

# **Renewable Energy Annual 1999**

## **With Data For 1998**

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This report is available on the Web at:  
<http://www.eia.doe.gov/fuelrenewable.html>.

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# Preface

This is the fifth annual report published by the Energy Information Administration (EIA) which presents information on U.S. renewable energy consumption, capacity, and electricity generation; U.S. solar thermal and photovoltaic collector manufacturing activities; and U.S. geothermal heat pump manufacturing activities. It updates and provides more detail on renewable energy information than what's published in the Energy Information Administration's (EIA) *Annual Energy Review 1998*.

The renewable energy resources included in the report are: biomass (wood, wood waste, municipal solid waste, ethanol, and biodiesel); geothermal; wind; solar (solar thermal and photovoltaic); and hydropower. However, hydropower is also regarded as a "conventional" energy source because it has furnished a significant amount of electricity for more than a century. Therefore, the contribution of hydropower to total renewable energy consumption is discussed, but not in great detail. Since EIA collects data only on terrestrial (land-based) solar energy systems, satellite and military applications are not included in this report.

The first chapter provides an overview of renewable energy use and capability from 1994 through 1998. It discusses renewable energy consumption, and electric capacity and generation data. Chapter 2 presents current (through 1998) information on the United States

solar energy industry. EIA collected this information on the Form EIA-63 A, "Annual Survey of Solar Collector Manufacturers," and the Form EIA-63 B, "Annual Survey of Photovoltaic Module/Cell Manufacturers." Chapter 3 presents information on the United States geothermal heat pump industry. This information was collected on the Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey," and covers the calendar years, 1994 through 1998.

Appendix A describes EIA surveys that include information on renewable energy sources. Appendix B discusses renewable energy data and its limitations. Appendix C presents information on renewable electric generation and capability by state for 1990 through 1998. Appendix D provides a list of Internet addresses for web sites that include renewable energy information. Appendix E lists State agencies that provide energy information, including information on renewable energy. A glossary of renewable energy terms is also included.

The Energy Information Administration was established formally by the Department of Energy Organization Act of 1977 (Public Law 95-91). The legislation requires EIA to carry out a comprehensive, timely, and accurate program of energy data collection and analysis. It also vests EIA with considerable independence in fulfilling its mission.

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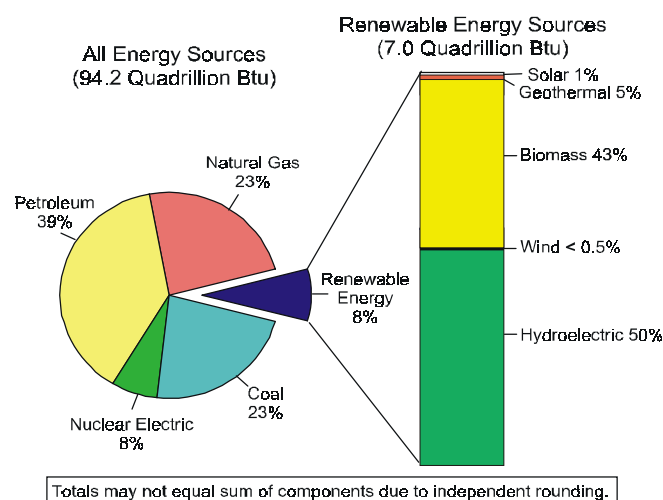
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# Highlights

## Renewable Energy Consumption

Renewable energy consumption declined 4 percent between 1997 and 1998 to 7 quadrillion Btu, accounting for almost 8 percent of total U.S. energy consumption (Figure H1 and Table H1). Hydroelectric power and biomass continued to dominate the renewable energy market, with 50 percent and 43 percent shares, respectively.

**Figure H1. U.S. Energy Consumption by Source, 1998**



Sources: Energy Information Administration (EIA), *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 1.3. **1998 Renewable Energy:** Consumption values based on the sum of electricity consumption from EIA, *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2 (Washington, DC, December 1999), and non-electricity consumption based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels.

Most of the decline was due to a drop in consumption for hydroelectric power. Despite the decline in overall renewable energy consumption, geothermal and biomass energy consumption increased in 1998. Excluding

hydroelectric power, renewable energy consumption (including net imports of geothermal energy) rose 2.2 percent in 1998.

Although generation from wind declined to its lowest level since 1992, wind electricity capacity rose 7.5 percent in 1998. This reflects the beginning of a sizable increase in wind energy projects which became commercial largely in 1999.

Although biomass energy consumption rose overall in 1998, consumption for electricity declined, while consumption for non-electric applications (mainly industrial process heat) rose. Industrial biomass energy consumption has risen each year since 1991, reflecting its position as a by-product of paper and forest product industry products.

Consumption of renewable energy for electricity generation dropped 8 percent in 1998, while renewable generating capacity held steady at its 1998 level, declining only 0.3 percent.

The five leading States for renewable electricity generation are: Washington, California, Oregon, New York, and Alabama. These States have considerable hydroelectric generation. Combined, they accounted for 60 percent of renewable electricity generated and sold in the United States in 1998.

## Solar Manufacturing Activities

Total shipments of solar thermal collectors<sup>1</sup> were nearly 8 million square feet in 1998. This represented a decrease of 5 percent from 1997. Low-temperature solar collector represented 94 percent of total shipments while medium-temperature collectors were responsible for almost 6 percent. High-temperature collectors are used by utilities and nonutilities in experimental grid electricity programs and represent less than 1 percent of total shipments.

<sup>1</sup> Solar Thermal collectors are divided into three categories of low, medium, and high-temperature collectors. The type is usually determined by the level of heat generated.



**Table H1. U.S. Renewable Energy Consumption by Energy Source, 1994-1998**  
(Quadrillion Btu)

Energy Source	1994	1995	1996	1997	1998
Conventional Hydroelectric Power <sup>a</sup> .....	R2.971	R3.474	R3.913	R3.922	3.540
Geothermal Energy <sup>b</sup> .....	0.395	0.339	0.352	R0.328	0.334
Biomass <sup>c</sup> .....	R2.917	R3.048	R3.108	R2.981	3.052
Solar Energy <sup>d</sup> .....	0.072	0.073	0.075	0.074	0.074
Wind Energy .....	0.036	0.033	0.035	R0.034	0.031
<b>Total Renewable Energy .....</b>	<b>R6.390</b>	<b>R6.968</b>	<b>R7.483</b>	<b>R7.339</b>	<b>7.032</b>

<sup>a</sup>Hydroelectricity generated by pumped storage is not included in renewable energy.

<sup>b</sup>Includes grid-connected electricity, geothermal heat pump and direct use energy.

<sup>c</sup>Includes wood, wood waste, peat, wood sludge, municipal solid waste, agricultural waste, straw, tires, landfill gases, fish oils, and/or other waste.

<sup>d</sup>Includes solar thermal and photovoltaic.

R = Revised data.

Notes: See Appendix B, "Renewable Data Limitations," for a detailed explanation of data issues. Totals may not equal sum of components due to independent rounding.

Sources: **1994-1996:** Energy Information Administration (EIA), *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 1.3. **1997 and 1998:** Consumption values based on the sum of electricity consumption from EIA, *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(97)/2 (Washington, DC, December 1999), and non-electricity consumption based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels.

The value of total shipments was \$28.4 million in 1998, a decrease of 2 percent from 1997. The average price for total shipments increased 3 percent, from \$3.56 per square foot in 1997 to \$3.66 per square foot in 1998. The residential sector was the largest market for solar collectors, totaling over 7 million square feet, or 92 percent of total shipments. The commercial sector was the second largest, with 0.5 million square feet (almost 7 percent). The largest end use for solar collectors shipped in 1998 was for heating swimming pools, consuming 7 million square feet (93 percent) of total shipments.

Photovoltaic (PV) cells and modules shipments<sup>2</sup> reached 51 peak megawatts in 1998, a 9-percent increase from the 1997 total of 46 peak megawatts. This was a substantially smaller increase than the 31-percent increase experienced from 1996 to 1997. Module shipments accounted for 32 peak megawatts, while cell shipments accounted for 18 peak megawatts. This change in module shipments represented a decrease of 4 percent since 1997, compared with a 44-percent gain in cell shipments. Exports totaled 35 peak megawatts, representing 70 percent of total shipments as compared

to 73 percent in 1997, and imports totaled almost 2 peak megawatts.

Crystalline silicon cells<sup>3</sup> and modules continued to dominate the PV industry in 1998, accounting for 93 percent of total shipments. Thin-film shipments grew 76 percent to more than 3 peak megawatts in 1998—up from 2 peak megawatts in 1997—representing 7 percent of total shipments.

The total value of photovoltaic module and cell shipments grew almost 6 percent to \$185 million in 1998 from \$175 million in 1997. The average price for modules (dollars per peak watt) decreased 5 percent, from \$4.16 in 1997 to \$3.94 in 1998. For cells, the average price increased 13 percent, from \$2.78 in 1997 to \$3.15 in 1998. The rise in cell prices was a result of a stronger demand for cells in the marketplace.

The residential sector replaced the industrial sector as the largest market for PV cells and modules, growing 45 percent from 11 peak megawatts in 1997 to 16 peak megawatts in 1998. The industrial sector grew 8 percent from 12 peak megawatts in 1997 to 13 peak megawatts

<sup>2</sup> A photovoltaic cell is an integrated device consisting of layers of semiconductor materials and electric contacts. Such a device is capable of converting incident light directly into electricity. A module is an integrated assembly of interconnected photovoltaic cells.

<sup>3</sup> Photovoltaic (PV) components are divided into three categories by product type: (1) crystalline silicon cells and modules which include single-crystal, cast silicon, and ribbon silicon; (2) thin-film cells and modules made from a number of layers of photosensitive materials such as amorphous silicon; and (3) concentrator cells and modules in which a lens is used to gather and converge sunlight onto the cell or module surface.

in 1998. The commercial sector grew 4 percent. Export shipments increased 5 percent from 34 peak megawatts in 1997 to 35 peak megawatts in 1998. The use of photovoltaics for electricity generation had 45 percent of the market in 1998; this was followed by communications and transportation which were also important.

## **Geothermal Heat Pump Manufacturing Activities**

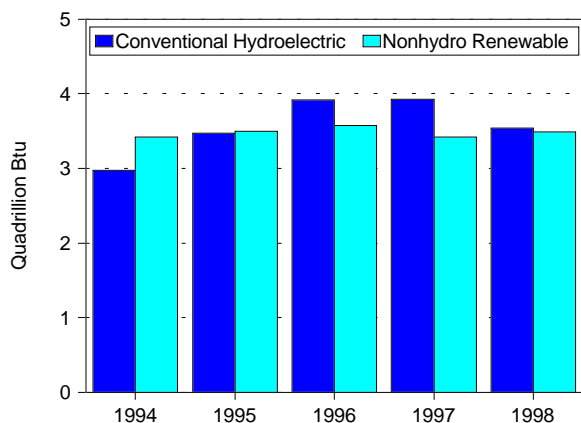
Manufacturers shipped 38,266 geothermal heat pumps in 1998, an increase of 2 percent from the 1997 total of 37,434. The total rated capacity of heat pumps shipped in 1998 was 141,446 tons, almost equal to the 1997 total of 141,556 tons.

# 1. U.S. Renewable Energy Consumption

## Overview

Renewable energy consumption amounted to 7.0 quads in 1998, a 4.2-percent decline from 1997 (Table 1). Renewable energy's contribution to the total energy picture also dropped, from 7.8 percent in 1997 to 7.5 percent in 1998. Conventional hydroelectric power supplied half of renewable energy consumed, followed by biomass with 43 percent (Figure 1). Renewable energy has grown at a 2.4-percent annualized rate since 1994.

**Figure 1. Renewable Energy Consumption by Source, 1994-1998**



Sources: **1994-1996:** Energy Information Administration (EIA), *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 1.3. **1997 and 1998:** Consumption values based on the sum of electricity consumption from EIA, *Electric Power Annual 1998, Volume II*, DOE/EIA-00348(98)/2 (Washington, DC, December 1999), and non-electricity consumption based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels.

Most of the decline was due to a drop in consumption for hydroelectric power from the electric utility sector, which was nearly 10 percent lower in 1998 than in 1997 (Table 2). Consumption in other sectors remained largely unchanged. Industrial sector consumption rose 1.6

percent, largely as a result of a 2.9-percent increase in biomass energy. Excluding hydroelectric power, renewable energy consumption (including net imports of geothermal energy) rose 2.2 percent in 1998.

Consumption of renewable energy for electricity generation dropped 8.1 percent in 1998, following the trend in utility hydroelectric power (Table 3). Renewable electricity generation declined by a slightly greater amount—8.4 percent—to 418 billion kilowatthours (Table 4). Utility generation was down 9.4 percent, while nonutility electricity generation dropped only 5.2 percent. This decline masks widely varying trends among sources for nonutility generators, ranging from an 18.3-percent decline in hydroelectric power to a 5.3-percent increase in geothermal generation. Consumption from net electricity imports decreased about 6 percent from its 1997 level.

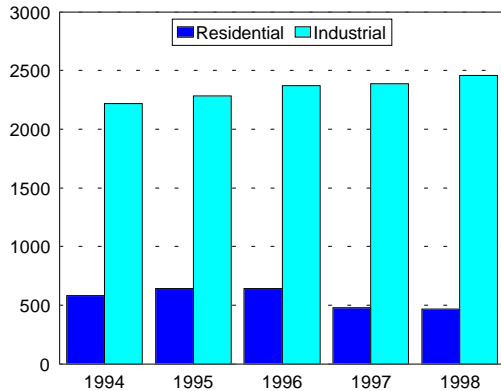
Renewable generating capacity held steady at its 1998 level, declining only 0.3 percent (Table 5). Wind and solar/PV capacity increased strongly during 1999, while biomass and hydroelectric power capacity declined. The increase in solar/PV capacity was the result of a 30-MW installation coming on line in Florida during 1998. The start-up of the 107-MW Lake Benton, MN wind farm led the jump in wind energy capacity.

Despite the decline in overall renewable energy consumption, geothermal and biomass energy consumption increased in 1998. Estimated biomass consumption increased to 3.1 quads (Table 6).<sup>1</sup> All of the increase was in the Industrial sector (Figure 2). Most of this gain occurred in the South, where paper plants and forest product manufacturing plants produce large amounts of biomass waste products which are used for fuel. Estimated biomass energy consumption in the residential sector declined slightly in 1998.

Within biomass, alcohol fuels (ethanol) grew most rapidly, reaching 0.105 quads. Virtually all ethanol is consumed as an oxygenate additive to conventional

<sup>1</sup> See "Non-Electric Renewable Energy Consumption" in Appendix B. Much of the biomass estimate is derived from sample surveys, making the level and change estimates described here only approximations of their true values.

**Figure 2. U.S. Biomass Energy Consumption by Major Sectors, 1994-1998**  
(Trillion Btu)



Source: Energy Information Administration, *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 10.3

unleaded gasoline. Waste energy grew 3.0 percent in 1998 to .554 quads, spurred by a 10.8-percent increase in landfill gas. This small category has grown at an annualized rate of 11.3 percent since 1994. Manufacturing waste energy consumption also grew comparatively rapidly, increasing 4.6 percent. Although experiencing the lowest percentage increase within biomass, wood energy's 2-percent growth to nearly 2.4 quads in 1998 indicates a growth in wood-related areas of the manufacturing sector. Further, the availability of wood energy, principally wood waste, is a function of industrial output. Thus, the opportunities for rapid growth in wood waste are more limited than in other areas of biomass.

Biomass provides most of the non-electric energy from renewable energy sources. Nearly 75 percent of non-electric renewable energy is derived from industrial biomass (Table 7). Whereas biomass consumption for electricity fell 2.6 percent in 1998, consumption of biomass for industrial process heat grew 4.7 percent. Though most renewable energy is consumed for producing electricity, substantial amounts are still consumed to produce non-electric energy—36 percent in 1998. Also, more than 62 percent of biomass energy was

consumed to produce process heat, the principal market for biomass energy.

## State Renewable Electricity Generation <sup>2</sup>

The five leading States for renewable electricity generation are: Washington, California, Oregon, New York, and Alabama. These States have considerable hydroelectric generation that when combined, accounted for 60 percent of renewable electricity generated and sold in the United States in 1998.<sup>3</sup> The leading States for total utility renewable generation are the same as for hydroelectric generation, except that Idaho replaces Alabama. This reflects the fact that utilities have long had sizable hydroelectric generating operations. California also dominated utility generation from geothermal (97 percent), solar (95 percent), and wind (86 percent), although its utility solar and wind generation is minimal. All but 6 States (Delaware, Kansas, Louisiana, Mississippi, New Jersey, and Rhode Island) and the District of Columbia had utility renewable generation in 1998.

The situation for nonutilities is quite different. The five leading States for nonutility renewable generation are: California, Florida, Maine, Alabama, and New York. Biomass is the leading renewable source for nonutility renewable electricity generation in all of these States except for California, which has geothermal resources on a scale unmatched anywhere else in the United States. These 5 States produced 45 percent of total nonutility renewable electricity in 1998. California produced over 80 percent of nonutility generation from geothermal in 1998, while Florida accounted for 16 percent of total U.S. nonutility generation from municipal solid waste (MSW) and landfill gas (LFG). The leading States for nonutility generation from wood and wood waste are States with large paper and forest product industries, which generate large volumes of biomass waste from industrial production. California also produced over 90 percent of nonutility wind electricity and all nonutility solar generation. Forty-five States (all but Arizona, Delaware, Nebraska, New Mexico, and South Dakota) and the District of Columbia had nonutility renewable electric operations in 1998.

<sup>2</sup> See Appendix Tables C1 through C54 which show renewable electric generation and capability by State for 1990 through 1998.

<sup>3</sup> "Generated and sold" excludes net electricity imports.

**Table 1. U.S. Energy Consumption by Energy Source, 1994-1998**  
(Quadrillion Btu)

Energy Source	1994	1995	1996	1997	1998
<b>Fossil Fuels</b>					
Coal	R19.960	R20.024	R20.940	R21.444	21.620
Coal Coke (Net Imports)	0.024	0.026	*	0.018	0.027
Natural Gas <sup>a</sup>	21.288	22.163	22.560	R22.544	21.840
Petroleum <sup>b</sup>	34.735	34.663	35.864	R36.381	36.573
<b>Total Fossil Fuels</b>	<b>R76.006</b>	<b>R76.877</b>	<b>R79.364</b>	<b>R80.387</b>	<b>80.061</b>
<b>Nuclear Electric Power</b>	<b>6.837</b>	<b>7.177</b>	<b>7.168</b>	<b>R6.678</b>	<b>7.157</b>
<b>Hydroelectric Pumped Storage<sup>c</sup></b>	<b>-0.035</b>	<b>-0.028</b>	<b>-0.032</b>	<b>-0.042</b>	<b>-0.046</b>
<b>Renewable Energy</b>					
Conventional Hydroelectric Power <sup>d</sup>	R2.971	R3.474	R3.913	R3.922	3.540
Geothermal Energy <sup>e</sup>	0.395	0.339	0.352	R0.328	0.334
Biomass <sup>f</sup>	R2.917	R3.048	R3.108	R2.981	3.052
Solar Energy <sup>g</sup>	0.072	0.073	0.075	0.074	0.074
Wind Energy	0.036	0.033	0.035	R0.034	0.031
<b>Total Renewable Energy</b>	<b>R6.390</b>	<b>R6.968</b>	<b>R7.483</b>	<b>R7.339</b>	<b>7.032</b>
<b>Total Energy Consumption</b>	<b>R89.264</b>	<b>R91.003</b>	<b>R93.969</b>	<b>R94.376</b>	<b>94.190</b>

<sup>a</sup>Includes supplemental gaseous fuels.

<sup>b</sup>Petroleum products supplied, including natural gas plant liquids and crude oil burned as fuel.

<sup>c</sup>Represents total pumped-storage facility production minus energy used for pumping.

<sup>d</sup>Hydroelectricity generated by pumped storage is not included in renewable energy.

<sup>e</sup>Includes grid-connected electricity, geothermal heat pump and direct use energy.

<sup>f</sup>Includes wood, wood waste, peat, wood sludge, municipal solid waste, agricultural waste, straw, tires, landfill gases, fish oils, digester gas, methane and/or other waste.

<sup>g</sup>Includes solar thermal and photovoltaic.

R = Revised data.

\* = value less than 0.0005 quadrillion Btu.

Notes: See Appendix B for a detailed explanation of limitations on renewable energy data. Totals may not equal sum of components due to independent rounding.

Sources: **1994-1998:** Energy Information Administration (EIA), *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 1.3. **1997 and 1998 Renewable Energy:** Consumption values based on the sum of electricity consumption from EIA, *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2 (Washington, DC, October 1999), and non-electricity consumption based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels.

**Table 2. Renewable Energy Consumption by Sector and Energy Source, 1994-1998**  
(Quadrillion Btu)

Sector and Source	1994	1995	1996	1997	1998
<b>Residential/Commercial</b>					
Biomass	0.582	0.641	0.644	0.475	0.468
Solar	0.064	0.065	0.066	0.065	0.065
Geothermal <sup>a</sup>	0.010	0.011	0.012	0.013	0.015
<b>Total</b>	<b>0.656</b>	<b>0.717</b>	<b>0.722</b>	<b>0.553</b>	<b>0.547</b>
<b>Industrial<sup>b</sup></b>					
Biomass	R2.217	R2.286	R2.370	R2.389	2.459
Geothermal <sup>a</sup>	0.214	0.210	0.217	R0.200	0.210
Conventional Hydroelectric Power <sup>c</sup>	0.136	0.152	0.171	0.185	0.151
Solar	R0.009	0.008	0.009	0.009	0.009
Wind	0.036	0.033	0.035	R0.033	0.031
<b>Total</b>	<b>R2.613</b>	<b>R2.690</b>	<b>R2.802</b>	<b>R2.816</b>	<b>2.860</b>
<b>Transportation</b>					
Biomass <sup>d</sup>	<b>0.097</b>	<b>0.104</b>	<b>0.074</b>	<b>0.097</b>	<b>0.105</b>
<b>Electric Utility</b>					
Biomass	R0.021	0.017	0.020	R0.020	0.021
Geothermal <sup>a</sup>	0.145	0.099	0.110	0.115	0.108
Conventional Hydroelectric Power <sup>c</sup>	R2.549	R3.056	R3.421	R3.519	3.184
Solar and Wind	*	*	*	*	*
Net Renewable Energy Imports <sup>e</sup>	0.310	0.284	0.334	0.219	0.206
<b>Total</b>	<b>R3.024</b>	<b>R3.457</b>	<b>3.886</b>	<b>R3.873</b>	<b>3.520</b>
<b>Total Renewable Energy Consumption</b>	<b>R6.390</b>	<b>R6.968</b>	<b>R7.483</b>	<b>R7.339</b>	<b>7.032</b>

<sup>a</sup>Includes geothermal heat pump and direct use energy. The Industrial and Electric Utility sectors also include grid connected electricity.

<sup>b</sup>Includes generation of electricity by cogenerators, independent power producers, and small power producers.

<sup>c</sup>Hydroelectricity generated by pumped storage is not included in renewable energy.

<sup>d</sup>Ethanol blended into gasoline.

<sup>e</sup>Includes only net imports of electricity known to be from renewable resources (geothermal and hydroelectric).

R = Revised data.

\*Less than 0.0005 quadrillion Btu.

Note: Totals may not equal sum of components due to independent rounding.

Sources: **1994-1996:** Energy Information Administration (EIA), *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 10.2. **1997 and 1998:** Electricity Consumption—EIA, *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2 (Washington, DC, October 1999). Non-electricity Consumption (except imports)—Based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels. **Net Renewable Energy Imports, 1994-1998:** Based on analysis by the Office of Coal, Nuclear, Electric and Alternate Fuels.

**Table 3. Renewable Energy Consumption for Electricity Generation by Energy Source, 1994-1998**  
(Quadrillion Btu)

Source	1994	1995	1996	1997	1998
<b>Industrial Sector<sup>a</sup></b>					
Biofuels .....	0.592	R0.594	R0.600	R0.570	0.554
Geothermal .....	0.212	0.207	0.214	R0.197	0.207
Hydroelectric .....	0.136	0.152	0.171	0.185	0.151
Solar .....	R0.009	0.008	0.009	0.009	0.009
Wind .....	0.036	0.033	0.035	R0.033	0.031
<b>Total .....</b>	<b>R0.985</b>	<b>R0.995</b>	<b>R1.030</b>	<b>R0.994</b>	<b>0.952</b>
<b>Electric Utility Sector<sup>b</sup></b>					
Biofuels .....	R0.021	0.017	0.020	R0.020	0.021
Geothermal .....	0.145	0.099	0.110	0.115	0.108
Conventional Hydroelectric .....	R2.549	R3.056	R3.421	R3.519	3.184
Solar and Wind .....	*	*	*	*	*
<b>Total .....</b>	<b>R2.714</b>	<b>R3.173</b>	<b>3.552</b>	<b>R3.654</b>	<b>3.314</b>
<b>Imports and Exports</b>					
Geothermal (Imports) .....	0.025	0.019	0.014	*	0.001
Conventional Hydroelectric (Imports) .....	0.314	0.297	0.345	0.289	0.268
Conventional Hydroelectric (Exports) .....	0.029	0.032	0.024	0.070	0.064
<b>Total Net Renewable Energy Imports .....</b>	<b>0.310</b>	<b>0.284</b>	<b>0.334</b>	<b>0.219</b>	<b>0.206</b>
<b>Total .....</b>	<b>R4.009</b>	<b>R4.451</b>	<b>4.915</b>	<b>R4.867</b>	<b>4.472</b>

<sup>a</sup>Includes generation of electricity by cogenerators, independent power producers, and small power producers.

<sup>b</sup>Excludes imports.

R = Revised data.

\*Less than 0.5 trillion Btu.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report;" Form EIA-867, "Annual Nonutility Power Producer Report;" and Form EIA-860B "Annual Electric Generator Report-Nonutility." Personal communication with Dave Walker of Natural Resources Canada (Ottawa, Canada, March 1999). Federal Energy Regulatory Commission, Form FE-781R, "Annual Report of International Electricity Export/Import Data."

**Table 4. Electricity Generation From Renewable Energy by Energy Source, 1994-1998**  
(Thousand Kilowatthours)

Source	1994	1995	1996	1997	1998
<b>Nonutility Sector (Gross Generation)<sup>a</sup></b>					
Biomass	57,391,594	R57,560,556	R58,080,464	R55,278,582	53,744,724
Geothermal	10,122,228	9,911,659	10,197,514	R9,381,646	9,881,958
Hydroelectric	13,226,934	14,773,801	16,555,389	R17,902,435	14,632,521
Solar	823,973	824,193	902,830	892,892	886,553
Wind	3,481,616	3,185,006	3,399,642	R3,248,140	3,015,497
<b>Total</b>	<b>85,046,345</b>	<b>R86,255,215</b>	<b>R89,135,839</b>	<b>R86,703,695</b>	<b>82,161,253</b>
<b>Electric Utility Sector (Net Generation)<sup>b</sup></b>					
Biomass	R1,988,257	R1,649,178	R1,967,057	R1,983,065	2,024,242
Geothermal	6,940,637	4,744,804	5,233,927	5,469,110	5,176,280
Conventional Hydroelectric	247,070,938	296,377,840	331,058,055	341,273,443	308,843,770
Solar	3,472	3,909	3,169	3,481	2,518
Wind	309	11,097	10,123	5,977	2,957
<b>Total</b>	<b>R256,003,613</b>	<b>R302,786,828</b>	<b>R338,272,331</b>	<b>R348,735,076</b>	<b>316,049,767</b>
<b>Imports and Exports</b>					
Geothermal (Imports)	1,172,117	884,950	649,514	R16,493	45,145
Conventional Hydroelectric (Imports)	30,478,863	28,823,244	33,359,983	27,990,905	26,031,784
Conventional Hydroelectric (Exports)	2,806,712	3,059,261	2,336,340	6,790,778	6,158,582
<b>Total Net Imports</b>	<b>28,844,268</b>	<b>26,648,933</b>	<b>31,673,157</b>	<b>R21,216,620</b>	<b>19,918,347</b>
<b>Total Renewable Electricity Generation</b>	<b>R369,894,226</b>	<b>R415,690,976</b>	<b>R459,081,327</b>	<b>R456,655,391</b>	<b>418,129,367</b>

<sup>a</sup>Includes generation of electricity by cogenerators, independent power producers, and small power producers.

<sup>b</sup>Excludes imports.

R = Revised data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report"; Form EIA-867, "Annual Nonutility Power Producer Report" (for 1998); Form EIA-860B, "Annual Electric Generator Report-Nonutility"; and *Electric Power Annual 1998, Volume II*, DOE/EIA-0348(98)/2 (Washington, DC, October 1999). Personal communication with Dave Walker of Natural Resources Canada (Ottawa, Canada, March 1999). U.S. Department of Energy, Office of Fossil Energy, Form FE-781R, "Annual Report of International Electricity Export/Import Data."



**Table 5. U.S. Electric Generating Capacity, 1994-1998**  
(Megawatts)

Source	1994	1995	1996	1997	1998
Hydroelectric <sup>a</sup> .....	78,042	78,563	R76,437	R79,788	79,573
Geothermal .....	3,006	2,968	2,893	2,853	2,917
Biomass .....	R10,468	R10,283	R10,560	R10,538	10,269
Solar/Photovoltaic .....	333	333	333	334	365
Wind .....	1,745	<sup>b</sup> 1,731	1,678	R1,579	1,698
<b>Total Renewables .....</b>	<b>R93,594</b>	<b>R93,877</b>	<b>R91,900</b>	<b>R95,093</b>	<b>94,822</b>
Nonrenewables <sup>c</sup> .....	R670,420	R675,640	R683,972	R683,409	681,062
<b>Total .....</b>	<b>764,014</b>	<b>769,517</b>	<b>775,872</b>	<b>R778,502</b>	<b>775,884</b>

<sup>a</sup>Excludes pumped storage, which is included in "Nonrenewables."

<sup>b</sup>Excludes 6.6 megawatts of utility capacity and 35 megawatts of nonutility capacity that were not captured by EIA sources.

<sup>c</sup>In addition to fossil-fired and nuclear capacity, includes hydrogen, sulfur, batteries, chemicals, spent sulfite liquor, and hydroelectric pumped storage.

R = Revised data.

Note: Capacity ratings for nonrenewables have been revised to reflect estimated net summer capability rather than nameplate capacity. The methodology for estimating net summer capability from reported nameplate capacity is presented in Energy Information Administration, *Inventory of Electric Utility Power Plants in the United States 1999 with data as of January 1, 1999*, DOE/EIA-0095(99) (Washington, DC, November 1999), p. 271.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report;" Form EIA-867, "Annual Nonutility Power Producer Report.;" Form EIA-860A, "Annual Electric Generator Report-Utility;" and Form EIA-860B, "Annual Electric Generator Report-Nonutility."

**Table 6. Biomass Energy Consumption by Sector and Census Region, 1994-1998**  
(Trillion Btu)

Energy Source	1994	1995	1996	1997	1998
<b>Wood Energy<sup>a</sup></b> .....	<b>R2,317</b>	<b>R2,423</b>	<b>R2,469</b>	<b>R2,346</b>	<b>2,393</b>
Sector					
Residential .....	537	596	595	433	428
Commercial .....	45	45	49	42	40
Industrial .....	R1,724	R1,771	R1,813	R1,860	1,914
Electric Utility .....	11	11	12	11	11
Census Region					
Northeast .....	R284	R369	R268	R257	260
Midwest .....	R228	R290	R255	R220	222
South .....	R1,469	R1,103	R1,523	R1,472	1,508
West .....	R335	R662	R424	R397	402
<b>Waste Energy<sup>b</sup></b> .....	<b>R503</b>	<b>R521</b>	<b>R565</b>	<b>R538</b>	<b>554</b>
Source					
Municipal Solid Waste .....	394	408	447	R415	426
Combustion .....	323	333	359	R317	317
Landfill Gas .....	71	75	88	R98	108
Manufacturing .....	R109	R113	R118	R123	129
Census Region					
Northwest .....	R169	R172	R187	191	194
Midwest .....	R59	R58	R63	R61	63
South .....	R204	R219	R235	R213	220
West .....	R70	R73	R80	R72	77
<b>Alcohol Fuels (Ethanol)</b> .....	<b>97</b>	<b>104</b>	<b>74</b>	<b>97</b>	<b>105</b>
Census Region					
Northwest .....	*	3	7	9	10
Midwest .....	68	74	43	56	61
South .....	16	10	8	11	12
West .....	12	17	16	21	23
<b>Biomass Energy Consumption</b> ..	<b>R2,917</b>	<b>R3,048</b>	<b>R3,108</b>	<b>R2,981</b>	<b>3,052</b>

<sup>a</sup> Assuming an average energy yield of 17 million Btu per ton.

<sup>b</sup> Municipal solid waste, manufacturing waste, refuse-derived fuel, and methane recovered from landfills.

\* = Less than 0.5 trillion Btu.

R = Revised data.

Note: The annual season runs from April 1 through March 31.

Source: Energy Information Administration, *Annual Energy Review 1998*, DOE/EIA-0384(98) (Washington, DC, July 1999), Table 10.3.

**Table 7. Renewable Energy Consumption for Nonelectric Use by Sector and Energy Source, 1994-1998**  
(Quadrillion Btu)

Sector and Source	1994	1995	1996	1997	1998
<b>Residential/Commercial</b>					
Biomass .....	0.582	0.641	0.644	0.475	0.468
Solar .....	0.064	0.026	0.066	0.065	0.065
Geothermal .....	0.010	0.011	0.012	0.013	0.015
<b>Total .....</b>	<b>0.656</b>	<b>0.717</b>	<b>0.722</b>	<b>0.553</b>	<b>0.547</b>
<b>Industrial<sup>a</sup></b>					
Biomass .....	1.625	1.692	1.769	1.819	1.904
Geothermal .....	0.003	0.003	0.003	0.003	0.003
<b>Total .....</b>	<b>1.628</b>	<b>1.695</b>	<b>1.772</b>	<b>1.822</b>	<b>1.907</b>
<b>Transportation</b>					
Biomass .....	0.097	0.104	0.074	0.097	0.105
<b>Total .....</b>	<b>2.381</b>	<b>2.517</b>	<b>2.568</b>	<b>2.472</b>	<b>2.560</b>

<sup>a</sup>Does not include small amounts of energy from solar and wind in the industrial sector, because data is not available.

Note: Totals may not equal sum of components due to independent rounding.

Source: Office of Coal, Nuclear, Electric and Alternate Fuel Analysis.

## 2. Solar Thermal and Photovoltaic Collector Manufacturing Activities

### Introduction

Material in this chapter is based upon manufacturing shipment information reported on Form EIA-63A (“Annual Solar Thermal Collector Manufacturers Survey”) and Form EIA-63B (“Annual Photovoltaic Module/Cell Manufacturers Survey”). Domestic shipments of photovoltaic cells and modules have more than doubled since 1993, while solar thermal collector shipments have grown 13 percent (Table 8).

### Solar Thermal Collector Manufacturing Activities

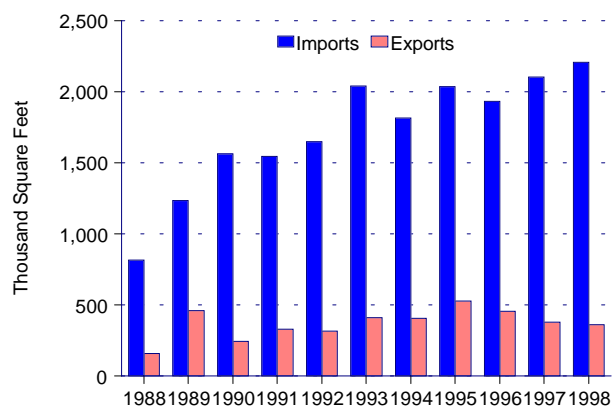
Total shipments of solar thermal collectors<sup>4</sup> were 7.8 million square feet in 1998. This represented a decrease of 4.7 percent from the 1997 total of 8.1 million square feet but exceeded the 1996 total of 7.6 million square feet. There were 28 companies in 1998 shipping solar collectors (Table 9). Import shipments totaled 2.2 million square feet, while export shipments were 0.4 million square feet (Figure 3).

Low-temperature solar collectors represented 94 percent of total shipments while medium-temperature collectors were responsible for almost 6 percent. High-temperature collectors are used by utilities and nonutilities in experimental grid electricity programs and represent less than 1 percent of total shipments (Table 10, Figure 4). U. S. manufacturers from 6 states (California, New Jersey, Florida, Hawaii, Texas, and New York) and Puerto Rico manufactured nearly 100 percent of U.S. solar thermal collectors in 1998 (Table 11). Shipments included both components and integrated solar collector systems.

Shipments were sent to 46 states, the District of Columbia, Puerto Rico, and the Virgin Islands (Table

<sup>4</sup> Solar thermal collectors are divided into three categories of low, medium, and high-temperature collectors. The type is usually determined by the level of heat generated.

**Figure 3. Import and Export Shipments of Solar Thermal Collectors, 1988-1998**



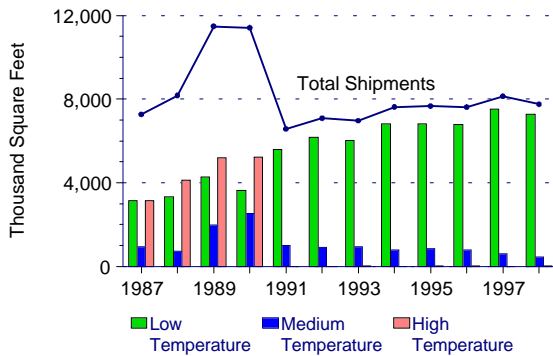
Notes: Total shipments as reported by respondents include all domestic and export shipments and may include imports that subsequently were shipped to domestic or foreign customers.

Source: Energy Information Administration, Form EIA-63A, “Annual Solar Thermal Collector Manufacturers Survey.”

12). Exports went mainly to Canada (32.3 percent), Austria (14.8 percent), Mexico (13.5 percent), and Germany (11.8 percent) (Table 13). Half of total shipments was sent directly to wholesale distributors, 41 percent was sent to retail distributors, 4 percent to installers, 3 percent to exporters, and 2 percent to other end users (Table 14). Compared with 1997, retail distributors gained at the expense of wholesalers.

The value of total shipments was \$28.4 million in 1998, a decrease of 2 percent from 1997 (Table 15). The average price for total shipments increased 3 percent, from \$3.56 per square foot in 1997 to \$3.66 per square foot in 1998. Low-temperature collectors registered an increase in total value of 5.2 percent, from \$19.6 million

**Figure 4. Solar Thermal Collector Shipments by Collector Type, 1987-1998**



Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

to \$20.6 million. This was due principally to an 8.8-percent increase in the average price for low-temperature collectors, from \$2.60 per square foot in 1997 to \$2.83 per square foot in 1998 (Figure 5). This increase was due primarily to rising material costs.

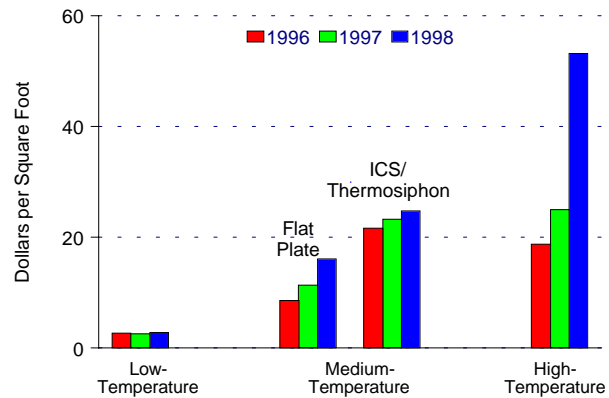
The residential sector was the largest market for solar collectors, totaling nearly 7.2 million square feet, or 92 percent of total shipments. The commercial sector was the second largest, with 0.5 million square feet (6.7 percent). The largest end use for solar collectors shipped in 1998 was for heating swimming pools, consuming 7.2 million square feet (93 percent) of total shipments. The second-largest use was for domestic hot water heating (6 percent). This marked a decrease from 1997, when domestic hot water heating represented approximately 7 percent of total shipments (Table 16). The value of shipments of complete systems increased from \$14.3 million in 1997 to \$15.2 million in 1998 (Table 17).

Of the 28 active companies, 3 are planning to introduce new low-temperature collectors, 5 are planning new medium-temperature collectors (four less than in 1997), and 2 expect to introduce high-temperature collectors (Table 18). In 1998, the industry continued to remain highly concentrated with the 10 largest companies representing 97 percent of total shipments (Table 19). Employment increased 13 percent in 1998 from 1997 (Table 20). A total of 22 firms were involved in the design of collectors or systems, 12 were involved in prototype collector development, and 10 were active in

<sup>5</sup> Data for cells and modules are for terrestrial use only (i.e., excludes space applications).

<sup>6</sup> A photovoltaic cell is an integrated device consisting of layers of semiconductor materials and electric contacts. Such a device is capable of converting incident light directly into electricity. A module is an integrated assembly of interconnected photovoltaic cells.

**Figure 5. Average Price of Solar Thermal Collector Shipments by Collector Type, 1996, 1997, and 1998**



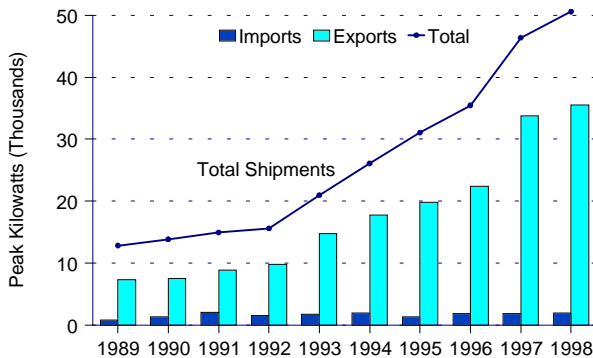
Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

prototype system development (Table 21). Nineteen companies had 90 to 100 percent of their total company-wide sales in solar collectors. Four companies had 50 to 89 percent of their total company-wide sales in solar collectors, while 5 companies had less than 10 percent of their total company-wide sales in solar collectors (Table 22).

## Photovoltaic Module and Cell Manufacturing Activities<sup>5</sup>

Photovoltaic (PV) cells and modules shipments<sup>6</sup> reached 50.6 peak megawatts in 1998, a 9.1-percent increase from the 1997 total of 46.4 peak megawatts. This was a substantially smaller increase than the 31-percent increase experienced from 1996 to 1997. Module shipments accounted for 32.3 peak megawatts, while cell shipments accounted for 18.2 peak megawatts. This change in module shipments represented a decrease of 4 percent since 1997, compared with a 44-percent gain in cell shipments (Table 23). Exports totaled 35.5 peak megawatts, representing 70 percent of total shipments as compared to 73 percent in 1997, and imports totaled 1.9 peak megawatts (Table 24 and Figure 6). Twenty-one companies reported PV cell and module shipments, unchanged from 1997 (Table 24).

**Figure 6. Import and Export Shipments of Photovoltaic Cells and Modules, 1989-1998**



Note: Total shipments as reported by respondents include all domestic and export shipments and may include imports that subsequently were shipped to domestic or foreign customers.

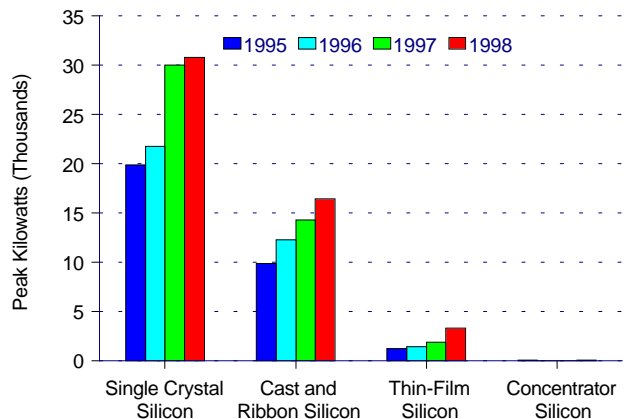
Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

Nearly 27 peak megawatts (53 percent) of total shipments were sent directly to wholesale distributors (Table 25). Module manufacturers and exporters combined received 15.3 peak megawatts, or 30 percent. Installers and retail distributors combined purchased 5.6 peak megawatts, or 11 percent.

Crystalline silicon cells<sup>7</sup> and modules continued to dominate the PV industry in 1998, accounting for 93 percent of total shipments (Table 26). Single-crystal shipments in 1998 totaled 30.8 peak megawatts, or 61 percent of total shipments, compared to 30 peak megawatts 1997 or 65 percent of total PV shipments. Cast and ribbon silicon shipments totaled 16.4 peak megawatts in 1998, or 32 percent of total shipments. By comparison, cast and ribbon totaled 14.3 peak megawatts or 31 percent of total shipments in 1997. Total shipments of crystalline silicon in 1998 were 6 percent higher than in 1997. Thin-film shipments grew 76 percent to 3.3 peak megawatts in 1998 from 1.9 peak megawatts in 1997 and now represent 7 percent of total shipments (Figure 7). The growth in thin film module and cell share essentially offset the drop in the single crystal market share.

The total value of photovoltaic module and cell shipments grew 5.7 percent to \$185 million in 1998 from

**Figure 7. Photovoltaic Cell and Module Shipments by Type, 1995-1998**



Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

\$175 million in 1997 (Table 27). The average price for modules (dollars per peak watt) decreased 5 percent, from \$4.16 in 1997 to \$3.94 in 1998. For cells, the average price increased 13 percent, from \$2.78 in 1997 to \$3.15 in 1998. The rise in cell prices was a result of a stronger demand for cells in the marketplace. Cell shipments increased 44 percent in 1998 from a base of 12.7 peak megawatts to 18.2 peak megawatts (Table 23).

The residential sector replaced the industrial sector as the largest market for PV cells and modules, growing 45 percent from 11 peak megawatts in 1997 to 16 peak megawatts in 1998 (Table 28). Internationally, the residential sector has benefitted from new governmental sponsored programs and loan subsidies. Japan and Germany have increased the residential demand for PVs with subsidies for PV systems for housing, and favorable tax credits and loan repayment timeframes. In developing countries like Indonesia and Brazil, the World Bank has made low interest energy loans with long term pay-back schedules for the installation of residential applications for PVs. The U.S. also has implemented a "Million Solar Roof-Top" program at the State and national levels as well as implementing loan programs. In addition, the U.S. has experienced higher disposable income levels in 1998, low interest rates—especially for mortgages and home equity

<sup>7</sup> Photovoltaic (PV) components are divided into three categories by product type: (1) crystalline silicon cells and modules which include single-crystal, cast silicon, and ribbon silicon; (2) Thin-film cells and modules made from a number of layers of photosensitive materials such as amorphous silicon; and (3) concentrator cells and modules in which a lens is used to gather and converge sunlight onto the cell or module surface.

loans—utility sponsored programs (like net metering, portfolio standards, and green pricing), much of which has resulted in the investment of residential PVs. In general, a growing group of residential sector customers appears willing to pay for PV- based installations.<sup>8</sup>

The industrial sector grew 13 percent from 11.7 peak megawatts in 1997 to 13.2 peak megawatts in 1998. The commercial sector grew 4 percent. The PV shipments for consumer goods more than tripled in 1998 from 1997. This was the result of targeting the recreational vehicle and marine sectors, two fast growing markets. Electricity generation, which consists of both grid-interactive and remote applications, continues to be the predominant end use for PV cells and modules. In 1998, these end uses accounted for 45 percent of total shipments, while communications and transportation were the second- and third-largest end uses, respectively. Shipments for grid-interactive electricity generation alone grew 72 percent in 1998 over 1997, while shipments for communications increased just 12 percent in 1998.

Export shipments increased 5 percent from 33.8 peak megawatts to 35.5 peak megawatts in 1998 (Table 29).

However, their share of total shipment declined from 73 percent in 1997 to 70 percent in 1998. Germany and Japan were the largest export markets, each receiving about 27 percent of total shipments, respectively (Table 30).

While complete PV systems<sup>9</sup> shipped decreased by 6 percent in 1998, the total value of complete systems increased 53 percent, as larger systems were shipped in 1998 than the prior year (Table 31). The total value for complete PV systems in 1998 was \$6.2 million. Employment in the PV manufacturing industry increased by 15 percent in 1998 (Table 32). Ten companies plan to introduce crystalline silicon products and 10 companies will introduce thin-film products. (Table 33). Many companies who are engaged in the manufacture and/or importation of PV modules and cells, reported that they also are involved in other PV-related activities. Thirteen are involved in cell manufacturing and eighteen in module or system design. Sixteen are involved in prototype module development and fourteen in prototype systems development. Seventeen companies are active in wholesale distribution, five in retail distribution, and six are involved in installation (Table 34).

<sup>8</sup> National Renewable Energy Laboratory (NREL), *Willingness to Pay For Electricity from Renewable Resources: A Review of Utility Market Research*, NREL/TP.550.26148 (Golden, CO, July 1999). The report contains the results of a survey, indicating that the majority of residential utility customers said that they were willing to pay at least a modest amount more per month on their electric bills for power from renewable sources. PVs were among the most favored renewable sources of electricity.

<sup>9</sup> A complete PV system is defined as a power supply unit that satisfies all the power requirements of an application. Such a system is generally made up of one or more modules, a power conditioning unit to process the electricity into the form needed by the application, wires and other electrical connectors. Batteries for back-up power supply are an option that can be included.

**Table 8. Annual Photovoltaic and Solar Thermal Shipments, 1979-1998**

Year	Domestic Shipments <sup>a</sup>	
	Photovoltaic Cells and Modules (Peak Kilowatts)	Solar Thermal Collectors (Thousand Square Feet)
1979 .....	----	13,396
1980 .....	----	18,283
1981 .....	----	19,362
1982 .....	6,897	18,166
1983 .....	10,717	16,669
1984 .....	7,759	16,843
1985 .....	4,099	<sup>b</sup> 19,166
1986 .....	3,224	9,136
1987 .....	3,029	7,087
1988 .....	4,318	8,016
1989 .....	5,462	11,021
1990 .....	6,293	11,164
1991 .....	6,035	6,242
1992 .....	5,760	6,770
1993 .....	6,137	6,557
1994 .....	8,363	7,222
1995 .....	11,188	7,136
1996 .....	13,016	7,162
1997 .....	12,561	7,759
1998 .....	15,069	7,396
<b>Total .....</b>	<b>129,927</b>	<b>224,553</b>

<sup>a</sup>Total shipments minus export shipments.

<sup>b</sup>Estimated Data

— = Not available.

Sources: **1979-1984** Energy Information Administration, Form EIA-63, "Annual Solar Thermal Collector and Photovoltaic Module Manufacturers Survey." **1985-1998:** Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey," and Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."



**Table 9. Annual Shipments of Solar Thermal Collectors, 1987-1998**

Year	Number of Companies	Collector Shipments (thousand square feet) <sup>a</sup>		
		Total <sup>b</sup>	Imports	Exports
1987	59	7,269	691	182
1988	51	8,174	814	158
1989	44	11,482	1,233	461
1990	51	11,409	1,562	245
1991	48	6,574	1,543	332
1992	45	7,086	1,650	316
1993	41	6,968	2,039	411
1994	41	7,627	1,815	405
1995	36	7,666	2,037	530
1996	28	7,616	1,930	454
1997	29	8,138	2,102	379
1998	28	7,756	2,206	360

<sup>a</sup>Includes imputation of shipment data to account for nonrespondents.

<sup>b</sup>Includes shipments of solar thermal collectors to the government, including the military, but excluding space applications.

Note: Total shipments as reported by respondents include all domestic and export shipments and may include imported collectors that subsequently were shipped to domestic or foreign customers.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 10. Annual Shipments of Solar Thermal Collectors by Type, 1987-1998**  
(Thousand Square Feet)

Year	Low-Temperature		Medium-Temperature		High-Temperature Total Shipments <sup>a,b</sup>
	Total Shipments <sup>a,c</sup>	Average per Manufacturer	Total Shipments <sup>a</sup>	Average per Manufacturer	
1987	3,157	263	957	19	3,155
1988	3,326	416	732	16	4,116
1989	4,283	428	1,989	55	5,209
1990	3,645	304	2,527	62	5,237
1991	5,585	349	989	24	1
1992	6,187	387	897	26	2
1993	6,025	464	931	28	12
1994	6,823	426	803	26	2
1995	6,813	487	840	32	13
1996	6,821	487	785	41	10
1997	7,524	579	606	29	7
1998	7,292	607	443	23	21

<sup>a</sup>Includes imputation of shipment data to account for nonrespondents.

<sup>b</sup>For high-temperature collectors, average annual shipments per manufacturer are not disclosed.

<sup>c</sup>Includes shipments of solar thermal collectors to the Government, including the military, but excluding space applications.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 11. Shipments of Domestic Solar Collectors Ranked by Top Five Origins and Destinations, 1997 and 1998**

Origin/Destination	1997 Shipments		1998 Shipments	
	Thousand Square Feet	Percent of U.S. Total	Thousand Square Feet	Percent of U.S. Total
<b>Origin</b>				
California . . . . .	2,308	38	2,651	48
New Jersey, Florida, and Hawaii . . . . .	2,656	44	2,596	47
Texas . . . . .	*	*	160	3
Puerto Rico . . . . .	*	*	63	1
New York . . . . .	957	16	34	1
<b>Top Five Total . . . . .</b>	<b>5,921</b>	<b>98</b>	<b>5,504</b>	<b>100</b>
<b>Destination</b>				
Florida . . . . .	3,975	49	3,306	45
California . . . . .	1,781	22	1,629	22
Arizona . . . . .	500	7	412	6
Nevada . . . . .	*	*	267	4
Hawaii . . . . .	204	3	267	4
Oregon . . . . .	145	2	*	*
<b>Top Five Total . . . . .</b>	<b>6,605</b>	<b>83</b>	<b>5,880</b>	<b>81</b>

\* = Not included in top 5 States for either 1997 or 1998.

Notes: Totals may not equal sum of components due to independent rounding. U.S. total includes territories.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 12. Shipments of Solar Thermal Collectors by Destination, 1998**  
(Square Feet)

<b>Destination</b>	<b>1998</b>	<b>Destination</b>	<b>1998</b>
Alabama	13,937	Nebraska	3,488
Alaska	0	Nevada	267,065
Arizona	411,504	New Hampshire	3,766
Arkansas	9,176	New Jersey	173,253
California	1,629,072	New Mexico	34,609
Colorado	34,128	New York	83,203
Connecticut	115,075	North Carolina	15,166
Delaware	254	North Dakota	0
District of Columbia	1,661	Ohio	103,725
Florida	3,305,887	Oklahoma	16,072
Georgia	69,575	Oregon	115,538
Hawaii	266,649	Pennsylvania	20,778
Idaho	481	Puerto Rico	76,285
Illinois	145,134	Rhode Island	0
Indiana	7,856	South Carolina	8,521
Iowa	1,777	South Dakota	0
Kansas	227	Tennessee	10,809
Kentucky	254	Texas	262,688
Louisiana	19,387	Utah	259
Maine	12,101	Vermont	3,888
Maryland	707	Virgin Islands (U.S.)	4,058
Massachusetts	7,178	Virginia	22,446
Michigan	39,549	Washington	26,846
Minnesota	18,551	West Virginia	2,665
Mississippi	450	Wisconsin	26,355
Missouri	3,434	Wyoming	321
Montana	101		
<b>Shipments to United States/Territories</b>			<b>7,395,909</b>
<b>Exports</b>			<b>360,327</b>
<b>Total Shipments</b>			<b>7,756,236</b>

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 13. Distribution of U.S. Solar Thermal Collector Exports by Country, 1998**

Country	Percent of U.S. Exports
<b>Asia</b>	
India .....	0.2
Japan .....	5.9
Taiwan .....	0.6
<b>Total</b> .....	<b>6.7</b>
<b>Europe and Middle East</b>	
Austria .....	14.8
Belgium .....	3.4
Denmark .....	0.2
England .....	0.1
France .....	0.4
Germany .....	11.8
Jordan .....	0.2
Norway .....	0.2
Portugal .....	4.4
Spain .....	0.4
Sweden .....	4.4
<b>Total</b> .....	<b>40.3</b>
<b>The Americas</b>	
Aruba .....	0.2
Bahamas .....	0.2
Belize .....	0.1
Bermuda .....	0.1
Bolivia .....	1.1
Bonaire .....	0.2
Brazil .....	0.1
British Virgin Islands .....	0.2
Canada .....	32.3
Chile .....	1.1
Jamaica .....	0.3
Mexico .....	13.5
St. Vincent .....	0.3
Trinidad .....	0.2
Turks & Caicos .....	0.2
<b>Total</b> .....	<b>50.1</b>
<b>Other</b> .....	<b>2.9</b>
<b>Total</b> .....	<b>100.0</b>

Notes: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturer Survey."

**Table 14. Distribution of Solar Thermal Collector Shipments, 1997 and 1998**

Recipient	Shipments (thousand square feet)	
	1997	1998
Wholesale Distributors .....	4,446	3,872
Retail Distributors .....	2,491	3,199
Exporters .....	417	237
Installers .....	585	326
End Users and Other <sup>a</sup> .....	199	122
<b>Total</b> .....	<b>8,138</b>	<b>7,756</b>

<sup>a</sup>Other includes minimal shipments not explained on Form EIA-63A.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 15. Solar Thermal Collector Shipments by Type, Quantity, Value, and Average Price, 1997 and 1998**

Type	1997			1998		
	Quantity (thousand square feet)	Value (thousand dollars)	Average Price (dollars per square foot)	Quantity (thousand square feet)	Value (thousand dollars)	Average Price (dollars per square foot)
<b>Low-Temperature</b>						
Liquid and Air . . . . .	7,524	19,584	2.60	7,292	20,608	2.83
<b>Medium-Temperature</b>						
Air . . . . .	54	2,484	46.00	190	1,858	9.75
Liquid						
ICS/Thermosiphon . . . . .	33	773	23.28	76	1,879	24.76
Flat Plate . . . . .	516	5,835	11.30	174	2,790	16.04
Evacuated Tube . . . . .	2	99	49.27	2	168	84.00
Concentrator . . . . .	0	0	--	0	0	--
All Medium-Temperature . . . . .	606	9,191	15.17	443	6,695	15.17
<b>High-Temperature</b>						
Parabolic Dish and Trough . . . . .	7	180	25.00	21	1,120	53.21
<b>Total . . . . .</b>	<b>8,138</b>	<sup>a</sup> <b>28,970</b>	<b>3.56</b>	<b>7,756</b>	<b>28,423</b>	<b>3.66</b>

<sup>a</sup>Total includes institutional research projects.

ICS = Integral Collector Storage.

Notes: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 16. Shipments of Solar Collectors by Market Sector, End Use, and Type, 1997 and 1998**  
(Thousand Square Feet)

Type	Low-Temperature	Medium-Temperature					High-Temperature	1998 Total	1997 Total
	Liquid/Air	Air	Liquid				Parabolic Dish/Trough		
	Metallic and Nonmetallic		ICS/Thermosiphon	Flat-Plate (Pumped)	Evacuated Tube	Concentrator			
<b>Market Sector</b>									
Residential . . . . .	6,810	119	68	167	1	0	0	7,165	7,360
Commercial . . . . .	429	54	8	7	1	0	18	517	768
Industrial . . . . .	44	18	0	0	0	0	0	62	7
Utility . . . . .	0	0	*	0	*	0	2	10	1
Other <sup>a</sup> . . . . .	2	0	0	0	0	0	1	3	2
<b>Total . . . . .</b>	<b>7,285</b>	<b>190</b>	<b>76</b>	<b>174</b>	<b>2</b>	<b>0</b>	<b>21</b>	<b>7,756</b>	<b>8,138</b>
<b>End Use</b>									
Pool Heating . . . . .	7,164	3	2	31	0	0	0	7,201	7,528
Hot Water . . . . .	60	171	73	138	2	0	18	463	595
Space Heating . . . . .	53	10	0	3	0	0	0	67	10
Space Cooling . . . . .	0	0	0	0	0	0	0	0	0
Combined Space and Water Heating . . . . .	8	6	0	2	0	0	*	15	4
Process Heating . . . . .	0	0	0	0	0	0	0	0	0
Electricity Generation . . . . .	0	0	0	0	0	0	2	10	0
Other <sup>b</sup> . . . . .	*	0	0	*	1	0	1	1	2
<b>Total . . . . .</b>	<b>7,285</b>	<b>190</b>	<b>76</b>	<b>174</b>	<b>2</b>	<b>0</b>	<b>21</b>	<b>7,756</b>	<b>8,138</b>

\*=Less than 500 square feet.

<sup>a</sup>Other market sectors include shipments of solar thermal collectors to other sectors such as government, including the military but excluding space applications.

<sup>b</sup>Other end use includes shipments of solar thermal collectors for other uses such as cooking, water pumping, water purification, desalinization, distilling, etc.

ICS = Integral Collector Storage.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 17. Shipments of Complete Solar Thermal Collector Systems, 1997 and 1998**

Shipment Information	1997	1998
Complete Collector Systems		
Shipped . . . . .	13,951	15,025
Thousand Square Feet . . . . .	2,975	2,602
Percent of Total Shipments . . . . .	37	34
Number of Companies . . . . .	29	28
Value of Systems (thousand dollars) . .	14,317	15,242

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 18. Number of Companies Expecting To Introduce New Solar Thermal Collector Products in 1999**

New Product Type	Number of Companies
Low-Temperature Collectors . . . . .	3
Medium-Temperature Collectors . . . . .	5
High-Temperature Collectors . . . . .	2
Noncollector Components . . . . .	3

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 19. Percent of Solar Collector Shipments by the 10 Largest Companies, 1987-1998**

Year	Company Rank	Shipments (thousand square feet)	Percent of Total Shipments
1987 . . . . .	1-5	6,371	88
	6-10	499	7
1988 . . . . .	1-5	7,585	93
	6-10	335	4
1989 . . . . .	1-5	9,748	85
	6-10	1,321	12
1990 . . . . .	1-5	9,955	87
	6-10	1,029	9
1991 . . . . .	1-5	5,429	83
	6-10	829	13
1992 . . . . .	1-5	6,110	86
	6-10	609	9
1993 . . . . .	1-5	6,135	88
	6-10	551	8
1994 . . . . .	1-5	6,401	84
	6-10	861	12
1995 . . . . .	1-5	6,525	85
	6-10	806	11
1996 . . . . .	1-5	6,452	85
	6-10	910	12
1997 . . . . .	1-5	7,183	88
	6-10	731	9
1998 . . . . .	1-5	6,938	89
	6-10	613	8

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration: Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 20. Employment in the Solar Thermal Industry, 1994-1998**

Year	Person Years Expended
1994	402
1995	386
1996	239
1997	184
1998	207

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 21. Companies Involved in Solar Thermal Activities by Type, 1997 and 1998**

Type of Activity	1997	1998
Collector or System Design . . . . .	22	22
Prototype Collector Development . .	12	12
Prototype System Development . . .	7	10
Wholesale Distribution . . . . .	20	20
Retail Distribution . . . . .	14	16
Installation . . . . .	11	12
Noncollector System Component Manufacture . . . . .	9	9

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 22. Solar-Related Sales as a Percentage of Total Sales, 1997 and 1998**

Percent of Total Sales	Number of Companies	
	1997	1998
90-100 . . . . .	19	19
50-89 . . . . .	5	4
10-49 . . . . .	1	0
Less than 10 . . . . .	4	5
<b>Total . . . . .</b>	<b>29</b>	<b>28</b>

Source: Energy Information Administration, Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Table 23. Annual Shipments of Photovoltaic Cells and Modules, 1996-1998**  
(Peak Kilowatts)

Item	1996	1997	1998
Cells . . . . .	10,930	12,709	18,249
Modules . . . . .	24,534	33,645	32,313
<b>Total . . . . .</b>	<b>35,464</b>	<b>46,354</b>	<b>50,562</b>

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."



**Table 24. Annual Shipments of Photovoltaic Cells and Modules, 1987-1998**

Year	Number of Companies	Photovoltaic Cell and Module Shipments (Peak Kilowatts) <sup>a</sup>		
		Total	Imports	Exports
1987 .....	17	6,850	921	3,821
1988 .....	14	9,676	1,453	5,358
1989 .....	17	12,825	826	7,363
1990 .....	<sup>b</sup> 19	<sup>b</sup> 13,837	1,398	7,544
1991 .....	23	14,939	2,059	8,905
1992 .....	21	15,583	1,602	9,823
1993 .....	19	20,951	1,767	14,814
1994 .....	22	26,077	1,960	17,714
1995 .....	24	31,059	1,337	19,871
1996 .....	25	35,464	1,864	22,448
1997 .....	21	46,354	1,853	33,793
1998 .....	21	50,562	1,931	35,493

<sup>a</sup>Does not include shipments of cells and modules for space/satellite applications.

<sup>b</sup>Includes data for one nonrespondent which exited the industry during 1990.

Note: Total shipments as reported by respondents include all domestic and export shipments and may include imported collectors that subsequently were shipped to domestic or foreign customers.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 25. Distribution of Photovoltaic Cells and Modules, 1996-1998**

Recipient	Shipments (Peak Kilowatts)		
	1996	1997	1998
Wholesale Distributors .....	21,424	31,385	26,664
Retail Distributors .....	1,457	424	1,621
Exporters .....	367	4,081	7,002
Installers .....	4,860	1,236	3,993
End Users .....	1,048	1,522	313
Module Manufacturers .....	5,528	5,247	8,278
Other <sup>a</sup> .....	781	2,459	2,691
<b>Total .....</b>	<b>35,464</b>	<b>46,354</b>	<b>50,562</b>

<sup>a</sup>Other includes categories not identified by reporting companies.

Note: Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 26. Photovoltaic Cell and Module Shipments by Type, 1996-1998**

Type	Shipments (Peak Kilowatts)			Percent of Total		
	1996	1997	1998	1996	1997	1998
Crystalline Silicon						
Single-Crystal .....	21,742	29,997	30,758	61	65	61
Cast and Ribbon .....	12,255	14,317	16,428	35	31	32
Subtotal .....	33,996	44,314	47,186	96	96	93
Thin-Film Silicon .....	1,445	1,886	3,318	4	4	7
Concentrator Silicon .....	23	154	58	*	*	*
Other <sup>a</sup> .....	0	0	0	0	0	0
<b>Total .....</b>	<b>35,464</b>	<b>46,354</b>	<b>50,562</b>	<b>100</b>	<b>100</b>	<b>100</b>

<sup>a</sup>Includes categories not identified by reporting companies.

\* = Less than 0.5 percent.

Notes: Data do not include shipments of cells and modules for space/satellite applications. Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 27. Photovoltaic Cell and Module Shipment Values by Type, 1997 and 1998**

Type	1997			1998		
	Value (Thousand Dollars)	Average Price (Dollars per Peak Watt)		Value (Thousand Dollars)	Average Price (Dollars per Peak Watt)	
		Modules	Cells		Modules	Cells
Crystalline Silicon						
Single-Crystal .....	108,226	4.08	2.81	108,914	4.29	2.87
Cast and Ribbon .....	55,701	4.03	2.59	62,099	3.56	5.43
Subtotal .....	163,927	4.06	2.78	171,013	3.93	3.14
Thin-Film Silicon .....	W	W	W	W	W	W
Concentrator Silicon .....	W	W	W	W	W	W
Other <sup>a</sup> .....	0	--	--	0	--	--
<b>Total .....</b>	<b>175,089</b>	<b>4.16</b>	<b>2.78</b>	<b>185,007</b>	<b>3.94</b>	<b>3.15</b>

<sup>a</sup>Includes categories not identified by reporting companies.

W = Data withheld to avoid disclosure of proprietary company data.

-- = Does not apply.

Notes: Data do not include shipments of cells and modules for space/satellite applications. Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 28. Shipments of Photovoltaic Cells and Modules by Market Sector, End Use, and Type, 1997 and 1998**  
(Peak Kilowatts)

Sector and End Use	Crystalline Silicon <sup>a</sup>	Thin-Film Silicon	Concentrator Silicon	Other	1998 Total	1997 Total
<b>Market Sector</b>						
Industrial .....	12,610	622	0	0	13,232	11,748
Residential .....	15,247	679	10	0	15,936	10,993
Commercial .....	7,733	680	48	0	8,460	8,111
Transportation .....	3,195	245	0	0	3,440	3,574
Utility .....	3,378	587	0	0	3,965	5,651
Government <sup>b</sup> .....	2,698	110	0	0	2,808	3,909
Other <sup>c</sup> .....	2,325	395	0	0	2,720	2,367
<b>Total .....</b>	<b>47,186</b>	<b>3,318</b>	<b>58</b>	<b>0</b>	<b>50,562</b>	<b>46,354</b>
<b>End Use</b>						
Electricity Generation						
Grid Interactive .....	13,392	800	0	0	14,193	8,273
Remote .....	7,841	783	10	0	8,634	8,630
Communications .....	7,635	645	0	0	8,280	7,383
Consumer Goods .....	1,097	101	0	0	1,198	347
Transportation .....	6,111	245	0	0	6,356	6,705
Water Pumping .....	4,162	144	0	0	4,306	3,783
Cells/Modules to OEM <sup>d</sup> .....	4,505	539	0	0	5,044	5,245
Health .....	1,000	61	0	0	1,061	1,303
Other <sup>e</sup> .....	1,443	0	48	0	1,491	4,684
<b>Total .....</b>	<b>47,186</b>	<b>3,318</b>	<b>58</b>	<b>0</b>	<b>50,562</b>	<b>46,354</b>

<sup>a</sup>Includes single-crystal and cast and ribbon types.

<sup>b</sup>Includes Federal, State, and local governments, excluding military.

<sup>c</sup>Other includes shipments that are manufactured for private contractors for research and development projects.

<sup>d</sup>Original equipment manufacturers.

<sup>e</sup>Other uses include shipments of photovoltaic cells and modules for other uses, such as cooking food, desalinization, distilling, etc.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 29. Export Shipments of Photovoltaic Cells and Modules by Type, 1997 and 1998**  
(Peak Kilowatts)

Item	Type							
	Crystalline Silicon		Thin-Film Silicon		Concentrator Silicon		Total	
	1997	1998	1997	1998	1997	1998	1997	1998
Cells .....	10,837	16,430	0	0	0	48	<b>10,837</b>	<b>16,478</b>
Modules .....	22,247	17,765	707	1,249	2	1	<b>22,956</b>	<b>19,015</b>
<b>Total .....</b>	<b>33,084</b>	<b>34,195</b>	<b>707</b>	<b>1,249</b>	<b>2</b>	<b>49</b>	<b>33,793</b>	<b>35,493</b>

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 30. Destination of U.S. Photovoltaic Cell and Module Export Shipments by Country, 1998**

Destination	Peak Kilowatts	Percent of U.S. Exports
<b>Africa</b>		
Angola . . . . .	1.7	*
Egypt . . . . .	82.5	0.2
Kenya . . . . .	108.3	0.3
Morocco . . . . .	597.9	1.7
Nigeria . . . . .	51.7	0.1
South Africa . . . . .	2,608.0	7.3
Uganda . . . . .	50.0	0.1
Tanzania . . . . .	9.3	0
Zimbabwe . . . . .	41.7	0.1
<b>Total . . . . .</b>	<b>3,551.1</b>	<b>10.0</b>
<b>Asia and the Middle East</b>		
Bangladesh . . . . .	50.9	0.1
China . . . . .	1.4	*
Hong Kong . . . . .	1,323.4	3.7
India . . . . .	435.0	1.2
Mongolia . . . . .	50.9	0.1
Japan . . . . .	9,585.6	27.0
Oman . . . . .	50.9	0.1
Philippines . . . . .	117.5	0.3
Saudi Arabia . . . . .	83.4	0.2
Singapore . . . . .	610.8	1.7
South Korea . . . . .	50.9	0.1
Taiwan . . . . .	50.9	0.1
Thailand . . . . .	50.0	0.1
United Arab Emirates . . . . .	100.0	0.3
Yemen . . . . .	58.3	0.2
<b>Total . . . . .</b>	<b>12,620.0</b>	<b>35.6</b>
<b>Australia . . . . .</b>	<b>119.2</b>	<b>0.3</b>
<b>Europe</b>		
Austria . . . . .	91.7	0.3
Finland . . . . .	90.7	0.3
France . . . . .	149.2	0.4
Germany . . . . .	9,727.0	27.4
Hungary . . . . .	9.0	*
Ireland . . . . .	689.0	1.9
Italy . . . . .	215.9	0.6
Netherlands . . . . .	41.7	0.1
Norway . . . . .	216.7	0.6
Spain . . . . .	1,441.7	4.1
Sweden . . . . .	318.5	0.9
Switzerland . . . . .	1,220.3	3.4
United Kingdom . . . . .	182.5	0.5
<b>Total . . . . .</b>	<b>14,393.90</b>	<b>40.6</b>
<b>North America</b>		
Canada . . . . .	633.0	1.8
Dominican Republic . . . . .	107.7	0.3
Mexico . . . . .	1,405.4	4.0
<b>Total . . . . .</b>	<b>2,146.10</b>	<b>6.1</b>

See notes at end of table.

**Table 30. Destination of U.S. Photovoltaic Cell and Module Export Shipments by Country, 1998 (Continued)**

Destination	Peak Kilowatts	Percent of U.S. Exports
<b>South America</b>		
Argentina . . . . .	517.8	1.5
Bolivia . . . . .	31.1	0.1
Brazil . . . . .	1,012.1	2.9
Chile . . . . .	135.2	*
Columbia . . . . .	117.3	0.3
Costa Rica . . . . .	50.9	0.1
Ecuador . . . . .	0.8	*
Guatemala . . . . .	50.9	0.1
Honduras . . . . .	159.3	0.4
Panama . . . . .	33.3	0.1
Peru . . . . .	261.9	0.7
Uruguay . . . . .	1.1	*
Venezuela . . . . .	31.7	0.1
<b>Total</b> . . . . .	<b>2,403.4</b>	<b>6.8</b>
<b>Other</b> . . . . .	<b>259.3</b>	<b>0.8</b>
<b>Total U.S. Exports</b> . . . . .	<b>35,493.0</b>	<b>100.0</b>

\* = Less than 0.05 percent.

Note: "Other" represents shipments to countries not disaggregated by companies on Form EIA-63B. Totals may not equal sum of components due to independent rounding.

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 31. Shipments of Complete Photovoltaic Module Systems, 1996-1998**

Shipment Information	1996	1997	1998
Complete Photovoltaic Module Systems Shipped . . . . .	1,615	3,926	3,680
Peak Kilowatts . . . . .	647	202	382
Percent of Total Modules Shipments . . . . .	3	1	1
Value of Systems (thousand dollars) . . . . .	3,489	4,061	6,198

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 32. Employment in the Photovoltaic Manufacturing Industry, 1991-1998**

Year	Number of Companies	Number of Person-Years
1991	23	1,588
1992	21	1,463
1993	19	1,431
1994	22	1,312
1995	24	1,578
1996	25	1,280
1997	21	1,736
1998	21	1,988

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 33. Companies Expecting To Introduce New Photovoltaic Products in 1999**

New Product Type	Number of Companies
<b>Crystalline Silicon</b>	
Single-Crystal Silicon Modules	4
Cast Silicon Modules	2
Ribbon Silicon Modules	4
<b>Thin Film</b>	
Amorphous Silicon Modules	6
Other (Thin-Film)	4
Other (Flat Plate)	0
Concentrators	2
Nonmodule System Components	2

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

**Table 34. Number of Companies Involved in Photovoltaic-Related Activities, 1997 and 1998**

Type of Activity	Number of Companies	
	1997	1998
Cell Manufacturing	13	13
Module or System Design	18	18
Prototype Module Development	14	16
Prototype Systems Development	10	14
Wholesale Distribution	15	17
Retail Distribution	4	5
Installation	5	6
Noncollector System		
Component Manufacturing	4	6

Source: Energy Information Administration, Form EIA-63B, "Annual Photovoltaic Module/Cell Manufacturers Survey."

### 3. Survey of Geothermal Heat Pump Shipments

This chapter provides information on geothermal heat pump shipments, based on the Energy Information Administration, Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey." The survey shows that manufacturers shipped 38,266 geothermal heat pumps in 1998, an increase of 2 percent from the 1997 total of 37,434 (Table 35). Of those shipped in 1998, 10,510 were ARI-320 rated, an increase of over 35 percent from 1997. The total shipments of ARI-325 and ARI-330 were 26,042 in 1998, a decrease of 8 percent from 1997. Non-ARI-rated units shipped in 1998 numbered 1,714, an increase of over 29 percent from 1997. The total rated capacity of heat pumps shipped in 1998 was

141,446 tons, almost equal to the 1997 total of 141,556 tons (Table 36).

The proportion of geothermal heat pumps shipped to each census region in 1998 was as follows: the South (42 percent), the North Central (32 percent), the Northeast (14 percent), the West (10 percent) and exports (1 percent) (Table 37). Forty-eight percent of geothermal heat pumps were shipped to installers and 38 percent went to wholesale distributors (Table 38). Eight percent were shipped to retail distributors, while 3 percent went to end-users.

**Table 35. Geothermal Heat Pump Shipments by Model Type, 1994-1998**  
(Number of Units)

Model	1994	1995	1996	1997	1998
ARI-320 . . . . .	R3,943	R4,696	R4,697	R7,772	10,510
ARI-325/330 . . . . .	21,947	26,800	25,697	28,335	26,042
Other Non-ARI Rated . . . . .	757	838	991	1,327	1,714
<b>Totals . . . . .</b>	<b>R26,647</b>	<b>R32,334</b>	<b>R31,385</b>	<b>R37,434</b>	<b>38,266</b>

R = Revised.

Source: Energy Information Administration, Form EIA-902 "Annual Geothermal Heat Pump Manufacturers Survey."

**Table 36. Capacity of Geothermal Heat Pump Shipments by Model Type, 1994-1998**  
(Total Rated Capacity Tons)

Model	1994	1995	1996	1997	1998
ARI-320 . . . . .	R10,855	R13,120	R15,060	R24,708	35,776
ARI-325/330 . . . . .	92,104	113,925	92,819	110,186	98,912
Other Non-ARI Rated . . . . .	2,879	3,935	5,091	6,662	6,758
<b>Totals . . . . .</b>	<b>R105,838</b>	<b>R130,980</b>	<b>R112,970</b>	<b>R141,556</b>	<b>141,446</b>

R = Revised.

Note: One ton of capacity is equal to 12,000 Btu's.

Source: Energy Information Administration, Form EIA-902 "Annual Geothermal Heat Pump Manufacturers Survey."

**Table 37. Geothermal Heat Pump Shipments by Export, Census Region, and Model Type, 1998**  
(Number of Units)

Export and Census Region	ARI-320	ARI-325/330	Other Non-ARI Rated GHPs	Total
Export .....	213	244	24	481
North Central .....	1,418	10,182	640	12,240
Northeast .....	1,872	3,284	247	5,403
South .....	5,789	9,698	708	16,195
West .....	1,218	2,634	95	3,947
<b>Total .....</b>	<b>10,510</b>	<b>26,042</b>	<b>1,714</b>	<b>38,266</b>

Note: The North Central Census region consists of Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. The Northeast Census region consists of Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. The South Census region consists of Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. The West Census region consists of Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

Source: Energy Information Administration, Form EIA-902 "Annual Geothermal Heat Pump Manufacturers Survey."

**Table 38. Geothermal Heat Pump Shipments by Customer Type and Model Type, 1998**  
(Number of Units)

Customer Type	ARI-320	ARI-325/330	Other Non-ARI Rated GHPs	Total
Exporter .....	0	109	0	109
Wholesale Distributor .....	5,093	8,474	810	14,377
Retail Distributor .....	0	3,043	179	3,222
Installer .....	4,517	13,329	583	18,429
End-User .....	0	959	35	994
Others .....	900	128	107	1,135
<b>Total .....</b>	<b>10,510</b>	<b>26,042</b>	<b>1,714</b>	<b>38,266</b>

Source: Energy Information Administration, Form EIA-902 "Annual Geothermal Heat Pump Manufacturers Survey."



## Appendix A

# EIA Renewable Energy Data Sources

The Energy Information Administration (EIA) develops renewable energy information from a wide variety of sources, cutting across different parts of the organization. This appendix provides a list of all sources which the EIA uses to obtain renewable energy information. While most data come from EIA data collection forms, some are derived from secondary sources. For EIA data collections, additional information is available in the EIA publication *Directory of Energy Data Collection Forms 1996*, DOE/EIA-0249(96), December 1996, or through the EIA home page.

### EIA-63A/B, “Annual Solar Thermal Collector Manufacturers Survey” and “Annual Photovoltaic Module/Cell Manufacturers Survey”

**Energy Sources:** Solar energy.

**Energy Functions:** Disposition.

**Frequency of Collection:** Annually.

**Respondent Categories:** Solar thermal collector manufacturers and/or importers; photovoltaic module/cell manufacturers and/or importers;

**Reporting Requirement:** Mandatory.

**Description:** Forms EIA-63A/B are designed to gather for publication data on shipments of solar thermal collectors and photovoltaic modules. Data are collected by end use and market sector. Collector types include low-temperature, medium-temperature air, medium-temperature liquid, thermosiphon, flat plate, concentrator, integral collector storage, and evacuated tube and concentrators. Respondents are manufacturers, importers, and exporters of solar thermal collectors and photovoltaic modules. These forms were formerly known as CE-63A/B.

### EIA-457A/H, “Residential Energy Consumption Survey”

**Energy Sources:** Coal and coal products; electricity; natural gas; petroleum and petroleum products; wood.

**Energy Functions:** Consumption costs and/or prices.

**Frequency of Collection:** Triennially.

**Respondent Categories:** Electric utilities; natural gas

distributors (including importers/exporters); petroleum and petroleum product distributors; institutions (non-profit); individuals/households.

**Reporting Requirement:** Voluntary and mandatory.

**Description:** Forms EIA-457A through G are used to collect comprehensive national and regional data on both the consumption of and expenditures for energy in the residential sector of the economy. Data are used for analyzing and forecasting residential energy consumption. Housing, appliance, and demographic characteristics data are collected via personal interviews with households, and consumption and expenditure billing data are collected from the energy suppliers. End-use intensities are produced for space heating, water heating, air conditioning, refrigerators, and appliances. Rental agents are contacted by telephone to check on fuels used in rented apartments. Surveys were conducted in 1978, 1979, 1980, 1981, 1982, 1984, 1987, 1990, 1993, and 1997. Form EIA-457H is used to collect detailed lighting usage information for a subsample.

### EIA-819M, “Monthly Oxygenate Telephone Report”

**Energy Sources:** Petroleum and petroleum products.

**Energy Functions:** Production, Supply.

**Frequency of Collection:** Monthly.

**Respondent Categories:** Oxygenate producers, Petroleum and petroleum product distributors, Petroleum and petroleum product processors, Petroleum and petroleum product storers.

**Reporting Requirement:** Mandatory.

**Legal Citation:** Public Law 93-275 (FEAA), 13(b), 5(a), 5(b), 52.

**Description:** Form EIA-819M is designed to obtain information on oxygenate production, imports, and end-of-month stocks. Data was previously collected using the EIA-819, Monthly Oxygenate Telephone Survey Data are reported by oxygenate type and PAD District. Respondents are a sample of: operators of facilities that produce oxygenates; operators of petroleum refineries; operators of bulk terminals, bulk stations, blending plants, and other non-refinery facilities that store or blend oxygenates; and importers of oxygenates.

## **EIA-846 (A,B,C), “Manufacturing Energy Consumption Survey”**

**Energy Sources:** Coal and coal products; electricity; natural gas; petroleum and petroleum products; wood.

**Energy Functions:** Consumption; disposition; financial; and/or management; production; research and development; other energy functions.

**Frequency of Collection:** Triennially.

**Respondent Categories:** Manufacturing.

**Reporting Requirement:** Mandatory.

**Description:** Forms EIA-846A through D are used to collect information on energy consumption, energy usage patterns, and fuel-switching capabilities of the manufacturing sector of the U.S. economy. The information from this survey is used to publish aggregate statistics on the consumption of energy for fuel and nonfuel purposes; fuel-switching capabilities; and certain energy-related issues such as energy prices, on-site electricity generation, and purchases of electricity from nonutilities. Since 1991, the survey has also collected information on end users of energy, participation in energy management programs, and penetration of new technology. Respondents are a sample of manufacturing establishments. Surveys were conducted for 1985, 1988, 1991, 1994, and 1998 although data for 1998 was not ready to be included in the preparation of this report.

## **EIA-860, “Annual Electric Generator Report”**

**Energy Sources:** Electricity.

**Energy Functions:** Financial and/or management; production.

**Frequency of Collection:** Annually.

**Respondent Categories:** Electric utilities.

**Reporting Requirement:** Mandatory.

**Description:** Form EIA-860 is used to collect data on the status of electric generating plants and associated equipment in operation and those scheduled to be in operation in the United States within 10 years of filing of the report. These data are used to maintain and update EIA's electric power plant frame data base. Data are collected on power plant sites, and the design data of electric generators. Respondents include each electric utility that operates, or plans to operate, a power plant in the United States within 10 years of the report.

## **EIA-860A, Annual Electric Generator Report - Utility**

**Energy Sources:** Electricity.

**Energy Functions:** Financial and/or management, Production.

**Frequency of Collection:** Annually.

**Respondent Categories:** Electric utilities.

**Reporting Requirement:** Mandatory.

**Description:** Form EIA-860A is used to collect data on the status of electric generating plants and associated equipment in operation and those scheduled to be in operation in the United States within 5 years of filing of the report. These data are used to maintain and update the EIA's electric power plant frame data base. Data are collected on power plant sites, and the design data of electric generators. Respondents include each electric utility that operates, or plans to operate, a power plant in the United States within 5 years of the report.

## **EIA-860B, Annual Electric Generator Report - Nonutility**

**Energy Sources:** Electricity.

**Energy Functions:** Production.

**Frequency of Collection:** Annually.

**Respondent Categories:** Nonutility power producers.

**Reporting Requirement:** Mandatory.

**Description:** EIA-860B collects data annually from non-utility power producers who own or plan on installing electric generation equipment with a total capacity of one megawatt or more at an existing or proposed site. Electricity generation, installed capacity, and energy consumption data are collected. These data are used to augment existing electric utility data and for electric power forecasts and analyses.

## **EIA-861, “Annual Electric Utility Report”**

**Energy Sources:** Electricity.

**Energy Functions:** Disposition; financial and/or management; production.

**Frequency of Collection:** Annually.

**Respondent Categories:** Electric utilities.

**Reporting Requirement:** Mandatory.

**Description:** Form EIA-861 is a mandatory collection of data, filed annually by each electric utility in the United States, its territories, and Puerto Rico. The survey collects data on generation, wholesale purchases, and sales and revenue by class of consumer and State. These data are used to maintain and update the EIA's electric utility frame data base. This data base provides information to answer questions from the Executive Branch, Congress, other public agencies, and the general public. Respondents include each electric utility that is a corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities within the United States, its territories, or Puerto Rico for the generation, transmission, distribution, or sale of electric energy primarily for use by the public.

## EIA-867, “Annual Nonutility Power Producer Report”

**Energy Sources:** Electricity.

**Energy Functions:** Production.

**Frequency of Collection:** Annually through 1997.

**Respondent Categories:** Nonutility power producers.

**Reporting Requirement:** Mandatory.

**Description:** Form EIA-867 is used to collect data annually from nonutility power producers who own or plan on installing electric generation equipment with a total capacity of one megawatt or more at an existing or proposed site. Electricity generation, installed capacity, and energy consumption data are collected. These data will be used to augment existing electric utility data and for electric power forecasts and analyses.

## EIA-871A/F, “Commercial Buildings Energy Consumption Survey”

**Energy Sources:** Electricity; natural gas; natural gas products; petroleum and petroleum products; wood; other energy sources.

**Energy Functions:** Consumption; costs and/or prices.

**Frequency of Collection:** Triennially.

**Respondent Categories:** Commercial buildings; electric utilities; natural gas distributors (including importers/exporters); petroleum and petroleum product distributors; other (industry); Federal government institutions (nonprofit).

**Reporting Requirement:** Voluntary and mandatory.

**Description:** Forms EIA-871A through F are used to collect information for the Commercial Buildings Energy Consumption Survey (CBECS). The survey provides comprehensive national and regional information on the consumption of, and expenditures for, energy in the commercial sector of the economy. Data are used in EIA models and published in statistical and analytical reports. Physical characteristics information for commercial buildings is collected by personal interviews with building owners and managers using Form EIA-871A. Billing and consumption data for the buildings are collected by mail from individual energy suppliers by using Forms EIA-871C through F (depending upon the energy source). Supplemental information on construction improvements, maintenance, and repairs is collected for the Bureau of the Census by using Form EIA-871G. This survey was renamed the CBECS in 1989. Previously it was conducted under the name of Nonresidential Buildings Energy Consumption Survey.

## EIA-902, “Annual Geothermal Heat Pump Manufacturers Survey”

**Energy Sources:** Geothermal.

**Energy Functions:** Disposition.

**Frequency of Collection:** Annually.

**Respondent Categories:** Geothermal heat pump manufacturers and importers.

**Reporting Requirement:** Mandatory.

**Description:** The Form EIA-902 collects information on shipments of geothermal heat pumps. The survey tracks shipments of the following three main types of geothermal heat pumps, as classified by the Air Conditioning & Refrigeration Institute (ARI), and the much smaller shipped volume of non-ARI rated systems. A brief description of the ARI-classified system is as follows:

ARI 320—Water-Source Heat Pumps (WSHP)—These systems are installed in commercial buildings, where a central chiller or boiler supplies chilled or heated water, respectively, to heat pumps installed in series. The heat pumps reject building heat to chilled water during the cooling season and, during the heating season, take heat from boiler water.

ARI 325—Ground Water-Source Heat Pumps (GWHP)—The GWHP is an open-loop system in which ground water is drawn from an aquifer or other natural body of water into piping. At the heat pump, heat is drawn from or dumped to the water through a heat exchanger to the refrigerant in the heat pump. The heated or cooled water returns to its source.

ARI 330—Ground Source Closed-Loop Heat Pumps (GSHP)—A water or water/glycol (antifreeze) solution flows continuously through a closed loop of pipe buried underground. Ground heat is absorbed into or rejected from the solution flowing in the closed loop. At the heat pump, heat is drawn from or dumped to the closed loop solution via heat transfer through a heat exchanger, which passes heat to or removes heat from the refrigerant in the heat pump. Depending on the type of ground and land area, systems can either be installed horizontally or vertically.

Data are collected by model type, heat pump capacity, region of destination, customer type, and economic sector. Respondents are manufacturers and importers.

## Appendix B

# Renewable Energy Data Limitations

This appendix provides information about the quality of renewable energy data presented in this report. Information pertinent to renewable energy source data quality, in general, is presented first, followed by discussion of electric and non-electric data sources by fuel type.

Renewable energy projects pose special challenges when attempting to collect complete information on them. One challenge is the dispersed nature of many renewable energy forms, such as a photovoltaic (PV) system for generating electricity that may operate in a stand-alone fashion in a remote location. If the facility is not connected to an electricity grid, there is no Federal regulatory requirement to report its operating information. Tracking down hundreds or thousands of such facilities, each with a small power output, can be extremely challenging.

Another challenge involves tracking renewable energy supplies. Conventional energy supplies, such as petroleum, are easily tracked because the distribution networks (usually pipelines) are limited and well-defined. This permits one to make reasonable assumptions about fuel consumption, assuming stocks can be reasonably estimated.<sup>10</sup> The same cannot be said for many renewable energy supplies. Often a large number of energy consumers must be surveyed in order to make reasonable inferences about renewable energy consumption. Wood, for example, is gathered by tens of thousands of entities—millions if residential use is considered—for fuel uses not reportable for regulatory purposes. Thus, obtaining accurate data on wood energy consumption would entail conducting large end use consumption surveys.

Finally, some renewable energy sources are byproducts (such as pulping liquor) of non-energy processes. To

track such uses, information must be solicited from respondents not generally in the energy supply chain.

## Electricity<sup>11</sup>

As noted in Chapter 1, 64 percent of renewable energy consumption measured by EIA is used to produce electric power. It is, therefore, important to examine the coverage quality of EIA renewable electricity data. EIA renewable electricity generation is derived from two principal sources: Form EIA-759, “Monthly Power Plant Report,” and Form-EIA-860B, “Annual Electric Generator Report-Nonutility.”<sup>12</sup> Form EIA-759 is sent to all utilities, while the EIA-860B is required of all nonutility generating facilities exceeding 1 megawatt capacity. (This includes facilities which meet Federal Energy Regulatory Commission [FERC] standards as a “qualifying facility” [QF], as well as independent power producers [IPPs]). Therefore, off-grid electric applications are not captured here (although they may be covered in EIA's Manufacturing Energy Consumption Survey<sup>13</sup>).

Because electric utilities are easily identified and have mandatory regulatory reporting requirements, complete coverage of utility-generated electricity is usually assured. As part of the electric power industry restructuring, some utilities are selling off generating assets. Every effort is made to assure that the new owner picks up reporting on the appropriate EIA survey. In contrast, nonutilities (i.e., QFs and IPPs) are required only to file regulatory reports at the time of their intention to become a grid electricity-producing facility. Over time, QF ownerships and locations change frequently. These factors, combined with the large number of QF applications, make tracking these facilities difficult. Accordingly, EIA has developed a threshold below

<sup>10</sup> Even if stock data are only approximate, conventional energy stocks are normally a small percentage of production.

<sup>11</sup> Information in this section is based on the report, “Renewable Energy Frame Review Updated Report: Survey Sampling Frame and Electricity Discrepancy Estimates,” by Decision Analysis Corporation of Virginia (Vienna, Virginia, August 1993).

<sup>12</sup> Before 1998 this report was called the Form EIA-867, “Annual Nonutility Power Producer Report.”

<sup>13</sup> Because the MECS is based on the Bureau of the Census' Annual Survey of Manufacturers, EIA does not know the identity of MECS respondents.

which nonutility units are not surveyed. The Form EIA-860B is a mandatory survey of all existing and planned nonutility electric generating facilities in the United States with a total generator nameplate capacity of 1 megawatt or more.

An analysis of the Form EIA-867 universe indicates that the survey's capacity under coverage varies between 3 and 10 percent, depending on the fuel source (Table B1). Capacity and unit coverage are the most difficult for wind, where numerous small units exist. EIA has analyzed the differences between capacities reported for identical renewable units on Form EIA-867 and alternative sources. Capacity discrepancies were found to result from these factors:

- **Obsolete information**
- **Facility versus generator reporting:** A non-EIA source may cite capacity figures for an entire facility, not taking into account individual generators that use conventional fuels or a mixture of conventional and renewable fuels. Because EIA assigns capability to the major energy source, when two or more sources are reported, renewable capability may be understated when another energy source is more important.
- **Capacity definition differences:** Form EIA-867 requests respondents to report nameplate electric capacity. However, alternative capacity measures are being reported on non-EIA data sources
- **Numerical rounding practices:** This has the greatest effect on small units.

In a follow-up study of capacity discrepancies, the EIA-867 was over four times more likely to have the correct value than the alternative source, which covered units of all sizes.

## Non-Electric Renewable Energy Consumption

### Overview

The primary application for renewable energy other than making electricity is creating heat for industrial processes, buildings, or water. Most non-electric consumption data are gathered on two EIA consumption surveys: the Manufacturing Energy Consumption Survey (MECS), and the Residential Energy Consumption Survey (RECS). MECS is based on the U.S. Bureau of the Census' Census of Manufacturing. As far as renewable energy is concerned, MECS provides consumption estimates of total industrial energy and various categories of biomass, including wood. MECS data was available for 1991 and 1994. Data for 1998 has been collected and is being compiled. RECS is based on an area probability sample of households selected by EIA. For renewable energy, it provides estimates of residential wood energy consumption. RECS data was available for 1990, 1993, and 1997. During intervening years, EIA estimated energy consumption by assessing industry trends, housing developments, and changes in weather conditions.

There are three other non-electric applications for renewable energy: solar heating, alcohol transportation

**Table B1. Evaluation of EIA's Undercoverage of Nonutility Electricity Data**

Fuel	Source	Number of Facilities <sup>a</sup>	Capacity (megawatts)
Biomass . . . . .	EIA-867 <sup>b</sup> (≥ 1 MW)	471	14,090
	"Electricity Discrepancy Estimates" <sup>c</sup>	759	15,037
Geothermal . . . . .	EIA-867	48	1,551
	"Electricity Discrepancy Estimates"	57	1,590
Wind . . . . .	EIA-867	82	1,803
	"Electricity Discrepancy Estimates"	739	1,992
Solar . . . . .	EIA-867	11	365
	"Electricity Discrepancy Estimates"	152	374

<sup>a</sup>Excludes some EIA-867 facilities that could not be matched with facilities contained in non-EIA data sources.

<sup>b</sup>Based on the 1991 survey year. Excludes some EIA-867 facilities that could not be matched with facilities contained in non-EIA data sources. The 1991 EIA-867 survey did not indicate what nonutility facilities under 5 megawatts are renewable.

<sup>c</sup>"Renewable Energy Frame Review Updated Report: Survey Sampling Frame and Electricity Discrepancy Estimates," by Decision Analysis Corporation of Virginia, August 2, 1993.

Source: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

fuels, and geothermal energy. Solar energy for non-electric applications is derived from the EIA Solar Collector Manufacturing Survey, Form EIA-63A/B (formerly CE-63A/B). The survey does not collect energy “consumption” data, but rather production statistics on various types of solar and photovoltaic energy units. EIA applies additional assumptions regarding their application to estimate the amount of heat energy derived from installed solar/PV panels. Alcohol fuel consumption information is provided by the Form EIA-819M, “Monthly Oxygenate Telephone Report.” Geothermal non-electric energy information is taken from data provided by the Oregon Institute of Technology, Geo-Heat Center.

## Biomass

Wood is the principal component of biomass energy. Information on non-electric wood energy consumption is derived from the MECS and RECS sample surveys.

Although some questions about MECS coverage have been raised, no formal analysis of current data exists to support this concern. According to 1983 U.S. Forest Service statistics on wood harvested for fuelwood, the Pulp and Paper Industry subgroup of the Forest Products Industry group consumed only 42 percent of total sector wood energy, not including black liquor (a byproduct fuel). MECS surveys the smaller-populated Pulp and Paper Industry intensively but only randomly samples the larger-populated remainder of the Forest Products Industry. For a variety of reasons, it is difficult to trace wood energy supply to wood consumed for energy. RECS covers wood consumption only for the primary residence of those surveyed; thus, wood consumption by second homes is omitted. This could cause residential wood energy consumption to be understated by about 5 percent, but EIA has adjusted the data presented in this report to avoid the undercount.

Of the 3.052 quads of biomass energy estimated to have been consumed in 1998, roughly three-fourths represents estimates from RECS and MECS. For MECS, 1998 estimated consumption of 1.914 quads has an appropriate relative standard error of 3 percent.<sup>14</sup> The RECS estimate of 0.428 quads of biomass energy consumption has a relative standard error of 10.3 percent.<sup>15</sup>

Cross-checks of Form EIA-819M information on alcohol fuels with data from the Bureau of Alcohol, Tobacco, and Firearms and the U.S. Department of Transportation have not revealed any major deficiencies in the Form EIA-819M data.

## Geothermal

EIA does not collect data on non-electric applications of geothermal energy such as crop drying and ground-water heat pumps. A study prepared for the U.S. Department of Energy by the Oregon Institute of Technology, Geo-Heat Center, indicates that non-electric uses of geothermal energy amounted to nearly 17.8 trillion Btu in 1998 (Table B2). Sixty-four percent of this energy was provided by geothermal heat pumps.

**Table B2. Geothermal Direct Use of Energy and Heat Pumps**  
(Quadrillion Btu)

	Direct Use	Heat Pumps	Total
1990 . . . .	0.0048	0.0054	0.0102
1991 . . . .	0.0050	0.0060	0.0110
1992 . . . .	0.0051	0.0067	0.0118
1993 . . . .	0.0053	0.0072	0.0125
1994 . . . .	R0.0056	R0.0076	0.0132
1995 . . . .	R0.0058	R0.0083	0.0141
1996 . . . .	R0.0059	R0.0093	0.0152
1997 . . . .	R0.0061	R0.0101	0.0162
1998 . . . .	0.0063	0.0115	0.0178

Source: John Lund, Oregon Institute of Technology, Geo-Heat Center (Klamath Falls, Oregon, March 1999), unpublished data.

## Wind, Solar, and Photovoltaics

EIA does not collect information on direct energy uses of wind (e.g., water-pumping). No comprehensive source of such information is known.

The data collected on Forms EIA-63A and EIA-63B are subject to various limitations including: (1) coverage (the list of respondents may not be complete or, on the other

<sup>14</sup> Energy Information Administration, *Manufacturing Consumption of Energy 1994*, DOE/EIA-0512(94) (Washington, DC, December 1997).

<sup>15</sup> Energy Information Administration, *Residential Energy Consumption Survey*, DOE/EIA-0632(97) (Washington, DC, November 1997).

hand, there may be double counting); (2) nonresponse (some of those surveyed may not respond, or they may not provide all the information requested); and (3) adjustments (errors may be made in estimating values for missing data).

EIA collects solar data only on terrestrial systems; it does not collect data on satellite and military applications. The total value of U.S. photovoltaic shipments in 1998 according to the Forms EIA-63A and EIA-63B was \$185 million. Based on anecdotal information for 1999, shipments ranging from about \$165 million to \$180 million went for satellite applications. Military applications cannot be estimated due to classified information and budgetary accounting. These figures do not include possible inventories held by distributors, retailers, and installers.

The universe of solar/PV survey respondents is a census of those U.S.-based companies involved in manufacturing and/or importing solar collectors and photovoltaic cells and modules. Care has been taken to establish the survey frames accurately. The frames of potential respondents are compiled from previous surveys and from information in the public domain. However, because the solar collector and photovoltaic cell and module industries are subject to sporadic entry and exit of manufacturers and importers, the frame may exclude some small companies that have recently entered or reentered the industry. From 1993 through 1997, EIA received reports from all known potential respondents.

## **Geothermal Heat Pump Manufacturing Activity**

In 1997, the EIA began collecting information on geothermal heat pumps using its new survey the Form EIA-902, "Annual Geothermal Heat Pump Manufacturers Survey." The principal data collected are the number and type of heat pumps shipped and their capacity ratings.

The data collected on Form EIA-902 are subject to various sources of error. These sources are: (1) coverage (the list of respondents may not be complete or, on the other hand, there may be double counting); (2) non-

response (all that are surveyed may not respond or may not provide all information requested); (3) respondents (respondents may commit errors in reporting the data); (4) processing (the data collection agency may omit or incorrectly transcribe a submission); (5) concept (the data collection elements may not measure the items they were intended to measure); and (6) estimation (errors may be made in estimating values for missing data). Because the survey is a census survey, the estimates shown in this report are not subject to sampling error. Although it is not possible to present estimates of nonsampling error, precautionary steps were taken at each stage of the survey design to minimize the possible occurrence of these errors.

In order to improve accuracy and the quality of data collected from U.S. geothermal heat pump manufacturers in 1999, EIA modified the Form EIA-902 by adding a new data element which requested respondents to report all ARI-320 heat pumps that were shipped in 1999 as well as the number of ARI-320 geothermal heat pump units that were manufactured to be connected to ground, ground water, or surface water connection for heat exchange. This modification clarifies for the manufacturer the type of ARI-320 applications manufacturers should report as geothermal and would separate out units that would be connected to a boiler/cooling tower. Respondents were asked to report the total number of heat pumps shipped and the number of only the ARI-320 geothermal heat pumps shipped. ARI-320 units may be connected either to a "boiler/cooling tower" configuration or ground/ground water. Ground/ground water connections are geothermal applications, while boiler/cooling tower configurations are traditional water-to-water exchange uses.

An additional modification to the Form EIA-902 was to combine both the ARI-325 and ARI-330 units into one reporting category. Many ARI-325 geothermal heat pumps are dual-rated to qualify as ARI-330 units. Which rating is appropriate depends on the installed application, information not necessarily known when the manufacturer shipped the unit. Therefore, the sum of ARI-325 and ARI-330 units may be regarded as an accurate total, whereas manufacturers would estimate the number of units in each category based upon heuristic information.

**Appendix C**

**Renewable Electric Generation and Capability  
by State for 1990 through 1998**



**C1. Renewable Electric Utility Net Generation, 1990**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	10,366,507	--	--	--	--	--	--	10,366,507
Alaska .....	974,521	--	--	--	--	--	--	974,521
Arizona .....	7,417,576	--	--	--	--	--	--	7,417,576
Arkansas .....	3,654,653	--	--	--	--	--	--	3,654,653
California .....	22,808,272	8,429,403	2,029	43	--	--	2,111	31,241,858
Colorado .....	1,308,961	--	--	--	--	--	164	1,309,125
Connecticut .....	495,848	--	--	--	421,546	--	--	917,394
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	174,604	--	--	--	--	--	--	174,604
Georgia .....	4,544,712	--	--	--	--	--	--	4,544,712
Hawaii .....	22,743	--	--	--	--	--	5,999	28,742
Idaho .....	8,617,362	--	--	--	--	--	--	8,617,362
Illinois .....	60,840	--	--	--	--	--	--	60,840
Indiana .....	441,021	--	--	--	--	--	--	441,021
Iowa .....	856,848	--	--	--	17,375	--	--	874,223
Kansas .....	11,769	--	--	45	--	--	--	11,814
Kentucky .....	3,160,383	--	--	--	--	--	--	3,160,383
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	2,110,064	--	--	--	--	--	--	2,110,064
Maryland .....	2,298,910	--	--	--	--	--	--	2,298,910
Massachusetts ....	969,108	--	--	--	--	--	--	969,108
Michigan .....	1,492,822	--	--	--	--	--	--	1,492,822
Minnesota .....	657,574	--	--	266	250,363	147,697	--	1,055,900
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	2,192,115	--	--	--	--	--	--	2,192,115
Montana .....	10,672,287	--	--	--	--	75,487	--	10,747,774
Nebraska .....	1,140,093	--	--	--	--	--	--	1,140,093
Nevada .....	1,731,848	--	--	--	--	--	--	1,731,848
New Hampshire ....	1,477,224	--	--	--	--	--	--	1,477,224
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	205,435	--	--	--	--	--	--	205,435
New York .....	26,802,148	--	--	--	--	--	--	26,802,148
North Carolina ....	6,776,551	--	--	--	--	--	--	6,776,551
North Dakota .....	1,711,148	--	--	--	--	--	--	1,711,148
Ohio .....	172,582	--	--	--	--	--	266,834	439,416
Oklahoma .....	2,730,594	--	--	--	--	--	--	2,730,594
Oregon .....	40,961,577	--	--	--	--	577	--	40,962,154
Pennsylvania .....	2,582,002	--	--	--	--	--	--	2,582,002
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	3,235,298	--	--	--	--	--	--	3,235,298
South Dakota .....	3,934,402	--	--	--	--	--	--	3,934,402
Tennessee .....	10,015,363	--	--	--	--	--	--	10,015,363
Texas .....	1,793,625	--	385	--	--	--	278,988	2,072,998
Utah .....	485,742	151,825	--	--	--	--	--	637,567
Vermont .....	1,214,248	--	--	--	--	94,238	--	1,308,486
Virginia .....	1,261,363	--	34	--	--	--	--	1,261,397
Washington .....	87,022,217	--	--	--	--	333,306	--	87,355,523
West Virginia .....	435,049	--	--	--	--	--	--	435,049
Wisconsin .....	1,791,037	--	--	44	13,754	158,831	--	1,963,666
Wyoming .....	644,613	--	--	--	--	--	--	644,613
<b>Total .....</b>	<b>283,433,659</b>	<b>8,581,228</b>	<b>2,448</b>	<b>398</b>	<b>703,038</b>	<b>810,136</b>	<b>554,096</b>	<b>294,085,003</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C2. Renewable Nonutility Gross Generation by State, 1990**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	W	2,188,534	W	2,217,814
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	W	--	W
Arkansas .....	--	--	--	--	--	W	W	1,418,956
California .....	W	W	663,387	3,030,817	1,606,450	4,058,251	545,407	17,445,407
Colorado .....	W	--	--	--	W	--	--	115,998
Connecticut .....	W	--	--	--	W	--	--	764,829
Delaware .....	-	-	-	-	-	-	-	--
Dist. of Col. ....	-	-	-	-	-	-	-	--
Florida .....	--	--	--	--	W	2,100,933	W	3,815,900
Georgia .....	44,854	--	--	--	W	2,369,773	W	2,555,659
Hawaii .....	57,346	--	--	W	W	--	431,518	949,551
Idaho .....	508,892	--	--	--	--	426,318	--	935,210
Illinois .....	W	--	--	--	157,040	W	--	241,311
Indiana .....	--	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	--	W
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	--	--	--
Louisiana .....	W	--	--	--	--	2,083,096	W	2,840,699
Maine .....	W	--	--	--	W	3,117,861	321,148	5,567,841
Maryland .....	--	--	--	--	W	W	--	534,939
Massachusetts ....	W	--	--	--	1,612,936	--	W	1,942,140
Michigan .....	W	--	--	--	323,966	1,284,202	W	1,761,620
Minnesota .....	201,487	--	--	--	W	279,272	W	730,524
Mississippi .....	--	--	--	--	--	1,725,798	--	1,725,798
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	-	-	-	-	-	-	-	--
Nevada .....	W	W	--	--	--	--	--	892,062
New Hampshire ....	W	--	--	--	W	880,897	--	1,438,978
New Jersey .....	W	--	--	--	W	--	--	283,214
New Mexico .....	--	--	--	--	--	--	--	--
New York .....	1,431,305	--	--	--	1,665,360	282,731	--	3,379,397
North Carolina ....	W	--	--	--	W	1,086,481	--	1,170,006
North Dakota .....	--	--	--	--	--	--	--	--
Ohio .....	W	--	--	--	W	W	--	394,201
Oklahoma .....	--	--	--	--	--	W	--	W
Oregon .....	283,042	--	--	W	W	850,821	--	1,227,694
Pennsylvania .....	290,091	--	--	--	313,345	591,178	--	1,194,614
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina .....	63,402	--	--	--	W	1,321,764	W	1,436,345
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	--	--	--	--	W	W	W	416,690
Texas .....	--	--	--	--	W	1,042,917	W	1,071,772
Utah .....	22,931	--	--	--	--	--	--	22,931
Vermont .....	W	--	--	--	--	W	--	173,694
Virginia .....	W	--	--	--	W	1,221,898	--	1,869,050
Washington .....	W	--	--	--	W	467,449	--	923,131
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	W	--	--	--	136,513	500,947	W	872,267
Wyoming .....	--	--	--	--	--	W	--	W
<b>Total .....</b>	<b>9,676,363</b>	<b>7,429,653</b>	<b>663,387</b>	<b>3,065,578</b>	<b>10,612,988</b>	<b>30,811,843</b>	<b>1,737,217</b>	<b>63,997,029</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C3. Renewable Electric Power Industry Generation by State, 1990<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama	10,366,507	--	--	--	W	2,188,534	W	12,584,321
Alaska	974,521	--	--	--	--	W	--	W
Arizona	7,417,576	--	--	--	--	W	--	W
Arkansas	3,654,653	--	--	--	--	W	W	5,073,609
California	W	W	665,416	3,030,860	1,606,450	4,058,251	547,518	48,687,265
Colorado	W	--	--	--	W	--	164	1,425,123
Connecticut	W	--	--	--	W	--	--	1,682,223
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	174,604	--	--	--	W	2,100,933	W	3,990,504
Georgia	4,589,566	--	--	--	W	2,369,773	W	7,100,371
Hawaii	80,089	--	--	W	W	--	437,517	978,293
Idaho	9,126,254	--	--	--	--	426,318	--	9,552,572
Illinois	W	--	--	--	157,040	W	--	302,151
Indiana	441,021	--	--	--	W	--	--	W
Iowa	W	--	--	--	W	--	--	W
Kansas	W	--	--	45	--	--	--	W
Kentucky	3,160,383	--	--	--	--	--	--	3,160,383
Louisiana	W	--	--	--	--	2,083,096	W	2,840,699
Maine	W	--	--	--	W	3,117,861	321,148	7,677,905
Maryland	2,298,910	--	--	--	W	W	--	2,833,849
Massachusetts	W	--	--	--	1,612,936	--	W	2,911,248
Michigan	W	--	--	--	323,966	1,284,202	W	3,254,442
Minnesota	859,061	--	--	266	W	426,969	W	1,786,424
Mississippi	--	--	--	--	--	1,725,798	--	1,725,798
Missouri	2,192,115	--	--	--	--	--	--	2,192,115
Montana	W	--	--	--	--	W	--	W
Nebraska	1,140,093	--	--	--	--	--	--	1,140,093
Nevada	W	W	--	--	--	--	--	2,623,910
New Hampshire	W	--	--	--	W	880,897	--	2,916,202
New Jersey	W	--	--	--	W	--	--	283,214
New Mexico	205,435	--	--	--	--	--	--	205,435
New York	28,233,453	--	--	--	1,665,360	282,731	--	30,181,545
North Carolina	W	--	--	--	W	1,086,481	--	7,946,557
North Dakota	1,711,148	--	--	--	--	--	--	1,711,148
Ohio	W	--	--	--	W	W	266,834	833,617
Oklahoma	2,730,594	--	--	--	--	W	--	W
Oregon	41,244,619	--	--	W	W	851,398	--	42,189,848
Pennsylvania	2,872,093	--	--	--	313,345	591,178	--	3,776,616
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	3,298,700	--	--	--	W	1,321,764	W	4,671,643
South Dakota	3,934,402	--	--	--	--	--	--	3,934,402
Tennessee	10,015,363	--	--	--	W	W	W	10,432,053
Texas	1,793,625	--	385	--	W	1,042,917	W	3,144,770
Utah	508,673	151,825	--	--	--	--	--	660,498
Vermont	W	--	--	--	--	W	--	1,482,180
Virginia	W	--	34	--	W	1,221,898	--	3,130,447
Washington	W	--	--	--	W	800,755	--	88,278,654
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	W	--	--	44	150,267	659,778	W	2,835,933
Wyoming	644,613	--	--	--	--	W	--	W
<b>Total</b>	<b>293,110,022</b>	<b>16,010,881</b>	<b>665,835</b>	<b>3,065,976</b>	<b>11,316,026</b>	<b>31,621,979</b>	<b>2,291,313</b>	<b>358,082,032</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C4. Renewable Electric Utility Net Generation, 1991**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	10,757,723	--	--	--	--	--	--	10,757,723
Alaska .....	896,113	--	--	--	--	--	--	896,113
Arizona .....	6,735,540	--	--	--	--	--	--	6,735,540
Arkansas .....	3,546,966	--	--	--	--	--	--	3,546,966
California .....	20,875,345	7,900,814	2,934	--	--	--	8,270	28,787,363
Colorado .....	1,680,825	--	--	--	--	--	58	1,680,883
Connecticut .....	397,074	--	--	--	439,392	--	--	836,466
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	263,066	--	--	--	--	--	--	263,066
Georgia .....	4,207,061	--	--	--	--	--	--	4,207,061
Hawaii .....	20,401	--	--	--	--	--	--	20,401
Idaho .....	8,281,191	--	--	--	--	--	--	8,281,191
Illinois .....	52,704	--	--	--	--	--	--	52,704
Indiana .....	399,051	--	--	--	--	--	--	399,051
Iowa .....	882,845	--	--	--	19,702	--	--	902,547
Kansas .....	9,102	--	--	42	--	--	--	9,144
Kentucky .....	3,657,801	--	--	--	--	--	--	3,657,801
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,985,152	--	--	--	--	--	--	1,985,152
Maryland .....	1,407,287	--	--	--	--	--	--	1,407,287
Massachusetts ....	855,193	--	--	--	--	--	--	855,193
Michigan .....	1,651,742	--	--	--	--	--	--	1,651,742
Minnesota .....	777,563	--	--	237	260,979	141,404	--	1,180,183
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,119,389	--	--	--	--	--	--	1,119,389
Montana .....	11,921,069	--	--	--	--	62,336	--	11,983,405
Nebraska .....	1,044,671	--	--	--	--	--	--	1,044,671
Nevada .....	2,361,817	--	--	--	--	--	--	2,361,817
New Hampshire ....	1,187,758	--	--	--	--	--	--	1,187,758
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	237,108	--	--	--	--	--	--	237,108
New York .....	25,913,018	--	--	--	--	--	--	25,913,018
North Carolina ....	5,807,244	--	--	--	--	--	--	5,807,244
North Dakota .....	1,756,684	--	--	--	--	--	--	1,756,684
Ohio .....	145,411	--	--	--	--	--	298,016	443,427
Oklahoma .....	1,922,137	--	--	--	--	--	--	1,922,137
Oregon .....	40,844,132	--	--	--	--	261	--	40,844,393
Pennsylvania .....	1,618,793	--	--	--	--	--	--	1,618,793
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	3,071,281	--	--	--	--	--	--	3,071,281
South Dakota .....	3,828,116	--	--	--	--	--	--	3,828,116
Tennessee .....	10,872,944	--	--	--	--	--	--	10,872,944
Texas .....	2,224,581	--	371	--	--	--	276,105	2,501,057
Utah .....	604,264	186,241	--	--	--	--	--	790,505
Vermont .....	940,608	--	--	--	--	109,322	--	1,049,930
Virginia .....	1,012,074	--	33	--	--	--	--	1,012,107
Washington .....	88,926,102	--	--	--	--	274,065	--	89,200,167
West Virginia .....	356,180	--	--	--	--	--	--	356,180
Wisconsin .....	2,269,563	--	--	6	11,600	144,989	--	2,426,158
Wyoming .....	735,932	--	--	--	--	--	--	735,932
<b>Total .....</b>	<b>280,060,621</b>	<b>8,087,055</b>	<b>3,338</b>	<b>285</b>	<b>731,673</b>	<b>732,377</b>	<b>582,449</b>	<b>290,197,798</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C5. Renewable Nonutility Gross Generation by State, 1991**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	2,359,366
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	W	--	W
Arkansas .....	--	--	--	--	--	W	W	1,427,390
California .....	W	W	779,206	3,008,040	1,585,862	4,184,222	952,440	18,725,966
Colorado .....	125,094	--	--	--	--	W	W	159,957
Connecticut .....	W	--	--	--	697,570	--	W	836,292
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	W	2,135,790	W	4,488,590
Georgia .....	W	--	--	--	--	3,170,740	W	3,234,942
Hawaii .....	51,099	--	--	W	W	--	426,603	901,330
Idaho .....	W	--	--	--	--	506,157	W	1,055,798
Illinois .....	W	W	--	--	172,068	W	W	336,699
Indiana .....	--	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	--	W
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	--	--	--
Louisiana .....	W	--	--	--	--	2,531,789	W	3,289,366
Maine .....	W	--	--	--	W	3,570,005	281,825	5,892,317
Maryland .....	--	--	--	--	W	W	--	517,315
Massachusetts ....	W	--	--	--	1,679,919	--	W	2,010,665
Michigan .....	151,971	--	--	--	522,398	1,264,208	--	1,938,578
Minnesota .....	W	--	--	--	W	316,589	--	748,323
Mississippi .....	--	--	--	--	--	1,908,492	--	1,908,492
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	1,029,460
New Hampshire ....	W	--	--	--	W	920,903	--	1,487,957
New Jersey .....	W	--	--	--	W	--	--	858,645
New Mexico .....	--	--	--	--	--	--	--	--
New York .....	W	--	--	--	1,176,132	317,232	W	3,455,302
North Carolina ....	W	--	--	--	W	1,353,904	--	1,438,578
North Dakota .....	--	--	--	--	--	--	--	--
Ohio .....	W	--	--	--	W	W	--	578,130
Oklahoma .....	--	--	--	--	--	W	--	W
Oregon .....	283,365	--	--	W	W	774,841	--	1,153,007
Pennsylvania .....	304,611	--	--	--	941,748	549,198	--	1,795,558
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	65,224	--	--	--	W	1,451,793	W	1,570,503
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	--	--	--	--	W	W	--	467,436
Texas .....	--	--	--	--	W	1,057,660	W	1,105,349
Utah .....	22,931	--	--	--	--	--	--	22,931
Vermont .....	W	--	--	--	--	W	--	141,466
Virginia .....	68,667	--	--	--	--	1,238,736	W	2,059,120
Washington .....	W	--	--	--	W	473,872	--	940,747
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	W	--	--	--	104,591	504,030	W	888,313
Wyoming .....	--	--	--	--	--	W	--	W
<b>Total .....</b>	<b>9,541,053</b>	<b>8,199,583</b>	<b>779,206</b>	<b>3,049,666</b>	<b>12,261,508</b>	<b>33,785,003</b>	<b>2,744,112</b>	<b>70,360,132</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C6. Renewable Electric Power Industry Generation by State, 1991<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama .....	10,757,723	--	--	--	--	W	W	13,117,089
Alaska .....	896,113	--	--	--	--	W	--	W
Arizona .....	6,735,540	--	--	--	--	W	--	W
Arkansas .....	3,546,966	--	--	--	--	W	W	4,974,356
California .....	W	W	782,140	3,008,040	1,585,862	4,184,222	960,710	47,513,329
Colorado .....	1,805,919	--	--	--	--	W	W	1,840,840
Connecticut .....	W	--	--	--	1,136,962	--	W	1,672,758
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	263,066	--	--	--	W	2,135,790	W	4,751,656
Georgia .....	W	--	--	--	--	3,170,740	W	7,442,003
Hawaii .....	71,500	--	--	W	W	--	426,603	921,731
Idaho .....	W	--	--	--	--	506,157	W	9,336,989
Illinois .....	W	W	--	--	172,068	W	W	389,403
Indiana .....	399,051	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	--	W
Kansas .....	W	--	--	42	--	--	--	W
Kentucky .....	3,657,801	--	--	--	--	--	--	3,657,801
Louisiana .....	W	--	--	--	--	2,531,789	W	3,289,366
Maine .....	W	--	--	--	W	3,570,005	281,825	7,877,469
Maryland .....	1,407,287	--	--	--	W	W	--	1,924,602
Massachusetts ....	W	--	--	--	1,679,919	--	W	2,865,858
Michigan .....	1,803,713	--	--	--	522,398	1,264,208	--	3,590,320
Minnesota .....	W	--	--	237	W	457,993	--	1,928,506
Mississippi .....	--	--	--	--	--	1,908,492	--	1,908,492
Missouri .....	1,119,389	--	--	--	--	--	--	1,119,389
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	1,044,671	--	--	--	--	--	--	1,044,671
Nevada .....	W	W	--	--	--	--	--	3,391,277
New Hampshire ....	W	--	--	--	W	920,903	--	2,675,715
New Jersey .....	W	--	--	--	W	--	--	858,645
New Mexico .....	237,108	--	--	--	--	--	--	237,108
New York .....	W	--	--	--	1,176,132	317,232	W	29,368,320
North Carolina ....	W	--	--	--	W	1,353,904	--	7,245,822
North Dakota .....	1,756,684	--	--	--	--	--	--	1,756,684
Ohio .....	W	--	--	--	W	W	298,016	1,021,557
Oklahoma .....	1,922,137	--	--	--	--	W	--	W
Oregon .....	41,127,497	--	--	W	W	775,102	--	41,997,400
Pennsylvania .....	1,923,404	--	--	--	941,748	549,198	--	3,414,351
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	3,136,505	--	--	--	W	1,451,793	W	4,641,784
South Dakota .....	3,828,116	--	--	--	--	--	--	3,828,116
Tennessee .....	10,872,944	--	--	--	W	W	--	11,340,380
Texas .....	2,224,581	--	371	--	W	1,057,660	W	3,606,406
Utah .....	627,195	186,241	--	--	--	--	--	813,436
Vermont .....	W	--	--	--	--	W	--	1,191,396
Virginia .....	1,080,741	--	33	--	W	1,238,736	W	3,071,227
Washington .....	W	--	--	--	W	747,937	--	90,140,914
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	W	--	--	6	116,191	649,019	W	3,314,471
Wyoming .....	735,932	--	--	--	--	W	--	W
<b>Total .....</b>	<b>289,601,674</b>	<b>16,286,638</b>	<b>782,544</b>	<b>3,049,951</b>	<b>12,993,181</b>	<b>34,517,380</b>	<b>3,326,561</b>	<b>360,557,930</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C7. Renewable Electric Utility Net Generation, 1992**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	10,260,023	--	--	--	--	--	--	10,260,023
Alaska .....	918,120	--	--	--	--	--	--	918,120
Arizona .....	6,620,757	--	--	--	--	--	--	6,620,757
Arkansas .....	3,377,119	--	--	--	--	--	--	3,377,119
California .....	19,209,788	7,917,440	2,789	--	--	--	4,836	27,134,853
Colorado .....	1,372,490	--	--	--	--	--	--	1,372,490
Connecticut .....	356,648	--	--	--	374,302	--	--	730,950
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	235,604	--	--	--	--	--	--	235,604
Georgia .....	4,859,204	--	--	--	--	--	--	4,859,204
Hawaii .....	9,823	--	--	--	--	--	--	9,823
Idaho .....	6,259,550	--	--	--	--	--	--	6,259,550
Illinois .....	51,600	--	--	--	--	--	8,448	60,048
Indiana .....	562,476	--	--	--	--	--	--	562,476
Iowa .....	981,399	--	--	--	14,218	--	--	995,617
Kansas .....	--	--	--	113	--	--	--	113
Kentucky .....	3,767,232	--	--	--	--	--	--	3,767,232
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,715,107	--	--	--	--	--	--	1,715,107
Maryland .....	1,824,659	--	--	--	--	--	--	1,824,659
Massachusetts ....	762,764	--	--	--	--	--	--	762,764
Michigan .....	1,647,175	--	--	--	--	--	--	1,647,175
Minnesota .....	757,962	--	--	145	261,201	145,954	--	1,165,262
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,481,265	--	--	--	--	--	--	1,481,265
Montana .....	8,223,420	--	--	50	--	79,070	--	8,302,540
Nebraska .....	1,075,446	--	--	--	--	--	6,435	1,081,881
Nevada .....	1,982,458	--	--	--	--	--	--	1,982,458
New Hampshire ....	964,442	--	--	--	--	--	--	964,442
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	255,046	--	--	--	--	--	--	255,046
New York .....	26,624,178	--	--	--	--	--	--	26,624,178
North Carolina ....	5,725,577	--	--	--	--	--	--	5,725,577
North Dakota .....	1,698,854	--	--	--	--	--	--	1,698,854
Ohio .....	244,352	--	--	--	--	--	309,613	553,965
Oklahoma .....	3,241,701	--	--	--	--	--	--	3,241,701
Oregon .....	31,475,583	--	--	--	--	5,797	--	31,481,380
Pennsylvania .....	2,135,454	--	--	--	--	--	--	2,135,454
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	3,245,473	--	--	--	--	--	--	3,245,473
South Dakota .....	3,612,010	--	--	--	--	--	--	3,612,010
Tennessee .....	10,011,047	--	--	--	--	--	--	10,011,047
Texas .....	2,638,164	--	369	--	--	--	281,022	2,919,555
Utah .....	579,683	186,369	--	--	--	--	--	766,052
Vermont .....	805,858	--	--	--	--	91,892	--	897,750
Virginia .....	1,017,844	--	11	--	--	--	--	1,017,855
Washington .....	67,967,061	--	--	--	--	360,650	--	68,327,711
West Virginia .....	422,620	--	--	--	--	--	--	422,620
Wisconsin .....	2,123,353	--	--	--	10,489	133,124	5,894	2,272,860
Wyoming .....	635,640	--	--	--	--	--	--	635,640
<b>Total .....</b>	<b>243,736,029</b>	<b>8,103,809</b>	<b>3,169</b>	<b>308</b>	<b>660,210</b>	<b>816,487</b>	<b>616,248</b>	<b>253,936,260</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C8. Renewable Nonutility Gross Generation by State, 1992**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	W	W	2,595,500
Alaska	--	--	--	--	--	W	W	W
Arizona	--	--	--	--	--	W	--	W
Arkansas	W	--	--	--	--	1,496,373	W	1,511,699
California	W	W	746,277	2,892,928	1,619,767	4,019,475	1,261,500	18,868,530
Colorado	W	--	--	--	--	--	W	156,761
Connecticut	W	--	--	--	821,629	--	W	1,087,933
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	2,893,059	2,251,880	186,220	5,331,159
Georgia	W	--	--	--	--	3,275,580	W	3,385,632
Hawaii	51,818	W	--	W	W	W	399,511	866,704
Idaho	W	--	--	--	--	565,008	W	972,395
Illinois	W	--	--	--	168,027	W	30,307	286,976
Indiana	--	--	--	--	W	--	--	W
Iowa	W	--	--	--	W	--	W	24,366
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	--	--	--
Louisiana	W	--	--	--	--	2,602,223	W	3,348,083
Maine	W	--	--	--	W	3,809,375	328,070	6,053,230
Maryland	--	--	--	--	W	W	--	524,557
Massachusetts	250,598	--	--	--	1,712,117	W	W	2,077,950
Michigan	W	--	--	--	338,256	1,404,373	W	1,928,728
Minnesota	W	--	--	--	W	382,076	--	972,049
Mississippi	--	--	--	--	--	2,053,165	--	2,053,165
Missouri	--	--	--	--	--	--	W	W
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	1,217,670
New Hampshire	W	--	--	--	167,091	1,042,142	W	1,643,253
New Jersey	W	--	--	--	958,906	--	W	983,531
New Mexico	--	--	--	--	--	--	W	--
New York	W	--	--	--	1,392,236	519,348	W	3,785,013
North Carolina	W	--	--	--	W	1,757,382	--	1,832,302
North Dakota	--	--	--	--	--	--	--	--
Ohio	W	--	--	--	W	W	--	402,188
Oklahoma	--	--	--	--	--	W	--	W
Oregon	245,406	--	--	W	W	725,257	--	1,067,904
Pennsylvania	W	--	--	--	1,334,856	608,384	W	2,392,115
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	65,629	--	--	--	W	1,739,965	W	1,871,466
South Dakota	--	--	--	--	--	--	--	--
Tennessee	--	--	--	--	W	451,531	W	514,229
Texas	--	--	--	--	W	W	43,327	1,131,569
Utah	22,931	--	--	--	--	--	--	22,931
Vermont	W	--	--	--	--	W	--	174,902
Virginia	W	--	--	--	811,271	1,341,346	W	2,227,646
Washington	W	--	--	--	W	750,800	--	1,297,253
West Virginia	W	--	--	--	--	--	W	W
Wisconsin	265,551	--	--	--	124,760	605,443	33,126	1,028,880
Wyoming	--	--	--	--	--	W	--	W
<b>Total</b>	<b>9,446,439</b>	<b>8,577,891</b>	<b>746,277</b>	<b>2,916,379</b>	<b>14,049,698</b>	<b>36,254,511</b>	<b>3,302,682</b>	<b>75,293,877</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."



**C9. Renewable Electric Power Industry Generation by State, 1992<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama .....	10,260,023	--	--	--	--	W	W	12,855,523
Alaska .....	918,120	--	--	--	--	W	W	W
Arizona .....	6,620,757	--	--	--	--	W	--	W
Arkansas .....	W	--	--	--	--	1,496,373	W	4,888,818
California .....	W	W	749,066	2,892,928	1,619,767	4,019,475	1,266,336	46,003,383
Colorado .....	W	--	--	--	--	--	W	1,529,251
Connecticut .....	W	--	--	--	1,195,931	--	W	1,818,883
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	235,604	--	--	--	2,893,059	2,251,880	186,220	5,566,763
Georgia .....	W	--	--	--	--	3,275,580	W	8,244,836
Hawaii .....	61,641	W	--	W	W	W	399,511	876,527
Idaho .....	W	--	--	--	--	565,008	W	7,231,945
Illinois .....	W	--	--	--	168,027	W	38,755	347,024
Indiana .....	562,476	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	W	1,019,983
Kansas .....	W	--	--	113	--	--	--	W
Kentucky .....	3,767,232	--	--	--	--	--	--	3,767,232
Louisiana .....	W	--	--	--	--	2,602,223	W	3,348,083
Maine .....	W	--	--	--	W	3,809,375	328,070	7,768,337
Maryland .....	1,824,659	--	--	--	W	W	--	2,349,216
Massachusetts ....	1,013,362	--	--	--	1,712,117	W	W	2,840,714
Michigan .....	W	--	--	--	338,256	1,404,373	W	3,575,903
Minnesota .....	W	--	--	145	W	528,030	--	2,137,311
Mississippi .....	--	--	--	--	--	2,053,165	--	2,053,165
Missouri .....	1,481,265	--	--	--	--	--	W	W
Montana .....	W	--	--	50	--	W	--	W
Nebraska .....	1,075,446	--	--	--	--	--	6,435	1,081,881
Nevada .....	W	W	--	--	--	--	--	3,200,128
New Hampshire ....	W	--	--	--	167,091	1,042,142	W	2,607,695
New Jersey .....	W	--	--	--	958,906	--	W	983,531
New Mexico .....	255,046	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,392,236	519,348	W	30,409,191
North Carolina ....	W	--	--	--	W	1,757,382	--	7,557,879
North Dakota .....	1,698,854	--	--	--	--	--	--	1,698,854
Ohio .....	W	--	--	--	W	W	309,613	956,153
Oklahoma .....	3,241,701	--	--	--	--	W	--	W
Oregon .....	31,720,989	--	--	W	W	731,054	--	32,549,284
Pennsylvania .....	W	--	--	--	1,334,856	608,384	W	4,527,569
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	3,311,102	--	--	--	W	1,739,965	W	5,116,939
South Dakota .....	3,612,010	--	--	--	--	--	--	3,612,010
Tennessee .....	10,011,047	--	--	--	W	451,531	W	10,525,276
Texas .....	2,638,164	--	369	--	W	W	324,349	4,051,124
Utah .....	602,614	186,369	--	--	--	--	--	788,983
Vermont .....	W	--	--	--	--	W	--	1,072,652
Virginia .....	W	--	11	--	811,271	1,341,346	W	3,245,501
Washington .....	W	--	--	--	W	1,111,450	--	69,624,964
West Virginia .....	W	--	--	--	--	--	W	W
Wisconsin .....	2,388,904	--	--	--	135,249	738,567	39,020	3,301,740
Wyoming .....	635,640	--	--	--	--	W	--	W
<b>Total .....</b>	<b>253,182,468</b>	<b>16,681,700</b>	<b>749,446</b>	<b>2,916,687</b>	<b>14,709,908</b>	<b>37,070,998</b>	<b>3,918,930</b>	<b>329,230,137</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C10. Renewable Electric Utility Net Generation, 1993**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	9,034,210	--	--	--	--	--	--	9,034,210
Alaska .....	1,302,992	--	--	--	--	--	--	1,302,992
Arizona .....	6,697,088	--	--	--	--	--	--	6,697,088
Arkansas .....	4,507,758	--	--	--	--	--	--	4,507,758
California .....	37,981,519	7,422,851	3,428	--	--	--	3,872	45,411,670
Colorado .....	1,785,086	--	--	--	--	--	--	1,785,086
Connecticut .....	349,663	--	--	--	406,095	--	--	755,758
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	210,776	--	--	--	--	--	--	210,776
Georgia .....	4,408,207	--	--	--	--	--	--	4,408,207
Hawaii .....	13,752	--	--	--	--	--	--	13,752
Idaho .....	9,022,551	--	--	--	--	--	--	9,022,551
Illinois .....	39,647	--	--	--	--	--	--	39,647
Indiana .....	448,400	--	--	--	--	--	--	448,400
Iowa .....	737,023	--	--	--	19,558	--	--	756,581
Kansas .....	--	--	--	58	--	--	--	58
Kentucky .....	3,155,113	--	--	--	--	--	--	3,155,113
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,575,593	--	--	--	--	--	--	1,575,593
Maryland .....	1,658,271	--	--	--	--	--	--	1,658,271
Massachusetts ....	677,833	--	--	--	--	--	--	677,833
Michigan .....	1,639,359	--	--	--	--	--	--	1,639,359
Minnesota .....	833,736	--	--	185	275,508	138,188	--	1,247,617
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	3,184,483	--	--	--	1,253	--	--	3,185,736
Montana .....	9,549,364	--	--	--	--	78,224	--	9,627,588
Nebraska .....	1,001,663	--	--	--	--	--	5,750	1,007,413
Nevada .....	1,959,953	--	--	--	--	--	--	1,959,953
New Hampshire ...	1,001,769	--	--	--	--	--	--	1,001,769
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	293,827	--	--	--	--	--	--	293,827
New York .....	28,123,706	--	--	--	--	13,237	--	28,136,943
North Carolina ....	4,960,533	--	--	--	--	--	--	4,960,533
North Dakota .....	1,415,110	--	--	--	--	--	--	1,415,110
Ohio .....	183,069	--	--	--	--	--	64,134	247,203
Oklahoma .....	4,357,456	--	--	--	--	--	--	4,357,456
Oregon .....	35,531,031	--	--	--	--	10,767	--	35,541,798
Pennsylvania .....	2,008,250	--	--	--	--	--	--	2,008,250
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	2,890,119	--	--	--	--	--	--	2,890,119
South Dakota .....	2,591,115	--	--	--	--	--	--	2,591,115
Tennessee .....	8,954,227	--	--	--	--	--	--	8,954,227
Texas .....	1,786,405	--	366	--	--	--	294,511	2,081,282
Utah .....	818,409	148,148	--	--	--	--	--	966,557
Vermont .....	838,619	--	--	--	--	64,407	--	903,026
Virginia .....	1,247,208	--	8	--	--	--	--	1,247,216
Washington .....	66,982,839	--	--	--	--	395,167	--	67,378,006
West Virginia .....	362,117	--	--	--	--	--	--	362,117
Wisconsin .....	2,191,053	--	--	--	150	190,198	29,388	2,410,789
Wyoming .....	787,427	--	--	--	--	--	--	787,427
<b>Total .....</b>	<b>269,098,329</b>	<b>7,570,999</b>	<b>3,802</b>	<b>243</b>	<b>702,564</b>	<b>890,188</b>	<b>397,655</b>	<b>278,663,780</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C11. Renewable Nonutility Gross Generation by State, 1993**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	3,480,041
Alaska .....	--	--	--	--	--	W	W	W
Arizona .....	--	--	--	--	--	W	--	W
Arkansas .....	W	--	--	--	--	1,613,830	W	1,645,775
California .....	2,536,371	W	896,796	W	1,744,743	3,719,425	1,249,270	21,180,844
Colorado .....	W	--	--	--	--	--	W	163,243
Connecticut .....	W	--	--	--	828,790	--	W	1,114,703
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	3,087,926	2,301,295	185,500	5,574,721
Georgia .....	W	--	--	--	W	3,387,632	77,868	3,518,749
Hawaii .....	42,920	W	--	W	W	W	413,203	997,665
Idaho .....	W	--	--	--	--	556,951	W	1,267,547
Illinois .....	W	--	--	--	221,502	W	35,266	348,488
Indiana .....	--	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	W	20,169
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	--	--	--
Louisiana .....	W	--	--	--	--	2,658,186	W	3,989,561
Maine .....	W	--	--	--	W	3,892,336	399,895	6,091,872
Maryland .....	--	--	--	--	W	W	--	497,944
Massachusetts ....	206,606	--	--	--	1,928,645	W	W	2,312,312
Michigan .....	W	--	--	--	489,477	1,647,982	W	2,328,751
Minnesota .....	W	--	--	--	W	457,316	--	1,046,684
Mississippi .....	--	--	--	--	--	2,028,022	--	2,028,022
Missouri .....	--	--	--	--	--	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	1,600,036
New Hampshire ....	W	--	--	--	171,356	1,047,834	W	1,632,552
New Jersey .....	W	--	--	--	999,766	--	W	1,021,820
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,254,352	569,744	W	3,891,917
North Carolina ....	26,806	--	--	--	W	1,749,324	W	1,821,154
North Dakota .....	--	--	--	--	--	--	--	--
Ohio .....	W	--	--	--	W	W	--	356,601
Oklahoma .....	--	--	--	--	--	W	--	W
Oregon .....	W	--	--	--	W	651,826	--	1,086,423
Pennsylvania .....	W	--	--	--	1,520,057	629,687	W	2,524,220
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	60,626	--	--	--	W	1,602,209	W	1,726,954
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	--	--	--	--	W	443,130	W	510,484
Texas .....	--	--	--	--	W	W	74,354	1,140,980
Utah .....	42,031	--	--	--	--	--	--	42,031
Vermont .....	W	--	--	--	--	W	--	350,641
Virginia .....	W	--	--	--	453,544	1,357,766	W	1,883,404
Washington .....	332,873	--	--	--	W	639,251	W	1,200,979
West Virginia .....	W	--	--	--	--	--	W	W
Wisconsin .....	282,472	--	--	--	119,557	606,976	45,716	1,054,720
Wyoming .....	--	--	--	--	--	--	--	--
<b>Total .....</b>	<b>11,510,786</b>	<b>9,748,634</b>	<b>896,796</b>	<b>3,052,416</b>	<b>14,489,375</b>	<b>37,420,941</b>	<b>3,835,465</b>	<b>80,954,414</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C12. Renewable Electric Power Industry Generation by State, 1993<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama	9,034,210	--	--	--	--	W	W	12,514,251
Alaska	1,302,992	--	--	--	--	W	W	W
Arizona	6,697,088	--	--	--	--	W	--	W
Arkansas	W	--	--	--	--	1,613,830	W	6,153,533
California	40,517,890	W	900,224	W	1,744,743	3,719,425	1,253,142	66,592,514
Colorado	W	--	--	--	--	--	W	1,948,329
Connecticut	W	--	--	--	1,234,885	--	W	1,870,461
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	210,776	--	--	--	3,087,926	2,301,295	185,500	5,785,497
Georgia	W	--	--	--	W	3,387,632	77,868	7,926,956
Hawaii	56,672	W	--	W	W	W	413,203	1,011,417
Idaho	W	--	--	--	--	556,951	W	10,290,098
Illinois	W	--	--	--	221,502	W	35,266	388,135
Indiana	448,400	--	--	--	W	--	--	W
Iowa	W	--	--	--	W	--	W	776,750
Kansas	W	--	--	58	--	--	--	W
Kentucky	3,155,113	--	--	--	--	--	--	3,155,113
Louisiana	W	--	--	--	--	2,658,186	W	3,989,561
Maine	W	--	--	--	W	3,892,336	399,895	7,667,465
Maryland	1,658,271	--	--	--	W	W	--	2,156,215
Massachusetts	884,439	--	--	--	1,928,645	W	W	2,990,145
Michigan	W	--	--	--	489,477	1,647,982	W	3,968,110
Minnesota	W	--	--	185	W	595,504	--	2,294,301
Mississippi	--	--	--	--	--	2,028,022	--	2,028,022
Missouri	3,184,483	--	--	--	1,253	--	W	W
Montana	W	--	--	--	--	W	--	W
Nebraska	1,001,663	--	--	--	--	--	5,750	1,007,413
Nevada	W	W	--	--	--	--	--	3,559,989
New Hampshire	W	--	--	--	171,356	1,047,834	W	2,634,321
New Jersey	W	--	--	--	999,766	--	W	1,021,820
New Mexico	293,827	--	--	--	--	--	W	W
New York	W	--	--	--	1,254,352	582,981	W	32,028,860
North Carolina	4,987,339	--	--	--	W	1,749,324	W	6,781,687
North Dakota	1,415,110	--	--	--	--	--	--	1,415,110
Ohio	W	--	--	--	W	W	64,134	603,804
Oklahoma	4,357,456	--	--	--	--	W	--	W
Oregon	W	--	--	--	W	662,593	--	36,628,221
Pennsylvania	W	--	--	--	1,520,057	629,687	W	4,532,470
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	2,950,745	--	--	--	W	1,602,209	W	4,617,073
South Dakota	2,591,115	--	--	--	--	--	--	2,591,115
Tennessee	8,954,227	--	--	--	W	443,130	W	9,464,711
Texas	1,786,405	--	366	--	W	W	368,865	3,222,262
Utah	860,440	148,148	--	--	--	--	--	1,008,588
Vermont	W	--	--	--	--	W	--	1,253,667
Virginia	W	--	8	--	453,544	1,357,766	W	3,130,620
Washington	67,315,712	--	--	--	W	1,034,418	W	68,578,985
West Virginia	W	--	--	--	--	--	W	W
Wisconsin	2,473,525	--	--	--	119,707	797,174	75,104	3,465,509
Wyoming	787,427	--	--	--	--	--	--	787,427
<b>Total</b>	<b>280,609,115</b>	<b>17,319,633</b>	<b>900,598</b>	<b>3,052,659</b>	<b>15,191,939</b>	<b>38,311,129</b>	<b>4,233,120</b>	<b>359,618,194</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C13. Renewable Electric Utility Net Generation, 1994**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	11,429,120	--	--	--	--	--	--	11,429,120
Alaska .....	1,345,407	--	--	--	--	--	--	1,345,407
Arizona .....	7,365,425	--	--	--	--	--	--	7,365,425
Arkansas .....	3,461,898	--	--	--	--	--	--	3,461,898
California .....	21,917,229	6,745,833	3,168	--	--	--	2,794	28,669,024
Colorado .....	1,428,515	--	--	--	--	--	--	1,428,515
Connecticut .....	409,502	--	--	--	438,962	--	--	848,464
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	274,474	--	--	--	--	--	--	274,474
Georgia .....	4,278,558	--	--	--	--	--	--	4,278,558
Hawaii .....	18,805	--	--	--	--	--	--	18,805
Idaho .....	7,303,162	--	--	--	--	--	--	7,303,162
Illinois .....	45,022	--	--	--	--	--	--	45,022
Indiana .....	406,867	--	--	--	--	--	--	406,867
Iowa .....	1,052,870	--	--	53	27,958	--	--	1,080,881
Kansas .....	--	--	--	55	--	--	--	55
Kentucky .....	4,013,590	--	--	--	--	--	--	4,013,590
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,681,717	--	--	--	--	--	--	1,681,717
Maryland .....	2,009,536	--	--	--	--	--	--	2,009,536
Massachusetts ....	746,370	--	--	--	--	--	--	746,370
Michigan .....	1,536,190	--	--	--	--	--	--	1,536,190
Minnesota .....	831,074	--	--	201	375,606	38,333	--	1,245,214
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,916,293	--	--	--	6,776	--	--	1,923,069
Montana .....	8,096,388	--	--	--	--	41,960	--	8,138,348
Nebraska .....	1,311,883	--	--	--	--	--	9,332	1,321,215
Nevada .....	1,865,760	--	--	--	--	--	--	1,865,760
New Hampshire ...	1,035,518	--	--	--	--	--	--	1,035,518
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	212,890	--	--	--	--	--	--	212,890
New York .....	26,345,630	--	--	--	--	10,794	--	26,356,424
North Carolina ...	5,224,967	--	--	--	--	--	--	5,224,967
North Dakota .....	1,856,461	--	--	--	--	--	--	1,856,461
Ohio .....	188,821	--	--	--	--	--	--	188,821
Oklahoma .....	2,514,648	--	--	--	--	--	--	2,514,648
Oregon .....	30,915,908	--	--	--	--	--	--	30,915,908
Pennsylvania .....	2,355,210	--	--	--	--	--	--	2,355,210
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ...	2,967,874	--	--	--	--	--	--	2,967,874
South Dakota .....	5,128,760	--	--	--	--	--	--	5,128,760
Tennessee .....	10,991,541	--	--	--	--	--	--	10,991,541
Texas .....	1,530,436	--	293	--	--	--	303,029	1,833,758
Utah .....	716,030	194,804	--	--	--	--	--	910,834
Vermont .....	895,095	--	--	--	--	71,683	--	966,778
Virginia .....	1,070,830	--	11	--	--	--	--	1,070,841
Washington .....	65,200,038	--	--	--	--	395,659	--	65,595,697
West Virginia .....	363,003	--	--	--	--	--	--	363,003
Wisconsin .....	1,914,414	--	--	--	4,973	206,239	54,159	2,179,785
Wyoming .....	897,209	--	--	--	--	--	--	897,209
<b>Total .....</b>	<b>247,070,938</b>	<b>6,940,637</b>	<b>3,472</b>	<b>309</b>	<b>854,275</b>	<b>764,668</b>	<b>369,314</b>	<b>256,003,613</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C14. Renewable Nonutility Gross Generation by State, 1994**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	W	W	4,288,400
Alaska	--	--	--	--	--	W	W	W
Arizona	--	--	--	--	--	W	--	W
Arkansas	W	--	--	--	--	1,499,931	W	1,536,344
California	W	W	823,973	3,421,341	1,787,088	4,165,960	983,829	20,584,040
Colorado	W	--	--	--	--	--	W	149,500
Connecticut	W	--	--	--	886,838	--	W	1,164,790
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	3,134,514	2,383,882	224,613	5,743,009
Georgia	W	--	--	--	W	3,312,343	44,580	3,424,922
Hawaii	123,678	W	--	W	W	W	369,562	1,104,507
Idaho	W	--	--	--	--	535,900	W	1,170,454
Illinois	W	--	--	--	251,268	W	W	377,229
Indiana	--	--	--	--	W	--	--	W
Iowa	W	--	--	--	W	W	W	59,599
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	--	--	--
Louisiana	W	--	--	--	--	2,806,767	W	3,884,432
Maine	W	--	--	--	W	3,525,878	422,656	5,927,101
Maryland	--	--	--	--	W	W	--	543,129
Massachusetts	195,375	--	--	--	1,983,954	W	W	2,382,214
Michigan	W	--	--	--	557,776	1,810,513	W	2,541,941
Minnesota	310,767	--	--	W	W	470,635	--	1,083,726
Mississippi	--	--	--	--	--	1,954,558	--	1,954,558
Missouri	--	--	--	--	--	--	W	W
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	1,646,823
New Hampshire	W	--	--	--	182,659	965,271	W	1,578,548
New Jersey	W	--	--	--	1,206,006	--	W	1,223,780
New Mexico	--	--	--	--	--	--	W	W
New York	W	--	--	--	1,249,346	563,803	W	3,821,957
North Carolina	1,988,722	--	--	--	W	1,793,416	W	3,829,262
North Dakota	--	--	--	--	--	--	W	W
Ohio	W	--	--	--	W	W	--	342,326
Oklahoma	--	--	--	--	--	W	--	W
Oregon	W	--	--	--	W	516,113	--	922,474
Pennsylvania	W	--	--	--	1,522,607	728,283	W	2,655,382
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	70,364	--	--	--	W	1,609,169	W	1,737,071
South Dakota	--	--	--	--	--	--	--	--
Tennessee	W	--	--	--	W	567,647	W	1,678,121
Texas	--	--	--	--	W	W	69,240	1,161,185
Utah	34,756	--	--	--	--	--	--	34,756
Vermont	W	--	--	--	--	W	--	355,609
Virginia	W	--	--	--	695,738	1,462,429	W	2,239,204
Washington	379,830	--	--	--	W	571,862	W	1,191,148
West Virginia	W	--	--	--	--	--	W	W
Wisconsin	308,856	--	--	--	136,058	692,198	48,658	1,185,771
Wyoming	--	--	--	--	--	W	--	W
<b>Total</b>	<b>13,226,934</b>	<b>10,122,228</b>	<b>823,973</b>	<b>3,481,616</b>	<b>15,402,236</b>	<b>38,595,032</b>	<b>3,394,326</b>	<b>85,046,345</b>

<sup>a</sup> Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C15. Renewable Electric Power Industry Generation by State, 1994<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama .....	11,429,120	--	--	--	--	W	W	15,717,520
Alaska .....	1,345,407	--	--	--	--	W	W	W
Arizona .....	7,365,425	--	--	--	--	W	--	W
Arkansas .....	W	--	--	--	--	1,499,931	W	4,998,242
California .....	W	W	827,141	3,421,341	1,787,088	4,165,960	986,623	49,253,064
Colorado .....	W	--	--	--	--	--	W	1,578,015
Connecticut .....	W	--	--	--	1,325,800	--	W	2,013,254
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	274,474	--	--	--	3,134,514	2,383,882	224,613	6,017,483
Georgia .....	W	--	--	--	W	3,312,343	44,580	7,703,480
Hawaii .....	142,483	W	--	W	W	W	369,562	1,123,312
Idaho .....	W	--	--	--	--	535,900	W	8,473,616
Illinois .....	W	--	--	--	251,268	W	W	422,251
Indiana .....	406,867	--	--	--	W	--	--	W
Iowa .....	W	--	--	53	W	W	W	1,140,480
Kansas .....	W	--	--	55	--	--	--	W
Kentucky .....	4,013,590	--	--	--	--	--	--	4,013,590
Louisiana .....	W	--	--	--	--	2,806,767	W	3,884,432
Maine .....	W	--	--	--	W	3,525,878	422,656	7,608,818
Maryland .....	2,009,536	--	--	--	W	W	--	2,552,665
Massachusetts ....	941,745	--	--	--	1,983,954	W	W	3,128,584
Michigan .....	W	--	--	--	557,776	1,810,513	W	4,078,131
Minnesota .....	1,141,841	--	--	W	W	508,968	--	2,328,940
Mississippi .....	--	--	--	--	--	1,954,558	--	1,954,558
Missouri .....	1,916,293	--	--	--	6,776	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	1,311,883	--	--	--	--	--	9,332	1,321,215
Nevada .....	W	W	--	--	--	--	--	3,512,583
New Hampshire ....	W	--	--	--	182,659	965,271	W	2,614,066
New Jersey .....	W	--	--	--	1,206,006	--	W	1,223,780
New Mexico .....	212,890	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,249,346	574,597	W	30,178,381
North Carolina ....	7,213,689	--	--	--	W	1,793,416	W	9,054,229
North Dakota .....	1,856,461	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	531,147
Oklahoma .....	2,514,648	--	--	--	--	W	--	W
Oregon .....	W	--	--	--	W	516,113	--	31,838,382
Pennsylvania .....	W	--	--	--	1,522,607	728,283	W	5,010,592
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	3,038,238	--	--	--	W	1,609,169	W	4,704,945
South Dakota .....	5,128,760	--	--	--	--	--	--	5,128,760
Tennessee .....	W	--	--	--	W	567,647	W	12,669,662
Texas .....	1,530,436	--	293	--	W	W	372,269	2,994,943
Utah .....	750,786	194,804	--	--	--	--	--	945,590
Vermont .....	W	--	--	--	--	W	--	1,322,387
Virginia .....	W	--	11	--	695,738	1,462,429	W	3,310,045
Washington .....	65,579,868	--	--	--	W	967,521	W	66,786,845
West Virginia .....	W	--	--	--	--	--	W	W
Wisconsin .....	2,223,270	--	--	--	141,031	898,437	102,817	3,365,556
Wyoming .....	897,209	--	--	--	--	W	--	W
<b>Total .....</b>	<b>260,297,872</b>	<b>17,062,865</b>	<b>827,445</b>	<b>3,481,925</b>	<b>16,256,511</b>	<b>39,359,700</b>	<b>3,763,640</b>	<b>341,049,958</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C16. Renewable Electric Utility Net Generation, 1995**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	9,501,510	--	--	--	--	--	--	9,501,510
Alaska .....	1,372,115	--	--	--	--	--	--	1,372,115
Arizona .....	8,288,419	--	--	--	--	--	--	8,288,419
Arkansas .....	3,217,714	--	--	--	--	--	--	3,217,714
California .....	44,928,985	4,605,062	3,653	10,917	--	--	1,931	49,550,548
Colorado .....	2,008,902	--	--	--	--	--	--	2,008,902
Connecticut .....	305,401	--	--	--	403,726	--	--	709,127
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	230,840	--	--	--	--	--	--	230,840
Georgia .....	4,146,208	--	--	--	--	--	--	4,146,208
Hawaii .....	15,957	--	--	--	--	--	--	15,957
Idaho .....	10,062,543	--	--	--	--	--	--	10,062,543
Illinois .....	47,699	--	--	--	--	853	67,053	115,605
Indiana .....	467,261	--	--	--	--	--	--	467,261
Iowa .....	991,088	--	--	117	19,578	--	--	1,010,783
Kansas .....	--	--	--	26	--	--	--	26
Kentucky .....	3,423,478	--	--	--	--	--	--	3,423,478
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,658,481	--	--	--	--	299	--	1,658,780
Maryland .....	1,442,006	--	--	--	--	--	--	1,442,006
Massachusetts ....	650,277	--	--	--	--	--	--	650,277
Michigan .....	1,486,539	--	--	--	--	--	--	1,486,539
Minnesota .....	822,599	--	--	37	406,971	21,618	--	1,251,225
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,918,507	--	--	--	24,979	--	--	1,943,486
Montana .....	10,698,465	--	--	--	--	--	--	10,698,465
Nebraska .....	1,426,058	--	--	--	--	--	16,268	1,442,326
Nevada .....	1,922,441	--	--	--	--	--	--	1,922,441
New Hampshire ....	983,966	--	--	--	--	--	--	983,966
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	263,920	--	--	--	--	--	--	263,920
New York .....	24,782,142	--	--	--	--	12,234	--	24,794,376
North Carolina ....	3,846,840	--	--	--	--	--	--	3,846,840
North Dakota .....	2,457,401	--	--	--	--	--	--	2,457,401
Ohio .....	227,459	--	--	--	--	--	--	227,459
Oklahoma .....	2,779,920	--	--	--	--	--	--	2,779,920
Oregon .....	40,415,006	--	--	--	--	--	--	40,415,006
Pennsylvania .....	1,683,697	--	--	--	--	--	--	1,683,697
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	3,392,394	--	--	--	--	--	--	3,392,394
South Dakota .....	6,009,871	--	--	--	--	--	--	6,009,871
Tennessee .....	8,801,848	--	--	--	--	--	--	8,801,848
Texas .....	1,703,348	--	253	--	--	--	--	1,703,601
Utah .....	926,336	139,742	--	--	--	--	--	1,066,078
Vermont .....	834,193	--	--	--	--	127,168	--	961,361
Virginia .....	917,654	--	3	--	--	--	--	917,657
Washington .....	82,028,297	--	--	--	--	261,094	--	82,289,391
West Virginia .....	394,451	--	--	--	--	--	--	394,451
Wisconsin .....	2,097,101	--	--	--	7,081	209,928	68,397	2,382,507
Wyoming .....	798,503	--	--	--	--	--	--	798,503
<b>Total .....</b>	<b>296,377,840</b>	<b>4,744,804</b>	<b>3,909</b>	<b>11,097</b>	<b>862,335</b>	<b>633,194</b>	<b>153,649</b>	<b>302,786,828</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."



**C17. Renewable Nonutility Gross Generation by State, 1995**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	4,320,903
Alaska .....	--	--	--	--	--	W	W	W
Arizona .....	--	--	--	--	--	W	--	W
Arkansas .....	--	--	--	--	--	W	W	1,633,621
California .....	W	W	824,193	3,106,909	1,778,286	2,738,999	965,981	20,580,549
Colorado .....	W	--	--	--	--	--	W	161,390
Connecticut .....	W	--	--	--	1,391,813	--	W	1,666,927
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	3,280,300	2,304,818	253,623	5,838,741
Georgia .....	W	--	--	--	W	3,178,516	70,996	3,320,506
Hawaii .....	82,680	W	--	W	W	W	297,383	1,038,127
Idaho .....	W	--	--	--	--	557,211	W	1,506,888
Illinois .....	W	--	--	--	239,934	W	W	361,852
Indiana .....	--	--	--	--	86,469	--	--	86,469
Iowa .....	W	--	--	--	W	W	W	61,141
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	W	127,869	3,876,536
Maine .....	W	--	--	--	W	3,392,921	460,104	5,711,469
Maryland .....	--	--	--	--	524,646	W	W	708,064
Massachusetts ....	220,579	--	--	--	1,949,877	W	W	2,377,170
Michigan .....	W	--	--	--	696,501	1,926,254	W	2,765,597
Minnesota .....	279,883	--	--	W	W	508,018	W	1,172,542
Mississippi .....	--	--	--	--	--	W	W	2,047,827
Missouri .....	--	--	--	--	--	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	1,677,886
New Hampshire ...	405,802	--	--	--	181,212	881,016	--	1,468,030
New Jersey .....	W	--	--	--	1,295,627	--	W	1,331,387
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,438,366	495,384	W	3,619,936
North Carolina ...	1,795,915	--	--	--	W	1,729,782	W	3,583,177
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	407,590
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	570,739	--	1,008,754
Pennsylvania .....	W	--	--	--	1,753,658	747,386	W	2,859,744
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ...	65,404	--	--	--	W	1,662,833	W	1,803,392
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	599,778	W	1,495,153
Texas .....	--	--	--	--	W	W	48,238	1,030,575
Utah .....	42,835	--	--	--	--	--	--	42,835
Vermont .....	W	--	--	--	--	W	--	346,642
Virginia .....	W	--	--	--	738,604	1,535,635	W	2,356,736
Washington .....	476,622	--	--	--	W	589,338	W	1,276,233
West Virginia .....	W	--	--	--	--	--	W	W
Wisconsin .....	276,500	--	--	--	143,927	658,427	38,118	1,116,972
Wyoming .....	--	--	--	--	--	--	--	--
<b>Total .....</b>	<b>14,773,801</b>	<b>9,911,659</b>	<b>824,193</b>	<b>3,185,006</b>	<b>16,926,438</b>	<b>37,282,619</b>	<b>3,351,499</b>	<b>86,255,216</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C18. Renewable Electric Power Industry Generation by State, 1995<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama .....	9,501,510	--	--	--	--	W	W	13,822,413
Alaska .....	1,372,115	--	--	--	--	W	W	W
Arizona .....	8,288,419	--	--	--	--	W	--	W
Arkansas .....	3,217,714	--	--	--	--	W	W	4,851,335
California .....	W	W	827,846	3,117,826	1,778,286	2,738,999	967,912	70,131,097
Colorado .....	W	--	--	--	--	--	W	2,170,292
Connecticut .....	W	--	--	--	1,795,539	--	W	2,376,054
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	230,840	--	--	--	3,280,300	2,304,818	253,623	6,069,581
Georgia .....	W	--	--	--	W	3,178,516	70,996	7,466,714
Hawaii .....	98,637	W	--	W	W	W	297,383	1,054,084
Idaho .....	W	--	--	--	--	557,211	W	11,569,431
Illinois .....	W	--	--	--	239,934	W	W	477,457
Indiana .....	467,261	--	--	--	86,469	--	--	553,730
Iowa .....	W	--	--	117	W	W	W	1,071,924
Kansas .....	W	--	--	26	--	--	--	W
Kentucky .....	3,423,478	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	W	127,869	3,876,536
Maine .....	W	--	--	--	W	3,393,220	460,104	7,370,249
Maryland .....	1,442,006	--	--	--	524,646	W	W	2,150,070
Massachusetts ....	870,856	--	--	--	1,949,877	W	W	3,027,447
Michigan .....	W	--	--	--	696,501	1,926,254	W	4,252,136
Minnesota .....	1,102,482	--	--	W	W	529,636	W	2,423,767
Mississippi .....	--	--	--	--	--	W	W	2,047,827
Missouri .....	1,918,507	--	--	--	24,979	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	1,426,058	--	--	--	--	--	16,268	1,442,326
Nevada .....	W	W	--	--	--	--	--	3,600,327
New Hampshire ...	1,389,768	--	--	--	181,212	881,016	--	2,451,996
New Jersey .....	W	--	--	--	1,295,627	--	W	1,331,387
New Mexico .....	263,920	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,438,366	507,618	W	28,414,312
North Carolina ....	5,642,755	--	--	--	W	1,729,782	W	7,430,017
North Dakota .....	2,457,401	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	635,049
Oklahoma .....	2,779,920	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	570,739	--	41,423,760
Pennsylvania .....	W	--	--	--	1,753,658	747,386	W	4,543,441
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	3,457,798	--	--	--	W	1,662,833	W	5,195,786
South Dakota .....	6,009,871	--	--	--	--	--	--	6,009,871
Tennessee .....	W	--	--	--	W	599,778	W	10,297,001
Texas .....	1,703,348	--	253	--	W	W	48,238	2,734,176
Utah .....	969,171	139,742	--	--	--	--	--	1,108,913
Vermont .....	W	--	--	--	--	W	--	1,308,003
Virginia .....	W	--	3	--	738,604	1,535,635	W	3,274,393
Washington .....	82,504,919	--	--	--	W	850,432	W	83,565,624
West Virginia .....	W	--	--	--	--	--	W	W
Wisconsin .....	2,373,601	--	--	--	151,008	868,355	106,515	3,499,479
Wyoming .....	798,503	--	--	--	--	--	--	798,503
<b>Total .....</b>	<b>311,151,641</b>	<b>14,656,463</b>	<b>828,102</b>	<b>3,196,103</b>	<b>17,788,773</b>	<b>37,915,813</b>	<b>3,505,148</b>	<b>389,042,044</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C19. Renewable Electric Utility Net Generation, 1996**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	11,081,921	--	--	--	--	--	--	11,081,921
Alaska .....	1,265,863	--	--	--	--	--	--	1,265,863
Arizona .....	9,214,356	--	--	--	--	--	--	9,214,356
Arkansas .....	2,796,669	--	--	--	--	--	--	2,796,669
California .....	41,862,216	5,042,015	2,909	9,992	--	--	54,585	46,971,717
Colorado .....	1,704,979	--	--	--	--	--	--	1,704,979
Connecticut .....	529,808	--	--	--	436,552	--	--	966,360
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	215,560	--	--	--	--	--	--	215,560
Georgia .....	4,626,275	--	--	--	--	--	--	4,626,275
Hawaii .....	17,866	--	--	--	--	--	--	17,866
Idaho .....	12,230,560	--	--	--	--	--	--	12,230,560
Illinois .....	22,431	--	--	--	--	162	133,434	156,027
Indiana .....	448,364	--	--	--	--	--	--	448,364
Iowa .....	918,180	--	--	108	22,634	--	--	940,922
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	3,496,989	--	--	--	--	--	--	3,496,989
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	2,115,695	--	--	--	--	682	--	2,116,377
Maryland .....	2,457,463	--	--	--	--	--	--	2,457,463
Massachusetts ....	920,790	--	--	--	--	--	--	920,790
Michigan .....	1,660,109	--	--	--	--	--	--	1,660,109
Minnesota .....	837,226	--	--	23	395,690	26,373	--	1,259,312
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,313,738	--	--	--	31,291	--	--	1,345,029
Montana .....	13,740,575	--	--	--	--	--	--	13,740,575
Nebraska .....	1,601,919	--	--	--	--	--	11,534	1,613,453
Nevada .....	2,143,302	--	--	--	--	--	--	2,143,302
New Hampshire ....	1,425,600	--	--	--	--	--	--	1,425,600
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	211,499	--	--	--	--	--	--	211,499
New York .....	27,116,202	--	--	--	--	39,886	--	27,156,088
North Carolina ....	4,176,414	--	--	--	--	--	--	4,176,414
North Dakota .....	3,150,873	--	--	--	--	--	--	3,150,873
Ohio .....	392,474	--	--	--	--	--	--	392,474
Oklahoma .....	2,157,775	--	--	--	--	--	--	2,157,775
Oregon .....	44,512,871	--	--	--	--	--	--	44,512,871
Pennsylvania .....	2,561,256	--	--	--	--	--	--	2,561,256
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	2,986,149	--	--	--	--	--	--	2,986,149
South Dakota .....	7,977,670	--	--	--	--	--	--	7,977,670
Tennessee .....	10,578,781	--	--	--	--	--	--	10,578,781
Texas .....	953,721	--	260	--	--	--	--	953,981
Utah .....	1,019,082	191,912	--	--	--	--	--	1,210,994
Vermont .....	1,066,748	--	--	--	--	135,156	--	1,201,904
Virginia .....	1,339,167	--	--	--	--	--	--	1,339,167
Washington .....	98,078,554	--	--	--	--	360,192	--	98,438,746
West Virginia .....	496,708	--	--	--	--	--	--	496,708
Wisconsin .....	2,401,860	--	--	--	9,365	225,703	83,818	2,720,746
Wyoming .....	1,231,797	--	--	--	--	--	--	1,231,797
<b>Total .....</b>	<b>331,058,055</b>	<b>5,233,927</b>	<b>3,169</b>	<b>10,123</b>	<b>895,532</b>	<b>788,154</b>	<b>283,371</b>	<b>338,272,331</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C20. Renewable Nonutility Gross Generation by State, 1996**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	W	W	4,579,581
Alaska	--	--	--	--	--	W	W	W
Arizona	--	--	--	--	--	W	--	W
Arkansas	W	--	--	--	--	1,617,114	W	1,639,305
California	W	W	902,830	3,243,062	1,648,704	3,071,608	606,346	20,698,247
Colorado	W	--	--	--	--	--	W	153,708
Connecticut	W	--	--	--	1,511,452	--	W	1,833,503
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	2,866,236	2,585,841	667,579	6,119,656
Georgia	W	--	--	--	W	3,167,864	71,523	3,326,011
Hawaii	87,711	W	--	W	W	W	289,171	991,526
Idaho	W	--	--	--	--	525,534	W	1,584,622
Illinois	83,998	--	--	--	280,548	W	W	413,535
Indiana	--	--	--	--	W	--	W	108,175
Iowa	W	--	--	--	W	W	W	66,182
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	W	--	W
Louisiana	W	--	--	--	--	W	99,184	4,097,387
Maine	W	--	--	--	W	3,075,168	455,108	5,838,063
Maryland	--	--	--	--	594,930	W	W	770,976
Massachusetts	270,540	--	--	--	1,394,965	W	W	2,485,859
Michigan	W	--	--	--	899,278	2,015,765	W	3,082,675
Minnesota	353,422	--	--	W	319,605	440,291	W	1,164,708
Mississippi	--	--	--	--	--	W	W	1,830,907
Missouri	--	--	--	--	--	--	W	W
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	1,684,070
New Hampshire	503,396	--	--	--	188,270	921,266	--	1,612,932
New Jersey	W	--	--	--	1,020,148	--	W	1,220,282
New Mexico	--	--	--	--	--	--	W	W
New York	W	--	--	--	1,462,434	600,075	W	4,502,101
North Carolina	1,903,300	--	--	--	W	1,638,030	W	3,599,973
North Dakota	--	--	--	--	--	--	W	W
Ohio	W	--	--	--	W	433,328	--	444,267
Oklahoma	--	--	--	--	W	W	--	W
Oregon	W	--	--	--	W	521,783	--	992,939
Pennsylvania	W	--	--	--	1,830,986	708,703	W	3,031,465
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	55,469	--	--	--	W	1,573,995	W	1,710,333
South Dakota	--	--	--	--	--	--	--	--
Tennessee	W	--	--	--	W	549,537	W	1,508,436
Texas	W	--	--	W	W	694,272	44,371	862,696
Utah	30,177	--	--	--	--	--	--	30,177
Vermont	W	--	--	--	--	W	--	390,419
Virginia	W	--	--	--	993,800	1,473,899	W	2,573,678
Washington	443,913	--	--	--	W	792,330	W	1,414,646
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	W	--	--	--	146,675	646,268	W	1,109,567
Wyoming	--	--	--	--	--	--	--	--
<b>Total</b>	<b>16,555,389</b>	<b>10,197,514</b>	<b>902,830</b>	<b>3,399,642</b>	<b>16,345,166</b>	<b>37,525,320</b>	<b>4,209,978</b>	<b>89,135,839</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C21. Renewable Electric Power Industry Generation by State, 1996<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama .....	11,081,921	--	--	--	--	W	W	15,661,502
Alaska .....	1,265,863	--	--	--	--	W	W	W
Arizona .....	9,214,356	--	--	--	--	W	--	W
Arkansas .....	W	--	--	--	--	1,617,114	W	4,435,974
California .....	W	W	905,739	3,253,054	1,648,704	3,071,608	660,931	67,669,964
Colorado .....	W	--	--	--	--	--	W	1,858,687
Connecticut .....	W	--	--	--	1,948,004	--	W	2,799,863
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	215,560	--	--	--	2,866,236	2,585,841	667,579	6,335,216
Georgia .....	W	--	--	--	W	3,167,864	71,523	7,952,286
Hawaii .....	105,577	W	--	W	W	W	289,171	1,009,392
Idaho .....	W	--	--	--	--	525,534	W	13,815,182
Illinois .....	106,429	--	--	--	280,548	W	W	569,562
Indiana .....	448,364	--	--	--	W	--	W	556,539
Iowa .....	W	--	--	108	W	W	W	1,007,104
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	3,496,989	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	W	99,184	4,097,387
Maine .....	W	--	--	--	W	3,075,850	455,108	7,954,440
Maryland .....	2,457,463	--	--	--	594,930	W	W	3,228,439
Massachusetts .....	1,191,330	--	--	--	1,394,965	W	W	3,406,649
Michigan .....	W	--	--	--	899,278	2,015,765	W	4,742,784
Minnesota .....	1,190,648	--	--	W	715,295	466,664	W	2,424,020
Mississippi .....	--	--	--	--	--	W	W	1,830,907
Missouri .....	1,313,738	--	--	--	31,291	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	1,601,919	--	--	--	--	--	11,534	1,613,453
Nevada .....	W	W	--	--	--	--	--	3,827,372
New Hampshire .....	1,928,996	--	--	--	188,270	921,266	--	3,038,532
New Jersey .....	W	--	--	--	1,020,148	--	W	1,220,282
New Mexico .....	211,499	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,462,434	639,961	W	31,658,189
North Carolina .....	6,079,714	--	--	--	W	1,638,030	W	7,776,387
North Dakota .....	3,150,873	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	433,328	--	836,741
Oklahoma .....	2,157,775	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	521,783	--	45,505,810
Pennsylvania .....	W	--	--	--	1,830,986	708,703	W	5,592,721
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina .....	3,041,618	--	--	--	W	1,573,995	W	4,696,482
South Dakota .....	7,977,670	--	--	--	--	--	--	7,977,670
Tennessee .....	W	--	--	--	W	549,537	W	12,087,217
Texas .....	W	--	260	W	W	694,272	44,371	1,816,677
Utah .....	1,049,259	191,912	--	--	--	--	--	1,241,171
Vermont .....	W	--	--	--	--	W	--	1,592,323
Virginia .....	W	--	--	--	993,800	1,473,899	W	3,912,845
Washington .....	98,522,467	--	--	--	W	1,152,522	W	99,853,392
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	W	--	--	--	156,040	871,971	W	3,830,313
Wyoming .....	1,231,797	--	--	--	--	--	--	1,231,797
<b>Total .....</b>	<b>347,613,444</b>	<b>15,431,441</b>	<b>905,999</b>	<b>3,409,765</b>	<b>17,240,698</b>	<b>38,313,474</b>	<b>4,493,349</b>	<b>427,408,170</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C22. Renewable Electric Utility Net Generation, 1997**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	11,520,637	--	--	--	--	--	--	11,520,637
Alaska .....	1,098,953	--	--	--	--	--	--	1,098,953
Arizona .....	12,049,393	--	--	--	--	--	--	12,049,393
Arkansas .....	3,511,260	--	--	--	--	--	--	3,511,260
California .....	38,783,138	5,300,592	3,269	5,859	--	--	121,533	44,214,391
Colorado .....	1,897,813	--	--	--	--	--	--	1,897,813
Connecticut .....	374,110	--	--	--	450,749	--	--	824,859
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	241,280	--	--	--	--	--	--	241,280
Georgia .....	4,228,269	--	--	--	--	--	--	4,228,269
Hawaii .....	18,791	--	--	--	--	--	--	18,791
Idaho .....	13,511,728	--	--	--	--	--	--	13,511,728
Illinois .....	16,773	--	--	--	--	--	23,595	40,368
Indiana .....	561,593	--	--	--	--	--	--	561,593
Iowa .....	794,739	--	--	118	22,360	--	--	817,217
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	3,380,233	--	--	--	--	--	--	3,380,233
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,779,887	--	--	--	--	--	--	1,779,887
Maryland .....	1,588,375	--	--	--	--	--	--	1,588,375
Massachusetts ....	788,540	--	--	--	--	--	--	788,540
Michigan .....	1,592,707	--	--	--	--	--	--	1,592,707
Minnesota .....	697,224	--	--	--	425,416	3,917	--	1,126,557
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	1,593,309	--	--	--	41,704	--	--	1,635,013
Montana .....	13,348,499	--	--	--	--	--	--	13,348,499
Nebraska .....	1,672,419	--	--	--	--	--	624	1,673,043
Nevada .....	2,567,451	--	--	--	--	--	--	2,567,451
New Hampshire ...	1,165,007	--	--	--	--	--	--	1,165,007
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	258,810	--	--	--	--	--	--	258,810
New York .....	29,004,673	--	--	--	--	17,793	--	29,022,466
North Carolina ....	3,894,248	--	--	--	--	--	--	3,894,248
North Dakota .....	3,319,577	--	--	--	--	--	--	3,319,577
Ohio .....	507,368	--	--	--	--	--	--	507,368
Oklahoma .....	2,921,206	--	--	--	--	--	--	2,921,206
Oregon .....	46,283,275	--	--	--	--	--	--	46,283,275
Pennsylvania .....	1,778,998	--	--	--	--	--	--	1,778,998
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	2,901,794	--	--	--	--	--	--	2,901,794
South Dakota .....	9,012,260	--	--	--	--	--	--	9,012,260
Tennessee .....	10,073,313	--	--	--	--	--	--	10,073,313
Texas .....	1,784,629	--	212	--	--	--	--	1,784,841
Utah .....	1,330,578	168,518	--	--	--	--	--	1,499,096
Vermont .....	896,312	--	--	--	--	150,345	--	1,046,657
Virginia .....	939,569	--	--	--	--	--	--	939,569
Washington .....	103,644,592	--	--	--	--	353,256	--	103,997,848
West Virginia .....	377,192	--	--	--	--	--	--	377,192
Wisconsin .....	2,182,208	--	--	--	12,085	213,980	145,708	2,553,981
Wyoming .....	1,380,713	--	--	--	--	--	--	1,380,713
<b>Total .....</b>	<b>341,273,443</b>	<b>5,469,110</b>	<b>3,481</b>	<b>5,977</b>	<b>952,314</b>	<b>739,291</b>	<b>291,460</b>	<b>348,735,076</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C23. Renewable Nonutility Gross Generation by State, 1997**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	W	--	--	--	--	3,285,240	W	3,539,668
Alaska .....	--	--	--	--	--	W	W	W
Arizona .....	--	--	--	--	--	W	--	W
Arkansas .....	W	--	--	--	--	1,457,855	W	1,473,713
California .....	W	W	892,892	2,179,462	1,730,961	3,086,562	405,394	18,488,057
Colorado .....	W	--	--	--	--	--	W	170,762
Connecticut .....	W	--	--	--	1,500,512	--	W	1,795,765
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	W	--	--	W	2,534,678	2,623,842	573,969	7,438,964
Georgia .....	W	--	--	--	W	2,886,172	29,999	2,980,955
Hawaii .....	97,515	W	--	W	W	W	232,692	990,407
Idaho .....	W	--	--	--	--	488,065	W	1,535,841
Illinois .....	W	--	--	--	260,494	W	263,513	651,152
Indiana .....	--	--	--	--	127,003	--	--	127,003
Iowa .....	W	--	--	--	W	W	W	89,319
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	W	108,238	4,492,512
Maine .....	W	--	--	--	W	3,068,459	207,442	5,481,123
Maryland .....	--	--	--	--	617,659	W	W	776,747
Massachusetts ....	345,527	--	--	--	2,073,267	W	W	2,575,319
Michigan .....	W	--	--	--	919,499	1,651,128	W	2,741,062
Minnesota .....	340,883	--	--	W	317,840	427,026	W	1,148,946
Mississippi .....	--	--	--	--	--	W	W	1,788,550
Missouri .....	--	--	--	--	--	--	W	W
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	1,595,259
New Hampshire ....	W	--	--	--	203,366	831,584	W	1,511,089
New Jersey .....	W	--	--	--	1,240,286	--	W	1,289,413
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	1,453,770	476,157	W	4,049,667
North Carolina ....	1,784,824	--	--	--	W	1,692,662	W	3,559,409
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	--	--	--	--	--	W	W	622,238
Oklahoma .....	--	--	--	--	--	W	--	W
Oregon .....	W	--	--	--	W	517,790	--	1,038,352
Pennsylvania .....	W	--	--	--	1,868,667	574,332	W	2,932,880
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	56,929	--	--	--	W	1,615,098	W	1,742,140
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	435,826	W	1,472,973
Texas .....	W	--	--	W	W	837,247	41,485	1,623,082
Utah .....	W	--	--	--	--	--	--	W
Vermont .....	W	--	--	--	--	W	--	383,983
Virginia .....	W	--	--	--	1,105,401	1,563,165	W	2,802,440
Washington .....	549,491	--	--	--	W	421,516	W	1,202,952
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	W	--	--	--	158,215	680,889	W	1,163,593
Wyoming .....	--	--	--	--	--	--	--	--
<b>Total .....</b>	<b>17,902,435</b>	<b>9,381,646</b>	<b>892,892</b>	<b>3,248,140</b>	<b>17,496,974</b>	<b>34,898,208</b>	<b>2,883,400</b>	<b>86,703,695</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C24. Renewable Electric Power Industry Generation by State, 1997<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama	W	--	--	--	--	3,285,240	W	15,060,305
Alaska	1,098,953	--	--	--	--	W	W	W
Arizona	12,049,393	--	--	--	--	W	--	W
Arkansas	W	--	--	--	--	1,457,855	W	4,984,973
California	W	W	896,161	2,185,321	1,730,961	3,086,562	526,927	62,702,448
Colorado	W	--	--	--	--	--	W	2,068,575
Connecticut	W	--	--	--	1,951,261	--	W	2,620,624
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	W	--	--	W	2,534,678	2,623,842	573,969	7,680,244
Georgia	W	--	--	--	W	2,886,172	29,999	7,209,224
Hawaii	116,306	W	--	W	W	W	232,692	1,009,198
Idaho	W	--	--	--	--	488,065	W	15,047,569
Illinois	W	--	--	--	260,494	W	287,108	691,520
Indiana	561,593	--	--	--	127,003	--	--	688,596
Iowa	W	--	--	118	W	W	W	906,536
Kansas	W	--	--	--	--	--	--	W
Kentucky	3,380,233	--	--	--	--	W	--	W
Louisiana	W	--	--	--	--	W	108,238	4,492,512
Maine	W	--	--	--	W	3,068,459	207,442	7,261,010
Maryland	1,588,375	--	--	--	617,659	W	W	2,365,122
Massachusetts	1,134,067	--	--	--	2,073,267	W	W	3,363,859
Michigan	W	--	--	--	919,499	1,651,128	W	4,333,769
Minnesota	1,038,107	--	--	W	743,256	430,943	W	2,275,503
Mississippi	--	--	--	--	--	W	W	1,788,550
Missouri	1,593,309	--	--	--	41,704	--	W	W
Montana	W	--	--	--	--	W	--	W
Nebraska	1,672,419	--	--	--	--	--	624	1,673,043
Nevada	W	W	--	--	--	--	--	4,162,710
New Hampshire	W	--	--	--	203,366	831,584	W	2,676,096
New Jersey	W	--	--	--	1,240,286	--	W	1,289,413
New Mexico	258,810	--	--	--	--	--	W	W
New York	W	--	--	--	1,453,770	493,950	W	33,072,133
North Carolina	5,679,072	--	--	--	W	1,692,662	W	7,453,657
North Dakota	3,319,577	--	--	--	--	--	W	W
Ohio	507,368	--	--	--	--	W	W	1,129,606
Oklahoma	2,921,206	--	--	--	--	W	--	W
Oregon	W	--	--	--	W	517,790	--	47,321,627
Pennsylvania	W	--	--	--	1,868,667	574,332	W	4,711,878
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	2,958,723	--	--	--	W	1,615,098	W	4,643,934
South Dakota	9,012,260	--	--	--	--	--	--	9,012,260
Tennessee	W	--	--	--	W	435,826	W	11,546,286
Texas	W	--	212	W	W	837,247	41,485	3,407,923
Utah	W	168,518	--	--	--	--	--	W
Vermont	W	--	--	--	--	W	--	1,430,640
Virginia	W	--	--	--	1,105,401	1,563,165	W	3,742,009
Washington	104,194,083	--	--	--	W	774,772	W	105,200,800
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	W	--	--	--	170,300	894,869	W	3,717,574
Wyoming	1,380,713	--	--	--	--	--	--	1,380,713
<b>Total</b>	<b>359,175,878</b>	<b>14,850,756</b>	<b>896,373</b>	<b>3,254,117</b>	<b>18,449,288</b>	<b>35,637,499</b>	<b>3,174,860</b>	<b>435,438,771</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-867, "Annual Nonutility Power Producer Report."



**C25. Renewable Electric Utility Net Generation, 1998**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	10,564,857	--	--	--	--	--	--	10,564,857
Alaska .....	1,113,332	--	--	--	--	--	--	1,113,332
Arizona .....	10,970,189	--	--	--	--	--	--	10,970,189
Arkansas .....	3,113,643	--	--	--	--	--	--	3,113,643
California .....	47,475,341	5,016,223	2,384	2,556	--	--	119,865	52,616,369
Colorado .....	1,346,170	--	--	--	--	--	--	1,346,170
Connecticut .....	384,447	--	--	--	427,389	--	--	811,836
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	198,505	--	--	--	--	--	--	198,505
Georgia .....	5,198,370	--	--	--	--	--	--	5,198,370
Hawaii .....	13,750	--	--	312	--	--	--	14,062
Idaho .....	11,977,826	--	--	--	--	--	--	11,977,826
Illinois .....	50,731	--	--	--	--	--	--	50,731
Indiana .....	478,668	--	--	--	--	--	--	478,668
Iowa .....	893,219	--	--	89	19,076	--	--	912,384
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	3,116,018	--	--	--	--	--	--	3,116,018
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	1,820,306	--	--	--	--	--	--	1,820,306
Maryland .....	1,739,737	--	--	--	--	--	--	1,739,737
Massachusetts ....	760,785	--	--	--	--	--	--	760,785
Michigan .....	1,282,471	--	--	--	--	--	--	1,282,471
Minnesota .....	694,836	--	--	--	451,293	--	--	1,146,129
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	2,346,585	--	--	--	77,787	--	--	2,424,372
Montana .....	11,053,648	--	--	--	--	--	--	11,053,648
Nebraska .....	1,682,834	--	--	--	--	--	707	1,683,541
Nevada .....	3,151,415	--	--	--	--	--	--	3,151,415
New Hampshire ....	975,057	--	--	--	--	--	--	975,057
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	236,412	--	--	--	--	--	--	236,412
New York .....	27,739,454	--	--	--	--	4,603	--	27,744,057
North Carolina ....	4,045,503	--	--	--	--	--	--	4,045,503
North Dakota .....	2,295,948	--	--	--	--	--	--	2,295,948
Ohio .....	406,427	--	--	--	--	--	--	406,427
Oklahoma .....	3,508,748	--	--	--	--	--	--	3,508,748
Oregon .....	39,504,178	--	--	--	--	--	--	39,504,178
Pennsylvania .....	2,027,827	--	--	--	--	--	--	2,027,827
Rhode Island .....	--	--	--	--	--	--	--	--
South Carolina ....	3,503,249	--	--	--	--	--	--	3,503,249
South Dakota .....	5,757,600	--	--	--	--	--	--	5,757,600
Tennessee .....	10,007,358	--	--	--	--	--	--	10,007,358
Texas .....	1,418,903	--	134	--	--	--	--	1,419,037
Utah .....	1,299,052	160,057	--	--	--	--	--	1,459,109
Vermont .....	848,291	--	--	--	--	145,458	--	993,749
Virginia .....	1,210,984	--	--	--	--	--	--	1,210,984
Washington .....	79,409,678	--	--	--	--	337,444	--	79,747,122
West Virginia .....	361,331	--	--	--	--	--	--	361,331
Wisconsin .....	1,517,765	--	--	--	14,730	231,802	194,088	1,958,385
Wyoming .....	1,342,322	--	--	--	--	--	--	1,342,322
<b>Total .....</b>	<b>308,843,770</b>	<b>5,176,280</b>	<b>2,518</b>	<b>2,957</b>	<b>990,275</b>	<b>719,307</b>	<b>314,660</b>	<b>316,049,767</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report."

**C26. Renewable Nonutility Gross Generation by State, 1998**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	4,207,922	6,931	4,214,853
Alaska	--	--	--	--	--	941	--	941
Arizona	--	--	--	--	--	--	--	--
Arkansas	3,132	--	--	--	--	1,102,344	5,860	1,111,336
California	2,093,797	8,068,680	886,553	2,745,370	1,693,961	2,909,343	388,222	18,785,925
Colorado	116,960	--	--	--	--	--	--	116,960
Connecticut	64,483	--	--	--	1,496,612	--	240,189	1,801,285
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	2,982,199	2,024,819	600,360	5,607,378
Georgia	35,699	--	--	--	19,309	3,031,702	32,372	3,119,082
Hawaii	108,609	244,416	--	19,161	381,464	2,135	152,655	908,439
Idaho	910,726	--	--	--	--	524,488	52	1,435,266
Illinois	90,418	--	--	--	484,748	119,063	64,247	758,476
Indiana	--	--	--	--	127,027	--	--	127,027
Iowa	19,895	--	--	--	48,830	397	17,669	86,791
Kansas	11,541	--	--	--	--	--	--	11,541
Kentucky	--	--	--	--	--	16,137	--	16,137
Louisiana	1,073,560	--	--	--	--	1,917,438	68,335	3,059,333
Maine	1,914,809	--	--	--	292,920	2,135,419	242,766	4,585,914
Maryland	--	--	--	--	646,505	162,330	1,213	810,048
Massachusetts	346,163	--	--	--	1,986,043	121,678	84,167	2,538,052
Michigan	131,192	--	--	--	974,554	1,929,321	67,381	3,102,448
Minnesota	260,595	--	--	148,336	338,612	368,506	--	1,116,048
Mississippi	--	--	--	--	--	1,100,741	--	1,100,741
Missouri	--	--	--	--	--	--	3,397	3,397
Montana	64,941	--	--	--	--	45,166	--	110,107
Nebraska	--	--	--	--	--	--	--	--
Nevada	15,061	1,568,861	--	--	--	--	--	1,583,922
New Hampshire	627,969	--	--	--	243,533	898,476	--	1,769,978
New Jersey	20,879	--	--	--	1,368,185	--	--	1,389,064
New Mexico	--	--	--	--	--	--	--	--
New York	1,585,502	--	--	--	1,117,131	422,965	904,824	4,030,422
North Carolina	1,709,802	--	--	--	79,895	1,416,375	12,843	3,218,915
North Dakota	--	--	--	--	--	--	1,571	1,571
Ohio	--	--	--	--	--	747,392	98	747,490
Oklahoma	--	--	--	--	--	233,301	--	233,301
Oregon	402,009	--	--	19,721	97,816	360,783	--	880,329
Pennsylvania	357,096	--	--	--	1,990,163	563,930	21,932	2,933,121
Rhode Island	8,764	--	--	--	113,423	--	--	122,187
South Carolina	66,835	--	--	--	59,122	1,636,088	5,349	1,767,396
South Dakota	--	--	--	--	--	--	--	--
Tennessee	806,737	--	--	--	41,756	483,098	13,816	1,345,407
Texas	5,978	--	--	80,844	46,029	784,917	51,479	969,248
Utah	15,817	--	--	--	--	--	--	15,817
Vermont	332,518	--	--	--	--	190,979	--	523,497
Virginia	73,042	--	--	--	1,127,137	1,605,984	6,809	2,812,972
Washington	409,064	--	--	--	196,031	826,114	29,593	1,460,802
West Virginia	732,337	--	--	--	--	--	--	732,337
Wisconsin	216,592	--	--	--	145,230	706,166	25,901	1,093,888
Wyoming	--	--	--	2,066	--	--	--	2,066
<b>Total</b>	<b>14,632,521</b>	<b>9,881,958</b>	<b>886,553</b>	<b>3,015,497</b>	<b>18,098,236</b>	<b>32,596,456</b>	<b>3,050,032</b>	<b>82,161,253</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860B, "Annual Electric Generator Report - Nonutility."

**C27. Renewable Electric Power Industry Generation by State, 1998<sup>a</sup>**  
(Thousand Kilowatthours)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>b</sup>	Total
Alabama	10,564,857	--	--	--	--	4,207,922	6,931	14,779,710
Alaska	1,113,332	--	--	--	--	941	--	1,114,273
Arizona	10,970,189	--	--	--	--	--	--	10,970,189
Arkansas	3,116,775	--	--	--	--	1,102,344	5,860	4,224,979
California	49,569,138	13,084,903	888,937	2,747,926	1,693,961	2,909,343	508,087	71,402,294
Colorado	1,463,130	--	--	--	--	--	--	1,463,130
Connecticut	448,930	--	--	--	1,924,001	--	240,189	2,613,121
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	198,505	--	--	--	2,982,199	2,024,819	600,360	5,805,883
Georgia	5,234,069	--	--	--	19,309	3,031,702	32,372	8,317,452
Hawaii	122,359	244,416	--	19,473	381,464	2,135	152,655	922,501
Idaho	12,888,552	--	--	--	--	524,488	52	13,413,092
Illinois	141,149	--	--	--	484,748	119,063	64,247	809,207
Indiana	478,668	--	--	--	127,027	--	--	605,695
Iowa	913,114	--	--	89	67,906	397	17,669	999,175
Kansas	11,541	--	--	--	--	--	--	11,541
Kentucky	3,116,018	--	--	--	--	16,137	--	3,132,155
Louisiana	1,073,560	--	--	--	--	1,917,438	68,335	3,059,333
Maine	3,735,115	--	--	--	292,920	2,135,419	242,766	6,406,220
Maryland	1,739,737	--	--	--	646,505	162,330	1,213	2,549,785
Massachusetts	1,106,948	--	--	--	1,986,043	121,678	84,167	3,298,837
Michigan	1,413,663	--	--	--	974,554	1,929,321	67,381	4,384,919
Minnesota	955,431	--	--	148,336	789,905	368,506	--	2,262,177
Mississippi	--	--	--	--	--	1,100,741	--	1,100,741
Missouri	2,346,585	--	--	--	77,787	--	3,397	2,427,769
Montana	11,118,589	--	--	--	--	45,166	--	11,163,755
Nebraska	1,682,834	--	--	--	--	--	707	1,683,541
Nevada	3,166,476	1,568,861	--	--	--	--	--	4,735,337
New Hampshire	1,603,026	--	--	--	243,533	898,476	--	2,745,035
New Jersey	20,879	--	--	--	1,368,185	--	--	1,389,064
New Mexico	236,412	--	--	--	--	--	--	236,412
New York	29,324,956	--	--	--	1,117,131	427,568	904,824	31,774,479
North Carolina	5,755,305	--	--	--	79,895	1,416,375	12,843	7,264,418
North Dakota	2,295,948	--	--	--	--	--	1,571	2,297,519
Ohio	406,427	--	--	--	--	747,392	98	1,153,917
Oklahoma	3,508,748	--	--	--	--	233,301	--	3,742,049
Oregon	39,906,187	--	--	19,721	97,816	360,783	--	40,384,507
Pennsylvania	2,384,923	--	--	--	1,990,163	563,930	21,932	4,960,948
Rhode Island	8,764	--	--	--	113,423	--	--	122,187
South Carolina	3,570,084	--	--	--	59,122	1,636,088	5,349	5,270,645
South Dakota	5,757,600	--	--	--	--	--	--	5,757,600
Tennessee	10,814,095	--	--	--	41,756	483,098	13,816	11,352,765
Texas	1,424,881	--	134	80,844	46,029	784,917	51,479	2,388,285
Utah	1,314,869	160,057	--	--	--	--	--	1,474,926
Vermont	1,180,809	--	--	--	--	336,437	--	1,517,246
Virginia	1,284,026	--	--	--	1,127,137	1,605,984	6,809	4,023,956
Washington	79,818,742	--	--	--	196,031	1,163,558	29,593	81,207,924
West Virginia	1,093,668	--	--	--	--	--	--	1,093,668
Wisconsin	1,734,357	--	--	--	159,960	937,968	219,989	3,052,273
Wyoming	1,342,322	--	--	2,066	--	--	--	1,344,388
<b>Total</b>	<b>323,476,291</b>	<b>15,058,238</b>	<b>889,071</b>	<b>3,018,454</b>	<b>19,088,511</b>	<b>33,315,763</b>	<b>3,364,692</b>	<b>398,211,020</b>

<sup>a</sup>Electric power industry generation is defined as the sum of electric utility net generation and nonutility gross generation.

<sup>b</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-759, "Monthly Power Plant Report," and Form EIA-860B, "Annual Electric Generator Report - Nonutility."

**C28. Renewable Electric Utility Net Summer Capability by State, 1990**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,934	--	--	--	--	--	--	2,934
Alaska .....	236	--	--	*	--	--	--	236
Arizona .....	2,595	--	--	--	--	--	--	2,595
Arkansas .....	1,262	--	--	--	--	--	--	1,262
California .....	9,199	1,592	3	--	--	--	--	10,794
Colorado .....	542	--	--	--	--	--	--	542
Connecticut .....	108	--	--	--	64	--	--	172
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	48	--	--	--	--	--	--	48
Georgia .....	1,981	--	--	--	--	--	--	1,981
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,227	--	--	--	--	--	--	2,227
Illinois .....	10	--	--	--	--	--	--	10
Indiana .....	66	--	--	--	--	--	--	66
Iowa .....	124	--	--	--	--	--	--	124
Kansas .....	2	--	--	*	--	--	--	2
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	420	--	--	--	--	--	--	420
Maryland .....	428	--	--	--	--	--	--	428
Massachusetts ....	204	--	--	--	--	--	--	204
Michigan .....	331	--	--	--	--	--	--	331
Minnesota .....	137	--	--	*	88	--	--	225
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	544	--	--	--	--	--	--	544
Montana .....	2,520	--	--	*	--	13	--	2,532
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	1,031	--	--	--	--	--	--	1,031
New Hampshire ...	319	--	--	--	--	--	--	319
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	57	--	--	--	--	--	--	57
New York .....	1,645	--	--	--	--	--	--	1,645
North Carolina ....	1,894	--	--	--	--	--	--	1,894
North Dakota ....	545	--	--	--	--	--	--	545
Ohio .....	125	--	--	--	90	--	--	215
Oklahoma .....	744	--	--	--	--	--	--	744
Oregon .....	8,988	--	--	--	--	11	--	9,000
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,031	--	--	--	--	--	--	1,031
South Dakota ....	1,821	--	--	--	--	--	--	1,821
Tennessee .....	2,211	--	--	--	--	--	--	2,211
Texas .....	640	--	*	--	--	--	29	669
Utah .....	213	21	--	--	--	--	--	234
Vermont .....	404	--	--	*	--	47	--	451
Virginia .....	764	--	*	--	--	--	--	764
Washington .....	20,640	--	--	--	--	46	--	20,686
West Virginia ....	108	--	--	--	--	--	--	108
Wisconsin .....	443	--	--	*	2	104	--	548
Wyoming .....	269	--	--	--	--	--	--	269
<b>Total .....</b>	<b>71,423</b>	<b>1,614</b>	<b>3</b>	<b>*</b>	<b>244</b>	<b>221</b>	<b>29</b>	<b>73,534</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C29. Renewable Nonutility Net Summer Capability by State, 1990**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	380
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	--	--	--	--	--	W	W	238
California .....	W	W	335	1,876	242	721	131	4,787
Colorado .....	W	--	--	--	--	--	W	34
Connecticut .....	W	--	--	--	W	--	--	108
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	295	489	46	830
Georgia .....	10	--	--	--	--	631	--	641
Hawaii .....	14	--	--	W	W	--	145	271
Idaho .....	218	--	--	--	--	70	--	287
Illinois .....	W	--	--	--	W	--	--	34
Indiana .....	--	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	--	--	--	W
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	--	--	--
Louisiana .....	W	--	--	--	--	355	W	551
Maine .....	351	--	--	--	W	563	W	970
Maryland .....	--	--	--	--	W	W	--	65
Massachusetts ....	W	--	--	--	247	--	W	313
Michigan .....	29	--	--	--	91	167	--	287
Minnesota .....	60	--	--	--	W	W	--	181
Mississippi .....	--	--	--	--	--	326	--	326
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	157
New Hampshire ...	W	--	--	--	W	138	--	244
New Jersey .....	W	--	--	--	137	--	W	151
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	237	46	W	579
North Carolina ....	W	--	--	--	W	306	--	324
North Dakota .....	--	--	--	--	--	--	--	--
Ohio .....	W	--	--	--	W	W	--	31
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	95	--	--	W	W	184	--	292
Pennsylvania .....	W	--	--	--	86	W	--	238
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	272	--	303
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	--	--	--	--	W	W	--	87
Texas .....	--	--	--	--	W	188	W	196
Utah .....	10	--	--	--	--	--	--	10
Vermont .....	W	--	--	--	--	W	--	44
Virginia .....	W	--	--	--	W	268	--	433
Washington .....	W	--	--	--	W	230	--	322
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	47	--	--	--	17	67	--	130
Wyoming .....	W	--	--	--	--	W	--	W
<b>Total .....</b>	<b>2,541</b>	<b>1,056</b>	<b>335</b>	<b>1,911</b>	<b>1,917</b>	<b>6,006</b>	<b>409</b>	<b>14,175</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C30. Renewable Electric Power Industry Net Summer Capability by State, 1990**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama . . . . .	2,934	--	--	--	--	W	W	3,314
Alaska . . . . .	236	--	--	*	--	W	--	W
Arizona . . . . .	2,595	--	--	--	--	--	--	2,595
Arkansas . . . . .	1,262	--	--	--	--	W	W	1,500
California . . . . .	W	W	338	1,876	242	721	131	15,581
Colorado . . . . .	W	--	--	--	--	--	W	576
Connecticut . . . . .	W	--	--	--	W	--	--	281
Delaware . . . . .	-	-	-	-	-	-	--	--
Dist. of Col. . . . .	-	-	-	-	-	-	--	--
Florida . . . . .	48	--	--	--	295	489	46	877
Georgia . . . . .	1,991	--	--	--	--	631	--	2,622
Hawaii . . . . .	18	--	--	W	W	--	145	275
Idaho . . . . .	2,444	--	--	--	--	70	--	2,514
Illinois . . . . .	W	--	--	--	W	--	--	44
Indiana . . . . .	66	--	--	--	W	--	--	W
Iowa . . . . .	W	--	--	--	--	--	--	W
Kansas . . . . .	W	--	--	*	--	--	--	W
Kentucky . . . . .	795	--	--	--	--	--	--	795
Louisiana . . . . .	W	--	--	--	--	355	W	551
Maine . . . . .	771	--	--	--	W	563	W	1,390
Maryland . . . . .	428	--	--	--	W	W	--	493
Massachusetts . . . . .	W	--	--	--	247	--	W	517
Michigan . . . . .	360	--	--	--	91	167	--	618
Minnesota . . . . .	197	--	--	*	W	W	--	406
Mississippi . . . . .	--	--	--	--	--	326	--	326
Missouri . . . . .	544	--	--	--	--	--	--	544
Montana . . . . .	W	--	--	*	--	W	--	W
Nebraska . . . . .	168	--	--	--	--	--	--	168
Nevada . . . . .	W	W	--	--	--	--	--	1,188
New Hampshire . . . . .	W	--	--	--	W	138	--	564
New Jersey . . . . .	W	--	--	--	137	--	W	151
New Mexico . . . . .	57	--	--	--	--	--	W	W
New York . . . . .	W	--	--	--	237	46	W	2,224
North Carolina . . . . .	W	--	--	--	W	306	--	2,218
North Dakota . . . . .	545	--	--	--	--	--	--	545
Ohio . . . . .	W	--	--	--	W	W	--	246
Oklahoma . . . . .	744	--	--	--	W	W	--	W
Oregon . . . . .	9,083	--	--	W	W	195	--	9,291
Pennsylvania . . . . .	W	--	--	--	86	W	--	885
Rhode Island . . . . .	W	--	--	--	W	--	--	W
South Carolina . . . . .	W	--	--	--	W	272	--	1,334
South Dakota . . . . .	1,821	--	--	--	--	--	--	1,821
Tennessee . . . . .	2,211	--	--	--	W	W	--	2,298
Texas . . . . .	640	--	*	--	W	188	W	866
Utah . . . . .	223	21	--	--	--	--	--	245
Vermont . . . . .	W	--	--	*	--	W	--	495
Virginia . . . . .	W	--	*	--	W	268	--	1,197
Washington . . . . .	W	--	--	--	W	276	--	21,008
West Virginia . . . . .	W	--	--	--	--	--	--	W
Wisconsin . . . . .	490	--	--	*	18	171	--	678
Wyoming . . . . .	W	--	--	--	--	W	--	W
<b>Total . . . . .</b>	<b>73,964</b>	<b>2,669</b>	<b>339</b>	<b>1,911</b>	<b>2,160</b>	<b>6,227</b>	<b>438</b>	<b>87,708</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C31. Renewable Electric Utility Net Summer Capability by State, 1991**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,934	--	--	--	--	--	--	2,934
Alaska .....	237	--	--	*	--	--	--	237
Arizona .....	2,569	--	--	--	--	--	--	2,569
Arkansas .....	1,262	--	--	--	--	--	--	1,262
California .....	9,235	1,541	3	--	--	--	--	10,779
Colorado .....	524	--	--	--	--	--	--	524
Connecticut .....	107	--	--	--	64	--	--	171
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	48	--	--	--	--	--	--	48
Georgia .....	1,982	--	--	--	--	--	--	1,982
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,226	--	--	--	--	--	--	2,226
Illinois .....	10	--	--	--	--	--	--	10
Indiana .....	66	--	--	--	--	--	--	66
Iowa .....	124	--	--	--	--	--	--	124
Kansas .....	--	--	--	*	--	--	--	*
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	420	--	--	--	--	--	--	420
Maryland .....	428	--	--	--	--	--	--	428
Massachusetts ....	203	--	--	--	--	--	--	203
Michigan .....	328	--	--	--	--	--	--	328
Minnesota .....	142	--	--	*	88	--	*	230
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	544	--	--	--	--	--	--	544
Montana .....	2,436	--	--	*	--	13	--	2,449
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	1,031	--	--	--	--	--	--	1,031
New Hampshire ...	291	--	--	--	--	--	--	291
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	58	--	--	--	--	--	--	58
New York .....	1,644	--	--	--	--	--	--	1,644
North Carolina ....	1,894	--	--	--	--	--	--	1,894
North Dakota ....	545	--	--	--	--	--	--	545
Ohio .....	125	--	--	--	90	--	--	215
Oklahoma .....	744	--	--	--	--	--	--	744
Oregon .....	8,988	--	--	--	--	11	--	9,000
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,115	--	--	--	--	--	--	1,115
South Dakota ....	1,821	--	--	--	--	--	--	1,821
Tennessee .....	2,211	--	--	--	--	--	--	2,211
Texas .....	644	--	*	--	--	--	--	644
Utah .....	236	21	--	--	--	--	--	257
Vermont .....	430	--	--	*	--	47	--	477
Virginia .....	764	--	*	--	--	--	--	764
Washington .....	20,660	--	--	--	--	46	--	20,706
West Virginia ....	108	--	--	--	--	--	--	108
Wisconsin .....	443	--	--	*	2	104	--	548
Wyoming .....	266	--	--	--	--	--	--	266
<b>Total .....</b>	<b>71,457</b>	<b>1,563</b>	<b>3</b>	<b>*</b>	<b>244</b>	<b>221</b>	<b>*</b>	<b>73,488</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C32. Renewable Nonutility Net Summer Capability by State, 1991**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	W	W	444
Alaska	--	--	--	--	--	W	--	W
Arizona	--	--	--	--	--	--	--	--
Arkansas	--	--	--	--	--	W	W	341
California	580	906	319	1,940	228	670	132	4,775
Colorado	W	--	--	--	--	--	W	34
Connecticut	W	--	--	--	90	--	W	140
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	444	495	53	992
Georgia	14	--	--	--	--	607	--	620
Hawaii	14	--	--	W	W	--	132	242
Idaho	220	--	--	--	--	130	--	350
Illinois	W	W	--	--	19	--	W	47
Indiana	--	--	--	--	W	--	--	W
Iowa	W	--	--	--	--	--	W	W
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	--	--	--
Louisiana	W	--	--	--	--	450	W	645
Maine	351	--	--	--	W	541	W	949
Maryland	--	--	--	--	W	W	--	65
Massachusetts	57	W	--	--	247	--	W	326
Michigan	29	--	--	--	93	193	--	315
Minnesota	60	--	--	--	W	W	--	162
Mississippi	--	--	--	--	--	302	--	302
Missouri	--	--	--	--	--	--	--	--
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	157
New Hampshire	W	--	--	--	W	138	--	244
New Jersey	W	--	--	--	169	--	W	182
New Mexico	--	--	--	--	--	--	W	W
New York	300	--	--	--	214	W	W	615
North Carolina	W	--	--	--	W	258	--	282
North Dakota	--	--	--	--	--	--	--	--
Ohio	W	--	--	--	W	W	--	109
Oklahoma	--	--	--	--	--	W	--	W
Oregon	102	--	--	W	W	179	--	294
Pennsylvania	W	--	--	--	203	W	--	354
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	W	--	--	--	W	329	--	360
South Dakota	--	--	--	--	--	--	--	--
Tennessee	--	--	--	--	W	W	--	87
Texas	--	--	--	--	W	243	W	252
Utah	10	--	--	--	--	--	--	10
Vermont	W	--	--	--	--	W	--	44
Virginia	W	--	--	--	W	346	--	514
Washington	W	--	--	--	W	206	--	322
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	47	--	--	--	17	131	--	194
Wyoming	W	--	--	--	--	W	--	W
<b>Total</b>	<b>2,562</b>	<b>1,070</b>	<b>319</b>	<b>1,975</b>	<b>2,185</b>	<b>6,456</b>	<b>522</b>	<b>15,088</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.  
-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."



**C33. Renewable Electric Power Industry Net Summer Capability by State, 1991**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama . . . . .	2,934	--	--	--	--	W	W	3,378
Alaska . . . . .	237	--	--	*	--	W	--	W
Arizona . . . . .	2,569	--	--	--	--	--	--	2,569
Arkansas . . . . .	1,262	--	--	--	--	W	W	1,603
California . . . . .	9,815	2,447	322	1,940	228	670	132	15,554
Colorado . . . . .	W	--	--	--	--	--	W	558
Connecticut . . . . .	W	--	--	--	154	--	W	311
Delaware . . . . .	--	--	--	--	--	--	--	--
Dist. of Col. . . . .	--	--	--	--	--	--	--	--
Florida . . . . .	48	--	--	--	444	495	53	1,040
Georgia . . . . .	1,996	--	--	--	--	607	--	2,602
Hawaii . . . . .	18	--	--	W	W	--	132	245
Idaho . . . . .	2,446	--	--	--	--	130	--	2,576
Illinois . . . . .	W	W	--	--	19	--	W	57
Indiana . . . . .	66	--	--	--	W	--	--	W
Iowa . . . . .	W	--	--	--	--	--	W	W
Kansas . . . . .	W	--	--	*	--	--	--	W
Kentucky . . . . .	795	--	--	--	--	--	--	795
Louisiana . . . . .	W	--	--	--	--	450	W	645
Maine . . . . .	772	--	--	--	W	541	W	1,369
Maryland . . . . .	428	--	--	--	W	W	--	493
Massachusetts . . . . .	260	W	--	--	247	--	W	530
Michigan . . . . .	356	--	--	--	93	193	--	643
Minnesota . . . . .	202	--	--	*	W	W	*	392
Mississippi . . . . .	--	--	--	--	--	302	--	302
Missouri . . . . .	544	--	--	--	--	--	--	544
Montana . . . . .	W	--	--	*	--	W	--	W
Nebraska . . . . .	168	--	--	--	--	--	--	168
Nevada . . . . .	W	W	--	--	--	--	--	1,188
New Hampshire . . . . .	W	--	--	--	W	138	--	535
New Jersey . . . . .	W	--	--	--	169	--	W	182
New Mexico . . . . .	58	--	--	--	--	--	W	W
New York . . . . .	1,943	--	--	--	214	W	W	2,258
North Carolina . . . . .	W	--	--	--	W	258	--	2,176
North Dakota . . . . .	545	--	--	--	--	--	--	545
Ohio . . . . .	W	--	--	--	W	W	--	324
Oklahoma . . . . .	744	--	--	--	--	W	--	W
Oregon . . . . .	9,091	--	--	W	W	190	--	9,294
Pennsylvania . . . . .	W	--	--	--	203	W	--	1,001
Rhode Island . . . . .	W	--	--	--	W	--	--	W
South Carolina . . . . .	W	--	--	--	W	329	--	1,475
South Dakota . . . . .	1,821	--	--	--	--	--	--	1,821
Tennessee . . . . .	2,211	--	--	--	W	W	--	2,298
Texas . . . . .	644	--	*	--	W	243	W	896
Utah . . . . .	246	21	--	--	--	--	--	268
Vermont . . . . .	W	--	--	*	--	W	--	521
Virginia . . . . .	W	--	*	--	W	346	--	1,278
Washington . . . . .	W	--	--	--	W	252	--	21,028
West Virginia . . . . .	W	--	--	--	--	--	--	W
Wisconsin . . . . .	490	--	--	*	18	235	--	742
Wyoming . . . . .	W	--	--	--	--	W	--	W
<b>Total . . . . .</b>	<b>74,019</b>	<b>2,632</b>	<b>323</b>	<b>1,975</b>	<b>2,428</b>	<b>6,677</b>	<b>522</b>	<b>88,576</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Producer Report."

**C34. Renewable Electric Utility Net Summer Capability by State, 1992**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,934	--	--	--	--	--	--	2,934
Alaska .....	352	--	--	*	--	--	--	352
Arizona .....	2,632	--	--	--	--	--	--	2,632
Arkansas .....	1,265	--	--	--	--	--	--	1,265
California .....	9,438	1,712	3	--	--	--	--	11,153
Colorado .....	546	--	--	--	--	--	--	546
Connecticut .....	106	--	--	--	64	--	--	170
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	--	--	--	47
Georgia .....	1,982	--	--	--	--	--	--	1,982
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,302	--	--	--	--	--	--	2,302
Illinois .....	10	--	--	--	--	--	--	10
Indiana .....	69	--	--	--	--	--	--	69
Iowa .....	125	--	--	--	--	--	--	125
Kansas .....	--	--	--	*	--	--	--	*
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	420	--	--	--	--	--	--	420
Maryland .....	428	--	--	--	--	--	--	428
Massachusetts ....	207	--	--	--	--	--	--	207
Michigan .....	326	--	--	--	--	--	--	326
Minnesota .....	143	--	--	*	88	--	*	231
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	544	--	--	--	--	--	--	544
Montana .....	2,478	--	--	--	--	13	--	2,491
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	1,031	--	--	--	--	--	--	1,031
New Hampshire ....	290	--	--	--	--	--	--	290
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	59	--	--	--	--	--	--	59
New York .....	1,645	--	--	--	--	--	--	1,645
North Carolina ....	1,894	--	--	--	--	--	--	1,894
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	125	--	--	--	90	--	--	215
Oklahoma .....	750	--	--	--	--	--	--	750
Oregon .....	9,011	--	--	--	--	11	--	9,023
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,268	--	--	--	--	--	--	1,268
South Dakota .....	1,821	--	--	--	--	--	--	1,821
Tennessee .....	2,215	--	--	--	--	--	--	2,215
Texas .....	644	--	*	--	--	--	--	644
Utah .....	251	27	--	--	--	--	--	278
Vermont .....	430	--	--	*	--	47	--	477
Virginia .....	763	--	--	--	--	--	--	763
Washington .....	20,638	--	--	--	--	46	--	20,684
West Virginia .....	108	--	--	--	--	--	--	108
Wisconsin .....	443	--	--	*	2	104	--	548
Wyoming .....	287	--	--	--	--	--	--	287
<b>Total .....</b>	<b>72,185</b>	<b>1,739</b>	<b>3</b>	<b>*</b>	<b>244</b>	<b>221</b>	<b>*</b>	<b>74,393</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C35. Renewable Nonutility Net Summer Capability by State, 1992**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	W	W	434
Alaska	--	--	--	--	--	W	--	W
Arizona	--	--	--	--	--	--	--	--
Arkansas	W	--	--	--	--	252	W	255
California	W	W	335	1,799	228	633	187	4,710
Colorado	W	--	--	--	--	--	W	34
Connecticut	W	--	--	--	109	--	W	159
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	444	495	53	992
Georgia	14	--	--	--	--	590	--	604
Hawaii	14	W	--	W	W	--	153	280
Idaho	222	--	--	--	--	130	--	352
Illinois	W	--	--	--	23	--	W	44
Indiana	--	--	--	--	W	--	--	W
Iowa	W	--	--	--	--	--	W	W
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	--	--	--
Louisiana	W	--	--	--	--	436	W	631
Maine	352	--	--	--	W	675	W	1,087
Maryland	--	--	--	--	W	W	--	65
Massachusetts	58	--	--	--	250	W	W	345
Michigan	29	--	--	--	104	232	--	365
Minnesota	W	--	--	--	W	73	--	178
Mississippi	--	--	--	--	--	302	--	302
Missouri	--	--	--	--	--	--	--	--
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	212
New Hampshire	89	--	--	--	21	138	--	247
New Jersey	W	--	--	--	128	--	W	142
New Mexico	--	--	--	--	--	--	W	W
New York	W	--	--	--	215	46	W	637
North Carolina	W	--	--	--	W	200	--	224
North Dakota	--	--	--	--	--	--	--	--
Ohio	W	--	--	--	W	W	--	32
Oklahoma	--	--	--	--	W	W	--	W
Oregon	102	--	--	W	W	179	--	295
Pennsylvania	W	--	--	--	203	W	--	356
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	W	--	--	--	W	329	--	360
South Dakota	--	--	--	--	--	--	--	--
Tennessee	--	--	--	--	W	W	--	105
Texas	--	--	--	--	W	242	W	257
Utah	10	--	--	--	--	--	--	10
Vermont	W	--	--	--	--	W	--	64
Virginia	18	--	--	--	153	356	--	527
Washington	W	--	--	--	W	175	--	291
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	48	--	--	--	17	173	--	237
Wyoming	W	--	--	--	--	W	--	W
<b>Total</b>	<b>2,588</b>	<b>1,171</b>	<b>335</b>	<b>1,822</b>	<b>2,198</b>	<b>6,434</b>	<b>605</b>	<b>15,154</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C36. Renewable Electric Power Industry Net Summer Capability by State, 1992**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,934	--	--	--	--	W	W	3,368
Alaska .....	352	--	--	*	--	W	--	W
Arizona .....	2,632	--	--	--	--	--	--	2,632
Arkansas .....	W	--	--	--	--	252	W	1,520
California .....	W	W	338	1,799	228	633	187	15,863
Colorado .....	W	--	--	--	--	--	W	580
Connecticut .....	W	--	--	--	173	--	W	329
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	444	495	53	1,039
Georgia .....	1,996	--	--	--	--	590	--	2,586
Hawaii .....	18	W	--	W	W	--	153	283
Idaho .....	2,524	--	--	--	--	130	--	2,654
Illinois .....	W	--	--	--	23	--	W	53
Indiana .....	69	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	--	--	W	W
Kansas .....	W	--	--	*	--	--	--	W
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	W	--	--	--	--	436	W	631
Maine .....	772	--	--	--	W	675	W	1,508
Maryland .....	428	--	--	--	W	W	--	493
Massachusetts ....	265	--	--	--	250	W	W	552
Michigan .....	355	--	--	--	104	232	--	691
Minnesota .....	W	--	--	*	W	73	*	409
Mississippi .....	--	--	--	--	--	302	--	302
Missouri .....	544	--	--	--	--	--	--	544
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	W	W	--	--	--	--	--	1,243
New Hampshire ...	379	--	--	--	21	138	--	537
New Jersey .....	W	--	--	--	128	--	W	142
New Mexico .....	59	--	--	--	--	--	W	W
New York .....	W	--	--	--	215	46	W	2,281
North Carolina ....	W	--	--	--	W	200	--	2,118
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	W	--	--	--	W	W	--	247
Oklahoma .....	750	--	--	--	W	W	--	W
Oregon .....	9,114	--	--	W	W	190	--	9,317
Pennsylvania .....	W	--	--	--	203	W	--	1,003
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	329	--	1,628
South Dakota .....	1,821	--	--	--	--	--	--	1,821
Tennessee .....	2,215	--	--	--	W	W	--	2,320
Texas .....	644	--	*	--	W	242	W	901
Utah .....	261	27	--	--	--	--	--	288
Vermont .....	W	--	--	*	--	W	--	541
Virginia .....	781	--	*	--	153	356	--	1,290
Washington .....	W	--	--	--	W	221	--	20,976
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	490	--	--	*	18	277	--	785
Wyoming .....	W	--	--	--	--	W	--	W
<b>Total .....</b>	<b>74,773</b>	<b>2,910</b>	<b>339</b>	<b>1,823</b>	<b>2,441</b>	<b>6,655</b>	<b>606</b>	<b>89,547</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.05 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Producer Report."

**C37. Renewable Electric Utility Net Summer Capability by State, 1993**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,955	--	--	--	--	--	--	2,955
Alaska .....	352	--	--	*	--	--	--	352
Arizona .....	2,633	--	--	--	--	--	--	2,633
Arkansas .....	1,298	--	--	--	--	--	--	1,298
California .....	9,718	1,712	4	--	--	--	--	11,434
Colorado .....	566	--	--	--	--	--	--	566
Connecticut .....	131	--	--	--	64	--	--	195
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	--	--	--	47
Georgia .....	2,029	--	--	--	--	--	--	2,029
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,299	--	--	--	--	--	--	2,299
Illinois .....	12	--	--	--	--	--	--	12
Indiana .....	69	--	--	--	--	--	--	69
Iowa .....	125	--	--	*	--	--	--	125
Kansas .....	--	--	--	*	--	--	--	*
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	421	--	--	--	--	--	--	421
Maryland .....	428	--	--	--	--	--	--	428
Massachusetts ....	208	--	--	*	--	--	--	208
Michigan .....	328	--	--	--	--	--	--	328
Minnesota .....	144	--	--	*	85	--	*	229
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,478	--	--	--	--	13	--	2,491
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	1,031	--	--	--	--	--	--	1,031
New Hampshire ....	291	--	--	--	--	--	--	291
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	59	--	--	--	--	--	--	59
New York .....	3,800	--	--	--	--	--	--	3,800
North Carolina ....	1,882	--	--	--	--	--	--	1,882
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	124	--	--	--	90	--	--	214
Oklahoma .....	750	--	--	--	--	--	--	750
Oregon .....	9,008	--	--	--	--	11	3	9,023
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,261	--	--	--	--	--	--	1,261
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,216	--	--	--	--	--	--	2,216
Texas .....	652	--	*	--	--	--	--	652
Utah .....	253	35	--	--	--	--	--	288
Vermont .....	430	--	--	*	--	47	--	477
Virginia .....	764	--	--	--	--	--	--	765
Washington .....	20,646	--	--	--	--	46	--	20,692
West Virginia .....	108	--	--	--	--	--	--	108
Wisconsin .....	440	--	--	*	2	102	--	544
Wyoming .....	287	--	--	--	--	--	--	287
<b>Total .....</b>	<b>74,763</b>	<b>1,747</b>	<b>4</b>	<b>1</b>	<b>241</b>	<b>219</b>	<b>3</b>	<b>76,978</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C38. Renewable Nonutility Net Summer Capability by State, 1993**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama	--	--	--	--	--	606	--	606
Alaska	--	--	--	--	--	W	--	W
Arizona	--	--	--	--	--	--	--	--
Arkansas	W	--	--	--	--	334	W	337
California	593	W	335	W	244	608	197	4,762
Colorado	W	--	--	--	--	--	W	34
Connecticut	W	--	--	--	106	--	W	156
Delaware	--	--	--	--	--	--	--	--
Dist. of Col.	--	--	--	--	--	--	--	--
Florida	--	--	--	--	444	477	53	974
Georgia	W	--	--	--	W	677	--	691
Hawaii	14	W	--	W	W	--	167	294
Idaho	254	--	--	--	--	130	--	384
Illinois	W	--	--	--	29	--	W	49
Indiana	--	--	--	--	W	--	--	W
Iowa	W	--	--	--	W	--	W	10
Kansas	W	--	--	--	--	--	--	W
Kentucky	--	--	--	--	--	--	--	--
Louisiana	W	--	--	--	--	435	W	633
Maine	352	--	--	--	W	616	W	1,029
Maryland	--	--	--	--	W	W	--	65
Massachusetts	59	--	--	--	277	W	W	373
Michigan	29	--	--	--	109	269	--	406
Minnesota	W	--	--	--	W	103	--	207
Mississippi	--	--	--	--	--	326	--	326
Missouri	--	--	--	--	--	--	--	--
Montana	W	--	--	--	--	W	--	W
Nebraska	--	--	--	--	--	--	--	--
Nevada	W	W	--	--	--	--	--	212
New Hampshire	89	--	--	--	21	138	--	248
New Jersey	W	--	--	--	128	--	W	142
New Mexico	--	--	--	--	--	--	W	W
New York	W	--	--	--	215	65	W	705
North Carolina	W	--	--	--	W	201	--	225
North Dakota	--	--	--	--	--	--	--	--
Ohio	W	--	--	--	W	W	--	32
Oklahoma	--	--	--	--	--	W	--	W
Oregon	W	--	--	--	W	165	--	286
Pennsylvania	W	--	--	--	203	W	--	356
Rhode Island	W	--	--	--	W	--	--	W
South Carolina	W	--	--	--	W	329	--	360
South Dakota	--	--	--	--	--	--	--	--
Tennessee	--	--	--	--	W	W	--	105
Texas	--	--	--	--	W	W	13	190
Utah	10	--	--	--	--	--	--	10
Vermont	W	--	--	--	--	W	--	71
Virginia	22	--	--	--	159	356	--	537
Washington	90	--	--	--	W	165	W	285
West Virginia	W	--	--	--	--	--	--	W
Wisconsin	49	--	--	--	17	143	--	208
Wyoming	W	--	--	--	--	W	--	W
<b>Total</b>	<b>2,642</b>	<b>1,231</b>	<b>335</b>	<b>1,813</b>	<b>2,244</b>	<b>6,664</b>	<b>677</b>	<b>15,607</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C39. Renewable Electric Power Industry Net Summer Capability by State, 1993**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,955	--	--	--	--	606	--	3,561
Alaska .....	352	--	--	*	--	W	--	W
Arizona .....	2,633	--	--	--	--	--	--	2,633
Arkansas .....	W	--	--	--	--	334	W	1,634
California .....	10,310	W	339	W	244	608	197	16,196
Colorado .....	W	--	--	--	--	--	W	600
Connecticut .....	W	--	--	--	170	--	W	351
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	444	477	53	1,021
Georgia .....	W	--	--	--	W	677	--	2,720
Hawaii .....	18	W	--	W	W	--	167	297
Idaho .....	2,552	--	--	--	--	130	--	2,683
Illinois .....	W	--	--	--	29	--	W	62
Indiana .....	69	--	--	--	W	--	--	W
Iowa .....	W	--	--	*	W	--	W	135
Kansas .....	W	--	--	*	--	--	--	W
Kentucky .....	795	--	--	--	--	--	--	795
Louisiana .....	W	--	--	--	--	435	W	633
Maine .....	772	--	--	--	W	616	W	1,449
Maryland .....	428	--	--	--	W	W	--	493
Massachusetts ....	267	--	--	*	277	W	W	581
Michigan .....	356	--	--	--	109	269	--	734
Minnesota .....	W	--	--	*	W	103	*	436
Mississippi .....	--	--	--	--	--	326	--	326
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	168	--	--	--	--	--	--	168
Nevada .....	W	W	--	--	--	--	--	1,243
New Hampshire ....	380	--	--	--	21	138	--	539
New Jersey .....	W	--	--	--	128	--	W	142
New Mexico .....	59	--	--	--	--	--	W	W
New York .....	W	--	--	--	215	65	W	4,505
North Carolina ....	W	--	--	--	W	201	--	2,107
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	W	--	--	--	W	W	--	246
Oklahoma .....	750	--	--	--	--	W	--	W
Oregon .....	W	--	--	--	W	176	3	9,308
Pennsylvania .....	W	--	--	--	203	W	--	1,003
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	329	--	1,621
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,216	--	--	--	W	W	--	2,321
Texas .....	652	--	*	--	W	W	13	842
Utah .....	263	35	--	--	--	--	--	298
Vermont .....	W	--	--	*	--	W	--	548
Virginia .....	786	--	*	--	159	356	--	1,302
Washington .....	20,735	--	--	--	W	211	W	20,977
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	489	--	--	*	18	245	--	752
Wyoming .....	W	--	--	--	--	W	--	W
<b>Total .....</b>	<b>77,405</b>	<b>2,978</b>	<b>340</b>	<b>1,813</b>	<b>2,485</b>	<b>6,883</b>	<b>681</b>	<b>92,585</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Producer Report."

**C40. Renewable Electric Utility Net Summer Capability by State, 1994**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,959	--	--	--	--	--	--	2,959
Alaska .....	352	--	--	*	--	--	--	352
Arizona .....	2,648	--	--	--	--	--	--	2,648
Arkansas .....	1,298	--	--	--	--	--	--	1,298
California .....	9,773	1,712	4	7	--	--	--	11,496
Colorado .....	598	--	--	--	--	--	--	598
Connecticut .....	131	--	--	--	64	--	--	195
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	--	--	--	47
Georgia .....	2,029	--	--	--	--	--	--	2,029
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,358	--	--	--	--	--	--	2,358
Illinois .....	12	--	--	--	--	--	--	12
Indiana .....	69	--	--	--	--	--	--	69
Iowa .....	125	--	--	*	--	--	--	125
Kansas .....	--	--	--	*	--	--	--	*
Kentucky .....	802	--	--	--	--	--	--	802
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	422	--	--	--	--	32	--	454
Maryland .....	530	--	--	--	--	--	--	530
Massachusetts ....	208	--	--	*	--	--	--	209
Michigan .....	329	--	--	--	--	--	--	329
Minnesota .....	142	--	--	*	85	--	*	227
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,514	--	--	--	--	13	--	2,527
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,046	--	--	--	--	--	--	1,046
New Hampshire ....	283	--	--	--	--	--	--	283
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	58	--	--	--	--	--	--	58
New York .....	3,796	--	--	--	--	--	--	3,796
North Carolina ....	1,532	--	--	--	--	--	--	1,532
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	124	--	--	--	90	--	--	214
Oklahoma .....	775	--	--	--	--	--	--	775
Oregon .....	9,021	--	--	--	23	12	3	9,059
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,261	--	--	--	--	--	--	1,261
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,136	--	--	--	--	--	--	2,136
Texas .....	653	--	*	--	--	--	--	654
Utah .....	257	35	--	--	--	--	--	292
Vermont .....	430	--	--	*	--	47	--	477
Virginia .....	763	--	--	--	--	--	--	764
Washington .....	20,740	--	--	--	--	47	--	20,787
West Virginia .....	105	--	--	--	--	--	--	105
Wisconsin .....	440	--	--	*	2	102	--	544
Wyoming .....	292	--	--	--	--	--	--	292
<b>Total .....</b>	<b>74,787</b>	<b>1,747</b>	<b>4</b>	<b>8</b>	<b>264</b>	<b>252</b>	<b>3</b>	<b>77,065</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."



**C41. Renewable Nonutility Net Summer Capability by State, 1994**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	748
Alaska .....	--	--	--	--	--	--	--	--
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	W	--	--	--	--	314	W	317
California .....	W	W	329	1,693	240	683	114	4,706
Colorado .....	W	--	--	--	--	--	W	34
Connecticut .....	W	--	--	--	106	--	W	156
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	480	525	53	1,058
Georgia .....	W	--	--	--	W	664	--	680
Hawaii .....	23	W	--	W	W	--	133	268
Idaho .....	247	--	--	--	--	130	--	377
Illinois .....	W	--	--	--	28	--	W	49
Indiana .....	--	--	--	--	W	--	--	W
Iowa .....	W	--	--	--	W	--	W	12
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	--	--	--
Louisiana .....	W	--	--	--	--	471	W	669
Maine .....	351	--	--	--	W	631	W	1,043
Maryland .....	--	--	--	--	W	W	--	65
Massachusetts ....	59	--	--	--	281	W	W	376
Michigan .....	28	--	--	--	119	269	--	416
Minnesota .....	64	--	--	W	W	103	--	229
Mississippi .....	--	--	--	--	--	326	--	326
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	229
New Hampshire ....	89	--	--	--	21	123	--	233
New Jersey .....	W	--	--	--	169	--	W	183
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	206	45	W	648
North Carolina ....	W	--	--	--	W	270	--	647
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	32
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	148	--	269
Pennsylvania .....	85	--	--	--	266	W	W	421
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	329	--	360
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	110	--	289
Texas .....	--	--	--	--	W	W	14	191
Utah .....	10	--	--	--	--	--	--	10
Vermont .....	W	--	--	--	--	W	--	71
Virginia .....	22	--	--	--	163	440	--	625
Washington .....	93	--	--	--	W	165	W	291
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	63	--	--	--	19	143	--	225
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>3,255</b>	<b>1,259</b>	<b>329</b>	<b>1,737</b>	<b>2,412</b>	<b>7,009</b>	<b>529</b>	<b>16,530</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C42. Renewable Electric Power Industry Net Summer Capability by State, 1994**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama . . . . .	2,959	--	--	--	--	W	W	3,708
Alaska . . . . .	352	--	--	*	--	--	--	352
Arizona . . . . .	2,648	--	--	--	--	--	--	2,648
Arkansas . . . . .	W	--	--	--	--	314	W	1,615
California . . . . .	W	W	333	1,699	240	683	114	16,202
Colorado . . . . .	W	--	--	--	--	--	W	632
Connecticut . . . . .	W	--	--	--	170	--	W	351
Delaware . . . . .	--	--	--	--	--	--	--	--
Dist. of Col. . . . .	--	--	--	--	--	--	--	--
Florida . . . . .	47	--	--	--	480	525	53	1,105
Georgia . . . . .	W	--	--	--	W	664	--	2,709
Hawaii . . . . .	27	W	--	W	W	--	133	272
Idaho . . . . .	2,605	--	--	--	--	130	--	2,735
Illinois . . . . .	W	--	--	--	28	--	W	61
Indiana . . . . .	69	--	--	--	W	--	--	W
Iowa . . . . .	W	--	--	*	W	--	W	136
Kansas . . . . .	W	--	--	*	--	--	--	W
Kentucky . . . . .	802	--	--	--	--	--	--	802
Louisiana . . . . .	W	--	--	--	--	471	W	669
Maine . . . . .	773	--	--	--	W	663	W	1,496
Maryland . . . . .	530	--	--	--	W	W	--	595
Massachusetts . . . . .	267	--	--	*	281	W	W	585
Michigan . . . . .	357	--	--	--	119	269	--	744
Minnesota . . . . .	206	--	--	W	W	103	*	457
Mississippi . . . . .	--	--	--	--	--	326	--	326
Missouri . . . . .	543	--	--	--	--	--	--	543
Montana . . . . .	W	--	--	--	--	W	--	W
Nebraska . . . . .	167	--	--	--	--	--	--	167
Nevada . . . . .	W	W	--	--	--	--	--	1,275
New Hampshire . . . . .	372	--	--	--	21	123	--	516
New Jersey . . . . .	W	--	--	--	169	--	W	183
New Mexico . . . . .	58	--	--	--	--	--	W	W
New York . . . . .	W	--	--	--	206	45	W	4,444
North Carolina . . . . .	W	--	--	--	W	270	--	2,179
North Dakota . . . . .	545	--	--	--	--	--	W	W
Ohio . . . . .	W	--	--	--	W	W	--	246
Oklahoma . . . . .	775	--	--	--	W	W	--	W
Oregon . . . . .	W	--	--	--	W	160	3	9,329
Pennsylvania . . . . .	732	--	--	--	266	W	W	1,068
Rhode Island . . . . .	W	--	--	--	W	--	--	W
South Carolina . . . . .	W	--	--	--	W	329	--	1,621
South Dakota . . . . .	1,820	--	--	--	--	--	--	1,820
Tennessee . . . . .	W	--	--	--	W	110	--	2,426
Texas . . . . .	653	--	*	--	W	W	14	845
Utah . . . . .	267	35	--	--	--	--	--	302
Vermont . . . . .	W	--	--	*	--	W	--	548
Virginia . . . . .	785	--	*	--	163	440	--	1,389
Washington . . . . .	20,833	--	--	--	W	212	W	21,078
West Virginia . . . . .	W	--	--	--	--	--	--	W
Wisconsin . . . . .	503	--	--	*	21	245	--	769
Wyoming . . . . .	W	--	--	--	--	--	--	W
<b>Total . . . . .</b>	<b>78,042</b>	<b>3,006</b>	<b>333</b>	<b>1,745</b>	<b>2,675</b>	<b>7,261</b>	<b>532</b>	<b>93,594</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Producer Report."

**C43. Renewable Electric Utility Net Summer Capability by State, 1995**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,955	--	--	--	--	--	--	2,955
Alaska .....	353	--	--	*	--	--	--	353
Arizona .....	2,699	--	--	--	--	--	--	2,699
Arkansas .....	1,298	--	--	--	--	--	--	1,298
California .....	9,807	1,712	4	7	--	--	--	11,530
Colorado .....	582	--	--	--	--	--	--	582
Connecticut .....	131	--	--	--	64	--	--	195
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	41	--	--	--	--	--	--	41
Georgia .....	2,209	--	--	--	--	--	--	2,209
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,418	--	--	--	--	--	--	2,418
Illinois .....	6	--	--	--	--	--	--	6
Indiana .....	68	--	--	--	--	--	--	68
Iowa .....	134	--	--	*	--	--	--	134
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	789	--	--	--	--	--	--	789
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	421	--	--	--	--	32	--	453
Maryland .....	530	--	--	--	--	--	--	530
Massachusetts ....	207	--	--	*	--	--	--	208
Michigan .....	263	--	--	--	--	--	--	263
Minnesota .....	142	--	--	*	82	--	*	224
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,551	--	--	--	--	13	--	2,563
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,046	--	--	--	--	--	--	1,046
New Hampshire ....	284	--	--	--	--	--	--	284
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	58	--	--	--	--	--	--	58
New York .....	3,906	--	--	--	--	--	--	3,906
North Carolina ....	1,528	--	--	--	--	--	--	1,528
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	117	--	--	--	90	--	--	207
Oklahoma .....	776	--	--	--	--	--	--	776
Oregon .....	9,031	--	--	--	23	12	3	9,068
Pennsylvania .....	647	--	--	--	--	--	--	647
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,262	--	--	--	--	--	--	1,262
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,212	--	--	--	--	--	--	2,212
Texas .....	680	--	*	--	--	--	--	680
Utah .....	261	35	--	--	--	--	--	296
Vermont .....	426	--	--	*	--	50	--	477
Virginia .....	786	--	--	--	--	--	--	786
Washington .....	20,795	--	--	--	--	97	--	20,892
West Virginia .....	58	--	--	--	--	--	--	58
Wisconsin .....	427	--	--	--	2	104	--	532
Wyoming .....	294	--	--	--	--	--	--	294
<b>Total .....</b>	<b>75,274</b>	<b>1,747</b>	<b>4</b>	<b>8</b>	<b>261</b>	<b>307</b>	<b>3</b>	<b>77,604</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C44. Renewable Nonutility Net Summer Capability by State, 1995**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	751
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	W	--	--	--	--	346	--	349
California .....	W	W	329	1,680	238	561	161	4,567
Colorado .....	W	--	--	--	--	--	W	35
Connecticut .....	W	--	--	--	212	--	W	262
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	480	630	53	1,163
Georgia .....	W	--	--	--	W	484	--	500
Hawaii .....	25	W	--	W	W	--	124	265
Idaho .....	251	--	--	--	--	130	--	382
Illinois .....	W	--	--	--	28	--	W	49
Indiana .....	--	--	--	--	14	--	--	14
Iowa .....	W	--	--	--	W	--	W	12
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	459	W	657
Maine .....	352	--	--	--	W	532	W	945
Maryland .....	--	--	--	--	W	W	W	129
Massachusetts ....	57	--	--	--	281	W	W	369
Michigan .....	28	--	--	--	128	306	--	462
Minnesota .....	64	--	--	W	W	103	W	237
Mississippi .....	--	--	--	--	--	326	--	326
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	232
New Hampshire ....	88	--	--	--	21	115	--	224
New Jersey .....	W	--	--	--	168	--	W	191
New Mexico .....	--	--	--	--	--	--	W	W
New York .....	W	--	--	--	271	45	W	756
North Carolina ....	W	--	--	--	W	201	--	573
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	32
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	163	--	285
Pennsylvania .....	85	--	--	--	255	W	W	369
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	266	--	297
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	W	--	273
Texas .....	--	--	--	--	W	169	W	182
Utah .....	10	--	--	--	--	--	--	10
Vermont .....	W	--	--	--	--	W	--	71
Virginia .....	21	--	--	--	163	406	--	591
Washington .....	97	--	--	--	W	87	W	214
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	51	--	--	--	18	123	--	192
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>3,289</b>	<b>1,220</b>	<b>329</b>	<b>1,723</b>	<b>2,644</b>	<b>6,495</b>	<b>574</b>	<b>16,274</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C45. Renewable Electric Power Industry Net Summer Capability by State, 1995**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,955	--	--	--	--	W	W	3,706
Alaska .....	353	--	--	*	--	W	--	W
Arizona .....	2,699	--	--	--	--	--	--	2,699
Arkansas .....	W	--	--	--	--	346	W	1,647
California .....	W	W	333	1,687	238	561	161	16,097
Colorado .....	W	--	--	--	--	--	W	616
Connecticut .....	W	--	--	--	276	--	W	457
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	41	--	--	--	480	630	53	1,204
Georgia .....	W	--	--	--	W	484	--	2,710
Hawaii .....	28	W	--	W	W	--	124	269
Idaho .....	2,669	--	--	--	--	130	--	2,799
Illinois .....	W	--	--	--	28	--	W	54
Indiana .....	68	--	--	--	14	--	--	82
Iowa .....	W	--	--	*	W	--	W	146
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	789	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	459	W	657
Maine .....	773	--	--	--	W	564	W	1,398
Maryland .....	530	--	--	--	W	W	W	659
Massachusetts ....	265	--	--	*	281	W	W	577
Michigan .....	291	--	--	--	128	306	--	724
Minnesota .....	206	--	--	W	W	103	W	461
Mississippi .....	--	--	--	--	--	326	--	326
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	W	W	--	--	--	--	--	1,278
New Hampshire ....	371	--	--	--	21	115	--	508
New Jersey .....	W	--	--	--	168	--	W	191
New Mexico .....	58	--	--	--	--	--	W	W
New York .....	W	--	--	--	271	45	W	4,662
North Carolina ....	W	--	--	--	W	201	--	2,101
North Dakota .....	545	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	W	--	239
Oklahoma .....	776	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	175	3	9,353
Pennsylvania .....	732	--	--	--	255	W	W	1,016
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	266	--	1,559
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	W	--	--	--	W	W	--	2,485
Texas .....	680	--	*	--	W	169	W	862
Utah .....	271	35	--	--	--	--	--	307
Vermont .....	W	--	--	*	--	W	--	548
Virginia .....	807	--	*	--	163	406	--	1,376
Washington .....	20,892	--	--	--	W	184	W	21,106
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	478	--	--	--	20	227	--	724
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>78,563</b>	<b>2,968</b>	<b>333</b>	<b>1,731</b>	<b>2,904</b>	<b>6,802</b>	<b>577</b>	<b>93,878</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Producer Report."

**C46. Renewable Electric Utility Net Summer Capability by State, 1996**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,881	--	--	--	--	--	--	2,881
Alaska .....	353	--	--	*	--	--	--	353
Arizona .....	2,699	--	--	--	--	--	--	2,699
Arkansas .....	1,298	--	--	--	--	--	--	1,298
California .....	9,804	1,587	4	7	--	--	--	11,401
Colorado .....	582	--	--	--	--	--	--	582
Connecticut .....	130	--	--	--	--	--	--	130
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	--	--	--	47
Georgia .....	2,252	--	--	--	--	--	--	2,252
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,412	--	--	--	--	--	--	2,412
Illinois .....	13	--	--	--	--	--	--	13
Indiana .....	62	--	--	--	--	--	--	62
Iowa .....	139	--	--	*	--	--	--	139
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	792	--	--	--	--	--	--	792
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	416	--	--	--	--	32	--	448
Maryland .....	530	--	--	--	--	--	--	530
Massachusetts ....	201	--	--	*	--	--	--	201
Michigan .....	265	--	--	--	--	--	--	265
Minnesota .....	144	--	--	*	83	33	*	259
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,546	--	--	--	--	13	--	2,558
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,046	--	--	--	--	--	--	1,046
New Hampshire ....	284	--	--	--	--	--	--	284
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	58	--	--	--	--	--	--	58
New York .....	1,657	--	--	--	--	--	--	1,657
North Carolina ....	1,554	--	--	--	--	--	--	1,554
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	117	--	--	--	90	--	--	207
Oklahoma .....	861	--	--	--	--	--	--	861
Oregon .....	9,029	--	--	--	23	12	3	9,066
Pennsylvania .....	617	--	--	--	--	--	--	617
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,262	--	--	--	--	--	--	1,262
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,193	--	--	--	--	--	--	2,193
Texas .....	683	--	*	--	--	--	--	683
Utah .....	262	35	--	--	--	--	--	297
Vermont .....	427	--	--	*	--	50	--	478
Virginia .....	785	--	--	--	--	--	--	785
Washington .....	20,794	--	--	--	--	47	--	20,841
West Virginia .....	55	--	--	--	--	--	--	55
Wisconsin .....	506	--	--	--	31	30	--	567
Wyoming .....	294	--	--	--	--	--	--	294
<b>Total .....</b>	<b>73,129</b>	<b>1,622</b>	<b>4</b>	<b>8</b>	<b>226</b>	<b>216</b>	<b>3</b>	<b>75,208</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C47. Renewable Nonutility Net Summer Capability by State, 1996**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	W	W	834
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	W	--	--	--	--	334	W	337
California .....	W	W	329	1,592	223	574	134	4,505
Colorado .....	W	--	--	--	--	--	W	35
Connecticut .....	W	--	--	--	212	--	W	262
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	--	--	406	679	124	1,210
Georgia .....	W	--	--	--	W	542	--	564
Hawaii .....	25	W	--	W	W	--	106	247
Idaho .....	251	--	--	--	--	130	--	381
Illinois .....	W	--	--	--	35	--	W	59
Indiana .....	--	--	--	--	W	--	W	17
Iowa .....	W	--	--	--	W	--	W	12
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	496	W	695
Maine .....	W	--	--	--	W	465	132	969
Maryland .....	--	--	--	--	W	W	W	129
Massachusetts ....	58	--	--	--	199	W	W	364
Michigan .....	28	--	--	--	147	285	--	459
Minnesota .....	W	--	--	W	49	103	--	246
Mississippi .....	--	--	--	--	--	310	--	310
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	232
New Hampshire ....	88	--	--	--	24	122	--	234
New Jersey .....	W	--	--	--	137	--	W	182
New Mexico .....	--	--	--	--	--	--	--	--
New York .....	W	--	--	--	205	69	W	713
North Carolina ....	W	--	--	--	W	270	--	646
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	31	--	40
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	167	--	288
Pennsylvania .....	W	--	--	--	258	W	--	427
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	340	--	371
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	W	--	274
Texas .....	W	--	--	W	W	127	W	176
Utah .....	10	--	--	--	--	--	--	10
Vermont .....	W	--	--	--	--	W	--	73
Virginia .....	21	--	--	--	218	335	--	575
Washington .....	97	--	--	--	W	176	W	302
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	50	--	--	--	20	143	--	214
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>3,308</b>	<b>1,271</b>	<b>329</b>	<b>1,670</b>	<b>2,478</b>	<b>6,859</b>	<b>778</b>	<b>16,693</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C48. Renewable Electric Power Industry Net Summer Capability by State, 1996**  
(Megawatts)

	Hydro-electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,881	--	--	--	--	W	W	3,715
Alaska .....	353	--	--	*	--	W	--	W
Arizona .....	2,699	--	--	--	--	--	--	2,699
Arkansas .....	W	--	--	--	--	334	W	1,634
California .....	W	W	333	1,599	223	574	134	15,906
Colorado .....	W	--	--	--	--	--	W	617
Connecticut .....	W	--	--	--	212	--	W	392
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	406	679	124	1,257
Georgia .....	W	--	--	--	W	542	--	2,816
Hawaii .....	28	W	--	W	W	--	106	250
Idaho .....	2,663	--	--	--	--	130	--	2,793
Illinois .....	W	--	--	--	35	--	W	72
Indiana .....	62	--	--	--	W	--	W	79
Iowa .....	W	--	--	*	W	--	W	150
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	792	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	496	W	695
Maine .....	W	--	--	--	W	497	132	1,416
Maryland .....	530	--	--	--	W	W	W	659
Massachusetts ....	259	--	--	*	199	W	W	566
Michigan .....	293	--	--	--	147	285	--	725
Minnesota .....	W	--	--	W	132	135	*	506
Mississippi .....	--	--	--	--	--	310	--	310
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	W	W	--	--	--	--	--	1,278
New Hampshire ...	372	--	--	--	24	122	--	518
New Jersey .....	W	--	--	--	137	--	W	182
New Mexico .....	58	--	--	--	--	--	--	58
New York .....	W	--	--	--	205	69	W	2,370
North Carolina ...	W	--	--	--	W	270	--	2,200
North Dakota ....	545	--	--	--	--	--	W	W
Ohio .....	W	--	--	--	W	31	--	247
Oklahoma .....	861	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	178	3	9,354
Pennsylvania .....	W	--	--	--	258	W	--	1,044
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	340	--	1,633
South Dakota ....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	W	--	--	--	W	W	--	2,467
Texas .....	W	--	*	W	W	127	W	859
Utah .....	272	35	--	--	--	--	--	307
Vermont .....	W	--	--	*	--	W	--	550
Virginia .....	806	--	*	--	218	335	--	1,359
Washington .....	20,891	--	--	--	W	223	W	21,143
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	556	--	--	--	51	173	--	780
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>76,437</b>	<b>2,893</b>	<b>333</b>	<b>1,678</b>	<b>2,704</b>	<b>7,075</b>	<b>781</b>	<b>91,900</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Power Producer Report."



**C49. Renewable Electric Utility Net Summer Capability by State, 1997**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	2,959	--	--	--	--	--	--	2,959
Alaska .....	362	--	--	*	--	--	--	362
Arizona .....	2,708	--	*	--	--	--	--	2,708
Arkansas .....	1,299	--	--	--	--	--	--	1,299
California .....	9,807	1,587	4	7	--	--	--	11,404
Colorado .....	615	--	--	--	--	--	--	615
Connecticut .....	130	--	--	--	--	--	--	130
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	3	--	--	50
Georgia .....	2,337	--	--	--	--	--	--	2,337
Hawaii .....	3	--	--	--	--	--	--	3
Idaho .....	2,435	--	--	--	--	--	--	2,435
Illinois .....	13	--	--	--	--	--	--	13
Indiana .....	59	--	--	--	--	--	--	59
Iowa .....	136	--	--	*	--	--	--	136
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	791	--	--	--	--	--	--	791
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	404	--	--	--	--	30	--	434
Maryland .....	530	--	--	--	--	--	--	530
Massachusetts ....	203	--	--	*	--	--	--	203
Michigan .....	257	--	--	--	--	--	--	257
Minnesota .....	142	--	--	*	83	43	*	268
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,591	--	--	--	--	--	--	2,591
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,046	--	--	--	--	--	--	1,046
New Hampshire ....	284	--	--	--	--	--	--	284
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	60	--	--	--	--	--	--	60
New York .....	3,855	--	--	--	--	--	--	3,855
North Carolina ....	1,564	--	--	--	--	--	--	1,564
North Dakota .....	545	--	--	--	--	--	--	545
Ohio .....	123	--	--	--	90	--	--	213
Oklahoma .....	775	--	--	--	--	--	--	775
Oregon .....	9,037	--	--	--	25	12	3	9,077
Pennsylvania .....	623	--	--	--	--	--	--	623
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,252	--	--	--	--	--	--	1,252
South Dakota .....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	2,219	--	--	--	--	--	--	2,219
Texas .....	686	--	1	--	--	--	--	687
Utah .....	263	35	--	--	--	--	--	298
Vermont .....	423	--	--	6	--	50	--	480
Virginia .....	740	--	*	--	--	--	--	740
Washington .....	21,470	--	--	--	--	83	--	21,553
West Virginia .....	98	--	--	--	--	--	--	98
Wisconsin .....	460	--	--	--	31	30	--	520
Wyoming .....	297	--	--	--	--	--	--	297
<b>Total .....</b>	<b>76,177</b>	<b>1,622</b>	<b>5</b>	<b>14</b>	<b>232</b>	<b>247</b>	<b>3</b>	<b>78,300</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report."

**C50. Renewable Nonutility Net Summer Capability by State, 1997**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	W	--	--	--	--	824	W	860
Alaska .....	--	--	--	--	--	W	--	W
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	W	--	--	--	--	W	--	363
California .....	636	981	329	1,154	230	566	73	3,970
Colorado .....	W	--	--	--	--	--	W	35
Connecticut .....	W	--	--	--	212	--	W	261
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	W	--	--	W	370	588	105	1,507
Georgia .....	W	--	--	--	W	540	--	559
Hawaii .....	25	W	--	W	W	--	96	236
Idaho .....	243	--	--	--	--	130	--	373
Illinois .....	W	--	--	--	62	--	W	159
Indiana .....	--	--	--	--	17	--	--	17
Iowa .....	W	--	--	--	W	--	--	W
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	--	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	423	W	676
Maine .....	354	--	--	--	W	463	W	915
Maryland .....	--	--	--	--	W	W	W	128
Massachusetts ....	68	--	--	--	230	W	W	314
Michigan .....	28	--	--	--	141	285	--	454
Minnesota .....	W	--	--	W	49	138	--	289
Mississippi .....	--	--	--	--	--	310	--	310
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	W	W	--	--	--	--	--	222
New Hampshire ....	W	W	--	--	29	101	--	218
New Jersey .....	16	--	--	--	178	--	--	195
New Mexico .....	--	--	--	--	--	--	--	--
New York .....	W	--	--	--	274	87	W	831
North Carolina ....	W	--	--	--	W	270	--	647
North Dakota .....	--	--	--	--	--	--	W	W
Ohio .....	--	--	--	--	--	117	--	117
Oklahoma .....	--	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	142	--	250
Pennsylvania .....	84	--	--	--	252	87	--	423
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	340	--	371
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	W	--	--	--	W	W	--	245
Texas .....	75	--	--	W	W	174	W	297
Utah .....	W	--	--	--	--	--	--	W
Vermont .....	W	--	--	--	--	W	--	72
Virginia .....	29	--	--	--	218	395	--	641
Washington .....	104	--	--	--	W	172	W	305
West Virginia .....	W	--	--	--	--	--	--	W
Wisconsin .....	51	--	--	--	21	143	--	216
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>3,611</b>	<b>1,232</b>	<b>329</b>	<b>1,566</b>	<b>2,631</b>	<b>6,873</b>	<b>553</b>	<b>16,794</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure or proprietary company data.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-867, "Annual Nonutility Power Producer Report."

**C51. Renewable Electric Power Industry Net Summer Capability by State, 1997**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	W	--	--	--	--	824	W	3,819
Alaska .....	362	--	--	*	--	W	--	W
Arizona .....	2,708	--	*	--	--	--	--	2,708
Arkansas .....	W	--	--	--	--	W	--	1,661
California .....	10,443	2,567	333	1,161	230	566	73	15,373
Colorado .....	W	--	--	--	--	--	W	650
Connecticut .....	W	--	--	--	212	--	W	391
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	W	--	--	W	373	588	105	1,557
Georgia .....	W	--	--	--	W	540	--	2,896
Hawaii .....	28	W	--	W	W	--	96	239
Idaho .....	2,677	--	--	--	--	130	--	2,808
Illinois .....	W	--	--	--	62	--	W	172
Indiana .....	59	--	--	--	17	--	--	76
Iowa .....	W	--	--	*	W	--	--	W
Kansas .....	W	--	--	--	--	--	--	W
Kentucky .....	791	--	--	--	--	W	--	W
Louisiana .....	W	--	--	--	--	423	W	676
Maine .....	758	--	--	--	W	493	W	1,348
Maryland .....	530	--	--	--	W	W	W	658
Massachusetts ....	271	--	--	*	230	W	W	518
Michigan .....	285	--	--	--	141	285	--	711
Minnesota .....	W	--	--	W	132	181	*	557
Mississippi .....	--	--	--	--	--	310	--	310
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	W	--	--	--	--	W	--	W
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	W	W	--	--	--	--	--	1,268
New Hampshire ...	W	W	--	--	29	101	--	501
New Jersey .....	16	--	--	--	178	--	--	195
New Mexico .....	60	--	--	--	--	--	--	60
New York .....	W	--	--	--	274	87	W	4,686
North Carolina ...	W	--	--	--	W	270	--	2,211
North Dakota ....	545	--	--	--	--	--	W	W
Ohio .....	123	--	--	--	90	117	--	330
Oklahoma .....	775	--	--	--	W	W	--	W
Oregon .....	W	--	--	--	W	153	3	9,327
Pennsylvania ....	707	--	--	--	252	87	--	1,046
Rhode Island .....	W	--	--	--	W	--	--	W
South Carolina ....	W	--	--	--	W	340	--	1,623
South Dakota ....	1,820	--	--	--	--	--	--	1,820
Tennessee .....	W	--	--	--	W	W	--	2,464
Texas .....	761	--	1	W	W	174	W	983
Utah .....	W	35	--	--	--	--	--	W
Vermont .....	W	--	--	6	--	W	--	552
Virginia .....	768	--	*	--	218	395	--	1,381
Washington .....	21,574	--	--	--	W	255	W	21,858
West Virginia ....	W	--	--	--	--	--	--	W
Wisconsin .....	511	--	--	--	52	173	--	736
Wyoming .....	W	--	--	--	--	--	--	W
<b>Total .....</b>	<b>79,788</b>	<b>2,853</b>	<b>334</b>	<b>1,579</b>	<b>2,862</b>	<b>7,120</b>	<b>556</b>	<b>95,093</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

W = Data withheld to avoid disclosure of proprietary company data.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860, "Annual Electric Generator Report," and Form EIA-867, "Annual Nonutility Power Producer Report."

**C52. Renewable Electric Utility Net Summer Capability by State, 1998**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	3,009	--	--	--	--	--	--	3,009
Alaska .....	359	--	--	*	--	--	--	359
Arizona .....	2,708	--	*	--	--	--	--	2,708
Arkansas .....	1,277	--	--	--	--	--	--	1,277
California .....	9,780	1,515	4	7	--	--	--	11,305
Colorado .....	614	--	--	--	--	--	--	614
Connecticut .....	130	--	--	--	--	--	--	130
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	--	--	3	--	--	50
Georgia .....	2,335	--	--	--	--	--	--	2,335
Hawaii .....	4	--	--	--	--	--	--	4
Idaho .....	2,435	--	--	--	--	--	--	2,435
Illinois .....	13	--	--	--	--	--	--	13
Indiana .....	59	--	--	--	--	--	--	59
Iowa .....	131	--	--	*	--	--	--	131
Kansas .....	--	--	--	--	--	--	--	--
Kentucky .....	808	--	--	--	--	--	--	808
Louisiana .....	--	--	--	--	--	--	--	--
Maine .....	402	--	--	--	--	30	--	432
Maryland .....	530	--	--	--	--	--	--	530
Massachusetts ....	152	--	--	*	--	--	--	152
Michigan .....	241	--	--	1	--	--	--	242
Minnesota .....	139	--	--	--	84	62	*	285
Mississippi .....	--	--	--	--	--	--	--	--
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,587	--	--	--	--	--	--	2,587
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,046	--	--	--	--	--	--	1,046
New Hampshire ....	64	--	--	--	--	--	--	64
New Jersey .....	--	--	--	--	--	--	--	--
New Mexico .....	81	--	--	--	--	--	--	81
New York .....	3,787	--	--	--	--	--	--	3,787
North Carolina ....	1,584	--	--	--	--	--	--	1,584
North Dakota .....	518	--	--	--	--	--	--	518
Ohio .....	123	--	--	--	90	--	--	213
Oklahoma .....	775	--	--	--	--	--	--	775
Oregon .....	9,032	--	--	--	25	12	3	9,072
Pennsylvania .....	621	--	--	--	--	--	--	621
Rhode Island .....	1	--	--	--	--	--	--	1
South Carolina ....	1,263	--	--	--	--	--	--	1,263
South Dakota .....	1,806	--	--	--	--	--	--	1,806
Tennessee .....	2,230	--	--	--	--	--	--	2,230
Texas .....	694	--	1	--	--	--	--	695
Utah .....	265	35	--	--	--	--	--	300
Vermont .....	103	--	--	1	--	52	--	156
Virginia .....	742	--	*	--	--	--	--	742
Washington .....	21,479	--	--	--	--	83	--	21,562
West Virginia .....	102	--	--	--	--	--	--	102
Wisconsin .....	443	--	--	--	31	30	--	503
Wyoming .....	298	--	--	--	--	--	--	298
<b>Total .....</b>	<b>75,525</b>	<b>1,550</b>	<b>5</b>	<b>9</b>	<b>232</b>	<b>268</b>	<b>3</b>	<b>77,593</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860A, "Annual Electric Generator Report - Utility."

**C53. Renewable Nonutility Net Summer Capability by State, 1998**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	--	--	--	--	--	785	5	789
Alaska .....	--	--	--	--	--	--	--	--
Arizona .....	--	--	--	--	--	--	--	--
Arkansas .....	--	--	--	--	--	252	--	252
California .....	476	1,117	330	1,480	225	575	104	4,306
Colorado .....	30	--	--	--	--	--	--	30
Connecticut .....	19	--	--	--	215	--	29	263
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	--	--	30	--	433	425	136	1,025
Georgia .....	10	--	--	--	2	528	5	546
Hawaii .....	25	33	--	20	62	--	93	232
Idaho .....	232	--	--	--	--	130	--	363
Illinois .....	24	--	--	--	131	--	--	154
Indiana .....	--	--	--	--	11	--	--	11
Iowa .....	5	--	--	--	5	--	--	11
Kansas .....	2	--	--	--	--	--	--	2
Kentucky .....	--	--	--	--	--	4	--	4
Louisiana .....	182	--	--	--	--	478	15	676
Maine .....	355	--	--	--	38	507	48	947
Maryland .....	--	--	--	--	124	3	1	128
Massachusetts ....	729	--	--	--	268	25	9	1,031
Michigan .....	24	--	--	--	155	286	--	465
Minnesota .....	64	--	--	129	50	128	--	371
Mississippi .....	--	--	--	--	--	263	--	263
Missouri .....	--	--	--	--	--	--	--	--
Montana .....	11	--	--	--	--	10	--	21
Nebraska .....	--	--	--	--	--	--	--	--
Nevada .....	4	218	--	--	--	--	--	222
New Hampshire ....	377	--	--	--	29	115	--	522
New Jersey .....	13	--	--	--	187	--	--	199
New Mexico .....	--	--	--	--	--	--	--	--
New York .....	347	--	--	--	158	42	121	669
North Carolina ....	406	--	--	--	13	260	--	679
North Dakota .....	--	--	--	--	--	--	9	9
Ohio .....	--	--	--	--	--	120	--	120
Oklahoma .....	--	--	--	--	16	60	--	76
Oregon .....	96	--	--	25	12	158	--	292
Pennsylvania .....	70	--	--	--	257	60	--	387
Rhode Island .....	2	--	--	--	15	--	--	17
South Carolina ....	18	--	--	--	13	322	--	353
South Dakota .....	--	--	--	--	--	--	--	--
Tennessee .....	170	--	--	--	10	73	--	253
Texas .....	2	--	--	34	5	174	8	223
Utah .....	2	--	--	--	--	--	--	2
Vermont .....	167	--	--	--	--	20	--	187
Virginia .....	21	--	--	--	212	424	--	657
Washington .....	83	--	--	--	5	187	4	279
West Virginia .....	36	--	--	--	--	--	--	36
Wisconsin .....	48	--	--	--	19	93	--	159
Wyoming .....	--	--	--	1	--	--	--	1
<b>Total .....</b>	<b>4,048</b>	<b>1,367</b>	<b>360</b>	<b>1,689</b>	<b>2,671</b>	<b>6,508</b>	<b>587</b>	<b>17,230</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860B, "Annual Electric Generator Report - Nonutility."

**C54. Renewable Electric Power Industry Net Summer Capability by State, 1998**  
(Megawatts)

	Hydro- electric	Geothermal	Solar/ PV	Wind	MSW Landfill Gas	Wood and Wood Waste	Other Waste <sup>a</sup>	Total
Alabama .....	3,009	--	--	--	--	785	5	3,799
Alaska .....	359	--	--	*	--	--	--	359
Arizona .....	2,708	--	*	--	--	--	--	2,708
Arkansas .....	1,277	--	--	--	--	252	--	1,529
California .....	10,256	2,631	334	1,487	225	575	104	15,611
Colorado .....	644	--	--	--	--	--	--	644
Connecticut .....	148	--	--	--	215	--	29	392
Delaware .....	--	--	--	--	--	--	--	--
Dist. of Col. ....	--	--	--	--	--	--	--	--
Florida .....	47	--	30	--	436	425	136	1,075
Georgia .....	2,345	--	--	--	2	528	5	2,881
Hawaii .....	28	33	--	20	62	--	93	236
Idaho .....	2,667	--	--	--	--	130	--	2,798
Illinois .....	37	--	--	--	131	--	--	167
Indiana .....	59	--	--	--	11	--	--	69
Iowa .....	136	--	--	*	5	--	--	142
Kansas .....	2	--	--	--	--	--	--	2
Kentucky .....	808	--	--	--	--	4	--	812
Louisiana .....	182	--	--	--	--	478	15	676
Maine .....	758	--	--	--	38	536	48	1,379
Maryland .....	530	--	--	--	124	3	1	658
Massachusetts ....	880	--	--	*	268	25	9	1,183
Michigan .....	265	--	--	1	155	286	--	707
Minnesota .....	203	--	--	129	133	190	*	655
Mississippi .....	--	--	--	--	--	263	--	263
Missouri .....	543	--	--	--	--	--	--	543
Montana .....	2,598	--	--	--	--	10	--	2,608
Nebraska .....	167	--	--	--	--	--	--	167
Nevada .....	1,050	218	--	--	--	--	--	1,268
New Hampshire ....	441	--	--	--	29	115	--	586
New Jersey .....	13	--	--	--	187	--	--	199
New Mexico .....	81	--	--	--	--	--	--	81
New York .....	4,134	--	--	--	158	42	121	4,455
North Carolina ....	1,990	--	--	--	13	260	--	2,263
North Dakota .....	518	--	--	--	--	--	9	527
Ohio .....	123	--	--	--	90	120	--	333
Oklahoma .....	775	--	--	--	16	60	--	851
Oregon .....	9,128	--	--	25	37	170	3	9,364
Pennsylvania .....	691	--	--	--	257	60	--	1,008
Rhode Island .....	3	--	--	--	15	--	--	18
South Carolina ....	1,281	--	--	--	13	322	--	1,616
South Dakota .....	1,806	--	--	--	--	--	--	1,806
Tennessee .....	2,400	--	--	--	10	73	--	2,483
Texas .....	695	--	1	34	5	174	8	918
Utah .....	266	35	--	--	--	--	--	301
Vermont .....	271	--	--	1	--	72	--	343
Virginia .....	763	--	*	--	212	424	--	1,399
Washington .....	21,562	--	--	--	5	270	4	21,841
West Virginia .....	137	--	--	--	--	--	--	137
Wisconsin .....	490	--	--	--	49	123	--	662
Wyoming .....	298	--	--	1	--	--	--	299
<b>Total .....</b>	<b>79,573</b>	<b>2,917</b>	<b>365</b>	<b>1,698</b>	<b>2,903</b>	<b>6,776</b>	<b>591</b>	<b>94,823</b>

<sup>a</sup>Agricultural waste, straw, tires, fish oils, paper pellets, tall oil, sludge waste, digester gas, methane, and waste alcohol.

-- = Not applicable.

\* = Capability was less than 0.5 megawatts.

Note: Totals may not equal sum of components due to independent rounding.

Sources: Energy Information Administration, Form EIA-860A, "Annual Electric Generator Report - Utility," and Form EIA-860B, "Annual Electric Generator Report - Nonutility."

## Appendix D

# Selected List of Internet Addresses: Renewable Energy Information by Resource

The list of addresses that follow are current as of Winter 2000. This list is abbreviated due to the great increase in Internet sites as well as the growing presence of links to associated web sites over the past few years. Therefore, this list should provide at least a useful start in a search for renewable energy information.

### General: Renewables

U.S. Department of Energy (DOE), Energy Efficiency and Renewable Energy Homepage  
<http://www.eren.doe.gov/>

For information on DOE Renewable Energy Regional Offices  
<http://www.eren.doe.gov/rso.html>

Energy Information Administration Homepage  
<http://www.eia.doe.gov>

North Carolina Solar Center, Renewable Energy State Incentives Database (co-sponsored by DOE)  
<http://www.ncsc.ncsu.edu>

Center for Renewable Energy and Sustainable Technology  
<http://www.crest.org/renewables/index.html>

International Energy Agency  
IEA CADDET International Information on Renewable Energy  
<http://www.caddet.co.uk/re/>

International Energy Agency  
Key World Energy Statistics  
[http://www.iea.org/stats/files/keystats/stats\\_98.htm](http://www.iea.org/stats/files/keystats/stats_98.htm)

National Renewable Energy Laboratory  
NREL Publications Database  
<http://www.nrel.gov/cgi-bin/pubspage.cgi>

National Association of Regulatory Utility Commissioners (NARUC) Homepage  
<http://www.naruc.org/>

California Energy Commission  
<http://www.energy.ca.gov/>

Green Energy News  
<http://www.nrglink.com>

Renewable Resource Data Center  
<http://rredc.nrel.gov>

U.S. Department of Energy Green Power Network  
<http://www.eren.doe.gov/greenpower>

State Renewable Energy News  
<http://www.nrel.gov/analysis/emma/projects/sren>

## **Biomass: Wood**

Regional Wood Energy Development Programme in Asia  
<http://www.rwedp.org/>

Information for standing woody biomass (TREEDYN3\*):  
<http://www.gsf.de/UFIS/ufis/modell60/grs957.html>

Chemical Nature of Biomass from Semi-Arid Forest Tree Species  
<http://www.metla.fi/conf/iufro95abs/d5pap22.htm>

PCSD BRIEFING BOOK Sustainable Agriculture BIOMASS ENERGY INITIATIVES PROJECT HISTORY  
[http://bertha.chattanooga.net/sustain/pcsd\\_briefing\\_book/agriculture\\_biomass.html](http://bertha.chattanooga.net/sustain/pcsd_briefing_book/agriculture_biomass.html)

Forest Industry Network  
World-wide directory of forestry, logging, harvesting, saw milling equipment, etc. companies and related information.  
<http://www.forestindustry.com>

Wood Products Council  
<http://www.woodinfo.org/>

## **Biomass: Biofuels**

Biofuels (Federal Government) Resources on the Internet  
<http://www.nal.usda.gov/ttic/biofuels/nonusda.htm>

WSU Energy Program Library Title List: Biofuels  
<http://www.biomass.org/sitesbf.html>

DOE BioPower Information Program  
<http://www.eren.doe.gov/biopower/>

American Bioenergy Association  
<http://www.biomass.org/>

Energy Information on Internet: BIOFUELS INFORMATION NETWORK  
[http://blister.ecn.nl/eii/homepgnl/eii\\_013.html](http://blister.ecn.nl/eii/homepgnl/eii_013.html)

DOE Alternative Fuels Data Center  
<http://www.afdc.doe.gov>

Sustainable Energy, Agricultural Energy, Agricultural Energy Assistance Program, California ALTERNATIVE ENERGY California Energy Commission: Alternative/Renewable Technologies EPA.  
[http://www.netins.net/showcase/s\\_energy/energy.htm](http://www.netins.net/showcase/s_energy/energy.htm)



National Renewable Energy Laboratories- DOE's National Biofuels Program  
<http://www.biofuels.nrel.gov/>

Short-Rotation Woody Crops (SRWC) Operations Working Group—a private and public partnership between wood products companies, equipment manufacturers, utility companies, the U.S. Forest Service, the U.S. Department of Energy's Oak Ridge National Laboratory (ORNL), the National Council of the Paper Industry for Air and Stream Improvement (NCASI) and university researchers.  
<http://www.woodycrops.org/>

## **Municipal Solid Waste**

Characterizations of Municipal Solid Waste in the United States 1995 Update  
[http://rredc.nrel.gov/biomass/epa/msw95/msw95\\_index.html](http://rredc.nrel.gov/biomass/epa/msw95/msw95_index.html)

Foundation for the Conservation of Nature, International Environmental Studies 17. Toxic and Solid Waste. Most waste produced by preindustrial societies is biodegradable. In industrial societies, much waste is nondegradable ...  
[http://www.fcn.org/fcn/ecosystem/wast\\_po.html](http://www.fcn.org/fcn/ecosystem/wast_po.html)

The Solid Waste Association of North America  
<http://www.swana.org/>

Municipal Solid Waste Factbook  
<http://www.epa.gov/epaoswer/non-hw/muncpl/factbook>

## **Waste-to-Energy**

Integrated Waste Services Association  
<http://www.wte.org/>

## **Geothermal**

Geothermal Products Inc. - Energy Star Programs  
<http://www.geoproducts.com/estar.html>

Geothermal Heat Pump Links  
<http://www.ilec.org/heatlink.html>

International Geothermal Association - US DOE Sites  
<http://www.demon.co.uk/geosci/wrusadoe.html>

US DOE/Geothermal Energy Technical Site  
<http://geothermal.id.doe.gov>

Geo-Heat Center, Oregon Institute of Technology, Geothermal Information and Technology Transfer  
<http://www.oit.osshe.edu/~geoheat/>

International Geothermal Association  
<http://www.demon.co.uk/geosci/igahome.html>

U.S. Geothermal Direct Use Projects and Resource Areas  
<http://www.oit.osshe.edu/~geoheat/dusys.htm>

Geothermal Theory: Introduction  
Summary: How Geothermal Systems Form. Geothermal Occurances Today.

<http://www.crest.org/renewables/re-kiosk/geothermal/theory/index.shtml>

Geothermal Energy in California

<http://www.energy.ca.gov/development/geothermal/index.html>

Geothermal Workshop

Summary: The New Zealand Geothermal Workshop is a three-day conference held annually in early November. The Workshop provides an international forum where engineers and earth scientists discuss aspects of geothermal development.

<http://www.auckland.ac.nz/gei/workshop.htm>

Geothermal Links

Summary: GEOTHERMAL LABORATORY GEOTHERMAL LINKS.

International Geothermal Association Nappa Valley/Geysers/Geothermal Area Sites/Geyser Resources/ Coso's Geothermal Field/Water Resources of California/Geothermal Resources Council/ World Geothermal Resources Maps.

<http://www.geology.smu.edu/~bonner/geothermlinks.html>

Geothermal Energy Association

<http://www.geotherm.org>

Geothermal Resources Council

<http://www.geothermal.org>

U.S. DOE Geothermal Energy Program

<http://www.eren.doe.gov/geothermal/>

## **Wind**

Danish Wind Turbine Manufacturers Association

<http://www.windpower.dk/core.htm>

Wind Info Resources on the Net

<http://www.afm.dtu.dk/wind/bookmark.html>

British Wind Energy Association

<http://www.bwea.com/>

German Wind Energy Institute

Wind Energy Use

<http://www.dewi.de/statistics.html>

RISO National Laboratory Denmark

Wind Energy & Atmospheric Physics Department

<http://www.risoe.dk/vea-wind>

American Wind Energy Association. This comprehensive, up-to-date reference includes contact as well as product information.

<http://www.awea.org>

Windpower Monthly

<http://www.wpm.co.nz>

U.S. Dept. of Energy, Energy Efficiency and Renewable Energy Network (EREN), Wind Energy Program

<http://www.eren.doe.gov/RE/wind.html>

National Renewable Energy Laboratory's National Wind Technology Center  
<http://www.nrel.gov/wind>

Wind Power Development  
<http://www.telosnet.com/wind>

Wind Powering America  
<http://www.eren.doe.gov/windpoweringamerica>

## **Solar Energy**

International Solar Energy Society  
<http://wire0.ises.org>

## **Solar Thermal**

ASME Solar Energy Division  
<http://www.asme.org/divisions/solar/index.html>

Solar Energy  
<http://solstice.crest.org/renewables/re-kiosk/solar/index.shtml>

Solar Thermal Case Studies  
<http://solstice.crest.org/renewables/re-kiosk/solar/solar-thermal/case-studies/index.shtml>

EREN - Solar Thermal Utilization Energy Efficiency and Renewable Energy Network  
<http://apollo.osti.gov/html/eren/1409.html>

Solar Radiation and Solar Thermal Systems  
Optical Engineering Press  
<http://www.spie.org/web/abstracts/oepress/MS54.html>

Sandia National Laboratories  
National Solar Thermal Test Facility  
[http://www.sandia.gov/Renewable\\_Energy/solarthermal/](http://www.sandia.gov/Renewable_Energy/solarthermal/)

Solstice: Renewable Energy Policy Project and the Center for Renewable Energy and Sustainable Technology  
<http://www.solstice.crest.org/index/html>

## **Solar Photovoltaic**

NREL National Center For Photovoltaics  
<http://www.nrel.gov/ncpv>

PV WEB SITES  
<http://www.pvpower.com/pvsites.html>

Photovoltaic Energy -- Electricity from the Sunlight  
<http://www.doe.gov/phv/phvhome.html>

Photovoltaic Module Businesses in the World  
<http://energy.sourceguides.com/businesses/byP/solar/pvM/pvM.shtml>

Siemens Solar  
<http://www.siemenssolar.com>

NASA Photovoltaic and Space Environment Effects Branch  
<http://powerweb.lerc.nasa.gov/pvsee>

Advancing Photovoltaic Technology at NREL's Outdoor Test Facility  
<http://www.nrel.gov/lab/pao/otf.html>

Million Solar Roofs Program  
<http://www.millionsolarroofs.org>

Utility Photovoltaic Group  
<http://www.ttcorp.com/upvg>

Sandia National Laboratories Photovoltaics Program  
<http://www.sandia.gov/pv>

Photovoltaic News/ PV Energy Systems, Inc.  
<http://www.pvenergy.com>

Photovoltaic Insider's Report  
<http://www.pvinsider.com>

## Appendix E

# State Energy Agencies

The following lists the State Energy Office (or equivalent) and the Public Utility Commission (or equivalent) for each State.<sup>16</sup>

### Alabama

#### State Energy Office

Terri Adams, Division Director  
Department of Economic and Community Affairs  
Science Technology and Energy Division  
P.O. Box 5690  
Montgomery, AL 36103-5690  
(334) 242-5292  
Fax: (334) 242-0552

#### Public Service Commission

Walter L. Thomas, Jr., Secretary  
P.O. Box 991  
Montgomery, AL 36101-0991  
(334) 242-5218  
Fax: (304) 242-0509

### Alaska

#### State Energy Office

Robert Brean  
Alaska Housing Finance Corporation  
P.O. Box 101020  
Anchorage, AK 99510  
(907) 338-6100  
Fax: (907) 338-1747

#### Alaska Department of Natural Resources

Kenneth A. Boyd, Director  
Division of Oil and Gas  
3601 C Street, Suite 1380  
Anchorage, AK 99503-5948  
(907) 269-8800  
Fax: (907) 562-3852  
E-Mail: kab@dnr.state.ak.us  
URL: <http://www.dnr.state.ak.us/oil>

#### Alaska Public Utilities Commission

Robert A. Lohr, Executive Director  
1016 West 6th Avenue, Suite 400  
Anchorage, AK 99501  
(907) 276-6222  
Fax: (907) 276-0160  
E-Mail: [bob\\_lohr@commerce.state.ak.us](mailto:bob_lohr@commerce.state.ak.us)

### American Samoa

#### State Energy Office

ASPA/Territorial Energy Office  
Samoa Energy House, Tafuna  
P.O. Box PPB  
Pago Pago, AS 96799  
011 (684) 699-1101  
Fax: 011 (684) 699-2835

### Arizona

#### State Energy Office

Amanda Ormond, Director  
Arizona Department of Commerce  
3800 North Central Avenue, Suite 1200  
Phoenix, AZ 85012  
(602) 280-1402  
Fax: (602) 280-1445

#### Corporation Commission

Jack Rose, Executive Secretary  
Arizona Corporation Commission  
1200 W. Washington  
Phoenix, AZ 85007-2996  
(602) 542-3931  
Fax: (602) 542-3977

### Arkansas

#### State Energy Office

Chris Benson, Team Leader  
Arkansas Department of Economic Development

<sup>16</sup> This information was excerpted from, Energy Information Administration, *Energy Information Directory, 1999*, DOE/EIA-0205(99) (Washington, DC, February 2000).

Arkansas Energy Office  
One State Capitol Mall  
Little Rock, AR 72201  
(501) 682-8065  
Fax: (501) 682-2703

**Public Service Commission**  
Sandra Hochstetter, Director  
Arkansas Public Service Commission  
1000 Center Street  
P.O. Box 400  
Little Rock, AR 72203-0400  
(501) 682-1794  
Fax: (501) 682-2572

## California

**State Energy Commission**  
William J. Keese, Chairman  
California Energy Commission  
1516 9th Street  
Sacramento, CA 95814  
(916) 654-5000  
Fax: (916) 654-4420

**California Public Utilities Commission**  
Wesley M. Franklin, Executive Director  
505 Van Ness Avenue, Room 5222  
San Francisco, CA 94102  
(415) 703-3808  
Fax: (415) 703-1758

## Colorado

**State Energy Office**  
Rick Grice, Director  
Governor's Office of Energy Conservation  
1675 Broadway, Suite 1300  
Denver, CO 80202-4613  
(303) 620-4292  
Fax: (303) 620-4288

**Public Utilities Commission**  
1580 Logan Street, Level 2  
Denver, CO 80203  
(303) 894-2000 Ext. 309  
Fax: (303) 894-2065

## Connecticut

**State Energy Office**  
Allan Johanson  
Policy Development and Planning Division  
Energy Unit  
450 Capitol Avenue, MS-52ENR

Hartford, CT 06106-1308  
(860) 418-6297  
Fax: (860) 418-6495

**Department of Public Utility Control**  
Steven D. Cadwallader  
Chief of Research and Policy Analysis  
10 Franklin Square  
New Britain, CT 06051  
(860) 827-2629  
Fax: (860) 827-2613

## Delaware

**State Energy Office**  
Charlie T. Smisson, Jr.  
Energy Program Administrator  
Division of Facilities Management  
149 Transportation Circle  
Dover, DE 19901  
(302) 739-5644  
Fax: (302) 739-6148  
URL: [CSMISSON@STATE.DE.US](mailto:CSMISSON@STATE.DE.US)

**Delaware Public Service Commission**  
Bruce H. Burcat, Executive Director  
861 Silverlake Boulevard  
Cannon Building, Suite 100  
Dover, DE 19904  
(302) 739-4247  
Fax: (302) 739-4849

## District of Columbia

**D.C. Energy Office**  
Charles J. Clinton, Director  
District of Columbia Energy Office  
2000 14th Street, N.W., Suite 300E  
Washington, DC 20009  
(202) 673-6750  
Fax: (202) 673-6725

**Public Service Commission**  
Marlene L. Johnson, Esq., Chairperson  
717 14th Street, N.W.  
Washington, DC 20005  
(202) 626-5100  
Fax: (202) 393-1389

## Florida

**State Energy Office**  
Alexander Mack, Director  
Department of Community Affairs  
2555 Shumard Oak Boulevard

Tallahassee, FL 32399-2100  
(850) 488-2475  
Fax: (850) 488-7688

**Public Service Commission**

William D. Talbott, Executive Director  
2540 Shumard Oak Boulevard  
Tallahassee, FL 32399-0850  
(850) 413-6055  
Fax: (850) 413-6052

**Georgia**

**State Energy Office**

Paul Burks  
Division of Energy  
Georgia Environmental Facilities Authority  
Equitable Building  
100 Peachtree Street, N.W., Suite 2090  
Atlanta, GA 30303  
(404) 656-0938  
Fax: (404) 656-6416  
Fax: (404) 656-7970 (Division of Energy)

**Public Service Commission**

B. B. Knowles, Director of Utilities  
47 Trinity Avenue  
Atlanta, GA 30334-5701  
(404) 656-7266  
Fax: (404) 656-0980

**Guam**

**State Energy Office**

Fred P. Camacho, Director  
Guam Energy Office  
1504 East Sunset Boulevard  
Tiyán, GU 96913  
(671) 477-0538  
Fax: (671) 477-0589

**Hawaii**

**State Energy Office**

Maurice H. Kaya, Administrator  
Energy, Resources, and Technology Division  
Department of Business, Economic  
Development, and Tourism  
P.O. Box 2359  
Honolulu, HI 96804  
(808) 587-3812  
Fax: (808) 586-2536

**Public Utilities Commission**

Dennis R. Yamada

Chairman  
465 S. King Street, #103  
Honolulu, HI 96813  
(808) 586-2020  
Fax: (808) 586-2066

**Idaho**

**Energy Division**

Bob Hoppie, Administrator  
Idaho Department of Water Resources  
1301 North Orchard Street  
Boise, ID 83706  
(208) 327-7968  
Fax: (208) 327-7866

**Public Utilities Commission**

Stephanie Miller, Administrator  
Utilities Division  
P.O. Box 83720  
Boise, ID 83720-0074  
(208) 334-0366  
Fax: (208) 334-3762

**Illinois**

**Department of Commerce and Community Affairs**

Mitch Beaver, Deputy Director  
Bureau of Energy and Recycling  
325 W. Adams Street, #300  
Springfield, IL 62704-1892  
(217) 785-2800  
Fax: (217) 785-2618

**Commerce Commission**

Donna M. Caton, Chief Clerk  
527 E. Capitol Avenue  
Box 19280  
Springfield, IL 62794-9280  
(217) 782-7434  
Fax: (217) 524-0673

**Indiana**

**Indiana Department of Commerce**

Cheryl L. DeVol-Glowinski, Director  
Energy Policy Division  
One North Capitol, Suite 700  
Indianapolis, IN 46204-2288  
(317) 232-8939  
Fax: (317) 232-8995

**Utility Regulatory Commission**

302 West Washington Street  
Suite E-306

Indianapolis, IN 46204  
(317) 232-2701  
Fax: (317) 232-6758

## **Iowa**

### **State Energy Office**

Larry Bean, Administrator  
Iowa Department of Natural Resources  
Energy and Geological Resources Division  
502 E. 9<sup>th</sup> Street  
Des Moines, IA 50319  
(515) 281-4308  
Fax: (515) 281-6794

### **Iowa Utilities Board**

Raymond K. Vawter, Executive Secretary  
350 Maple Street  
Des Moines, IA 50319-0069  
(515) 281-5256  
Fax: (515) 281-8821

## **Kansas**

### **State Energy Office**

Jim Ploger, Energy Program Manager  
Energy Programs  
Kansas Corporation Commission  
1500 S.W. Arrowhead Road  
Topeka, KS 66604-4027  
(785) 271-3349  
Fax: (785) 271-3268

### **Corporation Commission**

John Wine, Chairman  
Kansas Corporation Commission  
1500 S.W. Arrowhead Road  
Topeka, KS 66604  
(785) 271-3100  
Fax: (785) 271-3354

## **Kentucky**

### **State Energy Office**

John M. Stapleton, Director  
Kentucky Division of Energy  
663 Teton Trail  
Frankfort, KY 40601  
(502) 564-7192  
Fax: (502) 564-7484

### **Public Service Commission**

Helen Helton, Executive Director  
730 Schenkel Lane, Box 615

Frankfort, KY 40602  
(502) 564-3940  
Fax: (502) 564-3460

## **Louisiana**

### **State Energy Office**

Paula Ridgeway  
Louisiana Department of Natural Resources  
P.O. Box 44156  
Baton Rouge, LA 70804-4156  
(225) 342-1399  
Fax: (225) 342-1397

### **Public Service Commission**

Lawrence C. St. Blanc, Secretary  
Suite 1630, One American Place  
Baton Rouge, LA 70825  
(225) 342-4427  
Fax: (225) 342-4087

### **Mail letters to:**

P.O. Box 91154  
Baton Rouge, LA 70821-9154

## **Maine**

### **Public Utilities Commission**

Dennis L. Keschl, Administrative  
Director  
18 State House Station  
242 State Street  
Augusta, ME 04333  
(207) 287-3831  
Fax: (207) 287-1039

## **Maryland**

### **State Energy Office**

Frederick H. Hoover, Jr., Director  
Maryland Energy Administration  
45 Calvert Street, 4th Floor  
Annapolis, MD 21401  
(410) 260-7511  
Fax: (410) 974-2250

### **Public Service Commission**

Felecia L. Greer, Executive Secretary  
William Donald Schaefer Tower  
6 St. Paul Street, 16<sup>th</sup> Floor  
Baltimore, MD 21202-6806  
(410) 767-8067  
Fax: (410) 333-6495



## Massachusetts

### State Energy Office

David L. O'Connor, Commissioner  
Massachusetts Division of Energy Resources  
Leverett Saltonstall Building  
100 Cambridge Street, Room 1500  
Boston, MA 02202  
(617) 727-4732  
Fax: (617) 727-0030  
E-Mail: [energy@state.ma.us](mailto:energy@state.ma.us)  
URL: <http://www.state.ma.us/doer>

### Department of Telecommunications and Energy

Janet Gail Besser, Chair  
One South Station, 2<sup>nd</sup> Floor  
Boston, MA 02110  
(617) 305-3500  
Fax: (617) 345-9101  
URL: <http://www.state.ma.us/dpu/>

## Michigan

### Public Service Commission

John Strand, Chairman  
Michigan Public Service Commission  
P.O. Box 30221  
6545 Mercantile Way  
Lansing, MI 48909  
(517) 241-6190  
Fax: (517) 241-6189

## Minnesota

### State Energy Office

Krista L. Sanda, Commissioner  
Department of Public Service  
121 7th Place East, Suite 200  
St. Paul, MN 55101-2145  
(651) 296-7107  
Fax: (651) 297-1959

### Public Utilities Commission

Burl W. Haar, Executive Secretary  
121 Seventh Place East, Suite 350  
St. Paul, MN 55101-2147  
(651) 296-7124  
Fax: (651) 297-7073

## Mississippi

### State Energy Office

Chester B. Smith, Director  
Mississippi Department of Economic and

Community Development

Energy Division  
P.O. Box 850  
Jackson, MS 39205-0850  
(601) 359-6600  
Fax: (601) 359-6642

### Mississippi Public Utilities Staff

Robert G. Waites, Executive Director  
Room 1738, Walter Sillers State Office  
Building  
P.O. Box 1174  
Jackson, MS 39215-1174  
(601) 961-5493  
Fax: (601) 961-5804

## Missouri

### State Energy Office

Energy Center  
P.O. Box 176  
Jefferson City, MO 65102-0176  
(573) 751-4000  
Fax: (573) 751-6860  
E-mail: [energy@mail.dnr.state.mo.us](mailto:energy@mail.dnr.state.mo.us)  
URL: <http://www.dnr.state.mo.us/de/homede.htm>

### Public Service Commission

Gordon Persinger  
Acting Executive Director  
P.O. Box 360  
Jefferson City, MO 65102  
(573) 751-3234  
Fax: (573) 526-7341

## Montana

### State Energy Office

Timothy C. Fox, Acting Administrator  
Department of Environmental Quality Planning,  
Prevention and Assistance Division  
1520 East Sixth Avenue  
P.O. Box 200901  
Helena, MT 59620-0901  
(406) 444-6697  
Fax: (406) 444-6836

### Public Service Commission

Kathy Anderson, Commission Secretary  
1701 Prospect Avenue  
Helena, MT 59620  
(406) 444-6170  
Fax: (406) 444-7618

## Nebraska

### State Energy Office

Nebraska Energy Office  
Energy Square  
1111 "O" Street, Suite 223  
Lincoln, NE 68509  
(402) 471-2867  
Fax: (402) 471-3064

### Public Service Commission

Rob Logsdon, Executive Director  
300 The Atrium  
1200 N Street, P. O. Box 94927  
Lincoln, NE 68509-4927  
(402) 471-3101  
Fax: (402) 471-0254

## Nevada

### State Energy Office

DeeAnn Parsons, Administrator  
Nevada State Energy Office  
1050 East William, Suite 435  
Carson City, NV 89706  
(775) 687-4910  
Fax: (775) 687-4914  
E-mail: [dparsons@govmail.state.nv.us](mailto:dparsons@govmail.state.nv.us)

### Public Utilities Commission of Nevada

Donald Soderber, Chairman  
1150 E. William Street  
Carson City, NV 89701  
(775) 775-6007  
Fax: (775) 775-6110

## New Hampshire

### State Energy Office

Deborah Schachter, Director  
Office of Energy and Community Service  
57 Regional Drive  
Concord, NH 03301-8519  
(603) 271-2711  
Fax: (603) 271-2615

### Public Utilities Commission

Thomas B. Getz, Executive Director  
8 Old Suncook Road  
Concord, NH 03301-7319  
(603) 271-2431  
Fax: (603) 271-3878

## New Jersey

### New Jersey Board of Public Utilities

Herbert Tate, President  
2 Gateway Center, 8th Floor  
Newark, NJ 07102  
(973) 648-2026  
Fax: (973) 648-4195

Robert Chilton, Director

Division of Energy  
2 Gateway Center, 9th Floor  
Newark, NJ 07102  
(973) 648-3621  
Fax: (973) 648-2467

## New Mexico

### State Energy Office

Christopher Wentz, Deputy Director  
Energy Conservation & Management Division  
Energy, Minerals and Natural Resources  
Department  
P.O. Box 1948  
Santa Fe, NM 87504-1948  
(505) 827-4546  
Fax: (505) 827-5870

### Public Regulation Commission

Jack Hiatt, Chief of Staff  
P.O. Box 1269, Room 418  
Santa Fe, NM 87504-1269  
(505) 827-6942  
Fax: (505) 827-4068

## New York

### Department of Public Service

Debra Renner, Acting Secretary  
3 Empire State Plaza  
Albany, NY 12223-1350  
(518) 474-2508  
Fax: (518) 486-6081  
E-Mail: [web@dps.state.ny.us](mailto:web@dps.state.ny.us)

## North Carolina

### State Energy Office

T. C. Adams, III, Director  
Energy Division  
North Carolina Department of Commerce  
1830A Tillery Place

Raleigh, NC 27604  
(919) 733-2230  
Fax: (919) 733-2953  
E-mail: [tadams@energy.commerce.state.nc.us](mailto:tadams@energy.commerce.state.nc.us)

**Public Utilities Commission**

Robert P. Gruber, Executive Director  
Public Staff, P.O. Box 29520  
Raleigh, NC 27626-0520  
(919) 733-2435  
Fax: (919) 733-9565

**North Dakota**

**State Energy Office**

Kim Christianson  
Energy Program Manager  
Division of Community Services  
State Capitol Building  
600 E. Boulevard Avenue, 14th Floor  
Bismarck, ND 58505-0170  
(701) 328-4137  
Fax: (701) 328-2308

**Public Service Commission**

Jon H. Mielke, Executive Secretary  
600 E. Boulevard Ave. Dept 408  
Bismarck, ND 58505-0480  
(701) 328-2400  
Fax: (701) 328-2410

**Ohio**

**State Energy Office**

Sara Ward, Chief  
Ohio Department of Development  
Community Development Division  
Office of Energy Efficiency  
77 S. High Street, 26th Floor  
Columbus, OH 43216-1001  
(614) 466-6797  
Fax: (614) 466-1864

**Public Utilities Commission**

Gary Vigorito, Director  
Administration and Commission Secretary  
180 E. Broad Street  
Columbus, OH 43266-0573  
(614) 466-4294  
Fax: (614) 644-9546

**Oklahoma**

**Secretary of Energy**

Mike Smith

125 N.W. Sixth Street  
Oklahoma City, OK 73105  
(405) 235-4204  
Fax: (405) 522-3492

**State Alternative Fuels Office**

Debbie Sheffield, Acting Program Administrator  
Alternative Fuels Program  
Department of Central Services  
Will Rogers Office Building  
2401 N. Lincoln, Suite 112  
P.O. Box 53422  
Oklahoma City, OK 73152-3422  
(405) 521-4687  
Fax: (405) 822-2230

**State Energy Office**

Brenda Williams  
Oklahoma Department of Commerce  
Office of Community Development  
P.O. Box 26980  
Oklahoma City, OK 73126-0980  
(405) 815-5352  
Fax: (405) 815-5344

**Oklahoma Corporation Commission**

Ernest G. Johnson, Director  
Public Utility Division  
500 Jim Thorpe Office Building  
2101 North Lincoln Boulevard  
Oklahoma City, OK 73105  
(405) 521-3908  
Fax: (405) 521-3336

Larry A. Schroeder, Deputy Director  
(405) 521-2518

**Oregon**

**State Energy Office**

John Savage, Administrator  
Oregon Office of Energy  
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# Glossary

**Alternating Current:** An electric current that reverses its direction at regularly recurring intervals, usually 50 or 60 times per second.

**Amorphous Silicon:** An alloy of silica and hydrogen, with a disordered, noncrystalline internal atomic arrangement, that can be deposited in thin-layers (a few micrometers in thickness) by a number of deposition methods to produce thin-film photovoltaic cells on glass, metal, or plastic substrates.

**Annualized Growth Rates:** Calculated as follows:

$$(x_n / x_1)^{1/n} ,$$

where  $x$  is the value under consideration and  $n$  is the number of periods.

**Aquifer:** A subsurface rock unit from which water can be produced.

**ARI:** Air-Conditioning and Refrigeration Institute

**Availability Factor:** A percentage representing the number of hours a generating unit is available to produce power (regardless of the amount of power) in a given period, compared to the number of hours in the period.

**Biodiesel:** A renewable fuel synthesized from soy beans, other oil crops, or animal tallow which can substitute for petroleum diesel fuel.

**Biomass:** Organic nonfossil material of biological origin constituting a renewable energy source.

**Black Liquor:** A byproduct of the paper production process that can be used as a source of energy.

**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.

**Capacity, Gross:** The full-load continuous rating of a generator, prime mover, or other electric equipment

under specified conditions as designated by the manufacturer. It is usually indicated on a nameplate attached to the equipment.

**Capital Cost:** The cost of field development and plant construction and the equipment required for the generation of electricity.

**Cast Silicon:** Crystalline silicon obtained by pouring pure molten silicon into a vertical mold and adjusting the temperature gradient along the mold volume during cooling to obtain slow, vertically-advancing crystallization of the silicon. The polycrystalline ingot thus formed is composed of large, relatively parallel, interlocking crystals. The cast ingots are sawed into wafers for further fabrication into photovoltaic cells. Cast-silicon wafers and ribbon-silicon sheets fabricated into cells are usually referred to as polycrystalline photovoltaic cells.

**Climate Change (Greenhouse Effect):** The increasing mean global surface temperature of the Earth caused by gases in the atmosphere (including carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons). The greenhouse effect allows solar radiation to penetrate the Earth's atmosphere but absorbs the infrared radiation returning to space.

**Cogeneration:** The production of electrical energy and another form of useful energy (such as heat or steam) through the sequential use of energy.

**Combined Cycle:** An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. Such designs increase the efficiency of the electric generating unit.

**Concentrator:** A reflective or refractive device that focuses incident insolation onto an area smaller than the reflective or refractive surface, resulting in increased insolation at the point of focus.

**Cull Wood:** Wood logs, chips, or wood products that are burned.

**Direct Current:** An electric current that flows in a constant direction. The magnitude of the current does not vary or has a slight variation.

**Electric Utility Restructuring:** With some notable exceptions, the electric power industry historically has been composed primarily of investor-owned utilities. These utilities have been predominantly vertically integrated monopolies (combining electricity generation, transmission, and distribution), whose prices have been regulated by State and Federal government agencies. Restructuring the industry entails the introduction of competition into at least the generation phase of electricity production, with a corresponding decrease in regulatory control. Restructuring may also modify or eliminate other traditional aspects of investor-owned utilities, including their exclusive franchise to serve a given geographical area, assured rates of return, and vertical integration of the production process.

**Emission:** The release or discharge of a substance into the environment; generally refers to the release of gases or particulates into the air.

**Evacuated Tube:** In a solar thermal collector, an absorber tube, which is contained in an evacuated glass cylinder, through which collector fluids flows.

**Exempt Wholesale Generator (EWG):** A nonutility electricity generator that is not a qualifying facility under the Public Utility Regulatory Policies Act of 1978.

**Externalities:** Benefits or costs, generated as a by-product of an economic activity, that do not accrue to the parties involved in the activity. Environmental externalities are benefits or costs that manifest themselves through changes in the physical or biological environment.

**Flat Plate Pumped:** A medium-temperature solar thermal collector that typically consists of a metal frame, glazing, absorbers (usually metal), and insulation and that uses a pump liquid as the heat-transfer medium: predominant use is in water heating applications.

**Flow Control:** The laws, regulations, and economic incentives or disincentives used by waste managers to direct waste generated in a specific geographic area to a designated landfill, recycling, or waste-to-energy facility.

**Fuel Cells:** One or more cells capable of generating an electrical current by converting the chemical energy of a fuel 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.

**Fuelwood:** Wood and wood products, possibly including coppices, scrubs, branches, etc., bought or gathered, and used by direct combustion.

**Fumarole:** A vent from which steam or gases issue; a geyser or spring that emits gases.

**Generation (Electricity):** The process of producing electric energy from other forms of energy; also, the amount of electric energy produced, expressed in watt-hours (Wh).

**Geopressured:** A type of geothermal resource occurring in deep basins in which the fluid is under very high pressure.

**Geothermal Energy:** As used at electric utilities, hot water or steam extracted from geothermal reservoirs in the Earth's crust that is supplied to steam turbines at electric utilities that drive generators to produce electricity.

**Geothermal Plant:** A plant in which a turbine is driven either from hot water or by natural steam that derives its energy from heat found in rocks or fluids at various depths beneath the surface of the earth. The fluids are extracted by drilling and/or pumping.

**Geyser:** A special type of thermal spring that periodically ejects water with great force.

**Giga:** One billion.

**Green Pricing:** In the case of renewable electricity, green pricing represents a market solution to the various problems associated with regulatory valuation of the nonmarket benefits of renewables. Green pricing programs allow electricity customers to express their willingness to pay for renewable energy development through direct payments on their monthly utility bills.

**Grid:** The layout of an electrical distribution system.

**Groundwater:** Water occurring in the subsurface zone where all spaces are filled with water under pressure greater than that of the atmosphere.



**Heat Pump:** A year-round heating and air-conditioning system employing a refrigeration cycle. In a refrigeration cycle, a refrigerant is compressed (as a liquid) and expanded (as a vapor) to absorb and reject heat. The heat pump transfers heat to a space to be heated during the winter period and by reversing the operation extracts (absorbs) heat from the same space to be cooled during the summer period. The refrigerant within the heat pump in the heating mode absorbs the heat to be supplied to the space to be heated from an outside medium (air, ground or ground water) and in the cooling mode absorbs heat from the space to be cooled to be rejected to the outside medium.

**Heat Pump (Air Source):** An air-source heat pump is the most common type of heat pump. The heat pump absorbs heat from the outside air and transfers the heat to the space to be heated in the heating mode. In the cooling mode the heat pump absorbs heat from the space to be cooled and rejects the heat to the outside air. In the heating mode when the outside air approaches 32° F or less, air-source heat pumps lose efficiency and generally require a back-up (resistance) heating system.

**Heat Pump (Geothermal):** 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.

**Heat Pump (efficiency):** The efficiency of a heat pump, that is, the electrical energy to operate it, is directly related to temperatures between which it operates. Geothermal heat pumps are more efficient than conventional heat pumps or air conditioners that use the outdoor air since the ground or ground water a few feet below the earth's surface remains relatively constant throughout the year. It is more efficient in the winter to draw heat from the relatively warm ground than from the atmosphere where the air temperature is much colder, and in summer transfer waste heat to the relatively cool ground than to hotter air. Geothermal heat pumps are generally more expensive (\$2,000-\$5,000) to install than outside air heat pumps. However, depending on the location geothermal heat pumps can reduce energy consumption (operating cost) and correspondingly, emissions by more than 20 percent compared to high-efficiency outside air heat pumps. Geothermal heat pumps also use the waste heat from air-conditioning to provide free hot water heating in the summer.

**High-Temperature Collector:** A solar thermal collector designed to operate at a temperature of 180 degrees Fahrenheit or higher.

**Hot Dry Rock:** Heat energy residing in impermeable, crystalline rock. Hydraulic fracturing may be used to create permeability to enable circulation of water and removal of the heat.

**Hub Height:** In a horizontal-axis wind turbine, the distance from the turbine platform to the rotor shaft.

**Hydraulic Fracturing:** Fracturing of rock at depth with fluid pressure. Hydraulic fracturing at depth may be accomplished by pumping water into a well at very high pressures. Under natural conditions, vapor pressure may rise high enough to cause fracturing in a process known as hydrothermal brecciation.

**Independent Power Producer (IPP):** A wholesale electricity producer (other than a qualifying facility under the Public Utility Regulatory Policies Act of 1978), that is unaffiliated with franchised utilities in the area in which the IPP is selling power and that lacks significant marketing power. Unlike traditional utilities, IPPs do not possess transmission facilities that are essential to their customers and do not sell power in any retail service territory where they have a franchise.

**Internal Collector Storage (ICS):** A solar thermal collector in which incident solar radiation is absorbed by the storage medium.

**Kilowatt (kW):** One thousand watts of electricity (See Watt).

**Kilowatthour (kWh):** One thousand watthours.

**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).

**Liquid Collector:** A medium-temperature solar thermal collector, employed predominantly in water heating, which uses pumped liquid as the heat-transfer medium.

**Low-Temperature Collectors:** Metallic or nonmetallic solar thermal collectors that generally operate at temperatures below 110 degrees Fahrenheit and use pumped liquid or air as the heat transfer medium. They usually contain no glazing and no insulation, and they

are often made of plastic or rubber, although some are made of metal.

**Magma:** Naturally occurring molten rock, generated within the earth and capable of intrusion and extrusion, from which igneous rocks are thought to have been derived through solidification and related processes. It may or may not contain suspended solids (such as crystals and rock fragments) and/or gas phases.

**Marginal Cost:** The change in cost associated with a unit change in quantity supplied or produced.

**Medium-Temperature Collectors:** Solar thermal collectors designed to operate in the temperature range of 140 degrees to 180 degrees Fahrenheit, but that can also operate at a temperature as low as 110 degrees Fahrenheit. The collector typically consists of a metal frame, metal absorption panels with integral flow channels (attached tubing for liquid collectors or integral ducting for air collectors), and glazing and insulation on the sides and back.

**Megawatt (MW):** One million watts of electricity (See Watt).

**Merchant Facilities:** High-risk, high-profit facilities that operate, at least partially, at the whims of the market, as opposed to those facilities that are constructed with close cooperation of municipalities and have significant amounts of waste supply guaranteed.

**Net Photovoltaic Cell Shipment:** The difference between photovoltaic cell shipments and photovoltaic cell purchases.

**Net Photovoltaic Module Shipment:** The difference between photovoltaic module shipments and photovoltaic module purchases.

**Nonutility Generation:** Electric generation by nonutility power producers to supply electric power for industrial, commercial, and military operations, or sales to electric utilities. See **Nonutility Power Producer**.

**Nonutility Power Producer:** A corporation, person, agency, authority, or other legal entity or instrumentality that owns electric generating capacity and is not an electric utility. Nonutility power producers include qualifying cogenerators, qualifying small power producers, and other nonutility generators (including independent power producers) without a designated,

franchised service area that do not file forms listed in the *Code of Federal Regulations*, Title 18, Part 141.

**Operation and Maintenance (O&M) Cost:** Operating expenses are associated with operating a facility (i.e., supervising and engineering expenses). Maintenance expenses are that portion of expenses consisting of labor, materials, and other direct and indirect expenses incurred for preserving the operating efficiency or physical condition of utility plants that are used for power production, transmission, and distribution of energy.

**Parabolic Dish:** A high-temperature (above 180 degrees Fahrenheit) solar thermal concentrator, generally bowl-shaped, with two-axis tracking.

**Parabolic Trough:** A high-temperature (above 180 degrees Fahrenheit) solar thermal concentrator with the capacity for tracking the sun using one axis of rotation.

**Passive Solar:** A system in which solar energy alone is used for the transfer of thermal energy. Pumps, blowers, or other heat transfer devices that use energy other than solar are not used.

**Peak Watt:** A manufacturer's unit indicating the amount of power a photovoltaic cell or module will produce at standard test conditions (normally 1,000 watts per square meter and 25 degrees Celsius).

**Photovoltaic 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).

**Photovoltaic Module:** An integrated assembly of interconnected photovoltaic cells designed to deliver a selected level of working voltage and current at its output terminals, packaged for protection against environment degradation, and suited for incorporation in photovoltaic power systems.

**Public Utility Regulatory Policies Act of 1978 (PURPA):** One part of the National Energy Act, PURPA contains measures designed to encourage the conservation of energy, more efficient use of resources, and equitable rates. Principal among these were suggested retail rate reforms and new incentives for production of electricity by cogenerators and users of renewable resources.

**Pulpwood:** Roundwood, whole-tree chips, or wood residues.

**Quadrillion Btu:** Equivalent to 10 to the 15th power Btu.

**Qualifying Facility (QF):** A cogeneration or small power production facility that meets certain ownership, operating, and efficiency criteria established by the Federal Energy Regulatory Commission (FERC) pursuant to the Public Utility Regulatory Policies Act of 1978 (PURPA). (See the Code of Federal Regulations, Title 18, Part 292.)

**Refuse-Derived Fuel (RDF):** Fuel processed from municipal solid waste that can be in shredded, fluff, or densified pellet forms.

**Renewable Energy Source:** An energy source that is regenerative or virtually inexhaustible. Typical examples are wind, geothermal, and water power.

**Ribbon Silicon:** Single-crystal silicon derived by means of fabricating processes that produce sheets or ribbons of single-crystal silicon. These processes include edge-defined film-fed growth, dendritic web growth, and ribbon-to-ribbon growth.

**Roundwood:** Logs, bolts, and other round timber generated from the harvesting of trees.

**Silicon:** A semiconductor material made from silica, purified for photovoltaic applications.

**Single Crystal Silicon (Czochralski):** An extremely pure form of crystalline silicon produced by the Czochralski method of dipping a single crystal seed into a pool of molten silicon under high vacuum conditions and slowly withdrawing a solidifying single crystal boule rod of silicon. The boule is sawed into thin wafers and fabricated into single-crystal photovoltaic cells.

**Solar Energy:** The radiant energy of the sun, which can be converted into other forms of energy, such as heat or electricity.

**Solar Thermal Collector:** A device designed to receive solar radiation and convert it into thermal energy. Normally, a solar thermal collector includes a frame, glazing, and an absorber, together with the appropriate insulation. The heat collected by the solar thermal collector may be used immediately or stored for later use.

**Solar Thermal Collector, Special:** An evacuated tube collector or a concentrating (focusing) collector. Special

collectors operate in the temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes).

**Thermosiphon System:** A solar collector system for water heating in which circulation of the collection fluid through the storage loop is provided solely by the temperature and density difference between the hot and cold fluids.

**Tipping Fee:** Price charged to deliver municipal solid waste to a landfill, waste-to-energy facility, or recycling facility.

**Transmission System (Electric):** An interconnected group of electric transmission lines and associated equipment for moving or transferring electric energy in bulk between points of supply and points at which it is transformed for delivery over the distribution system lines to consumers, or is delivered to other electric systems.

**Turbine:** A machine for generating rotary mechanical power from the energy of a stream of fluid (such as water, steam, or hot gas). Turbines convert the kinetic energy of fluids to mechanical energy through the principles of impulse and reaction, or a mixture of the two.

**Vapor-Dominated Geothermal System:** A conceptual model of a hydrothermal system where steam pervades the rock and is the pressure-controlling fluid phase.

**Watt (Electric):** The electrical unit of power. The rate of energy transfer equivalent to 1 ampere of electric current flowing under a pressure of 1 volt at unity power factor.

**Watt (Thermal):** A unit of power in the metric system, expressed in terms of energy per second, equal to the work done at a rate of 1 joule per second.

**Watt-hour (Wh):** The electrical energy unit of measure equal to 1 watt of power supplied to, or taken from, an electric circuit steadily for 1 hour.

**Wheeling:** The use of the transmission facilities of one system to transmit power and energy by agreement of and for, another system with a corresponding wheeling charge (e.g., the transmission of electricity for compensation over a system that is received from one system and delivered to another system).

**Wood Pellets:** Fuel manufactured from finely ground wood fiber and used in pellet stoves.