

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.

Total energy consumption in 1982 amounted to 218 trillion British thermal units, compared with 226 trillion BTU a decade earlier. Transportation accounted for 47 percent of the 1982 total. Primary consumption expenditures for fuels and electricity in 1981 totaled \$1.9 billion.

Electricity sales exceeded 6.4 billion kilowatt-hours in 1983, a total that has doubled since 1968. Manufactured gas sales reached 31.3 million therms in 1983, 9.4 percent below the figure ten years earlier. Residential rates in 1983 averaged 11.3 cents per kilowatt-hour and \$1.80 per therm, both well above the corresponding rates only a few years earlier. Average residential use (6,569 kWh and 219 therms in 1983) 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 1983 was approximately 920 million gallons, compared with 825 million in 1974 and 755 million in 1970. The 1983 total included 310 million gallons of gasoline, 502 million of aviation fuel, and 104 million of diesel oil. The average price for unleaded gasoline rose from 69.6 cents per gallon in January 1976 to \$1.633 six years later, then fell to \$1.490 by June 1984.

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), with cumulative capital costs of \$53 million and Hawaii-based staff of 95 persons as of 1984. Federal research and development obligations in Hawaii approached \$45 million in 1982. Thirty patents were granted to Hawaii residents in 1983.

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 the Census, National Science Foundation, Hawaii State Department of Taxation, Hawaii State Department of Commerce and Consumer Affairs and its Division of Consumer Advocacy (formerly the 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. 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: 1984, Sections 20 and 21.

Table 480.-- CONSUMPTION OF ENERGY, BY SOURCE (PHYSICAL UNITS):
1960 TO 1982

[Revised from Data Book 1983, table 413]

Year	Petroleum ^{1/} (1,000 barrels)	Hydro- electric power ^{2/} (million kWh)	Geo- thermal power ^{3/} (million kWh)	Wood and waste ^{3/} (million kWh)	Natural gas (dry) (billion cubic feet)	Other types ^{4/}
1960	17,239	27	0	0	0	0
1961	20,628	24	0	0	0	0
1962	19,604	20	0	0	0	0
1963	20,955	23	0	0	0	0
1964	22,691	115	0	0	0	0
1965	23,732	105	0	0	0	0
1966	26,236	112	0	2	0	0
1967	29,939	108	0	0	0	0
1968	33,196	94	0	30	0	0
1969	34,645	100	0	29	0	0
1970	35,592	108	0	24	0	0
1971	38,079	89	0	15	0	0
1972	39,142	91	0	18	0	0
1973	39,976	95	0	22	0	0
1974	37,939	92	0	30	0	0
1975	38,313	89	0	25	0	0
1976	38,909	93	0	29	0	0
1977	40,777	86	0	26	0	0
1978	41,259	84	0	0	0	0
1979	45,477	90	0	0	0	0
1980	45,246	86	0	0	3	0
1981	40,209	80	0	15	3	0
1982	37,349	90	0	26	3	0

^{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.

^{4/} Coal and nuclear power.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1982 (May 1984), p. 204.

Table 481.-- CONSUMPTION OF ENERGY, BY SOURCE (TRILLION BTU):
1960 TO 1982

[Revised from Data Book 1983, table 414]

Year	Total energy consumed <u>1/</u>	Petro-leum <u>2/</u>	Hydro-electric power <u>3/</u>	Geo-thermal power <u>4/</u>	Wood and waste <u>4/</u>	Natural gas (dry)	Other types <u>5/</u>
1960	97.2	96.9	0.3	0.0	0.0	0.0	0.0
1961	117.3	117.0	0.3	0.0	0.0	0.0	0.0
1962	112.0	111.8	0.2	0.0	0.0	0.0	0.0
1963	120.0	119.8	0.2	0.0	0.0	0.0	0.0
1964	131.3	130.1	1.2	0.0	0.0	0.0	0.0
1965	137.7	136.6	1.1	0.0	0.0	0.0	0.0
1966	152.0	150.8	1.2	0.0	(Z)	0.0	0.0
1967	173.5	172.4	1.1	0.0	0.0	0.0	0.0
1968	192.5	191.2	1.0	0.0	0.3	0.0	0.0
1969	199.8	198.4	1.0	0.0	0.3	0.0	0.0
1970	205.4	204.0	1.1	0.0	0.3	0.0	0.0
1971	219.2	218.1	0.9	0.0	0.2	0.0	0.0
1972	225.9	224.7	0.9	0.0	0.2	0.0	0.0
1973	230.8	229.6	1.0	0.0	0.2	0.0	0.0
1974	218.9	217.6	1.0	0.0	0.3	0.0	0.0
1975	221.3	220.1	0.9	0.0	0.3	0.0	0.0
1976	224.8	223.6	1.0	0.0	0.3	0.0	0.0
1977	236.3	235.1	0.9	0.0	0.3	0.0	0.0
1978	239.0	238.2	0.9	0.0	0.0	0.0	0.0
1979	261.3	260.4	0.9	0.0	0.0	0.0	0.0
1980	264.0	259.9	0.9	0.0	0.0	3.2	0.0
1981	236.0	232.1	0.8	0.0	0.2	3.0	0.0
1982	217.9	213.8	0.9	0.0	0.3	2.9	0.0

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 and nuclear power.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1982 (May 1984), p. 204.

Table 482.-- CONSUMPTION OF ENERGY BY END-USE SECTOR: 1960 TO 1982

[Trillion Btu. Revised from Data Book 1983, table 415]

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	97.2	7.3	5.1	20.6	64.2	17.6
1961	117.3	7.5	5.4	28.2	76.2	19.4
1962	112.0	8.0	5.5	30.2	68.4	21.4
1963	120.0	8.9	6.0	31.2	73.9	24.2
1964	131.3	9.6	6.6	34.2	80.9	26.7
1965	137.7	10.1	6.7	37.0	83.8	27.6
1966	152.0	10.8	7.3	38.4	95.4	29.7
1967	173.5	12.1	8.0	43.2	110.3	31.3
1968	192.5	13.1	8.8	42.4	128.3	35.0
1969	199.8	14.9	9.8	44.5	130.6	38.7
1970	205.4	16.4	11.5	47.7	129.8	43.2
1971	219.2	17.8	11.4	46.7	143.4	47.7
1972	225.9	19.6	12.7	52.9	140.7	54.1
1973	230.8	20.0	13.4	52.7	144.6	55.6
1974	218.9	20.3	13.3	52.8	132.5	57.5
1975	221.3	19.6	13.8	53.8	134.0	58.8
1976	224.8	21.3	15.3	54.4	133.9	62.5
1977	236.3	21.8	16.8	56.3	141.4	65.2
1978	239.0	21.8	17.4	55.2	144.7	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

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/ 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, 1960-1982 (May 1984), p. 205.

Table 483.-- EXPENDITURES FOR FUELS AND ELECTRICITY:
1970 TO 1981

[Million dollars]

Year	Primary consumption expenditures			Less: Electric utility fuel expend.	Plus: Electricity purchased by end users	Total energy expend- itures
	Total	Petrol- eum products	Other energy sources			
1970	220.0	219.8	0.2	16.8	89.5	293
1971	248.5	248.4	.1	22.2	103.8	330
1972	256.7	256.6	.1	28.7	116.0	344
1973	305.3	305.1	.2	35.8	135.2	405
1974	436.2	435.9	.3	45.9	164.1	554
1975	554.5	554.2	.2	89.8	231.0	696
1976	610.2	609.9	.3	99.8	251.4	762
1977	706.2	705.9	.3	123.9	288.1	870
1978	777.8	777.8	-	149.5	334.2	963
1979	1,098.9	1,098.9	-	179.8	372.5	1,292
1980	1,549.0	1,549.0	-	270.6	485.2	1,764
1981	1,865.5	1,818.5	47.0	460.2	761.4	2,167

Source follows next table.

Table 484.-- EXPENDITURES AND PRICES OF FUELS AND ELECTRICITY, BY SECTORS:
1970, 1980, AND 1981

Sector and energy source	Expenditures (million dollars)			Average prices (dollars per million Btu)		
	1970	1980	1981	1970	1980	1981
Residential sector	41.7	173.8	272.6	6.86	22.09	29.09
Primary consumption ..	5.5	19.5	40.3	3.24	12.29	14.37
Electricity	36.2	154.3	232.3	8.26	24.57	35.38
Commercial sector	30.5	155.8	228.8	5.69	19.44	26.78
Primary consumption ..	4.3	19.9	40.1	1.56	6.56	11.15
Electricity	26.2	135.9	188.6	10.01	27.30	38.17
Industrial sector	44.0	319.3	535.7	1.45	8.37	12.74
Primary consumption ..	17.0	124.3	195.3	0.69	4.47	6.32
Electricity	27.1	195.0	340.4	4.62	18.87	30.51
Transportation sector ..	176.4	1,114.6	1,129.6	1.36	7.60	9.12
Primary consumption ..	176.4	1,114.6	1,129.6	1.36	7.60	9.12
Electricity	-	-	-	-	-	-
Four sectors	292.7	1,763.5	2,166.7	1.71	8.79	11.78
Primary consumption ..	203.2	1,278.3	1,405.3	1.28	7.14	8.72
Electricity	89.5	485.2	761.4	6.96	22.47	33.59
Electric utility sector:						
Primary consumption ..	16.8	270.6	460.2	0.39	3.89	6.60

Source: U.S. Department of Energy, Energy Information Administration, State Energy Price and Expenditure Report 1970-1981, DOE/EIA-0376(81) (June 1984), pp. 53-55.

Table 485.-- SOURCES OF ENERGY CONSUMPTION, BY COUNTIES:
1981

Subject	State total	City and County of Honolulu	Hawaii County	Kauai County	Maui County
Trillion BTU ...	263.9	213.7	21.2	9.7	19.3
Percent	100.0	100.0	100.0	100.0	100.0
Aviation fuel	33.6	41.0	2.6	0.7	1.5
Biomass <u>1/</u> ...	4.6	0.7	24.2	25.8	14.7
Gasoline	14.2	12.5	22.3	20.7	20.6
Gas <u>2/</u>	2.0	2.3	1.3	0.1	0.5
Diesel	9.2	9.2	7.4	4.1	12.9
Residual	6.0	6.5	3.3	3.7	4.7
Electricity <u>3/</u>	30.4	27.8	38.9	44.9	45.1

1/ Biomass is used for process steam, primarily on sugar plantations.

2/ Includes liquid petroleum gas (LPG).

3/ Includes primarily residual/diesel oils, biomass, hydropower resources used for electric generation.

Source: Hawaii State Department of Planning and Economic Development, State Energy Plan Technical Reference Document (October 1982), p. III-25.

Table 486.-- ELECTRIC UTILITIES: 1973 TO 1983

Year	Customers, Dec. 31			Installed capacity, Dec. 31 (kW)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
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
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

Year	Average annual use (kWh) 1/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential	Other	Residential	Other	Total	Residential	Other
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
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

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 487.-- ELECTRIC UTILITIES, BY ISLANDS: 1983

County or island	Customers, Dec. 31			Installed capacity, Dec. 31 (kw)	Power sold (1,000 kWh)		
	Total	Residential	Other		Total	Residential	Other
State total	319,449	276,194	43,255	1,578,780	6,425,578	1,814,336	4,611,242
Oahu	226,070	197,400	28,670	1,283,000	5,230,658	1,377,502	3,853,156
Hawaii	39,161	32,718	6,443	116,500	466,060	188,475	277,585
Kauai	18,390	15,674	2,716	62,080	209,713	74,919	134,794
Maui County	35,828	30,402	5,426	117,200	519,147	173,440	345,707
Lanai	872	714	158	-	5,867	3,431	2,436
Maui	32,584	27,742	4,842	110,300	490,223	160,663	329,560
Molokai	2,372	1,946	426	6,900	23,057	9,346	13,711
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	6,569	106,606	0.11348	0.09828	659,089	205,889	453,200
Oahu	6,978	134,397	0.10631	0.09204	501,094	146,447	354,647
Hawaii	5,761	43,083	0.12453	0.11768	56,138	23,471	32,667
Kauai	4,780	49,630	0.15568	0.15243	32,209	11,663	20,546
Maui County	5,705	63,713	0.14015	0.13115	69,648	24,308	45,340
Lanai	4,806	15,416	0.16298	0.16477	960	559	401
Maui	5,791	68,063	0.13485	0.12650	63,356	21,666	41,690
Molokai	4,803	32,187	0.22284	0.23697	5,332	2,083	3,249

^{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 488.-- GAS UTILITIES: 1973 TO 1983

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)			
	Total	Residential	Other	Total	Residential	Other	
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	
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	
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
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
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

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 489.-- GAS UTILITIES, BY ISLANDS: 1983

[Excludes bottled gas]

Island	Customers, Dec. 31			Gas sold (therms)			
	Total	Residen- tial	Other	Total	Residen- tial	Other	
State total	32,880	28,933	3,947	31,307,400	6,337,853	24,969,547	
Oahu	30,236	26,668	3,568	28,486,521	5,838,221	22,648,300	
Hawaii	1,986	1,667	319	2,047,072	368,822	1,678,250	
Kauai	276	276	-	64,532	64,532	-	
Maui	382	322	60	709,275	66,278	642,997	
Molokai	-	-	-	-	-	-	
Lanai	-	-	-	-	-	-	
Island	Average annual use (therms) 1/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Resi- dential	Other	Resi- dential	Other	Total	Resi- dential	Other
State total	219	6,326	1.79719	1.44022	47,352	11,390	35,962
Oahu	219	6,348	1.81360	1.45479	43,537	10,588	32,949
Hawaii	221	5,261	1.59814	1.30196	2,774	589	2,185
Kauai	234	-	1.62507	-	105	105	-
Maui	206	10,717	1.62680	1.28803	936	108	828
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 490.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1973 TO 1983

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					
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
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

1/ Net generated plus purchased power.

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

3/ Maximum generator nameplate. Figure for 1982 revised from Data Book 1983, table 421.

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

Table 491.-- RESIDENTIAL CUSTOMERS, VACANT UNITS, AND TURN-ONS, FOR HOUSING UNITS SERVED BY THE HAWAIIAN ELECTRIC COMPANY ON OAHU: 1978 TO 1983

Year	Residential customers, December	Vacant units, Dec.		Turn-ons, annual	
		Number	Ratio <u>1/</u>	Number	Ratio <u>1/</u>
1978	192,280	2,362	1.2	32,779	17.0
1979	201,013	1,297	0.6	32,419	16.1
1980 <u>2/</u> .	232,745	2,662	1.1	20,499	8.8
1981 <u>2/</u> ..	241,509	1,526	0.6	33,917	14.0
1982	227,506	1,366	0.6	20,581	9.0
1983	230,368	905	0.4	32,344	14.0

1/ Per 100 residential customers, December.

2/ Data may not be directly comparable to earlier years.

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

Table 492.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1973 TO 1983

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	
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
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

1/ Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 493.-- TYPICAL RESIDENTIAL UTILITY MONTHLY RATES, BY ISLANDS:
JANUARY 1, 1984

[In dollars]

Utility and monthly use	Oahu	Hawaii ^{1/}	Kauai	Maui	Molokai	Lanai
Water:						
5/8-inch meter, 5,000 gal.	6.13	8.20	7.60	9.70	9.70	4.00
5/8-inch meter, 10,000 gal. ...	10.33	12.35	11.20	15.40	15.40	6.75
1-inch meter, 20,000 gal.	19.85	24.65	20.40	35.05	33.05	13.50
1-1/2-inch meter, 50,000 gal. .	46.80	55.80	48.00	82.75	77.75	32.50
Electricity: ^{3/}						
250 kilowatt-hours	32.20	32.70	40.71	34.93	57.21	43.06
500 kilowatt-hours	58.40	58.90	76.42	64.87	105.92	81.12
750 kilowatt-hours	84.60	85.10	112.13	94.80	154.62	119.18
1,000 kilowatt-hours	110.80	111.30	147.84	124.73	203.33	157.24
Gas: ^{2/}						
10 therms	20.48	18.13	18.57	17.27	...	...
25 therms	42.20	37.83	38.93	35.68	...	...
50 therms	78.40	70.65	72.85	66.35	...	...
100 therms	150.80	136.30	140.70	127.70	...	...
Telephone: ^{3/}						
Individual line	10.90	9.60	9.05	9.05	7.55	6.65
Two-party line	8.65	7.80	7.40	7.40	6.20	5.45

^{1/} Water rates are those for all districts except Kaloko Mauka Subdivision System; gas rates are for district of South Hilo.

^{2/} Includes fuel adjustment and customer charge.

^{3/} Excludes federal excise tax (3 percent for 1984) and the monthly rental for the telephone set.

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy; Honolulu Board of Water Supply; Hawaii County Department of Water Supply; Kauai County Department of Water; Maui County Department of Water Supply; Dole Company, Lanai City.

Table 494.-- LIQUID FUEL TAX BASE: 1973 TO 1983

[In thousands of gallons]

Year reported ^{1/}	All types	Gasoline	Diesel oil	
			Non-hwy.	Hwy. use
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
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

Year reported ^{1/}	Liq. pet. gas		Aviation fuel	Small boats	
	Off-hwy.	Hwy. use		Gasoline	Diesel oil
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
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

^{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 495.-- LIQUID FUEL TAX BASE, BY COUNTIES: 1983

[In thousands of gallons]

Type of fuel	State total	City and Co. of Honolulu	County of Maui	County of Hawaii	County of Kauai
Total	919,865	764,538	68,634	60,366	26,326
Gasoline	310,085	224,182	31,162	39,297	15,445
Diesel oil, non-hwy.	86,790	38,416	26,699	11,802	9,873
Diesel oil, hwy. use	16,440	11,826	1,290	2,636	689
Liq. pet. gas, off hwy. ..	3,013	2,254	281	386	92
Liq. pet. gas, hwy. use ..	1,052	845	63	110	34
Small boats, gasoline	213	141	-	72	-
Small boats, diesel oil ..	624	446	(Z)	178	-
Aviation fuel	501,648	486,429	9,141	5,885	194

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base, Collections and Distribution, Year Ending December 31, 1983" (annual release).

Table 496.-- FUEL OIL AND KEROSENE DELIVERIES: 1982 AND 1983

[Thousands of barrels]

Use	Distillate fuel oil		Residual fuel oil		Kerosene	
	1982	1983	1982	1983	1982	1983
Total	4,570	4,762	13,323	12,228	-	-
Residential	-	-	-	-	-	-
Commercial	55	54	110	53	-	-
Industrial	83	82	254	123	-	-
Oil company	219	215	1,627	790	-	-
Electric utility	618	636	9,897	10,149	-	-
Farm	408	400	-	-	-	-
Military	2,102	2,202	240	166	-	-
Railroad	15	15	-	-	-	-
Vessel bunkering	65	64	860	785	-	-
On-highway	415	515	-	-	-	-
Off-highway	154	151	-	-	-	-
Other	436	428	335	162	-	-

Source: Energy Information Administration, Petroleum Supply Annual 1983, DOE/EIA-0340(83)/1, Vol. 1 (June 1984), pp. 124-129.

Table 497.-- GASOLINE PRICES PER GALLON CHARGED BY REPRESENTATIVE SERVICE STATIONS, FOR HONOLULU: 1903 TO 1973

[Cents per gallon, including taxes]

Date	Regular	Premium	Date	Regular	Premium
1903: Dec.	37.5	...	1944: Dec. 1/ ...	21.3	...
1909: June 1	37.5	...	1945: Dec. T/ ...	21.3	...
1913: Apr. 1	25.0	...	1947: Jan. 21 ...	22.0	24.0
1915: Apr. 3	25.0	...	Jan. 22 ...	22.5	24.5
1918: May	20-25	...	Dec. 29 ...	25.7	27.7
1920: Aug.	28.5	...	Dec. 30 ...	27.5	29.5
1928: March	21.0	...	1953: Feb. 16 ...	29.3	31.9
1930: June 13	21.5	24.5	Feb. 17 ...	32.5	34.6
June 14	18.5	21.5	1955: Feb. 24 ...	32.5	36.1
1931: Dec. 3	18.0	...	Feb. 25 ...	33.5	37.1
1935: Sept. 5	20.0	24.0	1956: Mar. 9	36.0	39.3
Sept. 6	17.5	19.5	1960: Jan.	41.9	45.9
1943: June 3 1/ ...	20.5	...	1965: Feb. 28 ...	41.9	45.9
June 4 T/ ...	21.3	...	1969: Feb. 7	35.9-43.9	...
Dec. 1/	21.3	...	1973: Oct.	45.2	48.7

1/ Office of Price Administration maximum.

Source: Paradise of the Pacific, Dec. 1903, p. 50, and March 1928, p. 29; Hawaii Promotion Committee, Hawaii, A Primer, editions of 1909, 1913, and 1918; Honolulu Star-Bulletin, April 3, 1915, p. 11, and Feb. 7, 1969, p. A-9; Hawaii State Department of Planning and Economic Development, Gasoline Prices in Hawaii, 1920-1980 (Statistical Report 140, August 8, 1980).

Table 498.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
1973 TO 1984

[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
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	...

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

2/ Survey initiated October 1973. Leaded premium price not available after December 1983.

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 and Food (monthly, 1979 forward), and printouts for 1978-1979.

Table 499.-- GASOLINE SERVICE STATIONS: 1977 AND 1982

[Data are shown only for establishments with payroll]

Subject	State total	Oahu only
1977		
Number of establishments	381	276
Offering self-service sale of gasoline	55	47
Offering sale of diesel fuel	23	(NA)
Sales (\$1,000)	172,799	131,285
Gallon sales (1,000):		
Gasoline, total	191,781	146,086
Through self-service	18,578	16,308
Other automotive fuels	3,734	3,548
Pumps, Dec. 31:		
Gasoline, total	2,006	1,595
Self-service	166	147
Other automotive fuel	40	23
1982		
Number of establishments	367	(NA)
Sales (\$1,000)	406,064	(NA)
Annual payroll	28,830	(NA)
Paid employees for pay period including March 12	3,706	(NA)

NA Not available.

Source: U.S. Bureau of the Census, 1977 Census of Retail Trade, RC77-S-2, Miscellaneous Subjects (October 1980), tables 2, 3, 4, 5, and 6; 1982 Census of Retail Trade, RC82-I-12(P), Gasoline Service Stations (May 1984), p. 3.

Table 500.-- BUNKER OIL LADEN IN HONOLULU CUSTOMS DISTRICT ON VESSELS
ENGAGED IN FOREIGN TRADE: 1982 AND 1983

[In barrels of 42 gallons]

Year	Total	American vessels		Foreign vessels	
		Fuel oil	Diesel oil	Fuel oil	Diesel oil
1982	1,072,715	45,995	33,366	504,811	488,543
1983	786,077	34,103	19,954	314,988	417,032

Source: U.S. Bureau of the Census, United States Foreign Trade, Bunker Fuels, Annual 1982 (FT810-82-13, March 1983) and Annual 1983 (FT810-83-13, March 1984).

Table 501.-- BOILERS AND PRESSURE VESSELS: DECEMBER 31, 1983

Island	Power boilers	Heating boilers <u>1/</u>	Pressure vessels <u>2/</u>
State total	628	2,652	5,162
Hawaii	86	232	792
Maui	59	220	515
Lanai	3	2	29
Molokai	7	29	30
Oahu	428	2,057	3,511
Kauai	45	112	285

1/ Decrease since 1982 is due to heat pump and solar water heating installations in which the hot water heating boilers are removed and only a storage tank is used for the hot water system.

2/ 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, records.

Table 502.-- ENERGY GENERATED, PURCHASED, SOLD AND USED BY
RAW SUGAR PLANTATIONS, BY ISLANDS: 1982

Subject	State total	Hawaii	Kauai	Maui	Oahu
Electricity (millions of kilowatt-hours)					
Generated	758.67	260.08	215.10	174.41	109.08
Purchased	31.50	2.44	2.09	3.34	23.63
Sold	343.13	161.09	119.22	60.08	2.74
Used ^{1/}	447.04	101.43	97.97	117.67	129.97
Gross heat values of boiler fuels (billions of Btu's)					
All fuels	25,930	10,942	5,267	5,633	4,088
Bagasse	23,540	10,100	4,940	4,940	3,560
Fuel oil	2,083	803	275	686	319
Other fuels	307	39	52	7	209

^{1/} Includes transmission losses and electricity used to operate power plant auxiliaries.

Source: Hawaiian Sugar Planters' Association, unpublished data.

Table 503.-- PURCHASED FUELS AND ELECTRIC ENERGY USED FOR HEAT AND POWER BY MANUFACTURING ESTABLISHMENTS, BY TYPE OF FUEL OR ENERGY: 1980 AND 1981

Subject	1980	1981
Purchased fuels and electric energy: 1/		
British thermal units (trillions)	13.3	14.0
Cost (million dollars)	76.5	97.4
Electric energy:		
Purchased:		
Quantity (million kWh)	556.1	402.8
Cost (million dollars)	29.6	37.6
Generated less sold (million kWh)	227.7	292.2
Purchased fuels:		
British thermal units (trillions)	11.3	12.6
Cost (million dollars)	46.7	59.8
Distillate fuel oil:		
Quantity (1,000 barrels)	(D)	(D)
Cost (million dollars)	(D)	(D)
Residual fuel oil:		
Quantity (1,000 barrels)	507.5	491.5
Cost (million dollars)	12.2	14.0
Natural gas:		
Quantity (billion cubic feet) .....	.3	(D)
Cost (million dollars) .....	.6	(D)
Liquefied petroleum gases:		
Quantity (million pounds)	2.7	5.4
Cost (million dollars) .....	.2	.3
Other fuels (million dollars)	2.5	2.6
Fuels not specified by kind (million dollars)	(D)	(D)

D Withheld to avoid disclosure of information pertaining to a specific organization.

1/ 1981 data revised from Data Book 1983, table 434.

Source: U.S. Bureau of the Census, 1980 Annual Survey of Manufactures, Fuels and Electric Energy Consumed, M80(AS)-4.2 (October 1982), pp. 42-43, and 1982 Census of Manufactures, Fuel and Electric Energy Consumed, MC82-S-4 (Part 2) (June 1983), table 3.

Table 504.-- PURCHASED FUELS AND ELECTRIC ENERGY USED FOR HEAT AND POWER BY MANUFACTURING ESTABLISHMENTS, BY MAJOR INDUSTRY GROUP: 1980 AND 1981

Industry group	British thermal units (trillions)		Cost (million dollars)	
	1980	1981	1980	1981
All manufacturing ^{1/}	13.3	14.0	76.5	97.4
Food and kindred products ^{1/}	5.2	5.0	30.5	34.3
Apparel and other textile products ..	.2	.1	2.4	1.5
Lumber and wood products	(Z)	.1	.3	.4
Printing and publishing .....	.2	.2	1.6	2.3
Chemicals and allied products .....	.1	.1	.9	1.2

Z Less than half the unit shown.

^{1/} 1980 data revised from Data Book 1983, table 435.

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 505.-- OCCUPIED HOUSING UNITS WITH SOLAR HEATING DEVICES, BY COUNTIES: 1981

County	Number	Percent
State total	19,292	6.8
Honolulu	12,197	5.4
Hawaii	1,848	6.3
Kauai	1,847	17.8
Maui	3,400	16.9

Source: Unpublished data from Hawaii State Department of Health, Hawaii Health Surveillance Program, compiled for Hawaii State Department of Planning and Economic Development, Division of Energy.

Table 506.-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT
IN HAWAII: 1971 TO 1982

[Millions of dollars. For fiscal years ended June 30 through
1976 and September 30 thereafter]

Fiscal year	Federal obligations for R and D	Federal obligations for R and D plant
1971	38.3	2.2
1972	47.4	.9
1973	47.9	.4
1974	53.1	.4
1975	43.0	6.2
1976	45.5	2.8
1977	36.9	.5
1978	44.6	.7
1979	40.8	.5
1980	42.6	.2
1981	49.9	.7
1982	44.5	.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.

Table 507.-- RESEARCH AND DEVELOPMENT EXPENDITURES
AT UNIVERSITIES AND COLLEGES: 1975 TO 1982

[Thousands of dollars]

Fiscal year	Total R and D expenditures	Federally financed R and D expenditures
1975	24,596	15,540
1976	28,049	17,578
1977	28,900	17,945
1978 ^{1/}	31,971	19,781
1979	35,703	22,500
1980	40,593	25,833
1981	42,997	25,153
1982	43,439	26,616

^{1/} Data were collected only from doctorate-granting institutions.

Source: National Science Foundation, Academic Science/Engineering, R and D Funds, Fiscal Year 1982, NSF 84-308, pp. 26-27.

Table 508.-- PATENTS ISSUED TO HAWAII
RESIDENTS: 1978 TO 1983

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

Fiscal year	Patents
1978	41
1979	32
1980	32
1981	49
1982	31
1983	30

Source: U.S. Department of Commerce, Patent and Trademark Office, Commissioner of Patents and Trademarks Annual Report, Fiscal Year '83, p. 52.