

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, Division of Consumer Advocacy; Hawaii State Department of Business, Economic Development & Tourism, Energy 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: 1996*, Sections 19 and 20.

**Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE
(PHYSICAL UNITS): 1970 TO 1993**

Year	Petroleum 1/ (1,000 barrels)	Hydroelectric power 2/ (million kWh)	Geothermal energy (million kWh)	Coal (1,000 short tons)	Other 3/ (million kWh)
1970	34,129	108	0	0	24
1971	36,754	89	0	0	15
1972	37,755	91	0	0	18
1973	38,785	95	0	0	22
1974	36,698	92	0	0	30
1975	37,056	89	0	0	25
1976	37,990	93	0	0	29
1977	40,249	86	0	0	26
1978	40,851	84	0	0	0
1979	44,486	90	0	0	0
1980	43,505	86	0	0	0
1981	38,721	80	0	0	15
1982	35,637	90	0	47	26
1983	36,297	84	0	42	28
1984	37,252	82	21	38	28
1985	40,004	86	19	46	25
1986	38,931	78	18	16	0
1987	39,669	82	13	63	0
1988	46,133	81	16	50	0
1989	47,940	89	14	32	11
1990	48,606	89	0	28	6
1991	45,487	87	0	37	0
1992	44,357	76	0	47	0
1993	38,778	80	0	73	0

1/ For data by type of petroleum, see source.

2/ Includes industrial and electric utility production.

3/ Electricity generated for distribution from biomass fuels and wind, photovoltaic, and solar thermal energy sources. Excludes natural gas and nuclear electric power.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report 1993, Consumption Estimates* (July 1995), p. 95.

**Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE (TRILLION BTU):
1970 TO 1993**

[Revised data, 1984-1990]

Year	Total energy consumed	Petroleum 1/	Hydro-electric power 2/	Geo-thermal energy	Coal	Natural gas	Other types 3/
1970	196.9	195.5	1.1	0.0	0.0	0.0	0.3
1971	211.6	210.5	0.9	0.0	0.0	0.0	0.2
1972	217.7	216.6	0.9	0.0	0.0	0.0	0.2
1973	223.7	222.5	1.0	0.0	0.0	0.0	0.2
1974	211.6	210.3	1.0	0.0	0.0	0.0	0.3
1975	213.9	212.7	0.9	0.0	0.0	0.0	0.3
1976	219.3	218.0	1.0	0.0	0.0	0.0	0.3
1977	232.6	231.5	0.9	0.0	0.0	0.0	0.3
1978	236.0	235.2	0.9	0.0	0.0	0.0	0.0
1979	255.2	254.3	0.9	0.0	0.0	0.0	0.0
1980	253.2	249.3	0.9	0.0	0.0	3.0	0.0
1981	226.4	222.6	0.8	0.0	0.0	2.8	0.2
1982	208.5	203.3	0.9	0.0	1.1	2.8	0.3
1983	210.3	205.4	0.9	0.0	1.0	2.7	0.3
1984	220.8	215.8	0.9	0.4	0.9	2.4	0.3
1985	237.4	232.1	0.9	0.4	1.1	2.7	0.3
1986	231.2	226.9	0.8	0.4	0.4	2.7	0.0
1987	236.0	230.5	0.9	0.3	1.6	2.8	0.0
1988	274.6	269.3	0.8	0.3	1.2	2.8	0.0
1989	284.6	279.6	0.9	0.3	0.8	2.9	0.1
1990	288.4	283.8	0.9	0.0	0.7	3.0	0.1
1991	269.6	264.9	0.9	0.0	0.9	2.9	0.0
1992	263.1	258.3	0.8	0.0	1.2	2.9	0.0
1993	229.3	223.8	0.8	0.0	1.8	2.8	0.0

1/ For data by type of petroleum, see source.

2/ Includes industrial and electric utility production.

3/ Electricity generated for distribution from biomass fuels and wind, photovoltaic, and solar thermal energy sources.

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report 1993, Consumption Estimates* (July 1995), p. 95.

**Table 17.03-- CONSUMPTION OF ENERGY BY END-USE SECTOR:
1970 TO 1993**

[Trillion Btu]

Year	Consumption				Input at electric utilities
	Residential	Commercial	Industrial	Transportation	
1970	16.4	11.6	43.6	125.3	43.2
1971	17.8	11.4	43.5	138.8	47.7
1972	19.6	12.7	48.9	136.5	54.1
1973	20.0	13.5	49.4	140.9	55.6
1974	20.3	13.3	49.4	128.7	57.5
1975	19.6	13.8	49.9	130.5	58.8
1976	21.3	15.3	51.0	131.7	62.5
1977	21.8	16.8	52.7	141.3	65.2
1978	21.8	17.4	52.2	144.6	66.8
1979	22.9	18.1	57.8	156.4	67.7
1980	23.2	20.8	62.4	146.7	69.7
1981	23.0	18.8	60.6	124.1	69.9
1982	21.5	17.6	67.1	102.2	66.9
1983	22.1	17.8	52.6	117.9	68.6
1984	21.0	19.5	50.9	129.3	70.6
1985	20.9	20.3	53.0	143.3	70.0
1986	21.3	22.8	60.2	126.9	72.9
1987	22.8	26.0	62.0	125.1	76.6
1988	23.9	39.2	69.4	142.1	81.9
1989	25.3	38.0	66.9	154.5	85.8
1990	25.1	34.3	72.3	156.7	86.1
1991	23.3	28.2	66.6	151.4	79.2
1992	23.1	32.8	64.3	142.9	74.6
1993	19.8	22.7	60.0	126.8	66.2

Source: U.S. Department of Energy, Energy Information Administration, *State Energy Data Report 1993, Consumption Estimates* (July 1995), pp. 96-100.

**Table 17.04-- PRIMARY ENERGY CONSUMPTION AND ELECTRICITY
SALES, TOTAL AND PER CAPITA: 1985 TO 1995**

Year	Primary energy consumption		Electricity sales by utilities	
	Total (trillion Btu)	Per capita 1/ (million Btu)	Total (1,000 kWh)	Per capita 1/ (kWh)
1985	266.21778	233.976	6,635,158	5,832
1986	271.05620	232.168	7,025,739	6,018
1987	284.20420	239.532	7,298,178	6,151
1988	306.92120	255.682	7,719,029	6,430
1989	314.96310	252.861	7,970,360	6,399
1990	306.70400	243.997	8,310,537	6,611
1991	315.50600	247.281	8,564,032	6,712
1992	321.72220	252.906	8,643,562	6,795
1993	304.79578	239.770	8,657,905	6,811
1994	310.42460	241.256	8,948,458	6,955
1995 2/	312.96020	241.760	9,187,429	7,097

1/ Based on estimated de facto population.

2/ Preliminary.

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

**Table 17.05-- PRIMARY ENERGY CONSUMPTION, BY SOURCE:
1985 TO 1995**

[Trillion Btu]

Year	Total	Petroleum	Biomass	Solar hot water
1985	266.2178	238.6470	23.1430	2.1327
1986	271.0562	242.5857	23.9670	2.1644
1987	284.2042	256.4061	22.1840	2.1914
1988	306.9212	279.1052	22.7080	2.1931
1989	314.9631	289.2301	20.8020	2.3310
1990	306.7040	280.8740	18.1200	2.3400
1991	315.5060	289.9000	17.9000	2.3000
1992	321.7222	290.8500	16.9840	2.3000
1993	304.7958	266.6563	16.8310	2.3000
1994	310.4246	270.8428	16.3660	2.3000
1995 1/	312.9602	271.6728	11.9510	2.8386

Year	Hydroelectric	Coal	Wind	Geothermal	Solid waste
1985	0.9808	0.9560	0.1697	0.1886	-
1986	1.0562	0.4970	0.6036	0.1823	-
1987	0.9670	1.4875	0.8236	0.1446	-
1988	0.9826	1.3509	0.4185	0.1629	-
1989	1.0183	0.8715	0.4189	0.1435	0.1478
1990	1.0700	0.8900	0.2900	-	3.1200
1991	1.0000	0.8000	0.3060	-	3.3000
1992	0.7226	6.9207	0.2573	0.0168	3.6708
1993	0.8024	13.2237	0.2352	1.5988	3.1484
1994	1.5300	13.5599	0.2251	1.8060	3.7948
1995 1/	1.0632	16.5249	0.2364	2.3045	6.3688

1/ Preliminary.

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

Table 17.06-- ELECTRICITY GENERATION BY SOURCE: 1989 TO 1995

[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

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

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.

Source: Hawaii State Department of Commerce and Consumer Affairs, records; Hawaii State Department of Business, Economic Development & Tourism, Energy Division, records; Hawaiian Sugar Planters' Association, records.

**Table 17.07-- ELECTRICITY PRODUCTION, BY SOURCE, BY ISLANDS:
1995**

[Million kWh]

Island	Total	Petroleum	Biomass	MSW 1/	Hydroelectric
State total	10,563	7,853	292	383	103
Hawaii	995	601	11	-	36
Maui	1,189	960	153	-	15
Lanai	28	28	-	-	-
Molokai	37	37	-	-	-
Oahu	7,822	5,861	54	383	-
Kauai	492	366	74	-	52
Island	Wind	Geothermal	Coal	PV 2/	Other
State total	23	223	1,674	(Z)	12
Hawaii	17	223	107	-	-
Maui	-	-	61	(Z)	-
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	6	-	1,506	-	12
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 Division, records; Hawaii State Department of Commerce and Consumer Affairs, records.

**Table 17.08-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY
SOURCE: 1985 TO 1995**

[Millions of dollars]

Year	Total energy expend.	Fuel expenditures			Less: electric utility fuel expend.	Plus: electric purch. by end-user
		Total	Electric utility	Other		
1985	1,921.6	1,586.6	337.6	1,249.0	337.6	672.6
1986	1,564.0	1,147.3	224.6	922.7	224.6	641.3
1987	1,575.1	1,176.2	203.7	972.5	203.7	602.6
1988	1,664.1	1,314.6	238.0	1,076.6	238.0	587.5
1989	1,895.2	1,530.6	277.5	1,253.1	277.5	642.1
1990	2,204.4	1,807.0	352.5	1,454.5	352.5	749.9
1991	2,217.5	1,736.4	304.8	1,431.6	304.8	785.9
1992	2,261.5	1,681.2	238.2	1,443.0	238.2	818.5
1993	2,353.2	1,643.7	213.3	1,430.4	213.3	922.8
1994	2,334.3	1,579.8	201.4	1,378.4	201.4	955.9
1995 1/	2,499.9	1,685.7	223.5	1,462.2	223.5	1,037.7

1/ Preliminary.

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

Table 17.09-- ELECTRIC UTILITIES: 1985 TO 1995

Year	Customers, Dec. 31 1/			Installed capacity (name-plate), Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential 2/	Other		Total	Residential 2/	Other
1985	330,407	285,117	45,290	1,567,230	6,635,158	1,879,027	4,756,131
1986	337,563	291,222	46,341	1,553,580	7,025,739	1,959,447	5,066,292
1987	347,085	299,758	47,327	1,535,700	7,297,905	2,069,859	5,228,046
1988	354,887	306,375	48,512	1,570,410	7,719,029	2,148,275	5,570,754
1989	362,281	312,347	49,934	1,517,500	7,969,694	2,238,874	5,730,820
1990	370,952	320,215	50,737	1,655,690	8,310,537	2,320,550	5,989,987
1991	380,963	328,899	52,064	1,572,349	8,460,186	2,363,726	6,076,697
1991 4/	380,963	328,899	52,064	1,572,349	8,524,088	2,385,276	6,178,756
1992 4/	385,055	332,863	52,192	1,650,639	8,666,889	2,430,152	6,213,410
1993 4/	395,402	341,471	53,931	1,717,914	8,657,903	2,453,830	6,204,075
1994 4/	403,595	346,977	56,618	1,710,224	8,948,458	2,551,240	6,397,218
1995 4/	409,983	352,589	57,394	1,714,729	9,187,430	2,597,010	6,590,419
Year	Average annual use (kWh 3/)		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 2/	Other	Residential 2/	Other	Total	Residential 2/	Other
1985	6,590	105,015	0.11361	0.09653	672,600	213,478	459,122
1986	6,728	109,326	0.09294	0.07505	562,345	182,110	380,234
1987	6,905	110,466	0.09431	0.07792	602,553	195,198	407,355
1988	7,011	114,832	0.08829	0.07141	587,528	189,689	397,839
1989	7,168	114,772	0.09265	0.07585	642,101	207,436	434,665
1990	7,247	118,060	0.10261	0.08544	749,857	238,103	511,754
1991	7,187	116,716	0.10539	0.08726	779,382	249,104	530,278
1991 4/	7,252	117,524	0.10546	0.08733	785,896	251,553	534,343
1992 4/	7,301	119,049	0.10932	0.08898	818,525	265,667	552,858
1993 4/	7,186	115,037	0.12309	0.10005	922,796	302,054	620,743
1994 4/	7,353	112,989	0.12464	0.09972	955,907	317,984	637,923
1995 4/	7,366	114,828	0.13337	0.10490	1,037,702	346,359	691,343

1/ 1990 based on November data.

2/ 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.

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

4/ Includes the effect of a change in the method of estimating unbilled kilowatt hour sales beginning in 1991 which increased power sold and revenues for all islands except Kauai and Molokai.

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

Table 17.10-- ELECTRIC UTILITIES, BY ISLANDS: 1995

[Includes the effect of a change in the method of estimating unbilled kilowatt hour sales beginning in 1991 which increased power sold and revenues for all islands except Kauai and Molokai]

County or island	Customers, Dec. 31			Installed capacity (name-plate) Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential 1/	Other		Total	Residential 1/	Other
State total	409,983	352,589	57,394	1,714,729	9,187,430	2,597,010	6,590,419
Oahu	269,307	235,905	33,402	1,188,910	6,962,794	1,815,661	5,147,133
Hawaii	58,515	49,129	9,386	3/ 206,600	846,565	323,217	523,348
Kauai	28,822	22,081	6,741	110,550	380,955	125,690	255,266
Maui County	53,339	45,474	7,865	208,669	997,116	332,443	664,673
Lanai	1,333	1,162	171	10,760	26,053	6,147	19,906
Maui	49,194	42,004	7,190	189,029	937,143	313,521	623,621
Molokai	2,812	2,308	504	8,880	33,920	12,774	21,145
County or island	Average annual use (kWh) 2/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
State total	7,366	114,828	0.13337	0.10490	1,037,702	346,359	691,343
Oahu	7,697	154,097	0.12302	0.09501	712,380	223,363	489,018
Hawaii	6,579	55,758	0.17281	0.15144	135,109	55,855	79,254
Kauai	5,692	37,868	0.17287	0.16140	62,928	21,728	41,200
Maui County	7,311	84,510	0.13660	0.12318	127,284	45,412	81,872
Lanai	5,290	116,410	0.17463	0.16538	4,366	1,073	3,292
Maui	7,464	86,735	0.13426	0.12008	116,982	42,095	74,887
Molokai	5,535	41,955	0.17570	0.17461	5,937	2,244	3,692

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.

3/ Includes purchase power companies.

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

Table 17.11-- GAS UTILITIES: 1985 TO 1995

[Revised. Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
1985	32,988	29,253	3,735	31,203	5,911	25,292
1986	33,369	29,678	3,691	31,122	5,762	25,360
1987	33,895	30,198	3,697	32,408	5,880	26,528
1988	34,103	30,450	3,653	32,733	5,780	26,952
1989	34,304	30,661	3,643	33,865	5,896	27,969
1990	34,477	30,840	3,637	34,806	5,924	28,882
1991	34,973	31,378	3,595	33,974	5,775	28,199
1992	35,236	31,625	3,611	33,662	5,733	27,929
1993	35,908	32,293	3,615	33,268	5,750	27,518
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

Year	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
1985	202	6,772	1.76934	1.33821	44,305	10,459	33,846
1986	194	6,871	1.57151	1.12027	37,465	9,055	28,410
1987	195	7,176	1.57204	1.10494	38,556	9,244	29,312
1988	189	7,378	1.54961	1.07840	38,023	8,957	29,066
1989	192	7,677	1.54200	1.06487	38,876	9,092	29,783
1990	192	7,941	1.62847	1.14834	42,813	9,646	33,167
1991	184	7,844	1.78649	1.25285	45,646	10,317	35,329
1992	181	7,735	1.79054	1.25466	45,307	10,265	35,042
1993	178	7,612	1.75962	1.22594	43,853	10,117	33,735
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

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 ISLANDS: 1995

[Excludes bottled gas]

Island	Customers, December 31			Gas sold (1,000 therms)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
State total	36,619	32,950	3,669	33,740	5,793	27,948
Oahu	33,876	30,598	3,278	30,582	5,332	25,250
Hawaii	1,739	1,416	323	2,320	289	2,031
Kauai	558	558	-	94	94	-
Maui	394	326	68	734	67	667
Molokai	52	52	-	10	10	-
Lanai	-	-	-	-	-	-

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	176	7,617	1.79670	1.25158	45,386	10,407	34,979
Oahu	174	7,703	1.81227	1.25895	41,452	9,664	31,788
Hawaii	204	6,287	1.59161	1.18908	2,875	460	2,415
Kauai	169	-	1.68758	-	159	159	-
Maui	205	9,812	1.52513	1.16273	878	102	776
Molokai	189	-	2.28182	-	22	22	-
Lanai	-	-	-	-	-	-	-

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: 1989 TO 1994**

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 (kW)
	Total	Residential only					
1989	247,120	216,063	6,617,943	6,254,220	7,534	0.08308	1,271,000
1990	248,692	217,681	6,835,025	6,470,587	7,620	0.09228	1,262,000
1991	255,176	223,304	6,876,964	6,538,952	7,610	0.09354	1,440,000
1992	257,442	225,229	7,061,157	6,650,449	7,711	0.09925	1,666,000
1993	263,478	230,192	7,029,839	6,607,424	7,581	0.11414	1,669,000
1994	264,992	232,115	7,222,978	6,797,364	7,681	0.11342	1,669,000

1/ Net generation plus purchased power.

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

Source: Hawaiian Electric Company, Inc., records.

**Table 17.14-- GAS UTILITY SERVICE BY THE GAS COMPANY, INC.,
FOR OAHU: 1989 TO 1994**

Calendar year	Customers, Dec. 31		Gas sold 1/ (1,000 therms)		Average annual residential usage 1/ (therms)
	Total	Residential	Total	Residential	
1989	31,812	28,539	30,776	5,446	191
1990	31,974	28,714	31,645	5,469	191
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	30,029	5,287	176
1994	33,597	30,344	30,765	5,372	177

1/ Includes liquefied petroleum gas.

Source: The Gas Company, BHP Petroleum, records.

Table 17.15-- LIQUID FUEL TAX BASE: 1986 TO 1996

[In thousands of gallons]

Year reported 1/	All types		Gasoline	Diesel oil	
	Total	Excluding aviation		Non-hwy.	Hwy. use
1986	1,059,180	456,013	336,559	95,022	19,354
1987	1,206,716	512,974	348,474	137,806	21,207
1988	1,216,828	515,273	357,986	131,292	21,057
1989	1,268,597	535,714	369,172	136,465	23,729
1990	1,307,887	557,097	375,382	151,095	24,763
1991	1,299,455	570,077	376,182	163,773	24,991
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

Year reported 1/	Liquefied petroleum gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
1986	2,969	1,031	603,167	163	916
1987	3,135	1,142	693,742	123	1,089
1988	3,012	1,071	701,555	63	792
1989	4,301	968	732,883	57	1,022
1990	4,757	834	750,790	78	188
1991	3,575	780	729,378	52	724
1992	3,644	532	711,402	48	102
1993	3,343	477	599,691	35	349
1994	3,210	566	661,608	60	198
1995	3,096	514	685,443	50	395
1996	3,249	413	558,969	50	228

1/ 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.

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base and Tax Collections" (annual report).

Table 17.16-- LIQUID FUEL TAX BASE, BY COUNTIES: 1996

[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	1,147,865	887,855	105,444	98,956	55,611
Gasoline	394,989	260,780	51,854	59,021	23,334
Diesel oil, non-hwy.	160,102	73,753	32,694	23,931	29,725
Diesel oil, hwy. use	29,864	18,976	3,453	6,326	1,108
Liq. pet. gas, off hwy.	3,249	1,863	569	545	272
Liq. pet. gas, hwy. use	413	357	26	21	9
Small boats, gasoline	50	50	-	-	-
Small boats, diesel oil	228	6	-	223	-
Aviation fuel	558,969	532,070	16,847	8,888	1,164

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base and Tax Collections, Calendar Year Ending December 31, 1996" (annual release).

**Table 17.17-- IMPORTS AND EXPORTS OF CRUDE OIL AND
PETROLEUM PRODUCTS: 1995**

[1,000 barrels]

Product	Imports			Exports		
	Total	Domestic	Foreign	Total	Domestic	Foreign
Crude oil	51,409	19,070	32,339	-	-	-
Distillates	-	-	-	77	-	77
Jet fuel 1/	812	-	812	-	-	-
Residual fuel oil	910	710	200	613	150	463
Naphtha	-	-	-	727	-	727
Other	589	-	589	168	-	168

1/ Excludes imports of unknown origin.

Source: Hawaii State Department of Business, Economic Development & Tourism, Energy Division, records; Energy Information Administration, records.

**Table 17.18-- GASOLINE SERVICE STATIONS (SIC 554) WITH PAYROLL, BY
COUNTIES: 1987, 1992, AND 1994**

Year	State total	City and Co. of Honolulu	Hawaii County	Kauai County	Maui County		
					Lanai	Maui	Molokai
1987	355	241	52	26	1	34	1
1992	326	212	57	21	-	35	1
1994	312	203	58	19	(1/)	1/ 32	(1/)

1/ Lanai and Molokai included with Maui.

Source: U.S. Bureau of the Census, *1987 Census of Retail Trade, Hawaii*, RC87-A-12 (May 1989), table 5; *1992 Census of Retail Trade, Hawaii*, RC92-A-12 (October 1994), table 4; and *County Business Patterns 1994, Hawaii*, CBP-94-13 (September 1996).

**Table 17.19-- BOILERS AND PRESSURE VESSELS, BY ISLANDS:
DECEMBER 31, 1994**

Island	Total	Power boilers	Heating boilers	Pressure vessels
State total	9,404	633	2,657	6,114
Hawaii	1,176	84	219	873
Maui	977	74	244	659
Lanai	65	5	11	49
Molokai	61	7	28	26
Oahu	6,696	426	2,024	4,246
Kauai	429	37	131	261
Niihau	-	-	-	-

Source: Hawaii State Department of Labor and Industrial Relations, Division of Occupational Safety and Health, Boiler and Elevator Inspection Bureau, records.

**Table 17.20-- ENERGY GENERATED, PURCHASED, SOLD, AND USED BY
SUGAR PLANTATIONS, BY ISLANDS: 1993**

Subject	State total	Hawaii	Kauai	Maui	Oahu
Electricity (millions of kilowatt-hours)					
Generated 1/ Purchased	687.63 33.33	179.23 1.80	124.92 14.82	250.32 6.07	133.15 10.64
Sold Used	335.74 385.21	116.23 64.80	71.02 68.72	104.03 152.36	44.46 99.33
Gross heat values of boiler fuels (billions of Btu's)					
All fuels	22,204	6,353	4,166	7,268	4,417
Bagasse	15,998	4,840	3,549	5,007	2,603
Fuel oil	5,373	1,514	591	2,049	1,220
Other fuels	833	-	27	212	594

1/ Includes electricity generated by steam, hydroelectric and diesel engine.

Source: Hawaiian Sugar Planters' Association, *Energy Inventory of Hawaiian Sugar Plantations - 1993* (Energy Report 33, May 1994), pp. 10-11.

**Table 17.21-- HIGH TECHNOLOGY COMPANIES, EMPLOYEES,
AND REVENUES: 1993**

Subject	All sectors	Manufacturing	Service	Support
Number of companies 1/	248	18	186	44
Employees 2/	7,125	991	4,281	1,853
Revenues (million dollars) 2/	958	388	376	194

1/ Number responding to survey. The estimated total number of high tech companies in Hawaii was 300.

2/ Based on survey response, and excluding GTE Hawaiian Tel and Hawaiian Electric.

Source: High Technology Development Corp., Mililani, Hawaii, 1993 survey.

**Table 17.22-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT
AND R&D PLANT IN HAWAII: 1989 TO 1994**

[Millions of dollars. For fiscal years ended September 30]

Type of obligation	1989	1990	1991	1992	1993	1994
Obligations for R&D	97.4	100.0	112.6	150.7	113.0	140.3
Obligations for R&D plant	0.4	1.4	9.2	6.5	19.3	14.3

Source: National Science Foundation, *Federal Funds for Research and Development: Fiscal Years 1992, 1993 and 1994*, Volume 42, Detailed Statistical Tables, NSF 94-328 (1994), pp. 346-349; <http://www.nsf.gov/sbe/srs/fedfunds/pubs/dst44/tables.htm>.

**Table 17.23-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1991-92 TO 1995-96**

[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)
1991-92	1,221	124,876,638	703	65,791,624	518	59,085,014
1992-93	1,146	131,075,215	636	61,059,928	510	70,015,287
1993-94	1,322	142,563,794	755	77,763,782	567	64,800,012
1994-95	1,147	139,199,221	616	70,222,653	531	68,976,568
1995-96	1,191	134,469,155	697	76,698,552	494	57,770,603

Source: Office of Research Services, University of Hawaii, *1995-1996 Extramural Awards* (1996), p. i.

Table 17.24-- RESEARCH AND DEVELOPMENT EXPENDITURES AT DOCTORATE-GRANTING INSTITUTIONS: 1988 TO 1992

[Thousands of dollars. For fiscal years ended September 30]

Type of expenditure	1988	1989	1990	1991	1992
Total R&D expenditures	64,278	70,733	76,525	78,166	80,258
Federally financed	38,560	40,574	42,665	44,857	47,684
All others	25,718	30,159	33,860	33,309	32,574

Source: National Science Foundation, *Academic Science and Engineering: R&D Expenditures, Fiscal Year 1992*, NSF 94-324, Detailed Statistical Tables (1994), tables B-23 and B-24.

**Table 17.25-- PATENTS ISSUED TO HAWAII RESIDENTS:
1984 TO 1994**

[Fiscal years ended September 30. Data include design, plant, and reissue patents]

Fiscal year	Patents	Fiscal year	Patents
1984	43	1990	78
1985	33	1991	78
1986	37	1992	85
1987	52	1993	88
1988	62	1994	1/ 116
1989	74		

1/ Hawaii ranked 45th among the 50 States.

Source: U.S. Department of Commerce, Patent and Trademark Office, *Working for Our Customers: A Patent and Trademark Office Review, Fiscal Year 1994*, p. 66, and *Annual Report* for 1984-1993.

**Table 17.26-- TELESCOPES AT THE SUMMITS OF MAUNA KEA AND
HALEAKALA: 1994**

Location and facility	Mirror size (meters)	Year completed	Costs (mil. dol.)		Local staff 1/	
			Capital	Operating		
Mauna Kea:						
UH 24-inch Telescope #1	0.61	1968	}	5	1.2	11
UH 24-inch Telescope #2	0.61	1969				
UH 88-inch Telescope	2.24	1970				
NASA Infrared Telescope Facility	3.0	1979	10	2.5	11	
Canada-France-Hawaii Telescope	3.6	1979	30	6.0	52	
United Kingdom Infrared Telescope	3.8	1979	5	2.7	27	
Caltech Submillimeter Observatory	10	1986	6	2.0	11	
James Clerk Maxwell Submillimeter	15	1986	32	3.5	39	
W.M. Keck Observatory	10	1992	94	5.0	35	
VLBA Antenna (Radio)	25	1992	7	0.25	3	
W.M. Keck Observatory (Keck II)	10	1996	93	5.0	35	
Japan National Large Telescope (Subaru)	8	1999	170	10.0	50	
Haleakala (on UH land):						
Mees Solar Observatory	...	1956	0.5	0.5	9	
Lunar Ranging Facility	...	1976/84	3.3	0.6	8	
Maui Space Surveillance Site	200	11.0	120	

1/ Based in same county as observatory.

Source: University of Hawaii at Manoa, Institute for Astronomy, *Fact Sheet--1993-1994* (February 1994).