

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 1988 amounted to 266 trillion British thermal units, compared with 236 trillion Btu a decade earlier. Transportation, including aviation fuels, accounted for 54 percent of the 1988 total. Total expenditures for fuels and electricity in 1988 were \$1.66 billion.

Electricity sales amounted to 8.0 billion kilowatt-hours in 1989, a total that has increased 29 percent since 1979. Manufactured gas sales reached 34 million therms in 1989, four percent below the figure ten years earlier. Residential rates in 1989 averaged 9.3 cents per kilowatt-hour and \$1.54 per therm, both significantly less than the corresponding rates a few years earlier. Average residential use (7,169 kWh and 192 therms in 1989) has declined since the early 1970s. By 1987, over 10 percent of the housing units in the State had solar heating devices.

The liquid fuel tax base for 1989 was approximately 1.3 billion gallons, compared with 961 million in 1979. The 1989 total included 369 million gallons of gasoline, 733 million of aviation fuel, and 160 million of diesel oil. The average price for automotive gasoline was \$1.36 per gallon during 1989.

The State is well served with scientific resources. Especially noteworthy is the cluster of large telescopes used for astronomical observations at the summits of Mauna Kea and Haleakala--twelve major facilities, including those under construction. Federal research and development obligations in Hawaii totaled \$82 million in 1988. Seventy-four patents were granted to Hawaii residents in 1989.

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, the DBED 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: 1990, Sections 19 and 20.

Table 476.-- CONSUMPTION OF ENERGY, BY SOURCE (PHYSICAL UNITS):
1960 TO 1988

| Year | Petroleum ^{1/} (1,000 barrels) | Hydro- electric power ^{2/} (million kWh) | Geothermal energy (million kWh) | Coal (1,000 short tons) | Other ^{3/} (million kWh) |
|-----------|-----------------------------------------------|------------------------------------------------------------|---------------------------------------|----------------------------------|--------------------------------------|
| 1960 | 17,497 | 27 | 0 | 0 | 0 |
| 1961 | 20,721 | 24 | 0 | 0 | 0 |
| 1962 | 19,733 | 20 | 0 | 0 | 0 |
| 1963 | 20,705 | 23 | 0 | 0 | 0 |
| 1964 | 22,117 | 115 | 0 | 0 | 0 |
| 1965 | 23,177 | 105 | 0 | 0 | 0 |
| 1966 | 25,804 | 112 | 0 | 0 | 2 |
| 1967 | 29,081 | 108 | 0 | 0 | 0 |
| 1968 | 32,363 | 94 | 0 | 0 | 30 |
| 1969 | 33,815 | 100 | 0 | | 29 |
| 1970 | 34,768 | 108 | 0 | 0 | 24 |
| 1971 | 37,416 | 89 | 0 | 0 | 15 |
| 1972 | 38,372 | 91 | 0 | 0 | 18 |
| 1973 | 39,339 | 95 | 0 | 0 | 22 |
| 1974 | 37,265 | 92 | 0 | 0 | 30 |
| 1975 | 37,588 | 89 | 0 | 0 | 25 |
| 1976 | 37,990 | 93 | 0 | 0 | 29 |
| 1977 | 40,249 | 86 | 0 | 0 | 26 |
| 1978 | 40,851 | 84 | 0 | 0 | 0 |
| 1979 | 44,594 | 90 | 0 | 0 | 0 |
| 1980 | 43,505 | 86 | 0 | 0 | 0 |
| 1981 | 38,721 | 80 | 0 | 0 | 15 |
| 1982 | 35,637 | 90 | 0 | 47 | 26 |
| 1983 | 36,297 | 84 | 0 | 42 | 28 |
| 1984 | 36,932 | 82 | 21 | 38 | 28 |
| 1985 | 39,351 | 86 | 19 | 46 | 25 |
| 1986 | 38,905 | 78 | 18 | 16 | 0 |
| 1987 | 39,459 | 82 | 13 | 63 | 0 |
| 1988 | 44,810 | 81 | 16 | 50 | 0 |

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

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

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

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1988 (April 1990), p. 93.

Table 477.-- CONSUMPTION OF ENERGY, BY SOURCE (TRILLION BTU):
1960 TO 1988

| Year | Total energy consumed | Petroleum <u>1/</u> | Hydro-electric power <u>2/</u> | Geo-thermal energy | Coal | Natural gas | Other types <u>3/</u> |
|-----------|-----------------------|---------------------|--------------------------------|--------------------|------|-------------|-----------------------|
| 1960 | 98.4 | 98.1 | 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 | 112.2 | 112.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1963 | 118.3 | 118.0 | 0.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1964 | 127.9 | 126.7 | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1965 | 134.2 | 133.1 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1966 | 149.1 | 147.9 | 1.2 | 0.0 | 0.0 | 0.0 | (Z) |
| 1967 | 168.1 | 167.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1968 | 187.3 | 186.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1969 | 194.8 | 193.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1970 | 200.4 | 199.0 | 1.1 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1971 | 215.1 | 214.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.2 |
| 1972 | 221.0 | 219.9 | 0.9 | 0.0 | 0.0 | 0.0 | 0.2 |
| 1973 | 226.7 | 225.5 | 1.0 | 0.0 | 0.0 | 0.0 | 0.2 |
| 1974 | 214.6 | 213.3 | 1.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1975 | 216.7 | 215.5 | 0.9 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1976 | 219.3 | 218.0 | 1.0 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1977 | 232.6 | 231.5 | 0.9 | 0.0 | 0.0 | 0.0 | 0.3 |
| 1978 | 236.0 | 235.2 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1979 | 255.9 | 255.0 | 0.9 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1980 | 253.2 | 249.3 | 0.9 | 0.0 | 0.0 | 3.0 | 0.0 |
| 1981 | 226.4 | 222.6 | 0.8 | 0.0 | 0.0 | 2.8 | 0.2 |
| 1982 | 208.5 | 203.3 | 0.9 | 0.0 | 1.1 | 2.8 | 0.3 |
| 1983 | 210.3 | 205.4 | 0.9 | 0.0 | 1.0 | 2.7 | 0.3 |
| 1984 | 218.7 | 213.8 | 0.8 | 0.4 | 0.9 | 2.4 | 0.3 |
| 1985 | 233.3 | 227.9 | 0.9 | 0.4 | 1.1 | 2.7 | 0.3 |
| 1986 | 230.9 | 226.7 | 0.8 | 0.4 | 0.4 | 2.7 | 0.0 |
| 1987 | 234.6 | 229.1 | 0.8 | 0.3 | 1.6 | 2.8 | 0.0 |
| 1988 | 265.9 | 260.6 | 0.8 | 0.3 | 1.3 | 2.8 | 0.0 |

Z Less than 0.05.

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

2/ Includes industrial and electric utility production.

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

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1988 (April 1990), p. 93.

Table 478.-- CONSUMPTION OF ENERGY BY END-USE SECTOR: 1960 TO 1988

[Trillion Btu]

| Year | Consumption ^{1/} | | | | Input at electric utilities |
|------------|---------------------------|------------|------------|----------------|-----------------------------|
| | Residential | Commercial | Industrial | Transportation | |
| 1960 | 7.3 | 5.2 | 20.7 | 65.2 | 17.6 |
| 1961 | 7.5 | 5.4 | 26.9 | 77.4 | 19.4 |
| 1962 | 8.0 | 5.5 | 28.9 | 69.8 | 21.4 |
| 1963 | 8.9 | 6.0 | 29.8 | 73.5 | 24.2 |
| 1964 | 9.6 | 6.6 | 32.4 | 79.2 | 26.7 |
| 1965 | 10.1 | 6.8 | 34.7 | 82.6 | 27.6 |
| 1966 | 10.8 | 7.4 | 35.8 | 95.1 | 29.7 |
| 1967 | 12.1 | 8.0 | 38.8 | 109.2 | 31.3 |
| 1968 | 13.1 | 8.8 | 38.7 | 126.7 | 35.0 |
| 1969 | 14.9 | 9.8 | 40.8 | 129.2 | 38.7 |
| 1970 | 16.4 | 11.6 | 43.6 | 128.8 | 43.2 |
| 1971 | 17.8 | 11.4 | 43.5 | 142.4 | 47.7 |
| 1972 | 19.6 | 12.7 | 48.9 | 139.8 | 54.1 |
| 1973 | 20.0 | 13.5 | 49.4 | 143.8 | 55.6 |
| 1974 | 20.3 | 13.3 | 49.4 | 131.7 | 57.5 |
| 1975 | 19.6 | 13.8 | 49.9 | 133.4 | 58.8 |
| 1976 | 21.3 | 15.3 | 51.0 | 131.7 | 62.5 |
| 1977 | 21.8 | 16.8 | 52.7 | 141.3 | 65.2 |
| 1978 | 21.8 | 17.4 | 52.2 | 144.6 | 66.8 |
| 1979 | 22.9 | 18.1 | 58.5 | 156.4 | 67.7 |
| 1980 | 23.2 | 20.8 | 62.4 | 146.7 | 69.7 |
| 1981 | 23.0 | 18.8 | 60.6 | 124.1 | 69.9 |
| 1982 | 21.5 | 17.6 | 67.1 | 102.2 | 66.9 |
| 1983 | 22.1 | 17.8 | 52.6 | 117.9 | 68.6 |
| 1984 | 21.0 | 19.4 | 46.6 | 131.7 | 70.6 |
| 1985 | 20.8 | 20.2 | 47.4 | 144.9 | 70.0 |
| 1986 | 21.4 | 22.7 | 57.4 | 129.4 | 72.9 |
| 1987 | 22.9 | 29.0 | 57.0 | 125.7 | 76.6 |
| 1988 | 24.0 | 36.1 | 62.3 | 143.5 | 81.9 |

^{1/} Excludes small quantities of energy sources for which consistent historical data are not available, such as solar energy obtained by the use of thermal and photovoltaic collectors; wind energy; and geothermal, biomass, and waste energy other than that consumed at the electric utilities.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data Report, Consumption Estimates, 1960-1988 (April 1990), pp. 94-98.

Table 479.-- PER CAPITA ENERGY CONSUMPTION, RESIDENT AND DE FACTO:
1960 TO 1988

[For definitions of resident and de facto population, see
table 3, footnotes 1 and 3]

| Year | Total energy consumed (trillion Btu) | Electricity sales (1,000 kWh) | Per capita consumption | | | |
|------------|-----------------------------------------|----------------------------------|----------------------------|----------|-------------------|----------|
| | | | Total energy (million Btu) | | Electricity (kWh) | |
| | | | De facto | Resident | De facto | Resident |
| 1960 | 99.15316 | 1,602,197 | 152.3 | 154.6 | 2,460 | 2,498 |
| 1961 | 116.97162 | 1,766,031 | 175.0 | 177.6 | 2,643 | 2,681 |
| 1962 | 111.79039 | 1,966,105 | 161.2 | 163.6 | 2,834 | 2,876 |
| 1963 | 117.84984 | 2,077,571 | 169.7 | 172.7 | 2,991 | 3,045 |
| 1964 | 127.23438 | 2,284,275 | 178.9 | 181.8 | 3,212 | 3,264 |
| 1965 | 132.72839 | 2,445,025 | 185.5 | 188.6 | 3,418 | 3,474 |
| 1966 | 147.99105 | 2,639,866 | 204.2 | 208.3 | 3,643 | 3,716 |
| 1967 | 167.45867 | 2,832,469 | 225.5 | 231.8 | 3,814 | 3,920 |
| 1968 | 186.50628 | 3,109,256 | 245.8 | 253.9 | 4,097 | 4,233 |
| 1969 | 193.83665 | 3,426,052 | 248.9 | 258.4 | 4,399 | 4,567 |
| 1970 | 198.62790 | 3,758,094 | 248.7 | 257.4 | 4,706 | 4,870 |
| 1971 | 213.94859 | 4,167,127 | 256.8 | 266.9 | 5,002 | 5,198 |
| 1972 | 219.48417 | 4,562,568 | 252.3 | 265.0 | 5,245 | 5,508 |
| 1973 | 224.98611 | 4,867,850 | 249.6 | 264.2 | 5,401 | 5,716 |
| 1974 | 213.57387 | 5,113,906 | 231.2 | 246.1 | 5,536 | 5,892 |
| 1975 | 238.35719 | 5,334,755 | 252.6 | 269.0 | 5,654 | 6,020 |
| 1976 | 240.51954 | 5,615,210 | 247.9 | 266.0 | 5,787 | 6,210 |
| 1977 | 254.54840 | 5,831,610 | 256.5 | 277.2 | 5,877 | 6,351 |
| 1978 | 259.11475 | 6,004,891 | 255.5 | 278.1 | 5,920 | 6,446 |
| 1979 | 278.45009 | 6,197,426 | 267.0 | 292.1 | 5,944 | 6,501 |
| 1980 | 273.88094 | 6,345,531 | 259.4 | 282.7 | 6,010 | 6,549 |
| 1981 | 273.32263 | 6,424,016 | 256.8 | 278.8 | 6,035 | 6,554 |
| 1982 | 272.11290 | 6,332,707 | 250.0 | 272.8 | 5,819 | 6,348 |
| 1983 | 279.03031 | 6,425,578 | 250.2 | 273.9 | 5,762 | 6,308 |
| 1984 | 276.36995 | 6,606,255 | 242.7 | 266.8 | 5,802 | 6,377 |
| 1985 | 266.21778 | 6,635,158 | 231.6 | 253.2 | 5,773 | 6,310 |
| 1986 | 271.05620 | 7,025,739 | 229.9 | 254.6 | 5,959 | 6,599 |
| 1987 | 282.71678 | 7,298,178 | 235.8 | 261.2 | 6,088 | 6,742 |
| 1988 | 312.77000 | 7,719,029 | 256.6 | 284.8 | 6,333 | 7,029 |

Source: Hawaii State Department of Business and Economic Development, State Energy Resources Coordinator Annual Report, July 1, 1987 to June 30, 1988, tables 21 and 23, and records.

Table 480.-- ENERGY CONSUMPTION, BY SOURCE: 1960 TO 1988

[Trillion Btu]

| Year | Total | Petroleum | Biomass | Solar water heating | Hydro-electricity | Coal | Wind | Geo-thermal |
|----------|----------|-----------|---------|---------------------|-------------------|--------|--------|-------------|
| 1960 ... | 120.4982 | 98.8532 | 21.3450 | - | 0.3000 | - | - | - |
| 1961 ... | 141.3156 | 116.6716 | 24.3440 | - | 0.3000 | - | - | - |
| 1962 ... | 137.1934 | 111.5904 | 25.4030 | - | 0.2000 | - | - | - |
| 1963 ... | 143.8698 | 117.6498 | 26.0200 | - | 0.2000 | - | - | - |
| 1964 ... | 153.9604 | 126.0344 | 26.7260 | - | 1.2000 | - | - | - |
| 1965 ... | 160.6014 | 131.6284 | 27.8730 | - | 1.1000 | - | - | - |
| 1966 ... | 175.5990 | 146.7910 | 27.6080 | - | 1.2000 | - | - | - |
| 1967 ... | 196.1247 | 166.3587 | 28.6660 | - | 1.1000 | - | - | - |
| 1968 ... | 214.9613 | 185.2063 | 28.7550 | - | 1.0000 | - | - | - |
| 1969 ... | 221.9387 | 192.5367 | 28.4020 | - | 1.0000 | - | - | - |
| 1970 ... | 225.2299 | 197.2279 | 26.9020 | - | 1.1000 | - | - | - |
| 1971 ... | 241.0916 | 212.8486 | 27.3430 | - | 0.9000 | - | - | - |
| 1972 ... | 245.1282 | 218.3842 | 25.8440 | - | 0.9000 | - | - | - |
| 1973 ... | 250.5421 | 223.7861 | 25.7560 | - | 1.0000 | - | - | - |
| 1974 ... | 237.2659 | 212.2739 | 23.9920 | - | 1.0000 | - | - | - |
| 1975 ... | 238.3572 | 213.4572 | 24.0000 | - | 0.9000 | - | - | - |
| 1976 ... | 240.5195 | 215.5195 | 24.0000 | - | 1.0000 | - | - | - |
| 1977 ... | 254.5484 | 229.5889 | 24.0000 | 0.0595 | 0.9000 | - | - | - |
| 1978 ... | 259.1148 | 233.5357 | 24.4000 | 0.2791 | 0.9000 | - | - | - |
| 1979 ... | 278.4501 | 253.0344 | 24.0000 | 0.5157 | 0.9000 | - | - | - |
| 1980 ... | 273.8809 | 248.0109 | 24.2000 | 0.7700 | 0.9000 | - | - | - |
| 1981 ... | 273.3226 | 245.5086 | 24.0900 | 1.1185 | 0.7356 | 1.8700 | - | - |
| 1982 ... | 272.1129 | 244.3151 | 23.9200 | 1.3567 | 1.0939 | 1.2700 | - | 0.1572 |
| 1983 ... | 279.0303 | 250.6283 | 24.8500 | 1.5269 | 0.8865 | 0.9500 | - | 0.1886 |
| 1984 ... | 276.3700 | 248.4026 | 24.3650 | 1.7683 | 0.7796 | 0.8470 | - | 0.2075 |
| 1985 ... | 266.2178 | 238.6470 | 23.1430 | 2.1327 | 0.9808 | 0.9560 | 0.1697 | 0.1886 |
| 1986 ... | 271.0562 | 242.5857 | 23.9670 | 2.1644 | 1.0562 | 0.4970 | 0.6036 | 0.1823 |
| 1987 ... | 282.7168 | 256.4061 | 22.1840 | 2.1914 | 0.9670 | - | 0.8236 | 0.1446 |
| 1988 ... | 312.7693 | 285.4040 | 23.5990 | 2.1931 | 0.9887 | - | 0.4211 | 0.1639 |

Source: Hawaii State Department of Business, Economic Development & Tourism, Energy Division, records.

Table 481.-- ELECTRICITY GENERATION BY SOURCE: 1981 TO 1988

[Millions of kWh generated]

| Year | Total | Petroleum | Biomass | Hydro-electric | Geo-thermal | Wind | Coal |
|-----------|-------|-----------|---------|----------------|-------------|------|------|
| 1981 | 7,615 | 6,913 | 628 | 74 | - | - | - |
| 1982 | 7,467 | 6,729 | 612 | 110 | 16 | - | - |
| 1983 | 7,689 | 6,914 | 667 | 89 | 19 | - | - |
| 1984 | 7,841 | 7,073 | 669 | 78 | 21 | - | - |
| 1985 | 7,821 | 7,001 | 670 | 98 | 19 | 17 | 16 |
| 1986 | 8,251 | 7,412 | 646 | 100 | 18 | 58 | 17 |
| 1987 | 8,368 | 7,577 | 605 | 93 | 14 | 79 | - |
| 1988 | 8,952 | 8,115 | 681 | 98 | 16 | 42 | - |

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

Table 482.-- ELECTRICITY PRODUCTION, BY SOURCE, BY ISLANDS: 1988

[Million kWh]

| Island | Total | Petroleum | Biomass | Hydro-electric | Wind | Geothermal |
|-----------------|-------|-----------|---------|----------------|------|------------|
| State total ... | 8,952 | 8,115 | 681 | 98 | 42 | 16 |
| Hawaii | 701 | 417 | 230 | 16 | 21 | 16 |
| Maui | 906 | 702 | 178 | 26 | (Z) | - |
| Lanai | 5 | 5 | - | - | - | - |
| Molokai | 30 | 29 | 1 | - | - | - |
| Oahu | 6,860 | 6,728 | 111 | - | 21 | - |
| Kauai | 450 | 234 | 161 | 55 | (Z) | - |

Z Less than 500,000 kWh.

Source: Hawaii State Department of Business and Economic Development, Energy Division, records; Department of Commerce and Consumer Affairs, Division of Consumer Advocacy, records.

Table 483.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SOURCE:
1970 TO 1988

[Millions of dollars]

| Year | Total energy expend. | Fuel expenditures | | | Less: electric utility fuel expend. | Plus: electric purch. by end-user |
|------------------|----------------------|-------------------|------------------|---------|-------------------------------------|-----------------------------------|
| | | Total | Electric utility | Other | | |
| 1970 | 282.7 | 215.9 | 17.3 | 198.6 | 17.3 | 84.1 |
| 1971 | 320.8 | 246.8 | 24.8 | 222 | 24.8 | 98.8 |
| 1972 | 332.4 | 250.4 | 27.3 | 223.1 | 27.3 | 109.3 |
| 1973 | 391.1 | 300.9 | 36.3 | 264.6 | 36.3 | 126.5 |
| 1974 | 534.5 | 433.2 | 49.8 | 383.4 | 49.8 | 151.1 |
| 1975 | 669.9 | 546.1 | 91.9 | 454.2 | 91.9 | 215.7 |
| 1976 | 735.6 | 600 | 100.4 | 499.6 | 100.4 | 236 |
| 1977 | 844.5 | 696.5 | 123.5 | 573 | 123.5 | 271.5 |
| 1978 | 932.2 | 767.8 | 149.3 | 618.5 | 149.3 | 313.7 |
| 1979 | 1,261.3 | 1,083.7 | 177 | 906.7 | 177 | 354.6 |
| 1980 | 1,721.3 | 1,529.8 | 267.8 | 1,262 | 267.8 | 459.3 |
| 1981 | 2,195.2 | 1,947.7 | 451.5 | 1,496.2 | 451.5 | 699 |
| 1982 | 2,153.8 | 1,869.6 | 439.4 | 1,430.2 | 439.4 | 723.6 |
| 1983 | 2,019.9 | 1,730.1 | 369.3 | 1,360.8 | 369.3 | 659.1 |
| 1984 | 2,048.4 | 1,724.8 | 379.3 | 1,345.5 | 379.3 | 702.9 |
| 1985 | 1,921.6 | 1,586.6 | 337.6 | 1,249.0 | 337.6 | 672.6 |
| 1986 | 1,564.0 | 1,147.3 | 224.6 | 922.7 | 224.6 | 641.3 |
| 1987 | 1,575.1 | 1,176.2 | 203.7 | 972.5 | 203.7 | 602.6 |
| 1988 <u>1/</u> . | 1,664.1 | 1,314.6 | 238.0 | 1,076.6 | 238.0 | 587.5 |

1/ Provisional.

Source: Hawaii State Department of Business and Economic Development, Division of Energy, records.

Table 484.-- EXPENDITURES FOR FUELS AND ELECTRICITY, BY SECTORS:
1970 TO 1988

[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 | 50.0 | 174.2 | 17.3 |
| 1971 | 246.8 | 8.7 | 38.8 | 17.9 | 60.0 | 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 | 94.0 | 328.3 | 49.8 |
| 1975 | 546.1 | 7.4 | 76.9 | 45.8 | 138.8 | 401.0 | 91.9 |
| 1976 | 600.0 | 12.7 | 84.0 | 45.9 | 152.0 | 441.0 | 100.4 |
| 1977 | 696.5 | 13.9 | 92.9 | 55.0 | 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 | 177.0 |
| 1980 | 1,529.8 | 19.5 | 146.4 | 135.4 | 312.9 | 1,107.1 | 267.8 |
| 1981 | 1,947.7 | 20.6 | 214.6 | 232.4 | 484.4 | 1,243.2 | 451.5 |
| 1982 | 1,869.6 | 26.2 | 222.4 | 283.6 | 501.2 | 1,120.4 | 439.4 |
| 1983 | 1,730.1 | 22.9 | 205.9 | 288.1 | 453.2 | 1,049.8 | 369.3 |
| 1984 | 1,724.8 | 20.6 | 217.4 | 192.1 | 485.5 | 1,132.8 | 379.3 |
| 1985 | 1,586.6 | 20.6 | 213.5 | 100.8 | 459.1 | 1,127.6 | 337.6 |
| 1986 | 1,147.3 | 13.8 | 195.8 | 65.8 | 445.6 | 843.1 | 224.6 |
| 1987 | 1,176.2 | (NA) | (NA) | (NA) | (NA) | (NA) | 203.7 |
| 1988 | 1,314.6 | (NA) | (NA) | (NA) | (NA) | (NA) | 238.0 |

NA Not available.

Source: Hawaii State Department of Business, Economic Development and Tourism, Division of Energy, unpublished estimates.

Table 485.-- ELECTRIC UTILITIES: 1979 TO 1989

| Year | Customers, Dec. 31 | | | Installed capacity, Dec. 31 (kW) | Power sold (1,000 kWh) | | |
|---------|----------------------------------------|-------------|--------------------------------|----------------------------------|------------------------|-------------|-----------|
| | Total | Residential | Other | | Total | Residential | Other |
| 1979 .. | 293,061 | 252,898 | 40,163 | 1,502,840 | 6,197,426 | 1,851,457 | 4,345,969 |
| 1980 .. | 301,544 | 260,358 | 41,186 | 1,514,180 | 6,345,531 | 1,852,984 | 4,492,547 |
| 1981 .. | 305,927 | 265,042 | 40,885 | 1,652,380 | 6,424,016 | 1,855,837 | 4,568,179 |
| 1982 .. | 313,009 | 270,712 | 42,297 | 1,644,980 | 6,332,707 | 1,801,297 | 4,531,410 |
| 1983 .. | 319,449 | 276,194 | 43,255 | 1,578,780 | 6,425,578 | 1,814,336 | 4,611,242 |
| 1984 .. | 324,384 | 280,518 | 43,866 | 1,578,780 | 6,606,255 | 1,837,954 | 4,768,301 |
| 1985 .. | 330,407 | 285,117 | 45,290 | 1,567,230 | 6,635,158 | 1,879,027 | 4,756,131 |
| 1986 .. | 337,563 | 291,222 | 46,341 | 1,553,580 | 7,025,739 | 1,959,447 | 5,066,292 |
| 1987 .. | 347,085 | 299,758 | 47,327 | 1,535,700 | 7,297,905 | 2,069,859 | 5,228,046 |
| 1988 .. | 354,887 | 306,375 | 48,512 | 1,570,410 | 7,719,029 | 2,148,275 | 5,570,754 |
| 1989 .. | 362,290 | 312,347 | 49,943 | 1,517,500 | 7,970,360 | 2,239,356 | 5,731,004 |
| Year | Average annual use (kWh) ^{1/} | | Average rate (dollars per kWh) | | Revenues (\$1,000) | | |
| | Residential | Other | Residential | Other | Total | Residential | Other |
| 1979 .. | 7,321 | 108,208 | .06420 | .05424 | 354,595 | 118,862 | 235,733 |
| 1980 .. | 7,117 | 109,079 | .07901 | .06964 | 459,251 | 146,397 | 312,854 |
| 1981 .. | 7,002 | 111,732 | .11563 | .10605 | 699,031 | 214,584 | 484,447 |
| 1982 .. | 6,654 | 107,133 | .12348 | .11061 | 723,622 | 222,423 | 501,199 |
| 1983 .. | 6,569 | 106,606 | .11348 | .09828 | 659,089 | 205,889 | 453,200 |
| 1984 .. | 6,552 | 108,702 | .11831 | .10181 | 702,899 | 217,447 | 485,452 |
| 1985 .. | 6,590 | 105,015 | .11361 | .09653 | 672,600 | 213,478 | 459,122 |
| 1986 .. | 6,728 | 109,326 | .09294 | .07505 | 562,345 | 182,110 | 380,234 |
| 1987 .. | 6,905 | 110,466 | .09431 | .07792 | 602,553 | 195,198 | 407,355 |
| 1988 .. | 7,011 | 114,832 | .08829 | .07141 | 587,528 | 189,689 | 397,839 |
| 1989 .. | 7,169 | 114,751 | .09257 | .07634 | 644,789 | 207,296 | 437,493 |

^{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 486.-- ELECTRIC UTILITIES, BY ISLANDS: 1989

| County or island | Customers, Dec. 31 | | | Installed capacity, Dec. 31 (kW) | Power sold (1,000 kWh) | | |
|-------------------|-----------------------------|-------------|--------------------------------|----------------------------------|------------------------|-------------|-----------|
| | Total | Residential | Other | | Total | Residential | Other |
| State total | 362,290 | 312,347 | 49,943 | 1,517,500 | 7,970,360 | 2,239,356 | 5,731,004 |
| Oahu | 247,120 | 216,063 | 31,057 | 1,189,000 | 6,254,220 | 1,620,439 | 4,633,781 |
| Hawaii | 48,321 | 40,012 | 8,309 | 128,000 | 663,512 | 259,304 | 404,208 |
| Kauai | 22,442 | 18,779 | 3,663 | 59,800 | 321,259 | 110,036 | 211,223 |
| Maui County | 44,407 | 37,493 | 6,914 | 140,700 | 731,369 | 249,576 | 481,793 |
| Lanai | 1,043 | 907 | 136 | 4,700 | 12,028 | 4,095 | 7,933 |
| Maui | 40,712 | 34,418 | 6,294 | 131,000 | 692,351 | 233,952 | 458,400 |
| Molokai | 2,652 | 2,168 | 484 | 5,000 | 26,990 | 11,530 | 15,460 |
| 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 | 7,169 | 114,751 | 0.09257 | 0.07580 | 641,712 | 207,296 | 434,416 |
| Oahu | 7,500 | 149,202 | 0.08308 | 0.06785 | 449,046 | 134,628 | 314,418 |
| Hawaii | 6,481 | 48,647 | 0.11847 | 0.10764 | 74,229 | 30,720 | 43,509 |
| Kauai | 5,860 | 57,664 | 0.12661 | 0.12489 | 40,312 | 13,932 | 26,380 |
| Maui County | 6,657 | 69,684 | 0.11225 | 0.10401 | 78,126 | 28,016 | 50,110 |
| Lanai | 4,515 | 58,333 | 0.15345 | 0.13840 | 1,726 | 628 | 1,098 |
| Maui | 6,797 | 72,831 | 0.10735 | 0.10020 | 71,046 | 25,114 | 45,932 |
| Molokai | 5,318 | 31,942 | 0.19716 | 0.19923 | 5,353 | 2,273 | 3,080 |

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.-- GAS UTILITIES: 1979 TO 1989

[Excludes bottled gas]

| Year | Customers, Dec. 31 | | | Gas sold (1,000 therms) | | |
|----------|--------------------|-------------|-------|----------------------------|-------------|--------|
| | Total | Residential | Other | Total | Residential | Other |
| 1979 ... | 33,309 | 29,014 | 4,295 | 35,264 | 7,326 | 27,937 |
| 1980 ... | 33,019 | 28,825 | 4,194 | 34,705 | 7,030 | 27,675 |
| 1981 ... | 32,421 | 28,343 | 4,078 | 32,396 | 6,422 | 25,975 |
| 1982 ... | 32,905 | 28,979 | 3,926 | 32,224 | 6,329 | 25,895 |
| 1983 ... | 32,880 | 28,933 | 3,947 | 31,307 | 6,338 | 24,970 |
| 1984 ... | 32,643 | 28,859 | 3,784 | 30,928 | 5,853 | 25,075 |
| 1985 ... | 32,988 | 29,253 | 3,735 | 31,203 | 5,911 | 25,292 |
| 1986 ... | 33,369 | 29,678 | 3,691 | 31,122 | 5,762 | 25,360 |
| 1987 ... | 33,895 | 30,198 | 3,697 | 32,408 | 5,880 | 26,528 |
| 1988 ... | 34,103 | 30,450 | 3,653 | 32,733 | 5,780 | 26,952 |
| 1989 ... | 34,304 | 30,661 | 3,643 | 33,865 | 5,896 | 27,969 |

| Year | Average annual use (therms) <u>1/</u> | | Average rate (dollars per therm) | | Revenues (\$1,000) | | |
|----------|------------------------------------------|-------|-------------------------------------|---------|-----------------------|-------------|--------|
| | Residential | Other | Residential | Other | Total | Residential | Other |
| 1979 ... | 253 | 6,505 | 1.09260 | .89221 | 32,931 | 8,006 | 24,925 |
| 1980 ... | 244 | 6,599 | 1.46583 | 1.25951 | 45,162 | 10,305 | 34,857 |
| 1981 ... | 227 | 6,369 | 1.72585 | 1.50091 | 50,069 | 11,083 | 38,986 |
| 1982 ... | 218 | 6,596 | 1.73311 | 1.43891 | 48,229 | 10,969 | 37,260 |
| 1983 ... | 219 | 6,326 | 1.79719 | 1.44022 | 47,352 | 11,390 | 35,962 |
| 1984 ... | 203 | 6,627 | 1.78958 | 1.37488 | 44,949 | 10,474 | 34,475 |
| 1985 ... | 202 | 6,772 | 1.76934 | 1.33821 | 44,305 | 10,459 | 33,846 |
| 1986 ... | 194 | 6,871 | 1.57151 | 1.12027 | 37,465 | 9,055 | 28,410 |
| 1987 ... | 195 | 7,176 | 1.57204 | 1.10494 | 38,556 | 9,244 | 29,312 |
| 1988 ... | 189 | 7,378 | 1.54961 | 1.07840 | 38,023 | 8,957 | 29,066 |
| 1989 ... | 192 | 7,677 | 1.54200 | 1.06487 | 38,876 | 9,092 | 29,783 |

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, BY ISLANDS: 1989

[Excludes bottled gas]

| Island | Customers, Dec. 31 | | | Gas sold (therms) | | | |
|---------------|--------------------------------|-------------|----------------------------------|-------------------|--------------------|-------------|--------|
| | Total | Residential | Other | Total | Residential | Other | |
| State total | 34,304 | 30,661 | 3,643 | 33,865,453 | 5,896,392 | 27,969,061 | |
| Oahu | 31,812 | 28,539 | 3,273 | 30,776,030 | 5,446,060 | 25,329,970 | |
| Hawaii | 1,847 | 1,539 | 308 | 2,230,590 | 331,219 | 1,899,371 | |
| Kauai | 276 | 276 | - | 58,052 | 58,052 | - | |
| Maui | 369 | 307 | 62 | 800,781 | 61,061 | 739,720 | |
| 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 | 192 | 7,677 | 1.54200 | 1.06487 | 38,876 | 9,092 | 29,783 |
| Oahu | 191 | 7,739 | 1.56489 | 1.07875 | 35,847 | 8,522 | 27,325 |
| Hawaii | 215 | 6,167 | 1.26204 | 0.94644 | 2,216 | 418 | 1,798 |
| Kauai | 210 | - | 1.30614 | - | 76 | 76 | - |
| Maui | 199 | 11,931 | 1.24338 | 0.89365 | 737 | 76 | 661 |
| 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 489.-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC CO., INC., ON OAHU:
1984 TO 1989

| 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) | Generating capability (kW) Dec. 31 |
|---------|------------------------------|------------------|----------------------------------------|---------------------------|-------------------------------------------------------|-----------------------------------------------|------------------------------------------|
| | Total | Residential only | | | | | |
| 1984 .. | 228,606 | 199,722 | 5,633,940 | 5,330,931 | 6,960 | 0.11032 | 1,283,000 |
| 1985 .. | 231,912 | 202,222 | 5,637,678 | 5,336,262 | 6,997 | 0.10417 | 1,283,000 |
| 1986 .. | 235,742 | 205,636 | 5,933,569 | 5,625,398 | 7,113 | 0.08328 | 1,277,000 |
| 1987 .. | 241,426 | 211,277 | 6,135,382 | 5,804,298 | 7,322 | 0.08591 | 1,277,000 |
| 1988 .. | 244,965 | 214,429 | 6,439,768 | 6,095,707 | 7,386 | 0.07973 | 1,258,000 |
| 1989 .. | 247,120 | 216,063 | 6,617,943 | 6,254,220 | 7,534 | 0.08308 | 1,271,000 |

^{1/} Net generation plus purchased power.

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

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

Table 490.-- GAS UTILITY SERVICE BY GASCO, INC., FOR OAHU: 1984 TO 1989

| Calendar year | Customers, Dec. 31 | | Gas sold ^{1/} (1,000 therms) | | Average annual residential usage ^{1/} (therms) |
|---------------|--------------------|-------------|------------------------------------------|-------------|------------------------------------------------------------|
| | Total | Residential | Total | Residential | |
| 1984 ... | 30,041 | 26,636 | 28,190 | 5,389 | 202 |
| 1985 ... | 30,442 | 27,085 | 28,255 | 5,436 | 201 |
| 1986 ... | 30,831 | 27,516 | 28,137 | 5,318 | 193 |
| 1987 ... | 31,398 | 28,069 | 29,345 | 5,435 | 194 |
| 1988 ... | 31,613 | 28,331 | 29,689 | 5,342 | 189 |
| 1989 ... | 31,812 | 28,539 | 30,776 | 5,446 | 191 |

^{1/} Includes liquefied petroleum gas.

Source: Gasco, Inc., records.

Table 491.-- LIQUID FUEL TAX BASE: 1979 TO 1989

[In thousands of gallons]

| Year reported ^{1/} | All types | | Gasoline | Diesel oil | |
|-----------------------------|-----------|--------------------|----------|------------|----------|
| | Total | Excluding aviation | | Non-hwy. | Hwy. use |
| 1979 | 960,837 | 454,012 | 324,337 | 108,460 | 16,596 |
| 1980 | 939,766 | 437,222 | 312,896 | 101,719 | 17,765 |
| 1981 | 918,437 | 428,886 | 305,886 | 101,212 | 15,771 |
| 1982 | 893,288 | 418,811 | 308,600 | 88,312 | 17,303 |
| 1983 | 919,865 | 418,217 | 310,085 | 86,790 | 16,440 |
| 1984 | 925,871 | 440,061 | 322,410 | 95,956 | 17,892 |
| 1985 | 970,555 | 432,500 | 327,021 | 83,147 | 17,636 |
| 1986 | 1,059,180 | 456,013 | 336,559 | 95,022 | 19,354 |
| 1987 | 1,206,716 | 512,974 | 348,474 | 137,806 | 21,207 |
| 1988 | 1,216,828 | 515,273 | 357,986 | 131,292 | 21,057 |
| 1989 | 1,268,597 | 535,714 | 369,172 | 136,465 | 23,729 |

| Year reported ^{1/} | Liquefied petroleum gas | | Aviation fuel | Small boats | |
|-----------------------------|-------------------------|----------|---------------|-------------|------------|
| | Off-hwy. | Hwy. use | | Gasoline | Diesel oil |
| 1979 | 2,213 | 1,140 | 506,825 | 410 | 856 |
| 1980 | 2,448 | 1,140 | 502,544 | 338 | 917 |
| 1981 | 2,378 | 1,136 | 489,551 | 424 | 2,079 |
| 1982 | 2,628 | 960 | 474,477 | 207 | 802 |
| 1983 | 3,013 | 1,052 | 501,648 | 213 | 624 |
| 1984 | 2,600 | 873 | 485,810 | 114 | 215 |
| 1985 | 2,804 | 1,028 | 538,055 | 187 | 676 |
| 1986 | 2,969 | 1,031 | 603,167 | 163 | 916 |
| 1987 | 3,135 | 1,142 | 693,742 | 123 | 1,089 |
| 1988 | 3,012 | 1,071 | 701,555 | 63 | 792 |
| 1989 | 4,301 | 968 | 732,883 | 57 | 1,022 |

^{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 492.-- LIQUID FUEL TAX BASE, BY COUNTIES: 1989

[In thousands of gallons]

| Type of fuel | State total | City and Co. of Honolulu | County of Maui | County of Hawaii | County of Kauai |
|--------------------------|-------------|--------------------------|----------------|------------------|-----------------|
| Total | 1,268,597 | 1,057,543 | 85,295 | 78,502 | 47,258 |
| Gasoline | 369,172 | 250,447 | 43,369 | 53,194 | 22,161 |
| Diesel oil, non-hwy. ... | 136,465 | 66,433 | 31,910 | 13,994 | 24,128 |
| Diesel oil, hwy. use ... | 23,729 | 16,486 | 2,316 | 4,311 | 615 |
| Liq. pet. gas, off hwy. | 4,301 | 3,029 | 534 | 569 | 170 |
| Liq. pet. gas, hwy. use | 968 | 792 | 82 | 57 | 37 |
| Small boats, gasoline .. | 57 | 56 | - | 1 | - |
| Small boats, diesel oil | 1,022 | 119 | - | 903 | - |
| Aviation fuel | 732,883 | 720,180 | 7,083 | 5,473 | 147 |

Source: Hawaii State Department of Taxation, "Liquid Fuel Tax Base, Collections and Distribution, Calendar Year Ending December 31, 1989" (annual release).

Table 493.-- IMPORTS AND EXPORTS OF CRUDE OIL AND PETROLEUM PRODUCTS: 1988

[1,000 barrels]

| Product | Imports | | | Exports | | |
|------------------------|---------|----------|---------|---------|----------|---------|
| | Total | Domestic | Foreign | Total | Domestic | Foreign |
| Crude oil | 41,218 | 20,755 | 20,463 | - | - | - |
| Refined products | 6,651 | 3,353 | 3,298 | 6,829 | 3,331 | 3,498 |
| Motor gasoline | 193 | 193 | - | 187 | 187 | - |
| Distillates | 217 | 217 | - | 1,658 | 1,067 | 591 |
| Jet fuel 1/ | 2,677 | 1,119 | 1,559 | 2,160 | 104 | 2,056 |
| Residual fuel oil .. | 3,563 | 1,824 | 1,739 | 2,524 | 1,673 | 851 |
| Other | - | - | - | 300 | 300 | - |

1/ Excludes imports of 3,686,500 barrels of unknown origin.

Source: Hawaii State Department of Business and Economic Development, Energy Division, records.

Table 494.-- GASOLINE SERVICE STATIONS (SIC 554)
WITH PAYROLL, BY COUNTIES: 1982 AND 1987

| Year | State total | City and Co. of Honolulu | Hawaii County | Kauai County | Maui County | | |
|------------------------|-------------|--------------------------|---------------|--------------|-------------|------|---------|
| | | | | | Lanai | Maui | Molokai |
| 1982 ^{1/} ... | 366 | 251 | 60 | 22 | - | 31 | 2 |
| 1987 | 355 | 241 | 52 | 26 | 1 | 34 | 1 |

^{1/} Unrevised data. The revised Statewide total, not available for counties, was 389.

Source: U.S. Bureau of the Census, Census of Retail Trade, Hawaii for 1982 (RC82-A-12, table 8) and 1987 (RC87-A-12, table 5).

Table 495.-- GASOLINE AVERAGE PRICES PER GALLON, FOR OAHU:
ANNUAL AVERAGES, 1984 TO 1989

[In dollars. Average prices include all applicable federal, state, and county taxes. For earlier years, 1903-1983, see Data Book 1984, tables 497 and 498]

| Period | All types ^{1/} | Leaded regular | Unleaded regular | Unleaded premium |
|------------|-------------------------|----------------|------------------|------------------|
| 1984 | 1.450 | 1.367 | 1.443 | (NA) |
| 1985 | 1.392 | 1.274 | 1.396 | (NA) |
| 1986 | 1.206 | 1.077 | 1.221 | 1.346 |
| 1987 | 1.233 | 1.099 | 1.254 | 1.372 |
| 1988 | 1.293 | 1.204 | 1.273 | 1.413 |
| 1989 | ^{2/} 1.365 | (NA) | 1.404 | 1.460 |

NA Not available.

^{1/} Includes types not shown separately.

^{2/} The U.S. city average for 1989 was \$1.060.

Source: Based on data in the U.S. Bureau of Labor Statistics, CPI Detailed Report (monthly). The 1984-1986 Honolulu prices and 1989 U.S. average are actual values; the 1987, 1988 and 1989 Honolulu prices are estimates based on actual prices for the last half of 1986 and CPI(U) changes for gasoline for subsequent years.

Table 496.-- GASOLINE AVERAGE PRICES PER GALLON, REGULAR AND PREMIUM,
BY TYPE OF SERVICE, FOR THE UNITED STATES AND HAWAII: APRIL 1990

[Dollars]

| Area | Weighted aver- age ^{1/} | Self-service | | Full-service | |
|----------------------|----------------------------------------|--------------|--------------|--------------|--------------|
| | | Regu- lar | Pre- mium | Regu- lar | Pre- mium |
| United States | 1.12 | 1.03 | 1.20 | 1.28 | 1.42 |
| Hawaii | 1.44 | 1.25 | 1.46 | 1.71 | 1.84 |
| Percent of U.S. | 128.6 | 121.4 | 121.7 | 133.6 | 129.6 |

^{1/} Hawaii ranked first among the 50 States and D.C. Alaska was second, at \$1.27; D.C. third, at \$1.23; and Connecticut fourth, at \$1.21.

Source: Survey by American Automobile Association cited in James Sylvester, "Hawaii's gas prices still lead the nation," Honolulu Star-Bulletin, April 11, 1990, pp. C-1, C-4.

Table 497.-- BOILERS AND PRESSURE VESSELS: 1988 AND 1989

| Date | Total | Power boilers | Heating boilers | Pressure vessels |
|-------------------|-------|------------------|--------------------|---------------------|
| 1988: Dec. 31 ... | 8,508 | 567 | 2,458 | 5,422 |
| 1989: Dec. 31 ... | 8,519 | 574 | 2,441 | 5,504 |

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

Table 498.-- ENERGY GENERATED, PURCHASED, SOLD, AND USED BY SUGAR PLANTATIONS, BY ISLANDS: 1988

| Subject | State total | Hawaii | Kauai | Maui | Oahu |
|-------------------------------------------------------|-------------|--------|--------|--------|--------|
| Electricity (millions of kilowatt-hours) | | | | | |
| Generated <u>1/</u> | 901 | 265 | 231 | 254 | 150 |
| Purchased | 17.61 | 1.58 | 3.66 | 5.09 | 7.29 |
| Sold | 455.45 | 184.41 | 119.81 | 97.56 | 53.67 |
| Used <u>2/</u> | 456.89 | 82.28 | 114.98 | 155.62 | 104.02 |
| Gross heat values of boiler fuels (billions of Btu's) | | | | | |
| All fuels | 27,646 | 8,861 | 6,322 | 7,925 | 4,538 |
| Bagasse | 22,241 | 6,882 | 5,876 | 6,325 | 3,159 |
| Fuel oil | 4,887 | 1,973 | 427 | 1,523 | 964 |
| Other fuels | 467 | 7 | 19 | 26 | 415 |

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 - 1988 (Energy Report 27, December 28, 1989), pp. 6-9.

Table 499.-- PERCENT OF HOUSING UNITS WITH SOLAR OR HEAT PUMP WATER HEATING SYSTEMS: 1977 TO 1987

| System | 1977 | 1979 | 1981 | 1983 | 1985 | 1986 | 1987 |
|-----------------|------|------|------|------|------|------|------|
| Solar | 0.3 | 2.9 | 5.9 | 7.9 | 10.6 | 10.6 | 10.5 |
| Heat pump | (NA) | (NA) | 0.6 | 1.6 | 1.6 | 1.6 | 1.6 |

NA Not available.

Source: Calculated from cumulative totals (as of Dec. 31) in table 500 and DBED estimates of total housing stock on following April 1 in table 619.

Table 500.-- STATE TAX CREDITS FOR RESIDENTIAL SOLAR AND HEAT PUMP WATER HEATING SYSTEMS: 1975 TO 1987

[The State allows individual income tax credits for solar energy devices installed after 1974 and heat pump systems installed after 1980. Data exclude commercial, military, and government systems, those installed previously, and those for which no State tax credit was made. Devices in condominiums may be claimed on a pro-rata basis for each housing unit. Federal solar tax credit was discontinued in 1986]

| Year installed | Number of claims | | Cumulative number of claims | | Average solar device cost (dollars) | Total tax credit allowed (\$1,000) | |
|----------------|------------------|------------|-----------------------------|------------|-------------------------------------|------------------------------------|------------|
| | Solar devices | Heat pumps | Solar devices | Heat pumps | | Solar devices | Heat pumps |
| 1975-77 | 1,101 | ... | 1,101 | ... | 2,135 | 230 | ... |
| 1978 | 4,061 | ... | 5,162 | ... | 2,907 | 1,120 | ... |
| 1979 | 4,375 | ... | 9,537 | ... | 3,031 | 1,250 | ... |
| 1980 | 4,704 | ... | 14,241 | ... | 3,346 | 1,493 | ... |
| 1981 | 6,445 | 2,013 | 20,686 | 2,013 | 3,500 | 2,107 | 164 |
| 1982 | 4,407 | 3,122 | 25,093 | 5,135 | 3,695 | 1,512 | 154 |
| 1983 | 3,148 | 665 | 28,241 | 5,800 | 3,601 | 1,076 | 40 |
| 1984 | 4,464 | 257 | 32,705 | 6,057 | 3,519 | 1,482 | 13 |
| 1985 | 6,740 | 12 | 39,445 | 6,069 | 3,897 | 2,616 | 1 |
| 1986 | 592 | 22 | 40,037 | 6,091 | 2,230 | 198 | 4 |
| 1987 | 354 | 137 | 40,391 | 6,228 | 3,213 | 149 | 14 |

Source: Hawaii State Department of Taxation, Tax Credits Claimed by Hawaii Residents for 1977-1987.

Table 501.-- RESEARCH AND DEVELOPMENT CHARACTERISTICS
AND RANK: 1985-1987

| Characteristic | Value | Rank <u>1/</u> |
|----------------------------------------------------------------------------|-----------|----------------|
| PERSONNEL CHARACTERISTICS | | |
| Scientists, 1986 | 9,400 | 43 |
| Engineers, 1986 | 9,300 | 37 |
| Doctoral scientists, 1987 | 2,262 | 37 |
| Doctoral engineers, 1987 | 209 | 43 |
| New S&E doctorates awarded, 1987 | 102 | 38 |
| S&E postdoctorates, 1987, in doctorate-granting institutions | 43 | 41 |
| S&E graduate students, 1987, in doctorate-granting institutions | 1,964 | 38 |
| FUNDING CHARACTERISTICS <u>2/</u> | | |
| Federal expenditures, 1987 | \$4,759 | 39 |
| Federal R&D obligations, 1987 | \$64 | 41 |
| Industrial R&D performance, 1985 | \$0-\$14 | 40-51 |
| Academic R&D performance at doctorate-granting institutions, 1987 | \$57 | 38 |
| Total R&D performance, 1985 | \$76-\$90 | 43-51 |

1/ Among 50 states and D.C.

2/ Dollar amounts in millions.

Source: National Science Foundation, Geographic Patterns: R&D in the United States, NSF 89-317 (1989), p. 49.

Table 502.-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT
IN HAWAII BY AGENCY AND PERFORMER: FISCAL YEAR 1987

| Agency and performer | Amount (\$1,000) | Rank |
|------------------------------------------------|---------------------|------|
| Total | 64,372 | 41 |
| Funding agency: | | |
| Department of Agriculture | 9,898 | 32 |
| Department of Commerce | 2,715 | 14 |
| Department of Defense | 14,045 | 38 |
| Department of Energy | 5,336 | 33 |
| Department of Health & Human Services | 9,534 | 43 |
| Department of the Interior | 6,906 | 16 |
| Department of Transportation | 142 | 43 |
| Environmental Protection Agency | 25 | 50 |
| National Aeronautics & Space Administration .. | 5,388 | 31 |
| National Science Foundation | 10,383 | 29 |
| Performer: | | |
| Federal intramural | 23,218 | 36 |
| Industrial firms | 4,660 | 44 |
| Universities and colleges | 31,188 | 38 |
| Other nonprofit | 4,711 | 31 |
| State and local government | 595 | 38 |

Source: National Science Foundation, Geographic Patterns: R&D in the United States, NSF 89-317 (1989), p. 49.

Table 503.-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT AND
R&D PLANT IN HAWAII: 1983 TO 1988

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

| Type of obligation | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 |
|---------------------------------|------|------|------|------|------|------|
| Obligations for R&D | 71.4 | 52.9 | 58.2 | 54.7 | 63.9 | 82.2 |
| Obligations for R&D plant | 1.6 | 0.6 | 0.9 | 0.6 | 0.6 | 6.9 |

Source: National Science Foundation, Federal Funds for Research and Development: Fiscal Years 1988, 1989, and 1990, Volume XXXVIII, NSF 90-306 (1990), pp. 100-101.

Table 504.-- R & D EXPENDITURES BY STATE GOVERNMENT: 1987 AND 1988

[\$1,000. Fiscal years ended June 30]

| State agency | All sources | | State sources | | Other sources | |
|--------------------------|-------------|---------|---------------|--------|---------------|--------|
| | 1987 | 1988 | 1987 | 1988 | 1987 | 1988 |
| All State govt. ... | 116,270 | 129,424 | 42,131 | 44,388 | 74,139 | 85,036 |
| University of Hawaii ... | 62,231 | 70,023 | 23,214 | 25,284 | 39,017 | 44,739 |
| Research Corp. of UH ... | 42,000 | 49,000 | 8,000 | 10,000 | 34,000 | 39,000 |
| Other State govt. | 12,039 | 10,401 | 10,917 | 9,104 | 1,122 | 1,297 |

Source: Hawaii State Department of Business and Economic Development, unpublished survey.

Table 505.-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1985-86 TO 1989-90

[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) |
| 1985-86 ... | 643 | 53,976,468 | 354 | 35,750,696 | 289 | 18,225,772 |
| 1986-87 ... | 643 | 52,360,382 | 378 | 35,787,240 | 265 | 16,573,142 |
| 1987-88 ... | 678 | 61,476,926 | 417 | 39,410,637 | 261 | 22,066,289 |
| 1988-89 ... | 777 | 71,898,382 | 466 | 46,990,238 | 311 | 24,908,144 |
| 1989-90 ... | 851 | 83,689,450 | 488 | 49,362,792 | 363 | 34,326,658 |

Source: Office of Research Administration, University of Hawaii, 1989-1990 Extramural Awards (1990), p. i.

Table 506.-- RESEARCH AND DEVELOPMENT EXPENDITURES AT
DOCTORATE-GRANTING INSTITUTIONS: 1984 TO 1988

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

| Type of expenditure | 1984 | 1985 | 1986 | 1987 | 1988 |
|------------------------------|--------|--------|--------|--------|--------|
| Total R&D expenditures | 51,051 | 54,025 | 57,383 | 57,345 | 64,278 |
| Federally financed | 32,701 | 34,886 | 35,322 | 34,472 | 38,560 |

Source: National Science Foundation, Academic Science/Engineering:
R & D Funds, Fiscal Year 1988, NSF 89-326 (1990), tables B-22 and B-23.

Table 507.-- TELESCOPES AT THE SUMMITS OF MAUNA KEA AND
HALEAKALA: 1988

| Location and telescope (diameter in meters) | Year com- pleted | Capital costs (millions of 1986 dollars) | Operating costs, 1988 (million dollars) | Local staff (persons) |
|------------------------------------------------------|------------------------|------------------------------------------------------|-----------------------------------------------------|-----------------------------|
| Mauna Kea: | | | | |
| UH 0.61-m. | 1969 | 0.3 | } 0.1 | } 13 |
| UH 0.61-m. | 1969 | 0.3 | | |
| UH 2.24-m. | 1970 | 8.0 | | |
| Canada-France-Hawaii (CFHT) .. | 1979 | 45.0 | 3.5 | 43 |
| NASA IRTF 3.0-m. | 1979 | 15.0 | 1.8 | 10 |
| UK (UKIRT) 3.8-m. | 1979 | 15.0 | 1.5 | 29 |
| James Clerk Maxwell (JCMT) ... | 1986 | 20.0 | 1.0 | 20 |
| Caltech Submillimeter (CSO) 10.4-m. | 1986 | 10.0 | 1.5 | 11 |
| W.M. Keck Observatory Optical/IR 10.0-m. 1/ | 1991 | 85.0 | 2.3 | 35 |
| Haleakala (on UH land): | | | | |
| Mees Solar Observatory | 1956 | 0.5 | 0.3 | 6 |
| Lunar Ranging Facility | 1976/84 | 3.25 | 0.7 | 9 |
| Gamma Ray Facility | 1985 | 2.0 | 0.2 | 1 |

1/ Under construction. Figures are projected.

Source: University of Hawaii at Manoa, Institute for Astronomy, data
provided July 18, 1988.

Table 508.-- PATENTS ISSUED TO HAWAII
RESIDENTS: 1982 TO 1989

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

| Fiscal year | Patents | Fiscal year | Patents |
|-------------|---------|-------------|---------|
| 1982 | 31 | 1986 | 37 |
| 1983 | 30 | 1987 | 52 |
| 1984 | 43 | 1988 | 62 |
| 1985 | 33 | 1989 | 74 |

Source: U.S. Department of Commerce, Patent and Trademark Office, Commissioner of Patents and Trademarks Annual Report, Fiscal Year '89, p. 59, and earlier editions.

Table 509.-- COMPUTER USE BY OAHU RESIDENTS EMPLOYED OUTSIDE
THEIR HOMES: 1988 AND 1989

[Percent. As of March]

| Subject | 1988 | 1989 |
|-------------------------------------------------|------|------|
| Use of personal computer at place of work | 100 | 100 |
| Always | 22 | 27 |
| Frequently | 14 | 13 |
| Occasionally | 15 | 16 |
| Never | 50 | 44 |
| Facsimile machine (FAX) at place of work | 100 | 100 |
| Yes | 41 | 52 |
| No | 46 | 44 |
| Don't know | 13 | 5 |
| Own a personal computer for use at home | 100 | 100 |
| Yes | 25 | 33 |
| No | 75 | 67 |

Source: Omnitrak/Hawaii Inc. Polls (400 telephone interviews each) reported in Honolulu Star-Bulletin, May 23, 1989 (p. C-1), May 30, 1989 (p. D-1), and June 6, 1989 (p. D-1).