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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.

Table 17.01-- CONSUMPTION OF ENERGY, BY SOURCE (PHYSICAL UNITS): 1985 TO 2021

Year	Coal (1,000 short tons)	Natural gas (billion cubic feet) 1/	Petroleum (1,000 barrels)	Hydroelectric power (million kWh) 2/	Fuel ethanol (1,000 barrels) 3/
1985	46	2	40,006	86	-
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	-
2001	829	3	41,479	101	-
2002	748	3	44,772	95	-
2003	784	3	46,861	91	-
2004	797	3	49,098	94	-
2005	740	3	51,267	96	344
2006	714	3	51,564	120	392
2007	764	3	52,905	92	501
2008	840	3	42,397	84	930
2009	791	3	42,472	113	1,065
2010	803	3	46,356	70	804
2011	783	3	47,367	93	933
2012	803	3	46,173	115	847
2013	753	3	46,470	78	874
2014	831	3	44,785	94	948
2015	747	3	45,635	121	1,147
2016	787	3	45,280	91	1,152
2017	759	3	47,091	66	1,162
2018	734	3	46,978	97	1,131
2019	717	3	47,435	95	1,158
2020	670	2	33,806	99	913
2021	634	3	40,205	115	1,042

1/ Includes supplemental gaseous fuels.

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

3/ Includes denaturant.

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) "State Energy Consumption Estimates, Selected Years, 1960-2020, Hawaii CT1" (June 2022) <https://www.eia.gov/state/seds/sep_use/notes/use_print.pdf> accessed June 30, 2022; and State Energy Data System (SEDS): 2021 <<https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US>> accessed June 16, 2023.

Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1985 TO 2021

[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/
1985	7/ 248.5	1.1	-	232.1	0.9	14.2	0.2	-	-	2.7	39.9
1990	321.4	0.7	-	292.8	0.8	25.9	(8/)	0.9	0.3	3.0	45.5
1995	296.8	19.9	-	252.3	1.0	19.8	2.4	1.2	0.2	2.9	49.0
2000	7/ 273.5	17.7	0.1	235.2	1.1	15.2	2.7	1.3	0.2	3.0	48.3
2005	324.7	16.5	0.2	293.8	1.0	9.6	2.2	1.3	0.1	2.9	57.0
2006	7/ 327.4	16.1	0.2	295.5	1.2	10.1	2.1	1.4	0.8	2.9	59.8
2007	337.8	17.1	0.2	303.5	0.9	9.9	2.3	1.5	2.4	3.0	58.3
2008	7/ 276.6	18.1	0.1	239.1	0.8	12.0	2.3	1.8	2.4	2.8	54.5
2009	7/ 276.0	17.1	0.2	238.9	1.1	12.5	1.6	2.1	2.5	2.7	55.1
2010	7/ 297.5	17.1	0.2	262.0	0.7	10.7	2.0	2.3	2.5	2.7	50.6
2011	7/ 302.6	16.1	0.2	265.8	0.9	11.2	2.2	2.9	3.3	2.7	56.4
2012	297.4	16.6	0.2	259.0	1.1	10.0	2.5	4.4	3.6	2.8	53.6
2013	7/ 301.8	15.3	0.2	260.4	0.7	11.7	2.6	6.1	4.8	2.9	54.4
2014	295.2	17.2	0.2	249.8	0.9	11.6	2.4	7.6	5.5	2.8	54.8
2015	299.0	15.6	0.2	253.7	1.1	12.1	2.2	8.4	5.7	2.9	55.9
2016	7/ 300.3	16.4	0.2	251.4	0.8	13.4	2.4	9.8	5.9	3.0	56.7
2017	308.4	14.9	0.2	261.3	0.6	10.9	3.0	12.6	4.9	3.0	56.4
2018	7/ 306.4	14.4	0.2	260.6	0.9	10.7	1.0	13.1	5.5	3.2	55.4
2019	7/ 307.7	14.2	0.2	263.5	0.8	10.0	(8/)	14.3	4.7	3.1	55.7
2020	7/ 232.6	13.3	0.2	187.6	0.9	8.4	0.1	16.9	5.2	2.3	43.5
2021	270.5	12.6	0.1	227.2	1.0	4.6	1.6	17.6	5.8	2.6	49.3

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Table 17.02-- CONSUMPTION OF ENERGY, BY SOURCE: 1985 TO 2021 -- Con.

1/ Excluding fossil fuels as commingled.

2/ Supplemental gaseous fuels (SGF) and fuel ethanol are consumed with natural gas and motor gasoline, respectively. In 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/ Revised from previous *Data Book*.

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

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) "State Energy Consumption Estimates, Selected Years, 1960-2020, Hawaii CT2" (June 2022) <https://www.eia.gov/state/seds/sep_use/notes/use_print.pdf> accessed June 30, 2022; and State Energy Data System (SEDS): 2021 <<https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US>> accessed June 16, 2023.

**Table 17.03-- CONSUMPTION OF ENERGY, BY END-USE SECTOR:
1960 TO 2021**

[Trillion Btu]

Year	Residential 1/	Commercial 1/ 2/ 3/	Industrial 1/ 2/	Transportation 3/	Electric power 1/
1960	7.1	5.3	20.6	61.8	17.6
1965	9.9	7.0	34.7	79.0	27.6
1970	15.5	12.5	43.6	125.3	43.2
1975	19.0	14.5	50.3	130.5	58.8
1980	21.0	20.1	74.5	146.7	69.7
1985	19.9	18.4	67.3	142.9	69.8
1990	30.7	37.2	98.9	154.5	105.9
1995	31.3	34.6	92.9	138.0	105.5
2000	33.0	37.3	77.9	125.1	108.5
2005	33.3	39.9	72.4	179.1	104.1
2006	33.7	40.7	71.6	181.4	104.7
2007	34.1	40.2	69.0	194.4	105.7
2008	33.4	40.9	65.8	136.5	102.8
2009	33.3	40.7	69.1	132.8	100.2
2010	32.7	40.1	68.1	156.7	98.7
2011	32.5	41.2	67.6	161.3	98.8
2012	31.5	39.3	65.1	161.5	94.8
2013	30.8	40.6	65.4	165.0	92.3
2014	31.4	41.1	64.6	158.1	92.1
2015	31.6	41.3	64.2	161.9	91.6
2016	32.5	41.5	63.1	163.3	91.8
2017	34.0	43.0	60.5	170.9	91.3
2018	34.2	42.7	56.3	173.1	89.7
2019	34.5	42.9	56.1	174.2	88.9
2020	36.8	39.4	47.3	109.0	85.5
2021	37.1	41.1	49.7	142.7	87.3

1/ 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.

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

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

Source: U.S. Department of Energy, Energy Information Administration, State Energy Data System (SEDS) "State Energy Consumption Estimates, Selected Years, 1960-2020, Hawaii CT4-CT8, (June 2022) and earlier editions <https://www.eia.gov/state/seds/sep_use/notes/use_print.pdf> accessed June 30, 2022; and State Energy Data System (SEDS): 2021 <<https://www.eia.gov/state/seds/seds-data-fuel.php?sid=US#TotalEnergy>> accessed June 16, 2023.

Table 17.04-- PRIMARY ENERGY CONSUMPTION AND ELECTRICITY SALES, TOTAL AND PER CAPITA: 1996 TO 2021

Year	Primary energy consumption		Electricity sales by utilities	
	Total (billion Btu) 1/	Per capita (million Btu) 1/	Total (1,000 kWh)	Per capita (kWh) 1/
1996	283,060	235.1	9,379	7,791
1997	273,483	225.7	9,363	7,728
1998	273,388	225.0	9,261	7,621
1999	269,352	222.5	9,381	7,751
2000	273,307	225.2	9,691	7,986
2001	270,122	220.3	9,785	7,982
2002	284,663	229.6	9,892	7,980
2003	300,914	240.5	10,391	8,305
2004	314,720	247.1	10,732	8,427
2005	324,737	251.2	10,539	8,153
2006	327,288	249.9	10,568	8,069
2007	337,829	256.8	10,585	8,045
2008	276,654	207.7	10,390	7,799
2009	275,928	204.9	10,126	7,519
2010	297,491	218.2	10,017	7,344
2011	302,442	219.3	9,962	7,221
2012	297,182	213.2	9,639	6,909
2013	301,931	214.3	9,503	6,745
2014	295,243	208.6	9,475	6,695
2015	298,984	210.1	9,511	6,684
2016	300,382	210.2	9,445	6,610
2017	308,366	216.3	9,324	6,540
2018	306,328	215.3	9,337	6,561
2019	307,983	217.4	9,453	6,678
2020	232,453	160.2	8,797	6,252
2021	270,210	186.7	8,936	5,731

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, 2023 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.05-- PRIMARY ENERGY CONSUMPTION, BY SOURCE: 2006 TO 2021

[Billion Btu. Components may not sum to totals due to rounding. Revised from previous *Data Book*]

Year	Total	Petroleum	Coal	Natural gas	Renewable
2006	327,288	295,474	16,102	179	15,534
2007	337,829	303,540	17,107	173	17,009
2008	276,654	239,055	18,095	148	19,356
2009	275,928	238,944	17,083	167	19,734
2010	297,491	264,993	17,117	161	18,177
2011	302,442	269,611	16,080	158	20,402
2012	297,182	262,327	16,572	187	21,430
2013	301,931	263,998	15,306	197	25,989
2014	295,243	253,751	17,241	167	27,996
2015	298,984	258,584	15,632	196	29,420
2016	300,382	256,648	16,431	162	32,368
2017	308,366	266,774	14,948	163	32,003
2018	306,328	265,984	14,367	192	31,126
2019	307,983	268,797	14,179	228	29,839
2020	232,453	191,501	13,281	199	31,467
2021	270,210	227,240	12,566	133	35,105
Year	Biomass	Solar	Wind	Geothermal	Hydro
2006	10,054	1,385	790	2,114	1,191
2007	9,936	1,526	2,354	2,280	913
2008	12,030	1,813	2,365	2,316	831
2009	12,482	2,055	2,454	1,643	1,099
2010	10,700	2,278	2,547	1,964	687
2011	11,187	2,816	3,311	2,183	905
2012	10,026	4,223	3,599	2,491	1,090
2013	11,720	6,090	4,802	2,630	747
2014	11,624	7,553	5,503	2,422	895
2015	12,075	8,356	5,710	2,154	1,129
2016	13,414	9,810	5,900	2,409	839
2017	10,944	12,573	4,902	2,980	609
2018	10,700	13,062	5,480	1/ 1,010	879
2019	9,971	14,308	4,714	1/ 8	842
2020	8,428	16,888	5,196	1/ 92	867
2021	9,041	17,596	5,818	1,633	1,017

1/ In May 2018, the Puna Geothermal Venture facility shut down due to a volcanic eruption and reopened in October 2020. Residual fuel was used during the closure period.

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, 2023 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.06-- ELECTRICITY GENERATION, BY SOURCE: 2008 TO 2021

[Millions of kWh generated]

Year	Total	Petroleum	Coal	Wind	Biomass 1/
2008	11,376.384	8,669.934	1,647.592	240.023	302.423
2009	11,010.534	8,289.107	1,500.166	251.427	284.427
2010	10,836.036	8,087.337	1,545.513	261.120	283.474
2011	10,723.333	7,923.925	1,424.036	340.812	312.627
2012	10,469.268	7,482.760	1,537.340	378.234	280.976
2013	10,267.052	7,222.766	1,403.754	503.310	329.364
2014	10,204.158	6,925.919	1,511.184	578.617	334.030
2015	10,119.500	7,023.150	1,337.412	612.772	320.941
2016	9,948.846	6,640.316	1,497.380	639.127	359.466
2017	9,812.968	6,633.596	1,375.724	532.055	292.762
2018	9,796.773	6,748.947	1,311.203	601.934	305.513
2019	9,749.997	6,864.169	1,301.946	529.310	291.542
2020	9,079.019	6,149.205	1,165.147	592.238	256.221
2021	9,182.190	6,155.207	1,084.555	657.891	282.637
Year	Geothermal	Hydro	Other gases 2/	Solar	Others 3/
2008	234.333	84.343	38.572	0.018	159.146
2009	167.591	112.649	22.345	1.390	381.432
2010	200.595	70.423	21.915	1.770	363.880
2011	223.888	93.141	35.250	3.593	366.061
2012	260.997	114.581	47.036	4.608	362.736
2013	274.841	78.295	41.330	19.466	393.927
2014	253.841	94.083	62.204	39.262	405.019
2015	230.340	121.170	50.155	54.397	369.163
2016	260.102	90.849	51.006	88.511	322.089
2017	322.592	66.075	52.022	175.019	363.123
2018	110.089	96.520	55.722	184.576	382.269
2019	(4/)	94.542	5.624	268.138	394.726
2020	9.640	98.820	2.874	484.030	320.844
2021	183.751	114.971	-	507.234	195.944

1/ Biomass includes biogenic municipal solid waste, other biomass liquid (biofuel), other biomass solids agricultural by-products, and wood and wood waste.

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

3/ Others include other fuel, including but not limited to non-biogenic municipal solid waste and energy storage.

4/ In May 2018, the Puna Geothermal Venture facility shut down due to a volcanic eruption and reopened in October 2020. Residual fuel was used during the closure period.

Source: U.S. Department of Energy, Energy Information Administration, Form EIA-923 detailed data with previous form data (EIA-906/920) <<https://www.eia.gov/electricity/data/eia923/>> accessed June 26, 2023 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.07-- ELECTRICITY PRODUCTION, BY SOURCE AND BY ISLAND: 2021

[Million kWh. Components may not sum to total due to rounding]

Island	Total	Petroleum	Coal	Wind	Biomass 1/
State total	9,182.19	6,155.21	1,084.56	657.89	282.64
Hawaii	1,074.17	679.04	-	120.76	47.49
Maui	1,032.16	753.06	-	266.02	-
Lanai	35.63	35.63	-	-	-
Molokai	31.80	31.80	-	-	-
Oahu	6,564.24	4,471.62	1,084.56	271.11	186.72
Kauai	442.96	184.06	-	-	48.43
Not specified	1.24	-	-	-	-
Island	Geothermal	Hydro	Other gases 2/	Solar	Others 3/
State total	183.75	114.97	-	507.23	201.51
Hawaii	183.75	43.13	-	-	-
Maui	-	0.63	-	12.64	0.19
Lanai	-	-	-	-	-
Molokai	-	-	-	-	-
Oahu	-	-	-	351.51	198.72
Kauai	-	71.21	-	141.85	2.59
Not specified	-	-	-	1.24	-

1/ Biomass includes biogenic municipal solid waste, other biomass liquid (biofuel), other biomass solids agricultural by-products, and wood and wood waste.

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

3/ Other includes other fuel, including but not limited to non-biogenic municipal solid waste and energy storage.

Source: U.S. Department of Energy, Energy Information Administration, Form EIA-923 detailed data with previous form data (EIA-906/920) <<https://www.eia.gov/electricity/data/eia923/>> accessed June 26, 2023 and calculations by Hawaii State Department of Business, Economic Development and Tourism.

**Table 17.08 -- FUEL, ELECTRICITY, AND TOTAL ENERGY EXPENDITURES
BY SOURCE: 1995 TO 2021**

[Millions of dollars]

Year	Total energy expenditures	Primary energy expenditures	Electricity additions	Retail electricity expenditures	Electricity fuel cost
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	3,335.9	2,341.4	994.5	1,478.9	484.4
2004	4,024.6	2,886.3	1,138.3	1,654.9	516.6
2005	4,996.9	3,892.2	1/ 1,104.6	1,897.8	1/ 793.2
2006	5,729.1	4,535.9	1,193.2	2,152.2	1/ 959.0
2007	6,177.1	4,994.8	1,182.3	2,213.3	1,031.0
2008	6,828.5	5,297.3	1/ 1,531.1	2,978.3	1/ 1,447.2
2009	4,804.8	3,540.0	1,264.8	2,111.7	846.9
2010	6,199.8	4,866.8	1,333.0	2,473.3	1,140.3
2011	8,067.9	6,569.5	1,498.4	3,090.5	1,592.1
2012	8,289.5	6,690.3	1,599.2	3,219.0	1,619.8
2013	8,214.8	6,543.6	1,671.2	3,153.6	1,482.4
2014	1/ 7,769.9	5,983.6	1,786.2	3,159.3	1/ 1,373.1
2015	1/ 5,906.4	4,207.6	1,698.7	2,474.9	1/ 776.2
2016	5,215.5	3,580.7	1,634.8	2,242.6	607.8
2017	5,843.1	4,194.4	1,648.8	2,416.2	1/ 767.4
2018	6,828.7	5,080.1	1,748.6	2,710.1	961.5
2019	1/ 6,731.5	1/ 4,942.6	1/ 1,788.9	2,700.5	1/ 911.6
2020	1/ 4,695.2	1/ 2,911.3	1,783.9	2,412.7	628.8
2021	6,346.8	4,548.3	1,798.5	2,696.6	898.1

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, 2023; and calculations by the Hawaii State Department of Business, Economic Development and Tourism.

Table 17.09-- ELECTRIC UTILITIES: 2011 TO 2022

Year	Customers, Dec. 31			Power sold (1,000 kWh)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
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	488,456	423,281	65,175	9,500,990	2,608,786	6,892,205
2014	492,358	426,862	65,496	9,406,166	2,538,865	6,867,301
2015	494,631	429,084	65,547	9,388,577	2,558,285	6,830,292
2016	497,292	431,496	65,796	9,284,424	2,496,694	6,787,729
2017	499,664	435,104	64,560	9,135,531	2,503,831	6,631,700
2018	500,794	436,545	64,249	9,139,886	2,585,508	6,554,378
2019	503,515	439,022	64,493	9,200,694	2,620,536	6,580,158
2020	506,484	442,170	64,314	8,535,501	2,702,575	5,832,926
2021	509,307	444,596	64,711	8,696,259	2,677,818	6,018,441
2022	508,566	443,737	64,829	8,814,222	2,607,153	6,207,069

Year	Average annual use (kWh) 2/		Average rate (dollars per kWh)		Revenues (\$1,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
2011	7,004	109,336	0.34680	0.30304	3,146,910	1,015,685	2,131,225
2012	6,518	107,014	0.37343	0.32727	3,281,058	1,022,944	2,258,114
2013	6,163	105,749	0.36887	0.31787	3,153,166	962,308	2,190,858
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
2016	5,786	103,163	0.27819	0.22555	2,225,520	694,564	1,530,956
2017	5,755	102,722	0.29967	0.24800	2,394,971	750,316	1,644,655
2018	5,923	102,015	0.32999	0.28000	2,688,400	853,198	1,835,202
2019	5,969	102,029	0.32612	0.27612	2,671,502	854,599	1,816,903
2020	6,112	90,694	0.31256	0.26807	2,408,354	844,710	1,563,644
2021	6,023	93,005	0.34032	0.29076	2,661,260	911,321	1,749,938
2022	5,875	95,745	0.43935	0.38605	3,541,686	1,145,440	2,396,246

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 records; Hawaii State Department of Business, Economic Development and Tourism, Strategic Industries Division and records; *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 17.10-- ELECTRIC UTILITIES, BY ISLAND: 2022

Island	Customers, Dec. 31			Net peak demand (mW)	Power sold (1,000 kWh)		
	Total	Residential 1/	Other		Total	Residential 1/	Other
State total	508,566	443,737	64,829	1,232.8	8,814,222	2,607,153	6,207,069
Oahu	306,978	273,352	33,626	847.9	6,213,010	1,583,392	4,629,618
Hawaii	88,757	77,214	11,543	126.4	1,053,833	434,187	619,646
Kauai	38,898	29,993	8,905	47.3	458,054	191,955	266,099
Lanai	1,748	1,485	263	6.0	34,745	8,615	26,129
Maui	68,910	58,963	9,947	199.4	1,025,930	377,600	648,330
Molokai	3,275	2,730	545	5.8	28,650	11,404	17,246
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	5,875	95,745	0.43935	0.38605	3,541,686	1,145,440	2,396,246
Oahu	5,793	137,680	0.43428	0.37468	2,422,232	687,629	1,734,603
Hawaii	5,623	53,682	0.47951	0.43794	479,563	208,195	271,368
Kauai	6,400	29,882	0.39314	0.37430	175,068	75,466	99,602
Lanai	5,802	99,351	0.54930	0.55180	19,151	4,732	14,418
Maui	6,404	65,178	0.43256	0.41236	430,676	163,333	267,343
Molokai	4,177	31,644	0.53346	0.51682	14,997	6,084	8,913

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) and calculations by the Hawaii State Department of Business, Economic Development and Tourism.

Table 17.11-- GAS UTILITIES: 2011 TO 2022

[Excludes bottled gas]

Year	Customers, Dec. 31			Gas sold (million therms)		
	Total	Residential 1/	Other	Total	Residential 1/	Other
2011	35,226	31,552	3,674	32.4	4.5	27.9
2012	35,183	31,478	3,705	32.3	4.6	27.7
2013	35,116	31,412	3,704	33.1	4.4	28.7
2014	35,186	31,463	3,723	33.1	4.3	28.8
2015	35,248	31,482	3,766	34.1	4.3	29.8
2016	35,408	31,574	3,834	35.5	4.3	31.2
2017	35,494	31,638	3,856	36.2	4.3	31.8
2018	35,694	31,794	3,900	37.6	4.4	33.2
2019	35,826	31,906	3,920	37.1	4.2	32.9
2020	35,990	32,137	3,853	27.4	4.4	23.1
2021	35,983	32,112	3,871	31.4	4.5	26.9
2022	35,925	31,987	3,938	33.7	4.3	29.4

Year	Average annual use (therms) 2/		Average rate (dollars per therm)		Revenues (\$1,000,000)		
	Residential 1/	Other	Residential 1/	Other	Total	Residential 1/	Other
2011	144	7,585	6.05	4.02	139.5	27.5	112.0
2012	146	7,481	5.61	4.28	144.5	25.8	118.7
2013	141	7,737	5.45	3.91	136.3	24.2	112.1
2014	137	7,738	5.48	3.89	135.8	23.6	112.2
2015	136	7,909	4.68	2.94	107.6	20.1	87.5
2016	138	8,129	4.31	2.50	96.8	18.7	78.0
2017	160	6,895	4.08	2.19	107.1	19.7	87.4
2018	138	8,511	5.09	3.13	126.1	22.3	103.9
2019	131	8,391	5.36	3.13	125.5	22.4	103.1
2020	136	5,983	4.83	2.82	86.2	21.1	65.0
2021	140	6,960	5.70	3.63	123.3	25.6	97.7
2022	133	7,475	6.76	4.65	165.7	28.8	136.9

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 records; Hawaii State Department of Business, Economic Development and Tourism, Strategic Industries Division and records; Hawaii Gas The Clean Energy Company, *Hawaii Gas Utility Monthly Financial Reports*; calculations by Hawaii State Department of Business, Economic Development and Tourism.

Table 17.12-- GAS UTILITIES, BY ISLAND: 2022

[Excludes bottled gas]

Island	Customers, December 31			Gas sold (1,000 therms)		
	Total	Residen- tial 1/	Other	Total	Residen- tial 1/	Other
State total	35,925	31,987	3,938	33,697	4,262	29,435
Oahu	31,850	28,377	3,473	29,790	3,506	26,284
Hawaii	2,042	1,709	333	2,569	428	2,141
Kauai	1,109	1,082	27	285	168	117
Lanai	25	25	-	17	17	-
Maui	817	712	105	1,024	131	893
Molokai	82	82	-	12	12	-

Island	Average annual use per customer (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	133	7,475	6.76	4.65	165,716	28,799	136,917
Oahu	124	7,568	7.17	4.87	152,999	25,123	127,876
Hawaii	250	6,429	4.76	2.85	8,141	2,038	6,103
Kauai	155	4,333	5.08	2.89	1,192	854	338
Lanai	680	-	4.53	(NA)	77	77	-
Maui	184	8,505	4.95	2.91	3,249	649	2,600
Molokai	146	-	4.83	(NA)	58	58	-

NA Not available.

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*; and Hawaii State Department of Business, Economic Development & Tourism, calculations and records.

**Table 17.13-- SERVICE PROVIDED BY HAWAIIAN ELECTRIC COMPANY, INC.
ON OAHU: 1991 TO 2022**

Year	Number of customers, Dec. 31		Net input (1,000 kWh) 1/	Electricity sales (1,000 kWh)	Average annual residential use (kWh) 2/	Average residential rate (dollars per kWh)	Generating capability Dec. 31 (1,000 kW) 3/
	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
2016	304,261	270,451	6,963,058	6,660,195	5,856	0.26069	1,735
2017	304,948	271,065	6,854,689	6,548,697	5,829	0.28215	1,735
2018	305,456	269,981	6,807,785	6,525,670	5,917	0.31194	1,794
2019	306,368	270,683	6,833,764	6,563,104	6,002	0.31065	1,794
2020	307,378	271,747	6,473,516	6,183,093	6,355	0.28763	1,794
2021	308,721	272,889	6,435,738	6,169,654	6,009	0.32493	1,794
2022	306,978	271,104	6,495,139	6,210,797	5,758	0.43452	1,614

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 2022**

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	141
2013	31,730	28,481	29,711	3,923	138
2014	31,766	28,504	29,703	3,790	133
2015	31,772	28,475	30,642	3,768	132
2016	31,829	28,469	32,109	3,807	134
2017	31,828	28,442	32,549	3,748	132
2018	31,861	28,442	33,654	3,729	131
2019	31,880	28,447	33,268	3,564	125
2020	31,972	28,598	24,316	3,757	131
2021	31,930	28,540	27,808	3,727	131
2022	31,850	28,445	29,756	3,496	123

1/ Includes liquefied petroleum gas.

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

Table 17.15-- LIQUID FUEL TAX BASE: 2010 TO 2022

[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	
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	
2016	844,235	671,751	461,719	136,249	46,245	
2017	945,406	697,345	476,901	139,233	48,092	
2018	930,729	665,805	463,671	116,955	47,573	
2019	969,494	700,513	465,325	141,648	46,766	
2020	723,690	579,900	372,276	136,243	40,848	
2021	880,782	622,555	414,423	131,118	45,175	
2022	970,230	662,188	419,799	156,974	52,591	

Year reported	Liquefied petroleum gas		Aviation fuel	Small boats		Other fuel 1/
	Off hwy.	Hwy. use		Gasoline	Diesel oil	
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
2016	-	12	172,483	541	3,221	23,765
2017	-	7	248,061	1,034	3,422	28,656
2018	-	26	264,923	1,567	2,625	33,387
2019	-	8	268,981	1,382	3,321	42,062
2020	-	15	143,790	1,188	3,382	25,948
2021	-	20	258,228	744	5,000	26,074
2022	-	20	308,042	1,278	4,370	27,155

1/ Includes ethanol, methanol, biodiesel, naphtha, compressed natural gas, and liquefied natural gas.

Source: Hawaii State Department of Taxation, Tax Research & Planning, *Liquid Fuel Tax Base & Tax Collections*, Calendar Year 2022 (annual) <https://tax.hawaii.gov/stats/a5_3txcolrpt/> accessed June 21, 2023.

Table 17.16-- LIQUID FUEL TAX BASE, BY COUNTY: 2021 AND 2022

[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 and year	State total	Honolulu County	Maui County	Hawaii County	Kauai County
2021					
Total	880,782.4	423,884.9	208,267.6	183,715.3	64,914.7
Gasoline	414,423.4	248,815.6	61,299.7	77,508.1	26,800.1
Diesel oil, non-hwy.	131,118.3	43,809.4	50,080.3	31,893.2	5,335.4
Diesel oil, hwy. use	45,174.6	23,134.4	5,441.5	13,505.6	3,093.1
Liq. pet. gas, hwy. use	20.4	18.6	0.1	1.3	0.4
Small boats, gasoline	744.4	352.2	56.6	335.6	-
Small boats, diesel oil	4,999.8	4,999.8	-	-	-
Aviation fuel	258,227.6	101,383.8	91,162.6	47,147.0	18,534.2
Other fuel 1/	26,073.9	1,371.1	226.8	13,324.4	11,151.5
2022					
Total	970,229.5	471,232.0	225,807.8	189,874.0	83,315.8
Gasoline	419,799.4	244,605.5	63,690.5	82,204.4	29,298.9
Diesel oil, non-hwy.	156,974.4	61,939.6	54,016.4	32,579.3	8,439.2
Diesel oil, hwy. use	52,591.4	31,417.8	5,882.6	12,222.4	3,068.6
Liq. pet. gas, hwy. use	19.9	17.9	0.1	1.1	0.8
Small boats, gasoline	1,277.9	883.8	66.9	327.1	-
Small boats, diesel oil	4,369.8	4,369.8	-	-	-
Aviation fuel	308,041.5	126,789.7	101,879.3	49,710.6	29,662.0
Other fuel 1/	27,155.3	1,207.9	272.1	12,829.0	12,846.3

1/ Includes ethanol, methanol, biodiesel, naphtha, compressed natural gas, and liquefied natural gas.

Source: Hawaii State Department of Taxation, Tax Research & Planning, *Liquid Fuel Tax Base & Tax Collections*, Calendar Year, ending December 31, 2021 and 2022 <https://tax.hawaii.gov/stats/a5_3txcolrpt/> accessed June 23, 2023.

Table 17.17-- GASOLINE STATIONS (NAICS 447), BY COUNTY: 1998 TO 2021

[Statistics are based on the North American Industry Classification System (NAICS)]

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
2014	284	171	57	17	39
2015	284	166	57	23	38
2016	264	153	54	20	37
2017	248	141	56	16	35
2018	244	139	55	16	34
2019	246	140	53	19	34
2020	248	144	52	16	36
2021	253	144	57	16	36

Source: U.S. Census Bureau, County Business Patterns, Table CB2000CBP <<http://data.census.gov/cedsci>> accessed April 28, 2023.

Table 17.18-- BOILERS AND PRESSURE VESSELS, BY ISLAND: 2021 AND 2022

[As of June 1. Data for 2021 revised from previous *Data Book*]

Island and year	Total	Power boilers	Heating boilers	Pressure vessels
2021				
State total	10,440	414	2,748	7,278
Hawaii	1,538	77	403	1,058
Maui	1,189	50	354	785
Lanai	64	3	23	38
Molokai	44	1	9	34
Oahu	7,029	258	1,791	4,980
Kauai	576	25	168	383
2022				
State total	10,398	412	2,764	7,222
Hawaii	1,535	75	430	1,030
Maui	1,158	50	344	764
Lanai	65	3	23	39
Molokai	43	1	9	33
Oahu	7,034	257	1,793	4,984
Kauai	563	26	165	372

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 2020

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

Year	Total	R&D	R&D plant
2000	236.1	234.3	1.8
2001	438.5	435.7	2.8
2002	434.7	428.3	6.4
2003	415.8	413.9	1.9
2004	495.2	488.2	7.0
2005	644.1	600.3	43.8
2006	385.9	380.3	5.6
2007	387.2	379.2	8.0
2008	350.9	347.8	3.1
2009	412.8	387.5	25.3
2010	427.5	389.4	38.1
2011	426.9	403.6	23.3
2012	397.9	382.5	15.4
2013	361.0	348.0	13.0
2014	341.7	326.5	15.2
2015	319.6	305.4	14.2
2016	298.6	283.8	14.8
2017	290.2	275.4	14.8
2018	460.5	441.3	19.2
2019	436.2	411.9	24.3
2020	400.0	393.9	6.1

Source: National Science Foundation/Division of Science Resources Statistics, *Federal Funds for Research and Development*, tables 88, 208-209 <<https://ncesdata.nsf.gov/fedfunds>> accessed May 19, 2022.

Table 17.20-- PRIVATE SECTOR TECHNOLOGY JOBS, 2015 TO 2021 AND AVERAGE EARNINGS, 2020

[Jobs includes paid employees and proprietors]

	2015	2016	2017	2018	2019	2020	2021	Earnings in 2020 (\$M) 1/ 2/
Technology sector	23,943.3	23,558.7	23,574.6	24,225.0	24,020.8	24,029.6	24,826.6	2,216.4
Computer services	6,545.8	6,370.1	6,482.1	6,415.4	5,987.3	5,788.0	5,913.5	563.5
Engineering and related services	6,304.6	6,277.1	6,240.7	6,470.0	6,563.5	6,721.4	6,897.0	728.0
Technical consulting services	4,528.2	4,568.7	4,766.6	5,235.5	5,371.2	5,338.0	5,457.1	378.9
Research & development services	2,025.6	1,966.1	1,730.5	1,551.0	1,537.7	1,575.0	1,646.4	153.9
Research & devel. in biotech.	510.3	508.3	460.9	380.6	333.4	371.2	383.3	34.1
Information & telecoms tech.	1,411.1	1,375.1	1,424.1	1,456.4	1,370.6	1,445.0	1,593.7	118.3
Medical labs and imaging centers	1,789.1	1,774.2	1,730.7	1,805.5	1,806.9	1,796.6	1,903.3	129.6
Technology equipment distribution	756.8	683.0	683.4	859.2	855.4	855.4	893.0	105.0
Technology manufacturing	582.2	544.4	516.4	431.9	528.2	510.2	522.7	39.3
Alternate power generation	2.0	0.2	-	-	-	-	-	-
Chemical & pharm. manufacturing	104.8	55.1	80.9	44.4	71.1	52.3	37.1	3.8
Other technology manufacturing	108.8	81.7	88.6	56.3	91.8	54.9	62.4	7.2
Medical device manufacturing	366.7	407.5	346.9	331.2	365.3	403.0	423.2	28.2

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

2/ Earnings data for 2021 not available at the time of publication.

Source: Hawaii State Department of Business, Economic Development and Tourism, records; see also *Hawaii's Targeted & Emerging Industries Report* (annual) <http://dbedt.hawaii.gov/economic/reports_studies/emerging-industries/>.

Table 17.21-- TECHNOLOGY AND SCIENCE INDEX, BY STATE: 2022

[The State Technology and Science Index observes 79 unique indicators that are categorized into the five major components shown below]

State	Average score	Ranking					
		Overall	Human capital invest.	Risk capital & entrepreneurial infrast.	Research & dev't inputs	Tech. concentration & dynamism	Tech. & science workforce
Massachusetts	86.08	1	1	4	1	6	4
California	80.00	2	6	2	5	2	5
Colorado	78.89	3	8	6	6	3	2
Maryland	77.67	4	2	26	2	7	3
Utah	76.84	5	3	3	12	1	10
Washington	74.97	6	12	8	13	4	1
Delaware	74.83	7	9	1	4	10	9
Virginia	69.59	8	5	19	14	5	8
Connecticut	69.38	9	4	9	8	14	11
New Hampshire	64.97	10	14	24	3	13	16
North Carolina	62.52	11	24	7	11	16	18
New Jersey	62.44	12	18	10	19	14	11
Minnesota	61.72	13	7	17	25	22	7
Oregon	59.74	14	16	22	22	25	6
Pennsylvania	59.05	15	12	16	7	33	17
Arizona	57.15	16	29	14	18	8	31
Michigan	56.67	17	19	36	10	26	13
Texas	56.12	18	36	11	31	9	22
New York	56.11	19	10	12	15	21	38
New Mexico	54.46	20	30	38	16	19	14
Illinois	52.60	21	11	15	17	28	35
Georgia	51.89	22	26	21	32	11	33
Rhode Island	50.77	23	15	29	9	44	28
Wisconsin	50.66	24	27	33	20	29	19
Idaho	50.42	25	38	18	35	12	24
Vermont	50.38	26	17	32	27	22	29
Alabama	48.30	27	35	41	24	24	21
Montana	48.03	28	32	25	26	37	22
Kansas	47.29	29	25	43	36	20	20
Ohio	46.83	30	33	28	23	39	25
Wyoming	46.16	31	34	23	30	30	29
Indiana	44.96	32	20	40	21	31	38
Iowa	44.52	33	23	35	29	45	26
Nebraska	44.46	34	21	20	38	38	32
Missouri	42.02	35	31	27	33	36	40
Alaska	41.73	36	37	50	34	27	15

Continued on next page.

Table 17.21-- TECHNOLOGY AND SCIENCE INDEX, BY STATE: 2022 -- Con.

State	Average score	Ranking					
		Overall	Human capital invest.	Risk capital & entrepreneurial infrast.	Research & dev't inputs	Tech. concentration & dynamism	Tech. & science workforce
Hawaii	41.57	37	39	42	28	33	27
Florida	40.99	38	42	13	41	17	46
Nevada	38.91	39	48	5	49	17	48
Tennessee	37.36	40	41	31	39	35	36
South Dakota	36.88	41	28	29	40	43	44
North Dakota	34.65	42	21	47	37	41	42
South Carolina	33.94	43	44	38	43	32	36
Maine	32.61	44	40	45	42	39	34
Kentucky	30.71	45	45	34	45	42	43
Oklahoma	27.38	46	50	44	44	45	41
West Virginia	24.53	47	43	49	47	48	45
Arkansas	23.19	48	49	37	50	45	50
Louisiana	22.34	49	46	46	46	49	47
Mississippi	17.49	50	46	48	48	50	49

Source: Milken Institute *State Technology and Science Index: Sustaining America's Innovation Economy 2022* <<http://statetechandscience.org/statetech.taf?page=state-ranking>> accessed June 20, 2023.

Table 17.22-- RESEARCH AND NON-RESEARCH EXTRAMURAL FUNDING FOR THE UNIVERSITY OF HAWAII: 1992 TO 2022

[Fiscal year ending June 30. 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]

Year	Total		Research		Non-research	
	Awards	Amount (dollars)	Awards	Amount (dollars)	Awards	Amount (dollars)
1992	1,221	124,876,638	703	65,791,624	518	59,085,014
1993	1,146	131,075,215	636	61,059,928	510	70,015,287
1994	1,322	142,563,794	755	77,763,782	567	64,800,012
1995	1,147	139,199,221	616	70,222,653	531	68,976,568
1996	1,191	134,469,155	697	76,698,552	494	57,770,603
1997	1,255	160,859,800	724	89,131,636	531	71,728,164
1998	1,300	159,948,612	763	91,746,988	537	68,201,624
1999	1,254	164,168,101	707	92,737,645	547	71,430,456
2000	1,379	180,629,855	767	102,845,010	612	77,784,845
2001	1,405	216,233,918	835	132,833,308	570	83,400,610
2002	1,629	252,370,477	971	141,875,022	658	110,495,455
2003	1,646	323,868,218	976	190,374,465	670	133,493,753
2004	1,675	328,982,431	1,002	199,944,709	673	129,037,722
2005	1,742	354,127,142	1,022	209,196,531	720	144,930,611
2006	1,785	433,360,395	1,068	236,708,881	717	196,651,514
2007	1,778	354,031,667	1,081	209,909,883	697	144,121,784
2008	1,758	367,580,150	1,093	211,778,184	665	155,801,966
2009	1,990	413,963,739	1,147	246,546,713	843	167,417,026
2010	1,944	452,408,669	1,161	255,734,059	783	196,674,610
2011	1,799	488,597,908	1,070	281,745,764	729	206,852,144
2012	1,727	435,874,967	1,039	256,980,266	688	178,894,701
2013	1,801	409,783,318	1,006	222,207,539	795	187,575,779
2014	1,774	392,314,955	1,081	238,286,786	693	154,028,169
2015	1,823	425,650,338	1,080	236,114,373	743	189,535,965
2016	1,855	391,334,528	1,025	199,840,628	830	191,493,900
2017	1,886	387,001,705	1,077	209,249,788	809	177,751,917
2018	1,879	386,311,703	1,072	215,982,321	807	170,329,382
2019 1/	1,925	421,852,160	1,069	222,860,456	856	198,991,704
2020 1/	1,879	450,439,249	1,079	229,664,292	800	220,774,957
2021 1/	1,963	485,528,926	1,061	238,259,645	902	247,269,281
2022	1,931	505,019,134	1,017	269,968,449	914	235,050,685

1/ Data is revised from previous *Data Book*.

Source: University of Hawaii, Office of Research Services, *Executive Managerial Report* (for 1992 to 2018) <<http://http://www.ors.hawaii.edu/index.php/reports/annual-executive-managerial-reports/111-reports/annual-reports/391-2017-2018-annual-report>> accessed May 22, 2019; *Board of Regents Monthly Reports* (Q4 annual) <<https://research.hawaii.edu/reports/reports/>> accessed April 28, 2023 and records.

Table 17.23-- RESEARCH AND DEVELOPMENT EXPENDITURES AT HIGHER EDUCATION INSTITUTIONS: 1996 TO 2021

[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
1996 2/	111,202	66,902	31,826	8,088	(NA)	4,386	-
1997 2/	120,107	72,421	28,440	5,944	(NA)	13,297	5
1998 3/	148,007	86,886	37,002	10,949	(NA)	13,170	-
1999 3/	156,810	93,418	35,111	13,021	(NA)	15,260	-
2000 3/	161,300	95,419	35,474	11,158	(NA)	19,249	-
2001 3/	156,976	97,716	33,125	7,232	(NA)	18,903	-
2002 3/	172,664	119,381	31,062	9,971	(NA)	12,232	18
2003 3/	184,602	148,662	11,822	6,931	(NA)	17,171	16
2004 4/	241,346	191,252	8,815	21,234	(NA)	19,892	153
2005 4/	240,247	199,135	7,077	12,155	(NA)	21,282	598
2006 4/	257,478	210,097	8,933	12,551	(NA)	25,888	9
2007 4/	274,373	215,806	15,534	22,080	(NA)	16,352	4,601
2008 4/	278,751	200,385	18,192	26,928	(NA)	28,132	5,114
2009 4/	300,302	211,256	17,479	30,357	(NA)	32,198	9,012
2010 5/	317,942	208,540	23,669	24,315	7,989	45,016	8,413
2011 5/	363,887	241,686	22,399	23,362	11,019	57,502	7,919
2012 5/	335,704	215,593	16,406	21,389	6,642	67,934	7,740
2013 5/	343,802	241,600	11,812	73,645	3,863	6,270	6,612
2014 5/	330,897	212,525	8,115	3,436	6,759	89,409	10,653
2015 5/	332,233	213,763	14,140	6,702	9,748	85,793	2,087
2016 5/	318,134	201,809	15,402	5,834	12,110	80,463	2,516
2017 5/	301,204	189,719	14,660	2,084	13,013	77,502	4,226
2018 5/	297,975	186,527	20,096	950	14,579	73,459	2,364
2019 5/	301,419	186,601	20,297	1,967	13,150	77,733	1,671
2020 5/	298,285	184,034	19,383	2,802	13,022	77,557	1,487
2021 5/	294,913	178,662	20,848	2,826	11,595	79,701	1,281

NA Not available.

1/ Category titled 'Industry financed' before 2010.

2/ Survey includes a sample of institutions with doctoral programs in S&E, are HBCUs with R&D expenditures in S&E, and/or are other institutions that expend at least \$50,000 in separately budgeted R&D in S&E.

3/ Survey includes institutions with doctoral programs in S&E, are HBCUs with R&D expenditures in S&E, or are master's or bachelor's degree-granting institutions that expend at least \$150,000 in separate R&D in S&E.

4/ Survey includes S&E bachelor's and higher degree-granting institutions that reported at least \$150,000 in separately budgeted R&D expenditures in S&E.

5/ Survey includes institutions which grant a bachelor's degree or higher, expend at least \$150,000 in separately budgeted R&D, and were geographically separate campuses headed by a president, chancellor, or equivalent.

Source: National Science Foundation, Division of Science Resources Statistics, *Higher Education Research and Development Survey*: Fiscal Year (annual) <<https://www.nsf.gov/statistics/srvyherd/>> accessed April 28, 2023.

Table 17.24-- PATENTS ISSUED TO HAWAII RESIDENTS: 1992 TO 2020

Year	Patents	Year	Patents	Year	Patents
1992	81	2002	91	2012	131
1993	106	2003	96	2013	146
1994	99	2004	86	2014	160
1995	84	2005	58	2015	166
1996	104	2006	101	2016	178
1997	93	2007	82	2017	153
1998	93	2008	101	2018	136
1999	97	2009	96	2019	155
2000	93	2010	144	2020	161
2001	107	2011	128		

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 May 8, 2017; and *Patent Counts by Origin and Type Calendar Year* (Annual) <https://www.uspto.gov/web/offices/ac/ido/oeip/taf/reports_stco.htm> accessed August 8, 2022; and records.

Table 17.25-- ASTRONOMY AND RELATED FACILITIES AT THE SUMMITS OF MAUNAKEA FOR 2016 AND HALEAKALA FOR 2017

[Categories may not sum to totals due to rounding]

Facility and year (mirror diameter in meters)	Capital cost (\$ mil) 1/	Annual operating cost (\$ mil)	County based staff	Operational
Maunakea observatories, 2016				
Total	601	72.4	501	(X)
UH 2.2-m (Optical/Infrared)	5	1.0	6	1970
Canada-France-Hawaii 3.6-m (Optical/Infrared)	30	7.5	49	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	4.5	36	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	14.2	125	1992/1996
Subaru 8-m (Optical/Infrared)	170	17.0	101	1999
Fredrick C. Gillett Gemini 8-m (Optical/Infrared)	92	15.0	83	1999
Submillimeter Array 8x6-m	80	5.5	23	2003
Maunakea Observatories Support Services	(X)	2/ 5.4	51	1980
Haleakala observatories, 2017				
Total	749	40.7	202	(X)
Mees Solar Observatory	1	0.2	1	1963
Haleakala Observatories Projects	(X)	0.2	2	(X)
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	0.8	5	2005
UH Haleakala Support Facilities	110	5.6	11	2009
Daniel K. Inouye Solar Telescope (DKIST)	9	1.2	15	1962/2008
	344	4/ 18.0	35	(5/)

X Not applicable.

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

2/ Only \$1.9 million are 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/ DKIST was scheduled to be operational by 2020. However, data are not yet available.

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