

Table
Number **Table Name**

(Click on the table number to go to corresponding table)

Narrative

17.01	Consumption of Energy, by Source (Physical Units): 1960 to 2013
17.02	Consumption of Energy, by Source: 1960 to 2013
17.03	Consumption of Energy, by End-Use Sector: 1960 to 2013
17.04	Primary Energy Consumption and Electricity Sales, Total and Per Capita: 1994 to 2014
17.05	Primary Energy Consumption, by Source: 1998 to 2014
17.06	Electricity Generation, by Source: 1998 to 2014
17.07	Electricity Production, by Source, by Island: 2014
17.08	Fuel, Electricity, and Total Energy Expenditures, by Source: 1994 to 2014
17.09	Electric Utilities: 2002 to 2015
17.10	Electric Utilities, by Island: 2015
17.11	Gas Utilities: 2002 to 2015
17.12	Gas Utilities, by Island: 2015
17.13	Service Provided by Hawaiian Electric Company, Inc., on Oahu: 1991 to 2015
17.14	Utility Service Provided by the Gas Company on Oahu: 1991 to 2015
17.15	Liquid Fuel Tax Base: 2001 to 2015
17.16	Liquid Fuel Tax Base, by County: 2015
17.17	Gasoline Stations (NAICS 447), by County: 1998 to 2013
17.18	Boilers and Pressure Vessels, by Island: 2015
17.19	Federal Obligations for Research and Development and for R&D Plant in Hawaii: 2000 to 2013
17.20	Private Sector Technology Jobs and Earnings: 2008 to 2015
17.21	Top 30 States for Technology and Science Index: 2014
17.22	Research and Non-Research Extramural Funding, for the University of Hawaii: 1991-1992 to 2014-2015
17.23	Research and Development Expenditures at Doctorate-Granting Institutions: 1991 to 2014
17.24	Patents Issued to Hawaii Residents: 1992 to 2015
17.25	Astronomy and Related Facilities at the Summits of Mauna Kea and Haleakala: 2015

Section 17

ENERGY AND SCIENCE

This section presents statistics on fuel resources, energy production and consumption, the electric and gas utility industries, research and development, and scientific, engineering, and technological resources. Related series are cited in Sections 12 (utility employment), 14 (prices), and 18 (gasoline consumption).

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; Hawaii State Department of Business, Economic Development & Tourism, Strategic Industries Division; University of Hawaii, Institute of 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: 2012*, Sections 16 and 19.

**Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE
(PHYSICAL UNITS): 1960 TO 2013**

Year	Coal (1,000 short tons)	Natural gas 1/ (billion cubic feet)	Petroleum (1,000 barrels)	Hydroelectric power 2/ (million kWh)	Fuel ethanol 3/
1960	-	-	16,844	27	(NA)
1961	-	-	20,074	24	(NA)
1962	-	-	19,015	20	(NA)
1963	-	-	19,931	23	(NA)
1964	-	-	21,257	115	(NA)
1965	-	-	22,478	105	(NA)
1966	-	-	25,113	112	(NA)
1967	-	-	28,252	108	(NA)
1968	-	-	31,456	94	(NA)
1969	-	-	33,007	100	(NA)
1970	-	-	34,105	108	(NA)
1971	-	-	36,734	89	(NA)
1972	-	-	37,753	91	(NA)
1973	-	-	38,826	95	(NA)
1974	-	-	36,739	92	(NA)
1975	-	-	37,097	89	(NA)
1976	-	-	38,047	93	(NA)
1977	-	-	40,326	86	(NA)
1978	-	-	40,945	84	(NA)
1979	-	-	44,660	90	(NA)
1980	-	3	43,562	86	(NA)
1981	-	3	38,811	80	4
1982	47	3	35,706	90	1
1983	42	3	36,291	84	-
1984	38	2	37,297	82	-
1985	46	2	40,006	86	-
1986	16	2	39,044	78	-
1987	63	3	39,389	82	-
1988	50	3	45,902	81	-
1989	32	3	48,021	56	-
1990	29	3	50,015	80	-
1991	45	3	45,758	71	-
1992	303	3	46,655	61	-
1993	691	3	41,392	56	-
1994	704	3	44,843	139	-
1995	895	3	43,842	98	-
1996	930	3	41,631	104	-
1997	933	3	39,829	115	-
1998	822	3	40,493	121	-
1999	801	3	39,662	115	-
2000	816	3	40,591	103	-

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**Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE
(PHYSICAL UNITS): 1960 TO 2013-- Con.**

Year	Coal (1,000 short tons)	Natural gas 1/ (billion cubic feet)	Petroleum (1,000 barrels)	Hydroelectric power 2/ (million kWh)	Fuel ethanol 3/
2001	829	3	41,479	101	-
2002	748	3	44,772	95	-
2003	837	3	46,861	91	-
2004	857	3	49,098	94	-
2005	805	3	51,267	96	341
2006	778	3	51,564	120	390
2007	850	3	52,905	92	497
2008	937	3	42,397	84	918
2009	878	3	41,920	113	1,051
2010	803	3	42,090	70	4/ 803
2011	783	3	43,773	93	4/ 931
2012	803	3	4/ 42,434	115	4/ 845
2013	753	3	41,626	78	867

NA Not available.

1/ Includes supplemental gaseous fuels.

2/ Conventional hydroelectric power. Does not include pumped-storage hydroelectricity.

3/ Includes denaturant.

4/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) Table CT1. Energy Consumption Estimates for Major Energy Sources in Physical Units, 1960-2013, Hawaii, and earlier editions <http://www.eia.gov/state/seds/sep_use/total/pdf/use_HI.pdf> accessed March 14, 2016.

Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1960 TO 2013

[Trillion Btu]

Year	Total 1/	Fossil fuels			Renewable energy					Fossil fuels (as commingled)	
		Coal	Natural gas 2/	Petroleum	Hydro-electric power 3/	Biomass	Geo-thermal	Solar/PV 4/	Wind	Natural Gas 2/ 5/	Motor Gasoline 2/ 6/
1960	94.9	-	-	94.6	0.3	-	-	(NA)	(NA)	-	18.0
1961	113.8	-	-	113.5	0.3	-	-	(NA)	(NA)	-	18.6
1962	108.3	-	-	108.1	0.2	-	-	(NA)	(NA)	-	19.5
1963	114.3	-	-	113.9	0.2	0.2	-	(NA)	(NA)	-	19.7
1964	123.5	-	-	122.1	1.2	0.2	-	(NA)	(NA)	-	20.3
1965	130.6	-	-	129.3	1.1	0.2	-	(NA)	(NA)	-	21.4
1966	145.5	-	-	144.2	1.2	0.1	-	(NA)	(NA)	-	22.6
1967	163.9	-	-	162.5	1.1	0.3	-	(NA)	(NA)	-	23.8
1968	182.8	-	-	181.1	1.0	0.7	-	(NA)	(NA)	-	25.6
1969	190.9	-	-	189.1	1.0	0.7	-	(NA)	(NA)	-	27.2
1970	197.0	-	-	195.4	1.1	0.4	-	(NA)	(NA)	-	29.9
1971	211.7	-	-	210.4	0.9	0.3	-	(NA)	(NA)	-	30.8
1972	218.1	-	-	216.6	0.9	0.6	-	(NA)	(NA)	-	32.6
1973	224.3	-	-	222.8	1.0	0.5	-	(NA)	(NA)	-	34.7
1974	212.1	-	-	210.6	1.0	0.6	-	(NA)	(NA)	-	34.4
1975	214.4	-	-	212.9	0.9	0.6	-	(NA)	(NA)	-	35.5
1976	220.1	-	-	218.4	1.0	0.7	-	(NA)	(NA)	-	36.9
1977	233.4	-	-	232.0	0.9	0.5	-	(NA)	(NA)	-	38.9
1978	237.0	-	-	235.8	0.9	0.3	-	(NA)	(NA)	-	40.1
1979	256.7	-	-	255.4	0.9	0.3	-	(NA)	(NA)	-	39.4
1980	262.5	-	-	249.6	0.9	11.9	-	(NA)	(NA)	3.0	38.0
1981	236.8	-	-	223.2	0.8	12.7	-	(NA)	(NA)	2.8	37.7
1982	218.3	1.1	-	203.8	0.9	12.4	-	(NA)	(NA)	2.8	38.1
1983	221.3	1.0	-	205.4	0.9	14.0	-	(NA)	-	2.7	38.0
1984	232.4	0.9	-	216.1	0.9	14.3	0.2	-	-	2.4	39.5
1985	248.6	1.1	-	232.1	0.9	14.2	0.2	-	-	2.7	39.9
1986	245.3	0.4	-	227.6	0.8	16.3	0.2	-	-	2.7	41.4
1987	249.5	1.6	0.2	228.9	0.9	17.8	0.1	-	-	2.8	43.0
1988	289.7	1.2	-	268.0	0.8	19.4	0.2	-	-	2.8	44.5
1989	309.8	0.8	-	280.1	0.6	27.0	0.1	0.8	0.3	2.9	46.0
1990	321.4	0.7	-	292.8	0.8	25.9	(7/)	0.9	0.3	3.0	45.5
1991	295.2	1.1	-	266.6	0.7	25.4	(7/)	1.0	0.4	2.9	47.1
1992	306.1	6.8	-	272.5	0.6	24.9	(7/)	1.0	0.2	2.9	46.6
1993	8/ 283.0	15.6	-	8/ 239.5	0.6	24.4	1.6	1.1	0.2	2.8	8/ 47.4
1994	299.4	15.7	-	258.2	1.4	20.7	1.9	1.1	0.2	2.9	48.9
1995	297.1	19.9	-	252.5	1.0	19.8	2.4	1.2	0.2	2.9	49.1
1996	283.3	20.4	-	238.8	1.1	19.1	2.5	1.2	0.2	2.8	48.9
1997	273.6	20.5	-	230.6	1.2	17.4	2.5	1.3	0.2	2.7	48.8
1998	273.6	18.2	-	233.6	1.2	16.5	2.4	1.3	0.2	2.8	48.7
1999	269.5	17.7	-	230.0	1.2	17.0	2.2	1.3	0.2	2.9	46.7
2000	273.5	17.7	0.1	235.3	1.1	15.2	2.7	1.3	0.2	3.0	48.4

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Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1960 TO 2013-- Con.

[Trillion Btu]

Year	Total 1/	Fossil fuels			Renewable energy					Fossil fuels (as commingled)	
		Coal	Natural gas 2/	Petro-leum	Hydro-electric power 3/	Biomass	Geo-thermal	Solar/PV 4/	Wind	Natural Gas 2/ 5/	Motor Gasoline 2/ 6/
2001	270.3	17.8	0.1	239.9	1.0	7.9	2.1	1.3	(7/)	2.9	50.6
2002	284.9	16.6	0.1	257.6	1.0	7.5	0.7	1.3	(7/)	2.9	54.3
2003	8/ 302.3	19.3	0.1	8/ 269.5	0.9	9.3	1.8	1.4	(7/)	2.9	8/ 55.1
2004	8/ 316.3	19.3	0.2	8/ 282.9	0.9	9.3	2.1	1.4	0.1	2.9	8/ 55.9
2005	8/ 326.5	18.0	0.2	8/ 293.9	1.0	9.6	2.2	1.5	0.1	2.9	8/ 57.1
2006	8/ 328.9	17.5	0.2	8/ 295.6	1.2	9.9	2.1	1.6	0.8	2.9	8/ 59.9
2007	8/ 340.0	19.0	0.2	8/ 303.7	0.9	9.7	2.3	1.8	2.4	3.0	8/ 58.5
2008	8/ 279.1	20.2	0.1	8/ 239.3	0.8	11.8	2.3	2.2	2.4	2.8	8/ 54.7
2009	8/ 274.9	19.0	0.2	8/ 235.7	1.1	12.2	1.6	2.6	2.5	2.7	8/ 55.3
2010	8/ 273.8	17.1	0.2	8/ 237.5	0.7	8/ 10.4	2.0	3.4	2.5	2.7	8/ 50.7
2011	8/ 283.4	16.1	0.2	8/ 245.5	0.9	8/ 10.6	2.2	4.6	3.3	2.7	8/ 56.5
2012	8/ 278.2	16.6	0.2	8/ 237.9	1.1	8/ 9.6	2.5	8/ 6.7	3.6	2.8	8/ 53.6
2013	277.1	15.3	0.2	233.0	0.7	11.2	2.6	9.3	4.8	2.9	54.0

NA Not available.

1/ Excluding fossil fuels as commingled.

2/ Supplemental gaseous fuels (SGF) and fuel ethanol are consumed with natural gas and motor gasoline, respectively.

On this table, natural gas excluding SGF and motor gasoline excluding fuel ethanol are presented so that a fossil fuel total can be calculated. Natural gas including SGF and motor gasoline including fuel ethanol are presented separately for reference.

3/ Conventional hydroelectric power. Does not include pumped-storage hydroelectricity.

4/ Solar thermal and photovoltaic energy.

5/ Including Supplemental Gaseous Fuels.

6/ Including Fuel Ethanol.

7/ Value less than +0.05 and greater than -0.05.

8/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS)

Table CT2. Primary Energy Consumption Estimates, Selected Years, 1960-2013, Hawaii, and earlier editions

<http://www.eia.gov/state/seds/sep_use/total/pdf/use_HI.pdf> accessed March 14, 2016.

**Table 17.03-- CONSUMPTION OF ENERGY, BY END-USE SECTOR:
1960 TO 2013**

[Trillion Btu]

Year	Residential 1/ 2/	Commercial 1/ 3/ 4/ 5/	Industrial 1/ 4/ 5/	Transportation 1/ 4/	Electric power 1/ 2/
1960	7.1	5.3	20.6	61.8	17.6
1961	7.3	5.6	26.8	74.0	19.4
1962	7.7	5.7	28.7	66.1	21.4
1963	8.7	6.2	29.9	69.5	24.2
1964	9.4	6.9	32.4	74.8	26.7
1965	9.9	7.0	34.7	79.0	27.6
1966	10.5	7.7	35.8	91.5	29.7
1967	11.7	8.4	38.7	105.1	31.3
1968	12.6	9.2	38.9	122.0	35.0
1969	14.1	10.7	41.0	125.1	38.7
1970	15.5	12.5	43.7	125.3	43.2
1971	16.8	12.5	43.6	138.8	47.7
1972	18.6	13.7	49.2	136.5	54.1
1973	19.0	14.5	49.9	140.9	55.6
1974	19.3	14.3	49.9	128.7	57.5
1975	19.0	14.5	50.4	130.5	58.8
1976	20.3	16.4	51.7	131.7	62.5
1977	20.7	18.0	53.3	141.3	65.2
1978	20.8	18.5	53.1	144.6	66.8
1979	21.4	19.7	59.2	156.4	67.7
1980	21.0	20.1	74.7	146.7	69.7
1981	20.9	18.1	73.7	124.1	69.9
1982	19.6	16.9	79.6	102.2	66.9
1983	20.1	17.2	66.2	117.9	68.6
1984	19.7	18.3	65.0	129.4	70.4
1985	19.9	18.4	67.3	142.9	69.8
1986	20.4	20.9	76.9	127.1	72.7
1987	22.0	23.8	79.6	124.1	76.5
1988	23.0	36.9	88.8	140.9	81.7
1989	25.4	36.1	93.8	154.5	86.5
1990	30.7	37.2	98.9	154.5	105.9
1991	26.1	28.8	89.0	151.2	88.7
1992	29.7	38.6	93.6	144.1	99.3
1993	29.6	30.7	92.3	130.4	99.5
1994	30.5	35.0	93.8	140.0	102.3
1995	31.3	34.6	93.0	138.2	105.5
1996	32.1	34.0	95.6	121.6	6/ 107.4
1997	32.2	35.5	88.7	117.3	107.3
1998	32.4	45.9	80.7	114.6	105.6
1999	32.4	36.0	78.0	123.1	106.6
2000	33.1	37.3	78.0	125.2	108.5

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**Table 17.03-- CONSUMPTION OF ENERGY, BY END-USE SECTOR:
1960 TO 2013-- Con.**

[Trillion Btu]

Year	Residential 1/ 2/	Commercial 1/ 3/ 4/ 5/	Industrial 1/ 4/ 5/	Transportation 1/ 4/	Electric power 1/ 2/
2001	6/ 32.2	36.6	69.5	132.0	105.3
2002	34.6	6/ 39.3	70.8	140.2	110.9
2003	33.7	39.6	66.1	162.9	109.0
2004	34.7	43.4	66.2	6/ 172.0	110.8
2005	35.2	41.8	70.2	6/ 179.1	109.8
2006	35.7	42.6	6/ 69.3	6/ 181.3	110.6
2007	36.3	42.2	67.1	6/ 194.4	6/ 111.7
2008	35.8	6/ 42.7	64.1	6/ 136.5	6/ 108.9
2009	35.8	42.2	64.0	6/ 133.0	6/ 105.5
2010	6/ 34.0	6/ 39.7	63.7	6/ 136.3	6/ 98.7
2011	34.9	6/ 40.6	6/ 63.5	6/ 144.3	6/ 98.9
2012	6/ 35.2	6/ 37.9	6/ 63.0	6/ 142.1	6/ 94.8
2013	35.7	39.0	61.2	141.2	92.3

1/ There is a discontinuity between 1988 and 1989 due to the expanded coverage of renewable energy sources beginning in 1989.

2/ Beginning in 1980, adjusted for the double-counting of supplemental gaseous fuels, which are included in both natural gas and the other fossil fuels from which they are mostly derived, but should be counted only once in net energy and total.

3/ Small amounts of solar thermal and photovoltaic energy consumed in the commercial sector cannot be separately identified and are included in residential consumption.

4/ From 1981 through 1992, includes fuel ethanol blended into motor gasoline that is not included in the motor gasoline column.

5/ Beginning in 1980, adjusted for the double-counting of supplemental gaseous fuels, which are included in both natural gas and the other fossil fuels from which they are mostly derived, but should be counted only once in net energy and total.

6/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) Consumption Estimates, Selected Years, 1960-2013, Hawaii, and earlier editions
<http://www.eia.gov/state/seds/sep_use/total/pdf/use_HI.pdf> accessed March 14, 2016.

Table 17.04-- PRIMARY ENERGY CONSUMPTION AND ELECTRICITY SALES, TOTAL AND PER CAPITA: 1994 TO 2014

[Include photovoltaic]

Year	Primary energy consumption		Electricity sales by utilities	
	Total (trillion Btu)	Per capita 1/ (million Btu)	Total (1,000 kWh)	Per capita 1/ (kWh)
1994	299.3730	232.107	8,948,458	6,938
1995	297.0650	228.847	9,187,430	7,078
1996	283.2950	217.265	9,378,962	7,193
1997	273.6140	206.045	9,345,281	7,037
1998	273.5600	205.048	9,261,070	6,942
1999	269.5020	202.262	9,379,808	7,040
2000	273.4950	204.711	9,690,598	7,253
2001	270.3250	202.093	9,776,882	7,309
2002	284.9000	210.561	9,958,768	7,360
2003 2/	301.0960	221.597	10,206,405	7,512
2004 2/	314.9100	226.951	10,508,642	7,573
2005 2/	324.9130	230.027	10,538,506	7,461
2006 2/	327.3890	228.861	10,567,913	7,387
2007 2/	338.0210	235.808	10,584,992	7,384
2008 2/	277.1060	193.426	10,390,010	7,252
2009 2/	276.6770	191.796	10,126,219	7,020
2010 2/	278.0460	189.345	10,013,104	6,819
2011 2/	287.1130	192.841	9,961,653	6,691
2012 2/	280.1710	184.886	9,639,157	6,361
2013 2/	281.3290	182.921	9,503,164	6,179
2014	281.2060	180.241	9,475,452	6,073

1/ Based on estimated de facto population.

2/ Primary energy consumption revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) <<http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=HI>> accessed June 18, 2016 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

**Table 17.05-- PRIMARY ENERGY CONSUMPTION, BY SOURCE:
1998 TO 2014**

[Trillion Btu]

Year	Total	Petroleum	Coal	Natural gas	Renewable
1998	273.5600	233.6360	18.2230	0.0000	21.7010
1999	269.5020	229.9900	17.6910	0.0000	21.8210
2000	273.4950	235.3150	17.6530	0.0760	20.4510
2001	270.3250	239.9480	17.7740	0.1340	12.4690
2002	284.9000	257.5930	16.6180	0.1400	10.5500
2003	1/ 301.0960	269.4860	1/ 18.0440	0.1370	13.4290
2004	1/ 314.9100	282.9230	1/ 17.9130	0.1550	13.9190
2005	1/ 324.9130	295.1040	1/ 16.5060	0.1950	1/ 14.2900
2006	1/ 327.3890	296.9070	1/ 16.1020	0.1790	1/ 15.5520
2007	1/ 338.0210	305.4410	1/ 17.1070	0.1730	1/ 17.0240
2008	1/ 277.1060	242.4900	1/ 18.0950	0.1480	1/ 19.5570
2009	1/ 276.6770	1/ 242.9840	1/ 17.0830	0.1670	1/ 20.0820
2010	1/ 278.0460	1/ 244.5230	1/ 17.1170	0.1610	1/ 19.0280
2011	1/ 287.1130	1/ 252.4970	1/ 16.0800	0.1580	1/ 21.6080
2012	1/ 280.1710	1/ 242.9260	1/ 16.5720	0.1870	1/ 23.4170
2013	1/ 281.3290	1/ 240.3660	1/ 15.3060	0.1930	1/ 28.4930
2014	281.2060	236.6200	17.2410	0.1770	30.4190
Year	Biomass	Solar	Wind	Geothermal	Hydro
1998	16.5480	1.3020	0.1970	2.4180	1.2370
1999	16.9810	1.3350	0.1690	2.1620	1.1750
2000	15.1940	1.3470	0.1730	2.6810	1.0550
2001	7.9470	1.3160	0.0220	2.1430	1.0410
2002	7.4800	1.3370	0.0160	0.7480	0.9670
2003	9.3050	1.3780	0.0160	1.8130	0.9160
2004	9.3360	1.4230	0.0750	2.1440	0.9410
2005	9.5650	1/ 1.4730	0.0660	2.2240	0.9620
2006	9.8750	1/ 1.5820	0.7900	2.1140	1.1910
2007	9.6930	1/ 1.7840	2.3540	2.2800	0.9130
2008	11.7950	1/ 2.2500	2.3650	2.3160	0.8310
2009	12.2250	1/ 2.6610	2.4540	1.6430	1.0990
2010	10.4480	1/ 3.3820	2.5470	1.9640	0.6870
2011	10.5500	1/ 4.6590	3.3110	2.1830	0.9050
2012	9.6040	1/ 6.6320	3.5990	2.4910	1.0900
2013	1/ 11.1790	1/ 9.1340	4.8020	2.6300	0.7470
2014	10.9500	10.6500	5.5030	2.4220	0.8950

1/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) <<http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=HI>> accessed June 18, 2016 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.06-- ELECTRICITY GENERATION, BY SOURCE: 1998 TO 2014

[Millions of kWh generated]

Year	Total	Petroleum	Coal	Wind	Biomass
1998	10,228	7,851	1,435	19	504
1999	10,404	7,995	1,440	16	577
2000	10,593	8,052	1,579	17	538
2001	10,633	8,224	1,605	2	288
2002	11,663	9,467	1,546	2	297
2003	10,976	8,503	1,644	2	347
2004	11,410	8,945	1,604	7	329
2005	11,523	9,068	1,631	7	310
2006	11,559	9,054	1,549	80	326
2007	11,533	8,914	1,579	238	285
2008	11,376	8,670	1,648	240	302
2009	11,011	8,289	1,500	251	284
2010	10,836	8,087	1,546	261	283
2011	10,723	7,924	1,424	341	313
2012	10,469	7,483	1,537	378	281
2013	10,267	7,223	1,404	503	329
2014	10,204	6,926	1,511	579	334

Year	Geothermal	Hydro	Other gases 1/	Solar	Others
1998	237	121	60	-	-
1999	211	115	50	-	-
2000	262	103	42	-	-
2001	207	101	38	-	169
2002	73	95	41	-	143
2003	178	91	40	-	172
2004	213	94	48	-	171
2005	222	96	41	-	149
2006	212	120	43	-	176
2007	230	92	45	-	149
2008	234	84	39	-	159
2009	168	113	22	1.4	381
2010	201	70	22	1.8	364
2011	224	93	35	3.6	366
2012	261	115	47	4.6	363
2013	275	78	41	19.5	394
2014	254	94	62	39.3	405

1/ Other gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) Detailed State Data 1990-2014 Net Generation by State by Type of Producer by Energy Source (EIA-906, EIA-920, and EIA-923) <<http://www.eia.gov/electricity/data/state/>> accessed June 18, 2016.

**Table 17.07-- ELECTRICITY PRODUCTION, BY SOURCE, BY ISLAND:
2014**

[Million kWh]

Island	Total	Petroleum	Coal	Wind	Biomass
State total	10,204	6,926	1,511	579	334
Hawaii	1,167	729	-	136	-
Maui	1,174	855	15	258	33
Lanai	29	29	-	-	-
Molokai	33	33	-	-	-
Oahu	7,344	4,874	1,496	184	301
Kauai	458	406	-	-	-
Island	Geothermal	Hydro	Other gases 1/	Solar	Others
State total	254	94	62	39	405
Hawaii	254	47	-	1	-
Maui	-	9	-	3	-
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	-	-	62	21	405
Kauai	-	38	-	14	-

1/ Other gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) Detailed State Data 1990-2014 Net Generation by State by Type of Producer by Energy Source (EIA-906, EIA-920, and EIA-923) <<http://www.eia.gov/electricity/data/state/>> accessed June 18, 2016 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.08 -- FUEL, ELECTRICITY, AND TOTAL ENERGY EXPENDITURES, BY SOURCE: 1994 TO 2014

[Millions of dollars]

Year	Total energy expenditures	Primary energy expenditures	Electricity additions	Retail electricity expenditures	Electricity fuel cost
1994	2,122.1	1,441.7	680.4	937.3	256.9
1995	2,202.7	1,470.2	1/ 732.4	1,017.7	1/ 285.3
1996	2,305.8	1,532.5	1/ 773.4	1,119.7	1/ 346.3
1997	2,272.6	1,455.8	1/ 816.7	1,152.7	1/ 336.0
1998	2,092.5	1,296.7	795.8	1,054.4	258.6
1999	2,163.2	1,379.8	783.4	1,106.5	323.1
2000	2,705.1	1,863.0	1/ 842.2	1,341.2	1/ 499.0
2001	2,779.2	1,891.1	1/ 888.2	1,353.4	1/ 465.2
2002	2,688.2	1,882.7	805.5	1,300.2	494.7
2003	3,328.1	2,345.2	982.9	1,478.9	496.0
2004	4,017.5	2,889.0	1,128.5	1,654.9	526.4
2005	4,990.0	3,897.1	1,092.9	1,897.8	804.9
2006	5,723.5	4,543.0	1,180.5	2,152.2	971.7
2007	6,170.2	5,001.5	1,168.7	2,213.3	1,044.6
2008	6,821.2	5,305.2	1/ 1,516.1	2,978.3	1/ 1,462.2
2009	1/ 4,801.1	1/ 3,547.9	1,253.1	2,111.7	858.6
2010	1/ 5,854.8	1/ 4,521.9	1,332.9	2,473.3	1,140.4
2011	1/ 7,668.6	1/ 6,170.6	1,498.1	3,090.5	1,592.4
2012	1/ 7,840.3	1/ 6,241.5	1,598.8	3,219.0	1,620.2
2013	1/ 7,645.3	1/ 5,974.6	1,670.7	3,153.6	1,482.9
2014	7,378.6	5,592.8	1,785.7	3,159.3	1,373.6

1/ Revised from previous *Data Book*.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) <<http://www.eia.gov/state/seds/seds-data-fuel.cfm?sid=HI>> accessed June 26, 2016 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.09-- ELECTRIC UTILITIES: 2002 TO 2015

Year	Customers, Dec. 31			Power sold (1,000 kWh)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
2002	441,323	380,608	60,715	9,958,768	2,921,563	7,037,206
2003	449,354	387,162	62,192	10,206,405	3,024,509	7,181,897
2004	455,278	391,567	63,711	10,508,642	3,156,499	7,352,142
2005	463,088	398,332	64,756	10,538,507	3,164,029	7,374,478
2006 2/	469,013	403,278	65,735	10,567,912	3,182,431	7,385,481
2007 2/	475,104	408,923	66,181	10,585,037	3,200,674	7,384,363
2008 2/	476,124	410,477	65,647	10,390,010	3,085,183	7,304,827
2009	478,588	413,641	64,947	10,125,935	3,055,242	7,070,693
2010	480,918	416,141	64,777	10,013,104	2,989,437	7,023,667
2011	482,498	418,174	64,324	9,961,653	2,928,743	7,032,910
2012	484,716	420,240	64,476	9,639,157	2,739,299	6,899,858
2013 2/	488,456	423,281	65,175	9,496,294	2,606,502	6,889,793
2014 2/	492,358	426,862	65,496	9,406,155	2,538,865	6,867,290
2015	494,632	429,085	65,547	9,388,577	2,558,285	6,830,292

Year	Average annual use (kWh) 3/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residen- tial 1/	Other	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
2002	7,676	115,906	0.15703	0.12508	1,338,980	458,781	880,199
2003	7,812	115,479	0.16743	0.13629	1,485,234	506,399	978,835
2004	8,061	115,398	0.18031	0.14793	1,656,764	569,162	1,087,601
2005	7,943	113,881	0.20656	0.17280	1,927,872	653,568	1,274,304
2006 2/	7,891	112,352	0.23347	0.19595	2,190,152	742,994	1,447,159
2007 2/	7,827	111,578	0.24122	0.20061	2,253,431	772,064	1,481,367
2008 2/	7,516	111,274	0.32497	0.27809	3,033,950	1,002,583	2,031,367
2009	7,386	108,869	0.24202	0.19923	2,148,123	739,416	1,408,707
2010	7,184	108,428	0.28101	0.23857	2,515,731	840,066	1,675,665
2011	7,004	109,336	0.34681	0.30304	3,146,960	1,015,703	2,131,256
2012	6,518	107,014	0.37343	0.32727	3,281,058	1,022,944	2,258,114
2013 2/	6,158	105,712	0.36813	0.31735	3,146,011	959,542	2,186,468
2014	5,948	104,851	0.37342	0.32126	3,154,227	948,062	2,206,164
2015	5,962	104,204	0.29918	0.24909	2,466,759	765,399	1,701,360

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Table 17.09-- ELECTRIC UTILITIES: 2002 TO 2015 -- Con.

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

2/ Revised from previous *Data Book*.

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

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy; and Hawaii State Department of Business, Economic Development and Tourism, Strategic Industries Division, *Monthly Financial Reports* issued by utility companies (Hawaiian Electric Company, Maui Electric Company, Hawaii Electric Light Company and Kauai Island Utility Cooperative), calculations by Hawaii State Department of Business, Economic Development and Tourism, and records.

Table 17.10-- ELECTRIC UTILITIES, BY ISLAND: 2015

Island	Customers, Dec. 31			Net Peak Demand	Power sold (1,000 kWh)		
	Total	Residential 1/	Other	(mW)	Total	Residential 1/	Other
State total	494,632	429,085	65,547	1,600.8	9,388,577	2,558,285	6,830,292
Oahu	302,958	269,207	33,751	1,144.4	6,754,083	1,626,917	5,127,166
Hawaii	84,309	71,217	13,092	180.8	1,064,785	388,374	676,410
Kauai	36,832	28,430	8,402	70.8	432,078	161,826	270,252
Lanai	1,718	1,474	244	4.8	25,817	7,492	18,325
Maui	65,603	56,085	9,518	194.7	1,083,129	363,863	719,265
Molokai	3,212	2,672	540	5.3	28,685	9,811	18,873
Island	Average annual use (kWh) 2/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
State total	5,962	104,204	0.29918	0.24909	2,466,759	765,399	1,701,360
Oahu	6,043	151,912	0.28019	0.23022	1,636,245	455,848	1,180,396
Hawaii	5,453	51,666	0.34646	0.30941	343,843	134,557	209,286
Kauai	5,692	32,165	0.34304	0.32354	142,949	55,513	87,436
Lanai	5,083	75,103	0.37630	0.38325	9,842	2,819	7,023
Maui	6,488	75,569	0.31048	0.29260	323,427	112,973	210,455
Molokai	3,672	34,951	0.37597	0.35837	10,452	3,689	6,764

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

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

Source: *Monthly Financial Reports* issued by utility companies (Hawaiian Electric Company, Maui Electric Company, Hawaii Electric Light Company and Kauai Island Utility Cooperative), calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.11-- GAS UTILITIES: 2002 TO 2015

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (1,000 therms)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
2002	36,236	32,629	3,607	33,974	5,357	28,617
2003	36,046	32,415	3,631	33,556	5,170	28,386
2004	36,049	32,413	3,636	34,241	5,087	29,154
2005	35,850	32,229	3,621	34,249	5,041	29,208
2006	35,793	32,164	3,629	34,340	4,983	29,357
2007	35,692	32,078	3,614	34,685	4,933	29,752
2008	35,364	31,752	3,612	33,100	4,807	28,293
2009	35,449	31,821	3,628	31,924	4,746	27,178
2010	35,317	31,656	3,661	32,279	4,742	27,537
2011	35,226	31,552	3,674	32,410	4,542	27,867
2012	35,183	31,478	3,705	32,320	4,601	27,719
2013	35,116	31,412	3,704	33,100	4,443	28,656
2014	35,186	31,463	3,723	33,118	4,309	28,809
2015	35,248	31,482	3,766	34,079	4,293	29,786

Year	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residen- tial 1/	Other	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
2002	164	7,934	2.87341	1.50635	58,500	15,393	43,107
2003	159	7,818	3.05760	1.71228	64,412	15,807	48,605
2004	157	8,018	3.23468	1.87938	71,245	16,453	54,792
2005	156	8,066	3.64213	2.26578	84,539	18,360	66,179
2006	155	8,090	3.87417	2.46238	91,593	19,305	72,288
2007	154	8,232	3.93554	2.52524	94,545	19,414	75,131
2008	151	7,833	4.89349	3.46955	121,687	23,523	98,164
2009	149	7,491	4.18816	2.68055	92,729	19,877	72,852
2010	150	7,522	4.98652	3.27435	113,810	23,644	90,166
2011	144	7,585	6.05389	4.02058	139,541	27,499	112,042
2012	146	7,481	5.60939	4.28156	144,488	25,809	118,679
2013	141	7,737	5.44508	3.91188	136,294	24,193	112,100
2014	137	7,738	5.48225	3.89496	135,832	23,622	112,210
2015	136	7,909	4.67712	2.93783	107,586	20,079	87,507

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Table 17.11-- GAS UTILITIES: 2002 TO 2015 -- Con.

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

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

Source: Hawaii State Department of Commerce and Consumer Affairs, Division of Consumer Advocacy; and Hawaii State Department of Business, Economic Development and Tourism, Strategic Industries Division, Hawai'i Gas The Clean Energy Company, *Hawaii Gas Utility Monthly Financial Reports*, calculations by Hawaii State Department of Business, Economic Development and Tourism, and records.

Table 17.12-- GAS UTILITIES, BY ISLAND: 2015

[Excludes bottled gas]

Island	Customers, December 31			Gas sold (1,000 therms)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
State total	35,248	31,482	3,766	34,079	4,293	29,786
Oahu	31,772	28,443	3,329	30,663	3,770	26,893
Hawaii	1,900	1,570	330	2,389	304	2,085
Kauai	960	942	18	170	101	68
Lanai	22	22	-	3	3	-
Maui	512	423	89	840	100	740
Molokai	82	82	-	14	14	-

Island	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000)		
	Residen- tial 1/	Other	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
State total	136	7,909	4.67712	2.93783	107,586	20,079	87,507
Oahu	133	8,078	4.69293	2.98615	98,000	17,693	80,307
Hawaii	194	6,318	4.72857	2.50733	6,664	1,437	5,228
Kauai	108	3,794	4.75031	2.53784	654	481	173
Lanai	136	-	5.07402	-	15	15	-
Maui	237	8,314	3.88384	2.43153	2,189	390	1,799
Molokai	175	-	4.37824	-	63	63	-

1/ Residential refers to single-metered residential customers which may include condominiums for visitor use but excludes master-metered apartment and condominium buildings used by residents which are classified as commercial customers.

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

Source: Hawai'i Gas The Clean Energy Company, *Hawaii Gas Utility Monthly Financial Reports*, calculations by Hawaii State Department of Business, Economic Development and Tourism, and records.

**Table 17.13-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC COMPANY, INC.,
ON OAHU: 1991 TO 2015**

Year	Number of customers, Dec. 31		Net input 1/ (1,000 kWh)	Electricity sales (1,000 kWh)	Average annual residential use 2/ (kWh)	Average residential rate (dollars per kWh)	Generating capability Dec. 31 3/ (1000 kW)
	Total	Residential only					
1991	255,176	223,304	6,876,964	6,538,952	7,610	0.09354	1,440
1992	257,442	225,229	7,061,157	6,650,449	7,711	0.09925	1,666
1993	263,478	230,192	7,029,839	6,607,424	7,581	0.11414	1,669
1994	264,992	232,115	7,222,978	6,797,364	7,681	0.11342	1,669
1995	269,307	235,905	7,359,195	6,962,794	7,732	0.12302	1,669
1996	271,602	237,860	7,499,202	7,091,147	7,868	0.12944	1,669
1997	271,801	238,825	7,424,259	7,040,291	7,773	0.13360	1,669
1998	272,675	239,945	7,299,149	6,938,326	7,603	0.12556	1,669
1999	275,467	242,579	7,356,725	6,997,936	7,654	0.12741	1,669
2000	278,260	245,027	7,589,409	7,211,760	7,793	0.14477	1,669
2001	280,911	247,672	7,643,288	7,276,681	7,816	0.14255	1,669
2002	283,161	249,896	7,757,699	7,390,367	8,050	0.13859	1,669
2003	286,677	253,033	7,908,957	7,522,230	8,224	0.14888	1,669
2004	288,456	254,797	8,126,998	7,732,834	8,481	0.15690	1,669
2005	291,580	257,804	8,104,303	7,721,296	8,360	0.17673	1,712
2006	292,988	259,098	8,104,872	7,700,605	8,248	0.20063	1,722
2007	294,591	260,583	8,089,115	7,675,355	8,214	0.20519	1,727
2008	293,740	259,929	7,950,649	7,555,962	7,868	0.28892	1,727
2009	295,282	261,630	7,761,597	7,377,537	7,759	0.21533	1,847
2010	296,422	262,635	7,657,018	7,277,229	7,540	0.25474	1,817
2011	296,800	263,384	7,593,813	7,242,311	7,319	0.32041	1,817
2012	297,529	264,047	7,310,995	6,975,996	6,729	0.35101	1,817
2013	299,528	265,772	7,187,329	6,858,536	6,283	0.34625	1,840
2014	301,953	268,056	7,101,879	6,781,665	6,036	0.35479	1,848
2015	302,958	269,207	7,086,141	6,754,083	6,052	0.28019	1,735

1/ Net generation plus purchased power.

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

3/ Gross capability including firm purchase power.

Source: Hawaiian Electric Company, Inc., records.

**Table 17.14-- UTILITY SERVICE PROVIDED BY THE GAS COMPANY
ON OAHU: 1991 TO 2015**

Year	Customers, Dec. 31		Sales (1,000 therms) 1/		Average annual residential usage (therms) 1/
	Total	Residential	Total	Residential	
1991	32,487	29,278	30,866	5,331	182
1992	32,598	29,375	30,528	5,285	180
1993	33,206	29,984	30,027	5,287	176
1994	33,597	30,344	30,762	5,372	177
1995	33,472	30,492	30,582	5,332	175
1996	33,914	30,668	30,339	5,203	170
1997	33,800	30,574	29,836	5,176	169
1998	33,705	30,497	29,930	5,284	173
1999	33,614	30,384	30,830	5,154	170
2000	33,613	30,383	31,619	5,054	166
2001	33,625	30,403	31,071	4,990	164
2002	33,446	30,202	30,852	4,962	164
2003	33,252	29,990	30,470	4,781	159
2004	33,231	29,964	31,011	4,701	157
2005	32,991	29,744	30,965	4,641	156
2006	32,776	29,519	30,935	4,530	153
2007	32,673	29,434	31,219	4,447	151
2008	32,358	29,123	29,930	4,320	148
2009	32,179	28,951	28,957	4,263	147
2010	32,109	28,867	28,823	4,197	145
2011	32,121	28,872	29,266	4,059	141
2012	31,875	28,622	29,563	4,036	137
2013	31,730	28,481	29,711	3,923	141
2014	31,766	28,504	29,703	3,790	133
2015	31,772	28,475	30,642	3,768	132

1/ Includes liquefied petroleum gas.

Source: The Gas Company LLC, formerly The Gas Company, Inc., records.

Table 17.15-- LIQUID FUEL TAX BASE: 2001 TO 2015

[In thousands of gallons. 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 ending November 30]

Year reported	All types		Gasoline	Diesel oil		
	Total	Excluding aviation		Non-hwy.	Hwy. use	
2001	962,973	627,076	409,910	179,000	34,018	
2002	994,141	646,185	429,613	175,096	36,157	
2003	835,991	587,927	452,499	91,988	37,004	
2004	1,066,808	727,943	459,321	220,562	43,223	
2005	972,642	647,843	454,115	146,922	43,440	
2006	869,789	657,355	472,658	131,665	50,065	
2007	1,018,233	782,580	480,632	230,812	52,826	
2008	920,042	710,863	443,918	158,894	57,613	
2009	898,720	713,534	438,849	166,209	53,437	
2010	820,268	638,300	416,134	132,451	51,512	
2011	881,047	671,169	449,606	133,480	47,237	
2012	900,993	673,513	444,638	151,509	47,674	
2013	866,768	635,587	446,571	107,415	51,235	
2014	902,720	665,707	447,267	137,449	45,921	
2015	899,923	698,487	457,535	157,018	45,248	

Year reported	Liquefied petroleum gas		Aviation fuel	Small boats		Other fuel
	Off hwy.	Hwy. use		Gasoline	Diesel oil	
2001	3,783	310	335,897	9	47	(X)
2002	4,991	267	347,956	5	40	16
2003	5,739	391	248,065	2	22	281
2004	3,368	246	338,866	8	16	1,200
2005	1,222	300	324,799	15	42	1,786
2006	1	142	212,434	23	45	2,756
2007	-	108	235,653	262	626	17,314
2008	-	96	209,179	452	5,004	44,886
2009	-	66	185,185	1,215	1,324	52,434
2010	-	62	181,968	787	947	36,406
2011	-	50	209,878	1,103	4,022	35,672
2012	-	35	227,480	1,144	399	28,113
2013	-	23	231,181	1,390	1,257	27,696
2014	-	22	237,012	1,565	2,763	30,721
2015	-	16	201,435	1,571	2,658	34,442

X Not applicable.

Source: Hawaii State Department of Taxation, Tax Research & Planning, "Liquid Fuel Tax Base & Tax Collections - CY Ending December 31, 2015" <<http://files.hawaii.gov/tax/stats/monthly/2015cy-fuels-base.pdf>> accessed April 4, 2016.

Table 17.16-- LIQUID FUEL TAX BASE, BY COUNTY: 2015

[In thousands of gallons. 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 ending November 30]

Type of fuel	State total	City and Co. of Honolulu	County of Maui	County of Hawaii	County of Kauai
Total	899,923	516,267	156,469	143,442	83,745
Gasoline	457,535	286,407	64,233	78,631	28,265
Diesel oil, non-hwy.	157,018	120,907	13,201	7,070	15,839
Diesel oil, hwy. use	45,248	25,028	6,277	10,854	3,089
Liq. pet. gas, hwy. use	16	14	-	-	2
Small boats, gasoline	1,571	897	-	418	257
Small boats, diesel oil	2,658	2,658	-	-	-
Aviation fuel	201,435	78,521	72,339	28,793	21,783
Other fuel	34,442	1,836	418	17,677	14,511

Source: Hawaii State Department of Taxation, Tax Research & Planning, "Liquid Fuel Tax Base & Tax Collections - CY Ending December 31, 2015" <<http://files.hawaii.gov/tax/stats/monthly/2015cy-fuels-base.pdf>> accessed April 4, 2016.

**Table 17.17-- GASOLINE STATIONS (NAICS 447), BY COUNTY:
1998 TO 2013**

[Excludes most government employees, railroad employees, and self-employed persons. Statistics based on the North American Industry Classification System (NAICS) which replaced the Standard Industrial Classification (SIC) system used in the *County Business Patterns* prior to 1998. Therefore, comparability between the current data and data prior to 1998 may be limited]

Year	State total	City and County of Honolulu	Hawaii County	Kauai County	Maui County
1998	350	219	67	19	45
1999	334	206	63	19	46
2000	328	207	61	20	40
2001	322	204	61	17	40
2002	321	200	62	19	40
2003	314	194	63	19	38
2004	294	181	60	18	35
2005	301	188	59	19	35
2006	305	190	63	17	35
2007	289	179	58	14	38
2008	281	177	57	14	33
2009	277	169	58	15	35
2010	283	168	58	17	40
2011	283	168	61	16	38
2012	283	174	58	14	37
2013	286	176	58	15	37

Source: U.S. Census Bureau, *County Business Patterns, Hawaii* (annual). See also <http://factfinder.census.gov/> accessed March 28, 2016.

Table 17.18-- BOILERS AND PRESSURE VESSELS, BY ISLAND: 2015

[As of December 31]

Island	Total	Power boilers	Heating boilers	Pressure vessels
State total	9,665	418	2,223	7,024
Hawaii	1,212	57	237	918
Maui	1,160	62	284	814
Lanai	43	-	14	29
Molokai	49	1	10	38
Oahu	6,664	269	1,554	4,841
Kauai	537	29	124	384

Source: Hawaii State Department of Labor and Industrial Relations, Hawaii Occupational Safety & Health Division (HIOSH), Boiler and Elevator Inspection Branch, records.

Table 17.19-- FEDERAL OBLIGATIONS FOR RESEARCH AND DEVELOPMENT AND FOR R&D PLANT IN HAWAII: 2000 TO 2013

[Millions of dollars. For fiscal year ending September 30]

Year	R&D	R&D plant	Year	R&D	R&D plant
2000	209.7	1.8	2007	343.6	8.0
2001	293.1	2.8	2008	347.8	3.1
2002	375.2	6.4	2009	378.7	25.3
2003	349.6	1.9	2010	389.4	38.1
2004	392.6	7.0	2011 1/	403.6	23.3
2005	384.4	43.8	2012	382.5	15.4
2006	340.1	5.6	2013	348.0	13.0

1/ Revised from previous *Data Book*.

Source: National Science Foundation/Division of Science Resources Statistics, *Federal Funds for Research and Development* <<http://www.nsf.gov/statistics/2015/nsf15324/pdf/tab100.pdf>> accessed March 28, 2016.

Table 17.20-- PRIVATE SECTOR TECHNOLOGY JOBS AND EARNINGS: 2008 TO 2015

[Jobs includes paid employees and proprietors. 2008-2014 revised from previous *Data Book*]

	2008	2009	2010	2011	2012	2013	2014	2015	Earnings in 2015 1/
Technology sector	24,154	23,830	23,428	23,468	23,849	23,698	23,356	23,542	78,608
Computer services	6,401	6,498	6,327	6,247	6,371	6,388	6,361	6,455	82,520
Engineering and related services	6,223	5,999	5,908	5,966	6,080	6,023	6,110	6,104	92,678
Technical consulting services	3,992	3,924	4,066	4,099	4,273	4,354	4,230	4,324	56,700
Research & development services	2,820	2,821	2,587	2,582	2,543	2,413	2,126	2,058	86,981
Research and development in biotechnology	703	675	656	691	687	606	544	501	80,610
Information and telecommunications technology	1,445	1,298	1,292	1,248	1,288	1,407	1,347	1,400	67,516
Medical labs and imaging centers	1,719	1,689	1,701	1,743	1,707	1,697	1,784	1,855	62,614
Technology equipment distribution	869	857	803	776	776	741	702	714	106,947
Technology manufacturing	684	745	745	807	810	674	696	633	60,771
Alternate power generation	18	20	25	23	48	37	39	37	70,602
Chemical & pharmaceutical manufacturing	89	115	111	101	108	159	178	120	54,473
Other technology manufacturing	102	90	97	127	156	108	104	90	47,333
Medical device manufacturing	476	519	511	555	498	370	376	385	66,424

1/ Earnings include wages and salaries, supplements to wages and salaries, and proprietors' income.

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

Table 17.21-- TOP 30 STATES FOR TECHNOLOGY AND SCIENCE INDEX: 2014

[The State Technology and Science Index observes 79 unique indicators that are categorized into five major components. These components are human capital investment, research and development inputs, risk capital and entrepreneurial infrastructure, technology and science work force and technology concentration and dynamism]

State	Average score	State ranking
Massachusetts	86.59	1
Maryland	81.48	2
California	76.64	3
Colorado	74.60	4
Utah	74.01	5
Washington	72.71	6
Virginia	71.58	7
New Hampshire	66.88	8
Connecticut	65.51	9
Delaware	65.34	10
New York	64.99	11
Minnesota	64.35	12
Rhode Island	64.20	13
Pennsylvania	63.06	14
North Carolina	62.04	15
New Jersey	61.32	16
Oregon	59.55	17
Vermont	58.99	18
Arizona	58.96	19
Texas	58.56	20
Illinois	58.27	21
Michigan	57.10	22
Georgia	55.03	23
New Mexico	54.91	24
Wisconsin	53.90	25
Ohio	51.72	26
Indiana	50.40	27
Kansas	49.47	28
North Dakota	48.72	29
Nebraska	48.15	30
Hawaii	44.37	35

Source: Milken Institute "*State Technology and Science Index: Enduring Lessons for the Intangible Economy 2014*" 2014 Overall Ranking <<http://statetechandscience.org/state-tech-and-science-report-2014.pdf>> accessed May 13, 2015.

**Table 17.22-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING,
FOR THE UNIVERSITY OF HAWAII: 1991-1992 TO 2014-2015**

[Research and non-research awards received through the Office of Research Services, University of Hawaii, and non-competitive awards from the U.S. Department of Agriculture]

Fiscal year ending June 30	Total		Research		Non-research	
	Awards	Amount (dollars)	Awards	Amount (dollars)	Awards	Amount (dollars)
1991-1992	1,221	124,876,638	703	65,791,624	518	59,085,014
1992-1993	1,146	131,075,215	636	61,059,928	510	70,015,287
1993-1994	1,322	142,563,794	755	77,763,782	567	64,800,012
1994-1995	1,147	139,199,221	616	70,222,653	531	68,976,568
1995-1996	1,191	134,469,155	697	76,698,552	494	57,770,603
1996-1997	1,255	160,859,800	724	89,131,636	531	71,728,164
1997-1998	1,300	159,948,612	763	91,746,988	537	68,201,624
1998-1999	1,254	164,168,101	707	92,737,645	547	71,430,456
1999-2000	1,379	180,629,855	767	102,845,010	612	77,784,845
2000-2001	1,405	216,233,918	835	132,833,308	570	83,400,610
2001-2002	1,629	252,370,477	971	141,875,022	658	110,495,455
2002-2003	1,646	323,868,218	976	190,374,465	670	133,493,753
2003-2004	1,675	328,982,431	1,002	199,944,709	673	129,037,722
2004-2005	1,742	354,127,142	1,022	209,196,531	720	144,930,611
2005-2006	1,785	433,360,395	1,068	236,708,881	717	196,651,514
2006-2007	1,778	354,031,667	1,081	209,909,883	697	144,121,784
2007-2008	1,758	367,580,150	1,093	211,778,184	665	155,801,966
2008-2009	1,990	413,963,739	1,147	246,546,713	843	167,417,026
2009-2010	1,944	452,408,669	1,161	255,734,059	783	196,674,610
2010-2011	1,799	488,597,908	1,070	281,745,764	729	206,852,144
2011-2012	1,727	435,874,967	1,039	256,980,266	688	178,894,701
2012-2013	1,801	409,783,318	1,006	222,207,539	795	187,575,779
2013-2014	1,774	392,314,955	1,081	238,286,786	693	154,028,169
2014-2015	1,823	425,650,338	1,080	236,114,373	743	189,535,965

Source: University of Hawaii, Office of Research Services, *2014-2015 Online Executive Managerial Report* <<http://www.ors.hawaii.edu/index.php/reports/111-reports/annual-reports/347-2014-2015-annual-report>> accessed April 11, 2016 and previous reports.

Table 17.23-- RESEARCH AND DEVELOPMENT EXPENDITURES AT DOCTORATE-GRANTING INSTITUTIONS: 1991 TO 2014

[In thousands of dollars. For fiscal year ending June 30]

Year	Total	Federally financed	State and local government financed	Business 1/	Nonprofit	Institutionally financed	All other sources
1991	78,166	44,857	27,321	856	(NA)	3,391	1,741
1992	80,258	47,684	26,775	337	(NA)	3,319	2,143
1993	73,961	41,362	27,099	151	(NA)	3,109	2,240
1994	70,079	39,392	25,204	434	(NA)	3,290	1,759
1995	78,429	44,238	26,789	299	(NA)	3,738	3,365
1996	111,202	66,902	31,826	8,088	(NA)	4,386	-
1997	120,107	72,421	28,440	5,944	(NA)	13,297	5
1998	148,007	86,886	37,002	10,949	(NA)	13,170	-
1999	156,810	93,418	35,111	13,021	(NA)	15,260	-
2000	161,300	95,419	35,474	11,158	(NA)	19,249	-
2001	156,976	97,716	33,125	7,232	(NA)	18,903	-
2002	172,664	119,381	31,062	9,971	(NA)	12,232	18
2003	184,602	148,662	11,822	6,931	(NA)	17,171	16
2004	241,346	191,252	8,815	21,234	(NA)	19,892	153
2005	240,247	199,135	7,077	12,155	(NA)	21,282	598
2006	257,478	210,097	8,933	12,551	(NA)	25,888	9
2007	274,373	215,806	15,534	22,080	(NA)	16,352	4,601
2008	278,751	200,385	18,192	26,928	(NA)	28,132	5,114
2009	300,302	211,256	17,479	30,357	(NA)	32,198	9,012
2010	317,942	208,540	23,669	24,315	7,989	45,016	8,413
2011	363,887	241,686	22,399	23,362	11,019	57,502	7,919
2012	335,704	215,593	16,406	21,389	6,642	67,934	7,740
2013	343,802	241,600	11,812	73,645	3,863	6,270	6,612
2014	330,897	212,525	8,115	3,436	6,759	89,409	10,653

NA Not available.

1/ Category called industry financed before 2010.

Source: National Science Foundation, Division of Science Resources Statistics, Academic Research and Development Expenditures: Fiscal Year (annual) Table 17 <<http://www.nsf.gov/statistics/rdexpenditures/>> accessed November 4, 2011 and Higher Education Research and Development (annual) <<http://ncesdata.nsf.gov/herd/2014/>> accessed April 11, 2016.

Table 17.24-- PATENTS ISSUED TO HAWAII RESIDENTS: 1992 TO 2015

Year	Patents	Year	Patents	Year	Patents
1992	81	2000	93	2008	101
1993	106	2001	107	2009	96
1994	99	2002	91	2010	144
1995	84	2003	96	2011	128
1996	104	2004	86	2012	131
1997	93	2005	58	2013	146
1998	93	2006	101	2014	160
1999	97	2007	82	2015	166

Source: U.S. Patent and Trademark Office, Electronic Information Products Division / PTMT, *Patent Counts by Country/State and Year, All Patents, All Types, January 1, 1977 -- December 31, 2015* (December 2015) <http://www.uspto.gov/web/offices/ac/ido/oeip/taf/cst_all.htm> accessed April 12, 2016.

**Table 17.25-- ASTRONOMY AND RELATED FACILITIES AT
THE SUMMITS OF MAUNAKEA AND HALEAKALA: 2015**

Facility (mirror diameter in meters)	Capital cost 1/ (\$ mil)	Annual operating cost (\$ mil)	County based staff	Operational
Maunakea observatories				
Total	601	72.4	484	(X)
UH 2.2-m (Optical/Infrared)	5	1.0	6	1970
Canada-France-Hawaii 3.6-m (Optical/Infrared)	30	7.4	45	1979
NASA IRTF 3.0-m (Infrared)	10	5.1	19	1979
UKIRT 3.8-m (Infrared)	5	2.2	6	1979
James Clerk Maxwell 15-m Submillimeter	32	4.7	35	1986
VLBA Antenna 25-m (Radio)	7	0.4	2	1992
W.M. Keck Observatory (Keck I & II) 10-m x 2 (Optical/Infrared)	170	13.5	120	1992/1996
Subaru 8-m (Optical/Infrared)	170	17.0	101	1999
Fredrick C. Gillett Gemini 8-m (Optical/Infrared)	92	13.7	83	1999
Submillimeter Array 8x6-m	80	5.5	23	2003
Maunakea Observatories Support Services	(X)	2/ 5.4	44	1980
Haleakala observatories				
Total	749	40.73	202	(X)
Mees Solar Observatory	1	0.2	1	1963
Haleakala Observatories Projects	(NA)	0.2	2	(NA)
Maui Space Surveillance Site (MSSS) 3/ Ground-Based Electro-Optical Deep Space Surveillance (GEODSS)	250	26.3	117	1965
Faulkes 2-m Telescope	25	6.1	16	1983
Transportable Laser Ranging System (TLRS4)	10	0.6	2	2003
Panoramic Survey Telescope And Rapid Response System (Pan-STARRS)	1	0.5	5	2005
Haleakala Support Facilities	110	5.6	11	2009
Daniel K. Inouye Solar Telescope (DKIST)	9	1.2	13	1962/2008
	344	4/ 18.0	35	(5/)

X Not applicable.

NA Not available.

1/ Historical cost, not adjusted for inflation, and not including subsequent capital improvements for Maunakea Observation.

2/ Only \$1.9 million of this included in total as the other \$3.5 million are part of facility operating costs.

3/ Formerly Air Force Maui Optical Station (AMOS).

4/ Operational cost of 18 million not included in the total.

5/ Daniel K. Inouye Solar Telescope scheduled to be operational by 2019.

Source: University of Hawaii at Manoa, Institute for Astronomy, records.