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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: 2007, Sections 16 and 19*.

**Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE
(PHYSICAL UNITS): 1960 TO 2003**

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	4/ 41,479	101
2002	748	3	4/ 45,068	95
2003	837	3	46,963	91

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/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data 2003*
<http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf> table 7 accessed April 2, 2007.

Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1960 TO 2003

[Trillion Btu]

Year	Total	Coal 1/	Natural gas 2/	Petroleum	Hydro-electric 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/ 278.6	17.8	2.9	7/ 239.8	1.0	11.4	5.7
2002	7/ 291.7	16.6	2.9	259.2	1.0	9.1	2.9
2003	309.6	19.3	2.9	270.1	0.9	11.3	5.2

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 2003*
 <http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf> table 7 accessed April 2, 2007.

**Table 17.03-- CONSUMPTION OF ENERGY BY END-USE SECTOR:
1960 TO 2003**

[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	73.1	132.0	109.4
2002	36.9	41.0	5/ 72.0	141.8	113.7
2003	36.2	42.1	67.8	163.6	113.3

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 2003* <http://www.eia.doe.gov/emeu/states/sep_use/total/pdf/use_hi.pdf> tables 8, 9, 10, 11 and 12 accessed April 2, 2007.

Table 17.04-- PRIMARY ENERGY CONSUMPTION AND ELECTRICITY SALES, TOTAL AND PER CAPITA: 1991 TO 2005

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	325.2151	2/ 243.678	9,690,598	2/ 7,261
2001	304.6372	2/ 228.443	9,776,882	2/ 7,332
2002	306.2823	2/ 227.240	9,958,768	2/ 7,389
2003	320.3960	2/ 236.315	10,206,405	2/ 7,528
2004	324.0634	2/ 235.490	10,508,642	2/ 7,636
2005 3/	324.5542	232.661	10,538,507	7,555

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 2005**

[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 1/	324.5542	291.5014	5.2839	4.4945

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/	1.1463	15.5778	0.0692	2.2801	4.2010

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 1998

[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 4/	10,455	8,009	178	364	87

Year	Geothermal	Wind	Coal	PV 2/	Other 3/
1989	14	41	-	-	(Z)
1990	-	28	-	-	306
1991	-	30	-	-	329
1992	1	21	-	-	999
1993	155	24	1,592	(Z)	10
1994	175	22	1,382	(Z)	19
1995	223	23	1,674	(Z)	12
1996	228	22	1,740	(Z)	19
1997	229	17	1,663	(Z)	20
1998 4/	220	21	1,553	(Z)	20

Z Less than 500,000 kWh.

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/ Preliminary

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:
1998**

[Million kWh]

Island	Total	Petroleum	Biomass	MSW 1/	Hydroelectric
State total	10,455	8,010	178	364	87
Hawaii	1,040	627	-	-	49
Maui	1,171	1,008	112	-	21
Lanai	28	28	-	-	-
Molokai	38	38	-	-	-
Oahu	7,723	5,937	-	364	-
Kauai	455	372	66	-	17

Island	Wind	Geothermal	Coal	PV 2/	Other
State total	21	220	1,555	(Z)	20
Hawaii	21	220	123	(Z)	-
Maui	-	-	30	(Z)	-
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	-	-	1,402	(Z)	20
Kauai	-	-	-	-	-

Z. Less than 500,000 kWh.

1/ Electricity generated from Honolulu municipal solid waste plant.

2/ Electricity generated from photovoltaic.

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 2005

[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 2/	5,492.9	4,258.5	693.5	3,565.0	1,927.9	693.5

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 2006

Year	Customers, Dec. 31			Power sold (1,000 kWh)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 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

Year	Average annual use (kWh) 2/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residen- tial 1/	Other	Residen- tial 1/	Other	Total	Residen- tial 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

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: 2006

Island	Customers, Dec. 31			Gross System Peak 2/	Power sold (1,000 kWh)		
	Total	Residential 1/	Other	(mW)	Total	Residential 1/	Other
State total	469,013	403,278	65,735	(X)	10,567,913	3,180,852	7,387,061
Oahu	292,988	259,098	33,890	1,315.0	7,700,605	2,134,432	5,566,173
Hawaii	76,417	62,851	13,566	206.5	1,148,761	442,293	706,468
Kauai	34,671	26,495	8,176	76.8	452,080	158,694	293,386
Lanai	1,620	1,381	239	5.6	28,691	8,088	20,603
Maui	60,218	50,922	9,296	210.8	1,202,503	424,628	777,875
Molokai	3,099	2,531	568	6.3	35,273	12,717	22,556
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	7,887	112,376	0.23358	0.19590	2,190,152	742,994	1,447,158
Oahu	8,238	164,242	0.20063	0.16768	1,361,566	428,239	933,327
Hawaii	7,037	52,076	0.31034	0.28526	338,786	137,259	201,527
Kauai	5,990	35,884	0.33126	0.31806	145,884	52,569	93,315
Lanai	5,857	86,205	0.32505	0.31364	9,091	2,629	6,462
Maui	8,339	83,678	0.27784	0.26349	322,941	117,980	204,961
Molokai	5,024	39,711	0.33955	0.33543	11,884	4,318	7,566

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 2006

[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

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

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: 2006

[Excludes bottled gas]

Island	Customers, December 31			Gas sold (1,000 therms)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
State total	35,793	32,164	3,629	34,340	4,983	29,357
Oahu	32,852	29,603	3,249	30,936	4,530	26,406
Hawaii	1,728	1,425	303	2,496	271	2,225
Kauai	730	730	-	92	92	-
Lanai	6	6	-	-	-	-
Maui	396	319	77	802	76	726
Molokai	81	81	-	14	14	-

Island	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residen- tial 1/	Other	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
State total	155	8,090	3.87417	2.46238	91,593	19,305	72,288
Oahu	153	8,127	3.86203	2.49992	83,508	17,495	66,013
Hawaii	190	7,343	4.18081	2.14652	5,909	1,133	4,776
Kauai	126	-	4.03261	-	377	371	6
Lanai	-	-	-	-	-	-	-
Maui	238	9,429	3.34211	2.05510	1,746	254	1,492
Molokai	173	-	3.71429	-	53	52	1

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 2006**

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

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 2006**

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

1/ Includes liquefied petroleum gas.
Source: The Gas Company, records.

Table 17.15-- LIQUID FUEL TAX BASE: 1992 TO 2006

[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	
1992	1,286,118	574,716	381,118	162,983	26,289	
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	
Year reported	Liquefied petroleum gas		Aviation fuel	Small boats		Other fuel
	Off hwy.	Hwy. use		Gasoline	Diesel oil	
1992	3,644	532	711,402	48	102	(X)
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

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> accessed June 15, 2007.

Table 17.16-- LIQUID FUEL TAX BASE, BY COUNTY: 2006

[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	869,789	515,502	151,542	135,657	67,089
Gasoline	472,658	291,466	66,563	80,714	33,916
Diesel oil, non-hwy.	131,665	87,564	14,229	11,754	18,118
Diesel oil, hwy. use	50,065	26,450	7,581	13,368	2,666
Liq. pet. gas, off hwy.	1	1	-	-	-
Liq. pet. gas, hwy. use	142	116	13	8	5
Small boats, gasoline	23	23	-	-	-
Small boats, diesel oil	45	24	-	21	-
Aviation fuel	212,434	107,967	62,292	29,791	12,384
Other fuel	2,756	1,892	864	-	-

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> accessed June 15, 2007.

**Table 17.17-- GASOLINE STATIONS (NAICS 447), BY COUNTY:
1997 TO 2004**

[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]

Year	State total	City and County of Honolulu	Hawaii County	Kauai County	Maui County
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

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://www.census.gov/prod/www/abs/cbptotal.html>> accessed December 7, 2006.

**Table 17.18-- BOILERS AND PRESSURE VESSELS, BY ISLAND:
2005 AND 2006**

[As of December 31]

Island	Total	Power boilers	Heating boilers	Pressure vessels
2005				
State total	10,277	515	2,569	7,193
Hawaii	1,413	71	353	989
Maui	1,184	59	296	829
Lanai	41	2	10	29
Molokai	51	3	13	35
Oahu	7,076	354	1,769	4,953
Kauai	512	26	128	358
2006				
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

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: 1999 TO 2004**

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

Type of obligation	1999	2000	2001	2002	2003	2004
R&D	198.8	209.7	293.1	375.2	349.6	392.6
R&D plant	9.3	1.8	2.8	6.4	1.9	7.0

Source: National Science Foundation/Division of Science Resources Statistics, *Federal Funds for Research and Development: Fiscal Years 2004-06*, volume 54, tables 129 and 131, <<http://www.nsf.gov/statistics/nsf07323/>> accessed June 29, 2007.

**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
Establishments					
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
Jobs					
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
Wages (\$ million)					
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
Average wage					
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>
accessed June 29, 2007.

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

[In percent, unless otherwise specified]

Year	Total State Job (number)	State	Hawaii	Maui	Honolulu	Kauai	County unknown
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-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1991-1992 TO 2005-2006**

[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	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

Source: University of Hawaii, Office of Research Services, *2005-2006 Executive Managerial Report* and previous reports <http://www.hawaii.edu/ors/filecabinet_managerial_report.htm> accessed April 30, 2007.

**Table 17.23-- RESEARCH AND DEVELOPMENT EXPENDITURES AT
DOCTORATE-GRANTING INSTITUTIONS: FISCAL YEARS 1991 TO 2004**

[In thousands of dollars]

Year	Total	Federally financed	State and local government financed	Industry financed	Institutionally financed	All other sources
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 1/	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

1/ Revised from previous *Data Book*.

Source: National Science Foundation, Division of Science Resources Statistics, *Academic Research and Development Expenditures. Fiscal Year 2004*, NSF 06-323 (July 2006), <<http://www.nsf.gov/statistics/nsf06323/pdf/nsf06323.pdf>> accessed November 28, 2006.

Table 17.24-- PATENTS ISSUED TO HAWAII RESIDENTS: 1984 TO 2006

Calendar year	Patents	Calendar year	Patents	Calendar year	Patents
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		

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, 2006* (March 2007)
 <http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_all.pdf> accessed April 30, 2007.

**Table 17.25-- 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)
Total	611	61.6	476	
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)
Total	263.8	32.68	195	

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.