

Section 17

ENERGY AND SCIENCE

This section presents statistics on energy production and consumption, the electric and gas utility industries, and research and development and scientific resources.

Electricity sales exceeded 6.3 billion kilowatt-hours in 1980, a total that has doubled since 1968. Manufactured gas sales reached 34.7 million therms in 1980, 25 percent above the figure ten years earlier. Residential rates in 1980 averaged 7.9 cents per kilowatt-hour and \$1.47 per therm, both well above the corresponding rates only a few years earlier. Average residential use (7,117 kWh and 244 therms in 1980) has declined significantly in recent years.

The liquid fuel tax base for 1980 was approximately 940 million gallons, compared with 825 million in 1974 and 755 million in 1970. The 1980 total included 313 million gallons of gasoline, 503 million of aviation fuel, and 119 million of diesel oil. The average price for leaded premium gasoline rose from 48.7 cents per gallon in October 1973 to \$1.606 in May 1981.

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 \$40 million in 1979. Thirty-two patents were granted to Hawaii residents in 1980.

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 appear in Hawaii Integrated Energy Assessment, Vol. IV, Energy Data Handbook, published by the State Energy Office of the Department of Planning and Economic Development in 1980. 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: 1980, Sections 20 and 21.

Table 362.-- 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 363.-- 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 364.-- 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 365.-- ELECTRIC UTILITIES: 1970 TO 1980

Year	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
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
1980 ..	301,544	260,358	41,186	1,514,180	6,345,531	1,852,984	4,492,547

Year	Average annual use (kWh) ^{1/}		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
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
1980 ..	7,117	109,079	.07901	.06964	459,251	146,397	312,854

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

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

Table 366.-- ELECTRIC UTILITIES, BY ISLANDS: 1980

County or island	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
State total	301,544	260,358	41,186	1,514,180	6,345,531	1,852,984	4,492,547
Oahu	217,142	189,771	27,371	1,209,400	5,266,522	1,446,130	3,820,392
Hawaii	35,590	29,476	6,114	124,300	426,857	175,426	251,431
Kauai	16,711	14,104	2,607	62,080	188,798	70,099	118,699
Maui County	32,101	27,007	5,094	118,400	463,354	161,329	302,025
Lanai	868	699	169	-	6,142	3,565	2,577
Maui	28,986	24,470	4,516	110,300	434,519	147,432	287,087
Molokai	2,247	1,838	409	8,100	22,693	10,332	12,361
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	7,117	109,079	0.07901	0.06964	459,251	146,397	312,854
Oahu	7,620	139,578	0.07073	0.06267	341,697	102,281	239,416
Hawaii	5,951	41,124	0.10332	0.10009	43,290	18,124	25,166
Kauai	4,970	45,531	0.13863	0.14233	26,612	9,718	16,894
Maui County	5,974	59,290	0.10088	0.10389	47,652	16,274	31,378
Lanai	5,100	15,247	0.11205	0.12201	714	400	314
Maui	6,025	63,571	0.09810	0.10074	43,385	14,463	28,922
Molokai	5,621	30,222	0.13662	0.17326	3,553	1,411	2,142

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

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

Table 367.-- GAS UTILITIES: 1970 TO 1980

[Excludes bottled gas.]

Year	Customers, Dec. 31			Gas sold (1,000 therms)		
	Total	Residential	Other	Total	Residential	Other
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
1980 ...	33,019	28,825	4,194	34,705	7,030	27,675

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
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
1980 ...	244	6,599	1.46583	1.25951	45,162	10,305	34,857

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

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

Table 368.-- GAS UTILITIES, BY ISLANDS: 1980

[Excludes bottled gas.]

Island	Customers, Dec. 31			Gas sold (therms)		
	Total	Residential	Other	Total	Residential	Other
State total	33,019	28,825	4,194	34,705,005	7,030,421	27,674,584
Oahu	30,265	26,455	3,810	31,636,007	6,456,326	25,179,681
Hawaii	2,076	1,751	325	2,295,493	423,882	1,871,611
Kauai	281	281	-	73,213	73,213	-
Maui	397	338	59	700,292	77,000	623,292
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	244	6,599	1.46583	1.25951	45,162	10,305	34,857
Oahu	244	6,609	1.49256	1.28550	42,005	9,636	32,369
Hawaii	242	5,759	1.17655	1.00025	2,371	499	1,872
Kauai	261	-	1.18661	-	87	87	-
Maui	228	10,564	1.08217	0.98782	699	83	616
Molokai	-	-	-	-	-	-	-
Lanai	-	-	-	-	-	-	-

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

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

Table 369.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1970 TO 1980

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					
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
1980 ..	217,142	189,771	5,525,998	5,266,522	7,661	0.07126	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 370.-- RESIDENTIAL CUSTOMERS, VACANT UNITS, AND TURN-ONS, FOR HOUSING UNITS SERVED BY THE HAWAIIAN ELECTRIC COMPANY ON OAHU: 1970 TO 1980

Year	Residential customers, Dec. 31	Vacant units, Dec.		Turn-ons, annual	
		Number	Ratio <u>1/</u>	Number	Ratio <u>1/</u>
1970	148,239	1,747	1.2	19,984	13.5
1971	155,544	1,708	1.1	20,871	13.4
1972	159,542	1,545	1.0	22,305	14.0
1973	163,590	2,392	1.5	20,918	12.8
1974	171,498	2,381	1.4	20,187	11.8
1975	175,254	3,326	1.9	22,300	12.7
1976	184,350	2,653	1.4	20,339	11.0
1977	188,456	2,352	1.2	22,673	12.0
1978	192,280	2,362	1.2	32,779	17.0
1979	201,013	1,297	0.6	32,419	16.1
1980	222,745	2,662	1.2	20,499	9.2

1/ Per 100 residential customers, Dec. 31.

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

Table 371.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1970 TO 1980

Calendar year	Customers, Dec. 31		Gas sold <u>1/</u> (1,000 therms)		Average annual residential usage <u>1/</u> (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
1980 ...	30,471	26,625	31,636	6,455	242

1/ Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 372.-- TYPICAL RESIDENTIAL UTILITY MONTHLY RATES, BY ISLANDS:
FEBRUARY 1981

[In dollars.]

Utility and monthly use	Oahu	Hawaii	Kauai	Maui	Molokai	Lanai
Water:						
5/8-inch meter, 5,000 gal.	6.30	7.25	4.50	5.80	5.80	2.95
5/8-inch meter, 10,000 gal. ...	10.10	10.80	7.00	8.60	8.60	4.65
1-inch meter, 20,000 gal.	17.70	21.40	15.00	19.70	19.70	9.30
1-1/2-inch meter, 50,000 gal. .	40.50	48.20	35.00	45.50	45.50	22.00
Electricity: <u>1/</u>						
250 kilowatt-hours	32.05	32.46	41.75	30.91	46.57	33.64
500 kilowatt-hours	57.68	56.93	76.94	54.62	86.68	60.08
750 kilowatt-hours	83.46	81.39	111.49	78.38	126.79	86.57
1,000 kilowatt-hours	109.69	105.86	146.03	102.65	166.90	113.56
Gas: <u>1/</u>						
10 therms	17.82	14.30	14.09	12.76	...	...
25 therms	38.92	31.81	32.32	29.46	...	...
50 therms	74.82	60.29	62.24	57.06	...	...
100 therms	147.62	117.59	122.29	112.56	...	...
Telephone: <u>2/</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/ Includes fuel adjustment surcharge.

2/ Excludes federal excise tax (2 percent for 1981).

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 373.-- LIQUID FUEL TAX BASE: 1970 TO 1980

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

Year reported <u>1/</u>	All types	Gasoline	Diesel oil	
			Non-hwy.	Hwy. use
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
1980	939,766	312,896	101,719	17,765

Year reported <u>1/</u>	Liq. pet. gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
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
1980	2,448	1,140	502,544	338	917

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 374.-- FUEL OIL AND KEROSENE DELIVERIES: 1978 AND 1979

[Thousands of barrels.]

Use	Distillate fuel oil		Residual fuel oil		Kerosene	
	1978	1979	1978	1979	1978	1979
Total	3,246	5,957	12,796	12,599	146	40
Heating and industrial ...	352	750	648	335	108	6
Residential .....	...	2	...	-	...	-
Commercial .....	...	259	...	16	...	6
Industrial .....	...	170	...	319	...	-
Farm .....	...	319	...	-	...	6
Oil company	30	581	553	379	-	-
Electric utility	523	278	9,819	10,407	-	-
Military	168	3,385	426	25	-	-
Railroad	2	2	-	-	-	-
Vessel bunkering	1,227	38	1,323	1,237	-	-
On-highway	360	399	-	-	-	-
Off-highway	495	182	-	-	-	-
Other	89	342	27	216	38	34

Source: U.S. Department of Energy, Energy Information Administration, "Deliveries of Fuel Oil and Kerosene in 1979," Energy Data Reports, DOE/EIA-0113(79), August 11, 1981.

Table 375.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
1973 TO 1981

[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
Dec.	1.407	1.348	1.413	1.441
1981: June	1.580	1.508	1.588	1.619

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-forward), 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 376.-- 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 377.-- BOILERS AND PRESSURE VESSELS: DECEMBER 31, 1980

Island	Power boilers	Heating boilers	Pressure vessels ^{1/}
State total	674	2,657	4,746
Hawaii	73	237	729
Maui	63	208	450
Lanai	3	2	26
Molokai	4	30	22
Oahu	478	2,063	3,262
Kauai	53	117	257

^{1/} Five cubic feet or more.

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

Table 378.-- HYDROELECTRIC PLANTS: DECEMBER 1980

Island	Locations	Units	Capacity (kW)	Annual output (million kWh)
State total ...	13	18	17,350	91.60
Hawaii	3	5	4,150	21.25
Maui	3	5	5,300	21.75
Lanai and Molokai ..	-	-	-	-
Oahu	-	-	-	-
Kauai	7	8	7,900	48.60
Niihau	-	-	-	-

Source: Hawaii State Department of Planning and Economic Development and U.S Department of Energy, Hydroelectric Power in Hawaii (February 1981), p. 41.

Table 379.-- OCCUPIED HOUSING UNITS WITH SOLAR HEATING DEVICES, BY COUNTIES: JAN.-JUNE 1981

[Preliminary.]

County	Units sampled	All occupied housing units	Units with solar heating devices	
			Number	Percent
State total	2,985	285,775	18,862	6.6
Honolulu	1,534	225,940	11,783	5.2
Hawaii	672	29,302	1,364	4.7
Kauai	337	10,396	1,984	19.1
Maui	442	20,137	3,731	18.5

Source: Unpublished data from Hawaii State Department of Health, Hawaii Health Surveillance Program, compiled for State Energy Office.

Table 380.-- ELECTRICITY USE REDUCTIONS OF SOLAR AND HEAT PUMP WATER HEATER INSTALLATIONS ON OAHU: 1976 TO 1980

[These recorded changes in energy consumption include other unidentified changes in energy consumption habits not related to the installation of the solar or heat pump water heaters. These could include the installation or removal of other energy-consuming devices and other conservation efforts by the residents in these homes.]

Study release date and type of water heating device installed	Number of residences in study	Average monthly kwh usage		Percentage reduction in kwh usage
		Before installation	After installation	
March 16, 1979: <u>1/</u> Solar, collectors under 50 sq. ft. ..	87	940	636	32
Solar, collectors between 50 and 60 sq. ft.	108	1,088	754	31
Solar, collectors over 60 sq. ft. ...	18	1,296	877	32
September 24, 1980: <u>1/</u> Solar	50	1,030	700	32
January 30, 1981: Heat pump	101	1,068	821	23

1/ During the period of these studies, the average annual rainfall accumulation was 73 percent of normal (as recorded at Honolulu International Airport).

Source: Hawaiian Electric Company, "A Report on the Study of Solar Water installations on Oahu and Related KWH usage by those customers (October 1980), and "A report on the Study of Heat Pump Water Heater Installations on Oahu and Related KWH usage by these customers" (January 30, 1981).

Table 381.-- FEDERAL R&D OBLIGATIONS IN HAWAII:
1965 TO 1979

Fiscal year ^{1/}	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
1979	40.8

^{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 and April 21, 1981.

Table 382.-- 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 <u>1/</u>
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 383.-- R&D EXPENDITURES AT UNIVERSITIES AND COLLEGES: 1972 TO 1977

[In millions of dollars.]

Fiscal year	Total R&D expenditures	Federally financed R&D expenditures
1972	23,520	13,725
1973	24,846	15,382
1974	21,143	14,065
1975	24,596	15,540
1976	28,049	17,578
1977	28,900	17,945

Source: National Science Foundation, Academic Science 1972-77, Final Report NSF 80-313 (1980), pp. 32-33.

Table 384.-- PATENTS ISSUED TO HAWAII
RESIDENTS: 1973 TO 1980

[Unless otherwise indicated, data include design,
plant, and reissue patents.]

Year ended --	Patents
1973: Dec. 31 <u>1/</u>	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
1980: 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, and Fiscal Year 1980, p. 38.