

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 262 trillion British thermal units, compared with 219 trillion BTU a decade earlier. Aviation fuels accounted for 31 percent of the 1984 total. Total expenditures for fuels and electricity in 1984 totaled almost \$2.0 billion.

Electricity sales exceeded 6.6 billion kilowatt-hours in 1984, a total that has increased 29 percent since 1974. Manufactured gas sales reached 30.9 million therms in 1984, 10.0 percent below the figure ten years earlier. Residential rates in 1984 averaged 11.8 cents per kilowatt-hour and \$1.79 per therm, both more than double the corresponding rates a decade earlier. Average residential use (6,552 kWh and 203 therms in 1984) has declined significantly in recent years. By 1981, almost seven percent of the housing units in the State had solar heating devices.

The liquid fuel tax base for 1984 was approximately 926 million gallons, compared with 825 million in 1974. The 1984 total included 322 million gallons of gasoline, 486 million of aviation fuel, and 114 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 \$1.39 by June 1985.

The State is well served with scientific resources. Especially noteworthy is the cluster of telescopes used for astronomical observations at the summit of Mauna Kea -- six major facilities (plus two under construction). Federal research and development obligations in Hawaii reached \$71 million in 1983. Forty-three patents were granted to Hawaii residents in 1984.

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: 1985, Sections 20 and 21.

Table 442.-- CONSUMPTION OF ENERGY, BY SOURCE
(PHYSICAL UNITS): 1960 TO 1983

[Revised from Data Book 1984, table 480]

Year	Petroleum 1/ (1,000 barrels)	Hydro- electric power 2/ (million kWh)	Geo- thermal power 3/ (million kWh)	Wood, waste, and wind 3/ (million kWh)
1960	17,648	27	0	0
1961	21,113	24	0	0
1962	20,125	20	0	0
1963	21,077	23	0	0
1964	22,523	115	0	0
1965	23,635	105	0	0
1966	26,351	112	0	2
1967	29,878	108	0	0
1968	33,039	94	0	30
1969	34,499	100	0	29
1970	35,490	108	0	24
1971	37,999	89	0	15
1972	39,076	91	0	18
1973	39,920	95	0	22
1974	37,883	92	0	30
1975	38,284	89	0	25
1976	38,895	93	0	29
1977	40,762	86	0	26
1978	41,246	84	0	0
1979	45,469	90	0	0
1980	45,245	86	0	0
1981	40,211	80	0	15
1982	37,349	90	0	26
1983	39,995	84	0	28

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

2/ Includes only utility production for 1960-1963 and industrial and utility production for 1964 and thereafter.

3/ Consumed at utilities to produce electricity.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1983 (May 1985), p. 204.

Table 443.-- CONSUMPTION OF ENERGY, BY SOURCE (TRILLION BTU):
1960 TO 1983

[Revised from Data Book 1984, table 481]

Year	Total energy consumed <u>1/</u>	Petroleum <u>2/</u>	Hydro-electric power <u>3/</u>	Geo-thermal power <u>4/</u>	Wood, waste, and wind <u>4/</u>	Other types <u>5/</u>
1960	99.3	99.0	0.3	0.0	0.0	0.0
1961	119.7	119.5	0.3	0.0	0.0	0.0
1962	114.7	114.5	0.2	0.0	0.0	0.0
1963	120.6	120.4	0.2	0.0	0.0	0.0
1964	130.5	129.3	1.2	0.0	0.0	0.0
1965	137.2	136.1	1.1	0.0	0.0	0.0
1966	152.6	151.4	1.2	0.0	(Z)	0.0
1967	173.2	172.1	1.1	0.0	0.0	0.0
1968	191.7	190.5	1.0	0.0	0.3	0.0
1969	199.0	197.7	1.0	0.0	0.3	0.0
1970	204.9	203.5	1.1	0.0	0.3	0.0
1971	218.8	217.7	0.9	0.0	0.2	0.0
1972	225.5	224.4	0.9	0.0	0.2	0.0
1973	230.5	229.3	1.0	0.0	0.2	0.0
1974	218.6	217.3	1.0	0.0	0.3	0.0
1975	221.1	220.0	0.9	0.0	0.3	0.0
1976	224.8	223.5	1.0	0.0	0.3	0.0
1977	236.2	235.0	0.9	0.0	0.3	0.0
1978	239.0	238.1	0.9	0.0	0.0	0.0
1979	261.3	260.3	0.9	0.0	0.0	0.0
1980	264.0	259.9	0.9	0.0	0.0	3.2
1981	236.0	232.1	0.8	0.0	0.2	3.0
1982	217.9	213.8	0.9	0.0	0.3	2.9
1983	231.0	227.0	0.9	0.0	0.3	2.8

Z Represents small, non-zero value.

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 utility production.

4/ Consumed at utilities to produce electricity.

5/ Coal, natural gas, and nuclear power.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1983 (May 1985), p. 204.

Table 444.-- CONSUMPTION OF ENERGY BY END-USE SECTOR: 1960 TO 1983

[Trillion Btu. Revised from Data Book 1984, table 482]

Year	Total energy consumed <u>1/</u>	Residential <u>2/</u>	Commercial <u>2/</u>	Industrial <u>2/</u>	Transportation <u>2/</u>	Electric utilities <u>3/</u>
1960	99.3	7.3	5.1	20.6	66.3	17.6
1961	119.7	7.5	5.4	28.2	78.6	19.4
1962	114.7	8.0	5.5	30.2	71.0	21.4
1963	120.6	8.9	6.0	31.2	74.5	24.2
1964	130.5	9.6	6.6	34.2	80.0	26.7
1965	137.2	10.1	6.7	37.0	83.3	27.6
1966	152.6	10.8	7.3	38.4	96.0	29.7
1967	173.2	12.1	8.0	43.2	110.0	31.3
1968	191.7	13.1	8.8	42.4	127.5	35.0
1969	199.0	14.9	9.8	44.5	129.9	38.7
1970	204.9	16.4	11.5	47.7	129.3	43.2
1971	218.8	17.8	11.4	46.7	143.0	47.7
1972	225.5	19.6	12.7	52.9	140.3	54.1
1973	230.5	20.0	13.4	52.7	144.3	55.6
1974	218.6	20.3	13.3	52.8	132.2	57.5
1975	221.1	19.6	13.8	53.8	133.9	58.8
1976	224.8	21.3	15.3	54.4	133.8	62.5
1977	236.2	21.8	16.8	56.3	141.4	65.2
1978	239.0	21.8	17.4	55.2	144.6	66.8
1979	261.3	22.9	18.1	63.9	156.4	67.7
1980	264.0	23.3	20.9	73.1	146.7	69.7
1981	236.0	23.0	18.8	70.1	124.0	69.9
1982	217.9	21.6	17.6	76.5	102.2	66.9
1983	231.0	22.1	17.7	67.8	123.3	68.6

1/ Totals do not include 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; and geothermal, biomass, and waste energy other than that consumed at the electric utilities.

2/ Data include power from electric utilities, including electrical energy losses incurred in the generation and transmission of electricity.

3/ 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, 1960-1983 (May 1985), p. 205.

Table 445.-- PURCHASED FUELS AND ELECTRIC ENERGY USED FOR HEAT AND POWER
BY MANUFACTURING ESTABLISHMENTS: 1980 AND 1981

Industry group	British thermal units (trillions)		Cost (million dollars)	
	1980	1981	1980	1981
All manufacturing	13.3	14.0	76.5	97.4
Food and kindred products	5.2	5.0	30.5	34.3

Source: U.S. Bureau of the Census, 1982 Census of Manufactures, Fuels and Electric Energy Consumed, MC82-S-4 (Part 2) (June 1983), table 3.

Table 446.-- ENERGY USE, BY PRIMARY SOURCE: 1981 TO 1984

Measure and year	All sources	Petrol- eum	Bio- mass	Hydro elec- tricity	Geo- thermal	Coal
Trillion Btu:						
1981	271.49	244.76	24.09	0.77	-	1.87
1982	270.58	244.08	23.92	1.14	0.17	1.27
1983	272.09	245.20	24.85	0.90	0.19	0.95
1984 <u>1/</u>	262.04	235.31	25.00	0.56	0.21	0.96
Oil equivalent <u>2/</u> (1,000 barrels):						
1981	47,178	42,533	4,187	133	-	325
1982	46,890	42,295	4,142	198	30	225
1983	47,131	42,474	4,305	154	33	165
1984 <u>1/</u>	45,455	40,819	4,337	96	36	167

1/ Preliminary.

2/ Amount of petroleum required to provide comparable amount of energy.

Source follows next table.

Table 447.-- ENERGY USE, BY PRODUCT: 1980 TO 1984

[1,000 barrels of oil equivalent]

Product	1981	1982	1983	1984 <u>1/</u>
All products	47,178	46,890	47,131	45,455
Electricity fuels:				
Petroleum	11,178	10,687	11,032	11,329
Biomass	1,352	1,352	1,503	1,516
Hydroelectricity	133	198	154	96
Geothermal	-	30	33	36
Other petroleum:				
Aviation fuels	16,506	15,472	14,652	14,046
Motor gasoline	7,033	6,823	7,273	7,746
Residual fuel oil	2,844	4,053	4,599	3,597
Diesel, other distil. ...	3,805	3,949	3,598	2,849
Propane, other petrol. ..	1,167	1,311	1,320	1,253
Biomass	2,835	2,790	2,802	2,821
Coal	325	225	165	167

1/ Preliminary

Source: Hawaii State Department of Planning and Economic Development, Energy Division, Total Energy Use in Hawaii (April 30, 1985).

Table 448.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SOURCE:
1970 TO 1984

[Millions of dollars]

Year	Total energy expend.	Fuel expenditures				Less: Electric utility fuel expend.	Plus: electric purch. by end-user
		Total	Petroleum fuel		Coal		
			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	1,492.9	3.3	451.5	699
1982	2,153.8	1,869.6	439.4	1,428	2.2	439.4	723.6
1983	2,019.9	1,730.1	369.3	1,359.1	1.7	369.3	659.1
1984	1,975.7	1,651.7	379.0	1,271.1	1.6	379.0	703.0

Source: Hawaii State Department of Planning and Economic Development, Division of Energy, unpublished estimates, April 17, 1985.

Table 449.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SECTORS:
1970 TO 1984

[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	1,651.7	20.6	217.0	206.8	486.0	1,045.3	379.0

Source: Hawaii State Department of Planning and Economic Development, Division of Energy, unpublished estimates, April 17, 1985.

Table 450.-- ELECTRIC UTILITIES: 1974 TO 1984

Year	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
1974 ..	255,901	219,633	36,268	1,419,892	5,113,906	1,635,928	3,477,928
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
Year	Average annual use (kWh) 1/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
1974 ..	7,449	95,895	.03493	.02704	151,177	57,149	94,028
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

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 451.-- ELECTRIC UTILITIES, BY ISLANDS: 1984

County or island	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
State total	324,384	280,518	43,866	1,578,780	6,606,255	1,837,954	4,768,301
Oahu	228,606	199,722	28,884	1,283,000	5,330,931	1,381,912	3,949,019
Hawaii	40,162	33,574	6,588	116,500	487,583	195,642	291,941
Kauai	18,865	16,030	2,835	62,080	228,951	79,835	149,116
Maui County	36,751	31,192	5,559	117,200	558,790	180,565	378,225
Lanai	872	737	135	-	5,701	3,433	2,268
Maui	33,445	28,451	4,994	110,300	528,842	167,620	361,222
Molokai	2,434	2,004	430	6,900	24,247	9,512	14,735
	Average annual use (kWh) <u>1/</u>		Average rate (dollars per kWh)		Revenues (\$1,000)		
County or island	Residential	Other	Residential	Other	Total	Residential	Other
State total	6,552	108,702	0.11831	0.10181	702,899	217,447	485,452
Oahu	6,919	136,720	0.11032	0.09492	527,288	152,452	374,836
Hawaii	5,827	44,314	0.13745	0.12828	64,341	26,890	37,451
Kauai	4,980	52,598	0.15254	0.15064	34,641	12,178	22,463
Maui County	5,789	68,038	0.14359	0.13405	76,629	25,927	50,702
Lanai	4,658	16,799	0.17867	0.18129	1,024	613	411
Maui	5,892	72,331	0.13877	0.13028	70,320	23,260	47,060
Molokai	4,747	34,268	0.21589	0.21928	5,285	2,054	3,231

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 452.-- GAS UTILITIES: 1974 TO 1984

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)			
	Total	Residential	Other	Total	Residential	Other	
1974 ...	35,228	30,620	4,608	34,363	8,096	26,267	
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	
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
1974 ...	264	5,700	.68361	.52267	19,264	5,535	13,729
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

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 453.-- GAS UTILITIES, BY ISLANDS: 1984

[Excludes bottled gas]

Island	Customers, Dec. 31			Gas sold (therms)			
	Total	Residen- tial	Other	Total	Residen- tial	Other	
State total	32,643	28,859	3,784	30,928,082	5,852,973	25,075,109	
Oahu	30,040	26,636	3,404	28,089,473	5,389,407	22,700,066	
Hawaii	1,949	1,630	319	2,010,680	343,456	1,667,224	
Kauai	275	275	-	59,857	59,857	-	
Maui	379	318	61	768,072	60,253	707,819	
Molokai	-	-	-	-	-	-	
Lanai	-	-	-	-	-	-	
Island	Average annual use (therms) <u>1/</u>		Average rate (dollars per (therm)		Revenues (\$1,000)		
	Resi- dential	Other	Resi- dential	Other	Total	Resi- dential	Other
State total	203	6,627	1.78958	1.37488	44,949	10,474	34,475
Oahu	202	6,669	1.80695	1.38741	41,233	9,739	31,494
Hawaii	211	5,226	1.58555	1.27442	2,669	544	2,125
Kauai	218	-	1.60955	-	96	96	-
Maui	189	11,604	1.57783	1.20966	951	95	856
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 454.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1979 TO 1984

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					
1979 ..	213,781	186,875	5,466,677	5,163,786	7,846	0.05813	1,140,180
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

^{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 455.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1979 TO 1984

Calendar year	Customers, Dec. 31		Gas sold ^{1/} (1,000 therms)		Average annual residential usage ^{1/} (therms)
	Total	Residential	Total	Residential	
1979 ...	30,582	26,686	32,135	6,736	252
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

^{1/} Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 456.-- LIQUID FUEL TAX BASE: 1974 TO 1984

[In thousands of gallons]

Year reported <u>1/</u>	All types	Gasoline	Diesel oil	
			Non-hwy.	Hwy. use
1974	824,653	270,267	75,124	11,539
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

Year reported <u>1/</u>	Liquefied petroleum gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
1974	2,093	789	463,728	312	801
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

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 457.-- LIQUID FUEL TAX BASE, BY COUNTIES: 1984

[In thousands of gallons]

Type of fuel	State total	City and Co. of Honolulu	County of Maui	County of Hawaii	County of Kauai
Total	925,871	742,516	85,941	64,516	32,898
Gasoline	322,410	229,081	35,459	41,388	16,482
Diesel oil, non-hwy.	95,956	36,831	30,866	12,694	15,566
Diesel oil, hwy. use	17,892	12,685	1,639	3,098	470
Liq. pet. gas, off hwy. ..	2,600	1,841	280	397	82
Liq. pet. gas, hwy. use ..	873	690	53	99	32
Small boats, gasoline	114	74	-	40	-
Small boats, diesel oil ..	215	76	-	138	-
Aviation fuel	485,810	461,238	17,646	6,661	266

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base, Collections and Distribution, Year Ending December 31, 1984" (annual release).

Table 458.-- BOILERS AND PRESSURE VESSELS: DECEMBER 31, 1984

Island	Power boilers	Heating boilers	Pressure vessels <u>1/</u>
State total	617	2,636	5,355
Hawaii	85	222	796
Maui	59	221	538
Lanai	3	2	29
Molokai	8	33	30
Oahu	421	2,052	3,664
Kauai	41	106	298

1/ Five cubic feet or more.

Source: Hawaii State Department of Labor and Industrial Relations, Division of Occupation Safety and Health, Boiler and Elevator Inspection Bureau, data provided February 7, 1985.

Table 459.-- 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 460.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
1978 TO 1985

[Dollars. Average prices include all applicable federal, state,
and county taxes]

Date	All types <u>1/</u>	Leaded regular	Unleaded regular	Leaded premium
1978: June	0.778	.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)

NA Not available.

1/ Includes types not shown separately.

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

Source: U.S. Bureau of Labor Statistics, Consumer Prices: Energy and Food (monthly, 1979 forward), and printouts for 1978-1979.

Table 461.-- ENERGY GENERATED, PURCHASED, SOLD AND USED BY
RAW SUGAR PLANTATIONS, BY ISLANDS: 1983

Subject	State total	Hawaii	Kauai	Maui	Oahu
Electricity (millions of kilowatt-hours)					
Generated <u>1/</u>	815.03	262.51	211.25	221.02	120.25
Purchased	46.23	2.02	3.60	11.62	28.99
Sold	332.53	156.95	105.75	64.32	5.51
Used <u>2/</u>	528.73	107.58	109.10	168.32	143.73
Gross heat values of boiler fuels (billions of Btu's)					
All fuels	27,023	11,006	4,691	7,320	4,006
Bagasse	24,340	10,240	4,350	6,200	3,550
Fuel oil	2,172	568	287	1,041	276
Other fuels	511	198	54	79	180

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 - 1983 (Energy Report 21, November 27, 1984), pp. 7-10.

Table 462.-- TAX CREDITS FOR SOLAR DEVICES AND HEAT PUMPS:
1977 TO 1983

[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

^{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 1977-1983.

Table 463.-- HOUSING UNITS WITH SOLAR WATER HEATING SYSTEMS:
1981 TO 1984

Subject	1981	1982	1983	1984
Number with systems, Dec. 31 ...	19,292	23,700	26,800	31,800
Percent with systems ^{1/}	5.6	6.8	7.6	8.9

^{1/} Based on April 1 estimates of total housing stock in DPED Statistical Report 177 (July 23, 1985).

Source: Hawaii State Department of Planning and Economic Development, Energy Division, estimates based on data from Hawaii State Department of Health, Department of Planning and Economic Development, and Department of Taxation, and City and County of Honolulu Building Department. The 1984 estimate is provisional.

Table 464.-- 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 465.-- 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 466.-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1980-81 TO 1984-85

[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)
1984-85 ...	627	53,267,244	385	36,699,412	242	16,567,832
1983-84 ...	583	47,954,042	358	30,204,420	225	17,749,622
1982-83 ...	595	45,652,413	392	33,733,083	203	11,919,330
1981-82 ...	513	37,233,647	314	26,458,595	199	10,775,052
1980-81 ...	613	46,152,470	366	27,100,723	247	19,051,747

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

Table 467.-- 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 468.-- TELESCOPES AT THE SUMMIT OF MAUNA KEA: 1984

Telescope (diameter in meters)	Year completed	Capital costs (million dollars)	Operating costs, 1983 (million dollars)	Hawaii-based staff (persons)
Completed:				
UH .61-m	1969	0.1	} 1.0	13
UH .61-m	1969	0.1		
UH 2.24-m	1970	3.0		
Canada-France-Hawaii	1979	30.0		
NASA 3.0-m IRTF	1979	10.0		
UK 3.8-m	1979	10.0		
Under construction:				
UK-Neth. 15-m Millimeter	1986	20.0	1.0	20
Caltech 10-m Submillimeter	1986	10.0	1.5	11

Source: University of Hawaii, Institute for Astronomy, IFA Fact Sheet -- 1983, as updated to November 1984.

Table 469.-- PATENTS ISSUED TO HAWAII RESIDENTS: 1980 TO 1984

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

Fiscal year	Patents
1980	32
1981	49
1982	31
1983	30
1984	43

Source: U.S. Department of Commerce, Patent and Trademark Office, Commissioner of Patents and Trademarks Annual Report, Fiscal Year '84, p. 54.