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## Section 17

# ENERGY AND SCIENCE

This section presents statistics on fuel resources, energy production and consumption, the electric and gas utility industries, research and development, and scientific, engineering, and technological resources. Related series are cited in Sections 12 (utility employment), 14 (prices), and 18 (gasoline consumption).

Information on energy and science can be obtained from reports and records of the U.S. Department of Energy; U.S. Patent and Trademark Office; U.S. Bureau of Labor Statistics; National Science Foundation; Hawaii State Department of Taxation; Hawaii State Department of Commerce and Consumer Affairs; Hawaii State Department of Business, Economic Development & Tourism, Strategic Industries Division; University of Hawaii, Institute of Astronomy; and individual utility companies. *Historical Statistics of Hawaii*, Section 19, presents data for earlier years. Data for the nation as a whole can be found in the *Statistical Abstract of the United States: 2008*, Sections 16 and 19.

**Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE  
(PHYSICAL UNITS): 1960 TO 2005**

Year	Coal 1/ (1,000 short tons)	Natural gas 2/ (billion cubic feet)	Petroleum (1,000 barrels)	Hydroelectric power 3/ (million kWh)
1960	-	-	16,844	27
1965	-	-	22,478	105
1970	-	-	34,105	108
1975	-	-	37,097	89
1980	-	3	43,562	86
1985	46	2	40,006	86
1990	29	3	50,015	80
1991	45	3	45,758	71
1992	303	3	46,655	61
1993	691	3	41,392	56
1994	704	3	44,843	139
1995	895	3	43,842	98
1996	930	3	41,631	104
1997	933	3	39,824	115
1998	822	3	40,484	121
1999	801	3	39,662	115
2000	816	3	40,591	103
2001	829	3	41,479	101
2002	748	3	45,068	95
2003	837	3	46,963	91
2004	857	3	49,029	94
2005	805	3	51,262	96

1/ The continuity of these data series estimates may be affected by changing data sources and estimation methodologies.

2/ Includes supplemental gaseous fuels.

3/ Includes hydroelectric pumped storage and conventional hydroelectric power.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data 2005*  
<[http://www.eia.doe.gov/emeu/states/sep\\_use/total/pdf/use\\_hi.pdf](http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf)> table 7 accessed April 3, 2008.

**Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1960 TO 2005**

[Trillion Btu]

Year	Total	Coal 1/	Natural gas 2/	Petroleum	Hydroelectric power 3/	Biomass 1/ 4/	Other 1/ 5/
1960	94.9	0.0	0.0	94.6	0.3	0.0	0.0
1965	130.6	0.0	0.0	129.3	1.1	0.2	0.0
1970	197.0	0.0	0.0	195.4	1.1	0.4	0.0
1975	214.4	0.0	0.0	212.9	0.9	0.6	0.0
1980	265.4	0.0	3.0	249.6	0.9	11.9	0.0
1985	251.4	1.1	2.7	232.1	0.9	14.2	0.4
1990	6/ 324.4	0.7	3.0	292.7	0.8	6/ 25.9	6/ 1.2
1991	298.1	1.1	2.9	266.5	0.7	25.4	1.4
1992	308.9	6.8	2.9	272.4	0.6	24.9	1.3
1993	287.6	15.6	2.8	239.7	0.6	24.4	4.5
1994	304.3	15.7	2.9	258.3	1.4	20.7	5.2
1995	302.5	19.9	2.9	252.6	1.0	19.8	6.3
1996	288.7	20.4	2.8	238.9	1.1	19.1	6.6
1997	278.9	20.5	2.7	230.5	1.2	17.4	6.6
1998	278.8	18.2	2.8	233.4	1.2	16.5	6.5
1999	274.6	17.7	2.9	229.9	1.2	17.0	6.0
2000	279.1	17.7	3.0	235.2	1.1	15.2	7.1
2001	7/ 279.0	17.8	2.9	239.8	1.0	7/ 11.7	5.7
2002	7/ 292.1	16.6	2.9	259.2	1.0	7/ 9.5	2.9
2003	7/ 310.0	19.3	2.9	270.1	0.9	7/ 11.7	5.2
2004	323.5	19.3	2.9	282.6	0.9	11.8	6.0
2005	333.4	18.0	2.9	295.2	1.0	10.1	6.3

1/ The continuity of these data series estimates may be affected by changing data sources and estimation methodologies.

2/ Includes supplemental gaseous fuels.

3/ Includes hydroelectric pumped storage and conventional hydroelectric power.

4/ Wood and waste.

5/ "Other" is geothermal, wind, photovoltaic, solar thermal energy and net imports of electricity.

6/ There is a discontinuity between 1988 and 1989 due to the expanded coverage of renewable energy sources beginning in 1989.

7/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data 2005* <[http://www.eia.doe.gov/emeu/states/sep\\_use/total/pdf/use\\_hi.pdf](http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf)> table 7 accessed April 3, 2008.

**Table 17.03-- CONSUMPTION OF ENERGY BY END-USE SECTOR:  
1960 TO 2005**

[Trillion Btu]

Year	Residential	Commercial 1/	Industrial	Transportation	Electric power 2/
1960	7.3	5.2	20.6	61.8	17.6
1965	10.1	6.8	34.7	79.0	27.6
1970	16.4	11.6	43.7	125.3	43.2
1975	19.6	13.8	50.4	130.5	58.8
1980	23.2	20.8	74.7	146.7	69.7
1985	20.9	20.2	67.4	3/ 142.9	70.0
1990	4/ 31.6	4/ 39.3	4/ 98.9	154.5	4/ 105.9
1991	27.0	30.8	89.0	151.2	88.7
1992	31.1	40.0	93.7	144.1	99.3
1993	30.8	33.2	93.1	130.4	101.1
1994	31.9	37.7	94.7	140.0	104.3
1995	32.8	37.5	94.1	138.2	108.0
1996	33.6	36.8	96.7	121.6	110.0
1997	33.9	37.7	90.1	117.2	110.0
1998	34.8	47.3	82.1	114.6	108.2
1999	34.3	37.8	79.4	123.1	108.9
2000	35.3	39.0	79.6	125.2	111.3
2001	34.8	38.7	5/ 73.4	132.0	109.4
2002	36.9	41.0	5/ 72.4	141.8	113.7
2003	36.2	42.1	5/ 68.2	163.6	113.3
2004	36.6	47.4	67.7	171.7	113.4
2005	37.1	45.4	71.5	179.4	112.4

1/ Small amounts of solar thermal and photovoltaic energy consumed in the commercial sector cannot be separately identified and are included in residential consumption.

2/ Replaces Electric Utilities of previous years.

3/ There is a discontinuity between 1980 and 1981 due to the expanded coverage of renewable energy sources beginning in 1981.

4/ There is a discontinuity between 1988 and 1989 due to the expanded coverage of renewable energy sources beginning in 1989.

5/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data 2005* <[http://www.eia.doe.gov/emeu/states/sep\\_use/total/pdf/use\\_hi.pdf](http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf)> tables 8, 9, 10, 11 and 12 accessed April 3, 2008.

**Table 17.04-- PRIMARY ENERGY CONSUMPTION AND ELECTRICITY  
SALES, TOTAL AND PER CAPITA: 1991 TO 2006**

Year	Primary energy consumption		Electricity sales by utilities	
	Total (trillion Btu)	Per capita 1/ (million Btu)	Total (1,000 kWh)	Per capita 1/ (kWh)
1991	322.9524	257.895	8,564,032	6,839
1992	339.0912	266.652	8,666,889	6,815
1993	307.7465	242.731	8,657,903	6,829
1994	327.4778	253.897	8,948,458	6,938
1995	315.1186	242.754	9,187,430	7,078
1996	315.9492	242.308	9,378,962	7,193
1997	315.9927	237.959	9,345,281	7,037
1998	302.8773	227.023	9,261,070	6,942
1999	308.4009	231.455	9,379,808	7,040
2000 2/	325.2151	243.680	9,690,598	7,261
2001 2/	304.6372	228.518	9,776,882	7,334
2002 2/	306.2823	227.434	9,958,768	7,395
2003 2/	320.3960	236.768	10,206,405	7,542
2004 2/	324.0634	235.974	10,508,642	7,652
2005 2/	324.5542	232.981	10,538,507	7,565
2006 3/	318.7241	226.428	10,567,913	7,508

1/ Based on estimated de facto population.

2/ Revised from previous *Data Book*.

3/ Preliminary.

Source: Hawaii State Department of Business, Economic Development & Tourism, Strategic Industries Division, Energy Branch, records.

**Table 17.05-- PRIMARY ENERGY CONSUMPTION, BY SOURCE:  
1990 TO 2006**

[Trillion Btu]

Year	Total	Petroleum	Biomass	Solar hot water
1990	312.1304	284.4906	18.1200	2.3400
1991	322.9524	294.6222	17.9000	2.3000
1992	339.0912	305.7758	16.9840	2.3000
1993	307.7465	266.9516	16.8310	2.3000
1994	327.4778	285.5010	16.3660	2.3000
1995	315.1186	273.9590	11.8232	2.8386
1996	315.9492	277.1298	10.3994	3.1225
1997	315.9927	278.3480	8.9527	3.1225
1998	302.8773	269.1272	7.5220	3.1225
1999	308.4009	272.4720	9.2784	3.5483
2000	325.2151	290.2354	7.1331	3.5483
2001	304.6372	273.7797	3.4243	3.6792
2002	306.2823	272.8375	5.5584	4.0214
2003	320.3960	284.4207	6.0847	4.0687
2004	324.0634	287.7538	6.1256	4.3053
2005	324.5542	291.5014	5.2839	4.4945
2006 1/	318.7241	283.6873	5.5054	4.6364

  

Year	Hydroelectric	Coal	Wind	Geothermal	Solid waste
1990	1.0700	0.8900	0.2900	-	4.9298
1991	1.0000	0.8000	0.3060	-	6.0242
1992	0.7226	6.9207	0.2573	0.0168	6.1140
1993	0.8024	13.2237	0.2352	1.5988	5.8038
1994	1.5300	13.5599	0.2251	1.8060	6.1898
1995	1.0632	16.5249	0.2364	2.3045	6.3688
1996	1.1332	16.9294	0.2244	2.3566	4.6539
1997	0.9544	16.7772	0.1796	2.3633	5.2950
1998	0.7654	14.7665	0.2159	2.2782	5.0796
1999	1.2410	14.5187	0.1738	2.0255	5.1432
2000	0.9481	15.4724	0.1794	2.5855	5.1086
2001	1.0439	15.7719	0.1809	2.1356	4.6107
2002	1.0318	17.1440	0.1354	0.7637	4.7791
2003	0.7962	18.2279	0.1137	1.8181	4.8467
2004	0.9034	17.8472	0.0788	2.1765	4.8533
2005	1.1463	15.5778	0.0692	2.2801	4.2010
2006 1/	1.2983	15.8569	0.8466	2.1937	4.6995

1/ Preliminary.

Source: Hawaii State Department of Business, Economic Development & Tourism, Strategic Industries Division, Energy Branch, records.

**Table 17.06-- ELECTRICITY GENERATION BY SOURCE: 1989 TO 2006**

[Millions of kWh generated]

Year	Total	Petroleum	Biomass	MSW 1/	Hydroelectric
1989	9,280	8,511	614	-	100
1990	9,566	8,589	538	-	105
1991	9,610	8,664	495	-	92
1992	10,104	8,556	460	-	67
1993	10,219	7,576	435	349	78
1994	10,341	7,793	423	379	148
1995	10,563	7,853	292	383	103
1996	10,742	8,027	270	326	110
1997	10,424	7,805	226	371	93
1998 5/	10,455	8,009	178	364	87
1999	10,719	8,144	333	361	113
2000	12,008	9,360	211	362	99
2001	10,839	8,449	153	275	109
2002	10,858	8,651	137	300	99
2003	10,978	8,548	174	338	71
2004	11,654	9,071	181	325	101
2005	11,676	9,135	174	337	111
2006	11,701	9,110	170	388	127

  

Year	Geothermal	Wind	Coal	PV 2/	Other 3/
1989	14	41	-	-	(4/)
1990	-	28	-	-	306
1991	-	30	-	-	329
1992	1	21	-	-	999
1993	155	24	1,592	(4/)	10
1994	175	22	1,382	(4/)	19
1995	223	23	1,674	(4/)	12
1996	228	22	1,740	(4/)	19
1997	229	17	1,663	(4/)	20
1998 5/	220	21	1,553	(4/)	20
1999	196	13	1,541	(4/)	18
2000	250	17	1,695	(4/)	14
2001	207	18	1,616	6/ 1	12
2002	74	13	1,580	-	4
2003	176	13	1,658	6/ 2	-
2004	211	8	1,757	6/ 2	-
2005	221	7	1,691	(4/)	-
2006	212	82	1,612	6/ 2	-

Continued on next page.

**Table 17.06-- ELECTRICITY GENERATION BY SOURCE: 1989 TO 2006 -- Con.**

- 1/ Electricity generated from Honolulu municipal solid waste plant.
- 2/ Electricity generated from photovoltaic.
- 3/ From 1989 to 1992, includes electricity production by coal, geothermal (a test well which ceased operation in 1989), and photovoltaic.
- 4/ Less than 500,000 kWh.
- 5/ Preliminary
- 6/ Data may not be complete.

Source: Hawaii State Department of Business, Economic Development & Tourism, Energy, Resources and Technology Division, records; Hawaii State Department of Commerce and Consumer Affairs, records; Hawaii Agriculture Research Center, records.

**Table 17.07-- ELECTRICITY PRODUCTION, BY SOURCE, BY ISLAND:  
2006**

[Million kWh]

<b>Island</b>	<b>Total</b>	<b>Petroleum</b>	<b>Biomass</b>	<b>MSW 1/</b>	<b>Hydroelectric</b>
State total	11,704	9,109	170	388	128
Hawaii	1,255	959	-	-	58
Maui	1,386	1,126	134	-	27
Lanai	30	30	-	-	-
Molokai	39	39	-	-	-
Oahu	8,495	6,507	28	388	-
Kauai	499	448	8	-	43
<b>Island</b>	<b>Wind</b>	<b>Geothermal</b>	<b>Coal</b>	<b>PV 2/ 3/</b>	<b>Other</b>
State total	82	212	1,613	2	-
Hawaii	25	212	-	1	-
Maui	57	-	42	-	-
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	-	-	1,571	1	-
Kauai	-	-	-	(4/)	-

1/ Electricity generated from Honolulu municipal solid waste plant.

2/ Electricity generated from photovoltaic.

3/ Data may not be complete.

4/ Less than 500,000 kWh.

Source: Hawaii State Department of Business, Economic Development & Tourism, Energy, Resources and Technology Division, records; Hawaii State Department of Commerce and Consumer Affairs, records.

**Table 17.08 -- FUEL, ELECTRICITY, AND TOTAL ENERGY EXPENDITURES BY SOURCE: 1991 TO 2006**

[Millions of dollars]

Year	Total energy expenditures	Fuel expenditures			Plus: electricity expenditures by customers	Minus: electric utility fuel expenditures 1/
		Total	Electric utility	Other		
1991	2,217.5	1,736.4	304.8	1,431.6	785.9	304.8
1992	2,340.3	1,760.0	238.2	1,521.8	818.5	238.2
1993	2,369.9	1,660.4	213.3	1,447.1	922.8	213.3
1994	2,397.0	1,642.5	201.4	1,441.1	955.9	201.4
1995	2,459.4	1,645.2	223.5	1,421.7	1,037.7	223.5
1996	2,712.0	1,843.9	268.9	1,575.0	1,137.0	268.9
1997	2,756.5	1,863.6	276.2	1,587.4	1,169.2	276.2
1998	2,442.9	1,580.2	210.9	1,369.3	1,073.6	210.9
1999	2,544.6	1,656.2	234.7	1,421.5	1,123.1	234.7
2000	3,305.5	2,339.9	394.2	1,945.7	1,359.8	394.2
2001	3,373.4	2,377.2	374.9	2,002.3	1,371.1	374.9
2002	3,078.5	2,073.0	333.5	1,739.5	1,339.0	333.5
2003	3,690.9	2,605.7	400.0	2,205.6	1,485.2	400.0
2004	4,346.1	3,213.9	524.5	2,689.4	1,656.8	524.5
2005	5,492.9	4,258.5	693.5	3,565.0	1,927.9	693.5
2006 2/	6,169.1	4,728.0	749.1	3,978.9	2,190.2	749.1

1/ Electric utility fuel expenditures are subtracted from the sum of total fuel expenditures and electricity expenditures by customers to avoid double counting when calculating total energy expenditures.

2/ Preliminary.

Source: Hawaii State Department of Business, Economic Development & Tourism, Strategic Industries Division, Energy Branch, records.

**Table 17.09-- ELECTRIC UTILITIES: 1994 TO 2007**

Year	Customers, Dec. 31			Power sold (1,000 kWh)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
1994	403,595	346,977	56,618	8,948,458	2,551,240	6,397,218
1995	409,983	352,589	57,394	9,187,430	2,597,010	6,590,419
1996	413,830	356,205	57,625	9,378,962	2,669,654	6,709,308
1997	415,964	358,683	57,281	9,345,281	2,659,248	6,686,033
1998	418,989	361,429	57,560	9,261,070	2,634,172	6,626,899
1999	424,603	366,273	58,330	9,379,808	2,683,408	6,696,400
2000	430,354	370,928	59,426	9,690,598	2,764,619	6,925,980
2001	436,150	376,054	60,096	9,776,882	2,802,432	6,974,450
2002	441,323	380,608	60,715	9,958,768	2,921,563	7,037,206
2003	449,354	387,162	62,192	10,206,405	3,024,509	7,181,897
2004	455,278	391,567	63,711	10,508,642	3,156,499	7,352,142
2005	463,088	398,332	64,756	10,538,507	3,164,029	7,374,478
2006	469,013	403,278	65,735	10,567,913	3,180,852	7,387,061
2007	475,104	408,923	66,181	10,585,038	3,200,675	7,384,363

  

Year	Average annual use (kWh) 2/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
1994	7,353	112,989	0.12464	0.09972	955,907	317,984	637,923
1995	7,366	114,828	0.13337	0.10490	1,037,702	346,359	691,343
1996	7,495	116,431	0.14272	0.11268	1,137,045	381,011	756,034
1997	7,414	116,723	0.14839	0.11584	1,169,134	394,603	774,531
1998	7,288	115,130	0.13884	0.10682	1,073,610	365,719	707,891
1999	7,326	114,802	0.14312	0.11037	1,123,126	384,043	739,083
2000	7,453	116,548	0.16409	0.13083	1,359,756	453,650	906,106
2001	7,452	116,055	0.16336	0.13095	1,371,113	457,797	913,317
2002	7,676	115,906	0.15703	0.12508	1,338,980	458,781	880,199
2003	7,812	115,479	0.16743	0.13629	1,485,234	506,399	978,835
2004	8,061	115,398	0.18031	0.14793	1,656,764	569,162	1,087,601
2005	7,943	113,881	0.20656	0.17280	1,927,872	653,568	1,274,304
2006	7,887	112,376	0.23358	0.19590	2,190,152	742,994	1,447,158
2007	7,827	111,578	0.24122	0.20061	2,253,432	772,065	1,481,368

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ Based on number of customers at end of year.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

**Table 17.10-- ELECTRIC UTILITIES, BY ISLAND: 2007**

Island	Customers, Dec. 31			Gross System Peak 2/	Power sold (1,000 kWh)		
	Total	Residential 1/	Other	(mW)	Total	Residential 1/	Other
State total	475,104	408,923	66,181	(X)	10,585,038	3,200,675	7,384,363
Oahu	294,591	260,583	34,008	1,261.0	7,675,355	2,134,536	5,540,819
Hawaii	78,983	65,305	13,678	207.6	1,162,684	451,386	711,298
Kauai	35,207	26,959	8,248	77.8	466,896	165,177	301,719
Lanai	1,697	1,431	266	5.5	30,736	8,465	22,271
Maui	61,485	52,066	9,419	209.3	1,213,611	428,414	785,197
Molokai	3,141	2,579	562	6.4	35,756	12,697	23,059
Island	Average annual use (kWh) 3/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
State total	7,827	111,578	0.24122	0.20061	2,253,432	772,065	1,481,368
Oahu	8,191	162,927	0.20519	0.17014	1,380,726	437,993	942,733
Hawaii	6,912	52,003	0.32774	0.29910	360,684	147,935	212,749
Kauai	6,127	36,581	0.35612	0.34489	162,884	58,823	104,061
Lanai	5,915	83,726	0.32782	0.32809	10,081	2,775	7,307
Maui	8,228	83,363	0.28056	0.26337	326,991	120,197	206,794
Molokai	4,923	41,030	0.34197	0.33497	12,066	4,342	7,724

X Not applicable.

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ System peak is the maximum amount of energy required by the electrical system at a point in time. The island electrical systems are not interconnected, therefore, peaks are reported separately for each island.

3/ Based on number of customers at end of year.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

**Table 17.11-- GAS UTILITIES: 1994 TO 2007**

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
1994	36,403	32,753	3,650	34,010	5,851	28,159
1995	36,619	32,950	3,669	33,740	5,793	27,948
1996	36,641	33,020	3,621	33,531	5,642	27,888
1997	36,575	32,977	3,598	32,980	5,603	27,377
1998	36,225	32,630	3,595	33,095	5,702	27,393
1999	36,363	32,757	3,606	34,099	5,577	28,522
2000	36,404	32,804	3,600	34,820	5,477	29,343
2001	36,431	32,833	3,598	34,159	5,401	28,758
2002	36,236	32,629	3,607	33,974	5,357	28,617
2003	36,046	32,415	3,631	33,556	5,170	28,386
2004	36,049	32,413	3,636	34,241	5,087	29,154
2005	35,850	32,229	3,621	34,249	5,041	29,208
2006	35,793	32,164	3,629	34,340	4,983	29,357
2007	35,692	32,078	3,614	34,685	4,933	29,752

  

Year	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
1994	179	7,715	1.71994	1.19455	43,700	10,064	33,637
1995	176	7,617	1.79670	1.25158	45,386	10,407	34,979
1996	171	7,702	2.10399	1.33578	49,124	11,872	37,252
1997	170	7,609	2.29075	1.40013	51,167	12,835	38,332
1998	175	7,620	2.16236	1.25934	46,826	12,329	34,497
1999	170	7,910	2.17266	1.24026	47,491	12,116	35,375
2000	167	8,151	2.45358	1.48560	57,031	13,439	43,592
2001	165	7,993	2.59225	1.56297	58,949	14,001	44,948
2002	164	7,934	2.87341	1.50635	58,500	15,393	43,107
2003	159	7,818	3.05760	1.71228	64,412	15,807	48,605
2004	157	8,018	3.23468	1.87938	71,245	16,453	54,792
2005	156	8,066	3.64213	2.26578	84,539	18,360	66,179
2006	155	8,090	3.87417	2.46238	91,593	19,305	72,288
2007	154	8,232	3.93554	2.52524	94,545	19,414	75,131

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ Based on number of customers at end of year.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

**Table 17.12-- GAS UTILITIES, BY ISLAND: 2007**

[Excludes bottled gas]

Island	Customers, December 31			Gas sold (1,000 therms)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
State total	35,692	32,078	3,614	34,685	4,933	29,752
Oahu	32,649	29,413	3,236	31,346	4,459	26,887
Hawaii	1,794	1,494	300	2,429	288	2,141
Kauai	739	738	1	90	90	-
Lanai	12	12	-	-	-	-
Maui	418	341	77	807	83	724
Molokai	80	80	-	13	13	-

  

Island	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
State total	154	8,232	3.93554	2.52524	94,545	19,414	75,131
Oahu	152	8,309	3.90895	2.54688	85,908	17,430	68,478
Hawaii	193	7,137	4.36458	2.34563	6,279	1,257	5,022
Kauai	122	-	4.24444	-	383	382	1
Lanai	-	-	-	-	3	3	-
Maui	243	9,403	3.49398	2.25138	1,920	290	1,630
Molokai	163	-	4.00000	-	52	52	-

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ Based on number of customers at end of year.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

**Table 17.13-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC COMPANY, INC.,  
ON OAHU: 1991 TO 2007**

Year	Number of customers, Dec. 31		Net input 1/ (1,000 kWh)	Electricity sales (1,000 kWh)	Average annual residential use 2/ (kWh)	Average residential rate (dollars per kWh)	Generating capability Dec. 31 3/ (1000 kW)
	Total	Residential only					
1991	255,176	223,304	6,876,964	6,538,952	7,610	0.09354	1,440
1992	257,442	225,229	7,061,157	6,650,449	7,711	0.09925	1,666
1993	263,478	230,192	7,029,839	6,607,424	7,581	0.11414	1,669
1994	264,992	232,115	7,222,978	6,797,364	7,681	0.11342	1,669
1995	269,307	235,905	7,359,195	6,962,794	7,732	0.12302	1,669
1996	271,602	237,860	7,499,202	7,091,147	7,868	0.12944	1,669
1997	271,801	238,825	7,424,259	7,040,291	7,773	0.13360	1,669
1998	272,675	239,945	7,299,149	6,938,326	7,603	0.12556	1,669
1999	275,467	242,579	7,356,725	6,997,936	7,654	0.12741	1,669
2000	278,260	245,027	7,589,409	7,211,760	7,793	0.14477	1,669
2001	280,911	247,672	7,643,288	7,276,681	7,816	0.14255	1,669
2002	283,161	249,896	7,757,699	7,390,367	8,050	0.13859	1,669
2003	286,677	253,033	7,908,957	7,522,230	8,224	0.14888	1,669
2004	288,456	254,797	8,126,998	7,732,834	8,481	0.15690	1,669
2005	291,580	257,804	8,104,303	7,721,296	8,360	0.17673	1,712
2006	292,988	259,098	8,104,872	7,700,605	8,248	0.20063	1,722
2007	294,591	260,583	8,089,115	7,675,355	8,214	0.20519	1,727

1/ Net generation plus purchased power.

2/ Based on average number of customers during the year.

3/ Gross capability including firm purchase power.

Source: Hawaiian Electric Company, Inc., records.

**Table 17.14-- SERVICE PROVIDED BY THE GAS COMPANY, INC.,  
ON OAHU: 1991 TO 2007**

Calendar year	Customers, Dec. 31		Gas sold 1/ (1,000 therms)		Average annual residential usage 1/ (therms)
	Total	Residential	Total	Residential	
1991	32,487	29,278	30,866	5,331	182
1992	32,598	29,375	30,528	5,285	180
1993	33,206	29,984	30,027	5,287	176
1994	33,597	30,344	30,762	5,372	177
1995	33,472	30,492	30,582	5,332	175
1996	33,914	30,668	30,339	5,203	170
1997	33,800	30,574	29,836	5,176	169
1998	33,705	30,497	29,930	5,284	173
1999	33,614	30,384	30,830	5,154	170
2000	33,613	30,383	31,619	5,054	166
2001	33,625	30,403	31,071	4,990	164
2002	33,446	30,202	30,852	4,962	164
2003	33,252	29,990	30,470	4,781	159
2004	33,231	29,964	31,011	4,701	157
2005	32,991	29,744	30,965	4,641	156
2006	32,776	29,519	30,935	4,530	153
2007	32,649	29,413	31,346	4,459	152

1/ Includes liquefied petroleum gas.

Source: The Gas Company, records.

**Table 17.15-- LIQUID FUEL TAX BASE: 1993 TO 2007**

[In thousands of gallons. Liquid fuel sold in a given month is usually reported the following month. Annual totals accordingly refer to fuel sold during a 12-month period ending November 30]

Year reported	All types		Gasoline	Diesel oil		
	Total	Excluding aviation		Non-hwy.	Hwy. use	
1993	1,173,458	573,767	384,444	160,121	24,997	
1994	1,240,366	578,758	392,404	152,628	29,692	
1995	1,286,038	600,596	396,446	172,684	27,411	
1996	1,147,866	588,896	394,989	160,102	29,864	
1997	955,834	585,400	400,435	150,737	30,109	
1998	954,860	597,410	394,674	169,930	28,983	
1999	969,434	621,832	384,260	201,664	32,098	
2000	1,053,114	684,247	400,920	246,426	33,282	
2001	962,973	627,076	409,910	179,000	34,018	
2002	994,141	646,185	429,613	175,096	36,157	
2003	835,991	587,927	452,499	91,988	37,004	
2004	1,066,808	727,943	459,321	220,562	43,223	
2005	972,642	647,843	454,115	146,922	43,440	
2006	869,789	657,355	472,658	131,665	50,065	
2007	1,018,233	782,580	480,632	215,503	66,030	
Year reported	Liquefied petroleum gas		Aviation fuel	Small boats		Other fuel
	Off hwy.	Hwy. use		Gasoline	Diesel oil	
1993	3,343	477	599,691	35	349	(X)
1994	3,210	566	661,608	60	198	(X)
1995	3,096	514	685,443	50	395	(X)
1996	3,249	413	558,969	50	228	(X)
1997	3,587	328	370,433	41	164	(X)
1998	3,280	383	357,450	9	151	(X)
1999	3,326	360	347,602	4	119	(X)
2000	3,250	332	368,867	2	35	(X)
2001	3,783	310	335,897	9	47	(X)
2002	4,991	267	347,956	5	40	16
2003	5,739	391	248,065	2	22	281
2004	3,368	246	338,866	8	16	1,200
2005	1,222	300	324,799	15	42	1,786
2006	1	142	212,434	23	45	2,756
2007	2,106	108	235,653	262	626	17,314

X Not applicable.

Source: Hawaii State Department of Taxation, Tax Research & Planning, "Liquid Fuel Tax Base & Tax Collections" (annual release); <[http://www.hawaii.gov/tax/a5\\_3txcolrptarchive.htm](http://www.hawaii.gov/tax/a5_3txcolrptarchive.htm)> accessed March 31, 2008.

**Table 17.16-- LIQUID FUEL TAX BASE, BY COUNTY: 2007**

[In thousands of gallons. Liquid fuel sold in a given month is usually reported the following month.  
Annual totals accordingly refer to fuel sold during a 12-month period ending November 30]

Type of fuel	State total	City and Co. of Honolulu	County of Maui	County of Hawaii	County of Kauai
Total	1,018,233	623,765	152,301	153,875	88,292
Gasoline	480,632	299,311	62,629	82,118	36,575
Diesel oil, non-hwy.	215,503	163,333	12,560	15,665	23,944
Diesel oil, hwy. use	66,030	39,091	9,019	13,079	4,841
Liq. pet. gas, off hwy.	2,106	2,106	-	-	-
Liq. pet. gas, hwy. use	108	88	7	7	5
Small boats, gasoline	262	186	-	62	13
Small boats, diesel oil	626	17	61	373	175
Aviation fuel	235,653	118,017	67,643	32,722	17,270
Other fuel	17,314	1,616	382	9,848	5,468

Source: Hawaii State Department of Taxation, Tax Research & Planning, "Liquid Fuel Tax Base & Tax Collections" (annual release); <[http://www.hawaii.gov/tax/a5\\_3txcolrptarchive.htm](http://www.hawaii.gov/tax/a5_3txcolrptarchive.htm)> accessed March 31, 2008.

**Table 17.17-- GASOLINE STATIONS (NAICS 447), BY COUNTY:  
1997 TO 2005**

[Excludes most government employees, railroad employees, and self-employed persons. Statistics based on the North American Industry Classification System (NAICS) which replaced the Standard Industrial Classification (SIC) system used in the *County Business Patterns* prior to 1998. Therefore, comparability between the current data and data prior to 1998 may be limited]

<b>Year</b>	<b>State total</b>	<b>City and County of Honolulu</b>	<b>Hawaii County</b>	<b>Kauai County</b>	<b>Maui County</b>
1997 1/	318	196	63	19	40
1998	350	219	67	19	45
1999	334	206	63	19	46
2000	328	207	61	20	40
2001	322	204	61	17	40
2002	321	200	62	19	40
2003	314	194	63	19	38
2004	294	181	60	18	35
2005	301	188	59	19	35

1/ *County Business Patterns* data from before 1998 reported in SIC (SIC 554) rather than NAICS.

Source: U.S. Census Bureau, *County Business Patterns, Hawaii* (annual). See also

<<http://censtats.census.gov/cbpnaic/cbpnaic.shtml>> accessed December 5, 2007.

**Table 17.18-- BOILERS AND PRESSURE VESSELS, BY ISLAND:  
2006 AND 2007**

[As of December 31]

<b>Island</b>	<b>Total</b>	<b>Power boilers</b>	<b>Heating boilers</b>	<b>Pressure vessels</b>
<b>2006</b>				
State total	10,619	476	2,349	7,794
Hawaii	1,419	76	319	1,024
Maui	1,313	66	303	944
Lanai	42	2	8	32
Molokai	53	2	10	41
Oahu	7,274	296	1,613	5,365
Kauai	518	34	96	388
<b>2007</b>				
State total	10,597	493	2,315	7,789
Hawaii	1,426	72	317	1,037
Maui	1,270	60	289	921
Lanai	41	2	8	31
Molokai	52	2	9	41
Oahu	7,269	318	1,601	5,350
Kauai	539	39	91	409

Source: Hawaii State Department of Labor and Industrial Relations, Hawaii Occupational Safety & Health Division (HIOSH), Boiler and Elevator Inspection Branch, records.

**Table 17.19-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT AND FOR R&D PLANT IN HAWAII: 1997 TO 2005**

[Millions of dollars. For fiscal year ending September 30]

Year	R&D	R&D plant	Year	R&D	R&D plant
1997	150.7	3.0	2002	375.2	6.4
1998	164.5	1.5	2003	349.6	1.9
1999	198.8	9.3	2004	392.6	7.0
2000	209.7	1.8	2005	384.4	43.8
2001	293.1	2.8			

Source: National Science Foundation/Division of Science Resources Statistics, *Federal Funds for Research and Development*, various issues, <<http://www.nsf.gov/statistics/nsf07323/>> accessed June 29, 2007, and records.

**Table 17.20-- CHARACTERISTICS OF THE PRIVATE TECHNOLOGY SECTOR:  
2001 TO 2005**

[Includes wage and salary jobs]

Category and year	Total private sector	Private technology			
		All categories	Scientific and technology research & development	Manufacture of technology products	Technology services
<b>Establishments</b>					
2001	34,047	980	127	56	797
2002	34,278	1,080	131	63	886
2003	35,394	1,109	140	62	907
2004	33,593	1,071	138	60	873
2005 1/	34,596	1,115	149	72	893
<b>Jobs</b>					
2001	446,130	13,463	1,911	653	10,900
2002	444,519	13,376	2,045	468	10,863
2003	454,089	13,104	2,243	342	10,518
2004	468,748	13,106	2,379	334	10,393
2005 1/	487,098	13,813	2,600	391	10,822
<b>Wages (\$ million)</b>					
2001	13,302	671.7	86.9	35.9	548.9
2002	13,756	680.6	95.8	20.0	564.8
2003	14,519	696.6	115.4	12.0	569.1
2004	15,742	728.7	129.9	12.0	586.9
2005 1/	16,837	793.7	148.1	16.6	629.0
<b>Average wage</b>					
2001	29,816	49,889	45,485	54,967	50,357
2002	30,947	50,883	46,847	42,706	51,995
2003	31,974	53,159	51,461	35,075	54,109
2004	33,583	55,606	54,616	35,811	56,468
2005 1/	34,566	57,458	56,942	42,552	58,120

1/ 2005 figures are estimates.

Source: Hawaii State Department of Business, Economic Development & Tourism,  
*Hawaii Tech Sector: Definition & Detailed Data*,  
<[http://www.hawaii.gov/dbedt/info/economic/data\\_reports/technology\\_report/Tech2005.pdf](http://www.hawaii.gov/dbedt/info/economic/data_reports/technology_report/Tech2005.pdf)>  
accessed June 29, 2007.

**Table 17.21-- SHARE OF TECHNOLOGY SECTOR JOBS, BY COUNTY:  
1999 AND 2001**

[In percent, unless otherwise specified]

<b>Year</b>	<b>Total State Job (number)</b>	<b>State</b>	<b>Hawaii</b>	<b>Maui</b>	<b>Honolulu</b>	<b>Kauai</b>	<b>County unknown</b>
1999	12,417	100	7	8	80	4	1
2001	13,553	100	6	8	82	4	< 1

Source: Hawaii State Department of Business, Economic Development & Tourism, DBEDT e-reports "Hawaii's Expanding Tech Sector", May 2001; DBEDT e-Reports "Hawaii's Technology Sector in 2001", November 2002 <<http://www.hawaii.gov/dbedt/tech02/index.html>> accessed January 14, 2003.

**Table 17.22-- TOP 30 STATES FOR TECHNOLOGY AND SCIENCE INDEX: 2002, 2004 AND 2008**

[The State Technology and Science Index observes 77 unique indicators that are categorized into five major components. These components are human capital investment, research and development inputs, risk capital and entrepreneurial infrastructure, technology and science work force and technology concentration and dynamism. Ranked by largest number in 2008]

City and state	Average score			State ranking		
	2002	2004	2008	2002	2004	2008
Massachusetts	84.9	84.4	82.6	1	1	1
Maryland	77.9	78.2	80.0	4	4	2
Colorado	80.6	78.8	78.3	2	3	3
California	80.4	78.9	74.6	3	2	4
Washington	71.8	69.9	72.1	6	6	5
Virginia	73.3	72.3	70.3	5	5	6
Connecticut	68.6	66.3	70.2	8	10	7
Utah	68.3	66.5	69.2	9	9	8
New Hampshire	63.4	63.5	67.9	13	12	9
Rhode Island	57.3	64.0	66.7	21	11	10
Minnesota	65.9	67.5	64.1	10	8	11
New Jersey	70.0	69.1	63.4	7	7	12
Pennsylvania	59.8	60.4	63.2	16	16	13
Delaware	65.5	62.5	62.3	11	13	14
New York	64.5	60.7	62.2	12	15	15
New Mexico	57.9	61.8	61.9	20	14	16
Arizona	58.6	58.5	61.3	18	17	17
North Carolina	58.9	57.3	59.6	17	20	18
Vermont	46.1	56.0	58.8	31	22	19
Texas	60.4	54.9	57.8	14	23	20
Illinois	58.4	56.6	57.2	19	21	21
Wisconsin	53.7	51.8	57.1	25	27	22
Oregon	55.5	57.8	56.2	23	19	23
Kansas	56.9	53.1	54.2	22	26	24
Georgia	60.2	58.1	53.3	15	18	25
Michigan	54.5	54.0	52.3	24	25	26
Idaho	51.0	49.1	51.4	26	30	27
<b>Hawaii</b>	<b>34.0</b>	<b>40.1</b>	<b>51.2</b>	<b>43</b>	<b>39</b>	<b>28</b>
Alabama	45.0	42.4	50.0	33	36	29
Missouri	47.5	48.1	49.6	28	31	30

Source: Milken Institute "State Technology and Science Index: Enduring Lessons for the Intangible Economy June 2008 " State Overall Ranking <<http://www.milkeninstitute.org/tech/tech.taf?sub=tsi>> accessed June 23, 2008.

**Table 17.23-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,  
FOR THE UNIVERSITY OF HAWAII: 1991-1992 TO 2006-2007**

[Research and non-research awards received through the Office of Research Services, University of Hawaii, and non-competitive awards from the U.S. Department of Agriculture]

Fiscal year ending June 30	Total		Research		Non-research	
	Awards	Amount (dollars)	Awards	Amount (dollars)	Awards	Amount (dollars)
1991-1992	1,221	124,876,638	703	65,791,624	518	59,085,014
1992-1993	1,146	131,075,215	636	61,059,928	510	70,015,287
1993-1994	1,322	142,563,794	755	77,763,782	567	64,800,012
1994-1995	1,147	139,199,221	616	70,222,653	531	68,976,568
1995-1996	1,191	134,469,155	697	76,698,552	494	57,770,603
1996-1997	1,255	160,859,800	724	89,131,636	531	71,728,164
1997-1998	1,300	159,948,612	763	91,746,988	537	68,201,624
1998-1999	1,254	164,168,101	707	92,737,645	547	71,430,456
1999-2000	1,379	180,629,855	767	102,845,010	612	77,784,845
2000-2001	1,405	216,233,918	835	132,833,308	570	83,400,610
2001-2002	1,629	252,370,477	971	141,875,022	658	110,495,455
2002-2003	1,646	323,868,218	976	190,374,465	670	133,493,753
2003-2004	1,675	328,982,431	1,002	199,944,709	673	129,037,722
2004-2005	1,742	354,127,142	1,022	209,196,531	720	144,930,611
2005-2006	1,785	433,360,395	1,068	236,708,881	717	196,651,514
2006-2007	1,778	354,031,667	1,081	209,909,883	697	144,121,784

Source: University of Hawaii, Office of Research Services, *2006-2007 Executive Managerial Report* and previous reports <[http://www.hawaii.edu/ors/filecabinet\\_managerial\\_report.htm](http://www.hawaii.edu/ors/filecabinet_managerial_report.htm)> accessed May 13, 2008.

**Table 17.24-- RESEARCH AND DEVELOPMENT EXPENDITURES AT  
DOCTORATE-GRANTING INSTITUTIONS: FISCAL YEARS 1991 TO 2005**

[In thousands of dollars]

<b>Year</b>	<b>Total</b>	<b>Federally financed</b>	<b>State and local government financed</b>	<b>Industry financed</b>	<b>Institutionally financed</b>	<b>All other sources</b>
1991	78,166	44,857	27,321	856	3,391	1,741
1992	80,258	47,684	26,775	337	3,319	2,143
1993	73,961	41,362	27,099	151	3,109	2,240
1994	70,079	39,392	25,204	434	3,290	1,759
1995	78,429	44,238	26,789	299	3,738	3,365
1996	111,202	66,902	31,826	8,088	4,386	-
1997	120,107	72,421	28,440	5,944	13,297	5
1998	148,007	86,886	37,002	10,949	13,170	-
1999	156,810	93,418	35,111	13,021	15,260	-
2000	161,300	95,419	35,474	11,158	19,249	-
2001	156,976	97,716	33,125	7,232	18,903	-
2002	172,664	119,381	31,062	9,971	12,232	18
2003	184,602	148,662	11,822	6,931	17,171	16
2004	241,346	191,252	8,815	21,234	19,892	153
2005	240,247	199,135	7,077	12,155	21,282	598

Source: National Science Foundation, Division of Science Resources Statistics, *Academic Research and Development Expenditures. Fiscal Year 2005*, NSF 07-318 (May 2007),  
<<http://www.nsf.gov/statistics/nsf07318/pdf/nsf07318.pdf>> accessed October 29, 2007.

**Table 17.25-- PATENTS ISSUED TO HAWAII RESIDENTS: 1984 TO 2007**

<b>Calendar year</b>	<b>Patents</b>	<b>Calendar year</b>	<b>Patents</b>	<b>Calendar year</b>	<b>Patents</b>
1984	39	1992	81	2000	93
1985	38	1993	106	2001	107
1986	46	1994	99	2002	91
1987	46	1995	84	2003	96
1988	62	1996	104	2004	86
1989	71	1997	93	2005	58
1990	85	1998	93	2006	101
1991	80	1999	97	2007	82

Source: U.S. Patent and Trademark Office, Information Products Division/TAF Branch, *Patent Counts by Country/State and Year, All Patents, All Types, January 1, 1977 -- December 31, 2007* (March 2008)  
 <[http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst\\_all.pdf](http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_all.pdf)> accessed April 21, 2008.

**Table 17.26-- ASTRONOMY AND RELATED FACILITIES AT  
THE SUMMITS OF MAUNA KEA AND HALEAKALA: 2002**

Facility (mirror diameter in meters)	Capital cost 1/ (\$ mil)	Annual operating cost (\$ mil)	County based staff	Operational
Mauna Kea observatories:				
UH 0.6-m (Optical)	0.3	(2/)	(2/)	1968
UH 2.2-m (Optical/Infrared)	5	1.3	8	1970
Canada-France-Hawaii 3.6-m (Optical/Infrared)	30	6.2	50	1979
NASA IRTF 3.0-m (Infrared)	10	3.2	16	1979
United Kingdom 3.8-m (Infrared)	5	3.0	31	1979
James Clerk Maxwell 15-m Submillimeter	32	5.0	39	1986
Caltech 10.4-m Submillimeter	10	2.6	11	1986
W.M. Keck Observatory (Keck I & II) 10-m x 2 (Optical/Infrared)	170	11.0	115	1992/96
VLBA Antenna 25-m (Radio)	7	0.25	2	1992
Submillimeter Array 8x6-m	80	6.0	36	2003
Subaru (Japan National Large Telescope) 8-m (Optical/Infrared)	170	15.0	70	1999
Fredrick C. Gillett Gemini 8m (Optical/Infrared)	92	8.0	70	1999
Mauna Kea Observatories Support Services	(X)	3/ 2.4	28	(X)
<b>Total</b>	<b>611</b>	<b>61.6</b>	<b>476</b>	
Haleakala observatories:				
Mees Solar Observatory	0.5	0.1	2	1968
Lunar Ranging Facility	3.3	0.7	7	1976/84
Haleakala Observatories Projects	(NA)	0.5	4	1979
Maui Space Surveillance Site (MSSS) 4/ Advanced Electro-Optical System 3.7-m Telescope (AEOS)	200.0	16.0	120	1979
Magnum 2-m Telescope 5/	50.0	15.0	55	1997
Faulkes 2-m Telescope 6/	5.0	0.25	1	2000
Haleakala Support Facilities	5.0	(NA)	(NA)	2003
	(X)	0.13	6	(NA)
<b>Total</b>	<b>263.8</b>	<b>32.68</b>	<b>195</b>	

NA Not available.

X Not applicable.

1/ Historical cost, not adjusted for inflation.

2/ Combined budget and staffing with UH 2.2-m telescope.

3/ Not included in the total since derived from facility operating costs.

4/ Formerly Air Force Maui Optical Station (AMOS).

5/ MAGNUM = Multicolor Active Galactic Nuclei Monitoring.

6/ Under construction.

Source: University of Hawaii at Manoa, Institute for Astronomy, records.