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Renewable Energy Consumption and Electricity Preliminary Statistics 2010

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Preface

This report, Renewable Energy Consumption and Electricity Preliminary Statistics 2010, presents preliminary information on renewable energy consumption and electricity generation and capacity for 2010. Final renewable energy consumption and electricity data will be included as a chapter in the Renewable Energy Annual 2010 scheduled to be released early in 2012.

The renewable energy resources in the report include: biomass (wood and derived fuels, municipal solid waste (MSW) biogenic, landfill gas, ethanol and biodiesel and other biomass); geothermal; wind; solar/PV (solar thermal and photovoltaic); and hydroelectric conventional. Hydroelectric pumped storage is excluded, because it is usually based on non-renewable energy sources.

Definitions for terms used in this report can be found in EIA's Energy Glossary: http://www.eia.gov/glossary/index.html. General information about all the EIA surveys with data related to renewable energy and referenced in this report can be found at: http://www.eia.gov/oss/forms.html.

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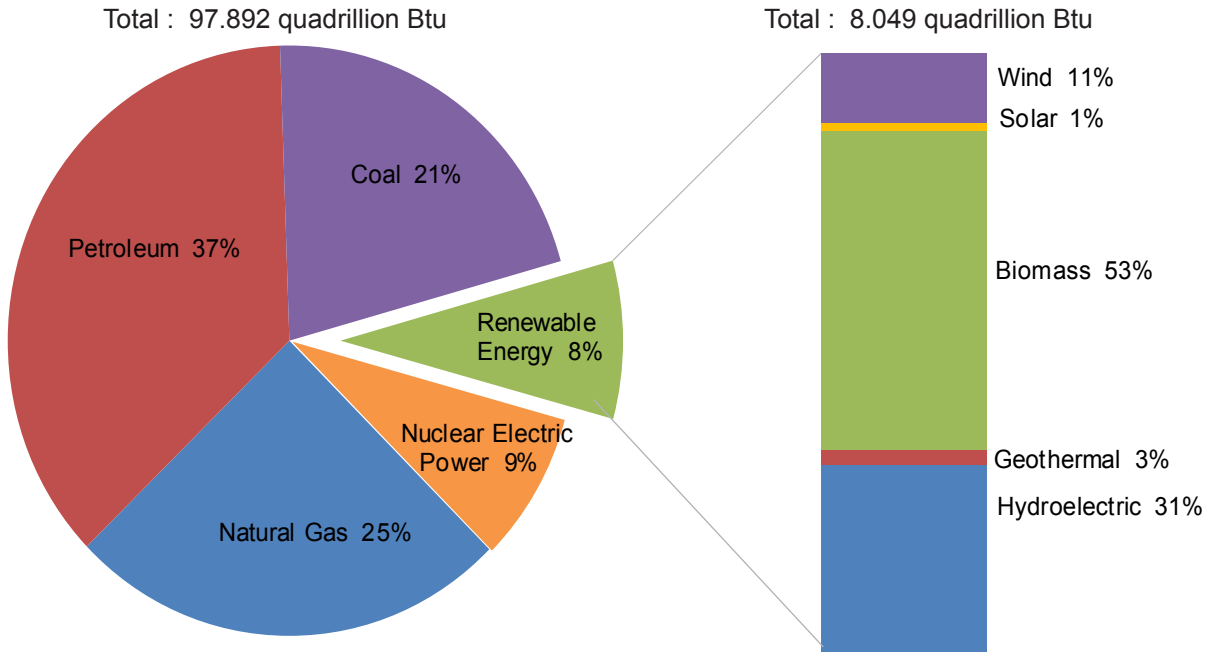
Renewable Energy Consumption and Electricity Preliminary Statistics 2010

Consumption

Between 2009 and 2010, renewable energy consumption rose by 6 percent to over 8 quadrillion Btu (Figure 1). At the same time, total U.S. energy consumption rebounded by 4 percent to nearly 98 quadrillion Btu, due in some measure to economic recovery (Table 1). Renewable energy's share of U.S. consumption in 2010 was up slightly to a little more than 8 percent. The main drivers behind the changes in renewable energy were consumption increases of 288 trillion Btu for biofuels and 203 trillion Btu for wind. These were partially offset by a decrease of 160 trillion Btu for conventional hydroelectric power.

Figure 1. Renewable energy consumption in the nation's energy supply, 2010



Source: U.S. Energy Information Administration.

Between 2006 and 2010, the biomass share of renewable consumption increased from 49 to 53 percent, wind increased from 4 to 11 percent, and conventional hydroelectric decreased from 43 to 31 percent (Figure 2). Geothermal's share stayed steady at 3 percent of renewable energy, but consumption rose from 181 trillion Btu to 212 trillion Btu. Likewise, solar's share remained steady at 1 percent, despite growing rapidly at an average annual rate of 12 percent.

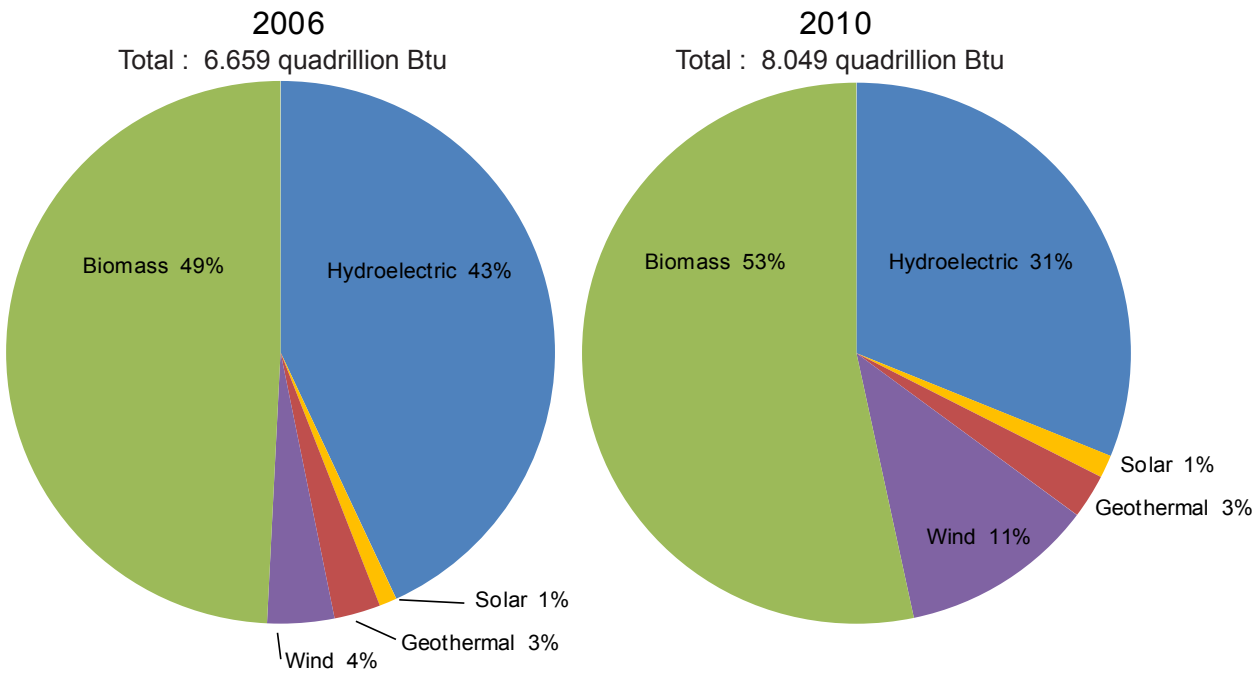
Between 2006 and 2010, ethanol consumption more than doubled to over 1 quadrillion Btu (Table 2). It is expected to grow further in the future, due in some measure to the changing regulatory environment. Near the end of 2010, the Environmental Protection Agency (EPA) issued the final volume of renewable fuels required in 2011 under the Clean Air Act Section 211(o), as amended by the Energy Independence and Secruity Act of 2007 (EISA).[1] The target is 13.95 billion ethanol equivalent gallons of renewable fuels, including corn ethanol, cellulosic biofuels, biomass-based diesel, and advanced biofuels. By comparison ethanol consumption with denaturant stood at 13.19 billion gallons for 2010.[2]

Also, to relieve constraints in the consumer ethanol market known as the 10 percent blend wall, EPA approved, as a first step, waivers to permit a blend of motor gasoline with 15 percent ethanol (E15) to be sold for use in light-duty vehicles model year 2001 and later. A blend of motor gasoline and 85 percent ethanol (E85) is another potential market for ethanol, but further expansion depends on a much greater number of E85 vehicles being made available and the expansion of infrastructure to deliver the fuel. Until the U.S. vehicle fleet is able to absorb substantially more ethanol, exports are expected to increase and imports will decline.

The consumption of biodiesel, the other main biofuel, dropped 30 percent in 2010 as domestic production plummeted due to the expiration of the biodiesel blender tax credit at the end 2009 and a further decline in imports. Late in December 2010, the credit was extended retroactively for 2010 and forward through 2011, so production and consumption may pick up temporarily, though there are issues about how the industry may respond to the uncertainties of a one-year renewal.

The electric power sector had the most renewable energy consumption, a little over 4,000 trillion Btu, but its market share decreased from 55 to 50 percent between 2006 and 2010 (Table 2). The industrial sector was second with 2,249 trillion Btu and a steady market share. The transportation sector's consumption more than doubled from 475 trillion Btu in 2006 to 1,098 trillion Btu in 2010, due to the expanded consumption of biofuels. As a result, the sector's share of renewable energy doubled from 7 to 14 percent. The residential and commercial sectors were the smallest sectors with stable market shares.

Figure 2. Renewable energy consumption by energy source, 2006 and 2010



Source: U.S. Energy Information Administration.

Electricity

Renewable energy provided 10 percent, or 425 billion kilowatthours (kWh) of electricity in 2010, out of a U.S. total of 4,120 billion kWh (Table 3).3 U.S. total net generation increased by 4 percent, while renewable generation increased just 2 percent between 2009 and 2010. Renewable generation would have been higher, but for a net decrease of 16 billion kWh in conventional hydropower due to low water availability. Thirty-seven states experienced losses in hydropower generation (Table 5 and Table 6). Washington and Oregon in the West and Alabama, New York and Tennessee in the East had the largest decreases. California was a notable exception, experiencing an increase of 6 billion kWh in hydropower generation. Over half of total renewable generation was provided by 5 states (California, New York, Oregon, Texas and Washington).

Wind generation increased by 21 billion kWh to 95 billion kilowatt hours, as it experienced across-the-board increases in 34 states between 2009 and 2010. The expansion was led by Texas with a 6 billion kWh increase, followed by Illinois, Indiana, Iowa and North Dakota, each with an increase of over 1 billion kWh. By 2010, wind provided 2 percent of total U.S. generation. All the other remaining renewable sources except other biomass increased as well.

Despite the lingering effects of the recession being felt in financial markets into 2010, competition from low natural gas prices, and an increased reluctance for utilities to enter power purchase agreements with wind, renewable capacity expanded by 3 percent, or 4,019 megawatts (MW) in 2010, according to preliminary data reported to the EIA (Table 4). This was not as large a gain as seen in 2009, but sizeable nonetheless. Some drivers contributing to this growth were:

- Federal Incentives
  - For 2010, the federal production tax credit (PTC) provided a 2.2 cent/ kWh credit for all wind facilities in operation by the end of 2012 and closed-loop biomass facilities operating by the end of 2013. A 1.1 cent/kWH credit was provided for all remaining eligible technologies: open-loop biomass, geothermal energy, landfill gas, municipal solid waste, qualified hydro electric and marine and hydrokinetic (150 kilowatts or larger) in operation by the end of 2013.

- The energy investment tax credit (ITC) was available in lieu of the PTC to those tax payers eligible for the PTC. The ITC was worth 30 percent of expenditures and was available to eligible systems in operation by specific due dates, which are as far away as 2016 for some technologies but just 2012 for wind.
- The Tax Relief, Unemployment Insurance Reauthorization, and Job Creation Act of 2010 (H.R. 4853) was signed in December 2010, and it extended the U.S. Treasury Grant program. Thus, projects in service or under construction by 2011 are eligible. The grant is equal to 30 percent of the basis of property for wind, closed and open loop biomass, geothermal energy, landfill gas, trash, qualified hydropower, marine and hydrokinetic, solar (except passive solar and solar for pool heating), fuel cells, and small wind turbine facilities (up to 100 kilowatts in capacity). The grant is 10 percent of the basis of property for geothermal heat pumps, micro turbines and certain combined heat and power facilities.
- The Renewable Production Incentive (REPI) provided a 2.2 cent per kWH incentive payment for new eligible facilities in operation before October 2016 and owned by local, state and tribal governments; municipal utilities; rural electric cooperatives and native corporations that have no tax liability. It is paid subject to availability of appropriations in each federal fiscal year of operation.

- Renewable portfolio standards or mandates in 37 states and the District of Columbia.
- Transmission expansion like California's new Tehachapi project, which takes electricity to market in Los Angeles and plans for the Texas Competitive Renewable Energy Zone (CREZ).
- Lower cost of silicon used in crystalline silicon PV installations.

Wind expanded by 3,593 MW between 2009 and 2010. Two states had wind capacity for the first time: Delaware with 2 MW and Maryland with 70 MW. In addition, wind expanded in 21 other states. The largest year to year increases were in Texas (573 MW), Illinois (350 MW), Minnesota (328 MW), Wyoming (311 MW) and Oregon (273 MW). Altogether, wind capacity has more than tripled from 11,329 MW in 2006 to 37,889 MW in 2010.

Solar has progressed rapidly from 2006, when it had central station capacity in just two states, California (402 MW) and Arizona (9 MW).[4] By 2010 it had expanded to a total of 15 states with capacity of 888 MW (Table 8). The largest states were California (460 MW), Nevada (137 MW), Florida (125 MW), Colorado (33 MW), and North Carolina (33 MW). Four states were new in 2010.

Data revisions

Residential solar energy consumption was revised downward for 1989-2009 to account for losses in roof top PV installations when converting from DC to AC electric power. Geothermal energy in the electric power sector was revised downward due to a misclassification of some geothermal facilities in Montana as geothermal when they were consuming waste heat. As a result, geothermal electric capacity was revised downward slightly for 2008 and 2009. Geothermal electric generation and consumption were revised downwards for 2008, while electric power sector other non-biogenic generation and consumption were revised upwards.

Notes

[1]See U.S. Environmental Protection Agency. http://www.epa.gov/otaq/fuels/renewablefuels/regulations.htm

[2]U.S. Energy Information Administration (EIA), Monthly Energy Review (MER) 2011, DOE/EIA-0035 (2011) (Washington, DC, March 2011), Table 10.3.

[3]U.S. Energy Information Administration, Electric Power Monthly (EPM) March 2011 (Washington, DC, March 2011), Table 1.1 and Table 1.1A.

[4]U.S. Energy Information Administration, Renewable Energy Annual 2007 (Washington DC, April 2009), Table 1.23.

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Table 1. U.S. energy consumption by energy source, 2006 - 2010

quadrillion Btu

Energy Source	2006	2007	2008	2009	2010
Total	99.624	101.362	99.270	94.485	97.892
Fossil Fuels	84.687	86.251	83.540	78.426	81.338
Coal	22.447	22.749	22.385	19.703	20.707
Coal Coke Net Imports	0.061	0.025	0.040	-0.023	-0.006
Natural Gas[1]	22.224	23.702	23.834	23.343	24.667
Petroleum[2]	39.955	39.774	37.280	35.403	35.970
Electricity Net Imports	0.063	0.106	0.113	0.116	0.064
Nuclear Electric Power	8.215	8.455	8.427	8.356	8.441
Renewable Energy	6.659	6.551	7.191	7.587	8.049
Biomass[3]	3.277	3.503	3.852	3.899	4.295
Biofuels[4]	0.771	0.991	1.372	1.567	1.855
Waste	0.397	0.413	0.436	0.452	0.454
Wood and Derived Fuels	2.109	2.098	2.044	1.881	1.986
Geothermal Energy	0.181	0.186	0.192	0.200	0.212
Hydroelectric Conventional	2.869	2.446	2.512	2.669	2.509
Solar Thermal/PV Energy	0.068	0.076	0.089	0.098	0.109
Wind Energy	0.264	0.341	0.546	0.721	0.924

[1]Includes supplemental gaseous fuels.
[2]Petroleum products supplied, including natural gas plant liquids and crude oil burned as fuel.
[3] Biomass includes: biofuels, waste (landfill gas, MSW biogenic, and other biomass), wood and wood derived fuels.
[4] Biodiesel primarily derived from soybean oil and ethanol primarily derived from corn.
PV = Photovoltaic.
Notes: Data revisions are discussed in the Highlights section.
Totals may not equal sum of components due to independent rounding.
Data for 2010 is preliminary.
Sources: Non-renewable energy: U.S. Energy Information Administration (EIA), Monthly Energy Review (MER) March 2011, DOE/EIA-0035 (2011/03) (Washington, DC, March 2011), Tables 1.3, 1.4a and 1.4b; Renewable Energy: Table 2 of this report.

Table 2. Renewable energy consumption by energy use sector and energy source, 2006 - 2010

quadrillion Btu

Sector and Source	2006	2007	2008	2009	2010
Total	6.659	6.551	7.191	7.587	8.049
Biomass	3.277	3.503	3.852	3.899	4.295
Biofuels	0.771	0.991	1.372	1.567	1.855
Biodiesel[1]	0.033	0.046	0.040	0.040	0.028
Ethanol[2]	0.453	0.569	0.800	0.910	1.088
Losses and Coproducts	0.285	0.377	0.532	0.617	0.738
Biodiesel Feedstock[3]	*	0.001	0.001	0.001	0.001
Ethanol Feedstock[4]	0.285	0.376	0.531	0.616	0.738
Waste	0.397	0.413	0.436	0.452	0.454
Landfill Gas	0.157	0.173	0.187	0.204	0.213
MSW Biogenic[5]	0.171	0.165	0.169	0.168	0.164
Other Biomass[6]	0.069	0.075	0.079	0.079	0.076
Wood and Derived Fuels[7]	2.109	2.098	2.044	1.881	1.986
Geothermal	0.181	0.186	0.192	0.200	0.212
Hydroelectric Conventional	2.869	2.446	2.512	2.669	2.509
Solar Thermal/PV	0.068	0.076	0.089	0.098	0.109
Wind	0.264	0.341	0.546	0.721	0.924
Residential	0.472	0.522	0.556	0.552	0.554
Biomass	0.390	0.430	0.450	0.430	0.420
Wood and Derived Fuels[8]	0.390	0.430	0.450	0.430	0.420
Geothermal	0.018	0.022	0.026	0.033	0.037
Solar Thermal/PV[9]	0.063	0.070	0.080	0.089	0.097
Commercial	0.117	0.118	0.125	0.129	0.127
Biomass	0.102	0.102	0.109	0.112	0.108
Biofuels	0.001	0.002	0.002	0.003	0.003
Ethanol[2]	0.001	0.002	0.002	0.003	0.003
Waste	0.036	0.031	0.034	0.036	0.034
Landfill Gas	0.004	0.003	0.003	0.003	0.003
MSW Biogenic[5]	0.026	0.021	0.026	0.028	0.026
Other Biomass[6]	0.007	0.007	0.005	0.005	0.005
Wood and Derived Fuels[7]	0.065	0.069	0.073	0.072	0.070
Geothermal	0.014	0.014	0.015	0.017	0.019
Hydroelectric Conventional	0.001	0.001	0.001	0.001	0.001
Solar Thermal/PV	-	-	*	-	*
Wind	-	-	-	*	*
Industrial	1.930	1.964	2.053	2.005	2.249
Biomass	1.897	1.944	2.031	1.982	2.229
Biofuels	0.295	0.387	0.544	0.630	0.754
Ethanol[2]	0.010	0.010	0.012	0.013	0.016
Losses and Coproducts	0.285	0.377	0.532	0.617	0.738
Biodiesel Feedstock[3]	*	0.001	0.001	0.001	0.001
Ethanol Feedstock[4]	0.285	0.376	0.531	0.616	0.738
Waste	0.130	0.144	0.144	0.154	0.168
Landfill Gas	0.081	0.093	0.093	0.104	0.118
MSW Biogenic[5]	0.006	0.006	0.003	0.004	0.004
Other Biomass[6]	0.043	0.046	0.048	0.047	0.046
Wood and Derived Fuels[7]	1.472	1.413	1.344	1.198	1.307
Geothermal	0.004	0.005	0.005	0.004	0.004
Hydroelectric Conventional	0.029	0.016	0.017	0.018	0.016
Solar Thermal/PV	-	-	-	-	*
Wind	-	-	-	-	-
Transportation	0.475	0.603	0.827	0.934	1.098
Biomass	0.475	0.603	0.827	0.934	1.098
Biofuels	0.475	0.603	0.827	0.934	1.098
Biodiesel[1]	0.033	0.046	0.040	0.040	0.028
Ethanol[2]	0.442	0.557	0.786	0.894	1.070
Electric Power[10]	3.665	3.345	3.630	3.967	4.022
Biomass	0.412	0.423	0.435	0.441	0.440
Waste	0.231	0.237	0.258	0.261	0.252
Landfill Gas	0.073	0.077	0.092	0.097	0.092
MSW Biogenic[5]	0.139	0.138	0.141	0.137	0.135
Other Biomass[6]	0.019	0.022	0.026	0.027	0.025
Wood and Derived Fuels[7]	0.182	0.186	0.177	0.180	0.189
Geothermal	0.145	0.145	0.146	0.146	0.153
Hydroelectric Conventional	2.839	2.430	2.495	2.650	2.492
Solar Thermal/PV	0.005	0.006	0.009	0.009	0.013
Wind	0.264	0.341	0.546	0.721	0.924

Table 2. Renewable energy consumption by energy use sector and energy source, 2006 - 2010 (cont)

[1]Biodiesel primarily derived from soybean oil.
[2]Ethanol primarily derived from corn minus denaturant.
[3]Losses and co-products from the production of biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of biodiesel.
[4]Losses and co-products from the production of fuel ethanol. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol.
[5]Includes paper and paper board, wood, food, leather, textiles and yard trimmings.
[6]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[7]Black liquor, and wood/wood waste solids and liquids.
[8]Wood and wood pellet fuels.
[9]Includes small amounts of distributed solar thermal and photovoltaic energy used in the commercial, industrial and electric power sectors.
[10]The electric power sector comprises electricity-only and combined-heat-power (CHP) plants within North American Classification System (NAICS) 22 category whose primary business is to sell electricity, or electricity and heat, to the public.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
* = Less than 500 billion Btu.
- = No data reported.
Notes: Totals may not equal sum of components due to independent rounding.
Data revisions are discussed in the Highlights section.
Energy consumption for the noncombustible renewable energy sources (geothermal, hydroelectric conventional, solar thermal, PV and wind) used in electricity generation is determined by mulitiplying generation times the fossil fuel equivalent heat rate. See U.S. Energy Information Administration (EIA), Monthly Energy Review (MER) 2011, DOE/EIA-0035 (2011) (Washington, DC, March 2011), Table A6.
Data for 2010 is preliminary.
Sources: Analysis conducted by U.S. Energy Information Administration (EIA), Office of Electricity, Coal, Nuclear and Renewables Analysis and specific sources described as follows. Residential: U.S. Energy Information Administration, Form EIA-457A/G, "Residential Energy Consumption Survey;" National Renewable Energy Laboratory; and U.S. Energy Information Administration, Form EIA-63-A, "Annual Solar Thermal Collector Manufacturers Survey" and Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey." Commercial: U.S. Energy Information Administration, Form EIA-906, "Power Plant Report," Form EIA-920, "Combined Heat and Power Plant Report," and Form EIA-923, "Power Plant Operations Report;" and National Renewable Energy Laboratory. Industrial: U.S. Energy Information Administration, Form EIA-846 (A, B, C) "Manufacturing Energy Consumption Survey," Form EIA-906, "Power Plant Report," Form EIA-920, "Combined Heat and Power Plant Report," and Form EIA-923, "Power Plant Operations Report;" and National Renewable Energy Laboratory;
U.S. Environmental Protection Agency, Landfill Methane Outreach Program estimates; and losses and coproducts from the production of biodiesel calculated as the difference between energy in feedstocks and production and from the production of ethanol calculated as the difference between energy feedstocks and production less denaturants. Biofuels for Transportation: Biodiesel: Consumption: 2006-2008: Calculated as biodiesel production plus net imports, 2009: January and February: EIA, Petroleum Supply Monthly, Table 1, data for refinery and blender net inputs of renewable fuels except ethanol. March 2009 and forward: Calculated as biodiesel production plus biodiesel net imports minus biodiesel stock change; Production: 2006: U.S. Department of Commerce, Bureau of Census, Current Industrial Reports, Fats and Oils - Production, Consumption and Stocks, data for soybean oil in methyl esters (biodiesel), 2007 and 2010: U.S. Department of Commerce, Bureau of Census, Current Industrial Reports, Fats and Oils - Production, Consumption and Stocks, data for fats and oils in methyl esters, 2008: U.S. Energy Information Administration, Form EIA-22S, "Supplement to the Monthly Biodiesel Production Survey," and 2009: U.S. Energy Information Administration, "Form EIA-22M, Monthly Biodiesel Production Survey;" Trade: USDA imports data for Harmonized Tariff Schedule code 3824.90.40.20, Fatty Esters Animal/ Vegetable Mixture, (for data through June 2010), and 3824.90.40.30, "Biodiesel/Mixes" (for data beginning July 2010); and exports data for Schedule B code 3824.90.40.00 (Fatty Substances Animal/ Vegetable Mixture; Stock Change: 2009: EIA Petroleum Supply Annual (PSA) various reports. Table 1 data for renewable fuels except ethanol and 2010: EIA, Petroleum Supply Monthly, Table 1 data for renewable fuels except ethanol; Balancing Item: Calculated as biodiesel consumption and biodiesel stock change minus biodiesel production and biodiesel net imports; and Ethanol: 2006-2008: EIA Petroleum Supply Annual various reports, Tables 1 and 15.
Calculated as motor gasoline blending components adustments (Table 1), plus finished motor gasoline adjustments (Table 1), plus fuel ethanol refinery and blender net inputs (Table 15). 2009: EIA Petroleum Supply Annual 2009, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments. 2010: EIA, Petroleum Supply Monthly, various reports, Table 1. Calculated as fuel ethanol refinery and blender net inputs minus fuel ethanol adjustments. Small amounts of ethanol consumption are distributed to the commercial and industrial sectors according to those sector`s shares of U.S. motor gasoline supplied. Electric Power: U.S. Energy Information Administration, Form EIA-906, "Power Plant Report," Form EIA-920, "Combined Heat and Power Plant Report," and Form EIA-923, "Power Plant Operations Report."

Table 3. Electricity net generation from renewable energy by energy use sector and energy source, 2006 - 2010

thousand kilowatthours

Sector/Source	2006	2007	2008	2009	2010
Total	385,771,908	352,747,486	380,932,388	417,723,797	425,195,509
Biomass	54,860,621	55,538,578	55,033,612	54,492,734	56,531,478
Waste	16,098,525	16,524,554	17,733,759	18,442,596	18,556,549
Landfill Gas	5,677,040	6,157,750	7,156,340	7,924,211	7,931,890
MSW Biogenic[1]	8,477,571	8,303,838	8,096,801	8,057,613	8,167,446
Other Biomass[2]	1,943,913	2,062,966	2,480,617	2,460,771	2,457,212
Wood and Derived Fuels[3]	38,762,096	39,014,024	37,299,853	36,050,138	37,974,929
Geothermal	14,568,029	14,637,213	14,839,977	15,008,658	15,666,388
Hydroelectric Conventional	289,246,416	247,509,974	254,831,385	273,445,094	257,051,672
Solar Thermal/PV	507,706	611,793	864,315	891,179	1,299,193
Wind	26,589,137	34,449,927	55,363,100	73,886,132	94,646,778
Commercial	1,712,691	1,691,439	1,614,986	1,839,466	1,839,396
Biomass	1,619,245	1,614,160	1,554,948	1,768,350	1,744,753
Waste	1,598,646	1,598,799	1,533,645	1,748,284	1,723,313
Landfill Gas	172,590	202,547	233,636	317,508	325,254
MSW Biogenic[1]	955,910	962,496	910,908	1,044,576	1,001,160
Other Biomass[2]	470,146	433,756	389,101	386,200	396,900
Wood and Derived Fuels[3]	20,599	15,361	21,303	20,066	21,440
Hydroelectric Conventional	93,446	77,279	59,957	70,866	92,389
Solar Thermal/PV	-	-	80	43	1,538
Wind	-	-	-	208	716
Industrial	31,871,511	30,508,807	29,138,172	27,900,961	28,852,646
Biomass	28,972,463	28,918,826	27,462,283	26,032,625	27,218,860
Waste	572,447	631,452	821,394	740,469	773,528
Landfill Gas	28,786	27,087	21,494	22,365	22,010
MSW Biogenic[1]	34,541	39,782	-	-	-
Other Biomass[2]	509,120	564,583	799,900	718,103	751,519
Wood and Derived Fuels[3]	28,400,016	28,287,374	26,640,889	25,292,157	26,445,332
Hydroelectric Conventional	2,899,048	1,589,981	1,675,889	1,868,336	1,631,520
Solar Thermal/PV	-	-	-	-	2,266
Electric Power[4]	352,187,707	320,547,239	350,179,231	387,983,371	394,503,467
Biomass	24,268,913	25,005,592	26,016,380	26,691,759	27,567,865
Waste	13,927,432	14,294,304	15,378,719	15,953,844	16,059,707
Landfill Gas	5,475,664	5,928,117	6,901,211	7,584,338	7,584,627
MSW Biogenic[1]	7,487,120	7,301,560	7,185,893	7,013,037	7,166,287
Other Biomass[2]	964,648	1,064,627	1,291,615	1,356,468	1,308,794
Wood and Derived Fuels[3]	10,341,481	10,711,288	10,637,661	10,737,915	11,508,157
Geothermal	14,568,029	14,637,213	14,839,977	15,008,658	15,666,388
Hydroelectric Conventional	286,253,922	245,842,714	253,095,539	271,505,893	255,327,763
Solar Thermal/PV	507,706	611,793	864,235	891,137	1,295,389
Wind	26,589,137	34,449,927	55,363,100	73,885,924	94,646,063

[1]Includes paper and paper board, wood, food, leather, textiles and yard trimmings.
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[3]Black liquor, and wood/wood waste solids and liquids.
[4]The electric power sector comprises electricity-only and combined-heat-power (CHP) plants within North American Classification System (NAICS) 22 category whose primary business is to sell electricity, or electricity and heat, to the public.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
- = No data reported.
Notes: Totals may not equal sum of components due to independent rounding.
Data revisions are discussed in the Highlights section.
Data for 2010 is preliminary.
Source: Electric Power: U.S. Energy Information Administration, Form EIA-923, "Power Plant Operations Report," and predecessor forms: Form EIA-906, "Power Plant Report," and Form EIA-920, "Combined Heat and Power Plant Report."

Table 4. U.S. electric net summer capacity, 2006 - 2010

megawatts

Source	2006	2007	2008	2009	2010
Total	986,215	994,888	1,010,171	1,025,400	1,040,771
Renewable Total	101,934	107,954	116,396	127,070	131,089
Biomass	10,100	10,839	11,050	11,256	11,377
Waste	3,727	4,134	4,186	4,317	4,421
Landfill Gas	978	1,319	1,429	1,418	1,512
MSW[1]	2,188	2,218	2,215	2,227	2,232
Other Biomass[2]	561	598	542	671	678
Wood and Derived Fuels[3]	6,372	6,704	6,864	6,939	6,956
Geothermal	2,274	2,214	2,229	2,382	2,385
Hydroelectric Conventional	77,821	77,885	77,930	78,518	78,550
Solar Thermal/PV	411	502	536	619	888
Wind	11,329	16,515	24,651	34,296	37,889
Nonrenewable Total	884,281	886,934	893,775	898,331	909,683

[1]Includes total capacity whose primary energy source is MSW.
[2]Agriculture byproducts/crops, sludge waste and other biomass solids, liquids and gases. Does not include tires.
[3]Black liquor, and wood/wood waste solids and liquids.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
Notes: Totals may not equal sum of components due to independent rounding.
Data revisions are discussed in the Highlights section.
Data for 2010 is preliminary.
Source: U.S. Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

Table 5. Total renewable net generation by energy source and State, 2009

thousand kilowatthours

		NonHydroelectric							
		Biomass							
		Waste							
State	Hydroelectric Conventional	Landfill Gas/MSW Biogenic[1]	Other Biomass[2]	Wood and Derived Fuels[3]	Geothermal	Solar Thermal/ PV	Wind	Total	Total
Alabama	12,535,373	-	14,482	3,035,375	-	-	-	3,049,857	15,585,230
Alaska	1,323,744	-	6,511	-	-	-	7,027	13,538	1,337,283
Arizona	6,427,345	18,299	3,691	136,641	-	14,145	29,545	202,321	6,629,666
Arkansas	4,192,706	34,371	22,679	1,528,501	-	-	-	1,585,550	5,778,256
California	27,888,036	1,841,859	625,802	3,732,016	12,852,783	647,390	5,839,813	25,539,662	53,427,698
Colorado	1,885,724	17,463	38,701	388	-	25,585	3,163,836	3,245,973	5,131,697
Connecticut	509,546	758,108	-	622	-	-	-	758,730	1,268,276
Delaware	-	125,611	-	-	-	-	-	125,611	125,611
District of Columbia	-	-	-	-	-	-	-	-	-
Florida	208,202	1,846,339	530,398	1,954,125	-	9,470	-	4,340,332	4,548,534
Georgia	3,259,683	50,719	28,881	2,745,569	-	-	-	2,825,170	6,084,853
Hawaii	112,649	180,067	104,359	-	167,591	1,390	251,427	704,835	817,483
Idaho	10,434,264	-	-	477,948	75,950	-	313,418	867,316	11,301,580
Illinois	136,380	709,136	607	461	-	16	2,819,532	3,529,752	3,666,132
Indiana	503,470	302,644	-	-	-	-	1,403,192	1,705,836	2,209,306
Iowa	971,165	93,417	74,471	194	-	-	7,420,520	7,588,601	8,559,766
Kansas	12,798	-	-	-	-	-	2,863,267	2,863,267	2,876,065
Kentucky	3,317,641	96,393	4,481	262,660	-	-	-	363,534	3,681,175
Louisiana	1,236,351	-	67,186	2,296,773	-	-	-	2,363,959	3,600,310
Maine	4,211,679	232,254	40,618	3,366,750	-	-	298,623	3,938,244	8,149,923
Maryland	1,888,769	375,722	-	175,057	-	-	-	550,780	2,439,549
Massachusetts	1,201,076	1,103,995	3,880	115,384	-	43	5,956	1,229,257	2,430,334
Michigan	1,371,926	828,878	5,133	1,489,001	-	-	300,172	2,623,184	3,995,110
Minnesota	809,088	384,238	503,066	796,331	-	-	5,053,022	6,736,657	7,545,745
Mississippi	-	-	6,960	1,417,319	-	-	-	1,424,279	1,424,279
Missouri	1,816,693	49,808	23,530	2,090	-	-	499,377	574,805	2,391,498
Montana	9,505,940	-	-	94,642	-	-	820,924	915,566	10,421,506
Nebraska	433,690	47,449	18,746	-	-	-	382,634	448,829	882,519
Nevada	2,460,595	-	-	890	1,633,213	174,309	-	1,808,412	4,269,007
New Hampshire	1,680,492	151,278	-	984,181	-	-	62,477	1,197,936	2,878,428
New Jersey	32,081	924,671	3,535	-	-	10,707	20,918	959,831	991,912
New Mexico	270,963	-	33,664	-	-	-	1,546,718	1,580,382	1,851,345
New York	27,615,106	1,664,816	-	535,853	-	-	2,266,339	4,467,008	32,082,114
North Carolina	5,171,257	120,191	11,300	1,757,350	-	4,563	-	1,893,404	7,064,660
North Dakota	1,475,251	-	11,572	-	-	-	2,997,530	3,009,102	4,484,353
Ohio	527,746	198,144	11,467	409,685	-	-	14,114	633,410	1,161,156
Oklahoma	3,552,573	-	163,010	68,064	-	-	2,698,199	2,929,273	6,481,846
Oregon	33,033.513	128,332	-2,759	674,381	-	-	3,469,714	4,272,427	37,305,940
Pennsylvania	2,682,866	1,576,577	-	694,242	-	3,562	1,074,788	3,351,928	6,034,794
Rhode island	4,736	144,600	-	-	-	-	-	144,600	149,336
South Carolina	2,332,005	137,254	5,775	1,610,717	-	-	-	1,747,971	4,079,977
South Dakota	4,432,451	-	7,409	-	-	-	420,981	426,756	4,859,207
Tennessee	10,211,962	28,891	30,816	862,421	-	-	51,747	950,468	11,162,430
Texas	1,028,657	398,259	-	649,298	-	-	20,026,103	21,104,476	22,133,134
Utah	835,257	47,878	-	-	279,121	-	159,537	486,536	1,321,793
Vermont	1,485,825	24,190	14,396	393,266	-	-	11,589	429,045	1,914,871
Virginia	1,478,630	694,807	10,954	1,708,316	-	-	-	2,417,519	3,896,149
Washington	72,932,704	156,068	-149	1,305,162	-	-	3,572,486	5,044,670	77,977,375
West Virginia	1,645,927	-	30,079	-689	-	-	742,439	741,602	2,387,529
Wisconsin	1,393,988	489,095	-	769,156	-	-	1,051,965	2,340,295	3,734,284
Wyoming	966,572	-	2,460,771	-	-	-	2,226,205	2,226,205	3,192,777
U.S. Total	273,445,094	15,981,824		36,050,138	15,008,658	891,179	73,886,132	144,278,703	417,723,797

[1]Includes landfill gas and MSW biogenic (paper and paper board, wood, food, leather, textiles and yard trimmings).
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[3]Black liquor, and wood/wood waste solids and liquids.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
- = No data reported.
Note: Totals may not equal sum of components due to independent rounding.
Source: U.S. Energy Information Administration, Form EIA-923, "Power Plant Operations Report."

Table 6. Total renewable net generation by energy source and State, 2010

thousand kilowatthours

		NonHydroelectric							
		Biomass							
		Waste							
State	Hydroelectric Conventional	Landfill Gas/MSW Biogenic[1]	Other Biomass[2]	Wood and Derived Fuels[3]	Geothermal	Solar Thermal/ PV	Wind	Total	Total
Alabama	9,089,115	-	10,783	3,045,537	-	-	-	3,056,320	12,145,435
Alaska	1,323,961	-	6,785	-	-	-	13,111	19,896	1,343,857
Arizona	6,625,861	17,757	3,593	139,826	-	16,819	118,777	296,772	6,922,633
Arkansas	3,760,909	35,031	30,735	1,571,554	-	-	-	1,637,320	5,398,229
California	33,875,970	1,905,954	655,058	3,781,916	12,958,100	823,479	6,614,069	26,738,576	60,614,546
Colorado	1,745,752	18,427	38,640	1,417	-	33,055	3,429,852	3,521,391	5,267,142
Connecticut	434,552	766,365	-	824	-	-	-	767,189	1,201,741
Delaware	-	131,415	-	-	-	-	2,410	133,824	133,824
District of Columbia	-	-	-	-	-	-	-	-	-
Florida	181,352	1,800,419	521,197	2,057,625	-	98,880	-	4,478,121	4,659,473
Georgia	3,319,445	47,026	44,434	3,032,201	-	-	-	3,123,660	6,443,105
Hawaii	85,640	174,445	101,772	-	200,595	1,634	239,329	717,776	803,416
Idaho	9,161,484	-	-	477,841	93,782	-	485,177	1,056,800	10,218,284
Illinois	108,105	775,035	701	120	-	20,395	4,492,034	5,288,285	5,396,390
Indiana	443,116	295,449	-	-	-	-	2,929,862	3,225,311	3,668,428
Iowa	831,258	94,503	90,576	525	-	-	8,798,764	8,984,368	9,815,626
Kansas	10,901	-	-	-	-	-	3,455,662	3,455,662	3,466,563
Kentucky	2,604,602	97,994	2,026	354,722	-	-	-	454,743	3,059,345
Louisiana	1,108,794	-	72,824	2,295,157	-	-	-	2,367,982	3,476,776
Maine	3,664,087	239,657	48,937	3,748,356	-	-	485,736	4,522,685	8,186,772
Maryland	1,670,294	407,582	-	165,342	-	-	1,494	574,418	2,244,712
Massachusetts	1,033,682	1,141,871	3,344	119,664	-	285	17,151	1,282,315	2,315,997
Michigan	1,265,452	793,874	6,845	1,660,434	-	-	351,575	2,812,728	4,078,180
Minnesota	752,186	416,515	458,943	909,544	-	-	5,231,294	7,016,296	7,768,483
Mississippi	-	-	6,924	1,512,318	-	-	-	1,519,242	1,519,242
Missouri	1,528,405	34,546	5,546	2,029	-	-	927,340	969,461	2,497,867
Montana	9,230,160	-	-	97,229	-	-	934,524	1,031,753	10,261,913
Nebraska	449,449	48,309	18,105	-	-	-	432,353	498,766	948,215
Nevada	2,146,040	-	-	-	2,139,553	222,280	-	2,361,833	4,507,873
New Hampshire	1,482,429	166,386	128	1,027,255	-	-	62,548	1,256,317	2,738,746
New Jersey	29,617	918,942	3,850	-	-	28,422	20,682	971,897	1,001,514
New Mexico	252,946	-	33,011	-	-	3,930	1,826,325	1,863,266	2,116,212
New York	25,200,929	1,649,203	-	576,330	-	-	2,749,971	4,975,505	30,176,433
North Carolina	4,670,188	133,536	10,520	1,861,369	-	12,962	-	2,018,387	6,688,576
North Dakota	2,042,118	-	12,137	-	-	-	4,175,454	4,187,591	6,229,709
Ohio	459,254	203,847	7,687	402,102	-	26,607	14,900	655,143	1,114,397
Oklahoma	2,894,256	-	160,231	68,443	-	-	3,700,648	3,929,322	6,823,578
Oregon	30,288,407	132,830	-	816,548	-	-	3,918,839	4,868,217	35,156,624
Pennsylvania	2,340,528	1,546,160	3,895	697,240	-	8,222	1,846,003	4,101,519	6,442,046
Rhode Island	4,224	140,641	-	-	-	-	-	140,641	144,865
South Carolina	2,372,460	122,327	-	1,669,355	-	-	-	1,791,682	4,164,142
South Dakota	5,765,187	-	-	-	-	-	849,437	849,437	6,614,624
Tennessee	8,305,845	30,023	10,628	902,209	-	-	40,570	983,431	9,289,276
Texas	1,032,466	415,826	31,696	623,036	-	2,223	26,132,202	27,204,983	28,237,449
Utah	791,899	31,554	-	-	274,358	-	453,241	759,154	1,551,053
Vermont	1,260,683	24,700	-	438,119	-	-	13,892	476,711	1,737,394
Virginia	1,529,502	666,294	13,589	1,445,221	-	-	-	2,125,105	3,654,606
Washington	66,112,384	163,053	11,378	1,654,067	-	-	4,652,328	6,480,826	72,593,209
West virginia	1,355,420	-	-	-	-	-	939,172	939,172	2,294,592
Wisconsin	1,392,318	511,840	30,691	819,457	-	-	1,092,695	2,454,683	3,847,001
Wyoming	1,018,036	-	-	-	-	-	3,197,356	3,197,356	4,215,393
U.S. Total	257,051,672	16,099,336	2,457,212	37,974,929	15,666,388	1,299,193	94,646,778	168,143,838	425,195,509

[1]Includes landfill gas and MSW biogenic (paper and paper board, wood, food, leather, textiles and yard trimmings).
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[3]Black liquor, and wood/wood waste solids and liquids.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
- = No data reported.
Notes: Totals may not equal sum of components due to independent rounding.
Data for 2010 is preliminary.
Source: U.S. Energy Information Administration, Form EIA-923, "Power Plant Operations Report."

Table 7. Total renewable net summer capacity by energy source and State, 2009

megawatts

		NonHydroelectric							
		Biomass							
		Waste							
State	Hydroelectric Conventional	Landfill Gas/ MSW[1]	Other Biomass[2]	Wood and Derived Fuels[3]	Geothermal	Solar Thermal/ PV	Wind	Total	Total
Alabama	3,272	-	-	591	-	-	-	591	3,863
Alaska	414	-	-	-	-	-	7	7	422
Arizona	2,720	4	-	29	-	11	63	106	2,826
Arkansas	1,337	5	6	312	-	-	-	323	1,659
California	10,144	306	96	646	2,004	450	2,650	6,152	16,295
Colorado	666	3	10	-	-	14	1,238	1,265	1,931
Connecticut	122	166	-	-	-	-	-	166	287
Delaware	-	7	-	-	-	-	-	7	7
District of Columbia	-	-	-	-	-	-	-	-	-
Florida	55	492	171	351	-	25	-	1,038	1,093
Georgia	2,046	15	-	587	-	-	-	602	2,648
Hawaii	24	60	162	-	31	1	64	318	341
Idaho	2,682	-	5	68	7	-	146	227	2,909
Illinois	34	139	-	-	-	9	1,596	1,744	1,777
Indiana	60	45	-	-	-	-	1,037	1,081	1,141
Iowa	144	11	3	-	-	-	3,352	3,367	3,511
Kansas	3	-	-	-	-	-	1,011	1,011	1,014
Kentucky	824	17	-	52	-	-	-	69	893
Louisiana	192	-	14	373	-	-	-	387	579
Maine	738	57	36	606	-	-	170	868	1,606
Maryland	590	135	-	3	-	-	-	137	727
Massachusetts	261	264	9	26	-	s	5	304	564
Michigan	251	168	-	230	-	-	143	541	792
Minnesota	194	132	75	177	-	-	1,615	1,999	2,192
Mississippi	-	-	-	229	-	-	-	229	229
Missouri	564	8	-	-	-	-	309	316	880
Montana	2,692	-	-	17	-	-	369	386	3,078
Nebraska	278	6	5	-	-	-	105	115	393
Nevada	1,051	-	-	-	306	89	-	395	1,446
New Hampshire	498	29	-	140	-	-	24	193	691
New Jersey	6	175	20	-	-	13	8	215	221
New Mexico	82	-	6	-	-	-	597	604	686
New York	4,310	344	-	86	-	-	1,274	1,704	6,013
North Carolina	1,952	20	-	318	-	3	-	342	2,294
North Dakota	508	-	10	-	-	-	1,202	1,212	1,720
Ohio	101	41	1	65	-	-	7	115	216
Oklahoma	854	16	-	58	-	-	1,130	1,203	2,057
Oregon	8,430	26	3	241	-	-	1,659	1,929	10,359
Pennsylvania	747	419	-	108	-	2	696	1,224	1,971
Rhode Island	3	24	-	-	-	-	-	24	26
South Carolina	1,337	23	-	200	-	-	-	244	1,580
South Dakota	1,594	-	-	-	-	-	320	320	1,914
Tennessee	2,614	8	2	165	-	-	29	203	2,817
Texas	689	79	28	180	-	-	9,378	9,665	10,354
Utah	256	9	-	-	34	-	222	265	521
Vermont	322	3	-	76	-	-	5	84	406
Virginia	716	278	-	409	-	-	-	687	1,403
Washington	21,088	41	-	369	-	1	2,006	2,416	23,50
West Virginia	264	-	-	-	-	-	330	330	594
Wisconsin	492	72	11	208	-	-	430	720	1,212
Wyoming	304	-	-	-	-	-	1,104	1,104	1,408
U.S. Total	78,518	3,645	671	6,939	2,382	619	34,296	48,552	127,070

[1]Total capacity whose primary energy source is landfill gas or MSW.
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[3]Black liquor, and wood/wood waste solids and liquids.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
s = Less than 500 kilowatts.
- = No data reported.
Note: Totals may not equal sum of components due to independent rounding.
Source: U.S. Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

Table 8. Total renewable net summer capacity by energy source and State, 2010

megawatts

		NonHydroelectric							
		Biomass							
		Waste		Wood and Derived Fuels[3]					
State	Hydroelectric Conventional	Landfill Gas/ MSW[1]	Other Biomass[2]		Geothermal	Solar Thermal/ PV	Wind	Total	Total
Alabama	3,272	-	-	591	-	-	-	591	3,863
Alaska	414	-	-	-	-	-	7	7	422
Arizona	2,720	4	-	29	-	16	63	111	2,831
Arkansas	1,337	9	6	312	-	-	-	327	1,664
California	10,146	325	96	646	2,004	460	2,789	6,319	16,465
Colorado	666	3	10	-	-	33	1,289	1,335	2,001
Connecticut	122	166	-	-	-	-	-	166	287
Delaware	-	7	-	-	-	-	2	9	9
District of Columbia	-	-	-	-	-	-	-	-	-
Florida	55	492	171	351	-	125	-	1,138	1,193
Georgia	2,050	15	4	604	-	-	-	623	2,673
Hawaii	24	60	162	-	31	1	62	315	339
Idaho	2,698	-	6	68	10	-	335	420	3,118
Illinois	34	142	-	-	-	9	1,946	2,097	2,131
Indiana	60	49	-	-	-	-	1,237	1,287	1,346
Iowa	144	11	3	-	-	-	3,352	3,367	3,511
Kansas	3	6	-	-	-	-	1,024	1,029	1,032
Kentucky	824	17	-	52	-	-	-	69	893
Louisiana	192	-	14	373	-	-	-	387	579
Maine	738	57	36	606	-	-	261	960	1,697
Maryland	590	135	-	3	-	-	70	207	797
Massachusetts	261	264	9	26	-	s	11	310	571
Michigan	251	170	-	230	-	-	163	563	814
Minnesota	194	137	75	177	-	-	1,943	2,331	2,525
Mississippi	-	-	-	229	-	-	-	229	229
Missouri	564	8	-	-	-	-	459	466	1,030
Montana	2,712	-	-	17	-	-	379	397	3,109
Nebraska	278	6	5	-	-	-	160	171	449
Nevada	1,051	-	-	-	306	137	-	443	1,494
New Hampshire	498	29	-	140	-	-	24	193	691
New Jersey	6	175	20	-	-	15	8	217	223
New Mexico	82	-	6	-	-	30	597	634	716
New York	4,313	348	-	86	-	-	1,274	1,708	6,021
North Carolina	1,952	25	-	318	-	33	-	376	2,328
North Dakota	508	-	10	-	-	-	1,423	1,433	1,941
Ohio	101	46	1	65	-	12	7	132	233
Oklahoma	858	16	-	58	-	-	1,282	1,355	2,213
Oregon	8,430	31	3	241	-	-	1,932	2,208	10,637
Pennsylvania	747	427	-	108	-	3	696	1,234	1,980
Rhode Island	3	24	-	-	-	-	-	24	26
South Carolina	1,337	27	-	220	-	-	-	248	1,584
South Dakota	1,594	-	-	-	-	-	419	419	2,013
Tennessee	2,614	8	2	165	-	-	29	203	2,817
Texas	689	87	28	180	-	14	9,951	10,259	10,948
Utah	256	9	-	-	34	-	222	265	521
Vermont	322	3	-	76	-	-	5	84	406
Virginia	689	290	-	409	-	-	-	699	1,388
Washington	21,095	41	-	369	-	1	2,196	2,607	23,702
West Virginia	264	-	-	-	-	-	431	431	694
Wisconsin	492	77	12	208	-	-	430	725	1,217
Wyoming	305	-	-	-	-	-	1,415	1,415	1,719
U.S. Total	78,550	3,743	678	6,956	2,385	888	37,889	52,539	131,089

[1]Total capacity whose primary energy source is landfill gas or MSW.
[2]Agriculture byproducts/crops, sludge waste, and other biomass solids, liquids and gases.
[3]Black liquor, and wood/wood waste solids and liquids.
MSW = Municipal Solid Waste.
PV = Photovoltaic.
s = Less than 500 kilowatts.
- = No data reported.
Notes: Totals may not equal sum of components due to independent rounding.
Data for 2010 is preliminary.
Source: U.S. Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

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