

Section 17

ENERGY AND SCIENCE

This section presents statistics relating to electrical, gas and petroleum power and energy, and to research and development and scientific resources.

Electricity sales exceeded 6.2 billion kilowatt-hours in 1979, a total that has doubled since 1968. Manufactured gas sales reached 35.3 million therms in 1979, 37 percent above the figure ten years earlier. Residential rates in 1979 averaged 6.4 cents per kilowatt-hour and \$1.09 per therm, both well above the corresponding rates several years earlier. Average residential use (7,321 kWh and 253 therms in 1979) has declined significantly in recent years.

The liquid fuel tax base for 1979 was approximately 961 million gallons, compared with 825 million in 1974 and 743 million in 1969. The 1979 total included 324 million gallons of gasoline, 507 million of aviation fuel, and 125 million of diesel oil. The average price for leaded premium gasoline rose from 48.7 cents per gallon in October 1973 to \$1.387 in April 1980.

Total energy consumption in 1978 amounted to 253 trillion British thermal units, compared with 196 trillion BTU a decade earlier. Transportation accounted for 58 percent of the 1978 total.

The State is well served with scientific resources. A 1976 inventory reported 384 companies and agencies with research or scientific capabilities. Employment in these organizations was more than 34,000. Federal research and development obligations in Hawaii exceeded \$44 million in 1978. Thirty-two patents were granted to Hawaii residents in 1979.

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, National Science Foundation, Hawaii State Department of Taxation, Hawaii State Department of Regulatory Agencies, Public Utilities Division, and individual utility companies. Detailed statistics on energy consumption, with special emphasis on petroleum products, appear in Energy Use in Hawaii, published by the State Energy Office of the Department of Planning and Economic Development in November 1977. Hawaii's Scientific Resources, 1977 Directory, issued by DPED in 1977, contains information on scientific organizations and facilities in the Islands. 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: 1979, Sections 20 and 21.

Table 317.-- CONSUMPTION OF ENERGY, BY TYPE (PHYSICAL UNITS):
1960 TO 1978

Year	Petroleum (1,000 barrels)	Hydro- electric power <u>1/</u> (million kWh)	Geo- thermal power <u>2/</u> (million kWh)	Wood and waste <u>2/</u> (million kWh)	Other types <u>3/</u>
1960	21,347	0	0	0	0
1961	24,863	0	0	0	0
1962	22,557	0	0	0	0
1963	23,563	23	0	0	0
1964	25,146	115	0	0	0
1965	26,150	105	0	0	0
1966	27,944	112	0	0	0
1967	31,803	108	0	0	0
1968	35,077	94	0	30	0
1969	37,068	100	0	29	0
1970	37,988	108	0	24	0
1971	40,623	89	0	15	0
1972	41,577	91	0	18	0
1973	42,810	95	0	22	0
1974	40,818	92	0	30	0
1975	40,851	89	0	25	0
1976	41,599	93	0	29	0
1977	44,760	91	0	26	0
1978	44,821	91	0	0	0

1/ Includes industrial and utility production, and net imports of electricity.

2/ Consumed at utilities to produce electricity.

3/ Coal, natural gas (dry), and nuclear power.

Source: U.S. Department of Energy, Energy Statistics Branch, State Energy Data Report, Statistical Tables and Technical Documentation, 1960 Through 1978 (April 1980), p. 111.

Table 318.-- CONSUMPTION OF ENERGY, BY TYPE (TRILLION BTU): 1960 TO 1978

Year	Total energy consumed	Petroleum	Hydro-electric power <u>1/</u>	Geo-thermal power <u>2/</u>	Wood and waste <u>2/</u>	Other types <u>3/</u>
1960	120.193	118.606	0.000	0.000	0.000	0.000
1961	138.188	138.063	0.000	0.000	0.000	0.000
1962	123.509	125.102	0.000	0.000	0.000	0.000
1963	127.118	130.400	0.240	0.000	0.000	0.000
1964	136.374	139.006	1.205	0.000	0.000	0.000
1965	142.633	144.662	1.093	0.000	0.000	0.000
1966	156.101	154.588	1.165	0.000	0.023	0.000
1967	176.129	175.396	1.131	0.000	0.000	0.000
1968	195.703	193.062	0.979	0.000	0.316	0.000
1969	206.186	203.577	1.043	0.000	0.299	0.000
1970	211.352	209.051	1.131	0.000	0.257	0.000
1971	226.070	223.589	0.936	0.000	0.158	0.000
1972	230.254	228.671	0.941	0.000	0.189	0.000
1973	238.747	236.099	0.985	0.000	0.233	0.000
1974	228.957	224.660	0.958	0.000	0.316	0.000
1975	229.453	224.433	0.929	0.000	0.259	0.000
1976	234.181	228.963	0.962	0.000	0.305	0.000
1977	249.223	247.343	0.948	0.000	0.270	0.000
1978	253.473	247.368	0.951	0.000	0.000	0.000

1/ Includes industrial and utility production, and net imports of electricity.

2/ Consumed at utilities to produce electricity.

3/ Coal, natural gas (dry), and nuclear power.

Source: U.S. Department of Energy, Energy Statistics Branch, State Energy Data Report, Statistical Tables and Technical Documentation, 1960 Through 1978 (April 1980), p. 111.

Table 319.-- CONSUMPTION OF ENERGY BY END-USE SECTOR: 1960 TO 1978

(Trillion Btu)

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	120.193	9.691	16.811	28.159	65.533	23.242
1961	138.188	9.943	20.443	31.561	76.241	24.356
1962	123.509	10.063	12.829	29.392	71.225	25.812
1963	127.118	9.926	10.868	30.369	75.956	27.641
1964	136.374	10.867	9.280	33.170	83.057	30.224
1965	142.633	11.742	10.281	34.956	85.653	31.573
1966	156.101	12.488	9.034	37.405	97.174	30.417
1967	176.129	13.618	9.517	40.528	112.466	31.900
1968	195.703	14.911	11.503	40.087	129.203	34.909
1969	206.186	17.792	12.552	44.604	131.237	38.721
1970	211.352	20.034	14.193	47.064	130.061	43.278
1971	226.070	21.493	13.494	48.106	142.978	47.694
1972	230.254	22.288	14.434	52.980	140.553	52.983
1973	238.747	23.613	15.554	55.141	144.439	55.730
1974	228.957	24.340	16.086	55.660	132.872	57.783
1975	229.453	22.939	16.933	56.246	133.335	58.845
1976	234.181	25.351	17.569	58.123	133.137	61.644
1977	249.223	26.050	18.258	62.077	142.838	67.923
1978	253.473	26.060	18.938	61.325	147.150	64.991

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; wind energy; 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/ Distributed among the other four sectors.

Source: U.S. Department of Energy, Energy Statistics Branch, State Energy Data Report, Statistical Tables and Technical Documentation, 1960 Through 1978 (April 1980), p. 112.

Table 320.-- ELECTRIC UTILITIES: 1969 TO 1979

Year	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
1969 ..	210,330	178,569	31,761	896,271	3,426,052	1,174,502	2,251,550
1970 ..	219,003	186,282	32,721	1,007,021	3,758,094	1,270,732	2,487,362
1971 ..	226,514	193,043	33,471	1,016,350	4,167,127	1,375,308	2,791,819
1972 ..	236,309	201,903	34,406	1,135,055	4,562,568	1,493,840	3,068,728
1973 ..	246,255	210,740	35,515	1,266,600	4,867,850	1,581,855	3,285,995
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

Year	Average annual use (kWh) 1/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
1969 ..	6,577	70,890	.026548	.019647	75,418	31,181	44,237
1970 ..	6,822	76,017	.026810	.020113	84,097	34,068	50,029
1971 ..	7,124	83,410	.028229	.021493	98,849	38,823	60,026
1972 ..	7,399	89,192	.02849	.02172	109,217	42,557	66,660
1973 ..	7,506	92,524	.03077	.02367	126,449	48,680	77,769
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

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

Source: Hawaii State Department of Regulatory Agencies, Public Utilities Division, records.

Table 321.-- ELECTRIC UTILITIES, BY ISLANDS: 1979

County or island	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
State total	293,061	252,898	40,163	1,502,840	6,197,426	1,851,457	4,345,969
Oahu	213,781	186,875	26,906	1,209,400	5,163,786	1,452,093	3,711,693
Hawaii	33,846	28,016	5,830	124,300	413,263	172,491	240,772
Kauai	15,562	13,082	2,480	62,080	184,459	67,249	117,210
Maui County	29,872	24,925	4,947	107,060	435,918	159,624	276,294
Lanai	847	679	168	-	6,094	3,601	2,493
Maui	26,933	22,573	4,360	98,960	406,926	145,352	261,574
Molokai	2,092	1,673	419	8,100	22,898	10,671	12,227
County or island	Average annual use (kWh) <u>1/</u>		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
State total	7,321	108,208	0.06420	0.05424	354,595	118,862	235,733
Oahu	7,770	137,950	0.05813	0.04850	264,414	84,411	180,003
Hawaii	6,157	41,299	0.08497	0.08258	34,541	14,657	19,884
Kauai	5,141	47,262	0.10690	0.10962	20,037	7,189	12,848
Maui County	6,404	55,851	0.07897	0.08324	35,603	12,605	22,998
Lanai	5,303	14,842	0.08184	0.09130	522	295	227
Maui	6,439	59,994	0.07678	0.08046	32,206	11,160	21,046
Molokai	6,378	29,182	0.10780	0.14103	2,875	1,150	1,725

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

Source: Hawaii State Department of Regulatory Agencies, Public Utilities Division, records.

Table 322.-- GAS UTILITIES: 1969 TO 1979

(Excludes bottled gas.)

Year	Customers, Dec. 31			Gas sold (1,000 therms)		
	Total	Residential	Other	Total	Residential	Other
1969 ...	36,134	34,829	1,305	25,649	11,848	13,801
1970 ...	36,142	32,163	3,979	27,831	10,891	16,940
1971 ...	36,153	32,072	4,081	30,445	9,279	21,167
1972 ...	36,083	31,806	4,277	33,322	9,321	24,000
1973 ...	35,781	31,142	4,639	34,540	8,931	25,609
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

Year	Average annual use (therms) <u>1/</u>		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
1969 ...	340	10,576	.3588	.2156	7,227	4,251	2,976
1970 ...	339	4,257	.3619	.2227	7,714	3,941	3,773
1971 ...	289	5,187	.3699	.2308	8,317	3,432	4,885
1972 ...	293	5,612	.36843	.22681	8,878	3,434	5,444
1973 ...	287	5,520	.37518	.23121	9,272	3,351	5,921
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

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

Source: Hawaii State Department of Regulatory Agencies, Public Utilities Division, records.

Table 323.-- GAS UTILITIES, BY ISLANDS: 1979

(Excludes bottled gas.)

Island	Customers, Dec. 31			Gas sold (therms)			
	Total	Residential	Other	Total	Residential	Other	
State total	33,309	29,014	4,295	35,263,642	7,326,194	27,937,448	
Oahu	30,550	26,647	3,903	32,134,889	6,736,460	25,398,429	
Hawaii	2,127	1,799	328	2,390,240	446,313	1,943,927	
Kauai	230	230	-	63,927	63,927	-	
Maui	402	338	64	674,586	79,494	595,092	
Island	Average annual use (therms) <u>1/</u>		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
State total	253	6,505	1.09260	0.89221	32,931	8,006	24,925
Oahu	253	6,507	1.11818	0.91767	30,840	7,533	23,307
Hawaii	248	5,927	0.81447	0.64053	1,609	364	1,245
Kauai	278	-	0.82594	-	53	53	-
Maui	235	9,298	0.70103	0.62767	429	56	373

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

Source: Hawaii State Department of Regulatory Agencies, Public Utilities Division, records.

Table 324.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1970 TO 1979

Year	Number of customers, Dec. 31		Net input 1/ (1,000 kWh)	Power sold (1,000 kWh)	Average annual residential use (kWh)	Average residential rate 2/ (dollars per kWh)	Installed capacity 3/ (kW) Dec. 31
	Total	Residential only					
1970 ..	168,531	144,854	3,494,059	3,275,673	7,478	0.02438	811,700
1971 ..	174,300	150,285	3,844,325	3,600,728	7,776	0.02555	811,700
1972 ..	180,794	156,249	4,175,342	3,942,679	8,108	0.02584	902,600
1973 ..	187,321	162,180	4,407,460	4,189,397	8,191	0.02812	1,005,200
1974 ..	194,043	168,525	4,641,204	4,393,616	8,110	0.03063	1,140,180
1975 ..	198,598	172,839	4,793,015	4,555,118	7,999	0.04313	1,140,180
1976 ..	201,974	175,581	5,038,978	4,761,592	8,102	0.04385	1,140,180
1977 ..	205,225	179,139	5,209,990	4,911,435	8,035	0.04810	1,140,180
1978 ..	209,907	183,519	5,331,724	5,025,540	7,875	0.05485	1,140,180
1979 ..	213,781	186,875	5,466,677	5,163,786	7,846	0.05813	1,140,180

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 325.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1970 TO 1979

Calendar year	Customers, Dec. 31		Gas sold 1/ (1,000 therms)		Average annual residential usage 1/ (therms)
	Total	Residential	Total	Residential	
1970 ...	33,851	29,880	26,696	10,026	336
1971 ...	33,691	29,621	29,082	8,290	280
1972 ...	33,479	29,256	31,643	8,258	282
1973 ...	33,142	28,813	32,610	8,041	279
1974 ...	32,455	28,200	32,166	7,522	267
1975 ...	31,856	27,778	32,885	7,600	274
1976 ...	31,443	27,429	32,649	7,490	276
1977 ...	30,926	26,993	31,831	7,007	260
1978 ...	30,659	26,722	31,842	6,797	254
1979 ...	30,582	26,686	32,135	6,736	252

1/ Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 326.-- TYPICAL RESIDENTIAL UTILITY MONTHLY RATES, BY ISLANDS:
 FEBRUARY 1980
 [In dollars]

Utility and monthly use	Oahu	Hawaii <u>1/</u>	Kauai	Maui	Molokai	Lanai
Water:						
5/8-inch meter, 5,000 gal. ...	5.13	5.90	4.50	5.65	5.65	2.95
5/8-inch meter, 10,000 gal. ..	8.33	8.55	7.00	8.30	8.30	4.65
1-inch meter, 20,000 gal.	15.85	16.85	15.00	19.55	19.55	9.30
1-1/2-inch meter, 50,000 gal..	36.80	37.50	35.00	44.75	44.75	22.00
Electricity: <u>2/</u>						
250 kilowatt-hours	21.23	31.00	37.10	27.03	39.39	28.01
500 kilowatt-hours	36.41	51.79	67.62	46.85	68.29	48.82
750 kilowatt-hours	51.70	72.59	97.52	66.73	97.53	69.68
1,000 kilowatt-hours	67.38	93.89	127.41	87.11	127.47	91.04
Gas: <u>2/</u>						
10 therms	15.69	11.55	11.34	10.01	...	...
25 therms	33.59	24.94	25.45	22.59	...	...
50 therms	64.17	46.54	48.49	43.31	...	...
100 therms	126.32	90.09	94.79	85.06	...	...
Telephone: <u>3/</u>						
Individual line	11.40	10.20	9.70	9.70	8.30	7.50
Two-party line	9.35	8.55	8.20	8.20	7.05	6.40

1/ Water rates are those for South Hilo, North and South Kohala and Ka'u Districts; for other districts, add \$0.12 per 1,000 gallons; for Kaloko Mauka (only 5/8-inch meter available) add \$0.47 per 1,000 gallons plus \$0.75.

2/ Includes fuel adjustment surcharge.

3/ Excludes federal excise tax (2 percent for 1980).

Source: Hawaii State Department of Regulatory Agencies, Public Utilities Division; Honolulu Board of Water Supply; Hawaii County Department of Water Supply; Kauai County Department of Water; Maui County Department of Water Supply; Koele Company, Inc.

Table 327.-- LIQUID FUEL TAX BASE: 1969 TO 1979

[In thousands of gallons. Excludes residual fuel, used in the generation of electrical power.]

Year reported <u>1/</u>	All types		Gasoline	Diesel oil	
	Off-hwy.	Hwy. use		Non-hwy.	Hwy. use
1969	743,255	223,088	49,147	7,703	
1970	754,632	235,178	58,129	8,029	
1971	809,628	250,191	57,405	8,852	
1972	827,825	261,452	65,163	9,523	
1973	882,932	281,122	74,608	11,159	
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	

Year reported <u>1/</u>	Liq. pet. gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
1969	674	242	460,753	226	1,424
1970	814	274	450,474	214	1,519
1971	1,044	579	489,767	231	1,559
1972	1,231	702	487,743	264	1,747
1973	1,909	453	511,502	280	1,899
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

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 & Distribution" (annual report).

Table 328-- SALES OF FUEL OILS, HEATING OILS, AND KEROSENE:
1977 AND 1978

[Thousands of barrels]

Type and use	1977	1978
Total:		
Distillate-type oils	3,502	3,246
Residual-type oils	12,512	12,796
Kerosine, except jet fuel	170	146
Heating	122	108
All other use	48	38
Distillate-type heating oils	75	88
No. 1	-	1
No. 2	75	87
No. 4	-	-
Residual-type heating oils	2	37
No. 5	2	37
No. 6	-	-
Fuel oils for industrial use	927	875
Distillate-type oils	269	264
Residual-type oils	658	611
Fuel oils for oil company use	625	583
Distillate-type oils	15	30
Residual-type oils	610	553
Fuel oils for railroad use	2	2
Distillate-type oils	2	2
Fuel oils for vessel bunkering use	2,095	2,550
Distillate-type oils	1,018	1,227
Residual-type oils	1,077	1,323
Fuel oils for military use	582	594
Distillate-type oils	167	168
Residual-type oils	415	426
Fuel oils for electric utility company use ^{1/}	10,819	10,342
Distillate-type oils	1,240	523
Residual-type oils	9,579	9,819
Oils for miscellaneous uses	881	971
Distillate-type oils	716	944
Diesel-type, on highway	329	360
Diesel-type, off highway	338	495
Other uses	49	89
Residual-type oils	171	27

^{1/} In 1978, the opening inventory was 1,009, the closing inventory was 708, and the amount burned was 10,643.

Source: U.S. Department of Energy, Energy Information Administration, "Sales of Fuel Oil and Kerosine in 1978," Energy Data Reports, DOE/EIA-0113(78), November 6, 1979.

Table 329.-- GASOLINE SERVICE STATIONS: 1939 TO 1977

Year	Number of stations	Sales				
		Total (\$1,000)	Per station (\$1,000)	Per gallon (dollars)	Per vehicle (dollars)	
1939	297	8,719	29	0.19	133	
1948	280	18,040	64	0.22	159	
1954	332	28,776	87	0.27	169	
1958	351	38,012	108	0.31	188	
1963	442	56,407	128	0.36	209	
1967	457	72,987	160	0.38	218	
1972	480	106,688	222	0.40	239	
1977	415	176,079	424	0.54	314	
		Highway fuel consumption			Registered motor vehicles	
Year	Total (1,000 gal.)	Per station (1,000 gal.)	Per vehicle (gallons)	Total	Per station	
1939	45,935	155	700	65,629	221	
1948	81,306	290	717	113,322	405	
1954	106,432	321	624	170,447	513	
1958	121,940	347	602	202,434	577	
1963	156,588	354	580	270,176	611	
1967	194,368	425	580	335,326	734	
1972	268,407	559	601	446,355	930	
1977	324,449	782	578	561,575	1,353	

Source: Number of stations and annual sales from U.S. Census of Retail Trade; highway fuel consumption and registered vehicles from Hawaii State Department of Transportation; ratios calculated.

Table 330.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
1973 TO 1980

(In dollars. Average prices include all applicable federal, state,
and county taxes.)

Date	All types <u>1/</u>	Leaded regular <u>2/</u>	Unleaded regular <u>3/</u>	Leaded premium <u>2/</u>
1973: Oct. ....	...	0.452	...	0.487
Dec. ....	...	.477	...	.512
1974: June ....	...	.599	...	.632
Dec. ....	...	.599	...	.629
1975: June ....	...	.673	...	.710
Dec. ....	...	.691	...	.733
1976: Jan. ....	...	.685	0.696	.727
June ....	...	.684	.692	.720
Dec. ....	...	.702	.714	.743
1977: June ....	...	.723	.738	.764
Dec. ....	...	.722	.743	.768
1978: June ....	...	.741	.772	.798
Revised series <u>4/</u>				
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

1/ Includes types not shown separately. Not calculated before June 1978.

2/ Survey initiated October 1973.

3/ Survey initiated January 1976.

4/ Not directly comparable to earlier data.

Source: U.S. Bureau of Labor Statistics, Retail Prices and Indexes of Fuels and Utilities (monthly, 1973-1978), Consumer Prices: Energy (monthly, 1979-present), and printouts for 1978-1979; Hawaii State Department of Planning and Economic Development, Gasoline Prices in Hawaii, 1920-1980 (Statistical Report 140, August 7, 1980), table 2.

Table 331.-- QUANTITY AND COST OF PURCHASED FUELS AND ELECTRIC ENERGY
USED FOR HEAT AND POWER BY MANUFACTURING INDUSTRIES: 1976

Type of fuel or energy	Quantity, all mfg. industries		Cost (million dollars)	
	Unit	Amount	Total, all mfg. industries	Food and kindred products
Purchased fuels and electric energy	Trillion Btu's	9.6	27.8	15.3
Purchased fuels	Trillion Btu's	8.1	15.4	10.3
Distillate fuel oil	1,000 barrels	280.3	3.4	3.1
Residual fuel oil	1,000 barrels	798.3	10.0	6.0
Coal and coke	1,000 short tons	-	-	-
Natural gas	Billion cubic feet	0.6	0.5	0.3
Other fuels .....	. . .	...	1.0	0.8
Fuels not specified by kind ...	. . .	...	0.5	0.1
Electric energy:				
Purchased	Million kWh	433.9	12.4	5.1
Generated less sold	Million kWh	315.4	...	...

Source: U.S. Bureau of the Census, Annual Survey of Manufactures 1976; Fuels and Electric Energy Consumed, M76 (AS)-4.2, pages 106-107.

Table 332.-- BUNKER OIL LADEN IN HONOLULU CUSTOMS DISTRICT ON VESSELS
ENGAGED IN FOREIGN TRADE: 1977 TO 1979

(In barrels of 42 gallons.)

Year	Total	American vessels		Foreign vessels	
		Fuel oil	Diesel oil	Fuel oil	Diesel oil
1977	1,728,413	241,964	35,068	376,207	1,075,174
1978	2,049,939	261,467	18,943	632,127	1,137,402
1979	1,550,905	111,171	66,414	464,493	908,827

Source: U.S. Bureau of the Census, United States Foreign Trade, Bunker Fuels, Annual 1977 (FT810-77-13, May 1978), Annual 1978 (FT810-78-13, July 1979), and Annual 1980 [sic] (FT810-79-13, April 1980).

Table 333.-- BOILERS AND PRESSURE VESSELS: DECEMBER 31, 1979

Island	Power boilers	Heating boilers	Pressure vessels <u>1/</u>
State total	654	2,599	4,656
Hawaii	76	232	698
Maui	63	198	407
Lanai	3	2	25
Molokai	4	30	24
Oahu	457	2,020	3,247
Kauai	51	117	255

1/ Five cubic feet or more.

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

Table 334.-- HYDROELECTRIC POWER RESOURCES: 1979

Category	Number of sites	Capacity (MW)	Energy (GWH)
Existing <u>1/</u>	14	19	102
Potential incremental <u>2/</u>	12	31	65
Undeveloped <u>3/</u>	7	30	77

MW Megawatts (1 megawatt equals 1,000 kilowatts).

GWH Gigawatt-hours (1 gigawatt-hour equals 1,000,000 kilowatt-hours).

1/ Existing hydroelectric power facilities currently generating power.

2/ Existing dams and/or other water resource projects with the potential for new and/or additional hydroelectric capacity.

3/ Undeveloped sites where no dam or other engineering structure now exists.

Source: U.S. Army Corps of Engineers, National Hydroelectric Power Resources Study: Preliminary Inventory of Hydropower Resources, Vol. 2, Pacific Southwest Region (July 1979), page 15.

Table 335.-- HOUSING UNITS WITH SOLAR WATER HEATING INSTALLATIONS: DECEMBER 31, 1979

Type of installation	Number of housing units
Total	13,000
Single-family dwelling: <u>1/</u>	
Retrofits	10,500
New construction	200
Multi-family dwelling <u>1/</u>	800
Installations without permit <u>1/</u>	500
Installations prior to 1977	1,000

1/ Estimate for solar units installed from 1977 through 1979.

Source: Estimated by State Energy Office, Department of Planning and Economic Development, based on data and/or estimates from the Counties, the State Department of Taxation, the Hawaiian Electric Company, and representatives of the solar industry.

Table 336.-- SCIENTIFIC ORGANIZATIONS AND RESOURCES: 1976

Type of organization	Number of organizations	Employment		
		Total	Professional	Technical
Total employing organizations	384	34,449	7,346	10,729
Organization with scientific capabilities	98	14,528	2,447	3,253
Computer science companies	54	2,510	697	1,096
R&D and allied companies	43	1,541	453	400
Testing laboratories	31	1,060	305	288
Private research agencies	39	778	299	118
Government agencies	119	14,032	3,145	5,574
Federal civilian	24	1,424	257	715
Military	10	6,118	676	3,705
State, except University of Hawaii	36	3,218	1,087	613
University of Hawaii	33	1,497	756	294
County	16	1,775	369	247

Subject	Number	Subject	Number
Professional associations:		Colleges and universities:	
Number of associations	44	Number of units	34
Regular membership	11,749	Full-time enrollment <u>1</u> /	37,770
Associate membership	753	Part-time enrollment <u>1</u> /	38,805
Scientific libraries:		Business and technical schools:	
Number of libraries	22	Number of units	4
Number of scientific books	846,436	Full-time enrollment <u>1</u> /	763
		Part-time enrollment <u>1</u> /	162

1/ Spring 1976. Because of differences in coverage and definition, these data differ from those in Section 3.

Source: Hawaii State Department of Planning and Economic Development, Hawaii's Scientific Resources. 1977 Directory, 8th edition (1977), p. 5.

Table 337.-- FEDERAL R&D OBLIGATIONS IN HAWAII:
1965 TO 1978

Fiscal year <u>1/</u>	Millions of dollars
1965	41.5
1966 .....	....
1967 .....	....
1968	35.0
1969	37.7
1970	43.8
1971	38.3
1972	47.4
1973	47.9
1974	53.1
1975	43.0
1976	45.5
1977	36.9
1978	44.6

1/ Fiscal years ended June 30 through 1976 and September 30 thereafter. State data were first compiled for fiscal 1965, and were not collected for 1966 and 1967.

Source: National Science Foundation, Division of Science Resources Studies, R&D Economic Studies Section, information provided January 25, 1980.

Table 338.-- STATE AND LOCAL GOVERNMENT EXPENDITURES FOR RESEARCH AND DEVELOPMENT, BY CHARACTER OF WORK: FISCAL YEAR 1977

(Thousands of dollars)

Character of work	State agency expenditures	Local government expenditures ^{1/}
Total	3,370	740
Research and development	2,873	722
Basic	3	90
Applied	1,599	227
Development	1,271	405
R&D plant	497	18

^{1/} City and County of Honolulu.

Source: National Science Foundation, Research and Development in State and Local Governments, Fiscal Year 1977, NSF 79-327, pp. 5, 31a, and 38.

Table 339.-- PATENTS ISSUED TO HAWAII RESIDENTS: 1973 TO 1979

(Unless otherwise indicated, data include design, plant, and reissue patents.)

Year ended --	Patents
1973: Dec. 31 ^{1/}	50
1974: June 30	55
1975: June 30	61
1976: June 30	51
1977: Sept. 30	43
1978: Sept. 30	41
1979: Sept. 30	32

^{1/} Excludes reissue patents.

Source: U.S. Department of Commerce, Patent and Trademark Office, Commissioner of Patents and Trademarks Annual Report, Fiscal Year 1979, p. 31.