

Section 17

ENERGY AND SCIENCE

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

Total energy consumption in 1984 amounted to 234 trillion British thermal units, compared with 215 trillion BTU a decade earlier. Transportation, including aviation fuels, accounted for 63 percent of the 1984 total. Total expenditures for fuels and electricity in 1985 totaled almost \$2.0 billion.

Electricity sales exceeded 6.6 billion kilowatt-hours in 1985, a total that has increased 24 percent since 1975. Manufactured gas sales reached 31 million therms in 1985, 12 percent below the figure ten years earlier. Residential rates in 1985 averaged 11.4 cents per kilowatt-hour and \$1.77 per therm, both more than double the corresponding rates a decade earlier. Average residential use (6,590 kWh and 202 therms in 1985) has declined significantly in recent years. By 1985, almost 11 percent of the housing units in the State had solar heating devices.

The liquid fuel tax base for 1985 was approximately 971 million gallons, compared with 839 million in 1975. The 1985 total included 327 million gallons of gasoline, 538 million of aviation fuel, and 102 million of diesel oil. The average price for automotive gasoline rose from 78 cents per gallon in June 1978 to \$1.58 three years later, then fell to \$1.21 by June 1986.

The State is well served with scientific resources. Especially noteworthy is the cluster of large telescopes used for astronomical observations at the summit of Mauna Kea -- nine major facilities, including those under construction. Federal research and development obligations in Hawaii reached \$71 million in 1983. Thirty-three patents were granted to Hawaii residents in 1985.

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 and its Division of Consumer Advocacy, Hawaii State Department of Planning and Economic Development Energy Division, UH Institute for 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: 1986, Sections 20 and 21.

Table 465.-- CONSUMPTION OF ENERGY, BY SOURCE (PHYSICAL UNITS):
1960 TO 1984

[Revised from Data Book 1985, table 442]

Year	Petroleum ^{1/} (1,000 barrels)	Hydro- electric power ^{2/} (million kWh)	Geothermal energy (million kWh)	Other ^{3/} (million kWh)
1960	17,067	27	0	0
1961	20,690	24	0	0
1962	19,733	20	0	0
1963	20,672	23	0	0
1964	22,117	115	0	0
1965	23,178	105	0	0
1966	25,823	112	0	2
1967	29,125	108	0	0
1968	32,385	94	0	30
1969	33,832	100	0	29
1970	34,806	108	0	24
1971	37,432	89	0	15
1972	38,390	91	0	18
1973	39,300	95	0	22
1974	37,286	92	0	30
1975	37,598	89	0	25
1976	37,965	93	0	29
1977	40,229	86	0	26
1978	40,820	84	0	0
1979	44,521	90	0	0
1980	43,500	86	0	0
1981	42,121	80	0	15
1982	41,562	90	0	26
1983	41,206	84	0	28
1984	39,814	82	21	28

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

^{2/} Includes industrial and electric utility production.

^{3/} Wood, waste, wind, photovoltaic, and solar thermal energy sources consumed at electric utilities to produce electricity. Excludes coal, natural gas, and nuclear electric power.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1984 (April 1986), p. 79.

Table 466.-- CONSUMPTION OF ENERGY, BY SOURCE (TRILLION BTU):
1960 TO 1984

[Revised from Data Book 1985, table 443]

Year	Total energy consumed <u>1/</u>	Petro-leum <u>2/</u>	Hydro-electric power <u>3/</u>	Geo-thermal energy	Coal, nuclear power, and natural gas <u>4/</u>	Other types <u>5/</u>
1960	95.8	95.5	0.3	0.0	0.0	0.0
1961	117.1	116.8	0.3	0.0	0.0	0.0
1962	112.2	112.0	0.2	0.0	0.0	0.0
1963	118.1	117.8	0.2	0.0	0.0	0.0
1964	127.9	126.7	1.2	0.0	0.0	0.0
1965	134.2	133.1	1.1	0.0	0.0	0.0
1966	149.2	148.0	1.2	0.0	0.0	(Z)
1967	168.4	167.2	1.1	0.0	0.0	0.0
1968	187.4	186.1	1.0	0.0	0.0	0.3
1969	194.9	193.6	1.0	0.0	0.0	0.3
1970	200.6	199.2	1.1	0.0	0.0	0.3
1971	215.2	214.1	0.9	0.0	0.0	0.2
1972	221.1	220.0	0.9	0.0	0.0	0.2
1973	226.5	225.3	1.0	0.0	0.0	0.2
1974	214.7	213.5	1.0	0.0	0.0	0.3
1975	216.8	215.6	0.9	0.0	0.0	0.3
1976	219.2	217.9	1.0	0.0	0.0	0.3
1977	232.5	231.3	0.9	0.0	0.0	0.3
1978	235.9	235.0	0.9	0.0	0.0	0.0
1979	255.4	254.5	0.9	0.0	0.0	0.0
1980	253.3	249.2	0.9	0.0	3.2	0.0
1981	245.9	241.9	0.8	0.0	3.0	0.2
1982	241.0	236.9	0.9	0.0	2.9	0.3
1983	237.1	233.2	0.9	0.0	2.8	0.3
1984	233.7	229.7	0.8	0.4	2.4	0.3

Z Less than 0.05.

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

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

3/ Includes industrial and electric utility production.

4/ Data for 1980-1984 are apparently in error.

5/ Wood, waste, wind, photovoltaic, and solar thermal energy sources consumed at electric utilities to produce electricity.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1984 (April 1986), p. 79.

Table 467.-- CONSUMPTION OF ENERGY BY END-USE SECTOR: 1960 TO 1984

[Trillion Btu. Revised from Data Book 1985, table 444]

Year	Consumption <u>1/</u>				Electric utilities <u>2/</u>
	Residential	Commercial	Industrial	Transportation	
1960	7.3	5.2	18.2	65.2	17.6
1961	7.5	5.4	26.8	77.4	19.4
1962	8.0	5.5	28.9	69.8	21.4
1963	8.9	6.0	29.6	73.5	24.2
1964	9.6	6.6	32.4	79.2	26.7
1965	10.1	6.8	34.7	82.6	27.6
1966	10.8	7.4	36.0	95.1	29.7
1967	12.1	8.0	39.1	109.2	31.3
1968	13.1	8.8	38.9	126.7	35.0
1969	14.9	9.8	41.0	129.2	38.7
1970	16.4	11.6	43.9	128.7	43.2
1971	17.8	11.4	43.7	142.3	47.7
1972	19.6	12.7	49.0	139.7	54.1
1973	20.0	13.5	49.2	143.8	55.6
1974	20.3	13.3	49.5	131.7	57.5
1975	19.6	13.8	49.9	133.4	58.8
1976	21.3	15.3	50.9	131.7	62.5
1977	21.8	16.8	52.6	141.3	65.2
1978	21.8	17.4	52.1	144.6	66.8
1979	22.9	18.1	58.0	156.3	67.7
1980	23.3	20.9	62.4	146.7	69.7
1981	23.0	18.9	60.5	143.4	69.9
1982	21.6	17.7	65.9	135.9	66.9
1983	22.1	17.8	51.5	145.7	68.6
1984	21.4	18.7	46.5	147.1	70.6

1/ Excludes small quantities of energy sources for which consistent historical data are not available, such as solar energy obtained by the use of thermal and photovoltaic collectors; wind energy; and geothermal, biomass, and waste energy other than that consumed at the electric utilities. Includes power from electric utilities, including electrical energy losses incurred in the generation and transmission of electricity.

2/ Energy input at electric utilities. Distributed among the other four sectors.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1984 (April 1986), pp. 80-84.

Table 468.-- PRIMARY ENERGY USE, BY SOURCE: 1981 TO 1985

[Thousands of barrels of oil equivalent]

Year	All sources	Petroleum	Biomass	Hydro electricity	Coal	Geothermal	Wind
1981	45,886	42,681	2,791	117	297	-	-
1982	45,705	42,325	2,980	174	202	25	-
1983	46,503	43,112	3,069	141	151	30	-
1984	46,051	42,640	3,119	124	135	33	-
1985 <u>1/</u>	46,213	42,837	3,008	155	156	30	27

1/ Preliminary.

Source: Hawaii State Department of Commerce and Consumer Affairs, records; Hawaii State Department of Planning and Economic Development, records; Hawaiian Sugar Planters' Association, records.

Table 469.-- ELECTRICITY GENERATION BY SOURCE: 1981 TO 1985

[Millions of kWh generated]

Year	Total	Petroleum	Biomass	Hydro-electric	Geothermal	Wind	Coal
1981	7,615	6,913	628	74	-	-	-
1982	7,467	6,729	612	110	16	-	-
1983	7,689	6,914	667	89	19	-	-
1984	7,841	7,073	669	78	21	-	-
1985	7,823	6,993	680	98	19	17	16

Source: Hawaii State Department of Commerce and Consumer Affairs, records; Hawaii State Department of Planning and Economic Development, records; Hawaiian Sugar Planters' Association, records.

Table 470.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SOURCE:
1970 TO 1985

[Millions of dollars]

Year	Total energy expend.	Fuel expenditures			Less: electric utility fuel expend.	Plus: electric purch. by end-user
		Total	Electric utility	Other		
1970	282.7	215.9	17.3	198.6	17.3	84.1
1971	320.8	246.8	24.8	222	24.8	98.8
1972	332.4	250.4	27.3	223.1	27.3	109.3
1973	391.1	300.9	36.3	264.6	36.3	126.5
1974	534.5	433.2	49.8	383.4	49.8	151.1
1975	669.9	546.1	91.9	454.2	91.9	215.7
1976	735.6	600	100.4	499.6	100.4	236
1977	844.5	696.5	123.5	573	123.5	271.5
1978	932.2	767.8	149.3	618.5	149.3	313.7
1979	1,261.3	1,083.7	177	906.7	177	354.6
1980	1,721.3	1,529.8	267.8	1,262	267.8	459.3
1981	2,195.2	1,947.7	451.5	1,496.2	451.5	699
1982	2,153.8	1,869.6	439.4	1,430.2	439.4	723.6
1983	2,019.9	1,730.1	369.3	1,360.8	369.3	659.1
1984	2,048.4	1,724.8	379.3	1,345.5	379.3	702.9
1985	1,964.0	1,632.0	340.6	1,291.4	340.6	672.6

Source: Hawaii State Department of Planning and Economic Development, Division of Energy, unpublished estimates, October 16, 1986.

Table 471.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SECTORS:
1970 TO 1985

[Millions of dollars]

Year	Total fuel	Residential		Commercial and industrial		Transport: fuel	Electric utilities: fuel
		Fuel	Elect.	Fuel	Elect.		
1970	215.9	5.5	34.1	18.9	50	174.2	17.3
1971	246.8	8.7	38.8	17.9	60	195.4	24.8
1972	250.4	6.1	42.6	20.5	66.7	196.5	27.3
1973	300.9	10.5	48.7	24.4	77.8	229.7	36.3
1974	443.2	10.4	57.1	44.7	94	328.3	49.8
1975	546.1	7.4	76.9	45.8	138.8	401	91.9
1976	600	12.7	84	45.9	152	441	100.4
1977	696.5	13.9	92.9	55	178.6	504.1	123.5
1978	767.8	13.3	105.8	52.6	207.9	552.6	149.3
1979	1,083.7	26.2	118.9	102.4	235.7	778.1	177
1980	1,529.8	19.5	146.4	135.4	312.9	1,107.1	267.8
1981	1,947.7	20.6	214.6	232.4	484.4	1,243.2	451.5
1982	1,869.6	26.2	222.4	283.6	501.2	1,120.4	439.4
1983	1,730.1	22.9	205.9	288.1	453.2	1,049.8	369.3
1984	1,724.8	20.6	217.4	192.1	485.5	1,132.8	379.3
1985	1,632.0	17.3	213.5	113.1	459.1	1,141.0	340.6

Source: Hawaii State Department of Planning and Economic Development, Division of Energy, unpublished estimates, October 16, 1986.

Table 472.-- ELECTRIC UTILITIES: 1975 TO 1985

Year	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
1975 ..	263,816	226,836	36,980	1,454,359	5,334,755	1,676,438	3,658,317
1976 ..	270,035	232,070	37,965	1,454,359	5,615,209	1,750,618	3,864,592
1977 ..	275,616	237,557	38,059	1,481,680	5,831,610	1,779,314	4,052,296
1978 ..	284,064	244,863	39,201	1,487,490	6,004,891	1,799,024	4,205,867
1979 ..	293,061	252,898	40,163	1,502,840	6,197,426	1,851,457	4,345,969
1980 ..	301,544	260,358	41,186	1,514,180	6,345,531	1,852,984	4,492,547
1981 ..	305,927	265,042	40,885	1,652,380	6,424,016	1,855,837	4,568,179
1982 ..	313,009	270,712	42,297	1,644,980	6,332,707	1,801,297	4,531,410
1983 ..	319,449	276,194	43,255	1,578,780	6,425,578	1,814,336	4,611,242
1984 ..	324,384	280,518	43,866	1,578,780	6,606,255	1,837,954	4,768,301
1985 ..	330,407	285,117	45,290	1,567,230	6,635,158	1,879,027	4,756,131
Year	Average annual use (kWh) 1/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
1975 ..	7,391	98,927	.04586	.03794	215,677	76,885	138,792
1976 ..	7,543	101,794	.04796	.03934	235,999	83,957	152,042
1977 ..	7,490	106,474	.05222	.04408	271,553	92,917	178,636
1978 ..	7,347	107,290	.05883	.04943	313,722	105,846	207,876
1979 ..	7,321	108,208	.06420	.05424	354,595	118,862	235,733
1980 ..	7,117	109,079	.07901	.06964	459,251	146,397	312,854
1981 ..	7,002	111,732	.11563	.10605	699,031	214,584	484,447
1982 ..	6,654	107,133	.12348	.11061	723,622	222,423	501,199
1983 ..	6,569	106,606	.11348	.09828	659,089	205,889	453,200
1984 ..	6,552	108,702	.11831	.10181	702,899	217,447	485,452
1985 ..	6,590	105,015	.11361	.09653	672,600	213,478	459,122
1986					562,345		

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

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

Table 473.-- ELECTRIC UTILITIES, BY ISLANDS: 1985

County or island	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
State total	330,407	285,117	45,290	1,567,230	6,635,158	1,879,027	4,756,131
Oahu	231,912	202,222	29,690	1,283,000	5,336,262	1,403,837	3,932,425
Hawaii	41,394	34,505	6,889	104,650	505,150	204,032	301,118
Kauai	19,421	16,493	2,928	62,080	231,007	83,758	147,249
Maui County	37,680	31,897	5,783	117,500	562,739	187,400	375,339
Lanai	876	753	123	-	5,507	3,382	2,125
Maui	34,295	29,087	5,208	110,300	532,687	174,240	358,447
Molokai	2,509	2,057	452	7,200	24,545	9,778	14,767
County or island	Average annual use (kWh) 1/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
State total	6,590	105,015	0.11361	0.09653	672,600	213,478	459,122
Oahu	6,942	132,449	0.10417	0.08871	495,077	146,243	348,834
Hawaii	5,913	43,710	0.13655	0.12650	65,950	27,860	38,090
Kauai	5,078	50,290	0.14900	0.14883	34,396	12,480	21,916
Maui County	5,875	64,904	0.14352	0.13396	77,177	26,895	50,282
Lanai	4,491	17,274	0.18793	0.18890	1,037	636	401
Maui	5,990	68,826	0.13856	0.13010	70,776	24,143	46,633
Molokai	4,753	32,670	0.21641	0.21994	5,364	2,116	3,248

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

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

Table 474.-- GAS UTILITIES: 1975 TO 1985

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)			
	Total	Residential	Other	Total	Residential	Other	
1975 ...	34,685	30,236	4,449	35,594	8,230	27,364	
1976 ...	34,264	29,873	4,391	35,568	8,121	27,447	
1977 ...	33,722	29,408	4,314	34,844	7,612	27,232	
1978 ...	33,413	29,091	4,322	34,919	7,388	27,532	
1979 ...	33,309	29,014	4,295	35,264	7,326	27,937	
1980 ...	33,019	28,825	4,194	34,705	7,030	27,675	
1981 ...	32,421	28,343	4,078	32,396	6,422	25,975	
1982 ...	32,905	28,979	3,926	32,224	6,329	25,895	
1983 ...	32,880	28,933	3,947	31,307	6,338	24,970	
1984 ...	32,643	28,859	3,784	30,928	5,853	25,075	
1985 ...	32,988	29,253	3,735	31,203	5,911	25,292	
Year	Average annual use (therms) <u>1/</u>		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residen- tial	Other	Residen- tial	Other	Total	Residen- tial	Other
1975 ...	272	6,151	.81723	.63583	24,125	6,726	17,399
1976 ...	272	6,251	.82767	.63369	24,115	6,722	17,393
1977 ...	259	6,313	.85883	.65821	24,462	6,537	17,925
1978 ...	254	6,370	.91647	.71792	26,536	6,770	19,766
1979 ...	253	6,505	1.09260	.89221	32,931	8,006	24,925
1980 ...	244	6,599	1.46583	1.25951	45,162	10,305	34,857
1981 ...	227	6,369	1.72585	1.50091	50,069	11,083	38,986
1982 ...	218	6,596	1.73311	1.43891	48,229	10,969	37,260
1983 ...	219	6,326	1.79719	1.44022	47,352	11,390	35,962
1984 ...	203	6,627	1.78958	1.37488	44,949	10,474	34,475
1985 ...	202	6,772	1.76934	1.33821	44,305	10,459	33,846

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

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

Table 475.-- GAS UTILITIES, BY ISLANDS: 1985

[Excludes bottled gas]

Island	Customers, Dec. 31			Gas sold (therms)		
	Total	Residential	Other	Total	Residential	Other
State total	32,988	29,253	3,735	31,203,218	5,911,402	25,291,816
Oahu	30,442	27,085	3,357	28,255,330	5,435,506	22,819,824
Hawaii	1,905	1,587	318	2,103,949	357,813	1,746,136
Kauai	272	272	-	58,995	58,995	-
Mauí	369	309	60	784,944	59,088	725,856
Molokai	-	-	-	-	-	-
Lanai	-	-	-	-	-	-

Island	Average annual use (therms) ^{1/}		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
State total	202	6,772	1.76934	1.33821	44,305	10,459	33,846
Oahu	201	6,798	1.79178	1.35453	40,649	9,739	30,910
Hawaii	225	5,491	1.50588	1.20498	2,643	539	2,104
Kauai	217	-	1.55350	-	92	92	-
Mauí	191	12,098	1.51598	1.14550	921	89	832
Molokai	-	-	-	-	-	-	-
Lanai	-	-	-	-	-	-	-

^{1/} Based on number of customers at end of year.

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

Table 476.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1980 TO 1985

Year	Number of customers, Dec. 31		Net input 1/ (1,000 kWh)	Power sold (1,000 kWh)	Average annual residential use 2/ (kWh)	Average residential rate (dollars per kWh)	Installed capacity 3/ (kW) Dec. 31
	Total	Residential only					
1980 ..	217,142	189,771	5,525,998	5,266,522	7,661	0.07126	1,140,180
1981 ..	218,162	191,283	5,507,151	5,276,227	7,474	0.11364	1,275,160
1982 ..	222,636	194,468	5,441,941	5,164,332	7,068	0.12066	1,255,600
1983 ..	226,070	197,400	5,546,600	5,230,658	7,030	0.10631	1,200,000
1984 ..	228,606	199,722	5,633,940	5,330,931	6,960	0.11032	1,200,000
1985 ..	231,912	202,222	5,637,678	5,336,262	6,997	0.10417	1,200,000

1/ Net generated plus purchased power.

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

3/ Maximum generator nameplate.

Source: Hawaiian Electric Co., Inc., records.

Table 477.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1980 TO 1985

Calendar year	Customers, Dec. 31		Gas sold 1/ (1,000 therms)		Average annual residential usage 1/ (therms)
	Total	Residential	Total	Residential	
1980 ...	30,471	26,625	31,636	6,455	242
1981 ...	30,019	26,201	29,543	5,893	225
1982 ...	30,221	26,665	29,307	5,765	216
1983 ...	30,305	26,674	28,795	5,849	219
1984 ...	30,041	26,636	28,190	5,389	202
1985 ...	30,442	27,085	28,255	5,436	201

1/ Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 478.-- LIQUID FUEL TAX BASE: 1975 TO 1985

[In thousands of gallons]

Year reported <u>1/</u>	All types	Gasoline	Diesel oil	
			Non-hwy.	Hwy. use
1975	839,289	284,552	75,120	12,710
1976	850,261	295,704	79,884	13,561
1977	888,136	311,409	85,484	13,817
1978	917,380	324,702	99,755	15,233
1979	960,837	324,337	108,460	16,596
1980	939,766	312,896	101,719	17,765
1981	918,437	305,886	101,212	15,771
1982	893,288	308,600	88,312	17,303
1983	919,865	310,085	86,790	16,440
1984	925,871	322,410	95,956	17,892
1985	970,555	327,021	83,147	17,636

Year reported <u>1/</u>	Liquefied petroleum gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
1975	1,823	1,380	462,384	411	908
1976	1,858	1,054	456,819	464	917
1977	2,036	1,280	472,654	558	899
1978	1,821	1,216	473,270	445	938
1979	2,213	1,140	506,825	410	856
1980	2,448	1,140	502,544	338	917
1981	2,378	1,136	489,551	424	2,079
1982	2,628	960	474,477	207	802
1983	3,013	1,052	501,648	213	624
1984	2,600	873	485,810	114	215
1985	2,804	1,028	538,055	187	676

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 ended November 30.

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

Table 479.-- LIQUID FUEL TAX BASE, BY COUNTIES: 1985

[In thousands of gallons]

Type of fuel	State total	City and Co. of Honolulu	County of Maui	County of Hawaii	County of Kauai
Total	970,555	795,259	79,184	64,144	31,968
Gasoline	327,021	232,092	35,441	41,872	17,616
Diesel oil, non-hwy.	83,147	31,327	26,750	11,737	13,334
Diesel oil, hwy. use	17,636	12,848	1,340	2,871	578
Liq. pet. gas, off hwy. ..	2,804	1,905	353	438	108
Liq. pet. gas, hwy. use ..	1,028	843	45	104	35
Small boats, gasoline	187	50	-	137	-
Small boats, diesel oil ..	676	69	-	607	-
Aviation fuel	538,055	516,125	15,255	6,377	298

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base, Collections and Distribution, Year Ending December 31, 1985" (annual release).

Table 480.-- GASOLINE SERVICE STATIONS (SIC 554)
WITH PAYROLL, BY COUNTIES: 1964 TO 1984

Year	State total	City and Co. of Honolulu	Hawaii County	Kauai County	Maui County
1964	378	276	47	20	34
1974	400	291	53	26	30
1981	340	254	45	17	24
1982	365	252	59	21	33
1983	379	267	59	25	28
1984	359	251	51	26	31

Source: U.S. Bureau of the Census, County Business Patterns, Hawaii (annual).

Table 481.-- GASOLINE SERVICE STATIONS: 1982

[Data are shown only for establishments with payroll]

Subject	State total	Oahu only
Number of establishments	366	251
Offering self-service sale of gasoline	64	53
Sales (\$1,000)	400,141	299,966
Gallon sales (1,000):		
Gasoline, total	228,151	172,809
Through self-service	51,926	48,879
Other automotive fuels	2,387	1,838
Pumps, Dec. 31:		
Gasoline, total	2,431	1,902
Self-service	478	412
Other automotive fuel	60	44
Total gallon storage capacity, all fuels (1,000)	6,300	(S)

S Withheld because estimates did not meet publication standards.

Source: U.S. Bureau of the Census, 1982 Census of Retail Trade, RC82-I-4, Miscellaneous Subjects (June 1985), tables 2, 3, 4, and 5.

Table 482.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
1978 TO 1986

[Dollars. Average prices include all applicable federal, state, and county taxes. This survey will be discontinued after December 1986]

Date	All types <u>1/</u>	Leaded regular	Unleaded regular	Leaded premium
1978: June .....	.778	.761	.765	.793
Dec. ....	.804	.778	.791	.821
1979: June .....	.957	.922	.956	.970
Dec.	1.150	1.087	1.164	1.175
1980: June	1.352	1.310	1.350	1.383
Dec.	1.407	1.348	1.413	1.441
1981: June	1.580	1.508	1.588	1.619
Dec.	1.584	1.520	1.586	1.621
1982: June	1.512	1.454	1.511	1.556
Dec.	1.518	1.446	1.522	1.566
1983: June	1.455	1.391	1.450	1.506
Dec.	1.474	1.409	1.470	1.530
1984: June	1.497	1.425	1.490	(NA)
August ...	1.498	1.419	1.492	(NA)
Revised series <u>2/</u>				
1984: Sept.	1.409	1.310	1.406	(NA)
Dec.	1.384	1.285	1.372	(NA)
1985: June	1.386	1.269	1.387	(NA)
Dec.	1.406	1.295	1.421	(NA)
1986: June	1.212	1.063	1.227	<u>3/</u> 1.334

NA Not available.

1/ Includes types not shown separately.

2/ Because of revised sample design, data are not directly comparable to earlier figures.

3/ Unleaded premium.

Source: U.S. Bureau of Labor Statistics, Consumer Prices: Energy and Food (monthly, 1979-1985), CPI Detailed Report (monthly, 1985-1986), and printouts for 1978-1979.

Table 483.-- ENERGY GENERATED, PURCHASED, SOLD AND USED BY
RAW SUGAR PLANTATIONS, BY ISLANDS: 1984

Subject	State total	Hawaii	Kauai	Maui	Oahu
Electricity (millions of kilowatt-hours)					
Generated <u>1/</u>	816.99	265.45	191.35	249.39	110.80
Purchased	41.91	2.12	4.68	9.76	25.35
Sold	319.04	163.52	82.90	61.43	11.19
Used <u>2/</u>	539.86	104.05	113.13	197.72	124.96
Gross heat values of boiler fuels (billions of Btu's)					
All fuels	26,089	10,345	4,938	8,080	3,447
Bagasse	23,411	9,215	4,577	6,409	3,210
Fuel oil	2,443	503	258	1,530	152
Other fuels	955	627	102	141	84

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

2/ Includes transmission losses and electricity used to operate power plant auxiliaries.

Source: Hawaiian Sugar Planters' Association, Energy Inventory of Hawaiian Sugar Plantations - 1984 (Energy Report 22, December 18, 1985), pp. 8-10.

Table 484.-- TAX CREDITS FOR SOLAR DEVICES AND HEAT PUMPS:
1977 TO 1984

[In 1976, the State Legislature approved a tax credit for solar energy devices installed after December 31, 1974. In 1981, the Legislature approved a tax credit for heat pumps installed after December 31, 1980]

Year in- stalled	Solar devices			Heat pumps	
	Number claiming	Average cost (dollars)	Total credit allowed 1/ (dollars)	Number claiming	Credit claimed 1/ (dollars)
1977	1,101	2,135	229,729	...	...
1978	4,061	2,907	1,119,870	...	...
1979	4,375	3,031	1,249,971	...	...
1980	4,704	3,346	1,492,602	...	...
1981	6,445	3,500	2,107,293	2,013	164,155
1982	4,407	3,659	1,511,796	3,122	154,173
1983	3,148	3,601	1,076,222	665	39,921
1984	4,464	3,519	1,482,095	257	12,935

1/ Credit limited to 10 percent of actual cost. Credits are prorated for condominium owners.

Source: Hawaii State Department of Taxation, Tax Credits Claimed by Hawaii Residents for 1977-1984.

Table 485.-- HOUSING UNITS WITH SOLAR WATER HEATING SYSTEMS:
1982 TO 1985

Subject	1982	1983	1984	1985
Number with systems, Dec. 31 ...	23,700	26,800	31,800	39,000
Percent with systems 1/	6.8	7.6	8.9	10.7

1/ Based on April 1 estimates of total housing stock in DPED Statistical Report 191 (July 18, 1986).

Source: Hawaii State Department of Planning and Economic Development, Energy Division, unpublished estimates. The 1985 estimate is provisional.

Table 486.-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT
IN HAWAII: 1980 TO 1983

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

Fiscal year	Federal obligations for R and D	Federal obligations for R and D plant
1980	42.6	0.2
1981	49.9	0.7
1982	44.5	0.1
1983	71.4	0.1

Source: National Science Foundation, Federal Funds for Research and Development: Fiscal Years 1981, 1982, and 1983, Vol. XXXI, Final Report NSF 83-320, pp. 188-189; and Federal Funds for Research and Development: Fiscal Years 1983, 1984, and 1985, Vol. XXXIII, Detailed Statistical Tables NSF 84-336, p. 141.

Table 487.-- RESEARCH AND DEVELOPMENT EXPENDITURES
AT UNIVERSITIES AND COLLEGES: 1980 TO 1983

[Thousands of dollars]

Fiscal year	Total R and D expenditures	Federally financed R and D expenditures
1980	40,593	25,833
1981	42,997	25,153
1982	43,439	26,616
1983	45,401	27,633

Source: National Science Foundation, Academic Science/Engineering: R and D Funds, Fiscal Year 1983, NSF 85-308, pp. 26-27.

Table 488.-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1980-81 TO 1985-86

[Research and non-research awards received through the Office
of Research Administration, University of Hawaii]

Fiscal year	Total		Research		Non-research	
	Awards	Amount (dollars)	Awards	Amount (dollars)	Awards	Amount (dollars)
1980-81 ...	613	46,152,470	366	27,100,723	247	19,051,747
1981-82 ...	513	37,233,647	314	26,458,595	199	10,775,052
1982-83 ...	595	45,652,413	392	33,733,083	203	11,919,330
1983-84 ...	583	47,954,042	358	30,204,420	225	17,749,622
1984-85 ...	627	53,267,244	385	36,699,412	242	16,567,832
1985-86 ...	643	53,976,468	354	35,750,696	289	18,225,772

Source: Office of Research Administration, University of Hawaii,
1984-1985 Extramural Awards (August 1985) and records.

Table 489.-- DOCTORAL SCIENTISTS AND ENGINEERS: 1983

Profession	Number	Median annual salary ^{1/} (dollars)
Total.....	1,779	39,100
Scientists	1,616	37,900
Physical scientists	282	...
Mathematical scientists	38	...
Computer/information spec. ..	21	...
Environmental scientists	92	...
Life scientists	543	35,300
Psychologists	157	...
Social scientists	483	36,200
Engineers	163	...

^{1/} Data limited to full-time employed civilians. Not reported
for groups with fewer than 20 individuals reporting salary.

Source: National Science Foundation, Characteristics of Doctoral
Scientists and Engineers in the United States: 1983, NSF85-303
(1985), pp. 60-65.

Table 490.-- TELESCOPES AT THE SUMMIT OF MAUNA KEA AND
HALEAKALA: 1986

Location and telescope (diameter in meters)	Year completed	Capital costs (million dollars)	Operating costs, 1986 (million dollars)	Hawaii-based staff (persons)
Mauna Kea:				
UH .61-m	1969	0.1	} 0.1	13
UH .61-m	1969	0.1		
UH 2.24-m	1970	3.0		
Canada-France-Hawaii	1979	30.0	3.5	43
NASA 3.0-m IRTF	1979	10.0	1.8	10
UK 3.8-m	1979	10.0	1.5	29
James Clerk Maxwell (UK/NL) ..	1986	20.0	1.0	20
Caltech 10.4-m Submillimeter .	1986	10.0	1.5	11
W.M. Keck Observatory 10-m Optical/IR (under const.) ..	1990	85.0	2.3	35
Haleakala (on UH land):				
Mees Solar Observatory	1956	0.5	0.3	6
Lunar Ranging Facility	1976/84	3.25	0.7	9
Gamma Ray Facility	1985	2.0	0.2	1

Source: University of Hawaii at Manoa, Institute for Astronomy, Fact Sheet - 1986, and data provided May 12, 1986.

Table 491.-- PATENTS ISSUED TO HAWAII
RESIDENTS: 1978 TO 1985

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

Fiscal year	Patents	Fiscal year	Patents
1978	41	1982	31
1979	32	1983	30
1980	32	1984	43
1981	49	1985	33

Source: U.S. Department of Commerce, Patent and
Trademark Office, Commissioner of Patents and
Trademarks Annual Report, Fiscal Year '85, p. 50.