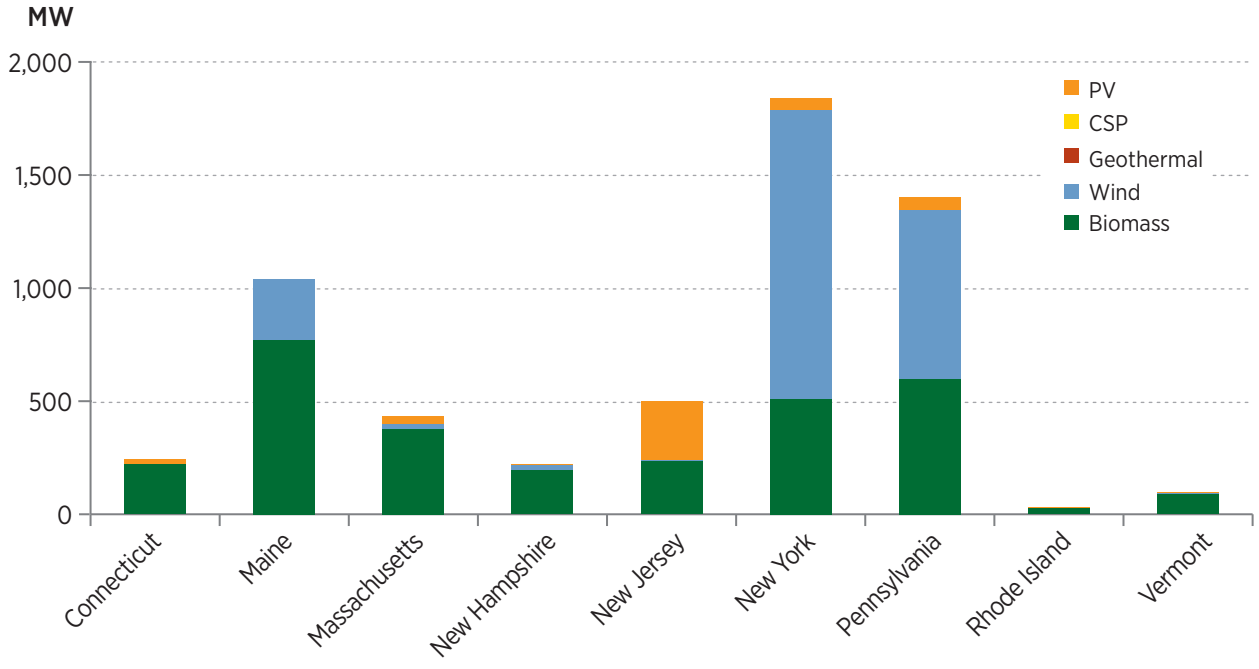
	Wind	PV*	CSP	Geothermal	Biomass	Hydropower	Total Renewables (incl. hydro)	Per capita RE (excl. hydro) watts/person
New York	1,274	55.5	0	0	510	4,657	**6,496**	**335**
Pennsylvania	748	54.8	0	0	597	778	**2,178**	**171**
Maine	266	0.5	0	0	771	725	**1,762**	**1,327**
Massachusetts	18	38.2	0	0	377	271	**705**	**108**
New Hampshire	25	2.0	0	0	194	445	**667**	**507**
Vermont	6	2.9	0	0	88	315	**412**	**658**
Connecticut	0	24.6	0	0	221	119	**364**	**102**
New Jersey	8	259.9	0	0	233	13	**514**	**58**
Rhode Island	2	0.6	0	0	26	3	**31**	**30**

Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC, U.S. Census

* Does not include off-grid installations

Renewables 2010 Installed Nameplate Capacity *(excluding hydropower)*
NORTHEAST

II



Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC

Renewables 2010 Installed Nameplate Capacity (MW)
MIDWEST

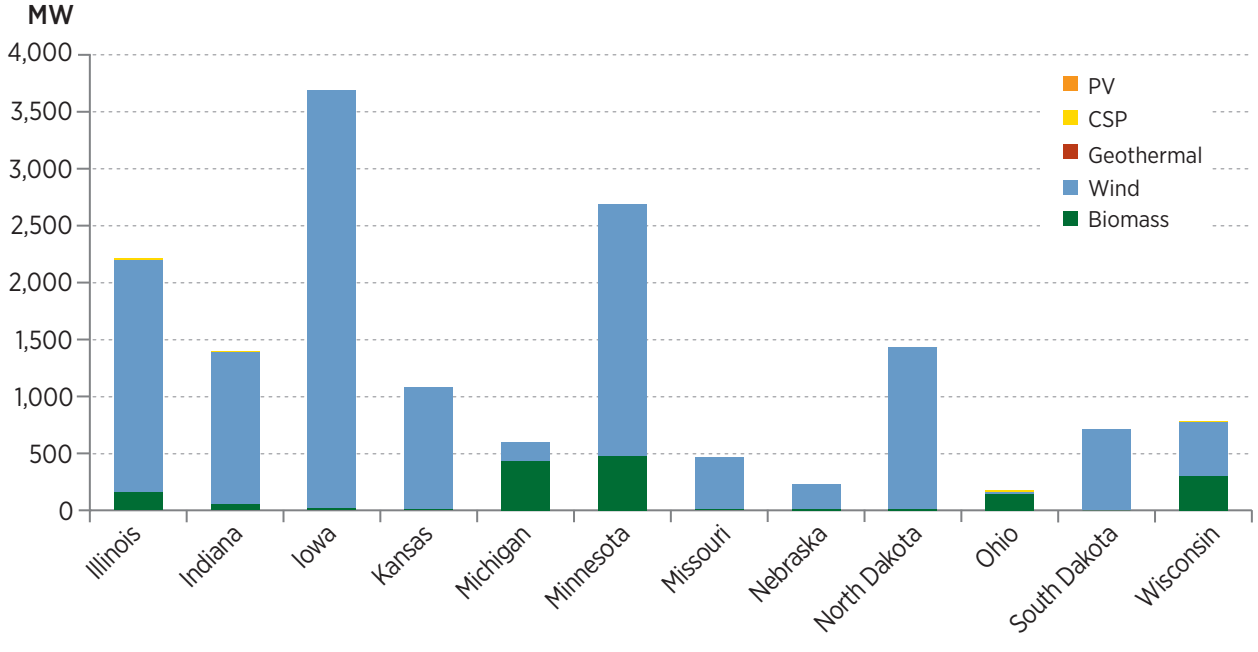
II

	Wind	PV*	CSP	Geothermal	Biomass	Hydropower	Total Renewables (incl. hydro)	Per capita RE (excl. hydro) watts/person
South Dakota	709	0.0	0	0	0	1,598	**2,307**	**871**
Minnesota	2,205	3.6	0	0	478	204	**2,891**	**506**
Iowa	3,675	0.1	0	0	15	131	**3,821**	**1,211**
Wisconsin	469	8.7	0	0	304	518	**1,299**	**137**
North Dakota	1,424	0.0	0	0	10	614	**2,048**	**2,132**
Michigan	164	2.6	0	0	432	377	**976**	**61**
Missouri	457	0.7	0	0	8	499	**965**	**78**
Nebraska	213	0.2	0	0	11	332	**556**	**123**
Kansas	1,074	0.0	0	0	6	3	**1,082**	**378**
Illinois	2,045	15.5	0	0	157	40	**2,257**	**173**
Ohio	10	20.7	0	0	146	128	**305**	**15**
Indiana	1,339	0.5	0	0	52	92	**1,484**	**215**

Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC, U.S. Census

* Does not include off-grid installations

Renewables 2010 Installed Nameplate Capacity *(excluding hydropower)*
MIDWEST



Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC

Renewables 2010 Installed Nameplate Capacity (MW)
SOUTH

II

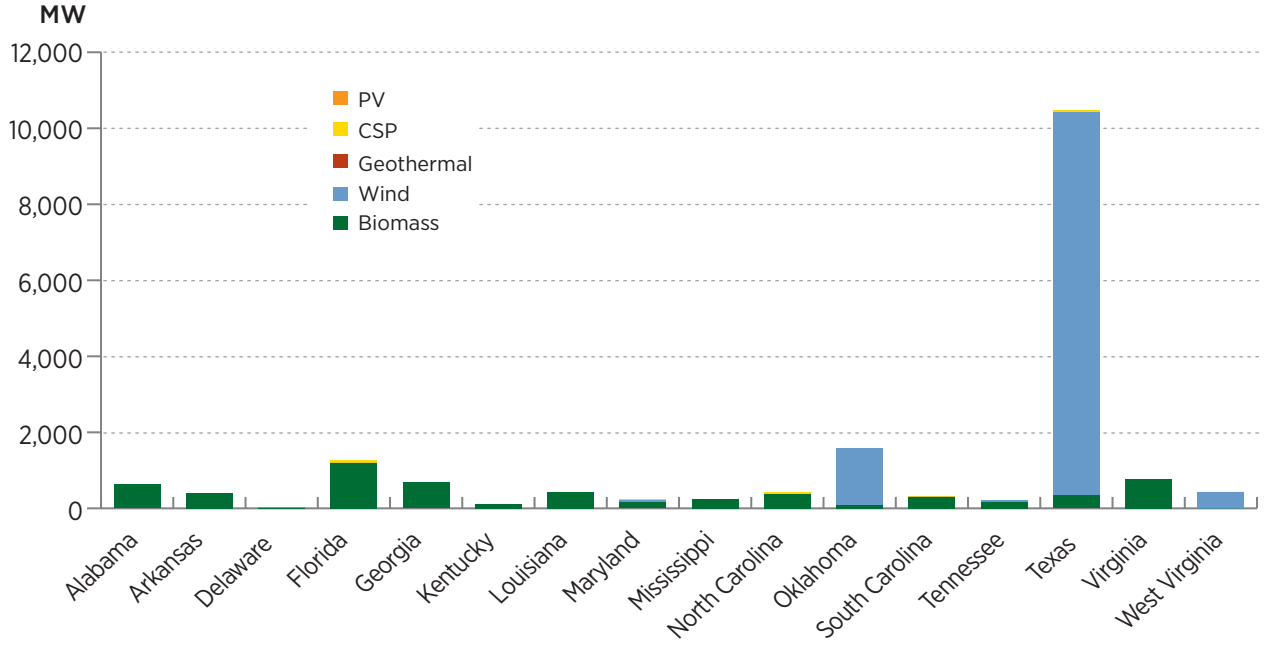
	Wind	PV*	CSP	Geothermal	Biomass	Hydropower	Total Renewables (incl. hydro)	Per capita RE (excl. hydro) watts/person
Alabama	0	0.4	0	0	627	3,280	**3,902**	**131**
Texas	10,089	34.5	0	0	342	697	**11,162**	**416**
Tennessee	29	4.7	0	0	175	2,479	**2,688**	**33**
Georgia	0	1.8	0	0	684	1,932	**2,617**	**71**
North Carolina	0	40.0	0	0	373	1,848	**2,261**	**43**
Arkansas	0	1.0	0	0	399	1,321	**1,721**	**137**
South Carolina	0	0.2	0	0	300	1,363	**1,663**	**65**
Virginia	0	2.8	0	0	770	744	**1,516**	**97**
Oklahoma	1,482	0.0	0	0	85	792	**2,358**	**418**
Florida	0	73.5	75	0	1,197	56	**1,401**	**72**
Kentucky	0	0.2	0	0	110	804	**914**	**25**
Maryland	70	10.9	0	0	157	527	**765**	**41**
Louisiana	0	0.3	0	0	426	192	**618**	**94**
Mississippi	0	0.3	0	0	238	0	**238**	**80**
West Virginia	431	0.0	0	0	0	325	**756**	**233**
Delaware	2	5.6	0	0	8	0	**16**	**17**

Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC, U.S. Census

* Does not include off-grid installations

Renewables 2010 Installed Nameplate Capacity *(excluding hydropower)*
SOUTH

II



Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC

Renewables 2010 Installed Nameplate Capacity (MW)
WEST

II

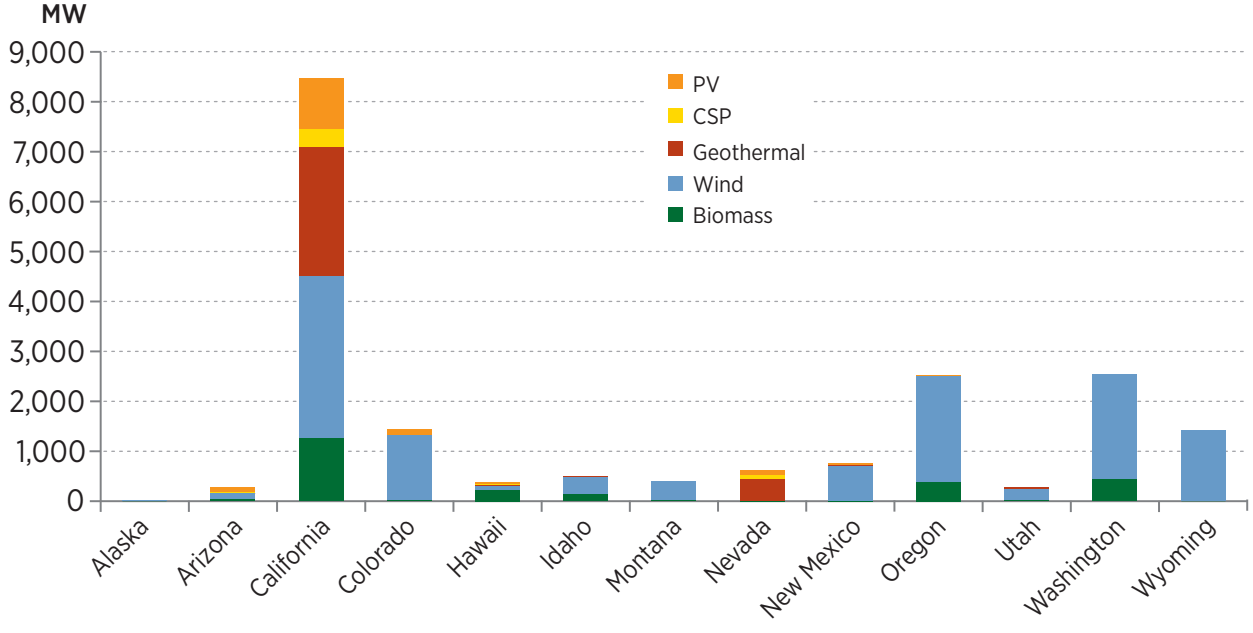
	Wind	PV*	CSP	Geothermal	Biomass	Hydropower	Total Renewables (incl. hydro)	Per capita RE (excl. hydro) watts/person
Washington	2,104	8.0	0	0	437	20,815	**23,364**	**379**
California	3,253	1,021.7	364	2,565.5	1,258	10,049	**18,510**	**227**
Oregon	2,104	23.9	0	0.3	384	8,240	**10,752**	**656**
Arizona	128	109.8	3	0.0	35	2,718	**2,994**	**43**
Idaho	353	0.4	0	15.8	133	2,531	**3,032**	**320**
Montana	386	0.7	0	0.0	17	2,570	**2,974**	**408**
Nevada	0	104.7	64	441.8	3	1,052	**1,666**	**227**
Colorado	1,299	121.1	1	0.0	18	650	**2,089**	**286**
New Mexico	700	43.3	0	0.2	7	79	**829**	**364**
Wyoming	1,412	0.2	0	0.3	0	301	**1,713**	**2,506**
Alaska	9	0.0	0	0.7	0	419	**429**	**14**
Utah	223	2.1	0	42.0	10	263	**539**	**100**
Hawaii	63	44.7	1	35.0	227	25	**395**	**272**

Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC, U.S. Census

* Does not include off-grid installations

Renewables 2010 Installed Nameplate Capacity *(excluding hydropower)* WEST

II



Sources: EIA, LBNL, GEA, SEIA/GTM, Larry Sherwood/IREC

III. Global Renewable Energy Development

Global Renewable Energy Development: Summary

- Global renewable electricity installations (excluding hydropower) have **more than quadrupled** from 2000–2010.

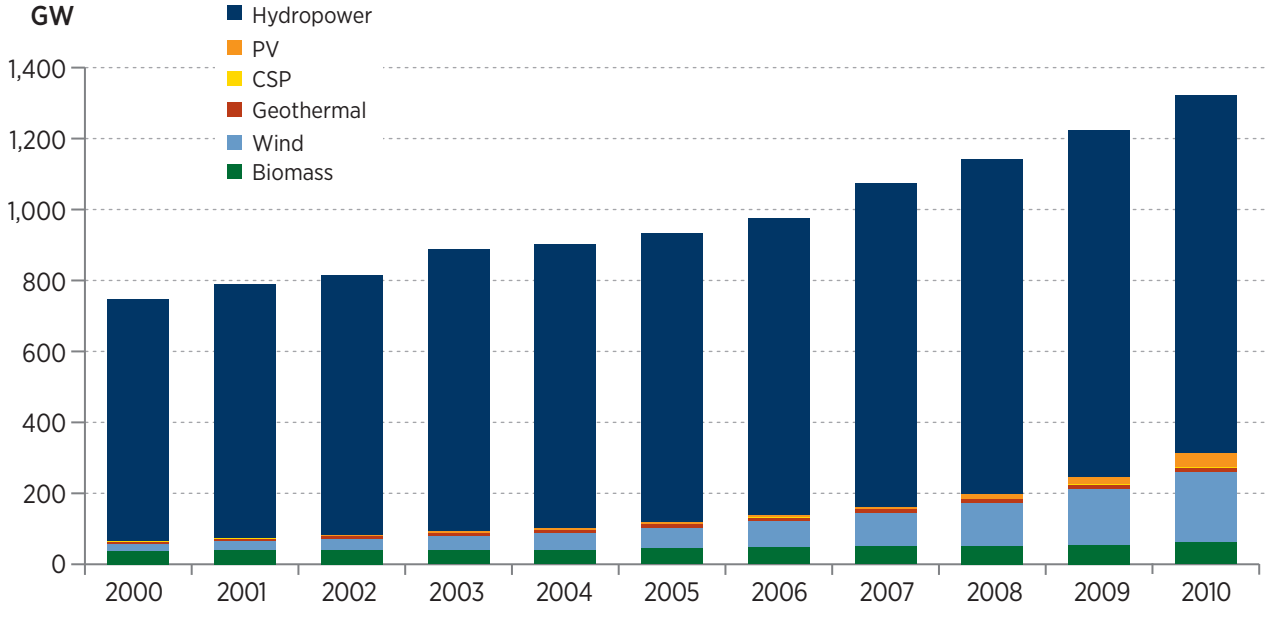
- Including hydropower, renewable energy accounts for **21%** of all global electricity generation; without hydropower, renewable energy accounts for **3.8%** of global generation.

- Wind and solar energy are the fastest growing renewable energy technologies worldwide. Wind grew by a factor of 11 and solar PV generation **grew by a factor of more than 28** between 2000 and 2010.

- In 2010, Germany led the world in cumulative solar PV installed capacity. The United States leads the world in geothermal and biomass installed capacity. China leads in wind, and Spain leads in CSP.

Renewable Electricity Capacity Worldwide *(including hydropower)*

III



Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

Renewable Electricity Generating Capacity Worldwide
(excluding hydropower)

*Grid-tied capacity.

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

World Renewable Cumulative Electricity Capacity
Percent Increase from the Previous Year

III

	Hydro	Solar PV	CSP	Wind	Geothermal	Biomass	Renewables without Hydro	All Renewables
2000	0%	22%	0%	31%	0%	6%	11%	1%
2001	5%	29%	0%	33%	0%	8%	15%	6%
2002	2%	33%	0%	29%	2%	0%	11%	3%
2003	9%	25%	0%	29%	9%	-3%	11%	9%
2004	1%	33%	0%	20%	0%	0%	10%	1%
2005	2%	38%	0%	23%	4%	13%	18%	4%
2006	2%	32%	0%	25%	3%	7%	17%	4%
2007	9%	5%	5%	27%	0%	6%	17%	10%
2008	4%	71%	14%	29%	4%	4%	22%	6%
2009	4%	62%	22%	31%	7%	4%	25%	7%
2010	3%	90%	83%	25%	3%	15%	27%	8%

- annual decrease | annual increase +

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

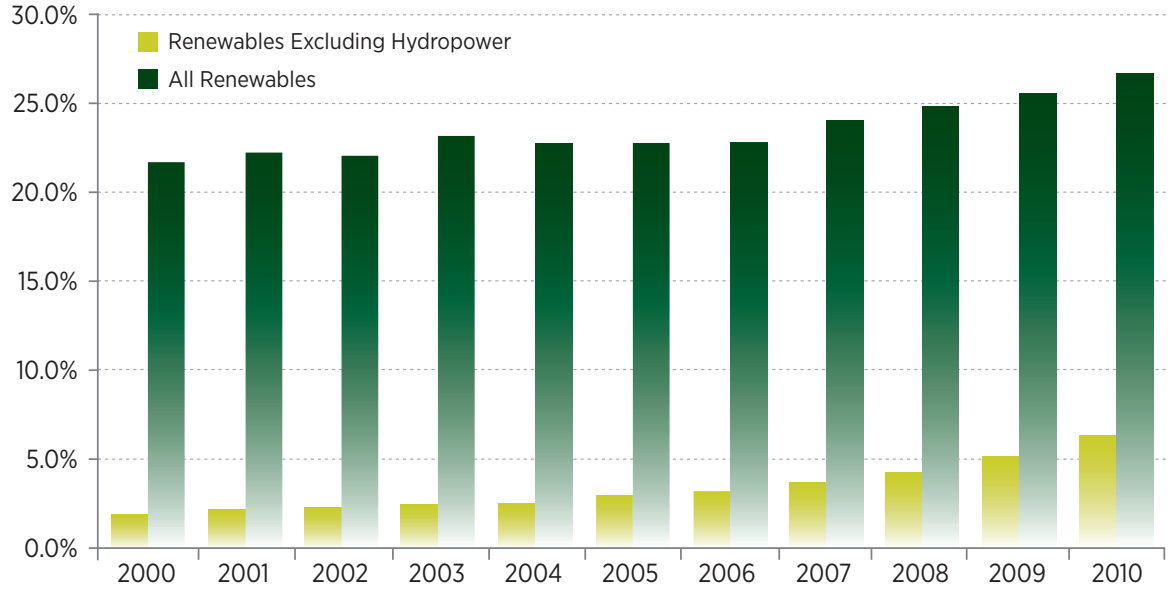
Renewables as a Percent of Total Installed Nameplate Capacity Worldwide

	Hydro	Solar PV	CSP	Wind	Geothermal	Biomass	All Renewables	Renewables without Hydropower	Renewable Capacity without Hydropower (GW)
2000	19.8%	0.0%	0.0%	0.5%	0.2%	1.1%	21.6%	1.9%	**65**
2001	20.1%	0.1%	0.0%	0.7%	0.2%	1.1%	22.2%	2.1%	**74**
2002	19.8%	0.1%	0.0%	0.8%	0.2%	1.1%	22.0%	2.2%	**82**
2003	20.8%	0.1%	0.0%	1.0%	0.2%	1.0%	23.1%	2.4%	**91**
2004	20.2%	0.1%	0.0%	1.2%	0.2%	1.0%	22.7%	2.5%	**100**
2005	19.8%	0.1%	0.0%	1.4%	0.2%	1.1%	22.7%	2.9%	**118**
2006	19.5%	0.2%	0.0%	1.7%	0.2%	1.1%	22.7%	3.2%	**138**
2007	20.4%	0.2%	0.0%	2.1%	0.2%	1.1%	24.0%	3.6%	**162**
2008	20.4%	0.3%	0.0%	2.6%	0.2%	1.1%	24.7%	4.2%	**197**
2009	20.4%	0.4%	0.0%	3.3%	0.2%	1.1%	25.5%	5.1%	**245**
2010	20.3%	0.8%	0.0%	4.0%	0.2%	1.2%	26.6%	6.3%	**312**

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

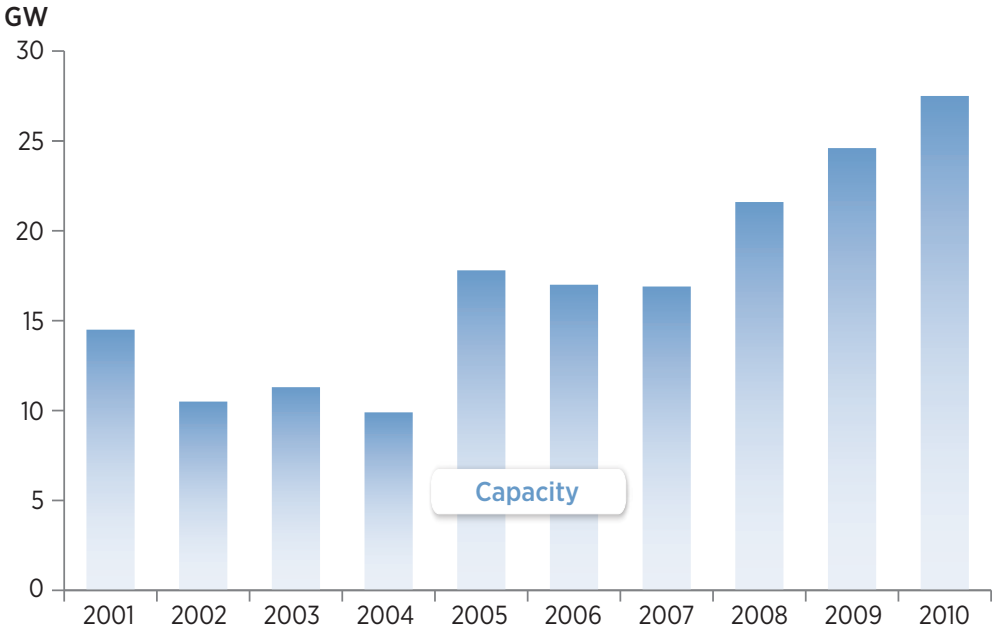
Renewables Share of Total Electricity Capacity Worldwide

III



Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

Annual Installed Renewable Electricity Growth Worldwide
(excluding hydropower)

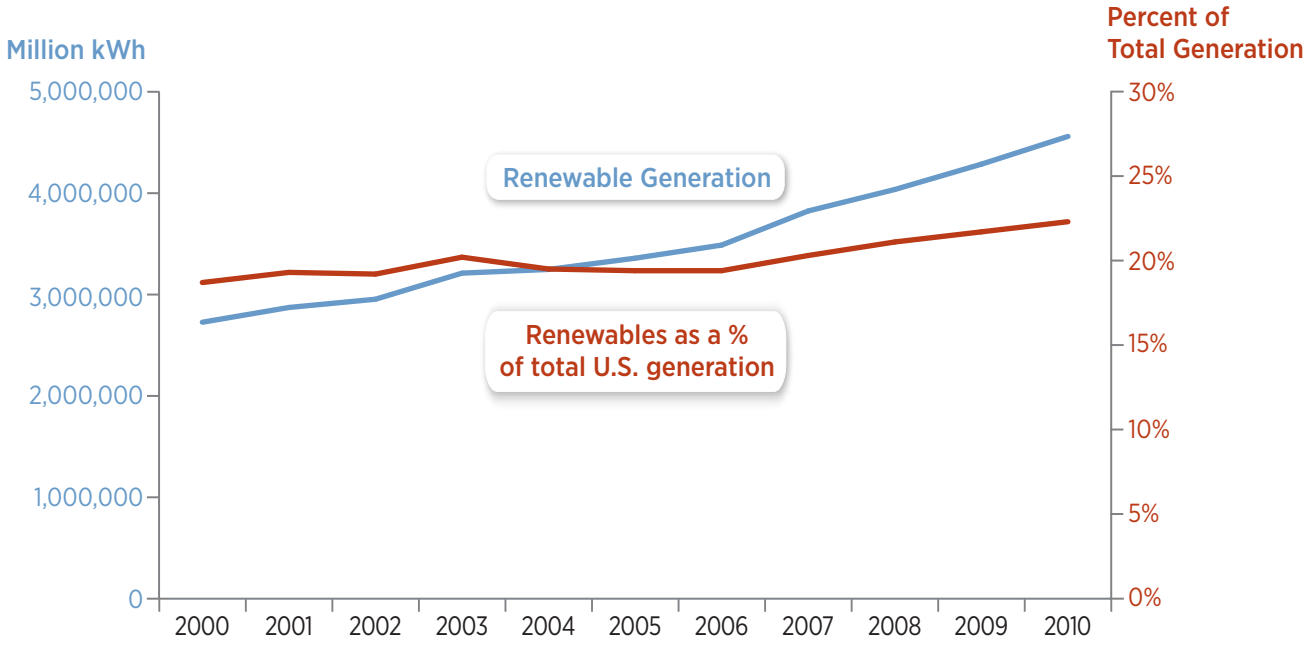


	Compounded Annual Growth Rate (CAGR) (2000–2010)
Wind	**27.1%**
Solar PV	**39.8%**
CSP	**10.3%**
Geothermal	**3.2%**
Biomass	**5.3%**
Renewables (excl. Hydro)	**17.0%**

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

Worldwide Renewable Electricity Generation *(including hydropower)*

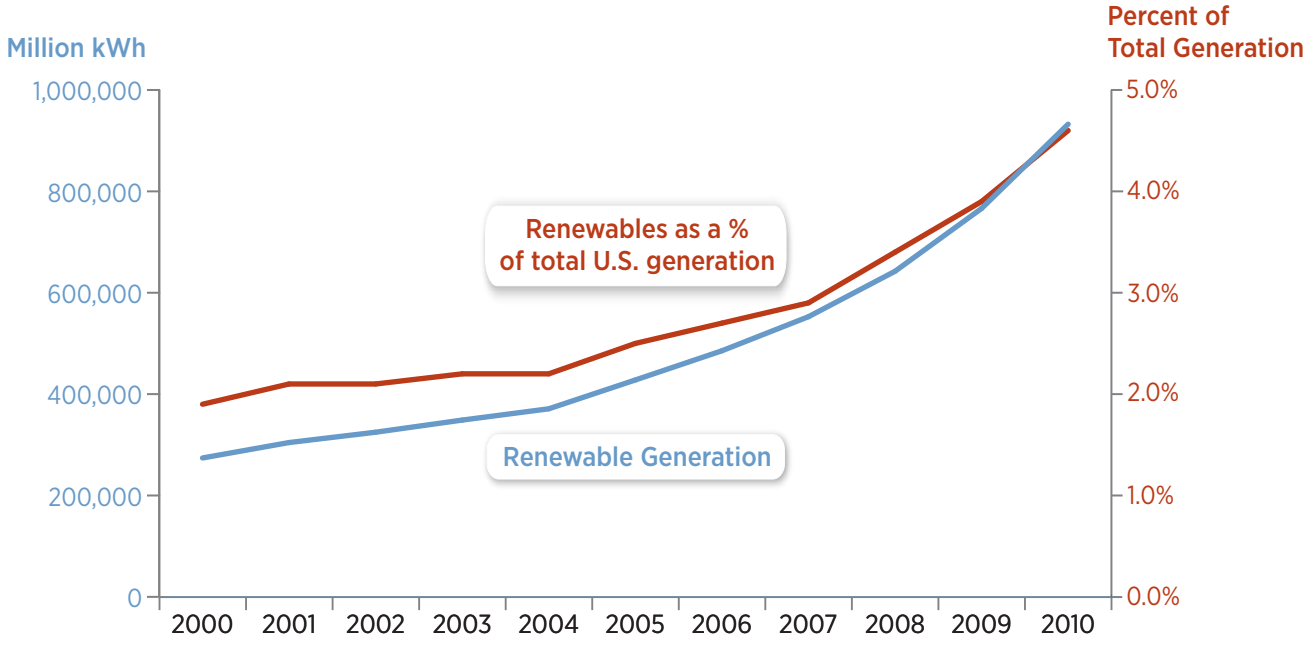
III



Generation derived using capacity factors of 14% for PV, 30% for wind, 70% for geothermal, 54% for biomass, 25% for CSP, and 41% for hydro.

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

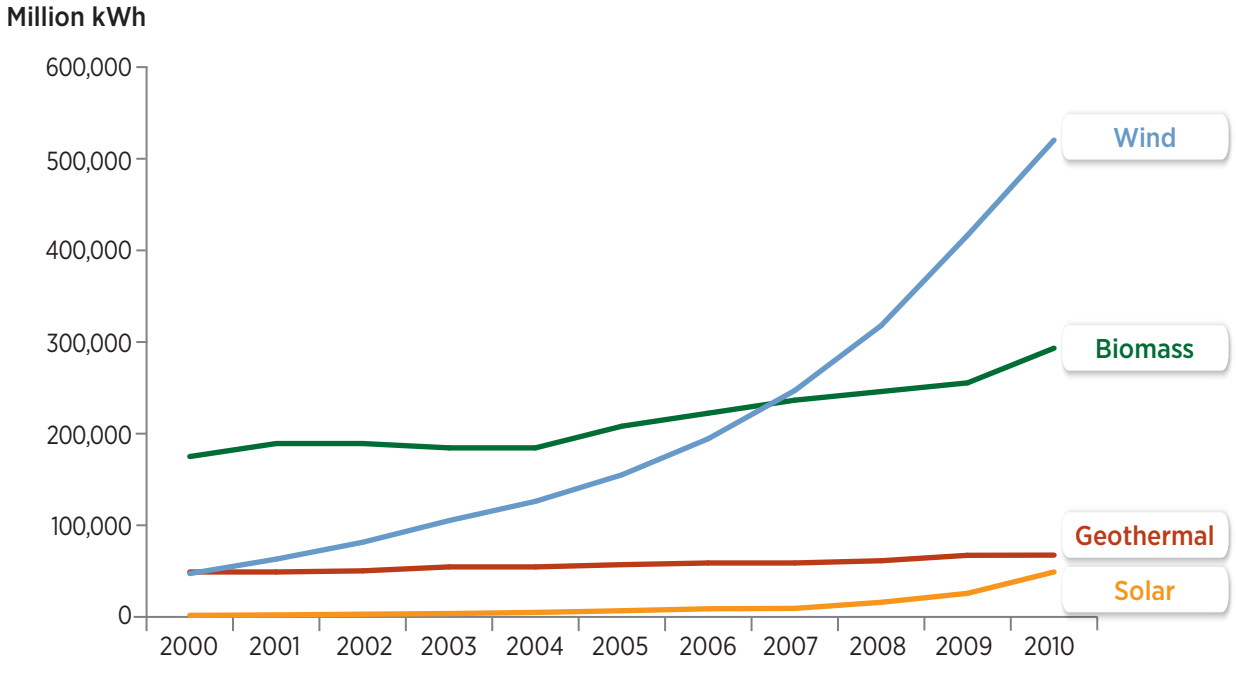
Renewable Electricity Generation Worldwide *(excluding hydropower)*



Generation derived using capacity factors of 14% for PV, 30% of wind, 70% for geothermal, 54% for biomass, 25% for CSP, and 41% for hydro.

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

Renewable Electricity Generation Worldwide by Technology (2000–2010)



Generation derived using capacity factors of 14% for PV, 30% of wind, 70% for geothermal, 54% for biomass, 25% for CSP, and 41% for hydro.

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

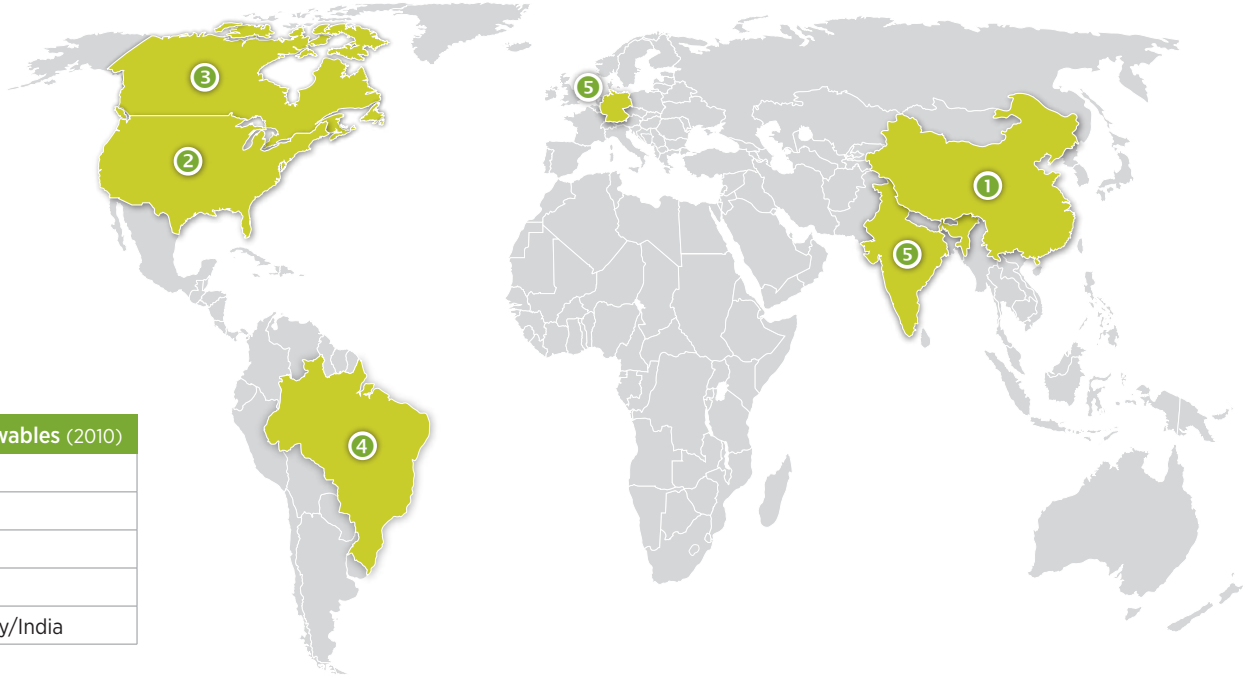
Worldwide Renewable Electricity Generation as a Percent of Total Generation

	Hydro	Solar PV	Biomass	Wind	Geothermal	All Renewables	Renewables without Hydropower	Renewable Generation without Hydropower (million kWh)
2000	16.8%	0.0%	1.2%	0.3%	0.3%	18.7%	1.9%	274,019
2001	17.3%	0.0%	1.3%	0.4%	0.3%	19.3%	2.1%	304,469
2002	17.1%	0.0%	1.2%	0.5%	0.3%	19.2%	2.1%	324,827
2003	18.0%	0.0%	1.2%	0.7%	0.3%	20.2%	2.2%	348,777
2004	17.3%	0.0%	1.1%	0.8%	0.3%	19.5%	2.2%	371,028
2005	16.9%	0.0%	1.2%	0.9%	0.3%	19.4%	2.5%	427,880
2006	16.7%	0.1%	1.2%	1.1%	0.3%	19.4%	2.7%	485,477
2007	17.4%	0.1%	1.3%	1.3%	0.3%	20.3%	2.9%	552,703
2008	17.8%	0.1%	1.3%	1.7%	0.3%	21.1%	3.4%	642,327
2009	17.8%	0.1%	1.3%	2.1%	0.3%	21.7%	3.9%	766,333
2010	17.7%	0.3%	1.4%	2.5%	0.3%	22.3%	4.6%	932,590

Sources: REN21, GWEC, GEA, EIA, SEIA/GTM

Top Countries with Installed Renewable Electricity

III



Total Renewables (2010)
1 China*
2 U.S.
3 Canada
4 Brazil
5 Germany/India

Sources: REN21, GWEC, SEIA/GTM

* Majority of China's renewable energy is from small hydropower.

Top Countries with Installed Renewable Electricity by Technology (2010)

Geothermal	Wind	Solar PV	CSP	Biomass
1 U.S.	1 China	1 Germany	1 Spain	1 U.S.
2 Philippines	2 U.S.	2 Spain	2 U.S.	2 Brazil
3 Indonesia	3 Germany	3 Japan		3 Germany
4 Mexico	4 Spain	4 Italy		4 Spain
5 Italy	5 India	5 U.S.		5 India

Sources: REN21, GWEC, SEIA/GTM

IV. Wind

Wind: Summary

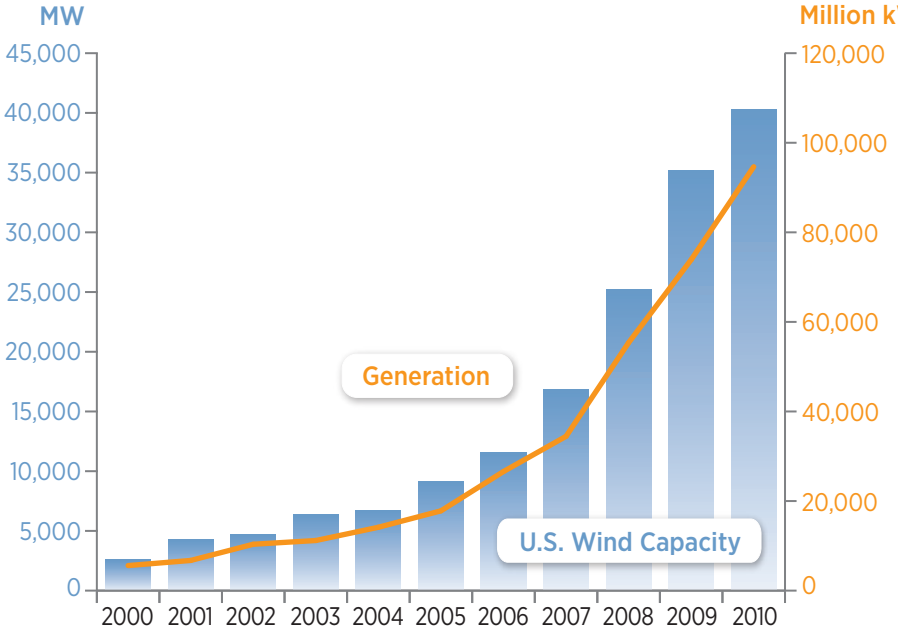
- In the United States, installed wind energy capacity **increased almost 16 fold between 2000 and 2010**.

- In the United States, wind experienced strong growth in 2010 and **over 5 GW of new capacity was added**. Texas led the United States in wind installations in 2010, installing 680 MW of wind capacity.

- In 2010, **China surpassed the United States** as the world leader in cumulative installed wind capacity, with more than 42 GW installed.

U.S. Total Installed Wind Energy Nameplate Capacity and Generation

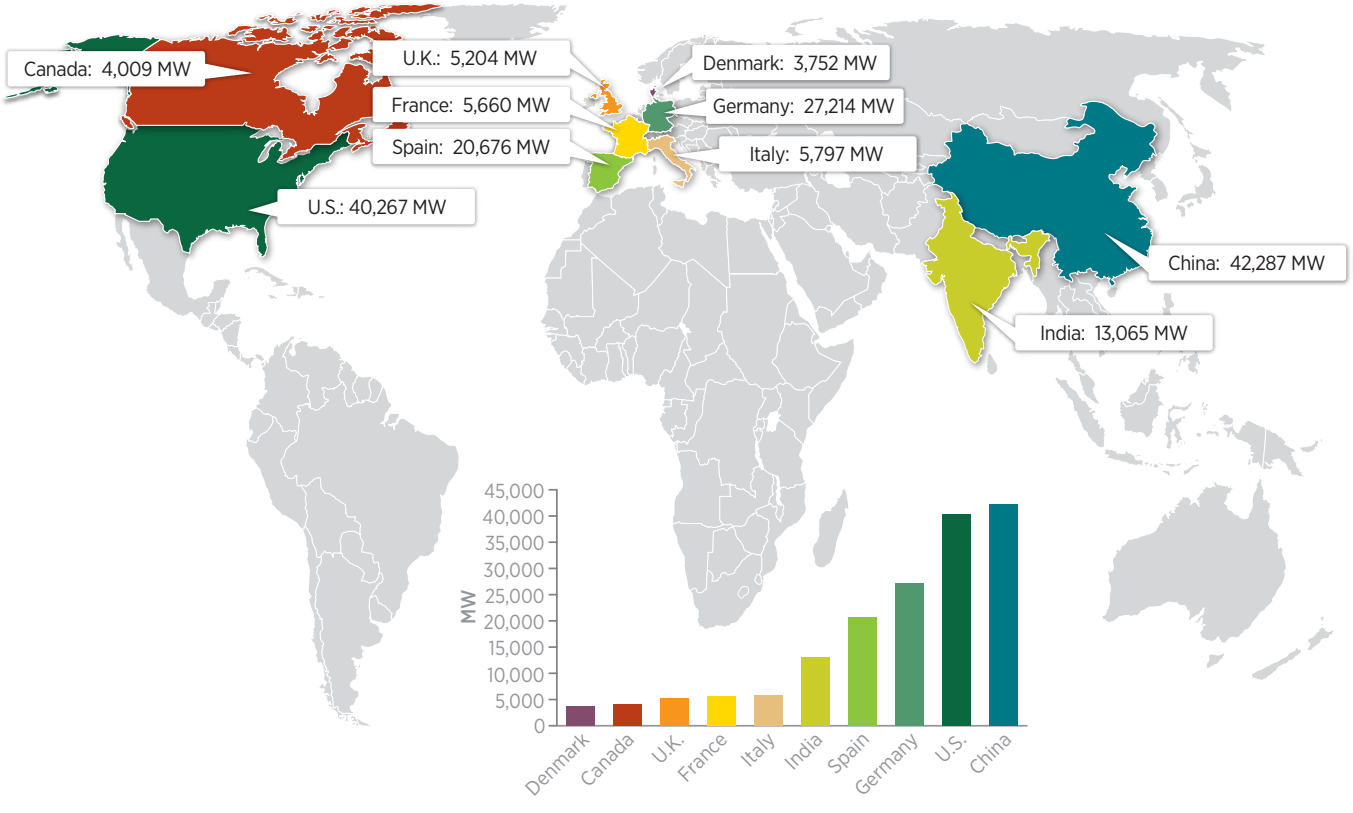
IV



	U.S. Wind Energy Generation (Million kWh)	U.S. Wind Energy Capacity and Percent Increase from Previous Year	
		Total (MW)	% Increase
2000	5,593	2,578	2.6%
2001	6,737	4,275	65.8%
2002	10,354	4,686	9.6%
2003	11,187	6,353	35.6%
2004	14,144	6,725	5.9%
2005	17,811	9,121	35.6%
2006	26,589	11,575	26.9%
2007	34,450	16,812	45.2%
2008	55,363	25,237	50.1%
2009	73,886	35,159	39.3%
2010	94,647	40,267	14.5%

Sources: LBNL, EIA

Wind Energy Capacity (2010) – Select Countries

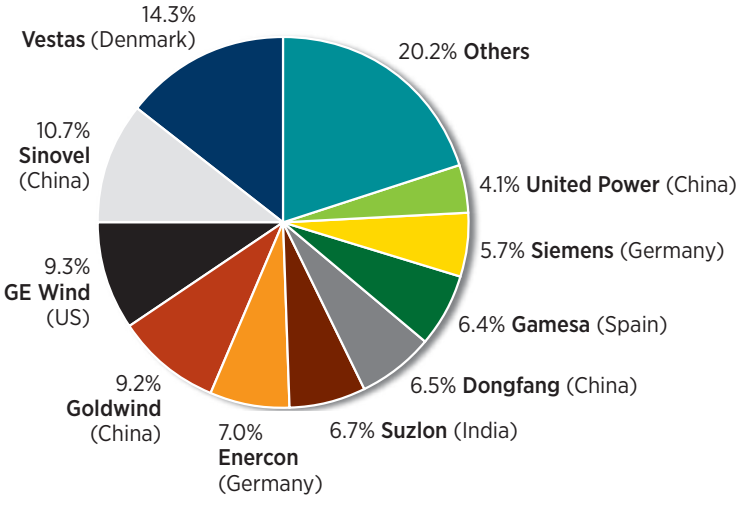


Sources: REN21, GWEC, LBNL

IV

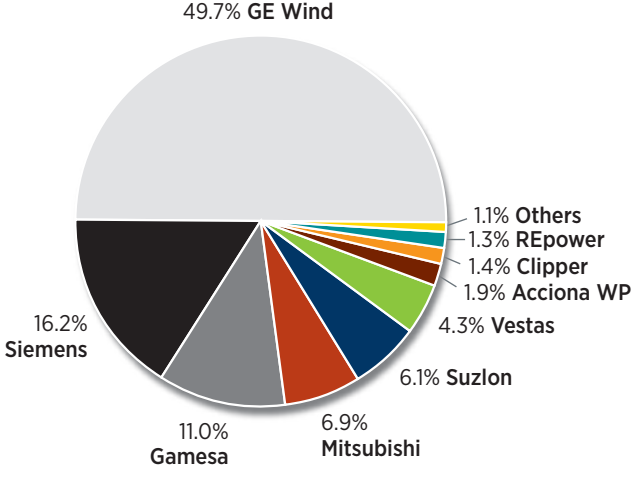
Global Wind Turbine Market Share 2010

Total Turbine Installations: 30 GW



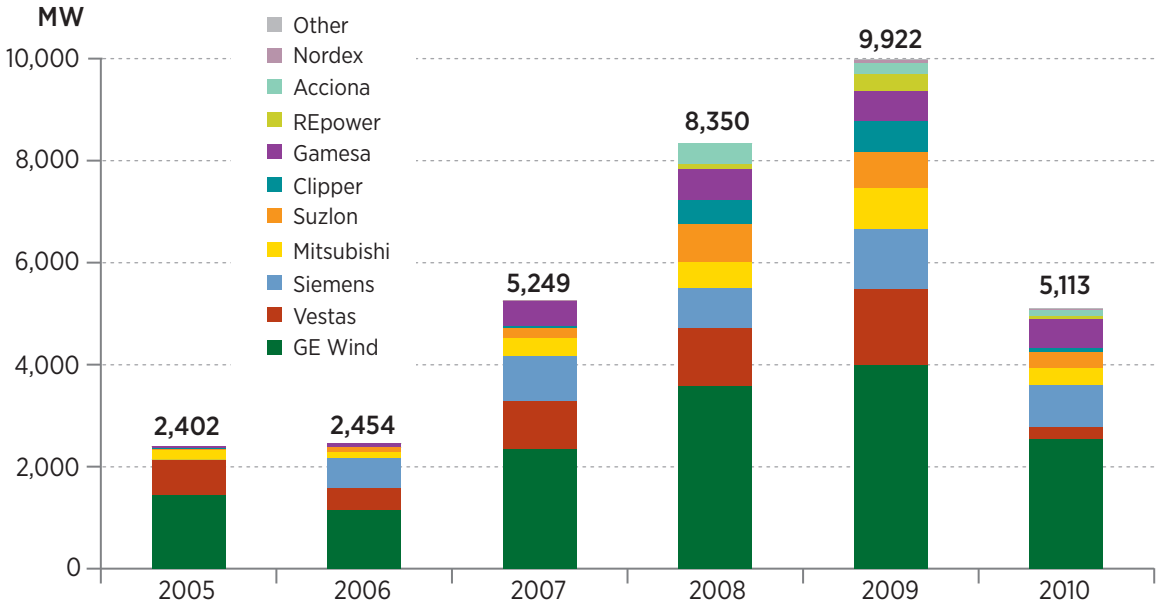
U.S. Wind Turbine Market Share 2010

Total Turbine Installations: 5,113 MW



Sources: REN21, GWEC, LBNL

Annual U.S. Wind Turbine Installations, by Manufacturer (MW)

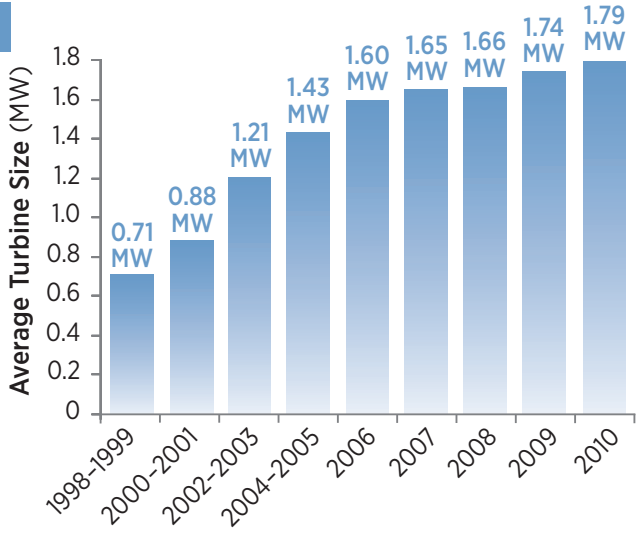


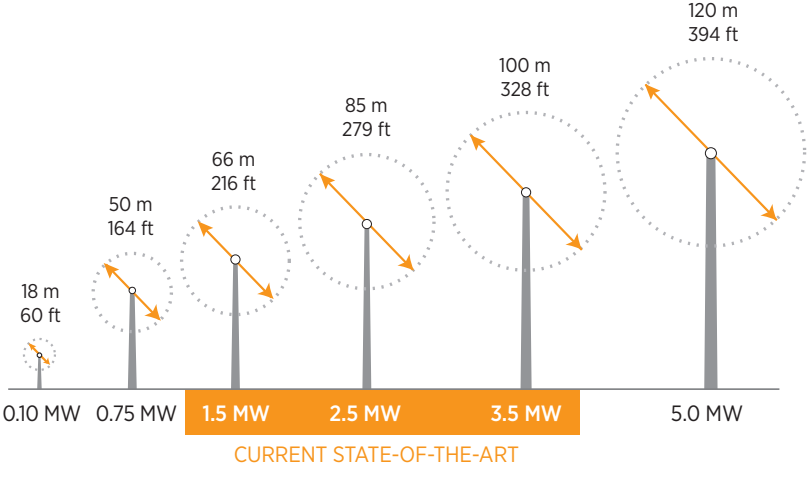
IV

Sources: REN21, GWEC, LBNL

Average Installed Turbine Size

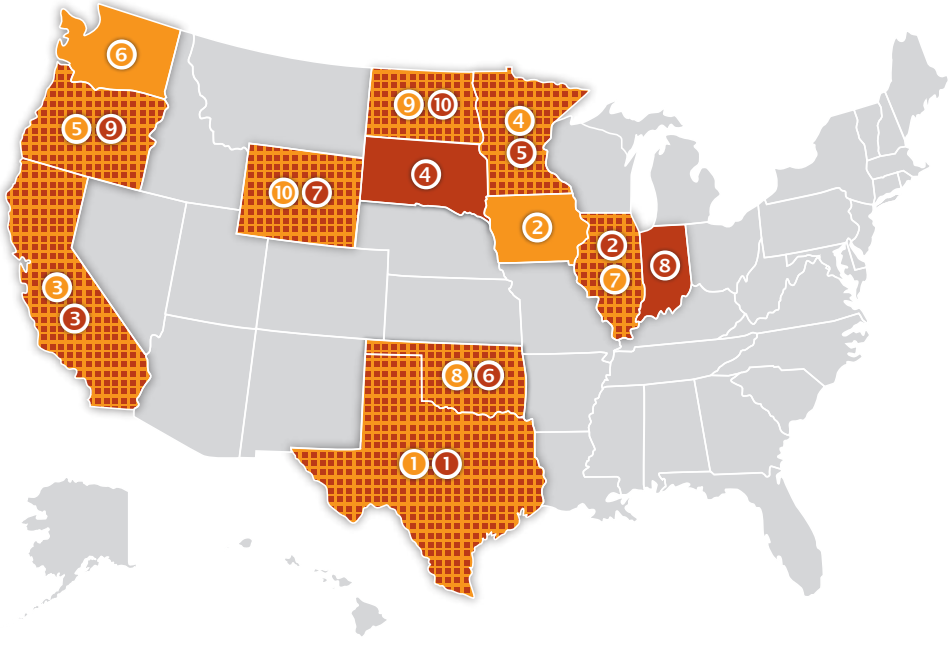
IV





Sources: REN21, GWEC, LBNL

States Leading Wind Power Development



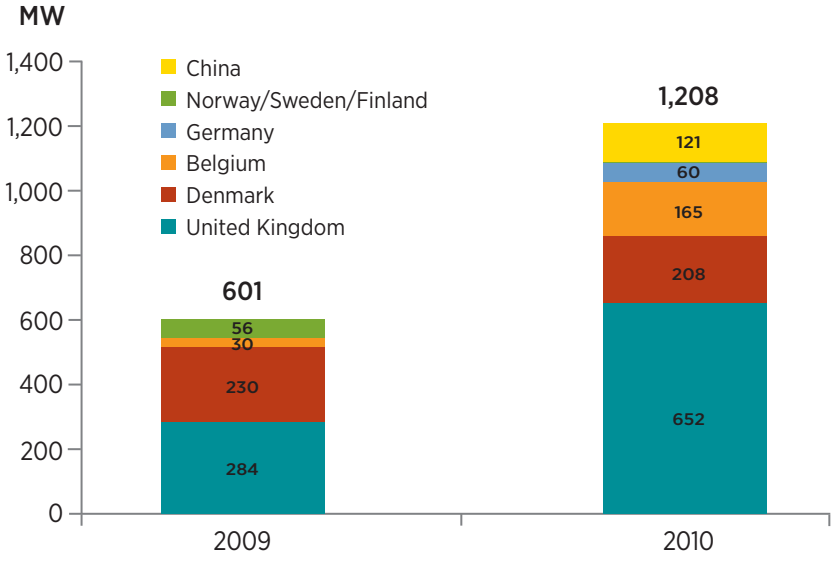
Cumulative Capacity (2010, MW)	
1 Texas	10,089
2 Iowa	3,675
3 California	3,253
4 Minnesota	2,205
5 Oregon	2,104
6 Washington	2,104
7 Illinois	2,045
8 Oklahoma	1,482
9 North Dakota	1,424
10 Wyoming	1,412

Annual Capacity (2010, MW)	
1 Texas	680
2 Illinois	498
3 California	455
4 South Dakota	396
5 Minnesota	396
6 Oklahoma	352
7 Wyoming	311
8 Indiana	303
9 Oregon	283
10 North Dakota	221

Source: LBNL

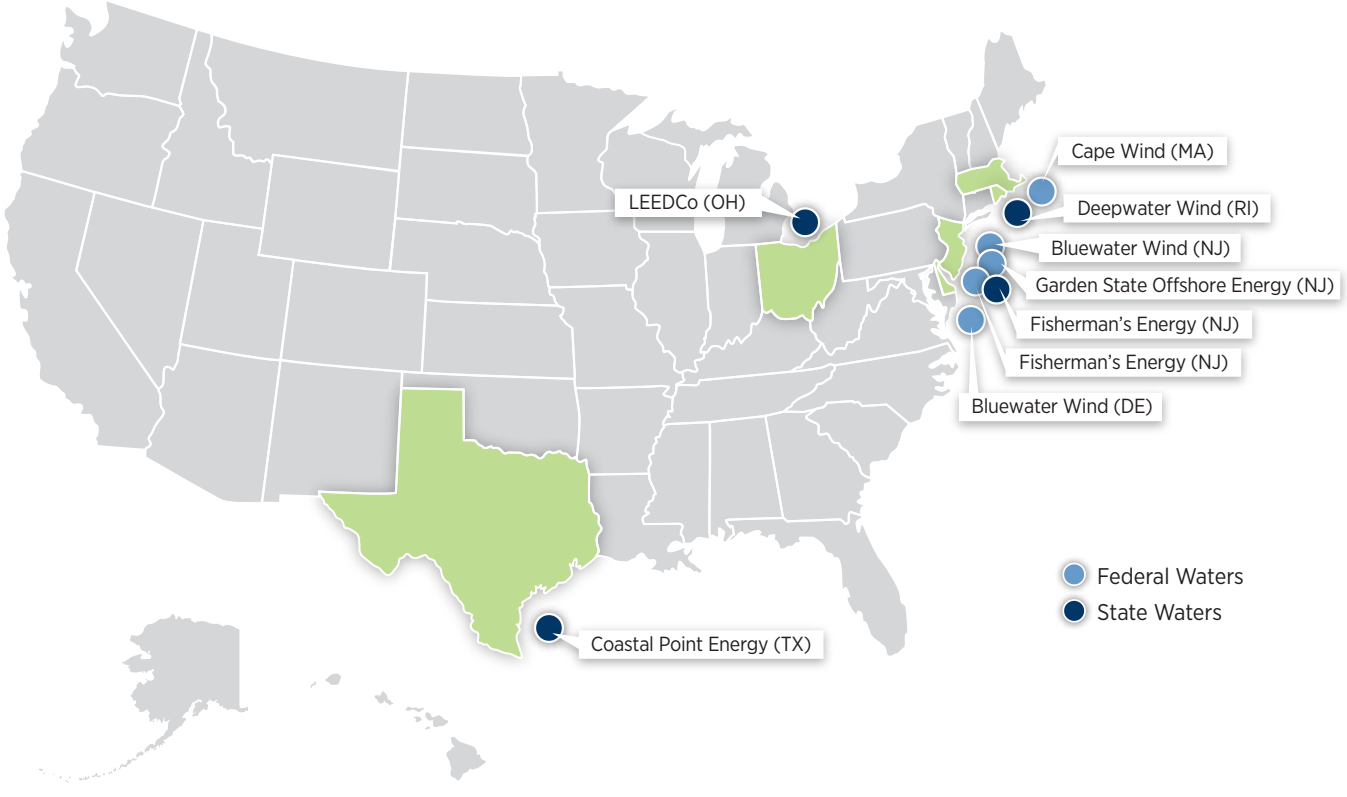
Annual Installed Offshore Wind Capacity By Country (MW)

IV



Source: Bloomberg New Energy Finance

U.S. Offshore Wind Energy Proposed Projects



Source: LBNL, prepared by Energetics Incorporated, March 25, 2011

V. Solar

Solar: Summary

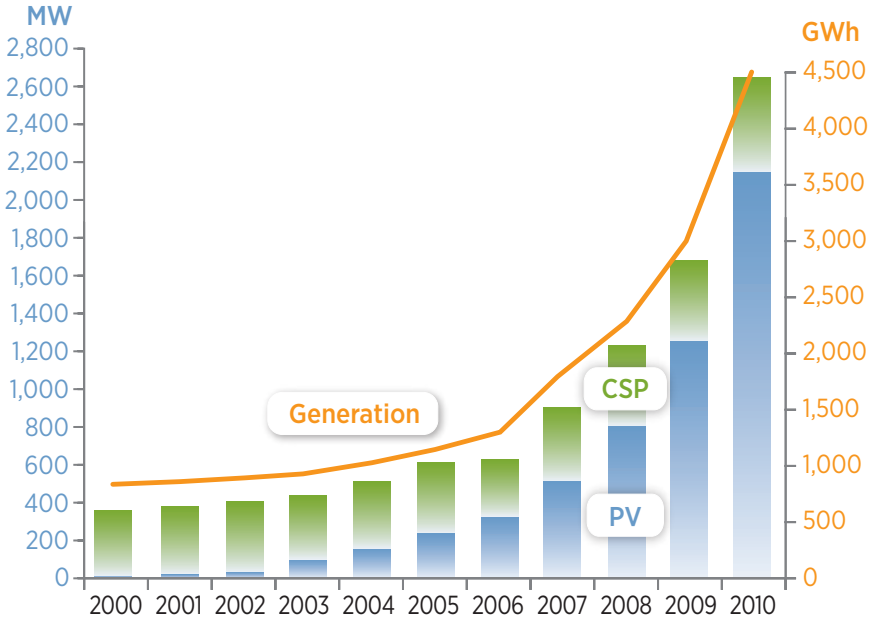
- Solar energy electricity generation has **grown by a factor of over 5 between 2000 and 2010**, but still represents a very small part of overall U.S. electricity generation.

- Countries with aggressive solar policies—such as Germany, Spain, and Japan—lead the world in solar photovoltaic (PV) deployment. Similarly, **U.S. states with aggressive solar incentives lead the United States in both cumulative and annual installations in 2010** (California, New Jersey, Colorado, Arizona, and Nevada).

- U.S. manufacturers currently have a small share of the world PV market. **China and Taiwan are the market leaders with nearly 60% of the global PV cell production** combined.

- A number of concentrating solar power (CSP) plants came online in 2010, including 77.5 MW in the United States and 150 MW in Spain.

U.S. Total Installed Solar Energy Nameplate Capacity and Generation



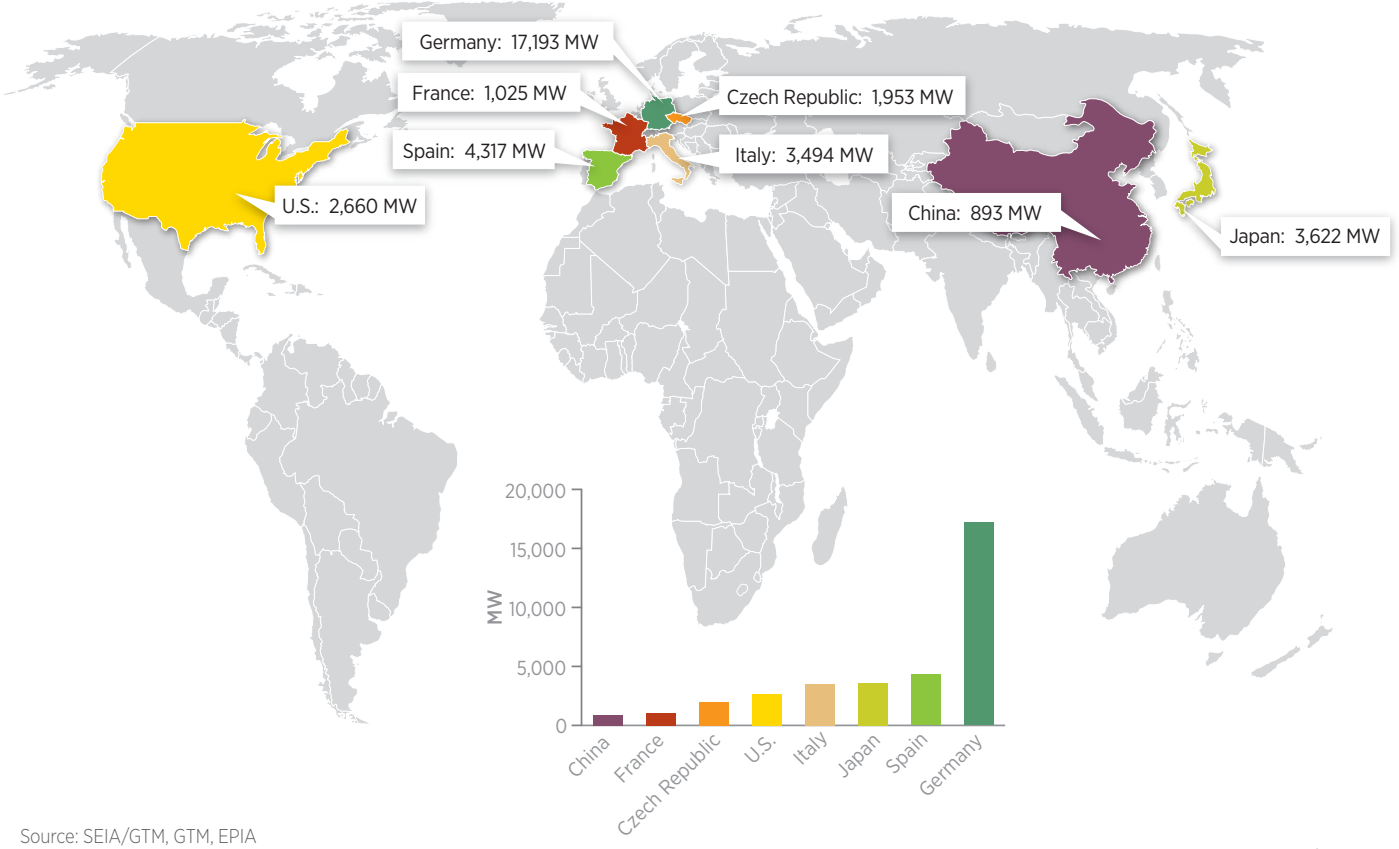
	U.S. Solar Energy Generation (Million kWh)	U.S. Solar Energy Capacity (MW) and % Increase from Previous Year			
		PV*	CSP	Total	Increase
2000	804	18	354	372	4.3%
2001	822	29	354	383	3.0%
2002	857	52	354	406	5.9%
2003	929	97	354	451	11.2%
2004	1,020	155	354	509	12.8%
2005	1,145	234	354	588	15.5%
2006	1,312	339	355	694	18.0%
2007	1,718	508	419	927	33.5%
2008	2,208	819	419	1,237	33.5%
2009	2,922	1,257	430	1,686	36.3%
2010	4,505	2,153	507	2,660	57.7%

Sources: SEIA/GTM, Larry Sherwood/IREC

Note: Generation numbers calculated from installed capacity using a 18% capacity factor for PV and 25% capacity factor for CSP.

* Includes on- and off-grid capacity.

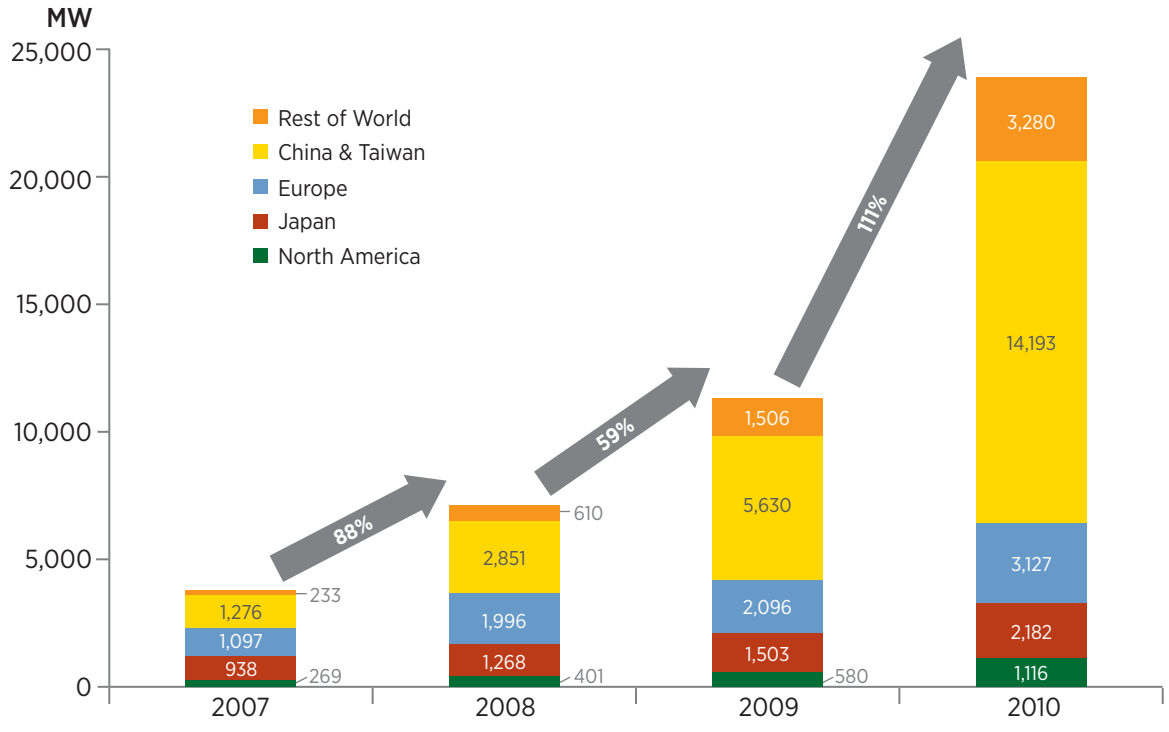
Solar Energy Installed Capacity (2010) – Select Countries



V

Source: SEIA/GTM, GTM, EPIA
* Includes PV and CSP

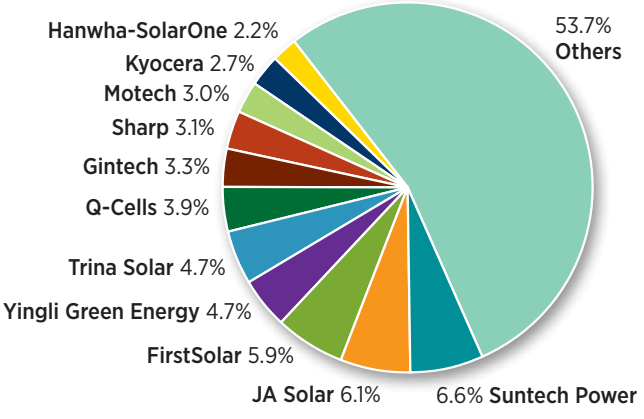
Solar Manufacturing by Country



Source: GTM PV News, May 2011

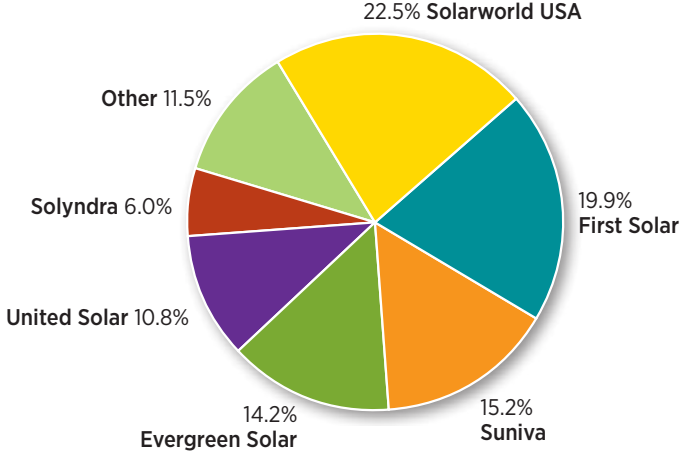
Global Solar Cell Production 2010:

23,899 MW



North America Cell Production 2010:

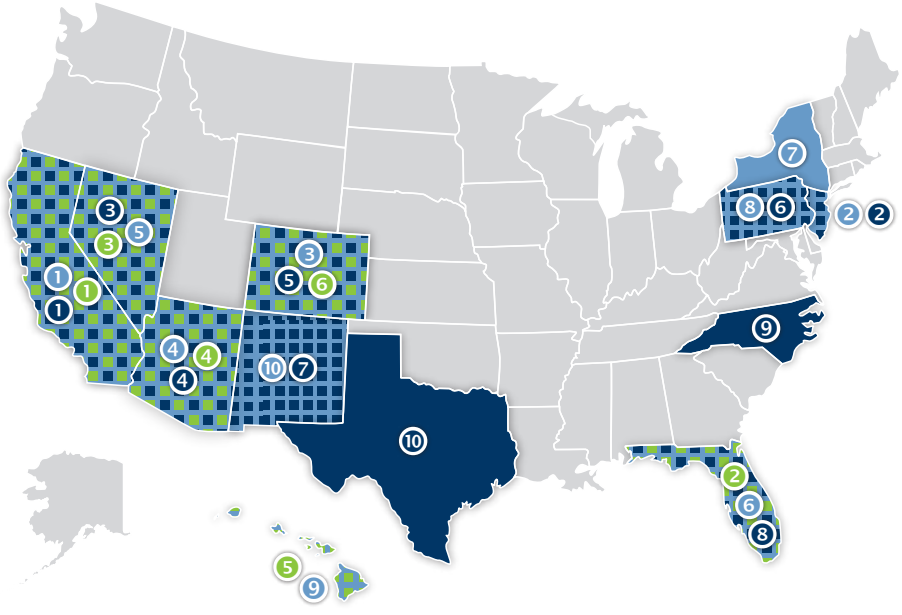
1,116 MW



V

States Leading Solar Energy Development (2010)

V



PV Cumulative Capacity (2010, MW)	
1 California	1,021.7
2 New Jersey	259.9
3 Colorado	121.1
4 Arizona	109.8
5 Nevada	104.7
6 Florida	73.5
7 New York	55.5
8 Pennsylvania	54.8
9 Hawaii	44.7
10 New Mexico	43.3

PV Annual Capacity Additions (2010, MW)	
1 California	252.0
2 New Jersey	132.4
3 Nevada	68.3
4 Arizona	63.6
5 Colorado	62.0
6 Pennsylvania	46.5
7 New Mexico	40.9
8 Florida	34.8
9 North Carolina	28.7
10 Texas	25.9

CSP Cumulative Capacity (2010, MW)	
1 California	364
2 Florida	75
3 Nevada	64
4 Arizona	2
5 Hawaii	1
6 Colorado	1

Sources: SEIA/GTM, Larry Sherwood/IREC
Note: Grid-tied capacity only.

VI. Geothermal

Geothermal: Summary

- U.S. geothermal energy generation has remained relatively stable from 2000 to 2010, with the **past 10 years experiencing an average of 1.0% growth**.

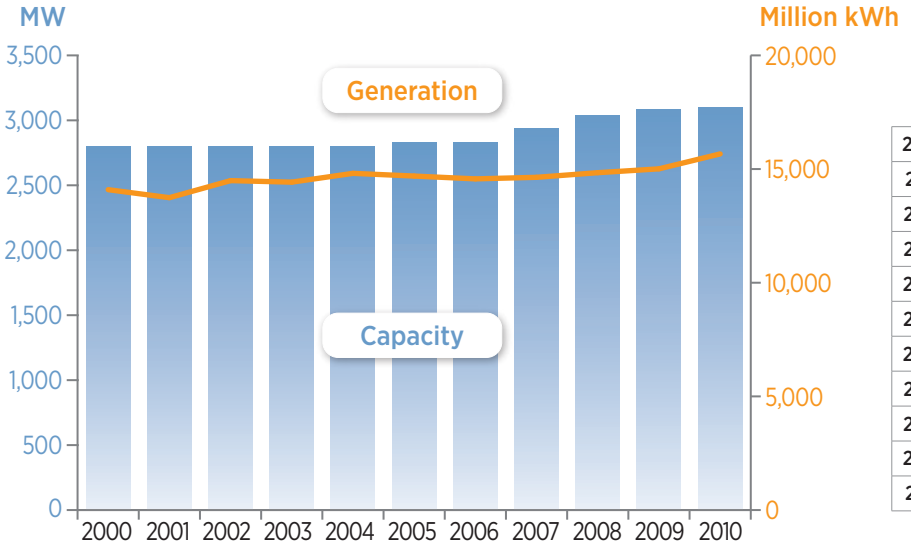
- **The United States leads the world in installed geothermal electricity capacity and generation**, with most of that power installed in California.

- As a base-load source of energy, geothermal is distinct from other renewables such as wind and solar, because **it can provide consistent electricity**.

VI

U.S. Geothermal Electricity Nameplate Capacity and Generation

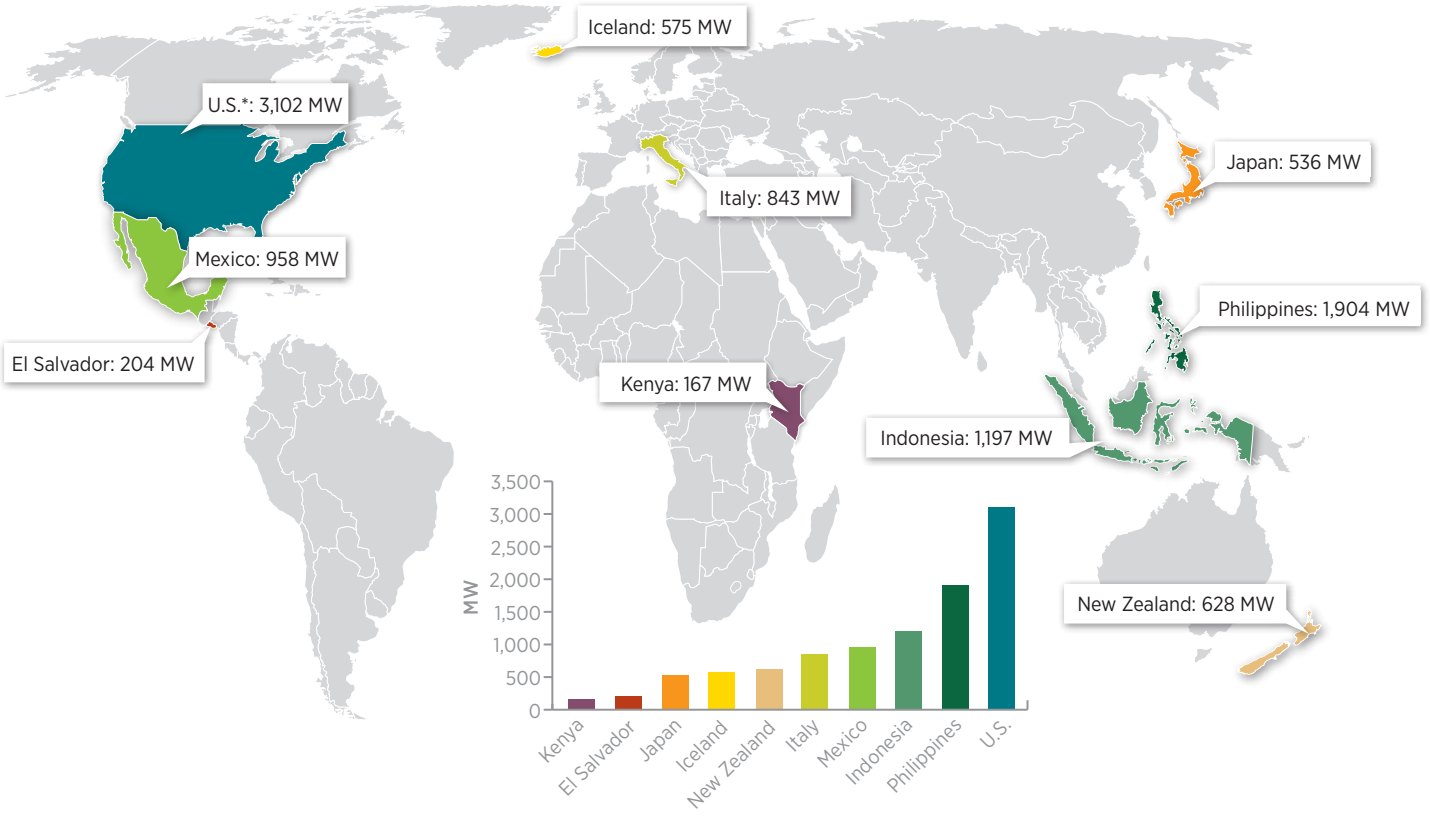
VI



	U.S. Geothermal Electricity Generation (Million kWh)	U.S. Geothermal Electricity Capacity and % Increase from Previous Year	
		Total (MW)	% Increase
2000	14,093	2,798	2.2%
2001	13,741	2,798	0.0%
2002	14,491	2,798	0.0%
2003	14,424	2,798	0.0%
2004	14,811	2,798	0.0%
2005	14,692	2,828	1.1%
2006	14,568	2,831	0.1%
2007	14,637	2,937	3.7%
2008	14,840	3,040	3.5%
2009	15,009	3,087	1.5%
2010	15,666	3,102	0.5%

Sources: GEA, EIA

Global Geothermal Electricity Capacity (2009) – Select Countries

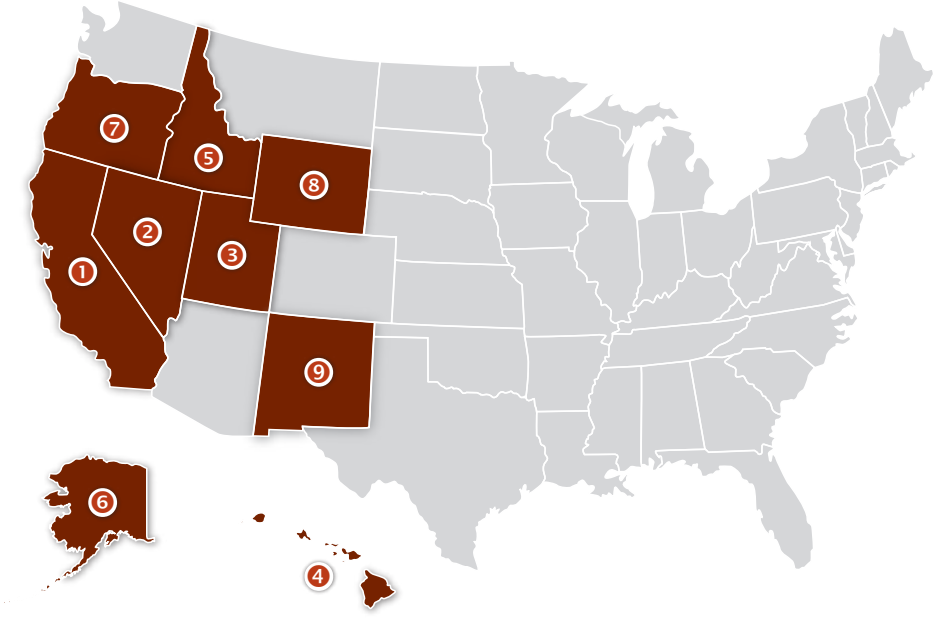


Source: GEA

*Note: U.S. is updated for 2010

State Geothermal Energy Development (2010)

VI



Total Installed Capacity (2010, MW)	
1 California	2,565.5
2 Nevada	441.8
3 Utah	42.0
4 Hawaii	35.0
5 Idaho	15.8
6 Alaska	0.7
7 Oregon	0.3
8 Wyoming	0.3
9 New Mexico	0.2

Source: GEA

VI

VII. Biopower

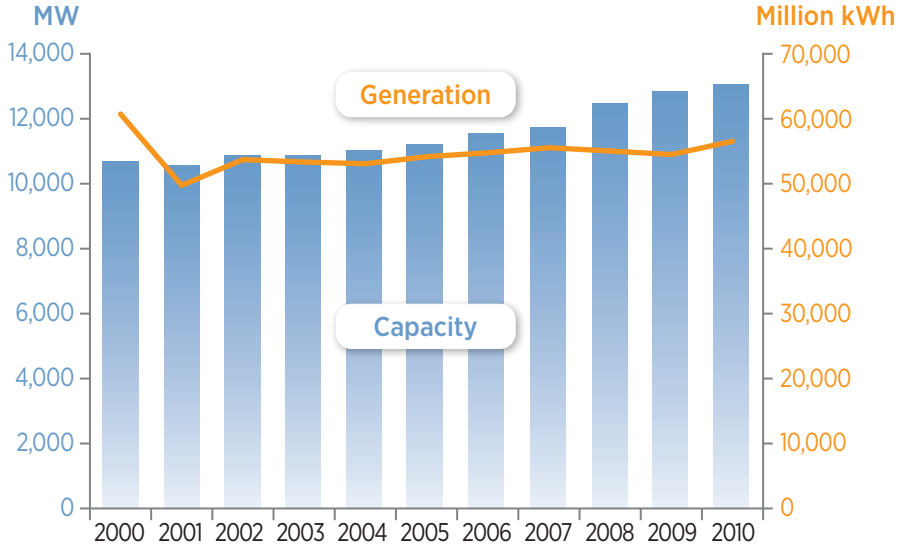
Biopower: Summary

- Biopower generation has remained steady during the past seven years, and currently accounts for **33% of all renewable energy generated in the United States** (excluding hydropower).

- Biomass electricity primarily comes from wood and agricultural residues that are burned as a fuel for cogeneration in the industrial sector (such as in the pulp and paper industry).

- U.S. installed biopower capacity has grown recently, with a **Compound Annual Growth Rate (CAGR) of 3.1% from 2006–2010**.

U.S. Biopower Nameplate Capacity and Generation

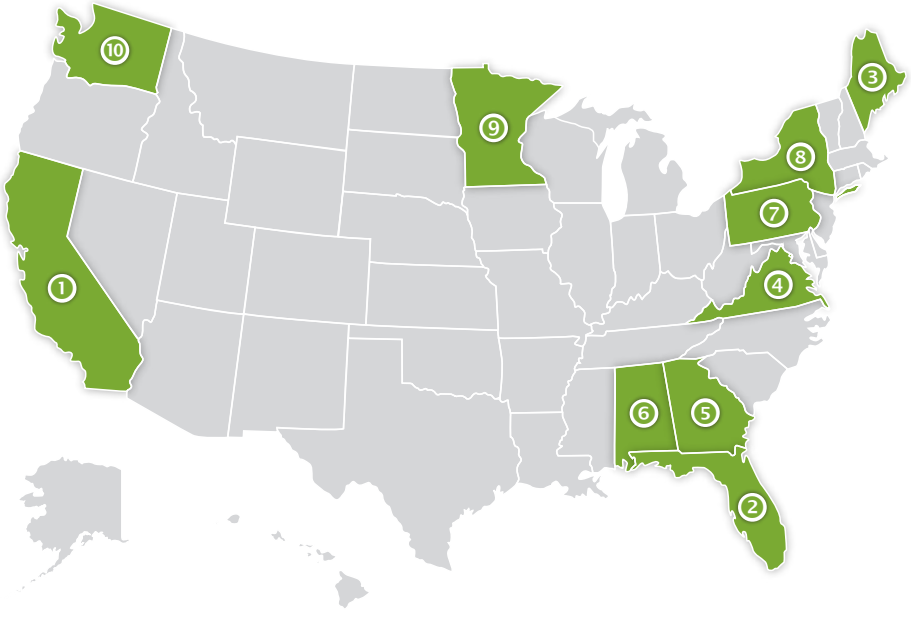


	U.S. Biopower Generation (Million kWh)	U.S. Biopower Capacity and % Increase from Previous Year	
		Total (MW)	% Change
2000	60,726	10,676	- 2.9%
2001	49,748	10,576	- 0.9%
2002	53,709	10,867	2.8%
2003	53,340	10,856	- 0.1%
2004	53,073	11,033	1.6%
2005	54,160	11,222	1.7%
2006	54,759	11,553	2.9%
2007	55,539	11,738	1.6%
2008	55,034	12,485	6.4%
2009	54,493	12,836	2.8%
2010	56,532	13,053	1.7%

Source: EIA

Note: The generation decrease between 2000 to 2001 reflects an EIA classification change. Beginning with 2001 data, non-biogenic municipal solid waste and tire-derived fuels were reclassified as non-renewable energy sources (previously considered waste biopower).

States Leading Biopower Energy Development (2010)

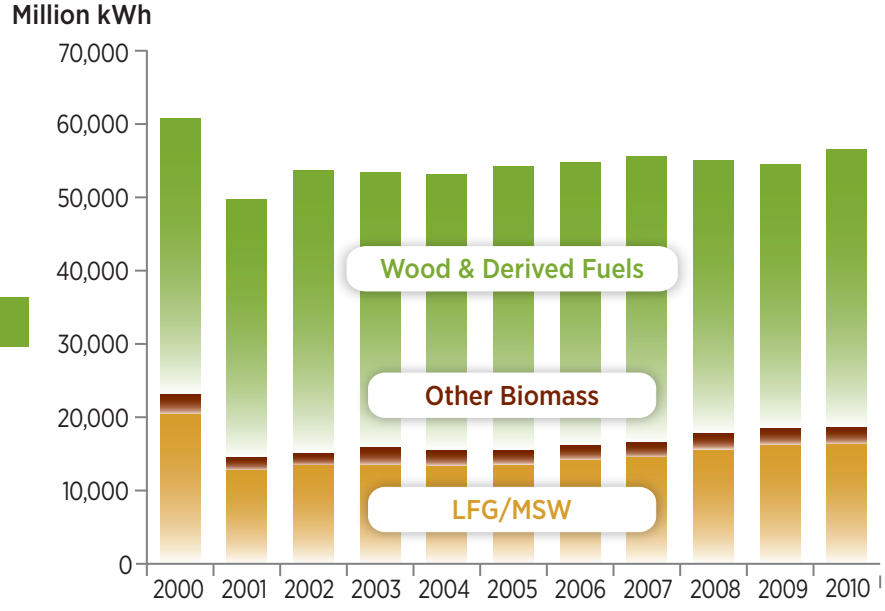


Total Installed Capacity (2010, MW)	
1 California	1,258
2 Florida	1,197
3 Maine	771
4 Virginia	770
5 Georgia	684
6 Alabama	627
7 Pennsylvania	597
8 New York	510
9 Minnesota	478
10 Washington	437

VII

Source: EIA

U.S. Biopower Generation Sources (2000–2010)



VII

	LFG/ MSW	Other Biomass	Wood and Derived Fuel	TOTAL
2000	20,305	2,826	37,595	60,726
2001	12,714	1,834	35,200	49,748
2002	13,398	1,646	38,665	53,709
2003	13,383	2,428	37,529	53,340
2004	13,281	2,216	37,576	53,073
2005	13,470	2,009	38,681	54,160
2006	14,106	2,004	38,649	54,759
2007	14,462	2,063	39,014	55,539
2008	15,520	2,214	37,300	55,034
2009	16,140	2,303	36,050	54,493
2010	16,240	2,317	37,975	56,532

Source: EIA

Note: LFG stands for Landfill Gas and MSW stands for Municipal Solid Waste

Note: The generation decrease between 2000 to 2001 reflects an EIA classification change. Beginning with 2001 data, non-biogenic municipal solid waste and tire-derived fuels were reclassified as non-renewable energy sources (previously considered waste biopower).

VII

VIII. Hydropower

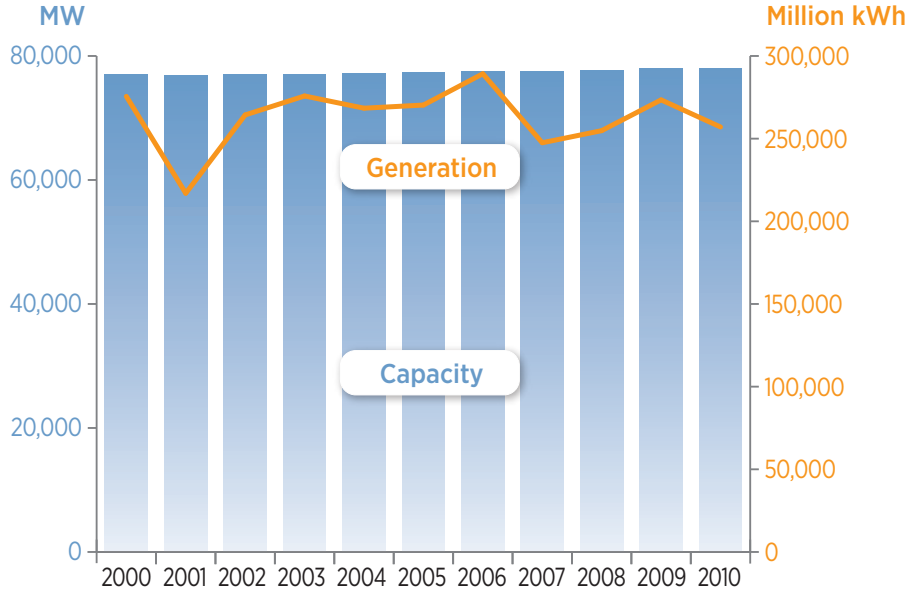
Hydropower: Summary

- Hydropower **capacity has remained constant between 2000–2010**, with generation fluctuation depending on water supply.

- Hydropower remains the largest source of renewable energy generation, and an important component of the energy mix; primarily large-scale hydropower **accounts for 6.2% of U.S. electricity generation**.

VIII

U.S. Hydropower* Nameplate Capacity and Generation

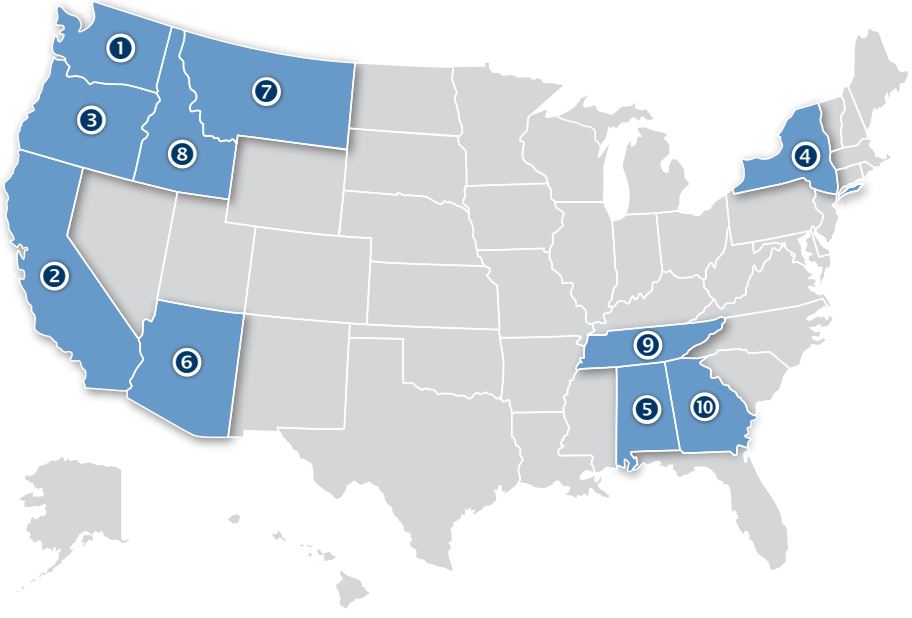


	U.S. Hydropower Generation (Million kWh)	U.S. Hydropower Capacity and % Increase from Previous Year	
		Total (MW)	% Increase
2000	275,573	76,946	0.0%
2001	216,961	76,911	0.0%
2002	264,329	77,047	0.2%
2003	275,806	77,020	0.0%
2004	268,417	77,130	0.1%
2005	270,321	77,354	0.3%
2006	289,246	77,419	0.1%
2007	247,510	77,432	0.0%
2008	254,831	77,640	0.3%
2009	273,455	77,910	0.3%
2010	257,052	77,931	0.0%

Source: EIA

*Note: Excludes pumped storage.

States Leading Hydropower Generation (2010)



Capacity (2010, MW)	
1 Washington	20,815
2 California	10,049
3 Oregon	8,240
4 New York	4,657
5 Alabama	3,280
6 Arizona	2,718
7 Montana	2,570
8 Idaho	2,531
9 Tennessee	2,479
10 Georgia	1,932

VIII

Source: EIA

IX. Advanced Water Power

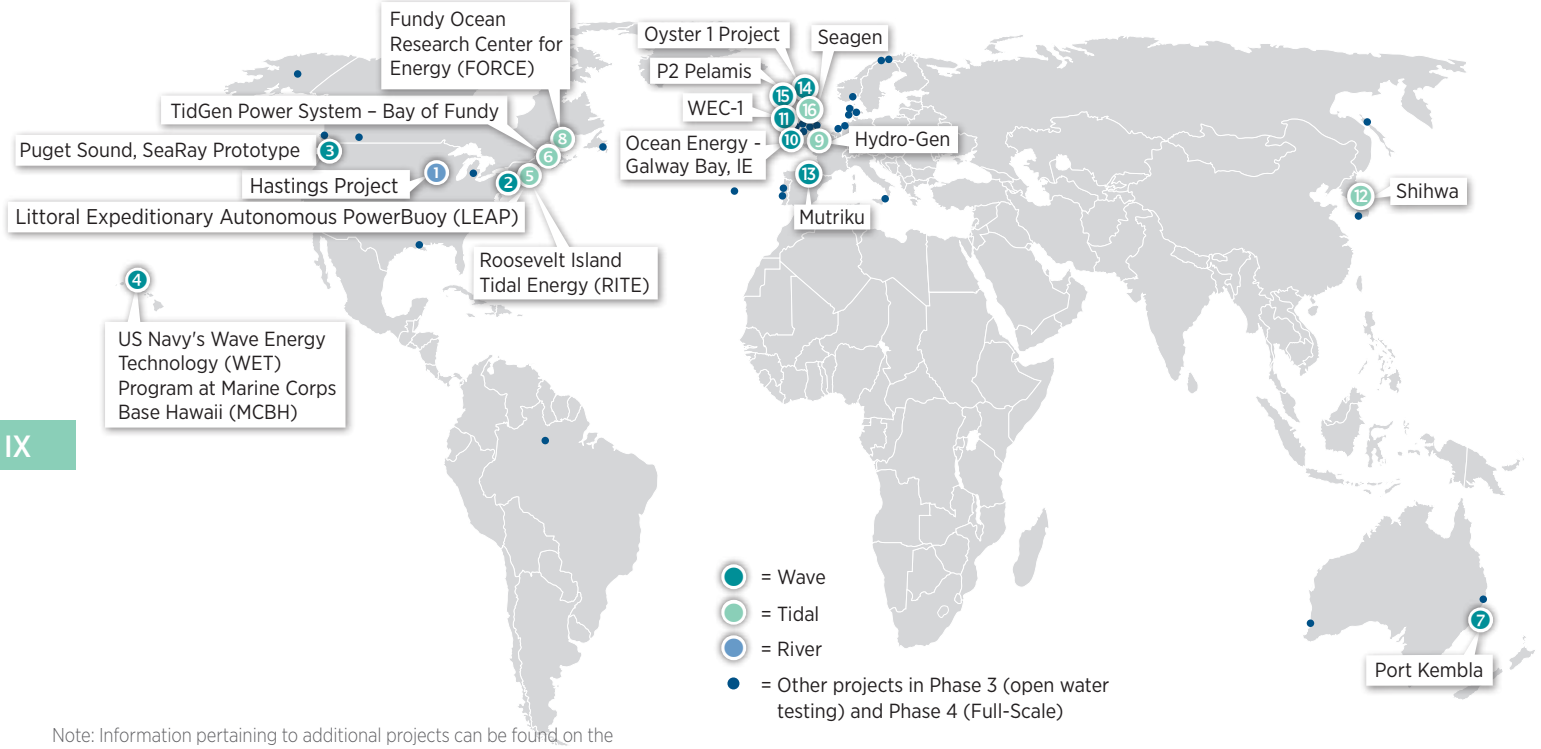
Advanced Water Power: Summary

- U.S. interest in advanced water power—such as **tidal, river and ocean current**, and **ocean wave** energy—is just beginning to grow, with many prototype projects in testing stages and permits being filed at the Federal Energy Regulatory Commission (FERC).

- No wave or tidal plants came online in 2010, although the U.S. currently has 68 projects that have received Preliminary Permits from FERC (as of September 2011) to commence site evaluations prior to applying for a department license.

- More information may be found at the FERC website at: http://www.ferc.gov/industries/hydropower/gen-info/licensing/hydrokinetics.asp

Worldwide Advanced Water Power: Sample of Commercial and Pilot Plants



Note: Information pertaining to additional projects can be found on the EERE's Marine and Hydrokinetic Technology Database, accessible online at: http://www1.eere.energy.gov/windandhydro/hydrokinetic/default.aspx

Sources: FERC, EERE

Worldwide Advanced Water Power: Sample of Commercial and Pilot Plants

PROJECT NAME	Type	Country	Location	Size (MW)	Installed
1 Hastings Project	River	United States	Mississippi River, Hastings, MN	0.07	2009
2 Littoral Expeditionary Autonomous PowerBuoy (LEAP)	Wave	United States	New Jersey	0.04	2011
3 Puget Sound, SeaRay Prototype	Wave	United States	Puget Sound, WA	0.08	2011
4 US Navy's Wave Energy Technology (WET) Program at Marine Corps Base Hawaii (MCBH)	Wave	United States	1 mile off Kaneohe Bay, Oahu, HI	0.1	2004
5 Roosevelt Island Tidal Energy (RITE)	Tidal	United States	New York City, NY	0.175	2002
6 TidGen Power System - Bay of Fundy	Tidal	United States	Maine (Bay of Fundy)	0.01	2010
7 Port Kembla	Wave	Australia	New South Wales, Port Kembla	0.45	2005
8 Fundy Ocean Research Center for Energy (FORCE)	Tidal	Canada	Bay of Fundy, Nova Scotia	1	2009
9 Hydro-Gen	Tidal	France	Brouennou	1	2011
10 Ocean Energy - Galway Bay, IE	Wave	Ireland	Galway Bay	0.015	2006
11 WEC-1	Wave	Ireland	Galway Bay (near Belmullet)	0.25	2006
12 Shihwa	Tidal	South Korea	40km south-west of Seoul	254	2011
13 Mutriku	Wave	Spain	Near Bilbao	0.3	2011
14 Oyster 1 Project	Wave	United Kingdom	Scotland Stromness, Orkney	0.315	2008
15 P2 Pelamis	Wave	United Kingdom	Scotland Stromness, Orkney	0.75	2011
16 Seagen Strangford	Tidal	United Kingdom	Northern Ireland Strangford Narrows	1.2	2003

Note: Information pertaining to additional projects can be found on the EERE's Marine and Hydrokinetic Technology Database, accessible online at: http://www1.eere.energy.gov/windandhydro/hydrokinetic/default.aspx

Sources: FERC, EERE


reliable
green-friendly
colorless
clean
ZERO EMISSION
HYDROGEN FUEL CELL - HYBRID-ELECTRIC DRIVE
FC2
AC TRANSIT

X. Hydrogen

Hydrogen: Summary

- At the end of 2010, there were approximately **58 hydrogen fueling stations** in the United States.
- An estimated 156 fuel cell vehicles are available in the United States to date.
- There are over 1,000 stationary fuel cell installations worldwide, 22 of which are greater than 1 MW in capacity.

X

Hydrogen Production

50 million tons of hydrogen are produced each year worldwide; **9 million** tons are consumed in the United States.

Approximately **60%** is used for making ammonia for fertilizer; **23%** is used to make gasoline cleaner by removing sulfur; **9%** is used to make methanol; and the remainder is for chemical processing, metal production, electronics, and for space exploration.

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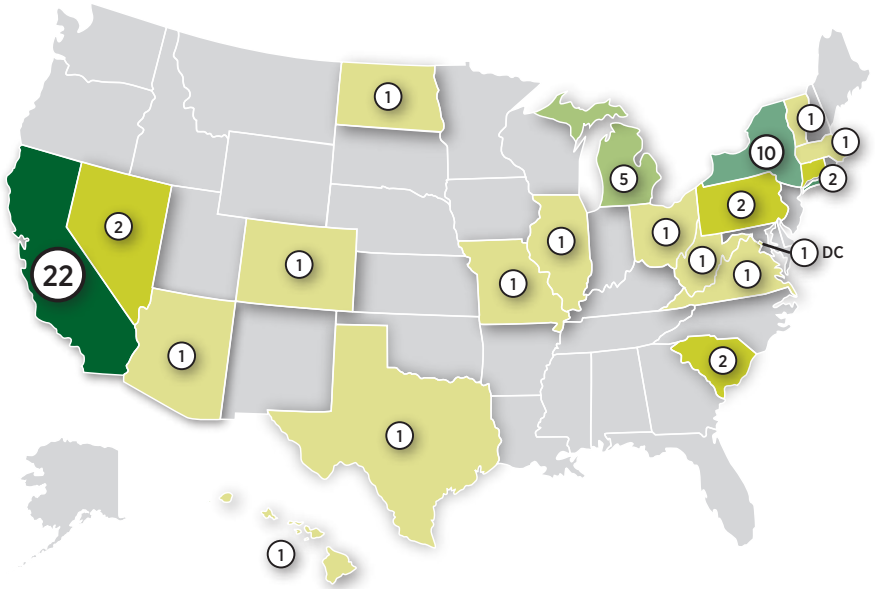
Sources: EERE, EIA, FuelCells.org

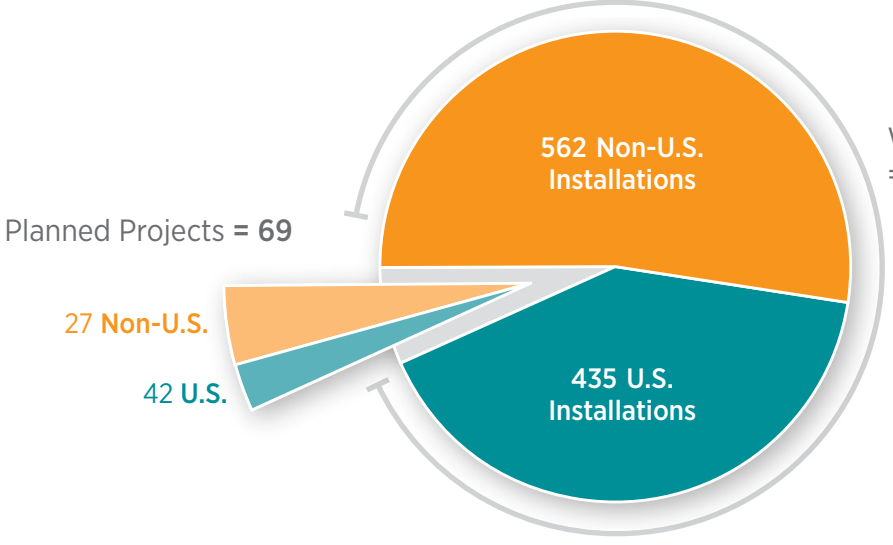
Number of Operational U.S. Hydrogen Fueling Stations

(December 2010 – **Total of 58**)



Number of recorded fuel cell vehicles in the United States = 156

Stationary Fuel Cell Installations (2010)



Worldwide Installations = **997**

Number of stationary fuel cells >1 MW = 22

Located in the U.S. (7), Canada (1), Germany (1), Italy (1), Japan (2), South Korea (10)

X

Source: FuelCells.org

XI. Renewable Fuels

Renewable Fuels – Ethanol: Summary

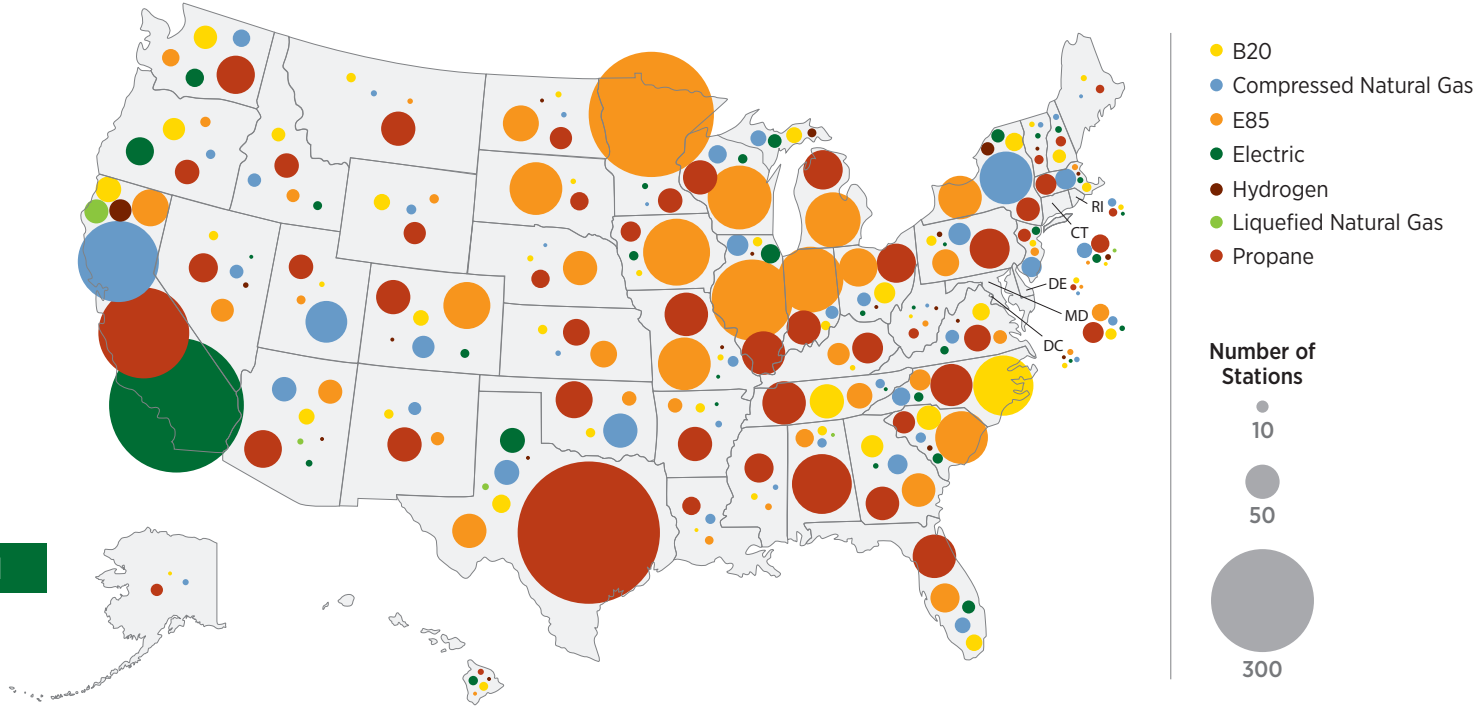
- Corn ethanol production continues to expand rapidly in the United States. **Between 2000 and 2010, production increased nearly 8 times**.
- Ethanol production **grew nearly 19% in 2010** to reach **13,000 million gallons** per year.
- Ethanol has steadily increased its percentage of the overall gasoline pool, and was **9.4%** in 2010.
- In 2010, the United States* produced 56.5% of the world's ethanol, followed by Brazil at 30.1%, the European Union at 5.1%, China at 2.4%, and Canada at 1.5%.

XI

* Most U.S. ethanol is currently produced from corn (in contrast to Brazil's ethanol coming from sugar cane); but efforts are underway by the U.S. Department of Energy and others to commercialize cellulosic ethanol, which is produced from non-food crops.

Note: Ethanol is blended with gasoline and generally comprises up to 10% of the fuel with gasoline as the other 90% (E10). Additionally, flex-fuel vehicles use a blend of 85% ethanol and 15% gasoline (E85).

Alternative Fueling Stations by State

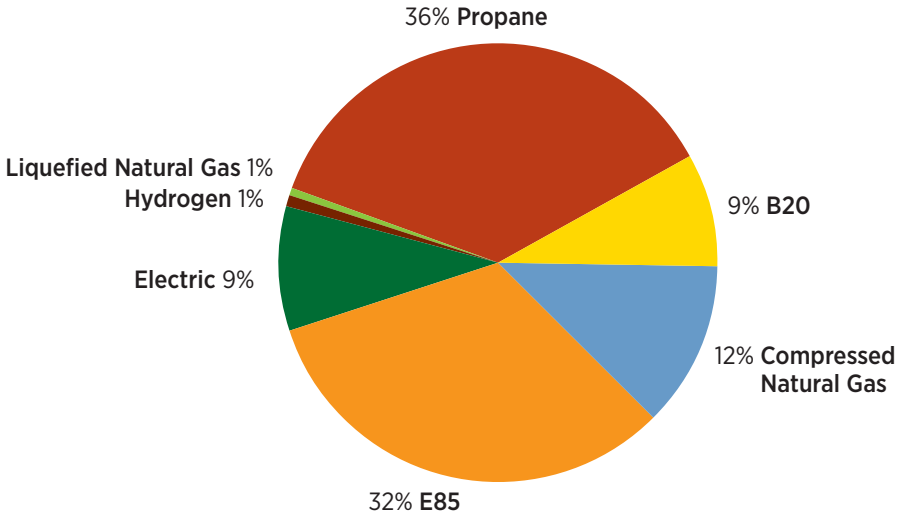


XI

Note: Data as of 12/31/2010

Sources: EERE, EIA

7,149 alternative fueling stations in the U.S.



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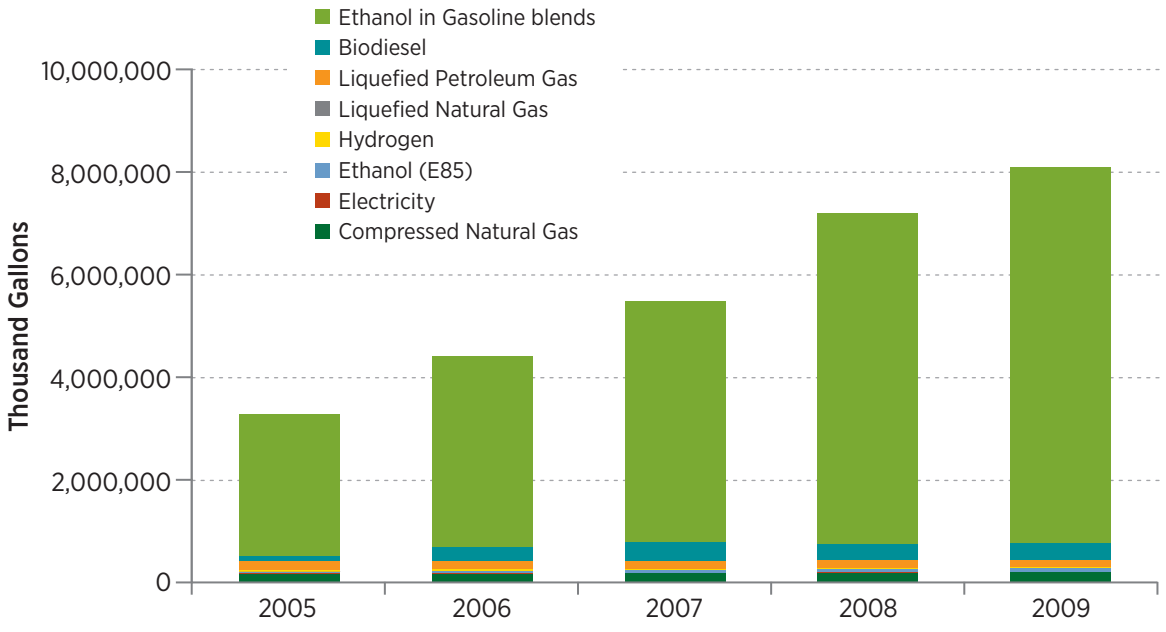
Note: Data as of 12/31/2010
Sources: EERE, EIA

Consumption of Alternative Fuel in the U.S. (2005–2009)

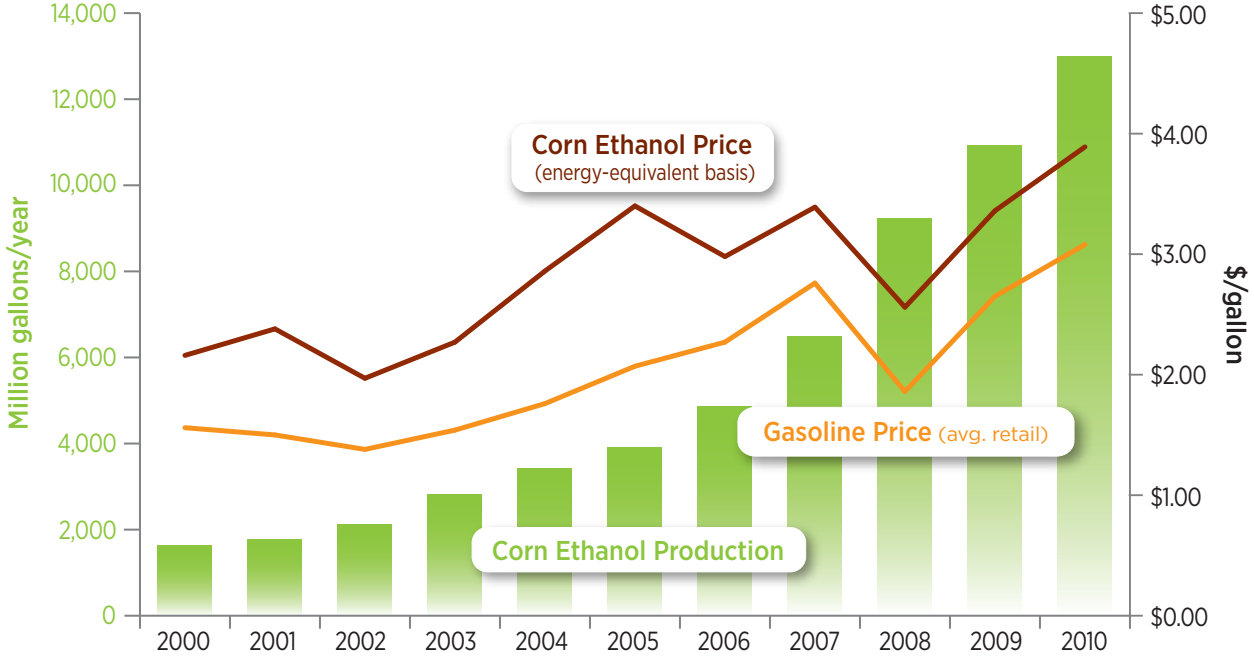


XI

Source: EIA

U.S. Corn Ethanol Production and Price Trends

In 2010, there were **1,424,878 ethanol (E85) fueled vehicles** on the road in the U.S.



XI

Sources: RFA, EERE, EIA

U.S. Ethanol Production and Growth in Gasoline Pool by Volume

	Gasoline Pool (Million gallons/yr)	Ethanol Production (Million gallons/yr)	Annual Growth (%)	Percent of Gasoline Pool
2000	128,662	1,630	11.0%	1.3%
2001	129,312	1,770	8.6%	1.4%
2002	132,782	2,130	20.3%	1.6%
2003	134,089	2,810	31.9%	2.1%
2004	137,022	3,410	21.4%	2.5%
2005	136,949	3,905	14.5%	2.9%
2006	138,378	4,855	24.3%	3.5%
2007	142,287	6,485	33.6%	4.6%
2008	137,797	9,235	42.4%	6.7%
2009	137,736	10,935	18.4%	7.9%
2010	138,456	13,000	18.9%	9.4%

U.S. Ethanol Distribution and Utilization

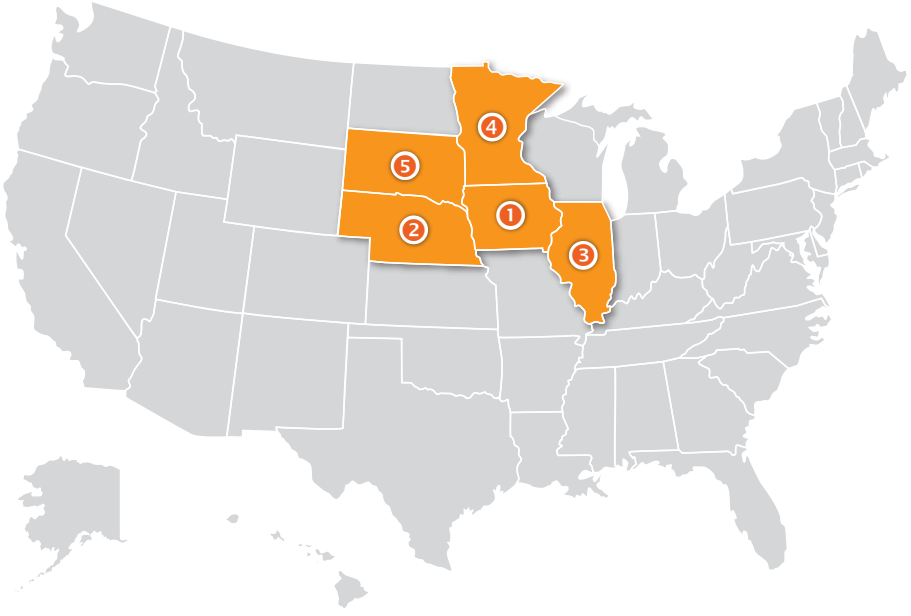
2,318 E85 stations (December 2010)

E85 average retail price (January 2011): **$3.89/gallon** (gasoline gallon equivalent basis), gasoline price: $3.08/gallon

Approximately 8 million flex-fuel vehicles (FFV) are on the road

Sources: RFA, EERE, EIA

U.S. Ethanol Production Capacity



Top Five States for U.S. Ethanol (operating) Production Capacity in 2010 (millions of gallons)	
1 Iowa	3,595
2 Nebraska	1,839
3 Illinois	1,480
4 Minnesota	1,119
5 South Dakota	1,016

Note: No sugarcane ethanol is currently produced in the United States.
Source: RFA

U.S. Ethanol Production Capacity

Total U.S. Ethanol Operating Production Capacity (2010):

13,507.9 million gallons/year (mmgy)

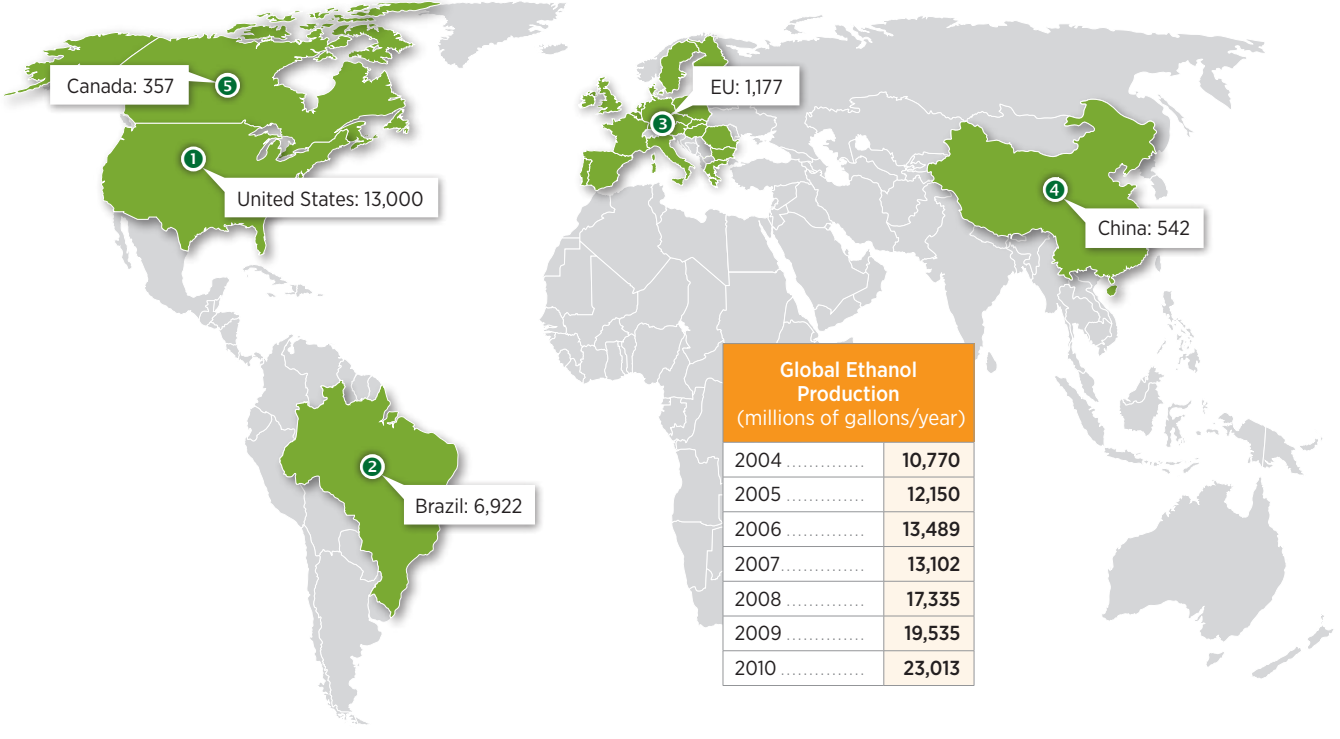
Top Five Ethanol Companies —Production Capacity 2010 (millions of gallons/year)	
1 Archer Daniels Midland Co.	1,750
2 Poet Biorefining	1,537
3 Valero Renewable Fuels	1,130
4 Green Plains Renewable Energy	657
5 Flint Hills Resources	420

XI

Source: RFA

Global Ethanol Production

Top Five Countries (2010) **Ethanol Production** (millions of gallons/year)



Global Ethanol Production (millions of gallons/year)	
2004	**10,770**
2005	**12,150**
2006	**13,489**
2007	**13,102**
2008	**17,335**
2009	**19,535**
2010	**23,013**

XI

Source: RFA

Renewable Fuels – Biodiesel: Summary

- Biodiesel has expanded from a relatively small production base in 2000, to a total U.S. production of **315 million gallons** in 2010. However, biodiesel is still a small percentage of the alternative fuel pool in the U.S., as over 40 times more ethanol was produced in 2010.

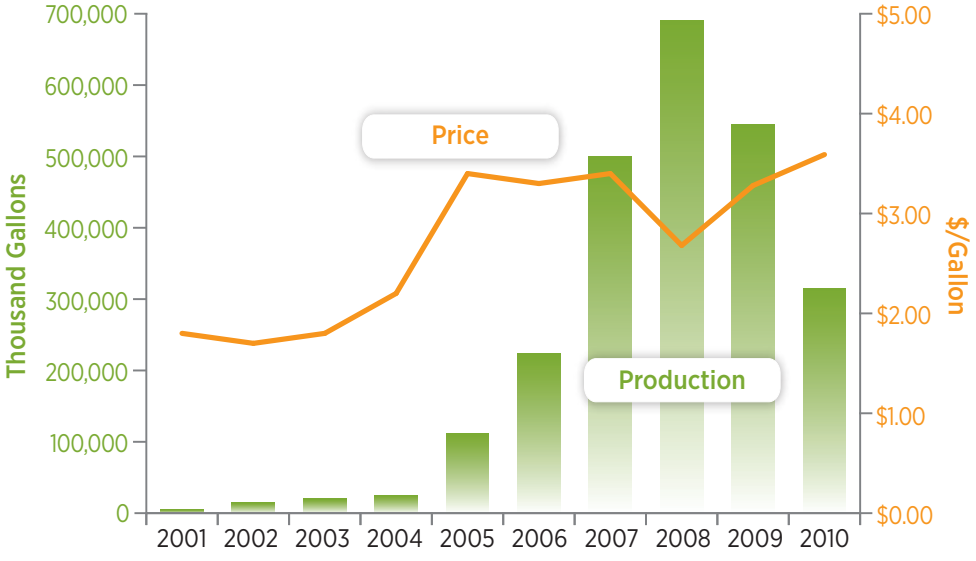
- Biodiesel production in the U.S. in 2010 is **63 times** what it was in 2001.

- Germany leads the world in biodiesel production, followed by Brazil, Argentina and France.

XI

- Biodiesel production globally grew more than 14% in 2010.

U.S. Biodiesel Demand and Price (2000–2010)



	Annual Growth	Total Production (thousand gallons)
2000	300%	2,000
2001	150%	5,000
2002	200%	15,000
2003	33%	20,000
2004	25%	25,000
2005	348%	112,000
2006	100%	224,000
2007	123%	500,000
2008	38%	691,000
2009	(21%)	545,000
2010	(42%)	315,000

XI

Sources: National Biodiesel Board, EERE

U.S. Biodiesel Production Capacity

Total U.S. Biodiesel Production Capacity (2010): 2,504.0 million gallons/year (mmgy)

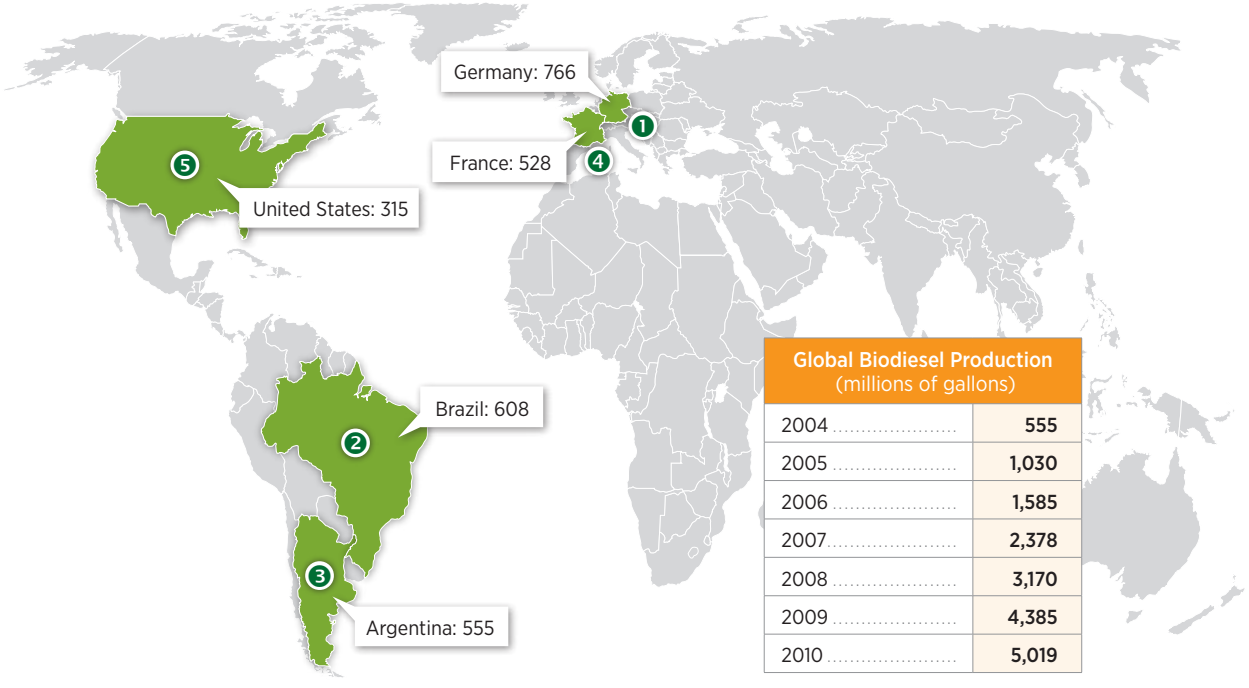
Top Five Biodiesel Companies — Production Capacity 2010 (millions of gallons/year)	
1 Renewable Energy Group, Inc	182
2 Renewable Biofuels, Inc	180
3 Imperium Renewables, Inc	100
4 Green Earth Fuels, LLC	90
5 Archer Daniels Midland Company	85

XI

Sources: National Biodiesel Board, REG, Renewable Biofuels Inc, Imperium Renewables, Green Earth Fuels LLC, ADM

Global Biodiesel Production

Top Five Countries (2010) **Biodiesel Production** (millions of gallons)



Global Biodiesel Production (millions of gallons)	
2004	555
2005	1,030
2006	1,585
2007	2,378
2008	3,170
2009	4,385
2010	5,019

XI

Source: REN21

XII. Clean Energy Investments

Clean Energy Investments: Summary

- U.S. investment in renewable energy has grown dramatically in the past decade, and in **2010 annual investment reached more than $28 billion**.

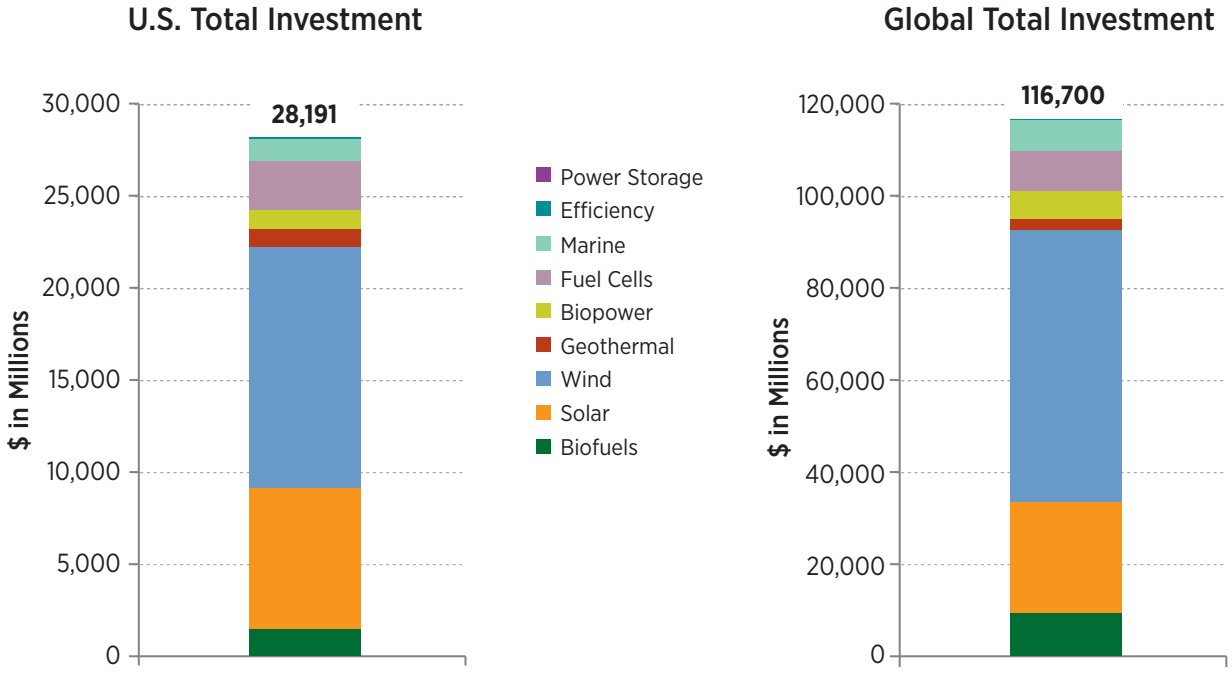
- U.S. investment in wind energy projects **grew from $303 million in 2001 to more than $13 billion in 2010**.

- In 2010, U.S. venture capital and private equity investment in renewable energy technology companies was **$2.7 billion—up from $261 million in 2001**.

- U.S. venture capital and private equity investment in solar technology companies has **increased from $40 million in 2001 to more than $1.7 billion in 2010**.

XII

U.S. and Global Total Investment in Renewable Energy, 2010 ($ millions)



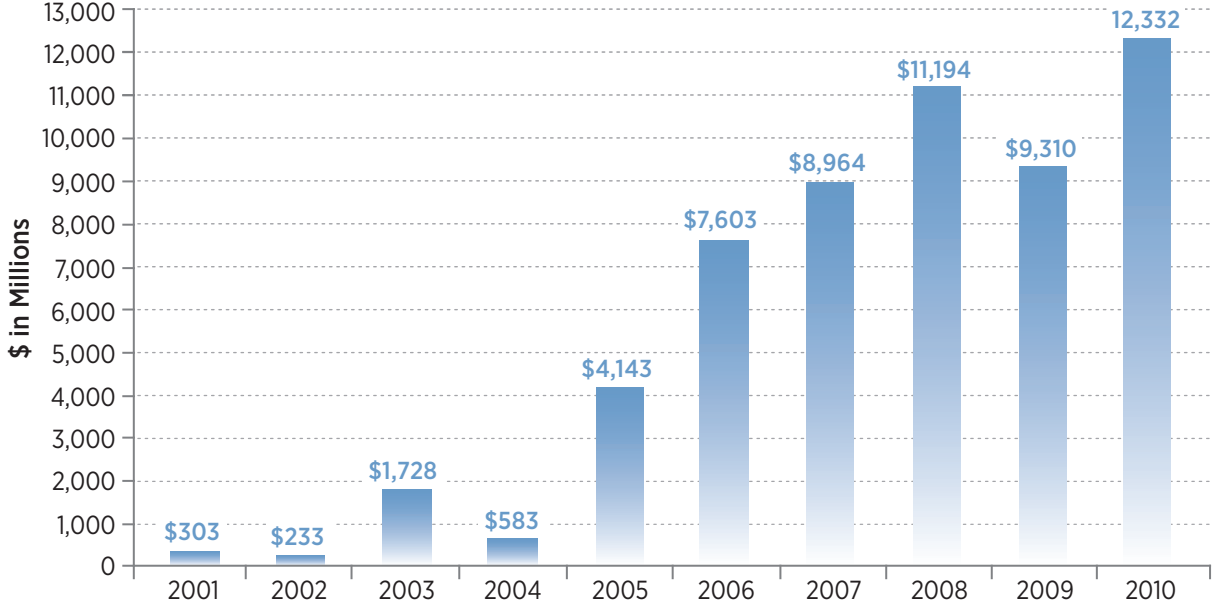
XII

Source: Bloomberg New Energy Finance

Completed and disclosed deals only. Does not adjust for undisclosed transactions.

Includes VC/PE, public market activity, and asset financing.

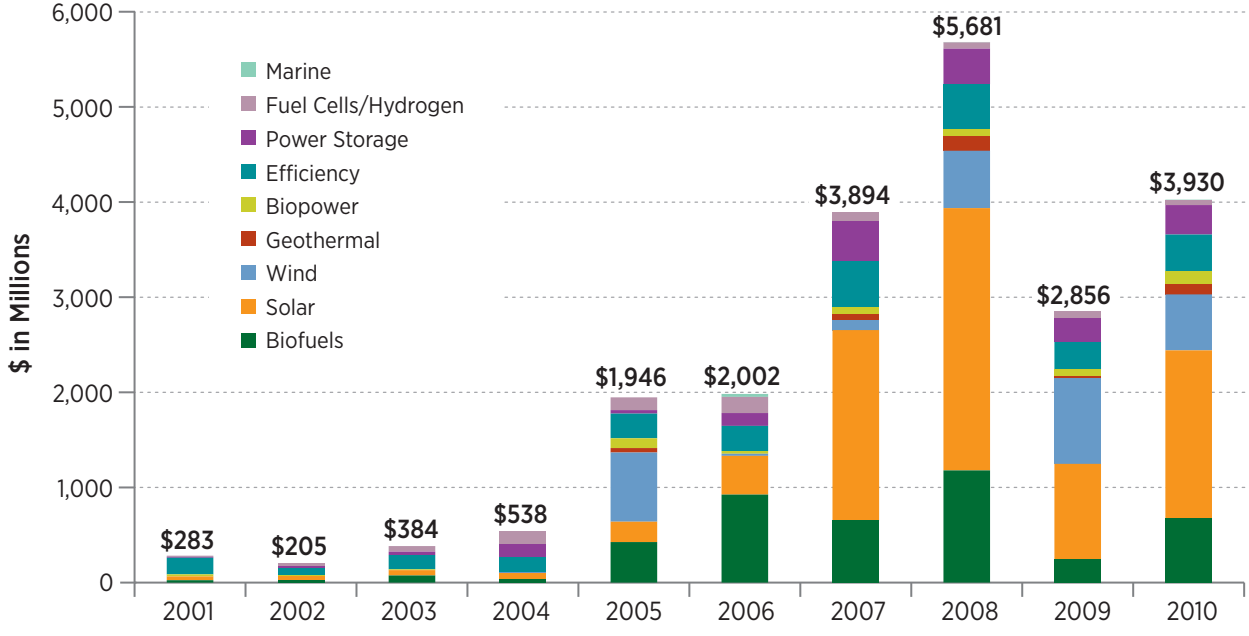
U.S. Wind Energy Project Asset Financing Transactions ($ millions), 2001–2010



XII

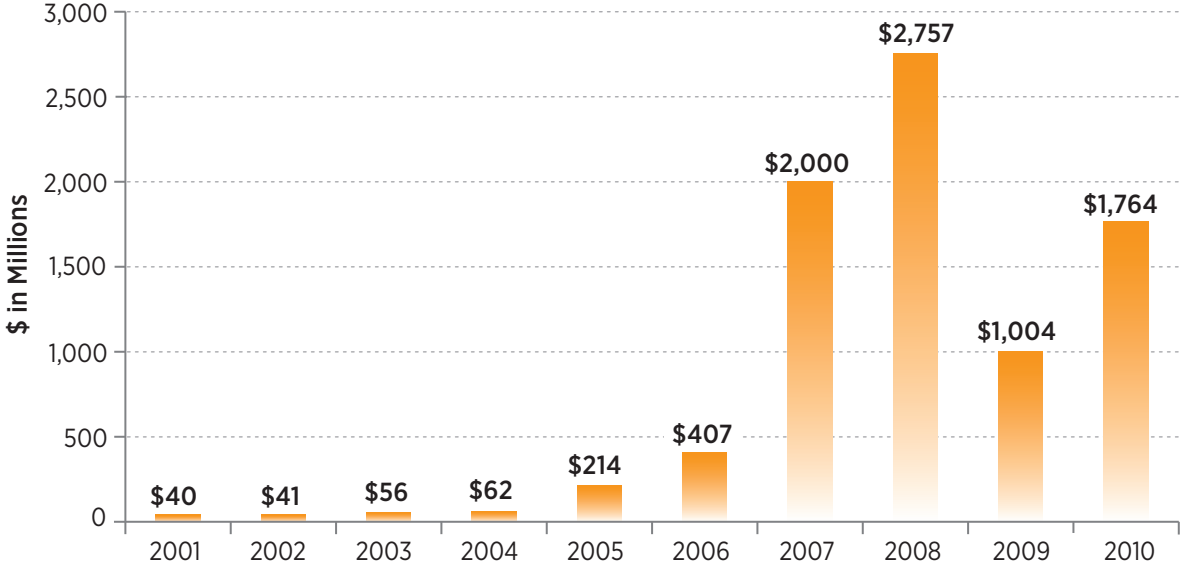
Figures represent disclosed deals derived from Bloomberg New Energy Finance's Desktop database.

U.S. Venture Capital and Private Equity Investment ($ millions) in Renewable Energy Technology Companies, 2001–2010



Figures represent disclosed deals derived from Bloomberg New Energy Finance's Desktop database.

U.S. Venture Capital and Private Equity Investment ($ millions) in Solar Energy Technology Companies, 2001–2010



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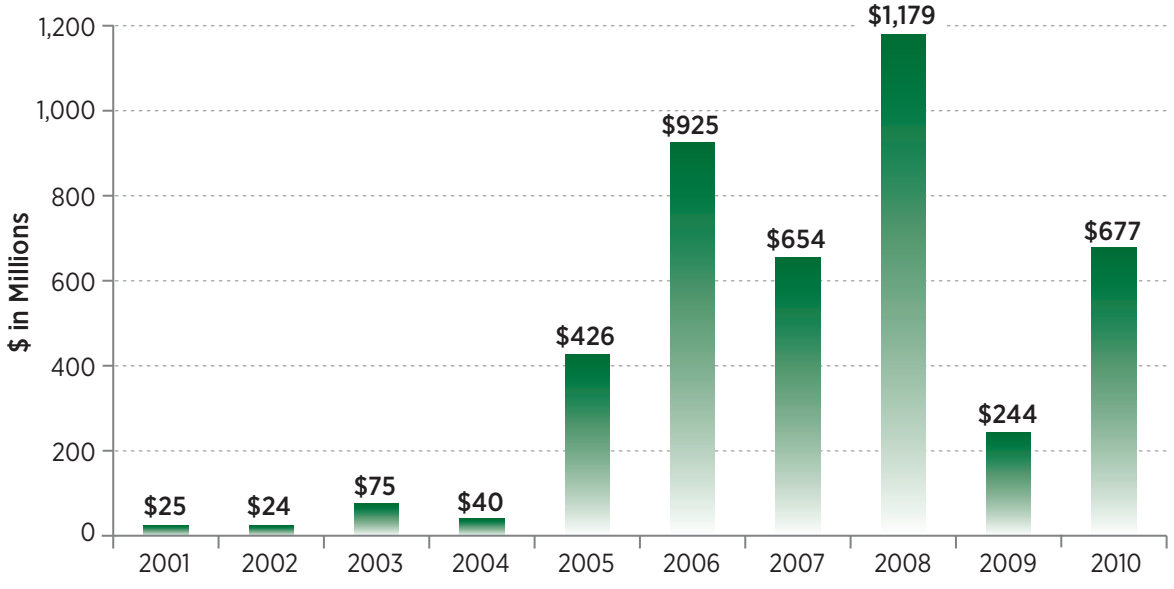
Figures represent disclosed deals derived from Bloomberg New Energy Finance's Desktop database.

U.S. Venture Capital and Private Equity Investment ($ millions) in Biofuels Technology Companies, 2001–2010



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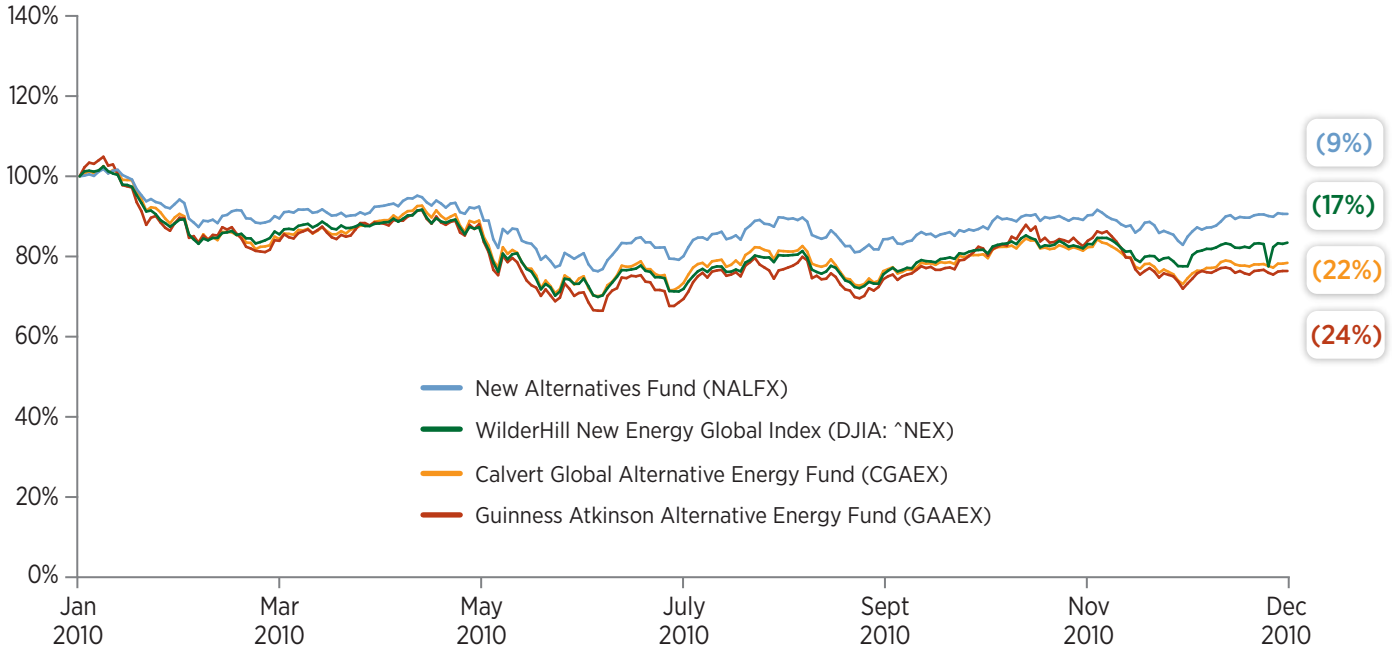
Figures represent disclosed deals derived from Bloomberg New Energy Finance's Desktop database.

Public Renewable Energy Index Performance, 2010 (Indexed to 100)



XII

B20

A fuel containing a mixture of 20 percent biodiesel and 80 percent petrodiesel.

Base-load capacity

The generating equipment normally operated to serve loads on an around-the-clock basis.

Biodiesel

Any liquid biofuel suitable as a diesel fuel substitute or diesel fuel additive or extender. Biodiesel fuels are typically made from oils such as soybeans, rapeseed, or sunflowers; or from animal tallow. Biodiesel can also be made from hydrocarbons derived from agricultural products such as rice hulls.

Biofuels

Liquid fuels and blending components produced from biomass (plant) feedstocks, used primarily for transportation.

Biomass

Organic non-fossil material of biological origin constituting a renewable energy source.

British Thermal Unit (Btu)

The quantity of heat required to increase the temperature of 1 pound of liquid water by 1 degree Fahrenheit at the temperature at which water has its greatest density (approximately 39 degrees Fahrenheit).

Capacity Factor

The ratio of the electrical energy produced by a generating unit for the period of time considered to the electrical energy that could have been produced at continuous full power operation during the same period.

Compound Annual Growth Rate

The year-over-year growth rate applied during a multiple-year period. The formula for calculating CAGR is (Current Value/ Base Value)^(1/# of years) - 1.

Concentrating Solar Power (CSP)

A solar energy conversion system characterized by the optical concentration of solar rays through an arrangement of mirrors to heat working fluid to a high temperature. Concentrating solar power (but not solar thermal power) may also refer to a system that focuses solar rays on a photovoltaic cell to increase conversion efficiency.

Cost

The amount paid to produce a good or service. Cost represents the sum of the value of the inputs in production

Direct Use

Use of electricity that (1) is self-generated, (2) is produced by either the same entity that consumes the power or an affiliate, and (3) is used in direct support of a service or industrial process located within the same facility or group of facilities that house the generating equipment. Direct use is exclusive of station use.

E85

A fuel containing a mixture of 85 percent ethanol and 15 percent gasoline.

Ethanol

A clear, colorless, flammable oxygenated hydrocarbon. Ethanol is typically produced chemically from ethylene, or biologically from fermentation of various sugars from carbohydrates found in agricultural crops and cellulosic residues from crops or wood. It is used in the United States as a gasoline octane enhancer and oxygenate (blended up to 10 percent concentration). Ethanol can also be used in high concentrations (E85) in vehicles designed for its use.

Federal Energy Regulatory Commission (FERC)

The federal agency with jurisdiction over interstate electricity sales, wholesale electric rates, hydroelectric licensing, natural gas pricing, oil pipeline rates, and gas pipeline certification. FERC is an independent regulatory agency within the Department of Energy (DOE) and is the successor to the Federal Power Commission.

Flexible-Fuel Vehicles

Vehicles that can operate on (1) alternative fuels (such as E85); (2) 100 percent petroleum-based fuels; (3) any mixture of an alternative fuel (or fuels) and a petroleum-based fuel. Flexible-fuel vehicles have a single fuel system to handle alternative and petroleum-based fuels.

Fuel Cell

A device capable of generating an electrical current by converting the chemical energy of a fuel (e.g., hydrogen) directly into electrical energy. Fuel cells differ from conventional electrical cells in that the active materials such as fuel and oxygen are not contained within the cell but are supplied from outside. It does not contain an intermediate heat cycle, as do most other electrical generation techniques.

Gasoline Pool

All gasoline produced by volume, including any additions such as ethanol or methyl tertiary-butyl ether (MTBE).

Generation

The total amount of electric energy produced by generating units and measured at the generating terminal in kilowatt-hours (kWh) or megawatt-hours (MWh).

Geothermal Energy

The heat that is extracted from hot water or steam that is mined from geothermal reservoirs in the earth's crust. Water or steam can be used as a working fluid for geothermal heat pumps, water heating, or electricity generation, and then is injected back into the earth.

Geothermal Heat Pump

A heat pump in which the refrigerant exchanges heat (in a heat exchanger) with a fluid circulating through an earth connection medium (ground or ground water). The fluid is contained in a variety of loop (pipe) configurations depending on the temperature of the ground and the ground area available. Loops may be installed horizontally or vertically in the ground or submersed in a body of water.

Gigawatt (GW)

One billion watts or one thousand megawatts.

Gigawatt-hour (GWh)

One billion watt-hours.

Incremental Capacity

Capacity added on an annual basis.

Insolation

The amount of radiation from the sun received at the surface of the Earth in a particular geographic location or region.

Kilowatt (kW)

One thousand watts.

Kilowatt-hour (kWh)

A measure of electricity defined as a unit of work or energy, measured as 1 kilowatt (1,000 watts) of power expended for 1 hour. One kWh is equivalent to 3,412 Btu.

Landfill Gas

Gas that is generated by decomposition of organic material at landfill disposal sites. The average composition of landfill gas is approximately 50% methane and 50% carbon dioxide and water vapor by volume. The methane in landfill gas may be vented, flared, or combusted to generate electricity or useful thermal energy on-site, or injected into a pipeline for combustion off-site.

Levelized Cost

The present value of the total cost of building and operating a generating plant over its economic life, converted to equal annual payments. Costs are levelized in real dollars (i.e., adjusted to remove the impact of inflation).

Megawatt (MW)

One million watts of electricity.

Megawatt-hour (MWh)

One thousand kilowatt-hours or 1 million watt-hours.

Municipal Solid Waste (MSW)

Residential solid waste and some nonhazardous commercial, institutional, and industrial wastes.

Nameplate Capacity

The maximum rated output of a generator under specific conditions designated by the manufacturer. Nameplate capacity is usually indicated in units of kilovolt-amperes (kVA) and in kilowatts (kW) on a nameplate physically attached to the generator.

Ocean Energy

Energy conversion technologies that harness the energy in tides, waves, and thermal gradients in the oceans.

Photovoltaic (PV) Cell

An electronic device consisting of layers of semiconductor materials fabricated to form a junction (adjacent layers of materials with different electronic characteristics) and electrical contacts and being capable of converting incident light directly into electricity (direct current).

Price

The amount paid to acquire a good or service.

Pumped-Storage Hydroelectric Plant

A plant that usually generates electric energy during peak load periods by using water previously pumped into an elevated storage reservoir during off-peak periods when excess generating capacity is available to do so. When additional generating capacity is needed, the water can be released from the reservoir through a conduit to turbine generators located in a power plant at a lower level.

Renewable Energy Resources

Energy resources that are naturally replenishing but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Solar Thermal Collector

A device designed to receive solar radiation and convert it to thermal energy. Normally, a solar thermal collector includes a frame, glazing, and an absorber, together with appropriate insulation. The heat collected by the solar collector may be used immediately or stored for later use. Solar collectors are used for space heating; domestic hot water heating; and heating swimming pools, hot tubs, or spas.

Thermoelectric Power Plant

A term used to identify a type of electric generating station, capacity, capability, or output in which the source of energy for the prime mover is heat.

Wind Energy

Kinetic energy present in wind motion that can be converted to mechanical energy for driving pumps, mills, and electric power generators.

References

U.S. Energy Production and Consumption — Pages 7–9

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