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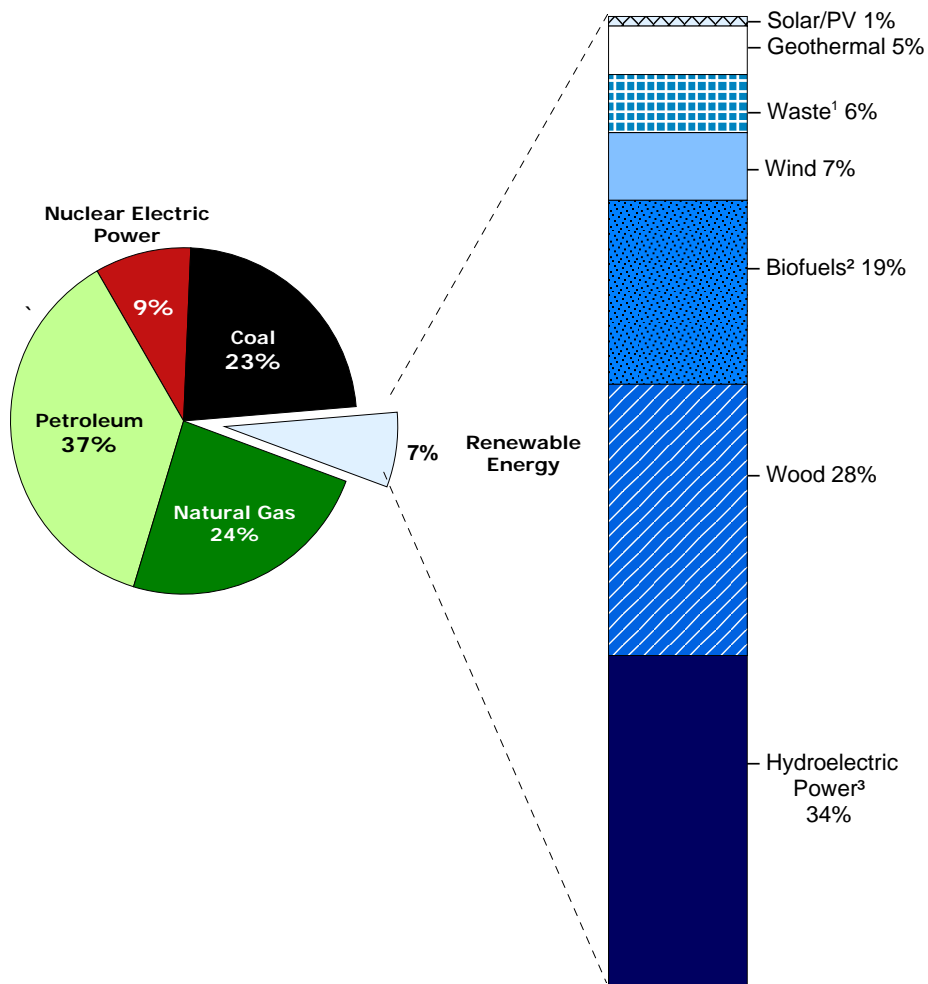
# Renewable Energy



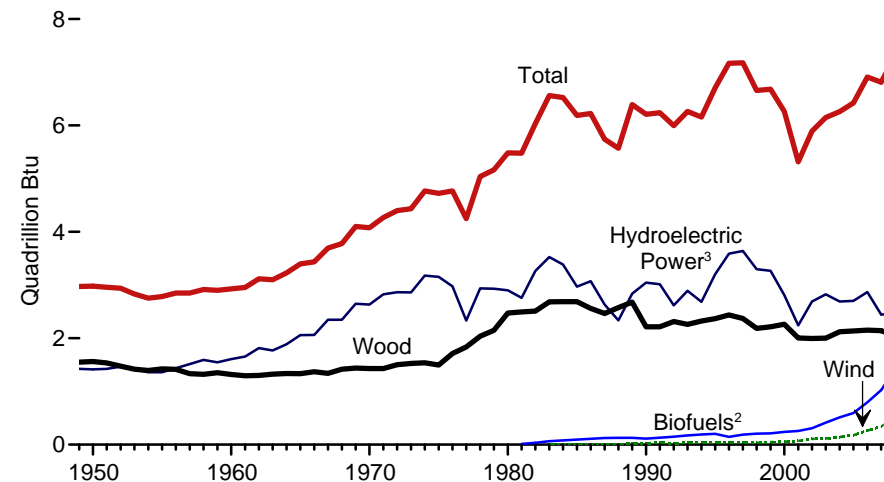
Grand Coulee Dam, Washington State. Source: U.S. Bureau of Reclamation.

# Figure 10.1 Renewable Energy Consumption by Major Sources

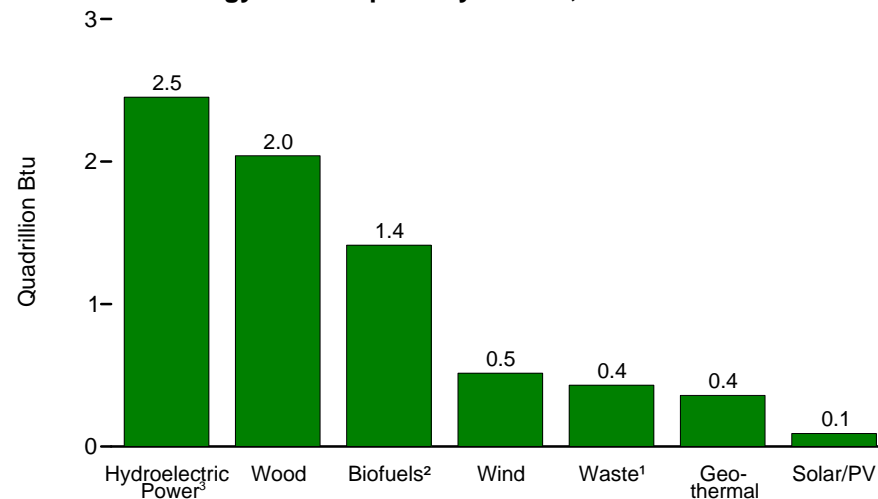
## Renewable Energy as Share of Total Primary Energy Consumption, 2008



## Renewable Energy Total Consumption and Major Sources, 1949-2008



## Renewable Energy Consumption by Source, 2008



<sup>1</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass.

<sup>2</sup> Fuel ethanol and biodiesel consumption, plus losses and co-products from the production of fuel ethanol and biodiesel.

<sup>3</sup> Conventional hydroelectric power.  
Sources: Tables 1.3 and 10.1.

**Table 10.1 Renewable Energy Production and Consumption by Primary Energy Source, Selected Years, 1949-2008**  
(Trillion Btu)

Year	Production <sup>1</sup>			Consumption								Total Renewable Energy
	Biomass		Total Renewable Energy <sup>4</sup>	Hydroelectric Power <sup>5</sup>	Geothermal <sup>6</sup>	Solar/PV <sup>7</sup>	Wind <sup>8</sup>	Biomass				
	Biofuels <sup>2</sup>	Total <sup>3</sup>						Wood <sup>9</sup>	Waste <sup>10</sup>	Biofuels <sup>11</sup>	Total	
1949	NA	1,549	2,974	1,425	NA	NA	NA	1,549	NA	NA	1,549	2,974
1950	NA	1,562	2,978	1,415	NA	NA	NA	1,562	NA	NA	1,562	2,978
1955	NA	1,424	2,784	1,360	NA	NA	NA	1,424	NA	NA	1,424	2,784
1960	NA	1,320	2,929	1,608	1	NA	NA	1,320	NA	NA	1,320	2,929
1965	NA	1,335	3,398	2,059	4	NA	NA	1,335	NA	NA	1,335	3,398
1970	NA	1,431	4,076	2,634	11	NA	NA	1,429	2	NA	1,431	4,076
1971	NA	1,432	4,268	2,824	12	NA	NA	1,430	2	NA	1,432	4,268
1972	NA	1,503	4,398	2,864	31	NA	NA	1,501	2	NA	1,503	4,398
1973	NA	1,529	4,433	2,861	43	NA	NA	1,527	2	NA	1,529	4,433
1974	NA	1,540	4,769	3,177	53	NA	NA	1,538	2	NA	1,540	4,769
1975	NA	1,499	4,723	3,155	70	NA	NA	1,497	2	NA	1,499	4,723
1976	NA	1,713	4,768	2,976	78	NA	NA	1,711	2	NA	1,713	4,768
1977	NA	1,838	4,249	2,333	77	NA	NA	1,837	2	NA	1,838	4,249
1978	NA	2,038	5,039	2,937	64	NA	NA	2,036	1	NA	2,038	5,039
1979	NA	2,152	5,166	2,931	84	NA	NA	2,150	2	NA	2,152	5,166
1980	NA	2,476	5,485	2,900	110	NA	NA	2,474	2	NA	2,476	5,485
1981	13	R2,597	R5,478	2,758	123	NA	NA	2,496	88	13	R2,597	R5,478
1982	35	2,664	6,034	3,266	105	NA	NA	2,510	119	35	2,664	6,034
1983	R64	R2,906	R6,562	3,527	129	NA	(s)	2,684	157	R64	R2,906	R6,562
1984	R79	R2,973	R6,524	3,386	165	(s)	(s)	2,686	208	R79	R2,973	R6,524
1985	R95	R3,018	R6,187	2,970	198	(s)	(s)	2,687	236	R95	R3,018	R6,187
1986	R109	R2,934	R6,225	3,071	219	(s)	(s)	2,562	263	R109	R2,934	R6,225
1987	R125	R2,877	R5,741	2,635	229	(s)	(s)	2,463	289	R125	R2,877	R5,741
1988	R127	R3,019	R5,570	2,334	217	(s)	(s)	2,577	315	R127	R3,019	R5,570
1989	R128	R3,162	R6,394	2,837	317	55	22	2,680	354	R128	R3,162	R6,394
1990	R113	R2,737	R6,208	3,046	336	60	29	2,216	408	R113	R2,737	R6,208
1991	R131	R2,784	R6,240	3,016	346	63	31	2,214	440	R131	R2,784	R6,240
1992	R148	R2,935	R5,995	2,617	349	64	30	2,313	473	R148	R2,935	R5,995
1993	R173	R2,912	R6,265	2,892	364	66	31	2,260	479	R173	R2,912	R6,264
1994	R192	R3,031	R6,157	2,683	338	69	36	2,324	515	R192	R3,031	R6,157
1995	R202	R3,103	R6,705	3,205	294	70	33	2,370	531	R204	R3,105	R6,707
1996	R144	R3,158	R7,168	3,590	316	71	33	2,437	577	R146	R3,160	R7,169
1997	190	R3,112	R7,181	3,640	325	70	34	2,371	551	187	R3,109	7,178
1998	R207	2,933	6,659	3,297	328	70	31	2,184	542	205	R2,932	R6,658
1999	215	2,969	6,683	3,268	331	69	46	2,214	540	213	R2,968	6,681
2000	238	3,010	6,262	2,811	317	66	57	2,262	511	241	3,013	6,264
2001	260	2,629	5,318	2,242	311	65	70	2,006	364	258	2,627	5,316
2002	R314	2,712	5,899	2,689	328	64	105	1,995	402	309	R2,707	R5,894
2003	R411	2,815	R6,148	2,825	331	64	115	2,002	401	R413	2,817	6,150
2004	R500	3,011	6,248	2,690	341	65	142	2,121	389	513	3,023	R6,260
2005	R581	R3,120	R6,410	2,703	343	66	178	R2,136	403	R594	R3,133	R6,423
2006	R743	R3,309	R6,857	2,869	343	72	264	R2,152	R414	795	R3,361	R6,908
2007	R1,011	R3,583	6,800	R2,446	R349	R81	R341	R2,142	R430	R1,025	R3,597	R6,814
2008 <sup>P</sup>	1,429	3,900	7,316	2,452	358	91	514	2,041	431	1,413	3,884	7,300

<sup>1</sup> Production equals consumption for all renewable energy sources except biofuels.

<sup>2</sup> Total biomass inputs to the production of fuel ethanol and biodiesel.

<sup>3</sup> Wood and wood-derived fuels, biomass waste, fuel ethanol, and biodiesel.

<sup>4</sup> Hydroelectric power, geothermal, solar/PV, wind, and biomass.

<sup>5</sup> Conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>6</sup> Geothermal electricity net generation (converted to Btu using the geothermal energy plants heat rate), and geothermal heat pump and direct use energy.

<sup>7</sup> Solar thermal and photovoltaic electricity net generation (converted to Btu using the fossil-fueled plants heat rate), and solar thermal direct use energy.

<sup>8</sup> Wind electricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>9</sup> Wood and wood-derived fuels.

<sup>10</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and

other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

<sup>11</sup> Fuel ethanol and biodiesel consumption, plus losses and co-products from the production of fuel ethanol and biodiesel.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • See Note, "Renewable Energy Production and Consumption," at end of section. • See Table E1 for estimated renewable energy consumption for 1635-1945. • Totals may not equal sum of components due to independent rounding.

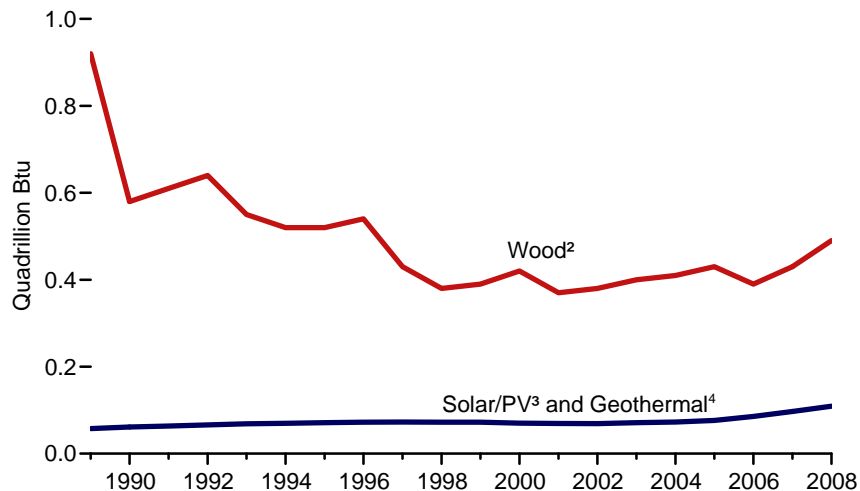
Web Pages: • For all data beginning in 1949, see <http://www.eia.doe.gov/emeu/aer/renew.html>.

• For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

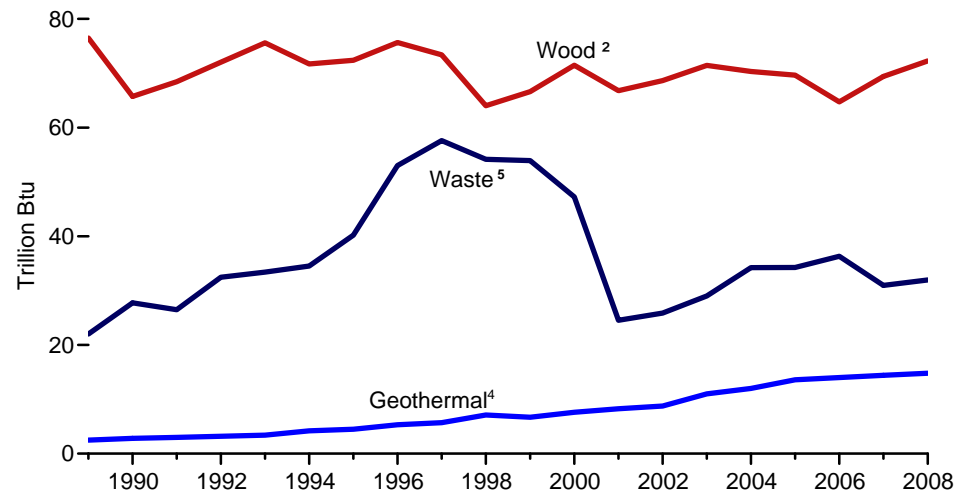
Sources: **Biofuels:** Tables 10.3 and 10.4. **All Other Data:** Tables 10.2a-c.

**Figure 10.2a Renewable Energy Consumption: End-Use Sectors, 1989-2008**

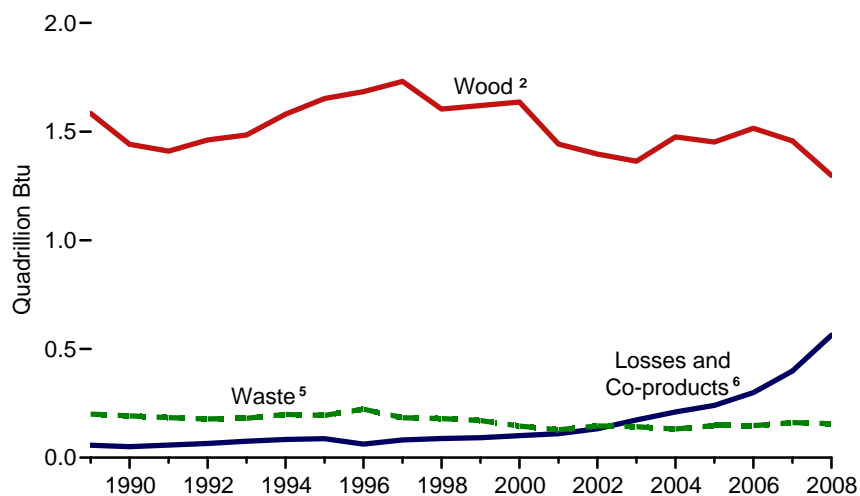
**Residential Sector**



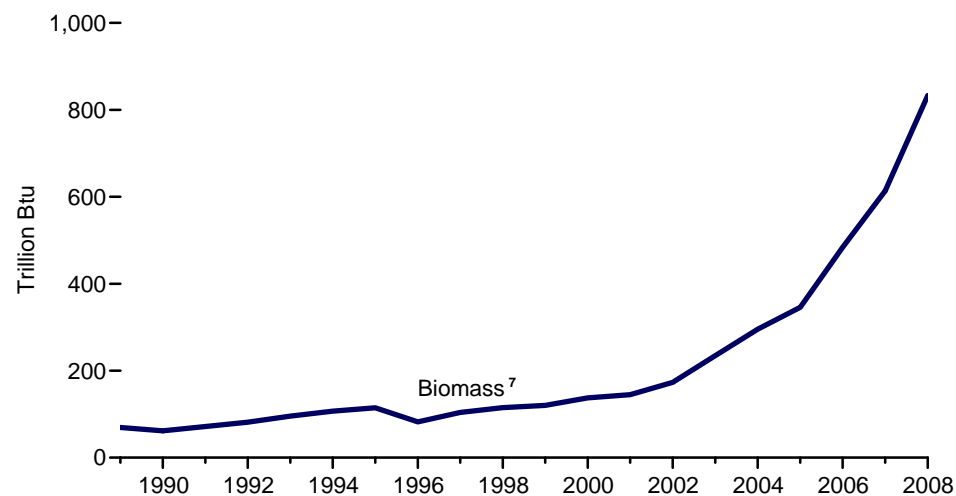
**Commercial<sup>1</sup> Sector, Major Sources**



**Industrial<sup>1</sup> Sector, Major Sources**



**Transportation Sector**



<sup>1</sup> Includes fuel used at combined-heat-and-power (CHP) plants and a small number of electricity-only plants.

<sup>2</sup> Wood and wood-derived fuels.

<sup>3</sup> Solar thermal direct use energy, and photovoltaic electricity generation. Includes small amounts of commercial sector use.

<sup>4</sup> Geothermal heat pump and direct use energy.

<sup>5</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal

solid waste from non-biogenic sources, and tire-derived fuels).

<sup>6</sup> From the production of fuel ethanol and biodiesel.

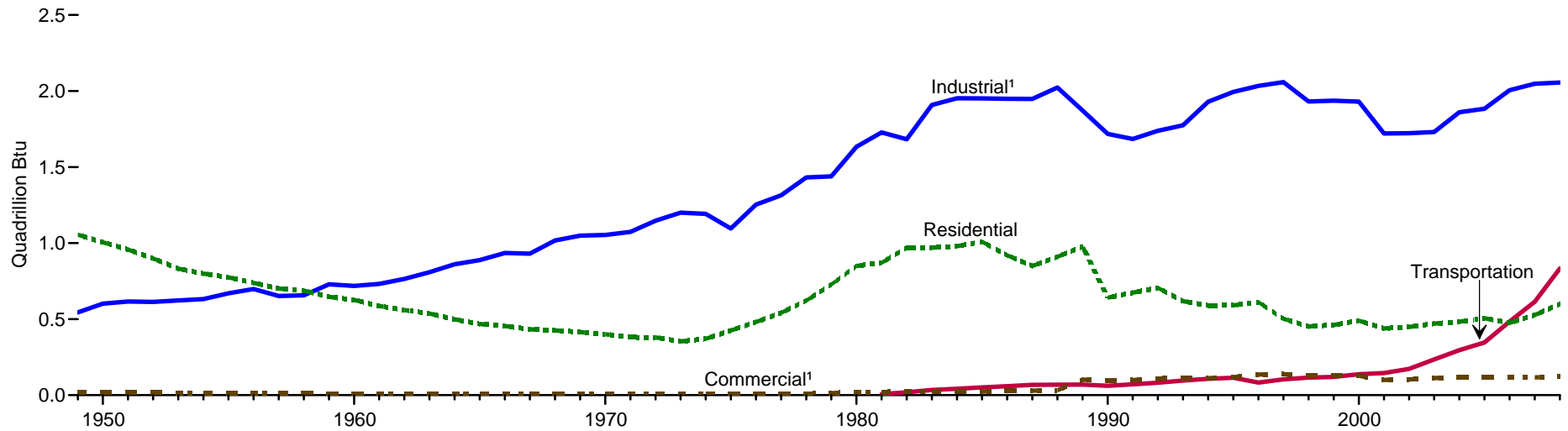
<sup>7</sup> The ethanol portion of motor fuels (such as E10 and E85), and biofuels used as diesel fuel substitutes or additives.

Note: See related Figures 10.2b and 10.2c.

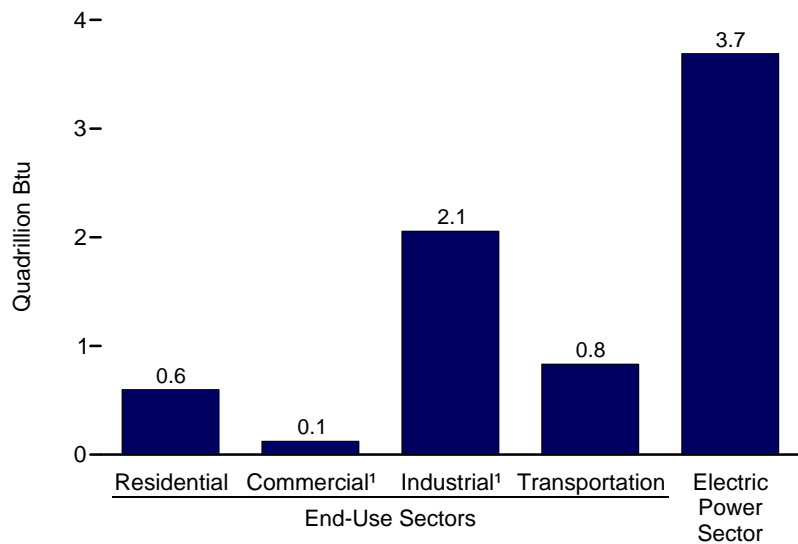
Sources: Tables 10.2a and 10.2b.

**Figure 10.2b Renewable Energy Consumption: End-Use Sectors and Electric Power Sector**

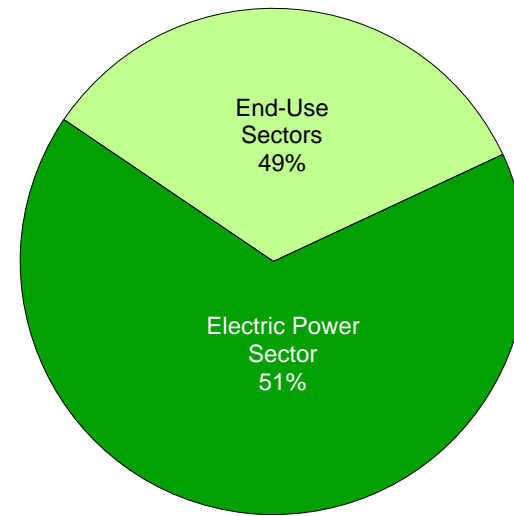
**End-Use Sectors, 1949-2008**



**End-Use Sectors and Electric Power Sector, 2008**



**End-Use Sectors and Electric Power Sector Shares of Total Renewable Energy Consumption, 2008**



<sup>1</sup>Includes fuel use at combined-heat-and-power (CHP) plants and a small number of electricity-only plants.

Note: See related Figures 10.2a and 10.2c.  
Sources: Tables 10.2a-10.2c.

**Table 10.2a Renewable Energy Consumption: Residential and Commercial Sectors, Selected Years, 1949-2008**  
(Trillion Btu)

Year	Residential Sector				Commercial Sector <sup>1</sup>						
	Geo-thermal <sup>2</sup>	Solar/PV <sup>3</sup>	Biomass	Total	Hydro-electric Power <sup>5</sup>	Geo-thermal <sup>2</sup>	Biomass				Total
			Wood <sup>4</sup>				Wood <sup>4</sup>	Waste <sup>6</sup>	Fuel Ethanol <sup>7</sup>	Total	
1949	NA	NA	1,055	1,055	NA	NA	20	NA	NA	20	20
1950	NA	NA	1,006	1,006	NA	NA	19	NA	NA	19	19
1955	NA	NA	775	775	NA	NA	15	NA	NA	15	15
1960	NA	NA	627	627	NA	NA	12	NA	NA	12	12
1965	NA	NA	468	468	NA	NA	9	NA	NA	9	9
1970	NA	NA	401	401	NA	NA	8	NA	NA	8	8
1971	NA	NA	382	382	NA	NA	7	NA	NA	7	7
1972	NA	NA	380	380	NA	NA	7	NA	NA	7	7
1973	NA	NA	354	354	NA	NA	7	NA	NA	7	7
1974	NA	NA	371	371	NA	NA	7	NA	NA	7	7
1975	NA	NA	425	425	NA	NA	8	NA	NA	8	8
1976	NA	NA	482	482	NA	NA	9	NA	NA	9	9
1977	NA	NA	542	542	NA	NA	10	NA	NA	10	10
1978	NA	NA	622	622	NA	NA	12	NA	NA	12	12
1979	NA	NA	728	728	NA	NA	14	NA	NA	14	14
1980	NA	NA	850	850	NA	NA	21	NA	NA	21	21
1981	NA	NA	870	870	NA	NA	21	NA	(s)	21	21
1982	NA	NA	970	970	NA	NA	22	NA	(s)	22	22
1983	NA	NA	970	970	NA	NA	22	NA	(s)	22	22
1984	NA	NA	980	980	NA	NA	22	NA	(s)	22	22
1985	NA	NA	1,010	1,010	NA	NA	24	NA	(s)	24	24
1986	NA	NA	920	920	NA	NA	27	NA	(s)	27	27
1987	NA	NA	850	850	NA	NA	29	NA	1	30	30
1988	NA	NA	910	910	NA	NA	32	NA	1	33	33
1989	5	53	920	978	1	3	76	22	1	99	102
1990	6	56	580	641	1	3	66	28	1	94	98
1991	6	58	610	674	1	3	68	26	(s)	95	100
1992	6	60	640	706	1	3	72	32	(s)	105	109
1993	7	62	550	618	1	3	76	33	(s)	109	114
1994	6	64	520	590	1	4	72	35	(s)	106	112
1995	7	65	520	591	1	5	72	40	(s)	113	118
1996	7	65	540	612	1	5	76	53	(s)	129	135
1997	8	65	430	503	1	6	73	58	(s)	131	138
1998	8	65	380	452	1	7	64	54	(s)	118	127
1999	9	64	390	462	1	7	67	54	(s)	121	129
2000	9	61	420	490	1	8	71	47	(s)	119	128
2001	9	60	370	439	1	8	67	25	(s)	92	101
2002	10	59	380	449	(s)	9	69	26	(s)	95	104
2003	13	58	400	471	1	11	71	29	1	101	113
2004	14	59	410	483	1	12	70	34	1	105	118
2005	16	61	R430	R507	1	14	70	34	1	105	119
2006	18	67	R390	R475	1	14	65	36	1	102	117
2007	22	R75	R430	R527	1	14	R69	R31	2	R102	R118
2008 <sup>P</sup>	26	83	490	599	1	15	72	32	3	107	123

<sup>1</sup> Commercial sector, including commercial combined-heat-and-power (CHP) and commercial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 8.

<sup>2</sup> Geothermal heat pump and direct use energy.

<sup>3</sup> Solar thermal direct use energy, and photovoltaic electricity net generation (converted to Btu using the fossil-fueled plants heat rate). Includes a small amount of commercial sector use.

<sup>4</sup> Wood and wood-derived fuels.

<sup>5</sup> Conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>6</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and

other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

<sup>7</sup> The ethanol portion of motor fuels (such as E10) consumed by the commercial sector.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • All values are estimated, except for commercial sector hydroelectric power and waste.

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

Web Pages: • For all data beginning in 1949, see <http://www.eia.doe.gov/emeu/aer/renew.html>.

• For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

Sources: See end of section.

**Table 10.2b Renewable Energy Consumption: Industrial and Transportation Sectors, Selected Years, 1949-2008**  
(Trillion Btu)

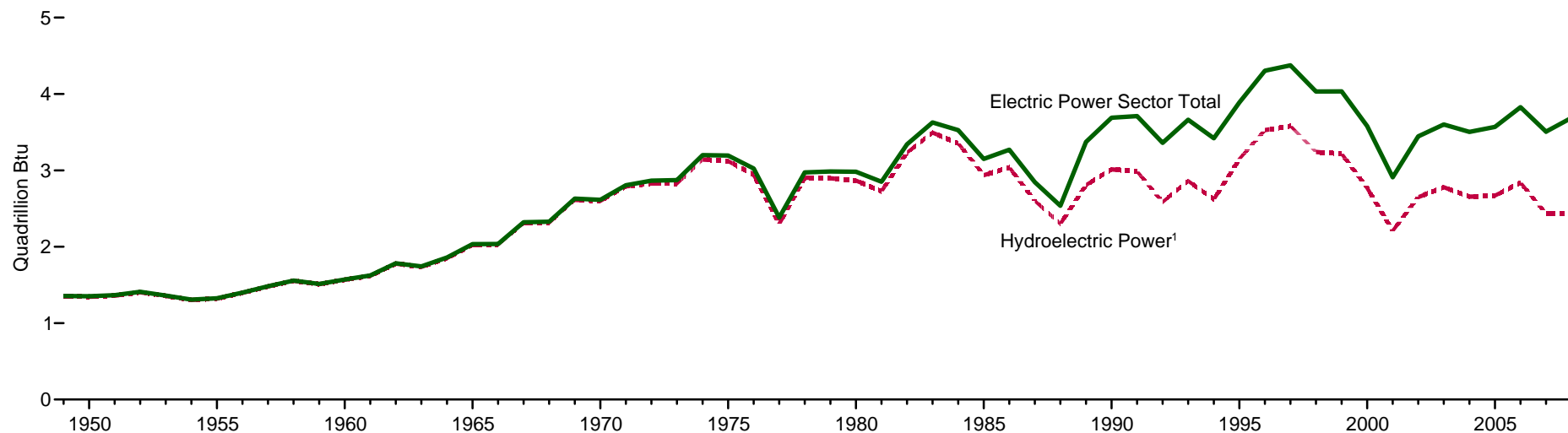
Year	Industrial Sector <sup>1</sup>							Transportation Sector			
	Hydro-electric Power <sup>2</sup>	Geo-thermal <sup>3</sup>	Biomass				Total	Biomass			
			Wood <sup>4</sup>	Waste <sup>5</sup>	Fuel Ethanol <sup>6</sup>	Losses and Co-products <sup>7</sup>		Fuel Ethanol <sup>8</sup>	Biodiesel <sup>9</sup>	Total	
1949	76	NA	468	NA	NA	NA	468	544	NA	NA	NA
1950	69	NA	532	NA	NA	NA	532	602	NA	NA	NA
1955	38	NA	631	NA	NA	NA	631	669	NA	NA	NA
1960	39	NA	680	NA	NA	NA	680	719	NA	NA	NA
1965	33	NA	855	NA	NA	NA	855	888	NA	NA	NA
1970	34	NA	1,019	NA	NA	NA	1,019	1,053	NA	NA	NA
1971	34	NA	1,040	NA	NA	NA	1,040	1,074	NA	NA	NA
1972	34	NA	1,113	NA	NA	NA	1,113	1,147	NA	NA	NA
1973	35	NA	1,165	NA	NA	NA	1,165	1,200	NA	NA	NA
1974	33	NA	1,159	NA	NA	NA	1,159	1,192	NA	NA	NA
1975	32	NA	1,063	NA	NA	NA	1,063	1,096	NA	NA	NA
1976	33	NA	1,220	NA	NA	NA	1,220	1,253	NA	NA	NA
1977	33	NA	1,281	NA	NA	NA	1,281	1,314	NA	NA	NA
1978	32	NA	1,400	NA	NA	NA	1,400	1,432	NA	NA	NA
1979	34	NA	1,405	NA	NA	NA	1,405	1,439	NA	NA	NA
1980	33	NA	1,600	NA	NA	NA	1,600	1,633	NA	NA	NA
1981	33	NA	1,602	87	(s)	6	1,695	1,728	7	NA	7
1982	33	NA	1,516	118	(s)	16	R1,650	R1,683	19	NA	19
1983	33	NA	1,690	155	(s)	R29	R1,875	R1,908	34	NA	34
1984	33	NA	1,679	204	1	R36	R1,919	R1,952	42	NA	42
1985	33	NA	1,645	230	1	R43	R1,919	R1,952	51	NA	51
1986	33	NA	1,610	256	1	R49	R1,916	R1,949	59	NA	59
1987	33	NA	1,576	282	1	R56	R1,915	R1,948	67	NA	67
1988	33	NA	1,625	308	1	R57	R1,990	R2,023	68	NA	68
1989	28	2	1,584	200	1	R57	R1,842	R1,872	69	NA	69
1990	31	2	1,442	192	1	R50	R1,685	R1,718	62	NA	62
1991	30	2	1,410	185	1	R58	R1,653	R1,685	72	NA	72
1992	31	2	1,461	179	1	R65	R1,706	R1,739	81	NA	81
1993	30	2	1,484	181	1	R76	R1,742	R1,774	96	NA	96
1994	62	3	1,580	199	1	R84	R1,864	R1,929	107	NA	107
1995	55	3	1,652	195	2	R87	R1,936	R1,994	115	NA	115
1996	61	3	1,683	224	1	R62	1,970	R2,034	82	NA	82
1997	58	3	1,731	184	1	R82	R1,998	R2,059	104	NA	104
1998	55	3	1,603	180	1	88	1,873	1,931	115	NA	115
1999	49	4	1,620	171	1	92	1,883	1,936	120	NA	120
2000	42	4	1,636	145	1	101	1,884	1,930	138	NA	138
2001	33	5	1,443	129	3	110	1,684	1,721	144	1	145
2002	39	5	1,396	146	3	133	1,679	R1,722	171	R2	R173
2003	43	3	1,363	142	5	R173	1,684	R1,730	233	2	R234
2004	33	4	1,476	132	6	210	1,824	R1,860	292	R3	R295
2005	32	4	1,452	148	7	R240	R1,847	R1,883	334	12	346
2006	29	4	1,515	R147	R10	R300	R1,972	R2,005	451	R33	R484
2007	R16	5	1,457	R162	R10	R399	R2,028	R2,048	R568	R46	R614
2008 <sup>P</sup>	19	5	1,298	157	14	563	2,032	2,056	792	41	833

<sup>1</sup> Industrial sector, including industrial combined-heat-and-power (CHP) and industrial electricity-only plants. See Note 2, "Classification of Power Plants Into Energy-Use Sectors," at end of Section 8.  
<sup>2</sup> Conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate).  
<sup>3</sup> Geothermal heat pump and direct use energy.  
<sup>4</sup> Wood and wood-derived fuels.  
<sup>5</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).  
<sup>6</sup> The ethanol portion of motor fuels (such as E10) consumed by the industrial sector.  
<sup>7</sup> Losses and co-products from the production of fuel ethanol and biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol and biodiesel—these

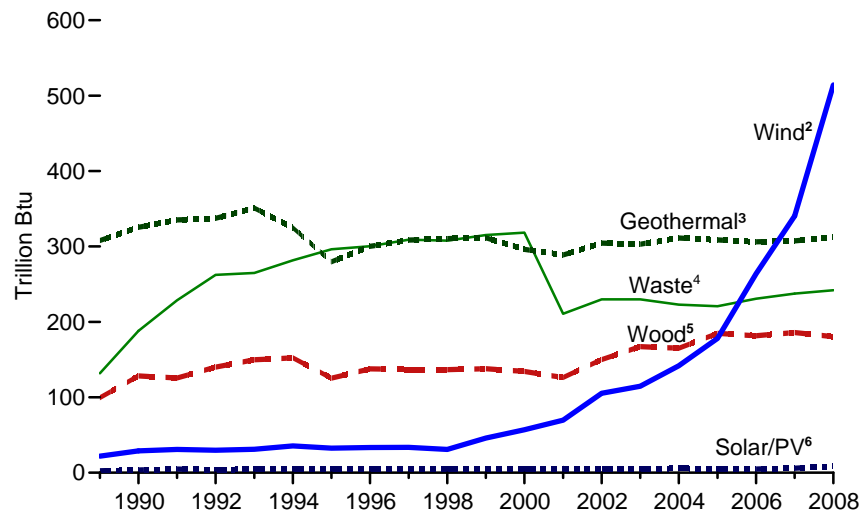
are included in the industrial sector consumption statistics for the appropriate energy source.  
<sup>8</sup> The ethanol portion of motor fuels (such as E10 and E85) consumed by the transportation sector.  
<sup>9</sup> "Biodiesel" is any liquid biofuel suitable as a diesel fuel substitute, additive, or extender. See "Biodiesel" in Glossary.  
R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.  
Notes: • All values are estimated, except for industrial sector hydroelectric power in 1949-1978 and 1989 forward. • Totals may not equal sum of components due to independent rounding.  
Web Pages: • For all data beginning in 1949, see <http://www.eia.doe.gov/emeu/aer/renew.html>.  
• For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.  
Sources: See end of section.

## Figure 10.2c Renewable Energy Consumption: Electric Power Sector

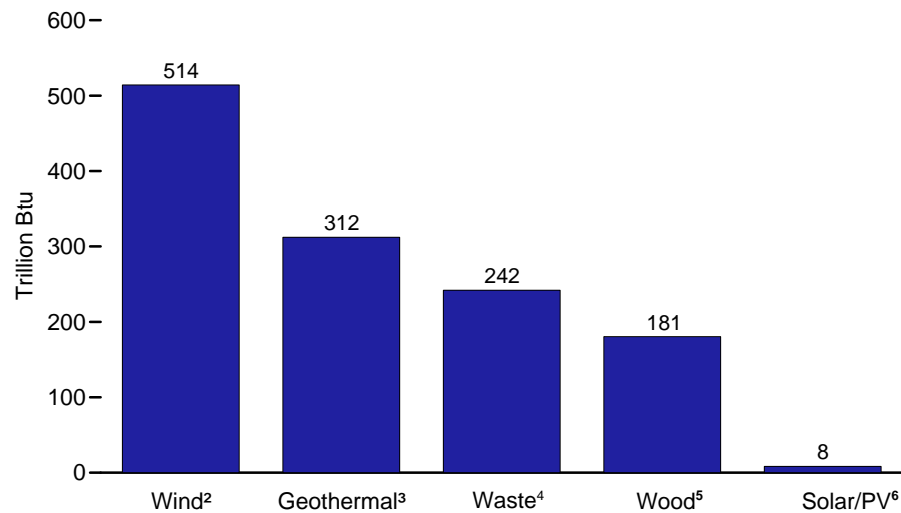
### Electric Power Sector Total and Hydroelectric Power, 1949-2008



### Non-Hydroelectric Power Sources, 1989-2008



### Non-Hydroelectric Power Sources, 2008



<sup>1</sup>Conventional hydroelectricity net generation.

<sup>2</sup>Wind electricity net generation.

<sup>3</sup>Geothermal electricity net generation.

<sup>4</sup>Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid

waste from non-biogenic sources, and tire-derived fuels).

<sup>5</sup>Wood and wood-driven fuels.

<sup>6</sup>Solar thermal and photovoltaic electricity net generation.

Note: See related Figures 10.2a and 10.2b on the end-use sectors.

Source: Table 10.2c.

**Table 10.2c Renewable Energy Consumption: Electric Power Sector, Selected Years, 1949-2008**

(Trillion Btu)

Year	Hydroelectric Power <sup>1</sup>	Geothermal <sup>2</sup>	Solar/PV <sup>3</sup>	Wind <sup>4</sup>	Biomass			Total
					Wood <sup>5</sup>	Waste <sup>6</sup>	Total	
1949	1,349	NA	NA	NA	6	NA	6	1,355
1950	1,346	NA	NA	NA	5	NA	5	1,351
1955	1,322	NA	NA	NA	3	NA	3	1,325
1960	1,569	1	NA	NA	2	NA	2	1,571
1965	2,026	4	NA	NA	3	NA	3	2,033
1970	2,600	11	NA	NA	1	2	4	2,615
1971	2,790	12	NA	NA	1	2	3	2,806
1972	2,829	31	NA	NA	1	2	3	2,864
1973	2,827	43	NA	NA	1	2	3	2,873
1974	3,143	53	NA	NA	1	2	3	3,199
1975	3,122	70	NA	NA	(s)	2	2	3,194
1976	2,943	78	NA	NA	1	2	3	3,024
1977	2,301	77	NA	NA	3	2	5	2,383
1978	2,905	64	NA	NA	2	1	3	2,973
1979	2,897	84	NA	NA	3	2	5	2,986
1980	2,867	110	NA	NA	3	2	5	2,982
1981	2,725	123	NA	NA	3	1	4	2,852
1982	3,233	105	NA	NA	2	1	3	3,341
1983	3,494	129	NA	(s)	2	2	4	3,627
1984	3,353	165	(s)	(s)	5	4	9	3,527
1985	2,937	198	(s)	(s)	8	7	14	3,150
1986	3,038	219	(s)	(s)	5	7	12	3,270
1987	2,602	229	(s)	(s)	8	7	15	2,846
1988	2,302	217	(s)	(s)	10	8	17	2,536
1989 <sup>7</sup>	2,808	308	3	22	100	132	232	3,372
1990	3,014	326	4	29	129	188	317	3,689
1991	2,985	335	5	31	126	229	354	3,710
1992	2,586	338	4	30	140	262	402	3,360
1993	2,861	351	5	31	150	265	415	3,662
1994	2,620	325	5	36	152	282	434	3,420
1995	3,149	280	5	33	125	296	422	3,889
1996	3,528	300	5	33	138	300	438	4,305
1997	3,581	309	5	34	137	309	446	4,375
1998	3,241	311	5	31	137	308	444	4,032
1999	3,218	312	5	46	138	315	453	4,034
2000	2,768	296	5	57	134	318	453	3,579
2001	2,209	289	6	70	126	211	337	2,910
2002	2,650	305	6	105	150	230	380	3,445
2003	2,781	303	5	115	167	230	397	3,601
2004	2,656	311	6	142	165	223	388	3,503
2005	2,670	309	6	178	185	221	406	3,568
2006	2,839	306	5	264	182	231	412	3,827
2007	<sup>R</sup> 2,430	<sup>R</sup> 308	6	<sup>R</sup> 341	<sup>R</sup> 186	<sup>R</sup> 237	<sup>R</sup> 423	<sup>R</sup> 3,508
2008 <sup>P</sup>	2,432	312	8	514	181	242	423	3,690

<sup>1</sup> Conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>2</sup> Geothermal electricity net generation (converted to Btu using the geothermal energy plants heat rate).

<sup>3</sup> Solar thermal and photovoltaic electricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>4</sup> Wind electricity net generation (converted to Btu using the fossil-fueled plants heat rate).

<sup>5</sup> Wood and wood-derived fuels.

<sup>6</sup> Municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass. Through 2000, also includes non-renewable waste (municipal solid waste from non-biogenic sources, and tire-derived fuels).

<sup>7</sup> Through 1988, data are for electric utilities only. Beginning in 1989, data are for electric utilities and

independent power producers.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.

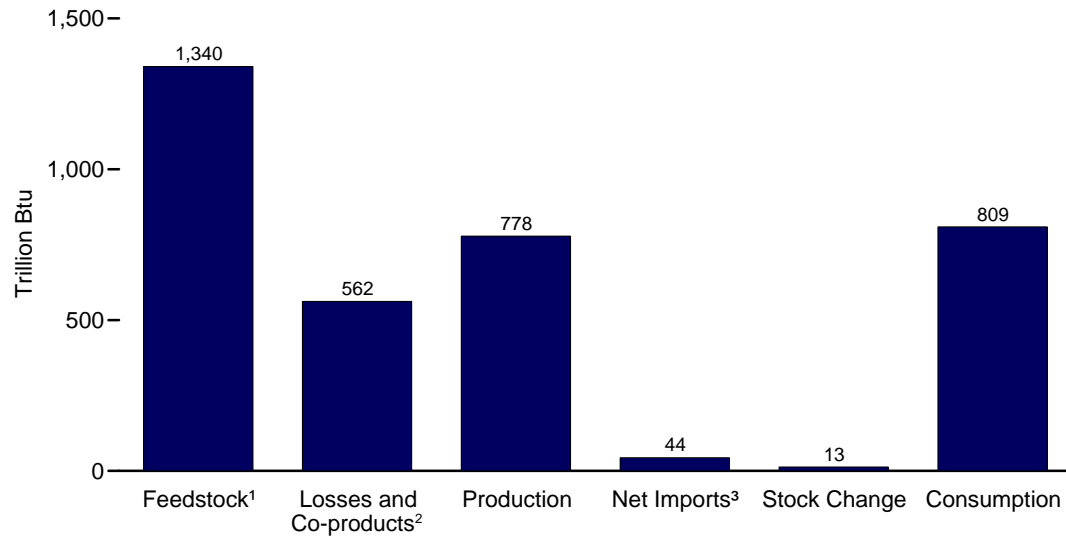
Notes: • The electric power sector comprises electricity-only and combined-heat-and-power (CHP) plants within the NAICS 22 category whose primary business is to sell electricity, or electricity and heat, to the public. • See Note 3, "Electricity Imports and Exports," at end of Section 8. • Totals may not equal sum of components due to independent rounding.

Web Pages: • For all data beginning in 1949, see <http://www.eia.doe.gov/emeu/aer/renew.html>. • For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

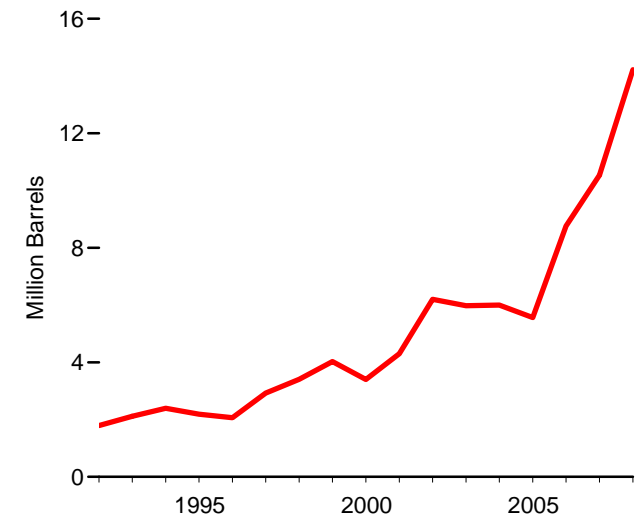
Sources: Tables 8.2b, 8.5b, 8.7b, and A6.

## Figure 10.3 Fuel Ethanol Overview

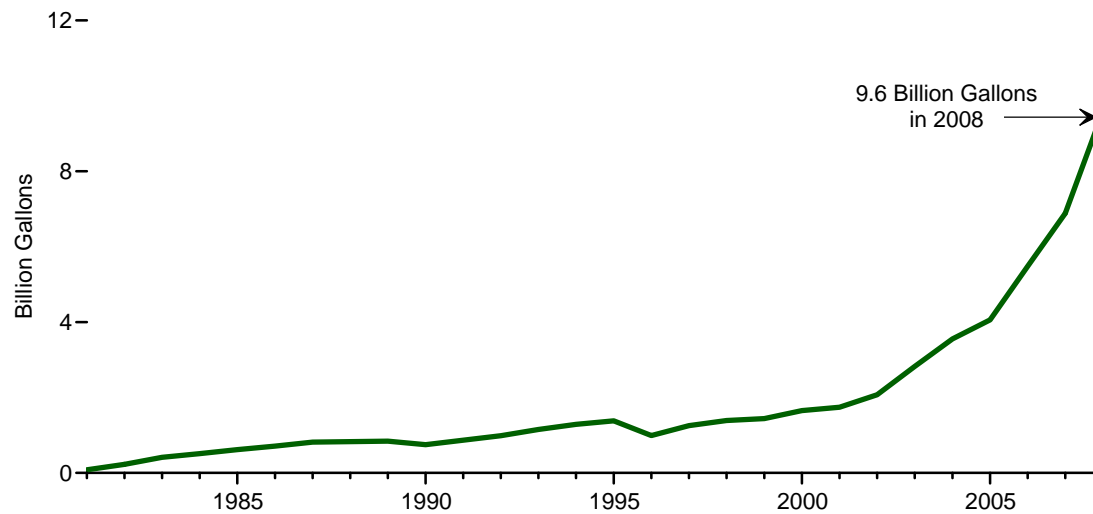
### Overview, 2008



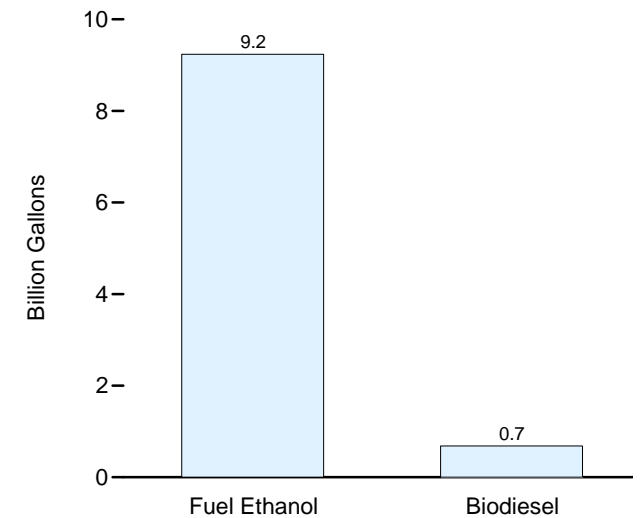
### Stocks, 1992-2008



### Consumption, 1981-2008



### Fuel Ethanol and Biodiesel Production, 2008



<sup>1</sup> Total corn and other biomass inputs to the production of fuel ethanol.

<sup>2</sup> Losses and co-products from the production of fuel ethanol.

<sup>3</sup> Fuel ethanol imports only. Data for fuel ethanol exports are not available.

Sources: Tables 10.3, 10.4, and A3.

**Table 10.3 Fuel Ethanol Overview, 1981-2008**

Year	Feedstock <sup>1</sup>	Losses and Co-products <sup>2</sup>	Production			Trade			Stocks <sup>4</sup>	Stock Change <sup>5</sup>	Consumption		
						Imports	Exports	Net Imports <sup>3</sup>					
			Trillion Btu	Trillion Btu	Thousand Barrels	Million Gallons	Trillion Btu	Thousand Barrels			Thousand Barrels	Thousand Barrels	Thousand Barrels
1981	13	6	1,978	83	7	NA	NA	NA	NA	NA	1,978	83	7
1982	35	16	5,369	225	19	NA	NA	NA	NA	NA	5,369	225	19
1983	R64	R29	9,890	415	35	NA	NA	NA	NA	NA	9,890	415	35
1984	R79	R36	12,150	510	43	NA	NA	NA	NA	NA	12,150	510	43
1985	R95	R43	14,693	617	52	NA	NA	NA	NA	NA	14,693	617	52
1986	R109	R49	16,954	712	60	NA	NA	NA	NA	NA	16,954	712	60
1987	R125	R56	19,497	819	69	NA	NA	NA	NA	NA	19,497	819	69
1988	R127	R57	19,780	831	70	NA	NA	NA	NA	NA	19,780	831	70
1989	R128	R57	20,062	843	71	NA	NA	NA	NA	NA	20,062	843	71
1990	R113	R50	17,802	748	63	NA	NA	NA	NA	NA	17,802	748	63
1991	R131	R58	20,627	866	73	NA	NA	NA	NA	NA	20,627	866	73
1992	R148	R65	23,453	985	83	NA	NA	NA	1,791	NA	23,453	985	83
1993	R173	R76	27,484	1,154	97	244	NA	244	2,114	323	27,405	1,151	97
1994	R192	R84	30,689	1,289	109	279	NA	279	2,393	279	30,689	1,289	109
1995	R202	R87	32,325	1,358	114	387	NA	387	2,186	-207	32,919	1,383	117
1996	R144	R62	23,178	973	82	313	NA	313	2,065	-121	23,612	992	84
1997	R190	R82	30,674	1,288	109	85	NA	85	2,925	860	29,899	1,256	106
1998	R207	88	33,453	1,405	118	66	NA	66	3,406	481	33,038	1,388	117
1999	215	92	34,881	1,465	123	87	NA	87	4,024	618	34,350	1,443	122
2000	238	101	38,627	1,622	137	116	NA	116	3,400	-624	39,367	1,653	139
2001	259	110	42,028	1,765	149	315	NA	315	4,298	898	41,445	1,741	147
2002	313	133	50,956	2,140	180	306	NA	306	6,200	1,902	49,360	2,073	175
2003	410	R173	66,772	2,804	236	292	NA	292	5,978	-222	67,286	2,826	238
2004	497	210	81,058	3,404	287	3,542	NA	3,542	6,002	24	84,576	3,552	299
2005	R569	R240	92,961	3,904	329	3,234	NA	3,234	5,563	-439	96,634	4,059	342
2006	R711	R299	116,294	4,884	412	17,408	NA	17,408	8,760	3,197	130,505	5,481	462
2007	R948	R398	R155,263	R6,521	R549	R10,457	NA	R10,457	R10,535	R1,775	R163,945	R6,886	R580
2008 <sup>P</sup>	1,340	562	219,927	9,237	778	12,347	NA	12,347	14,219	63,710	228,564	9,600	809

<sup>1</sup> Total corn and other biomass inputs to the production of fuel ethanol.

<sup>2</sup> Losses and co-products from the production of fuel ethanol. Does not include natural gas, electricity, and other non-biomass energy used in the production of fuel ethanol—these are included in the industrial sector consumption statistics for the appropriate energy source.

<sup>3</sup> Net imports equal imports minus exports.

<sup>4</sup> Stocks are at end of year.

<sup>5</sup> A negative number indicates a decrease in stocks and a positive number indicates an increase.

<sup>6</sup> Derived from preliminary 2007 stocks value, not final 2007 value shown in this table.

R=Revised. P=Preliminary. NA=Not available.

Notes: • Fuel ethanol data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to trillion Btu by multiplying by 0.003539 (the approximate heat content of fuel ethanol—see Table A3). • Through 1980, data are not available. For 1981-1992, data are estimates. Beginning in 1993, only data for feedstock and losses and co-products are estimates. • Totals may not equal sum of components due to independent rounding.

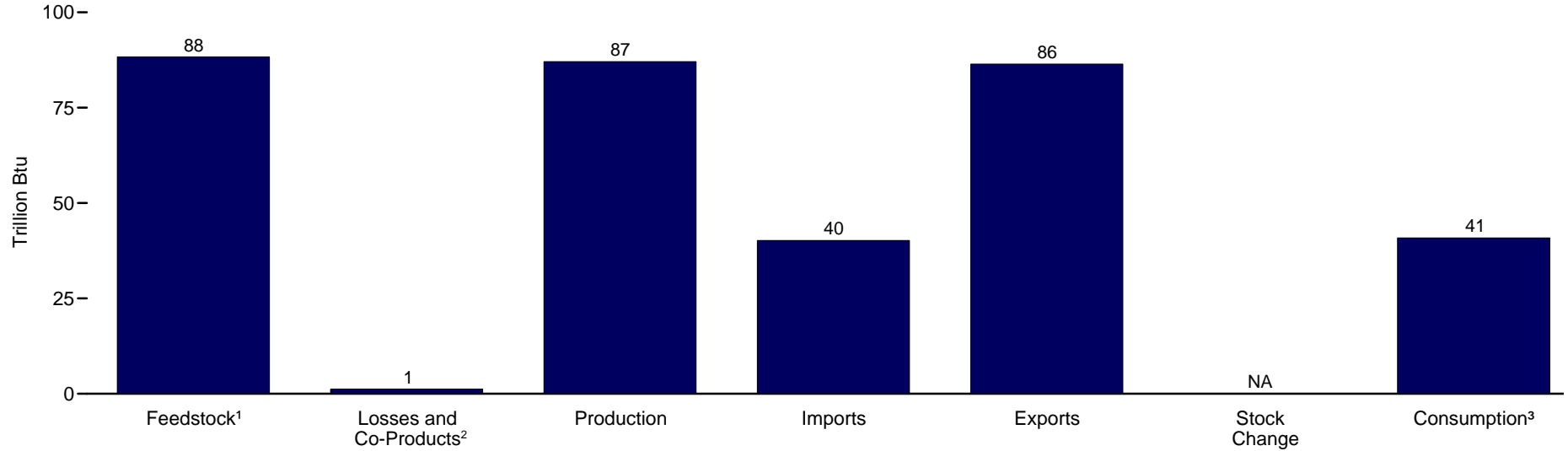
Web Page: For related information, see [http://www.eia.doe.gov/oil\\_gas/petroleum/data\\_publications/petroleum\\_supply\\_monthly/psm.html](http://www.eia.doe.gov/oil_gas/petroleum/data_publications/petroleum_supply_monthly/psm.html).

Sources: **Feedstock:** Calculated as fuel ethanol production in thousand barrels multiplied by the fuel ethanol feedstock factor—see Table A3. **Losses and Co-products:** Calculated as fuel ethanol feedstock

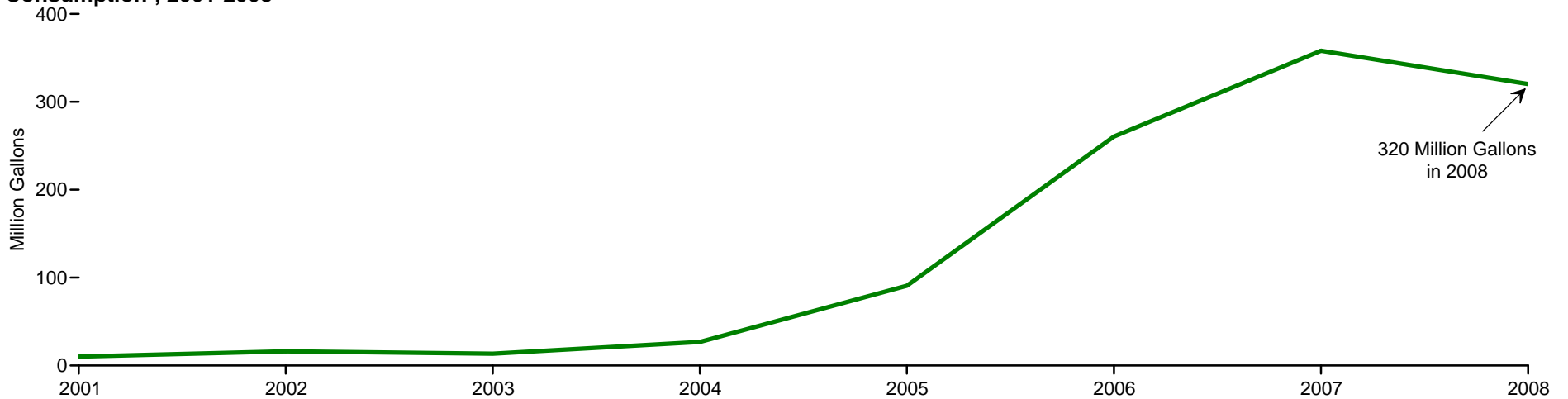
minus fuel ethanol production. **Production:** • 1981-1992—Fuel ethanol production is assumed to equal fuel ethanol consumption—see sources for "Consumption." • 1993-2004—Calculated as fuel ethanol consumption plus fuel ethanol stock change minus fuel ethanol net imports. These data differ slightly from the original production data from Energy Information Administration (EIA), Form EIA-819, "Monthly Oxygenate Report," and predecessor form, which were not reconciled and updated to be consistent with the final balance. • 2005 forward—EIA, Form EIA-819, "Monthly Oxygenate Report." **Trade, Stocks, and Stock Change:** • 1992-2007—EIA, *Petroleum Supply Annual (PSA)*, annual reports. • 2008—EIA, *Petroleum Supply Monthly (PSM)*, monthly reports. **Consumption:** • 1981-1989—EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 10; and EIA, Office of Coal, Nuclear, Electric and Alternate Fuels (CNEAF), estimates. • 1990-1992—EIA, *Estimates of U.S. Biomass Energy Consumption 1992*, Table D2; and EIA, CNEAF, estimates. • 1993-2004—EIA, *PSA*, annual reports, Tables 2 and 16. Calculated as ten percent of oxygenated finished motor gasoline field production (Table 2), plus fuel ethanol refinery input (Table 16). • 2005-2007—EIA, *PSA*, annual reports, Tables 1 and 15. Calculated as motor gasoline blending components adjustments (Table 1), plus finished motor gasoline adjustments (Table 1), plus fuel ethanol refinery and blender net inputs (Table 15). • 2008—EIA, *PSM*, monthly reports, Tables 1 and 27. Calculated as motor gasoline blending components adjustments (Table 1), plus finished motor gasoline adjustments (Table 1), plus fuel ethanol refinery and blender net inputs (Table 27).

## Figure 10.4 Biodiesel Overview

### Overview, 2008



### Consumption<sup>3</sup>, 2001-2008



<sup>1</sup>Total vegetable oil and other biomass inputs to the production of biodiesel.

<sup>2</sup>Losses and co-products from the production of biodiesel.

<sup>3</sup>Calculated as biodiesel production plus biodiesel net imports.

NA= Not Available.

Sources: Tables 10.4 and A3.

**Table 10.4 Biodiesel Overview, 2001-2008**

Year	Feedstock <sup>1</sup>	Losses and Co-products <sup>2</sup>	Production			Trade			Stocks	Stock Change	Consumption		
						Imports	Exports	Net Imports <sup>3</sup>					
			Trillion Btu	Trillion Btu	Thousand Barrels	Million Gallons	Trillion Btu	Thousand Barrels			Thousand Barrels	Thousand Barrels	Thousand Barrels
2001	1	(s)	204	9	1	78	39	39	NA	NA	243	10	1
2002	1	(s)	250	10	1	191	56	135	NA	NA	385	16	2
2003	2	(s)	338	14	2	94	110	-16	NA	NA	322	14	2
2004	4	(s)	666	28	4	97	124	-26	NA	NA	640	27	3
2005	12	(s)	2,162	91	12	207	206	1	NA	NA	2,163	91	12
2006	32	(s)	5,963	250	32	1,069	828	242	NA	NA	6,204	261	33
2007	<sup>R</sup> 63	1	<sup>R</sup> 11,662	<sup>R</sup> 490	<sup>R</sup> 62	3,342	6,477	-3,135	NA	NA	8,528	358	46
2008 <sup>P</sup>	88	1	16,251	683	87	7,502	16,128	-8,626	NA	NA	7,624	320	41

<sup>1</sup> Total vegetable oil and other biomass inputs to the production of biodiesel.

<sup>2</sup> Losses and co-products from the production of biodiesel. Does not include natural gas, electricity, and other non-biomass energy used in the production of biodiesel—these are included in the industrial sector consumption statistics for the appropriate energy source.

<sup>3</sup> Net imports equal imports minus exports.

R=Revised. P=Preliminary. NA=Not available. (s)=Less than 0.5 trillion Btu.

Notes: • Biodiesel data in thousand barrels are converted to million gallons by multiplying by 0.042, and are converted to trillion Btu by multiplying by 0.005359 (the approximate heat content of biodiesel—see Table A3). For other conversion factors related to biodiesel, see Table A3 (columns 11 and 12, and footnote 8). • Through 2000, data are not available. Beginning in 2001, data are estimates. • Totals may not equal sum of components due to independent rounding.

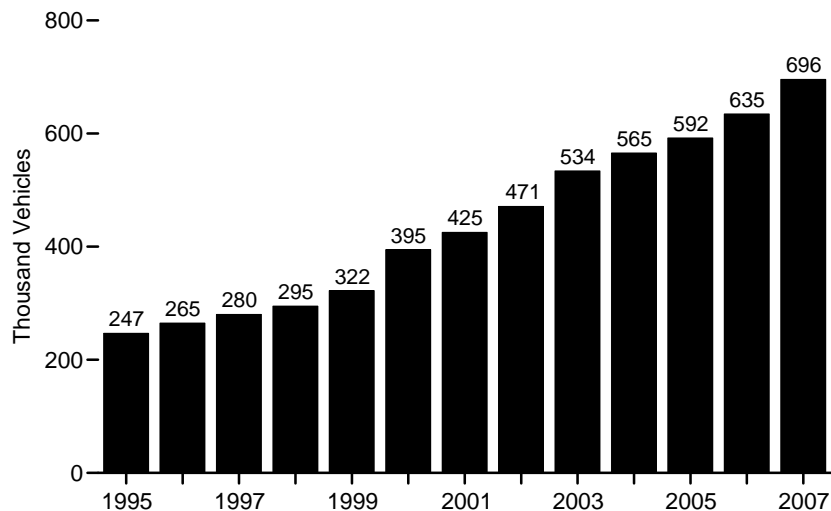
Web Page: For related information, see <http://www.census.gov/cir/www/311/m311k.html>.

Sources: **Feedstock:** Calculated as biodiesel production in thousand barrels multiplied by 0.005433 (the biodiesel feedstock factor—see Table A3). **Losses and Co-products:** Calculated as biodiesel

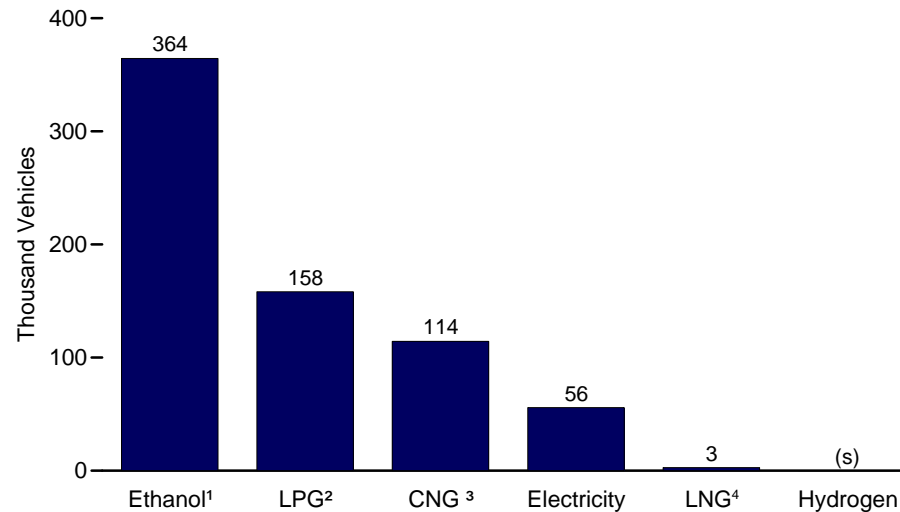
feedstock minus biodiesel production. **Production:** • 2001-2005—U.S. Department of Agriculture, Commodity Credit Corporation, Bioenergy Program records. Annual data are derived from quarterly data. • 2006—U.S. Department of Commerce, Bureau of the Census, "M311K - Fats and Oils: Production, Consumption, and Stocks," Table 3A, data for soybean oil consumed in methyl esters (biodiesel). In addition, the Energy Information Administration (EIA), Office of Integrated Analysis and Forecasting, estimates that 14.4 million gallons of yellow grease were consumed in methyl esters (biodiesel). • 2007 and 2008—U.S. Department of Commerce, Bureau of the Census, "M311K - Fats and Oils: Production, Consumption, and Stocks," Table 3A, data for all fats and oils consumed in methyl esters (biodiesel). **Trade:** U.S. Department of Agriculture, imports data for Harmonized Tariff Schedule code 3824.90.40.20 (Fatty Esters Animal/Vegetable/Mixture), and exports data for Schedule B code 3824.90.40.00 (Fatty Substances Animal/Vegetable/Mixture). Although these categories include products other than biodiesel (such as those destined for soaps, cosmetics, and other items), biodiesel is the largest component. In the absence of other reliable data for biodiesel trade, EIA sees these data as good estimates. **Consumption:** Calculated as biodiesel production plus biodiesel net imports.

**Figure 10.5 Estimated Number of Alternative-Fueled Vehicles in Use and Alternative Fuel Consumption**

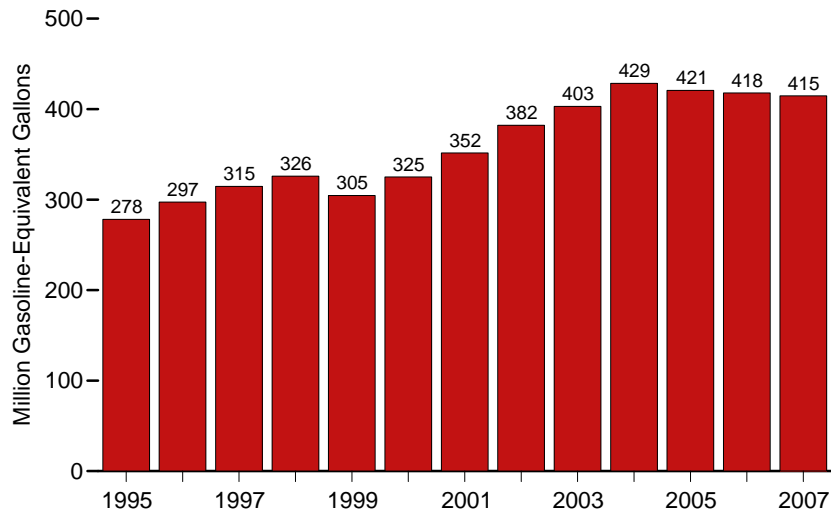
**Vehicles in Use, 1995-2007**



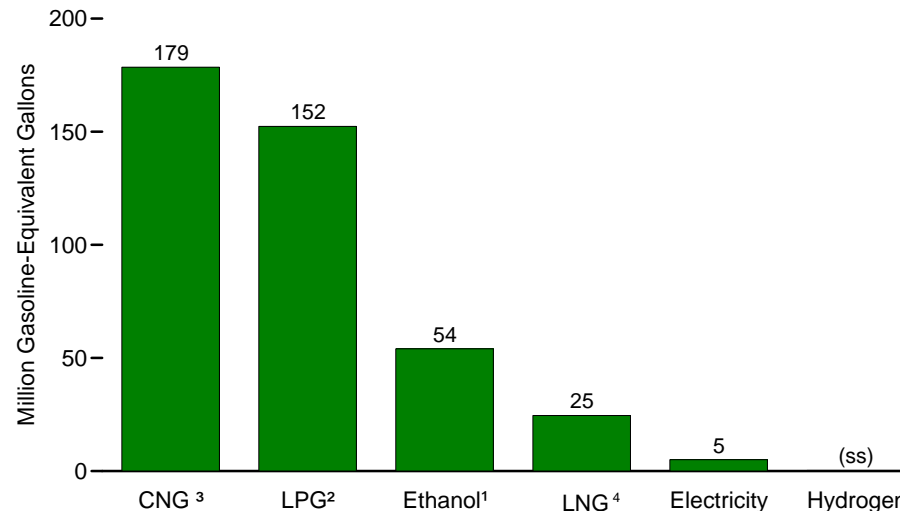
**Vehicles in Use by Fuel Type, 2007**



**Fuel Consumption, 1995-2007**



**Fuel Consumption by Type, 2007**



<sup>1</sup> Ethanol, 85 percent (E85). Includes only those E85 vehicles believed to be used as alternative-fueled vehicles, primarily fleet-operated vehicles; excludes other vehicles with E85-fueling capability.

<sup>2</sup> Liquefied petroleum gases.

<sup>3</sup> Compressed natural gas.

<sup>4</sup> Liquefied natural gas.

(s)=Fewer than 0.5 thousand vehicles.

(ss)=Less than 0.5 million gasoline-equivalent gallons.

Source: Table 10.5.

**Table 10.5 Estimated Number of Alternative-Fueled Vehicles in Use and Fuel Consumption, 1992-2007**

Year	Alternative and Replacement Fuels <sup>1</sup>											Oxygenates <sup>2</sup>			Bio-diesel <sup>10</sup>	Total
	Liquefied Petroleum Gases	Compressed Natural Gas	Liquefied Natural Gas	Methanol, 85 Percent (M85) <sup>3</sup>	Methanol, Neat (M100) <sup>4</sup>	Ethanol, 85 Percent (E85) <sup>3,5</sup>	Ethanol, 95 Percent (E95) <sup>3</sup>	Electricity <sup>6</sup>	Hydrogen	Other Fuels <sup>7</sup>	Subtotal	Methyl Tertiary Butyl Ether <sup>8</sup>	Ethanol in Gasohol <sup>9</sup>	Total		
<b>Alternative-Fueled Vehicles in Use <sup>11</sup> (number)</b>																
1992	NA	23,191	90	4,850	404	172	38	1,607	NA	NA	NA	NA	NA	NA	NA	
1993	NA	32,714	299	10,263	414	441	27	1,690	NA	NA	NA	NA	NA	NA	NA	
1994	NA	41,227	484	15,484	415	605	33	2,224	NA	NA	NA	NA	NA	NA	NA	
1995	172,806	50,218	603	18,319	386	1,527	136	2,860	0	0	246,855	NA	NA	NA	NA	
1996	175,585	60,144	663	20,265	172	4,536	361	3,280	0	0	265,006	NA	NA	NA	NA	
1997	175,679	68,571	813	21,040	172	9,130	347	4,453	0	0	280,205	NA	NA	NA	NA	
1998	177,183	78,782	1,172	19,648	200	12,788	14	5,243	0	0	295,030	NA	NA	NA	NA	
1999	178,610	91,267	1,681	18,964	198	24,604	14	6,964	0	0	322,302	NA	NA	NA	NA	
2000	181,994	100,750	2,090	10,426	0	87,570	4	11,830	0	0	394,664	NA	NA	NA	NA	
2001	185,053	111,851	2,576	7,827	0	100,303	0	17,847	0	0	425,457	NA	NA	NA	NA	
2002	187,680	120,839	2,708	5,873	0	120,951	0	33,047	0	0	471,098	NA	NA	NA	NA	
2003	190,369	114,406	2,640	0	0	179,090	0	47,485	9	0	533,999	NA	NA	NA	NA	
2004	182,864	118,532	2,717	0	0	211,800	0	49,536	43	0	565,492	NA	NA	NA	NA	
2005	173,795	117,699	2,748	0	0	246,363	0	51,398	119	3	592,125	NA	NA	NA	NA	
2006	164,846	116,131	2,798	0	0	297,099	0	53,526	159	3	634,562	NA	NA	NA	NA	
2007 <sup>P</sup>	158,254	114,391	2,781	0	0	364,384	0	55,730	223	3	695,766	NA	NA	NA	NA	
<b>Fuel Consumption <sup>12</sup> (thousand gasoline-equivalent gallons)</b>																
1992	NA	17,159	598	1,121	2,672	22	87	359	NA	NA	NA	1,175,964	719,408	1,895,372	NA	NA
1993	NA	22,035	1,944	1,671	3,321	49	82	288	NA	NA	NA	2,070,897	779,958	2,850,854	NA	NA
1994	NA	24,643	2,398	2,455	3,347	82	144	430	NA	NA	NA	2,020,455	868,113	2,888,569	NA	NA
1995	233,178	35,865	2,821	2,122	2,255	195	1,021	663	0	0	278,121	2,693,407	934,615	3,628,022	NA	3,906,142
1996	239,648	47,861	3,320	1,862	364	712	2,770	773	0	0	297,310	2,751,955	677,537	3,429,492	NA	3,726,802
1997	238,845	66,495	3,798	1,630	364	1,314	1,166	1,010	0	0	314,621	3,106,745	852,514	3,959,260	NA	4,273,880
1998	241,881	73,859	5,463	1,271	471	1,772	61	1,202	0	0	325,980	2,905,781	912,858	3,818,639	NA	4,144,620
1999	210,247	81,211	5,959	1,126	469	4,019	64	1,524	0	0	304,618	3,405,390	975,255	4,380,645	NA	4,685,263
2000	213,012	88,478	7,423	614	0	12,388	13	3,058	0	0	324,986	3,298,803	1,114,313	4,413,116	6,828	4,744,930
2001	216,319	106,584	9,122	461	0	15,007	0	4,066	0	0	351,558	3,354,949	1,173,323	4,528,272	<sup>R</sup> 10,627	<sup>R</sup> 4,890,457
2002	223,600	123,081	9,593	354	0	18,250	0	7,274	0	0	382,152	3,122,859	1,450,721	4,573,580	<sup>R</sup> 16,824	<sup>R</sup> 4,972,556
2003	224,697	133,222	13,503	0	0	26,376	0	5,141	2	0	402,941	2,368,400	1,919,572	4,287,972	<sup>R</sup> 14,082	<sup>R</sup> 4,704,995
2004	211,883	158,903	20,888	0	0	31,581	0	5,269	8	0	428,532	1,877,300	2,414,167	4,291,467	<sup>R</sup> 27,968	<sup>R</sup> 4,747,967
2005	188,171	166,878	22,409	0	0	38,074	0	5,219	25	2	420,778	1,654,500	2,756,663	4,411,163	<sup>R</sup> 94,513	<sup>R</sup> 4,926,454
2006	173,130	172,011	23,474	0	0	44,041	0	5,104	41	2	417,803	435,000	3,729,168	4,164,168	<sup>R</sup> 271,159	<sup>R</sup> 4,853,130
2007 <sup>P</sup>	152,360	178,565	24,594	0	0	54,091	0	5,037	66	2	414,715	618,000	4,694,304	5,312,304	372,691	6,099,710

<sup>1</sup> See "Alternative Fuel" and "Replacement Fuel" in Glossary.

<sup>2</sup> See "Oxygenates" in Glossary.

<sup>3</sup> Remaining portion is motor gasoline. Consumption data include the motor gasoline portion of the fuel.

<sup>4</sup> One hundred percent methanol.

<sup>5</sup> Includes only those E85 vehicles believed to be used as alternative-fuels vehicles (AFVs), primarily fleet-operated vehicles; excludes other vehicles with E85-fueling capability. In 1997, some vehicle manufacturers began including E85-fueling capability in certain model lines of vehicles. For 2007, the Energy Information Administration (EIA) estimates that the number of E85 vehicles that are capable of operating on E85, motor gasoline, or both, is about 7.1 million. Many of these AFVs are sold and used as traditional gasoline-powered vehicles.

<sup>6</sup> Excludes gasoline-electric hybrids.

<sup>7</sup> May include P-Series fuel or any other fuel designated by the Secretary of Energy as an alternative fuel in accordance with the Energy Policy Act of 1995.

<sup>8</sup> In addition to methyl tertiary butyl ether (MTBE), includes a very small amount of other ethers, primarily tertiary amyl methyl ether (TAME) and ethyl tertiary butyl ether (ETBE).

<sup>9</sup> Data do not include the motor gasoline portion of the fuel.

<sup>10</sup> "Biodiesel" may be used as a diesel fuel substitute or diesel fuel additive or extender. See "Biodiesel" in Glossary.

<sup>11</sup> "Vehicles in Use" data represent accumulated acquisitions, less retirements, as of the end of each

calendar year; data do not include concept and demonstration vehicles that are not ready for delivery to end users. See "Alternative-Fueled Vehicle" in Glossary.

<sup>12</sup> Fuel consumption quantities are expressed in a common base unit of gasoline-equivalent gallons to allow comparisons of different fuel types. Gasoline-equivalent gallons do not represent gasoline displacement. Gasoline equivalent is computed by dividing the gross heat content of the replacement fuel by the gross heat content of gasoline (using an approximate heat content of 122,619 Btu per gallon) and multiplying the result by the replacement fuel consumption value. See "Heat Content" in Glossary.

R=Revised. P=Preliminary. NA=Not available.

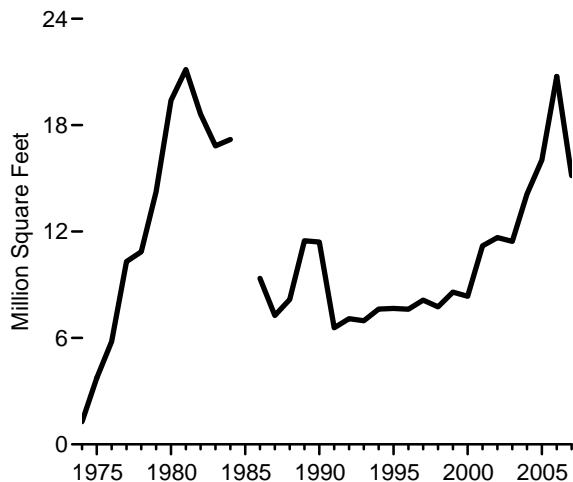
Note: Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

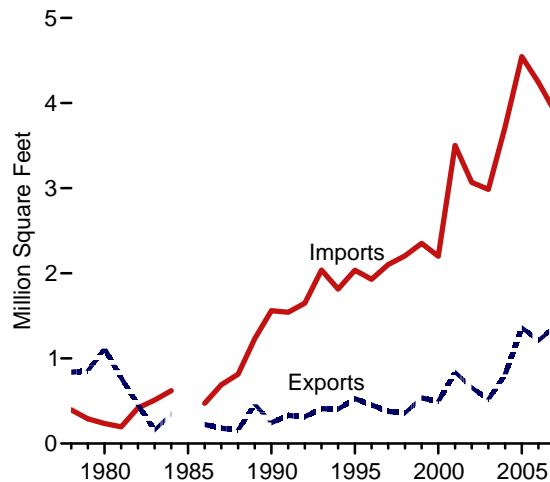
Sources: • 1992-1994—Science Applications International Corporation, "Alternative Transportation Fuels and Vehicles Data Development," unpublished final report prepared for the EIA, (McLean, VA, July 1996), and U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. Data were revised by using gross instead of net heat contents. For a table of gross and net heat contents, see EIA, *Alternatives to Traditional Transportation Fuels: An Overview* (June 1994), Table 22. • 1995-2002—EIA, "Alternatives to Traditional Transportation Fuels 2003 Estimated Data" (February 2004), Tables 1 and 10, and unpublished revisions. Data were revised by using gross instead of net heat contents. • 2003 forward—EIA, "Alternatives to Traditional Transportation Fuels 2007" (April 2009), Tables V1 and C1, and unpublished revisions.

**Figure 10.6 Solar Thermal Collector Shipments by Type, Price, and Trade**

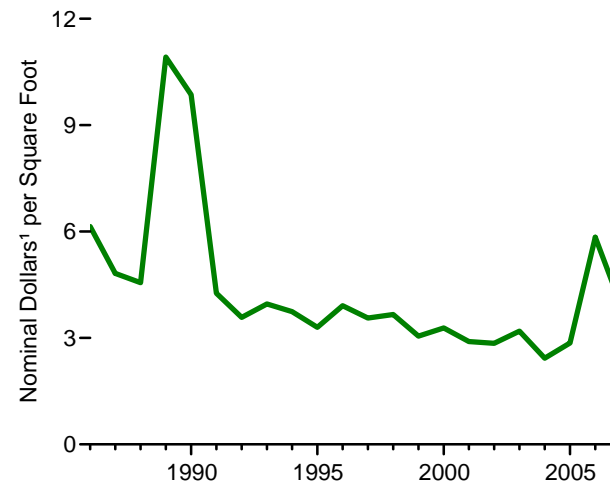
**Total Shipments, 1974-1984 and 1986-2007**



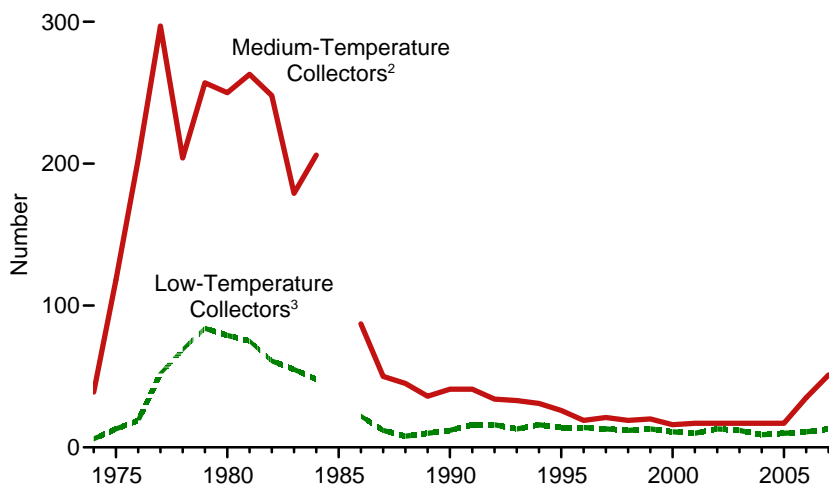
**Trade, 1978-1984 and 1986-2007**



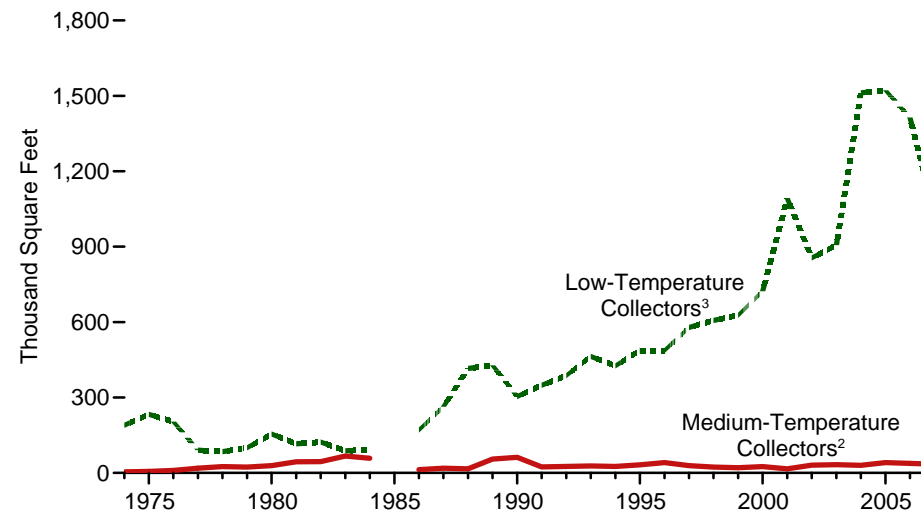
**Price of Total Shipments, 1986-2007**



**Number of U.S. Manufacturers by Type of Collector, 1974-1984 and 1986-2007**



**Average Annual Shipments per Manufacturer, 1974-1984 and 1986-2007**



<sup>1</sup> See "Nominal Dollars" in Glossary.

<sup>2</sup> Collectors that generally operate in the temperature range of 140 degrees Fahrenheit to 180 degrees Fahrenheit but can also operate at temperatures as low as 110 degrees Fahrenheit. Special collectors—evacuated tube collectors or concentrating (focusing) collectors—are included in the medium-temperature category.

<sup>3</sup> Collectors that generally operate at temperatures below 110 degrees Fahrenheit.

Notes: • Shipments are for domestic and export shipments, and may include imports that subsequently were shipped to domestic or foreign customers. • Data were not collected for 1985.

Source: Table 10.6.

**Table 10.6 Solar Thermal Collector Shipments by Type, Price, and Trade, 1974-2007**

(Thousand Square Feet, Except as Noted)

Year	Low-Temperature Collectors <sup>1</sup>				Medium-Temperature Collectors <sup>2</sup>				High-Temperature Collectors <sup>3</sup>		Total Shipments		Trade	
	Number of U.S. Manufacturers	Quantity Shipped	Shipments per Manufacturer	Price <sup>4</sup> (nominal dollars <sup>5</sup> per square foot)	Number of U.S. Manufacturers	Quantity Shipped	Shipments per Manufacturer	Price <sup>4</sup> (nominal dollars <sup>5</sup> per square foot)	Quantity Shipped	Price <sup>4</sup> (nominal dollars <sup>5</sup> per square foot)	Quantity Shipped	Price <sup>4</sup> (nominal dollars <sup>5</sup> per square foot)	Imports	Exports
1974	6	1,137	190	NA	39	137	4	NA	NA	NA	1,274	NA	NA	NA
1975	13	3,026	233	NA	118	717	6	NA	NA	NA	3,743	NA	NA	NA
1976	19	3,876	204	NA	203	1,925	10	NA	NA	NA	5,801	NA	NA	NA
1977	52	4,743	91	NA	297	5,569	19	NA	NA	NA	10,312	NA	NA	NA
1978	69	5,872	85	NA	204	4,988	25	NA	NA	NA	10,860	NA	396	840
1979	84	8,394	100	NA	257	5,856	23	NA	NA	NA	14,251	NA	290	855
1980	79	12,233	155	NA	250	7,165	29	NA	NA	NA	19,398	NA	235	1,115
1981	75	8,677	116	NA	263	11,456	44	NA	NA	NA	21,133	NA	196	771
1982	61	7,476	123	NA	248	11,145	45	NA	NA	NA	18,621	NA	418	455
1983	55	4,853	88	NA	179	11,975	67	NA	NA	NA	16,828	NA	511	159
1984	48	4,479	93	NA	206	11,939	58	NA	773	NA	17,191	NA	621	348
1985 <sup>6</sup>	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1986	22	3,751	171	2.30	87	1,111	13	18.30	4,498	NA	9,360	6.14	473	224
1987	12	3,157	263	2.18	50	957	19	13.50	3,155	NA	7,269	4.82	691	182
1988	8	3,326	416	2.24	45	732	16	14.88	4,116	NA	8,174	4.56	814	158
1989	10	4,283	428	2.60	36	1,989	55	11.74	5,209	17.76	11,482	10.92	1,233	461
1990	12	3,645	304	2.90	41	2,527	62	7.68	5,237	15.74	11,409	9.86	1,562	245
1991	16	5,585	349	2.90	41	989	24	11.94	1	31.94	6,574	4.26	1,543	332
1992	16	6,187	387	2.50	34	897	26	10.96	2	75.66	7,086	3.58	1,650	316
1993	13	6,025	464	2.80	33	931	28	11.74	12	22.12	6,968	3.96	2,039	411
1994	16	6,823	426	2.54	31	803	26	13.54	2	177.00	7,627	3.74	1,815	405
1995	14	6,813	487	2.32	26	840	32	10.48	13	53.26	7,666	3.30	2,037	530
1996	14	6,821	487	2.67	19	785	41	14.48	10	18.75	7,616	3.91	1,930	454
1997	13	7,524	579	2.60	21	606	29	15.17	7	25.00	8,138	3.56	2,102	379
1998	12	7,292	607	2.83	19	443	23	15.17	21	53.21	7,756	3.66	2,206	360
1999	13	8,152	627	2.08	20	427	21	19.12	4	286.49	8,583	3.05	2,352	537
2000	11	7,948	723	2.09	16	400	25	W	5	W	8,354	3.28	2,201	496
2001	10	10,919	1,092	2.15	17	268	16	W	2	W	11,189	2.90	3,502	840
2002	13	11,126	856	1.97	17	535	31	W	2	W	11,663	2.85	3,068	659
2003	12	10,877	906	2.08	17	560	33	W	7	W	11,444	3.19	2,986	518
2004	9	13,608	1,512	1.80	17	506	30	19.30	0	--	14,114	2.43	3,723	813
2005	10	15,224	1,522	2.00	17	702	41	W	115	W	16,041	2.86	4,546	1,361
2006	11	15,546	1,413	1.95	35	1,346	38	W	3,852	W	20,744	5.84	4,244	1,211
2007	13	13,323	1,025	1.97	51	1,797	35	W	33	W	15,153	3.95	3,891	1,376

<sup>1</sup> Low-temperature collectors are solar thermal collectors that generally operate at temperatures below 110° F.

<sup>2</sup> Medium-temperature collectors are solar thermal collectors that generally operate in the temperature range of 140° F to 180° F but can also operate at temperatures as low as 110° F. Special collectors are included in this category. Special collectors are evacuated tube collectors or concentrating (focusing) collectors. They operate in the temperature range from just above ambient temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes).

<sup>3</sup> High-temperature collectors are solar thermal collectors that generally operate at temperatures above 180° F. High-temperature collector shipments are dominated by one manufacturer.

<sup>4</sup> Prices equal shipment value divided by quantity shipped. Value includes charges for advertising and warranties. Excluded are excise taxes and the cost of freight or transportation for the shipments.

<sup>5</sup> See "Nominal Dollars" in Glossary.

<sup>6</sup> No data are available for 1985.

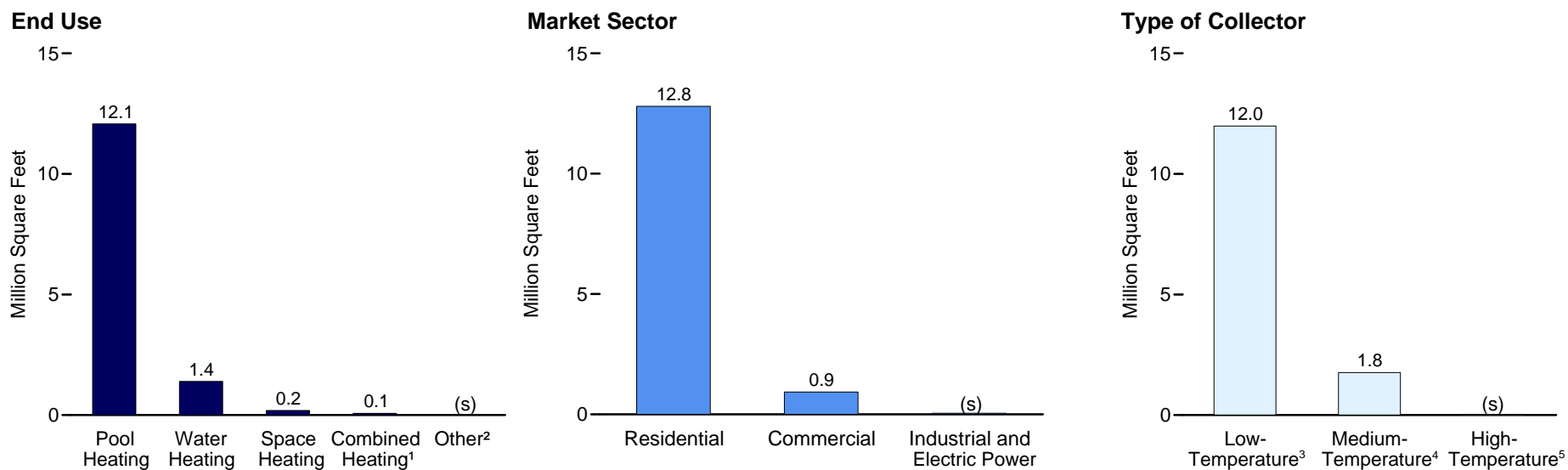
NA=Not available. -- = Not applicable. W=Value withheld to avoid disclosure of proprietary company data.

Notes: • Shipments data are for domestic and export shipments, and may include imports that subsequently were shipped to domestic or foreign customers. • Manufacturers producing more than one type of collector are accounted for in both groups.

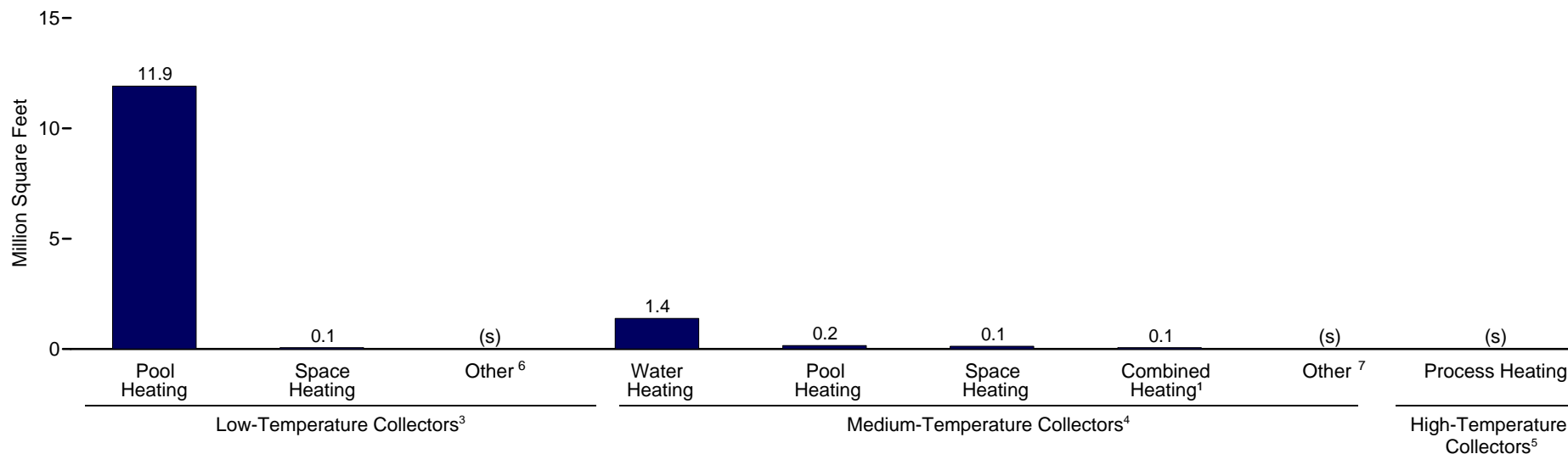
Web Page: For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

Sources: • 1974-1992—Energy Information Administration (EIA), *Solar Collector Manufacturing Activity*, annual reports, and Form CE-63A, "Annual Solar Thermal Collector Manufacturers Survey," and predecessor forms. • 1993-2002—EIA, *Renewable Energy Annual*, annual reports, and Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey," and predecessor form. • 2003-2006—EIA, *Solar Thermal and Photovoltaic Collector Manufacturing Activities*, annual reports, and Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey." • 2007—EIA, *Solar Thermal Collector Manufacturing Activities 2007* (October 2008), Tables 2.1, 2.3, and 2.12, and Form EIA-63A, "Annual Solar Thermal Collector Manufacturers Survey."

**Figure 10.7 Solar Thermal Collector Domestic Shipments by End-Use, Market Sector, and Type, 2007**



**End Use by Type of Collector**



<sup>1</sup>Combined space and water heating.

<sup>2</sup>Process heating, space cooling, and electricity generation.

<sup>3</sup>Collectors that generally operate at temperatures below 110 degrees Fahrenheit.

<sup>4</sup>Collectors that generally operate in the temperature range of 140 degrees Fahrenheit to 180 degrees Fahrenheit but can also operate at temperatures as low as 110 degrees Fahrenheit.

<sup>5</sup>Collectors that generally operate at temperatures above 180 degrees Fahrenheit.

<sup>6</sup>Water heating and electric generation.

<sup>7</sup>Space cooling and electricity generation.

(s)=Less than 0.05 million square feet.

Source: Table 10.7.

**Table 10.7 Solar Thermal Collector Shipments by Market Sector, End Use, and Type, 2000-2007**  
(Thousand Square Feet)

Year and Type	By Market Sector					By End Use							Total
	Residential	Commercial <sup>1</sup>	Industrial <sup>2</sup>	Electric Power <sup>3</sup>	Other <sup>4</sup>	Pool Heating	Water Heating	Space Heating	Space Cooling	Combined Heating <sup>5</sup>	Process Heating	Electricity Generation	
<b>Total Shipments<sup>6</sup></b>													
<b>2000 Total</b> ....	<b>7,473</b>	<b>810</b>	<b>57</b>	<b>5</b>	<b>10</b>	<b>7,863</b>	<b>367</b>	<b>99</b>	<b>0</b>	<b>2</b>	<b>20</b>	<b>3</b>	<b>8,355</b>
Low <sup>7</sup> .....	7,102	786	52	0	9	7,836	0	92	0	0	20	0	7,949
Medium <sup>8</sup> .....	370	23	5	(s)	1	26	365	7	0	2	0	0	400
High <sup>9</sup> .....	1	1	0	3	0	0	2	0	0	(s)	0	3	5
<b>2001 Total</b> ....	<b>10,125</b>	<b>1,012</b>	<b>17</b>	<b>1</b>	<b>35</b>	<b>10,797</b>	<b>274</b>	<b>70</b>	<b>0</b>	<b>12</b>	<b>34</b>	<b>2</b>	<b>11,189</b>
Low <sup>7</sup> .....	9,885	987	12	0	34	10,782	42	61	0	0	34	0	10,919
Medium <sup>8</sup> .....	240	24	5	0	1	16	232	9	0	12	0	0	268
High <sup>9</sup> .....	0	1	0	1	0	0	0	0	0	0	0	2	2
<b>2002 Total</b> ....	<b>11,000</b>	<b>595</b>	<b>62</b>	<b>4</b>	<b>1</b>	<b>11,073</b>	<b>423</b>	<b>146</b>	<b>(s)</b>	<b>17</b>	<b>4</b>	<b>0</b>	<b>11,663</b>
Low <sup>7</sup> .....	10,519	524	2	0	0	11,045	1	0	0	0	0	0	11,046
Medium <sup>8</sup> .....	481	69	60	4	1	28	422	146	(s)	15	4	0	615
High <sup>9</sup> .....	0	2	0	0	0	0	0	0	0	2	0	0	2
<b>2003 Total</b> ....	<b>10,506</b>	<b>864</b>	<b>71</b>	<b>0</b>	<b>2</b>	<b>10,800</b>	<b>511</b>	<b>76</b>	<b>(s)</b>	<b>23</b>	<b>34</b>	<b>0</b>	<b>11,444</b>
Low <sup>7</sup> .....	9,993	813	71	0	0	10,778	0	65	0	0	34	0	10,877
Medium <sup>8</sup> .....	513	44	0	0	2	22	511	11	(s)	16	0	0	560
High <sup>9</sup> .....	0	7	0	0	0	0	0	0	0	7	0	0	7
<b>2004 Total</b> ....	<b>12,864</b>	<b>1,178</b>	<b>70</b>	<b>0</b>	<b>3</b>	<b>13,634</b>	<b>452</b>	<b>13</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>0</b>	<b>14,115</b>
Low <sup>7</sup> .....	12,386	1,178	44	0	0	13,600	0	8	0	0	0	0	13,608
Medium <sup>8</sup> .....	478	0	26	0	3	33	452	5	0	16	0	0	506
High <sup>9</sup> .....	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>2005 Total</b> ....	<b>14,681</b>	<b>1,160</b>	<b>31</b>	<b>114</b>	<b>56</b>	<b>15,041</b>	<b>640</b>	<b>228</b>	<b>2</b>	<b>16</b>	<b>0</b>	<b>114</b>	<b>16,041</b>
Low <sup>7</sup> .....	14,045	1,099	30	0	50	15,022	12	190	0	0	0	0	15,224
Medium <sup>8</sup> .....	636	58	1	0	6	20	628	38	0	16	0	0	702
High <sup>9</sup> .....	0	2	0	114	0	0	0	0	2	0	0	114	115
<b>2006 Total</b> ....	<b>15,123</b>	<b>1,626</b>	<b>42</b>	<b>3,845</b>	<b>107</b>	<b>15,362</b>	<b>1,136</b>	<b>330</b>	<b>3</b>	<b>66</b>	<b>0</b>	<b>3,847</b>	<b>20,744</b>
Low <sup>7</sup> .....	13,906	1,500	40	0	100	15,225	10	290	0	21	0	0	15,546
Medium <sup>8</sup> .....	1,217	120	2	0	7	137	1,126	40	3	38	0	2	1,346
High <sup>9</sup> .....	0	7	0	3,845	0	0	0	0	0	7	0	3,845	3,852
<b>Domestic Shipments<sup>6</sup></b>													
<b>2007 Total</b> ....	<b>12,799</b>	<b>931</b>	<b>46</b>	<b>1</b>	<b>-</b>	<b>12,076</b>	<b>1,393</b>	<b>189</b>	<b>13</b>	<b>73</b>	<b>27</b>	<b>6</b>	<b>13,777</b>
Low <sup>7</sup> .....	11,352	633	-	1	-	11,917	4	63	-	-	-	1	11,986
Medium <sup>8</sup> .....	1,447	298	18	-	-	158	1,389	126	13	73	-	5	1,764
High <sup>9</sup> .....	-	(s)	27	-	-	-	(s)	-	-	-	27	-	27

<sup>1</sup> Through 2006, data are for the commercial sector, excluding government, which is included in "Other." Beginning in 2007, data are for the commercial sector, including government.

<sup>2</sup> Through 2006, data are for the industrial sector and independent power producers. Beginning in 2007, data are for the industrial sector only; independent power producers are included in "Electric Power."

<sup>3</sup> Through 2006, data are for electric utilities only; independent power producers are included in "Industrial." Beginning in 2007, data are for electric utilities and independent power producers.

<sup>4</sup> Through 2006, data are for other sectors such as government, including the military, but excluding space applications. Beginning in 2007, data are for the transportation sector.

<sup>5</sup> Combined space and water heating.

<sup>6</sup> Through 2006, data are for domestic and export shipments, and may include imports that subsequently were shipped to domestic or foreign customers. Beginning in 2007, data are for domestic shipments only.

<sup>7</sup> Low-temperature collectors are solar thermal collectors that generally operate at temperatures below 110° F.

<sup>8</sup> Medium-temperature collectors are solar thermal collectors that generally operate in the temperature

range of 140° F to 180° F, but can also operate at temperatures as low as 110° F. Special collectors are included in this category. Special collectors are evacuated tube collectors or concentrating (focusing) collectors. They operate in the temperature range from just above ambient temperature (low concentration for pool heating) to several hundred degrees Fahrenheit (high concentration for air conditioning and specialized industrial processes).

<sup>9</sup> High-temperature collectors are solar thermal collectors that generally operate at temperatures above 180° F. These are parabolic dish/trough collectors used primarily by independent power producers to generate electricity for the electric grid.

- = No data reported. (s)=Less than 0.5 thousand square feet.

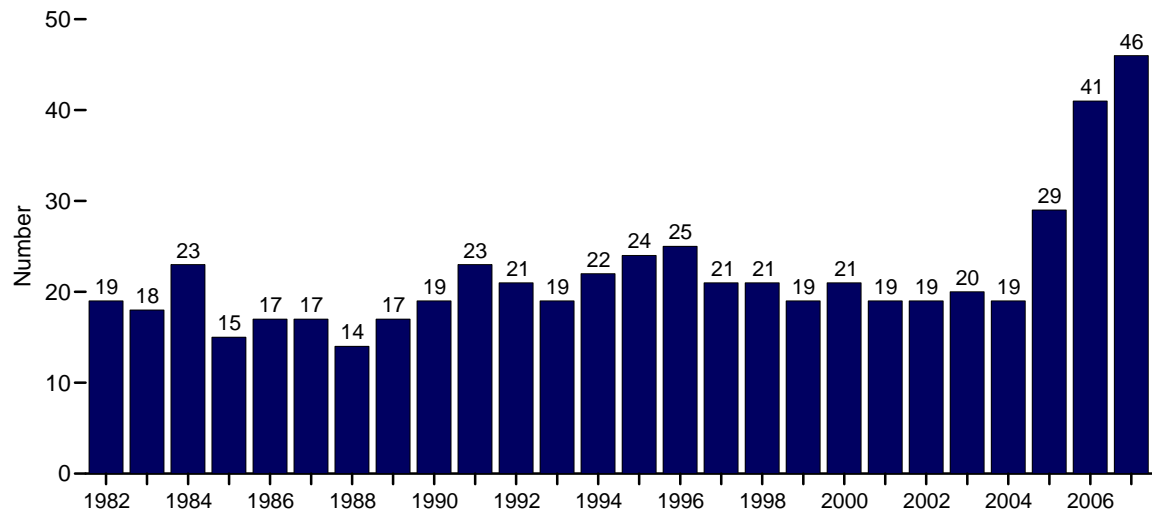
Note: Totals may not equal sum of components due to independent rounding.

Web Page: For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

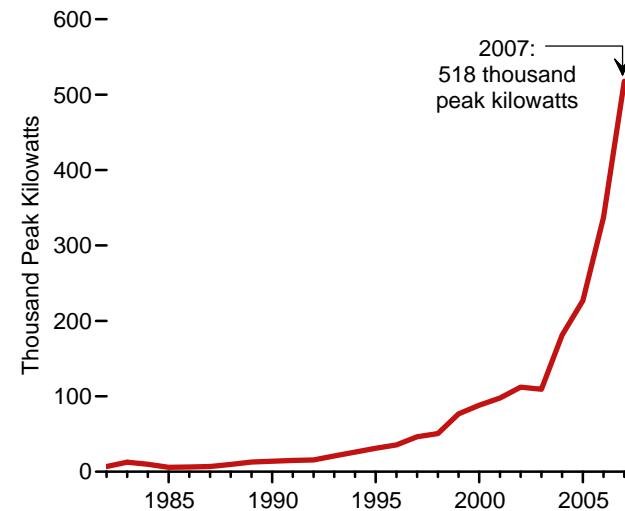
Sources: • 2000-2002—Energy Information Administration (EIA), *Renewable Energy Annual*, annual reports. • 2003-2006—EIA, *Solar Thermal and Photovoltaic Collector Manufacturing Activities*, annual reports. • 2007—EIA, *Solar Thermal Collector Manufacturing Activities 2007* (October 2008), Table 2.13.

**Figure 10.8 Photovoltaic Cell and Module Shipments, Trade, and Prices**

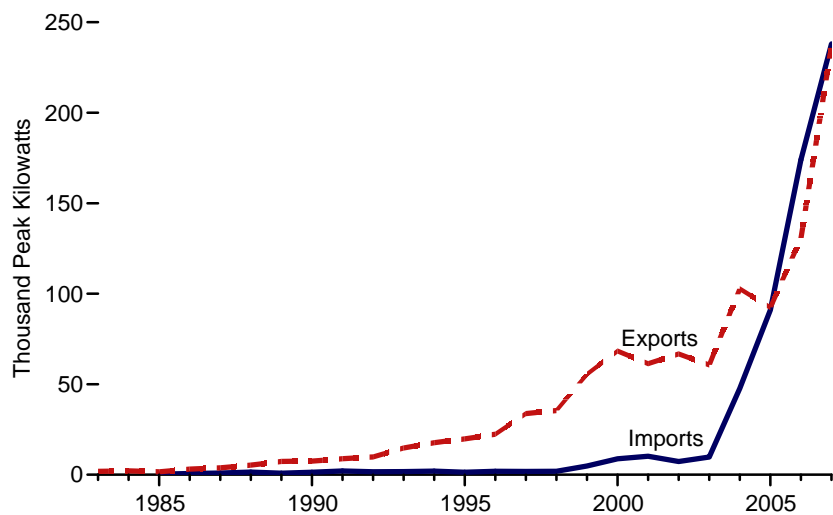
**Number of U.S. Companies Reporting Shipments, 1982-2007**



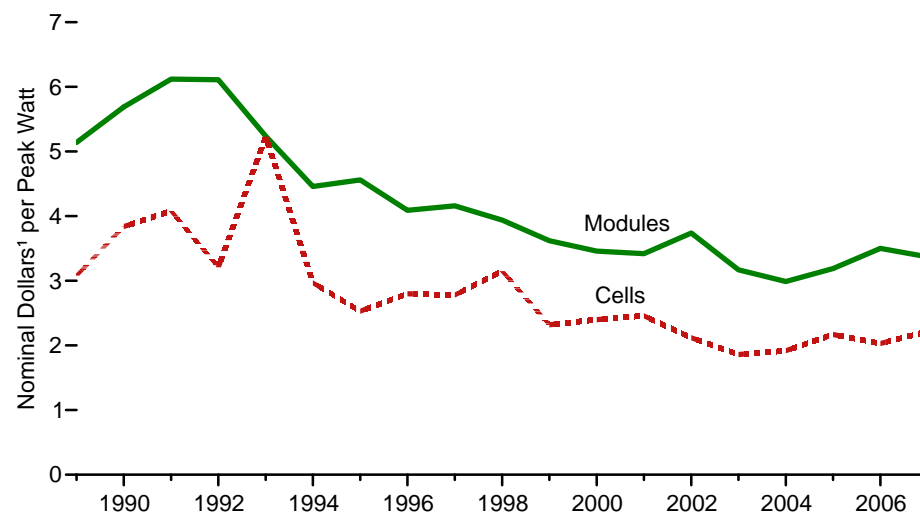
**Total Shipments, 1982-2007**



**Trade, 1983-2007**



**Prices, 1989-2007**



<sup>1</sup> See "Nominal Dollars" in Glossary.

Note: Shipments are for domestic and export shipments, and may include imports that subsequently were shipped to domestic and foreign customers.

Source: Table 10.8.

**Table 10.8 Photovoltaic Cell and Module Shipments by Type, Trade, and Prices, 1982-2007**

	U.S. Companies Reporting Shipments	Shipments			Trade		Prices <sup>1</sup>	
		Crystalline Silicon	Thin-Film Silicon	Total <sup>2</sup>	Imports	Exports	Modules	Cells
Year	Number	Peak Kilowatts <sup>3</sup>					Nominal Dollars <sup>4</sup> per Peak Watt <sup>3</sup>	
1982	19	NA	NA	6,897	NA	NA	NA	NA
1983	18	NA	NA	12,620	NA	1,903	NA	NA
1984	23	NA	NA	9,912	NA	2,153	NA	NA
1985	15	5,461	303	5,769	285	1,670	NA	NA
1986	17	5,806	516	6,333	678	3,109	NA	NA
1987	17	5,613	1,230	6,850	921	3,821	NA	NA
1988	14	7,364	1,895	9,676	1,453	5,358	NA	NA
1989	17	10,747	1,628	12,825	826	7,363	5.14	3.08
1990	<sup>5</sup> 19	12,492	1,321	<sup>5</sup> 13,837	1,398	7,544	5.69	3.84
1991	23	14,205	723	14,939	2,059	8,905	6.12	4.08
1992	21	14,457	1,075	15,583	1,602	9,823	6.11	3.21
1993	19	20,146	782	20,951	1,767	14,814	5.24	5.23
1994	22	24,785	1,061	26,077	1,960	17,714	4.46	2.97
1995	24	29,740	1,266	31,059	1,337	19,871	4.56	2.53
1996	25	33,996	1,445	35,464	1,864	22,448	4.09	2.80
1997	21	44,314	1,886	46,354	1,853	33,793	4.16	2.78
1998	21	47,186	3,318	50,562	1,931	35,493	3.94	3.15
1999	19	73,461	3,269	76,787	4,784	55,562	3.62	2.32
2000	21	85,155	2,736	88,221	8,821	68,382	3.46	2.40
2001	19	84,651	12,541	97,666	10,204	61,356	3.42	2.46
2002	19	104,123	7,396	112,090	7,297	66,778	3.74	2.12
2003	20	97,940	10,966	109,357	9,731	60,693	3.17	1.86
2004	19	159,138	21,978	181,116	47,703	102,770	2.99	1.92
2005	29	172,965	53,826	226,916	90,981	92,451	3.19	2.17
2006	41	233,518	101,766	337,268	173,977	130,757	3.50	2.03
2007	46	310,330	202,519	517,684	238,018	237,209	3.37	2.22

<sup>1</sup> Prices equal shipment value divided by quantity shipped. Value includes charges for advertising and warranties. Excluded are excise taxes and the cost of freight or transportation for the shipments.

<sup>2</sup> Includes all types of photovoltaic cells and modules (single-crystal silicon, cast silicon, ribbon silicon, thin-film silicon, and concentrator silicon). Excludes cells and modules for space and satellite applications.

<sup>3</sup> See "Peak Kilowatt" and "Peak Watt" in Glossary.

<sup>4</sup> See "Nominal Dollars" in Glossary.

<sup>5</sup> Data were imputed for one nonrespondent who exited the industry during 1990.

NA=Not available.

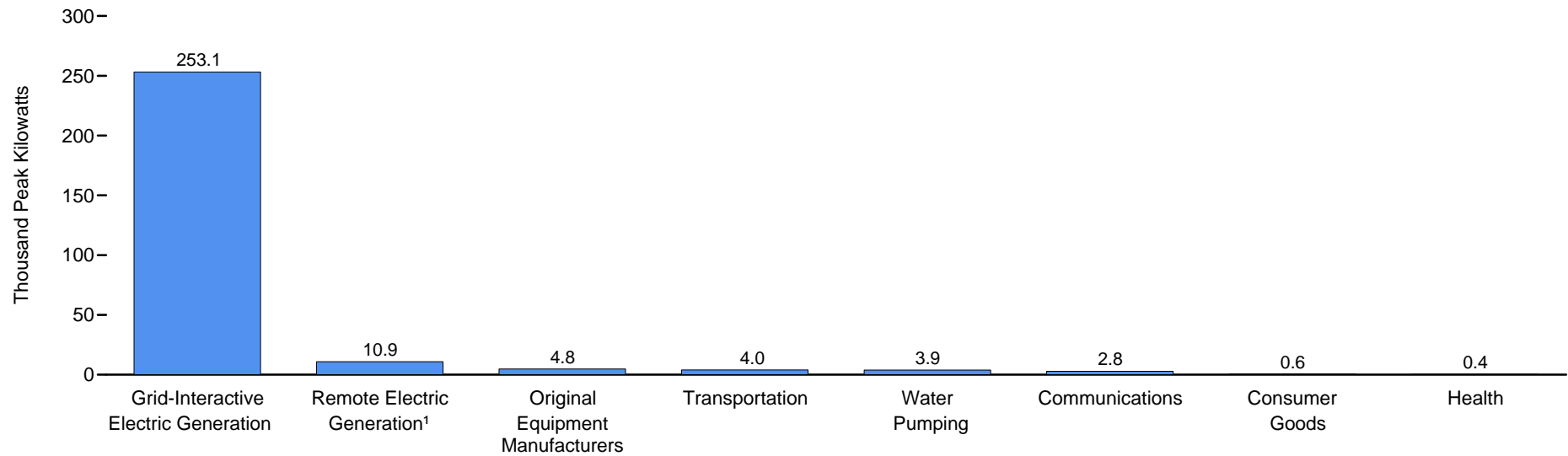
Note: Shipments data are for domestic and export shipments, and may include imports that subsequently were shipped to domestic or foreign customers.

Web Page: For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

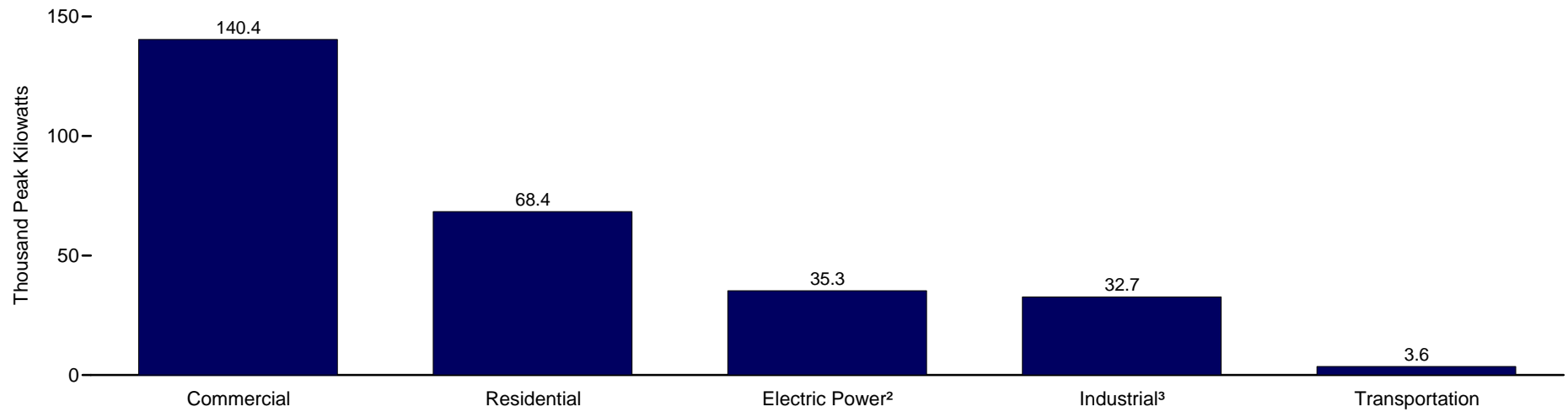
Sources: • 1982-1992—Energy Information Administration (EIA), *Solar Collector Manufacturing Activity*, annual reports. • 1993-2002—EIA, *Renewable Energy Annual*, annual reports. • 2003-2006—EIA, *Solar Thermal and Photovoltaic Collector Manufacturing Activities*, annual reports. • 2007—EIA, *Solar Photovoltaic Cell/Module Manufacturing Activities 2007* (December 2008), Tables 3.1, 3.5, and 3.6.

**Figure 10.9 Photovoltaic Cell and Module Domestic Shipments by Market Sector and End Use, 2007**

**By End Use**



**By Market Sector**



<sup>1</sup> Electricity for general use that does not interact with the electrical distribution system.

<sup>2</sup> Electric utilities and independent power producers.

<sup>3</sup> Industrial sector only; independent power producers are included in "Electric Power."

Source: Table 10.9.

**Table 10.9 Photovoltaic Cell and Module Shipments by Market Sector and End Use, 1989-2007**

(Peak Kilowatts <sup>1</sup>)

Year	By Market Sector							By End Use								Total	
	Residential	Commercial <sup>3</sup>	Government	Industrial <sup>4</sup>	Transportation	Electric Power <sup>5</sup>	Other <sup>6</sup>	Communications	Consumer Goods	Electricity Generation <sup>2</sup>		Health	Original Equipment Manufacturers <sup>7</sup>	Transportation	Water Pumping		Other <sup>8</sup>
										Grid-Interactive	Remote						
<b>Total Shipments <sup>9</sup></b>																	
1989	1,439	3,850	1,077	3,993	1,130	785	551	2,590	2,788	1,251	2,620	5	1,595	1,196	711	69	12,825
1990	1,701	6,086	1,002	2,817	974	826	432	4,340	2,484	469	3,097	5	1,119	1,069	1,014	240	13,837
1991	3,624	3,345	815	3,947	1,555	1,275	377	3,538	3,312	856	3,594	61	1,315	1,523	729	13	14,939
1992	4,154	2,386	1,063	4,279	1,673	1,553	477	3,717	2,566	1,227	4,238	67	828	1,602	809	530	15,583
1993	5,237	4,115	1,325	5,352	2,564	1,503	856	3,846	946	1,096	5,761	674	2,023	4,238	2,294	74	20,951
1994	6,632	5,429	2,114	6,855	2,174	2,364	510	5,570	3,239	2,296	9,253	79	1,849	2,128	1,410	254	26,077
1995	6,272	8,100	2,000	7,198	2,383	3,759	1,347	5,154	1,025	4,585	8,233	776	3,188	4,203	2,727	1,170	31,059
1996	8,475	5,176	3,126	8,300	3,995	4,753	1,639	6,041	1,063	4,844	10,884	977	2,410	5,196	3,261	789	35,464
1997	10,993	8,111	3,909	11,748	3,574	5,651	2,367	7,383	347	8,273	8,630	1,303	5,245	6,705	3,783	4,684	46,354
1998	15,936	8,460	2,808	13,232	3,440	3,965	2,720	8,280	1,198	14,193	8,634	1,061	5,044	6,356	4,306	1,491	50,562
1999	19,817	17,283	3,107	24,972	4,341	5,876	1,392	12,147	2,292	24,782	10,829	1,466	12,400	8,486	4,063	322	76,787
2000	24,814	13,692	4,417	28,808	5,502	6,298	4,690	12,269	2,870	21,713	14,997	2,742	12,153	12,804	5,644	3,028	88,221
2001	33,262	15,710	5,728	28,063	8,486	5,846	571	14,743	4,059	27,226	21,447	3,203	6,268	12,636	7,444	641	97,666
2002	29,315	20,578	8,565	32,218	12,932	7,640	841	17,290	3,400	33,983	21,693	4,202	7,869	16,028	7,532	93	112,090
2003	23,389	32,604	5,538	27,951	11,089	8,474	313	14,185	2,995	42,485	15,025	2,924	11,334	14,143	6,073	194	109,357
2004	53,928	74,509	3,257	30,493	1,380	3,233	14,316	11,348	6,444	129,265	18,371	341	6,452	1,380	1,322	6,193	181,116
2005	75,040	89,459	28,683	22,199	1,621	143	9,772	8,666	5,787	168,474	24,958	0	11,677	2,159	1,343	3,853	226,916
2006	95,815	180,852	7,688	28,618	2,458	3,981	17,857	6,888	4,030	274,197	18,003	0	6,132	2,438	2,093	23,487	337,268
<b>Domestic Shipments <sup>9</sup></b>																	
2007	68,417	<sup>10</sup> 140,434	( <sup>10</sup> )	32,702	3,627	35,294	--	2,836	589	253,101	10,867	410	4,802	4,018	3,852	--	280,475

<sup>1</sup> See "Peak Killowatt" in Glossary.

<sup>2</sup> Grid-interactive means connection to the electrical distribution system; remote means electricity for general use that does not interact with the electrical distribution system, such as at an isolated residential site or mobile home. The other end uses in this table also include electricity generation, but only for the specific use cited.

<sup>3</sup> Through 2006, data are for the commercial sector, excluding government, which is included in "Government." Beginning in 2007, data are for the commercial sector, including government.

<sup>4</sup> Through 2006, data are for the industrial sector and independent power producers. Beginning in 2007, data are for the industrial sector only; independent power producers are included in "Electric Power."

<sup>5</sup> Through 2006, data are for electric utilities only; independent power producers are included in "Industrial." Beginning in 2007, data are for electric utilities and independent power producers.

<sup>6</sup> Through 2006, data are for shipments for specialty purposes such as research.

<sup>7</sup> "Original Equipment Manufacturers" are non-photovoltaic manufacturers that combine photovoltaic

technology into existing or newly developed product lines.

<sup>8</sup> Through 2006, includes applications such as cooking food, desalinization, and distilling.

<sup>9</sup> Through 2006, data are for domestic and export shipments, and may include imports that subsequently were shipped to domestic or foreign customers. Beginning in 2007, data are for domestic shipments only.

<sup>10</sup> Beginning in 2007, the government sector is included in "Commercial."

-- = Not applicable.

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

Web Page: For related information, see <http://www.eia.doe.gov/fuelrenewable.html>.

Sources: • 1989-1992—Energy Information Administration (EIA), *Solar Collector Manufacturing Activity*, annual reports. • 1993-2002—EIA, *Renewable Energy Annual*, annual reports. • 2003-2006—EIA, *Solar Thermal and Photovoltaic Collector Manufacturing Activities*, annual reports. • 2007—EIA, *Solar Photovoltaic Cell/Module Manufacturing Activities 2007* (December 2008), Table 3.7.

## Renewable Energy

**Note. Renewable Energy Production and Consumption.** In Table 10.1, renewable energy consumption consists of: conventional hydroelectricity net generation (converted to Btu using the fossil-fueled plants heat rate); geothermal electricity net generation (converted to Btu using the geothermal plants heat rate), and geothermal heat pump and geothermal direct use energy; solar thermal and photovoltaic electricity net generation (converted to Btu using the fossil-fueled plants heat rate), and solar thermal direct use energy; wind electricity net generation (converted to Btu using the fossil-fueled plants heat rate); wood and wood-derived fuels consumption; biomass waste (municipal solid waste from biogenic sources, landfill gas, sludge waste, agricultural byproducts, and other biomass) consumption; fuel ethanol and biodiesel consumption; and losses and co-products from the production of fuel ethanol and biodiesel. Production is assumed to equal consumption for all renewable energy sources except biofuels (biofuels production comprises biomass inputs to the production of fuel ethanol and biodiesel).

### Table 10.2a Sources

**Residential Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.

**Residential Sector, Solar/PV:** Energy Information Administration (EIA), Office of Coal, Nuclear, Electric and Alternate Fuels (CNEAF), estimates based on Form EIA-63A, “Annual Solar Thermal Collector Manufacturers Survey,” and Form EIA-63B, “Annual Photovoltaic Module/Cell Manufacturers Survey.”

**Residential Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980 forward: EIA, Form EIA-457, “Residential Energy Consumption Survey”; and EIA, CNEAF, estimates based on Form EIA-457 and regional heating degree-day data.

**Commercial Sector, Hydroelectric Power:** EIA, *Annual Energy Review (AER) 2008*, Tables 8.2d and A6.

**Commercial Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.

**Commercial Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980–1983: EIA, *Estimates of U.S. Wood Energy Consumption 1980-1983*, Table ES1. • 1984: EIA, CNEAF, estimate. • 1985–1988: Values interpolated. • 1989 forward: EIA, *AER 2008*, Table 8.7c; and EIA, CNEAF, estimates based on Form EIA-871, “Commercial Buildings Energy Consumption Survey.”

**Commercial Sector, Biomass Waste:** EIA, *AER 2008*, Table 8.7c.

**Commercial Sector, Ethanol:** EIA, *AER 2008*, Tables 5.11, 5.13a, and 10.3. Calculated as commercial sector motor gasoline consumption (Table 5.13a) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol consumption (Table 10.3).

### Table 10.2b Sources

**Industrial Sector, Hydroelectric Power:** • 1949–1988: EIA, *AER 2008*, Tables 8.1 and A6. • 1989 forward: EIA, *AER 2008*, Tables 8.2d and A6.

**Industrial Sector, Geothermal:** Oregon Institute of Technology, Geo-Heat Center.

**Industrial Sector, Wood:** • 1949–1979: EIA, *Estimates of U.S. Wood Energy Consumption from 1949 to 1981*, Table A2. • 1980–1983: EIA, *Estimates of U.S. Wood Energy Consumption 1980-1983*, Table ES1. • 1984: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 1. • 1985 and 1986: Values interpolated. • 1987: EIA, *Estimates of Biofuels Consumption in the United States During 1987*, Table 2. • 1988: Value interpolated. • 1989 forward: EIA, *AER 2008*, Table 8.7c; and EIA, CNEAF, estimates based on Form EIA-846, “Manufacturing Energy Consumption Survey.”

**Industrial Sector, Biomass Waste:** • 1981: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see *AER 2008*, Table 10.2c). • 1982 and 1983: EIA, CNEAF, estimates for total waste consumption minus electric power sector waste consumption (see *AER 2008*, Table 10.2c). • 1984: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see *AER 2008*, Table 10.2c). • 1985 and 1986: Values interpolated. • 1987: EIA, *Estimates of U.S. Biofuels Consumption 1990*, Table 8, total waste consumption minus electric power sector waste consumption (see *AER 2008*, Table 10.2c). • 1988: Value interpolated. • 1989 forward: EIA, *AER 2008*, Table 8.7c; and EIA, CNEAF, estimates based on information presented in Government Advisory Associates, *Resource Recovery Yearbook* and *Methane Recovery Yearbook*, and information provided by the U.S. Environmental Protection Agency, Landfill Methane Outreach Program.

**Industrial Sector, Ethanol:** EIA, *AER 2008*, Tables 5.11, 5.13b, and 10.3. Calculated as industrial sector motor gasoline consumption (Table 5.13b) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol consumption (Table 10.3).

**Industrial Sector, Losses and Co-products:** EIA, *AER 2008*, Table 10.3.

**Transportation Sector, Ethanol:** EIA, *AER 2008*, Tables 5.11, 5.13c, and 10.3. Calculated as transportation sector motor gasoline consumption (Table 5.13c) divided by total motor gasoline product supplied (Table 5.11), and then multiplied by fuel ethanol consumption (Table 10.3).

**Transportation Sector, Biodiesel:** EIA, *AER 2008*, Table 10.3.