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State of Hawaii Energy Data and Trends
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Executive Summary

Energy plays an important role in Hawaii's economy. Hawaii's total primary energy expenditure (without the net revenue from electricity sales), reached a peak of $6.2 billion in 2012, largely due to the state's heavy dependence on imported petroleum and petroleum's high price in 2012. Hawaii's total energy expenditure (including electricity additions defined as total electricity expenditure minus the fuel costs of electricity generation) reached $7.8 billion in 2012, which was equivalent to 10.8 percent of Hawaii's total Gross Domestic Product (GDP) in 2012. In 2016, total primary energy expenditure and total energy expenditure decreased to $3.4 billion and $5.0 billion, equivalent to 4.0 percent and 5.9 percent of Hawaii's total GDP, respectively. This was largely due to reduced petroleum prices.

In terms of Hawaii's energy consumption as measured by British thermal units (Btu), petroleum accounted for 83.0 percent of primary energy consumption, followed by renewable sources at 11.1 percent, coal at 5.8 percent, and natural gas at 0.1 percent in 2016. In terms of expenditures, petroleum accounted for 95.9 percent of Hawaii's primary energy expenditures and 64.7 percent of total energy expenditures in 2016.

From 1970 to 2012, Hawaii's primary energy expenditures and total energy expenditures increased 8.5 percent and 8.3 percent per year on average, respectively. This increase was primarily caused by the rapid increase in petroleum prices prior to 2012, which pushed up energy costs. From 2012

to 2016, Hawaii's primary energy expenditures and total energy expenditures decreased 14.1 percent and 10.5 percent per year on average, respectively.

Of the primary energy expenditures in 2016, 73.4 percent was spent on transportation, 17.9 percent was spent on electricity generation, and the remainder was spent on residential, industrial, and commercial uses. If the net revenue from electricity sales is included and the electricity use is allocated by sector, then the transportation sector accounted for 49.6 percent of total energy expenditures; followed by the commercial sector at 17.9 percent, the industrial sector at 17.3 percent, and the residential sector at 15.3 percent in 2016.

In 1970, 8,019 Btu's were required to produce 1 dollar of real GDP in Hawaii (in 2009 constant dollars). In 2016, less than half of the 1970 amount (3,811 Btu) was required to produce the same amount of GDP. The cost of energy per dollar of real GDP decreased slightly from 7.3 cents in 1970 to 7.0 cents in 2016.

In 2017, 53.2 percent of the electricity in Hawaii was generated by utilities, 12.2 percent was generated by independent power producers (IPP), and 34.6 percent was produced by combined heat and power (CHP) systems. In terms of energy sources used for generating electricity, 82.2 percent of the electricity in Hawaii was generated using fossil fuels (67.6 percent petroleum, 14.0 percent coal, 0.5 percent other gases), and 17.8 percent was generated using renewable sources.

In 2017, the industrial sector accounted for 38.7 percent of the electricity sales, the commercial sector accounted for 33.0 percent, and the residential sector accounted for 28.2 percent. The average retail price of electricity in 2017 was 26.05 cents per kWh, while the 2012 retail price was 34.04 cents per kWh.

This report presents an overview of Hawaii's energy use through 2016 by analyzing economic data combined with energy data and is an update of the State of Hawaii Energy Data and Trends published in February 2018. It is important to note that, although petroleum prices are near record lows in 2017, the most recent energy data available for this report is 2016.

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1. INTRODUCTION

Energy plays an important role in Hawaii's economy. Because of the state's heavy dependence on imported petroleum and high petroleum prices in 2012, Hawaii's total primary energy expenditure reached a peak of $6.2 billion in 2012. Hawaii's total energy expenditure (including electricity additions which is the total electricity expenditure minus the fuel costs of electricity generation) reached $7.8 billion in 2012, equivalent to 10.8 percent of Hawaii's total Gross Domestic Product (GDP). In 2016, due to reduced petroleum prices, total primary energy expenditure and total energy expenditure decreased to $3.4 billion and $5.0 billion, respectively. Petroleum accounted for 95.9 percent of Hawaii's primary energy expenditures in 2016.

Energy expenditure in Hawaii increased substantially from 1970 to 2012, largely due to rising petroleum prices during this period. From 1970 to 2012, Hawaii's primary energy expenditures and total energy expenditures increased 8.5 percent and 8.3 percent per year on average, respectively. Energy expenditure decreased substantially since 2012. From 2012 to 2016, Hawaii's primary energy expenditures and total energy expenditures decreased 14.1 percent and 10.5 percent per year on average, respectively.

This report is an update on the State of Hawaii Energy Data and Trends published in February 2018. It presents a comprehensive picture of Hawaii's energy use through 2016 by analyzing economic data, consumption data, and economic impact data. The impact on the economy for the years after 2016 will be analyzed in future reports, as the data becomes available.

In addition to total energy expenditure and consumption data, this paper provides an overview of energy use by sector and source, including renewable energy. Overall, the main points of the report are:

- At 83.0 percent, Hawaii remains strongly dependent on oil for its primary energy needs.
- From 2002 to 2016, the share of renewable energy increased from 3.7 percent to 11.1 percent, mainly due to increased consumption of solar/PV, wind, and fuel ethanol.
- Heavy fuel oil for electrical generation, jet fuel, and gasoline remain the primary fuels in the state demand profile.
- Imported coal, as a share of total primary energy consumption, has remained almost unchanged over the past 24 years from 1993 to 2016.

Section 2 examines the total energy consumption by end-use sector and by primary energy sources. The data shows that:

- In 2016, more than half of Hawaii's total energy was used by the transportation sector, followed by electricity generation at 32.4 percent and the industrial, commercial, and residential sectors at about 15.9 percent of total primary energy consumption.
- In 2016, 39.4 percent of the electricity generated in Hawaii was consumed by the industrial sector, followed by the commercial sector at 32.9 percent, and the residential sector at 27.7 percent.
- The primary use of coal in Hawaii was for electricity production.

Section 3 examines the trends of energy expenditures and prices of the major end-use sectors in Hawaii. The data shows that:

- In terms of energy use, more money was expended on gasoline than any other fuel.
- In 2016, more than two-thirds (73.4 percent) of the money spent on primary energy (excluding electricity generation) was for transportation. Electricity generation accounted for 17.9 percent of primary energy expenditures.
- During the 2002-2012 period, the price of petroleum increased 260.3 percent. From 2012 to 2016, however, the price of petroleum decreased 45.8 percent.

Section 4 examines the historical trends of Hawaii's energy efficiency and intensity. The analysis shows that:

- On a per capita basis, total energy used has been relatively stable during the 1970 to 2007 period. However, there was a decrease of about 22.9 percent from 2007 to 2016.
- On a per capita basis, electricity use increased dramatically from 1970 to 2004. However, from 2004 to 2016, electricity use decreased about 21.5 percent. Petroleum consumption was relatively stable from 1970 to 2007 and then decreased significantly from 2007 to 2016.
- From 1970 to 2016, Hawaii's energy consumption per dollar of real GDP decreased by 52.5 percent. Energy expenditure per dollar of real GDP decreased about 4.8 percent (in constant dollars).
- During the 1970 to 2016 period, per capita energy costs in Hawaii increased about 55.4 percent, as measured in constant dollars.

Section 5 examines the energy consumption and intensity changes over time by sectors and the data shows that:

- In the transportation sector, the use of gasoline and distillate fuel increased dramatically since 1960.
- Hawaii's industrial sector used about 22.1 percent of the total energy consumed.
- Renewable energy (biomass, geothermal, hydro, wind, and solar) accounted for about 11.6 percent of the total electric power sector's energy consumption in 2016.
- Of the renewable energy resources used for electricity generation, wind and geothermal contributed the most for Hawaii's energy consumption (excluding roof-top PV).
- From 1990 to 2017, the share of electricity produced by utility companies decreased from 82.4 percent to 53.2 percent.

Section 6 examines the environmental impacts of electricity generation in Hawaii and the analysis showed that:

- The emissions generated by the electric power industry varied by type. During the 1990 to 2016 period, CO_2 emissions from the electric power industry decreased 10.8 percent, NOX emissions increased 9.4 percent, and SO_2 emissions decreased 49.5 percent (in line with changes in federal clean air standards).

The primary data source for this report was the U.S. Energy Information Administration (EIA). The EIA data is publicly available and includes annual state level data. Other sources include the U.S. Bureau of Economic Analysis (BEA), the U.S. Census Bureau, the State of Hawaii Data Book, the State of Hawaii Department of Taxation, and the State of Hawaii Department of Transportation. It is important to note that the tables and figures use various units of measure depending on the type of analysis:

1. Energy consumption data is measured in British Thermal Units (BTUs) and in physical units. The physical unit measurements are barrels of petroleum (BBL), short tons (ST), million cubic feet (MCF), and kilowatt hours (kWh).
2. Energy expenditure data is listed in dollar units.
3. Average energy expenditure data is listed in dollars per physical units (BBLs, ST, cubic feet and kWh).
4. Energy price data are listed in dollars per million BTUs and dollars per physical units.

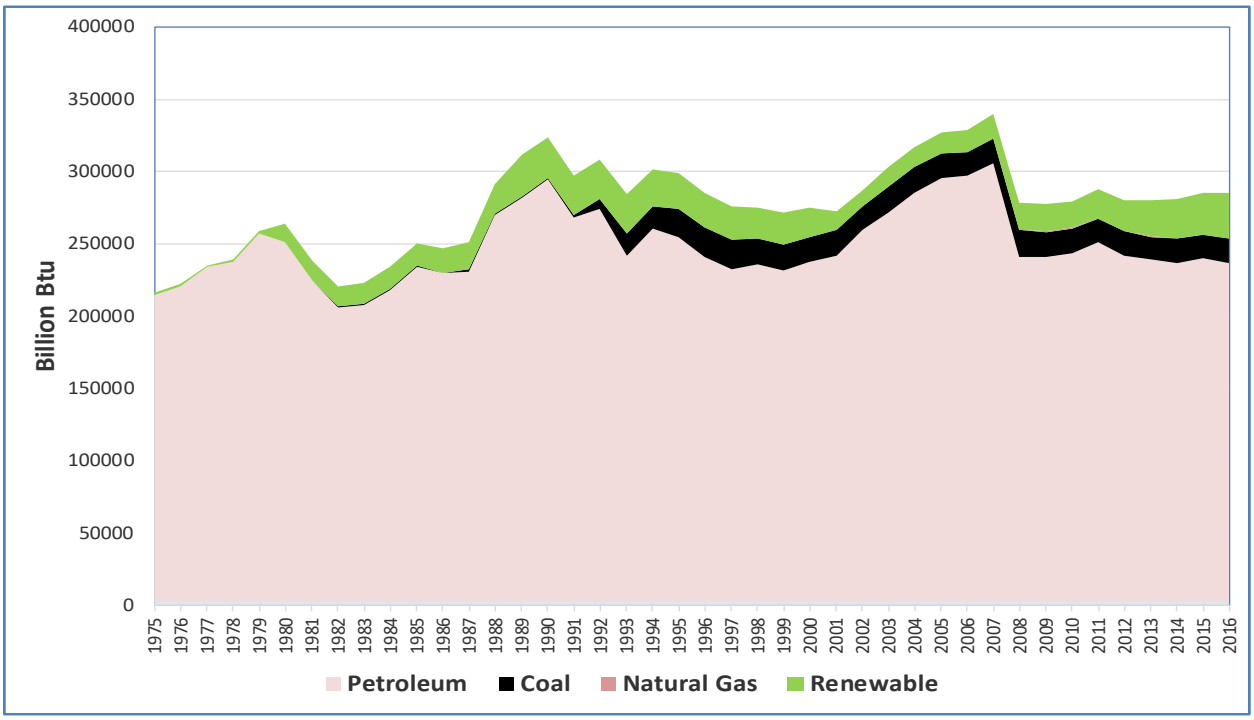
2. HAWAII'S ENERGY USE

2.1. Primary Energy Consumption by Source

Primary energy is defined as an energy resource that has not been subjected to any conversion or transformation process such as petroleum, coal, and natural gas. Hawaii's total primary energy consumption increased from less than 100 trillion Btu in 1960 to 283 trillion Btu in 2016, with an average annual growth rate of 2.4 percent. The growth of energy consumption varied over time. From 1960 to 1990, energy consumption increased at an average annual rate of 4.2 percent; generally, increasing at a steady pace during this period. The exceptions to this steady increase were the periods following each respective oil crisis. From 1990 to 2001, energy consumption decreased from 321 trillion Btu to 270 trillion Btu. Energy consumption increased 3.8 percent per year from 2001 to 2007 and then decreased 1.9 percent per year from 2007 to 2016.

Before 1980, Hawaii's primary energy consumption was almost entirely dependent on imported petroleum; however, the increased consumption of renewable energy and coal reduced this dependence. As a result, from 1990 to 2016, the share of renewable energy increased from 8.7 to 11.1 percent and the share of coal increased from 0.2 to 5.8 percent. In contrast, the petroleum share of total primary energy consumption decreased from 91.1 to 83.0 percent.

Figure 2.1. Hawaii's Total Primary Energy Consumption by Source: 1975-2016



The historical trend of Hawaii's primary energy consumption by source is provided in Table 2.1.

Table 2.1. Hawaii's Primary Energy Consumption by Source

	Total Energy Consumption	Energy Consumption By Source % of Total				Renewable Energy % of Total				
Year	Billion Btu	Petroleum	Coal	Natural Gas	Renewable	Biomass	Geothermal	Hydro	Solar	Wind
1960	94,855	99.7	0.0	0.0	0.3	0.0	0.0	0.3	0.0	0.0
1970	196,979	99.2	0.0	0.0	0.8	0.2	0.0	0.6	0.0	0.0
1975	214,429	99.3	0.0	0.0	0.7	0.3	0.0	0.4	0.0	0.0
1980	262,456	95.1	0.0	0.0	4.9	4.5	0.0	0.3	0.0	0.0
1985	248,555	93.4	0.5	0.0	6.2	5.7	0.1	0.4	0.0	0.0
1986	245,329	92.8	0.2	0.0	7.1	6.6	0.1	0.3	0.0	0.0
1987	249,461	91.8	0.6	0.1	7.5	7.2	0.1	0.3	0.0	0.0
1988	289,692	92.5	0.4	0.0	7.1	6.7	0.1	0.3	0.0	0.0
1989	309,767	90.4	0.3	0.0	9.3	8.7	0.0	0.2	0.3	0.1
1990	321,421	91.1	0.2	0.0	8.7	8.1	0.0	0.3	0.3	0.1
1991	295,155	90.3	0.4	0.0	9.3	8.6	0.0	0.3	0.3	0.1
1992	306,042	89.0	2.2	0.0	8.8	8.1	0.0	0.2	0.3	0.1
1993	282,878	84.7	5.5	0.0	9.8	8.6	0.6	0.2	0.4	0.1
1994	299,349	86.3	5.3	0.0	8.5	6.9	0.6	0.5	0.4	0.1
1995	297,037	85.0	6.7	0.0	8.3	6.7	0.8	0.3	0.4	0.1
1996	283,262	84.3	7.2	0.0	8.5	6.7	0.9	0.4	0.4	0.1
1997	273,576	84.3	7.5	0.0	8.2	6.4	0.9	0.4	0.4	0.1
1998	273,516	85.4	6.7	0.0	7.9	6.1	0.9	0.5	0.5	0.1
1999	269,448	85.4	6.6	0.0	8.1	6.3	0.8	0.4	0.5	0.1
2000	273,430	86.1	6.5	0.0	7.5	5.6	1.0	0.4	0.5	0.1
2001	270,245	88.8	6.6	0.0	4.6	2.9	0.8	0.4	0.5	0.0
2002	284,802	90.4	5.8	0.0	3.7	2.6	0.3	0.3	0.4	0.0
2003	300,977	89.5	6.0	0.0	4.4	3.1	0.6	0.3	0.4	0.0
2004	314,760	89.9	5.7	0.0	4.4	3.0	0.7	0.3	0.4	0.0
2005	324,741	90.5	5.1	0.1	4.4	2.9	0.7	0.3	0.4	0.0
2006	327,186	90.3	4.9	0.1	4.7	3.0	0.6	0.4	0.4	0.2
2007	337,743	89.9	5.1	0.1	5.0	2.9	0.7	0.3	0.4	0.7
2008	276,646	86.5	6.5	0.1	6.9	4.3	0.8	0.3	0.6	0.9
2009	276,035	86.7	6.2	0.1	7.1	4.4	0.6	0.4	0.7	0.9
2010	277,128	87.3	6.2	0.1	6.5	3.8	0.7	0.2	0.8	0.9
2011	285,548	87.4	5.6	0.1	6.9	3.7	0.8	0.3	1.0	1.2
2012	277,935	86.4	6.0	0.1	7.6	3.5	0.9	0.4	1.5	1.3
2013	278,508	85.3	5.5	0.1	9.1	4.0	0.9	0.3	2.2	1.7
2014	279,321	84.0	6.2	0.1	9.8	3.9	0.9	0.3	2.7	2.0
2015	283,187	84.2	5.5	0.1	10.2	4.1	0.8	0.4	2.9	2.0
2016	282,912	83.0	5.8	0.1	11.1	4.4	0.9	0.3	3.5	2.1

Source: Energy Information Administration, State Energy Data System

Table 2.2 lists primary energy consumption in physical units by source. In 2016, Hawaii's petroleum consumption mainly included jet fuel (31.0%), motor gasoline (26.6%), residual fuel (22.9%), and distillate fuel (10.7%). The "other" category accounted for about 8.8 percent of total petroleum consumption and included mainly still gas, hydrocarbon gas liquids (LPG), asphalt road oil, and petroleum coke.

Table 2.2. Hawaii's Energy Consumption in Physical Units

	Petroleum									
Year	Jet Fuel T BBL	Residual Fuel T BBL	Motor Gasoline T BBL	Distillate Fuel T BBL	Other Petroleum T BBL	Total Petroleum T BBL	Coal T ST	Natural Gas MCF	Renewable Electricity M KWH	Total Electricity M KWH
1960	4,321	4,766	3,429	886	3,442	16,844	-	-	27	1,285
1965	7,618	7,230	4,082	1,612	1,936	22,478	-	-	22	2,452
1970	14,273	10,154	5,691	1,695	2,292	34,105	-	-	22	3,776
1975	14,849	11,255	6,766	1,948	2,279	37,097	-	-	18	5,310
1980	14,116	13,196	7,231	5,987	3,032	43,562	-	3,131	20	6,331
1985	13,260	13,185	7,594	4,526	1,441	40,006	46	2,483	38	6,635
1990	12,646	19,067	8,670	6,489	3,143	50,015	29	2,788	52	8,311
1991	11,123	15,599	8,970	7,210	2,856	45,758	45	2,694	56	8,524
1992	9,993	17,856	8,870	6,219	3,717	46,655	303	2,695	35	8,667
1993	8,891	13,845	9,060	5,929	3,667	41,392	691	2,681	188	8,658
1994	9,472	15,120	9,343	6,321	4,587	44,843	704	2,778	268	8,948
1995	9,940	14,473	9,416	5,787	4,226	43,842	895	2,773	289	9,188
1996	10,087	12,667	9,374	4,950	4,553	41,631	930	2,672	304	9,379
1997	10,221	12,218	9,358	4,640	3,392	39,829	933	2,611	310	9,363
1998	9,999	13,243	9,342	4,451	3,458	40,493	822	2,654	302	9,261
1999	9,474	12,945	8,953	5,314	2,976	39,662	801	2,735	272	9,381
2000	9,438	13,520	9,289	5,094	3,250	40,591	816	2,841	322	9,691
2001	8,895	13,284	9,710	6,040	3,550	41,479	829	2,818	259	9,785
2002	10,189	12,738	10,419	8,086	3,340	44,772	748	2,734	110	9,892
2003	12,708	12,079	10,597	8,206	3,271	46,861	784	2,732	220	10,391
2004	13,379	13,110	10,741	8,634	3,234	49,098	797	2,774	277	10,732
2005	16,372	13,210	10,978	7,307	3,400	51,267	740	2,795	291	10,539
2006	15,334	14,687	11,533	6,691	3,319	51,564	714	2,783	374	10,568
2007	12,756	16,318	11,348	9,294	3,189	52,905	764	2,850	523	10,585
2008	10,702	12,421	10,675	5,501	3,098	42,397	840	2,701	519	10,390
2009	9,303	12,384	10,834	6,053	3,898	42,472	791	2,608	497	10,126
2010	9,837	11,889	9,993	6,856	4,179	42,754	803	2,627	493	10,017
2011	10,948	11,710	11,145	6,314	4,262	44,379	783	2,618	614	9,962
2012	11,311	10,726	10,586	6,099	4,048	42,770	803	2,689	700	9,639
2013	11,323	10,378	10,746	5,719	4,170	42,336	753	2,854	831	9,503
2014	12,922	9,871	10,831	4,362	3,988	41,974	831	2,916	914	9,475
2015	13,421	9,744	11,053	4,730	3,838	42,786	747	2,924	960	9,511
2016	13,104	9,679	11,220	4,536	3,707	42,246	787	3,041	1,041	9,445

Table 2.2. Hawaii's Energy Consumption in Physical Units - Continued

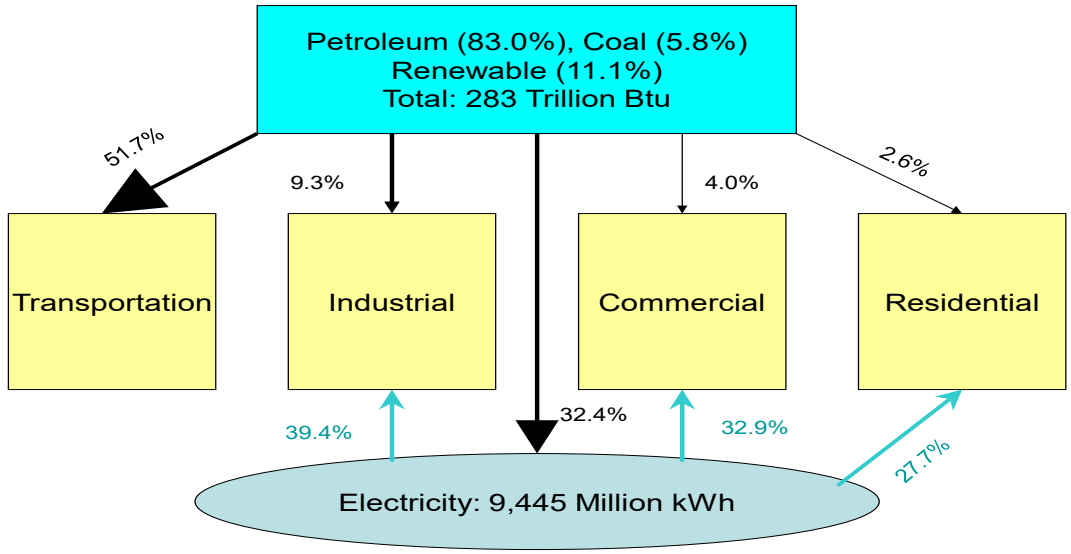
	Other Petroleum							
Year	Aviation Gasoline T BBL	Asphalt Road Oil T BBL	Kerosene T BBL	LPG T BBL	Lubricants T BBL	Still Gas T BBL	Petroleum Coke T BBL	Total Other T BBL
1960	2,640	29	91	112	38	430	103	3,442
1965	613	306	49	219	94	466	159	1,936
1970	133	377	153	938	71	453	131	2,292
1975	116	379	76	872	104	472	220	2,279
1980	199	285	9	1,573	94	525	306	3,032
1985	155	308	2	133	86	658	372	1,441
1990	272	381	-	178	96	2,401	333	3,143
1991	261	383	-	214	86	2,324	381	2,856
1992	243	431	-	651	88	2,388	367	3,717
1993	198	444	1	884	90	2,372	344	3,667
1994	210	407	1	1,619	94	2,346	356	4,587
1995	218	438	1	1,316	92	2,310	368	4,226
1996	165	401	1	1,319	89	2,329	411	4,553
1997	121	396	1	241	94	2,290	390	3,392
1998	107	322	-	844	99	2,200	362	3,458
1999	58	353	-	376	100	2,165	351	2,976
2000	45	604	-	562	98	2,181	366	3,250
2001	48	342	-	582	90	2,219	376	3,550
2002	18	107	-	770	89	2,179	372	3,340
2003	15	110	-	492	82	2,254	381	3,271
2004	39	120	-	462	83	2,235	388	3,234
2005	44	199	-	432	83	2,241	382	3,400
2006	41	3	-	471	81	2,247	361	3,319
2007	41	3	-	419	83	2,179	357	3,189
2008	28	2	-	674	77	2,088	300	3,098
2009	30	685	-	819	70	2,123	287	3,898
2010	37	773	-	826	103	2,136	256	4,179
2011	35	702	-	900	107	2,140	288	4,262
2012	31	441	-	889	96	2,186	306	4,048
2013	27	721	-	824	101	2,131	343	4,170
2014	28	677	-	881	94	2,089	333	3,988
2015	9	638	-	747	103	2,025	342	3,838
2016	6	413	-	799	96	2,040	342	3,707

Source: Energy Information Administration, State Energy Data System

2.2. Total Energy Consumption by Sector

Hawaii's primary energy is used in four end-use sectors and also for electricity generation. In 2016, 51.7 percent of Hawaii's total primary energy was directly used in the transportation sector, 9.3 percent in the industrial sector, 4.0 percent in the commercial sector, and 2.6 percent in the residential sector (Figure 2.2). Electricity generation accounted for 32.4 percent of the total primary energy consumption. The electricity generated was mainly consumed in the industrial (39.4%), commercial (32.9%), and residential (27.7%) sectors.

Figure 2.2. 2016 Hawaii Energy Use by Sector



The historical trend of Hawaii's end-use energy consumption by sector is provided in Figure 2.3 and Table 2.3. End-use energy consumption in each sector includes the primary energy directly consumed by the respective sector, electricity consumed by (i.e. purchased by) the sector, and the sector's share of electrical system energy losses.

From 1960 to 2016, the share of the residential sector consumption increased from 7.5 percent to 11.6 percent and the share of the commercial sector increased from 5.6 percent to 14.7 percent. During this same period, the share of the industrial sector increased slightly from 21.8 to 22.1 percent; and the share of transportation sector decreased from 65.1 to 51.7 percent. Energy used for electricity generation had a large increase, from 18.6 to 32.4 percent.

Figure 2.3. Hawaii's End-Use Energy Consumption by Sector: 1975-2016

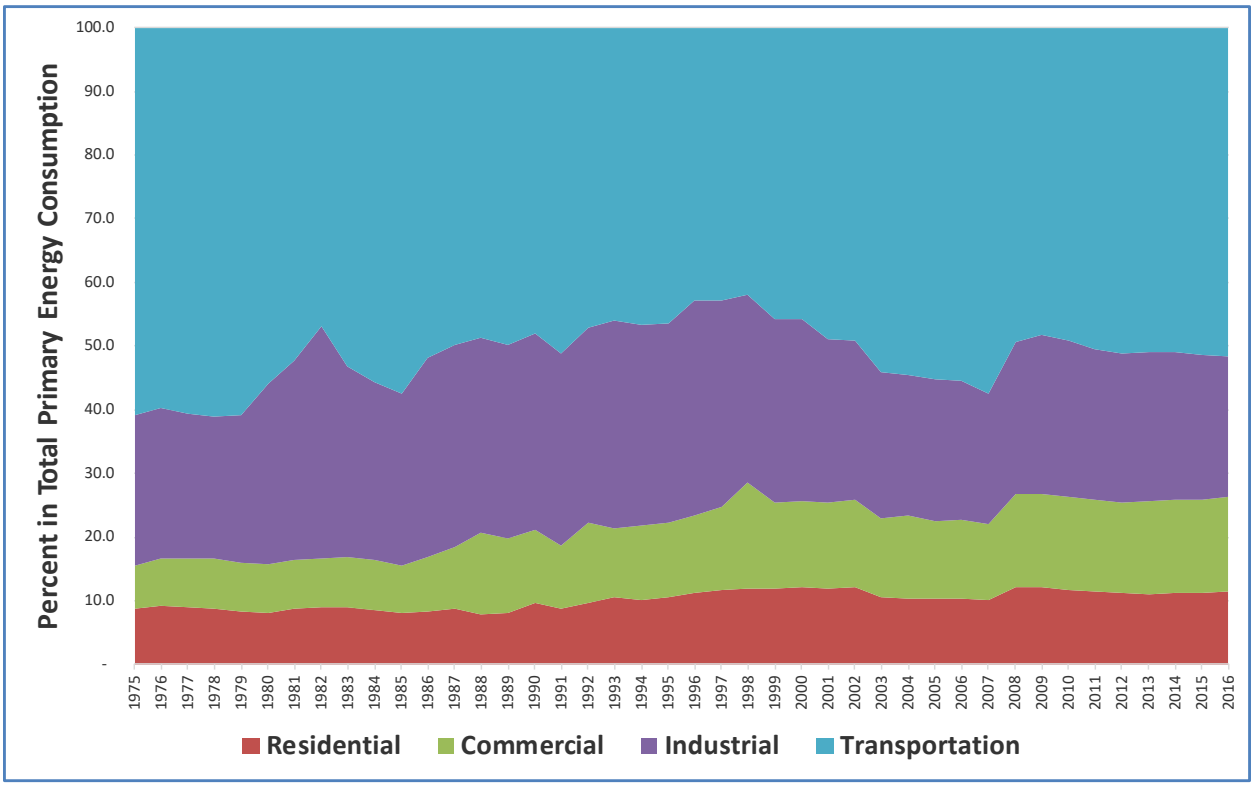


Table 2.3. Hawaii's End-Use Energy Consumption by Sector

	% of Total Energy Consumption					Electric
Year	Residential	Commercial	Industrial	Transportation	Total	Power
1960	7.5	5.6	21.8	65.1	100.0	18.6
1970	7.8	6.4	22.2	63.6	100.0	21.9
1980	8.0	7.6	28.4	55.9	100.0	26.6
1985	8.0	7.4	27.1	57.5	100.0	28.1
1990	9.6	11.6	30.8	48.1	100.0	33.0
1995	10.5	11.7	31.3	46.5	100.0	35.5
2000	12.1	13.6	28.5	45.8	100.0	39.7
2005	10.3	12.3	22.3	55.2	100.0	32.1
2006	10.3	12.4	21.9	55.4	100.0	32.0
2007	10.1	11.9	20.4	57.5	100.0	31.3
2008	12.1	14.8	23.8	49.3	100.0	37.2
2009	12.1	14.7	25.0	48.2	100.0	36.3
2010	11.8	14.5	24.6	49.2	100.0	35.6
2011	11.4	14.4	23.6	50.6	100.0	34.6
2012	11.3	14.1	23.4	51.2	100.0	34.1
2013	11.1	14.6	23.5	50.9	100.0	33.2
2014	11.2	14.7	23.1	50.9	100.0	33.0
2015	11.2	14.6	22.7	51.5	100.0	32.3
2016	11.6	14.7	22.1	51.7	100.0	32.4

Source: Energy Information Administration, State Energy Data System

2.3. Petroleum Consumption by Sector

Petroleum is mainly consumed for transportation and electricity generation in Hawaii. In 2016, transportation and electricity generation accounted for about 61.2 and 27.2 percent of total petroleum consumption, respectively. From 1960 to 2016, the transportation sector's share decreased from 65.3 to 61.2 percent, and the industrial sector's share decreased from 15.1 to 9.3 percent. In contrast, the power sector's share increased from 18.3 percent to 27.2 percent.

Table 2.4. Hawaii's Petroleum Consumption by Sector

	Petroleum Consumption By Sector (Including Ethanol) % of Total Petroleum Consumption				
Year	Transportation	Electricity	Industrial	Commercial	Residential
1960	65.3	18.3	15.1	1.2	0.1
1970	64.1	21.8	11.7	1.9	0.4
1980	58.8	27.9	11.5	1.6	0.3
1985	61.6	29.8	8.0	0.6	0.1
1990	52.8	33.3	10.9	2.9	0.1
1991	56.7	30.1	11.5	1.6	0.1
1992	52.9	31.6	11.2	4.0	0.3
1993	54.4	31.8	12.5	1.2	0.1
1994	54.2	30.6	13.0	2.1	0.1
1995	54.7	31.8	12.4	1.1	0.1
1996	50.9	34.6	13.7	0.7	0.1
1997	50.9	35.5	12.2	1.3	0.1
1998	49.1	35.2	9.5	5.8	0.4
1999	53.5	36.3	8.9	1.1	0.2
2000	53.2	35.8	9.5	1.1	0.3
2001	55.0	35.0	8.7	0.9	0.3
2002	54.4	35.5	8.6	1.2	0.3
2003	60.4	30.2	8.2	1.0	0.2
2004	60.8	30.0	7.8	1.1	0.2
2005	60.7	29.2	8.8	1.1	0.2
2006	61.0	29.1	8.5	1.1	0.2
2007	63.6	27.9	7.5	0.8	0.2
2008	56.3	33.8	8.3	1.2	0.4
2009	54.7	33.0	10.3	1.5	0.4
2010	55.7	31.9	10.5	1.5	0.4
2011	57.2	30.7	10.2	1.7	0.3
2012	58.5	29.7	9.7	1.5	0.5
2013	58.9	29.1	10.1	1.6	0.3
2014	59.8	28.2	9.8	1.9	0.4
2015	60.1	27.8	9.8	2.1	0.2
2016	61.2	27.2	9.3	2.0	0.3

Petroleum consumption, as measured in thousand barrels allocated by sector, is provided in Table 2.4. From 1960 to 2016, total annual petroleum consumption in Hawaii increased from 16.8 million barrels (BBLs) to 42.2 million BBLs. In 2016, 26.8 million BBLs were consumed by the transportation sector and 10.5 million BBLs was consumed by the electric power sector.

Table 2.4. Hawaii's Petroleum Consumption by Sector - Continued

	Petroleum Consumption By Sector Unit: 1000 BBL (T BBL)					
Year	Total	Transportation	Electric	Industrial	Commercial	Residential
1960	16,844	11,487	2,756	2,367	209	26
1970	34,105	22,473	6,798	3,874	760	200
1980	43,562	26,317	11,127	5,135	792	192
1985	40,006	25,641	11,047	2,997	275	45
1990	50,015	27,639	15,657	5,231	1,430	57
1991	45,758	27,034	12,903	4,989	773	58
1992	46,655	25,631	13,865	5,078	1,897	184
1993	41,392	23,305	12,272	5,250	524	41
1994	44,843	25,017	12,735	6,151	899	42
1995	43,842	24,759	12,921	5,643	480	40
1996	41,631	22,058	13,319	5,880	326	48
1997	39,829	21,334	13,175	4,672	560	88
1998	40,493	20,876	13,264	3,765	2,338	250
1999	39,662	22,177	13,453	3,380	511	142
2000	40,591	22,532	13,623	3,685	558	194
2001	41,479	23,704	13,588	3,513	478	197
2002	44,772	25,306	14,842	3,779	648	197
2003	46,861	29,347	13,098	3,733	536	146
2004	49,098	30,897	13,704	3,704	644	149
2005	51,267	32,278	13,888	4,298	651	152
2006	51,564	32,597	13,952	4,194	662	159
2007	52,905	34,678	13,738	3,844	517	128
2008	42,397	24,917	13,209	3,367	636	267
2009	42,472	24,320	12,954	4,131	825	242
2010	42,754	24,889	12,610	4,208	808	239
2011	44,379	26,470	12,518	4,225	943	222
2012	42,770	26,039	11,677	3,894	833	326
2013	42,336	25,969	11,295	3,987	867	218
2014	41,974	26,112	10,822	3,833	987	220
2015	42,786	26,717	10,880	3,919	1,138	132
2016	42,246	26,798	10,498	3,694	1,076	180

Source: Energy Information Administration, State Energy Data System

Petroleum consumed in Hawaii was mainly imported from foreign countries. In recent years, significant petroleum was also imported from domestic sources. As shown in Table 2.5 from 2006 to 2017, total petroleum imports from foreign countries averaged 43.0 million BBLs per year. On average, about 85 percent of the imported petroleum was crude oil and 10 percent was kerosene-type jet fuel. From 2006 to 2017, total petroleum foreign imports decreased by 45 percent, from 54.0 million BBLs in 2006 to 29.7 million BBLs in 2017.

Table 2.5. Hawaii Foreign Petroleum Imports by Major Type: 2006-2017

	2006 Annual TBBL	2007 Annual TBBL	2008 Annual TBBL	2009 Annual TBBL	2010 Annual TBBL	2011 Annual TBBL	2012 Annual TBBL	2013 Annual TBBL	2014 Annual TBBL	2015 Annual TBBL	2016 Annual TBBL	2017 Annual TBBL	Average Annual TBBL
Total Foreign Imports	53,963	52,863	46,220	43,616	47,176	44,594	43,587	44,197	35,056	36,158	39,314	29,677	43,035
Crude Oil	49,033	46,137	41,447	40,981	42,331	42,316	39,568	31,308	28,118	28,823	29,009	22,294	36,780
Jet Fuel, Kerosene-Type	2,542	4,956	3,781	1,608	3,873	1,850	2,858	7,181	3,752	4,835	7,524	5,787	4,212
Fuel Ethanol	1,101	718	496	579	-	-	261	-	119	82	-	-	280
Residual Fuel	584	567	196	78	297	-	68	1,709	580	740	1,033	-	488
Distillate	238	181	76	-	-	-	-	796	732	761	768	62	301
Propane	134	60	224	125	338	269	386	642	520	657	739	664	397
Others	331	244	-	245	337	159	446	2,561	1,235	260	241	870	577
% of Total Foreign Imports	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Average
Total Foreign Imports	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Crude Oil	91%	87%	90%	94%	90%	95%	91%	71%	80%	80%	74%	75%	85%
Jet Fuel, Kerosene-Type	5%	9%	8%	4%	8%	4%	7%	16%	11%	13%	19%	19%	10%
Fuel Ethanol	2%	1%	1%	1%	0%	0%	1%	0%	0%	0%	0%	0%	1%
Residual Fuel	1%	1%	0%	0%	1%	0%	0%	4%	2%	2%	3%	0%	1%
Distillate	0%	0%	0%	0%	0%	0%	0%	2%	2%	2%	2%	0%	1%
Propane	0%	0%	0%	0%	1%	1%	1%	1%	1%	2%	2%	2%	1%
Others	1%	0%	0%	1%	1%	0%	1%	6%	4%	1%	1%	3%	1%

Source: EIA

2.4. Electricity Consumption by Sector

In 2016, a total of 9,445 million kWh of electricity was consumed in Hawaii. Of this total, residential accounted for 27.7 percent, commercial accounted for 32.9 percent, and industrial accounted for 39.4 percent.

From 1960 to 1980, the residential sector's share of electricity consumption decreased more than 10 percentage points, while the industrial sector's share increased more than 10 percentage points. From 1980 to 2016, the commercial sector's share increased almost 10 percentage points, the industrial sector's share decreased about 8 percentage points, and the residential sector's share decreased slightly.

Table 2.6. Hawaii's Electricity Consumption by Sector

	Residential	Commercial	Industrial	Total	% of Total		
Year	Million kWh	Million kWh	Million kWh	Million kWh	Residential	Commercial	Industrial
1960	514	306	465	1,285	40.0	23.8	36.2
1970	1,285	771	1,720	3,776	34.0	20.4	45.6
1980	1,841	1,462	3,028	6,331	29.1	23.1	47.8
1990	2,324	2,253	3,734	8,311	28.0	27.1	44.9
2000	2,765	3,092	3,834	9,691	28.5	31.9	39.6
2001	2,802	3,192	3,790	9,785	28.6	32.6	38.7
2002	2,898	3,223	3,770	9,892	29.3	32.6	38.1
2003	3,028	3,517	3,846	10,391	29.1	33.8	37.0
2004	3,162	3,632	3,937	10,732	29.5	33.8	36.7
2005	3,164	3,463	3,912	10,539	30.0	32.9	37.1
2006	3,182	3,490	3,896	10,568	30.1	33.0	36.9
2007	3,201	3,520	3,864	10,585	30.2	33.3	36.5
2008	3,085	3,501	3,804	10,390	29.7	33.7	36.6
2009	3,055	3,388	3,683	10,126	30.2	33.5	36.4
2010	2,989	3,355	3,672	10,017	29.8	33.5	36.7
2011	2,929	3,368	3,665	9,962	29.4	33.8	36.8
2012	2,739	3,238	3,662	9,639	28.4	33.6	38.0
2013	2,609	3,271	3,623	9,503	27.5	34.4	38.1
2014	2,584	3,202	3,690	9,475	27.3	33.8	38.9
2015	2,641	3,174	3,696	9,511	27.8	33.4	38.9
2016	2,612	3,111	3,722	9,445	27.7	32.9	39.4

Source: Energy Information Administration, State Energy Data System

2.5. Other Energy Consumption by Sector

Other primary energy consumed in Hawaii includes coal, natural gas, and renewable energy (mainly biomass geothermal, hydropower, solar, and wind).

Hawaii's industrial sector started to consume coal in 1982, and in 1990 the electric power sector also started to consume coal. Currently, coal is mainly used for electricity generation in Hawaii. From 1993 to 2016, coal consumption in Hawaii remained relatively stable, but the share of coal consumed in the electric power sector increased from about 88.4 percent to 98.4 percent.

Table 2.7. Hawaii's Coal Consumption by Sector

	Coal Consumption By Sector Units: Billion Btu			Coal Consumption By Sector % of Coal Consumption		
Year	Total Billion Btu	Electric Power	Industrial	Total	Electric Power	Industrial
1982	1,149	-	1,149	100.0	0.0	100.0
1990	721	26	695	100.0	3.6	96.4
1993	15,575	13,762	1,813	100.0	88.4	11.6
1994	15,740	13,891	1,849	100.0	88.3	11.7
1995	19,914	15,795	4,119	100.0	79.3	20.7
1996	20,371	16,731	3,640	100.0	82.1	17.9
1997	20,513	16,778	3,735	100.0	81.8	18.2
1998	18,223	14,859	3,364	100.0	81.5	18.5
1999	17,691	14,999	2,692	100.0	84.8	15.2
2000	17,653	15,514	2,139	100.0	87.9	12.1
2001	17,774	15,730	2,044	100.0	88.5	11.5
2002	16,618	15,963	655	100.0	96.1	3.9
2003	18,044	16,670	1,374	100.0	92.4	7.6
2004	17,913	16,661	1,253	100.0	93.0	7.0
2005	16,506	15,095	1,411	100.0	91.5	8.5
2006	16,102	14,465	1,637	100.0	89.8	10.2
2007	17,107	15,313	1,795	100.0	89.5	10.5
2008	18,095	15,784	2,311	100.0	87.2	12.8
2009	17,083	15,049	2,033	100.0	88.1	11.9
2010	17,117	15,702	1,415	100.0	91.7	8.3
2011	16,080	14,775	1,305	100.0	91.9	8.1
2012	16,572	15,432	1,140	100.0	93.1	6.9
2013	15,306	13,948	1,358	100.0	91.1	8.9
2014	17,241	15,873	1,368	100.0	92.1	7.9
2015	15,632	14,495	1,136	100.0	92.7	7.3
2016	16,431	16,160	271	100.0	98.4	1.6

Source: Energy Information Administration, State Energy Data System

Hawaii's biomass consumption began in 1963. Prior to 2005, wood waste was the primary biomass resource consumed in Hawaii. This was mainly utilized by the industrial sector and also for electricity generation.

Since 2005, ethanol has been consumed by the transportation sector. In 2016, biomass accounted for about 4.4 percent of total primary energy consumption, with about 30.4 percent of biomass (ethanol) consumed in the transportation sector. Other biomass (wood and waste) was mainly consumed by the industrial sector (27.8%) and the commercial sector (31.3%).

Table 2.8. Hawaii's Biomass Consumption by Sector

		Biomass Consumption By Sector (Including Ethanol) % of Biomass Consumption				
	Total	Wood & Waste				Ethanol
Year	Billion Btu	Electric Power	Industrial	Commercial	Residential	Transportation
1963	206	-	100.0	-	-	-
1965	172	-	100.0	-	-	-
1966	144	16.0	83.3	-	-	-
1970	429	59.9	40.1	-	-	-
1975	569	45.5	54.5	-	-	-
1980	11,910	-	100.0	-	-	-
1985	14,217	1.8	98.2	-	-	-
1990	25,924	30.0	70.0	-	-	-
1995	19,803	33.1	66.9	-	-	-
2000	15,194	35.0	65.0	-	-	-
2001	7,947	35.6	64.4	-	-	-
2002	7,480	32.1	68.0	-	-	-
2003	9,305	27.5	72.5	-	-	-
2004	9,336	-	72.8	27.2	-	-
2005	9,574	-	62.2	23.7	1.8	12.3
2006	9,885	-	58.4	26.5	1.6	13.6
2007	9,707	-	56.5	24.2	1.8	17.5
2008	11,834	-	45.9	25.9	1.6	26.6
2009	12,274	0.4	42.6	24.8	2.8	29.4
2010	10,464	0.4	42.4	28.2	2.8	26.2
2011	10,564	5.5	35.0	26.4	2.9	30.2
2012	9,616	4.2	39.7	23.0	3.0	30.1
2013	11,195	4.6	36.4	28.7	3.5	26.7
2014	11,023	5.5	31.4	29.9	3.6	29.5
2015	11,534	7.4	28.4	29.0	2.6	32.7
2016	12,459	8.6	27.8	31.3	1.9	30.4

Source: Energy Information Administration, State Energy Data System

Hawaii's natural gas consumption is mainly supplemental gaseous fuels (SGF), which is not a source of primary energy. Primary natural gas accounted for only about 5.5 percent of total natural gas consumption in 2016.

Natural gas was not consumed in Hawaii until 1980. From 1980 to 2016, natural gas consumption remained at about the same level, but the share of residential consumption decreased while the shares of industrial and commercial consumption increased. In 2016, natural gas was consumed mainly in the commercial sector (63.3%), the residential sector (18.8%), and the industrial sector (17.8%).

Table 2.9. Hawaii's Natural Gas Consumption by Sector

	Total	% of Total Natural Gas Consumption				Primary
	Consumption					Natural Gas
Year	Billion Btu	Residential	Commercial	Industrial	Transportation	Billion Btu
1980	3,015	45.2	54.8	-	-	-
1985	2,687	25.2	74.8	-	-	-
1990	2,983	20.3	79.7	-	-	-
1995	2,906	20.7	79.3	-	-	-
2000	2,975	18.8	62.3	18.9	-	76
2001	2,920	19.1	62.1	18.9	-	134
2002	2,898	19.7	62.9	17.4	-	140
2003	2,861	19.6	64.1	16.3	-	137
2004	2,907	18.9	65.0	16.1	0.1	155
2005	2,898	18.5	65.7	15.7	0.1	195
2006	2,914	18.6	65.1	16.2	0.1	179
2007	2,956	17.9	64.4	17.6	0.1	173
2008	2,817	18.5	65.5	16.0	0.1	148
2009	2,712	19.5	67.2	13.2	0.1	167
2010	2,732	19.4	67.6	12.9	0.1	161
2011	2,744	18.5	67.5	13.8	0.1	158
2012	2,813	17.9	68.8	13.2	0.1	187
2013	2,871	20.4	65.6	13.6	0.4	197
2014	2,796	20.0	66.2	13.8	0.0	167
2015	2,871	19.6	65.3	15.1	0.1	196
2016	2,983	18.8	63.3	17.8	0.1	163

Source: Energy Information Administration, State Energy Data System

Other renewable energy sources, including geothermal, hydro, solar, and wind, accounted for about 6.7 percent of Hawaii's total primary energy consumption in 2016. Other renewable energy sources are mainly used for electricity generation.

3. HAWAII'S ENERGY EXPENDITURES AND PRICES

3.1. Energy Expenditures by Source

From 1970 to 2012, Hawaii's total primary energy expenditure increased about 8.5 percent per year on average, from $204 million to $6,247 million. The additional expenditures for electricity (total expenditures on retail electricity minus the fuel cost of electricity generation) increased about 7.7 percent per year, from $70 million to $1,599 million. The total energy expenditure increased about 8.3 percent per year, from $274 million to $7,846 million.

From 2012 to 2016, Hawaii's total primary energy expenditure decreased about 14.1 percent per year on average. The total energy expenditure decreased about 10.5 percent per year. In 2016, total primary energy expenditure accounted for 67.5 percent of the total energy expenditure and electricity additional expenditure accounted for 32.5 percent.

Table 3.1. Hawaii's Energy Expenditures by Source

	Total Energy Expenditures By Source: $ Million										
	Petroleum										
Year	Jet Fuel	Residual Fuel	Motor Gasoline	Distillate Fuel	Other Petroleum	Total Petroleum	Coal	Natural Gas	Biomass	Primary Energy	Energy Total
1970	58	25	99	10	11	204	-	-	0	204	274
1975	170	109	194	26	20	518	-	-	1	519	652
1980	492	309	411	229	50	1,490	-	39	10	1,540	1,721
1985	462	395	444	207	33	1,542	3	38	12	1,595	1,907
1990	425	469	533	297	41	1,765	1	37	5	1,808	2,118
1995	251	267	564	246	66	1,393	29	39	9	1,470	2,203
2000	373	416	650	276	69	1,784	26	47	6	1,863	2,705
2001	296	400	735	316	66	1,813	22	48	8	1,891	2,779
2002	315	376	673	371	64	1,799	28	47	9	1,883	2,688
2003	474	359	838	501	51	2,223	51	54	13	2,341	3,336
2004	714	405	962	645	57	2,782	34	58	12	2,886	4,025
2005	1,200	670	1,182	668	67	3,785	25	69	13	3,892	4,997
2006	1,313	858	1,434	740	73	4,419	28	79	11	4,536	5,729
2007	1,173	1,102	1,436	1,088	72	4,871	33	78	13	4,995	6,177
2008	1,359	1,222	1,607	830	121	5,139	41	101	16	5,297	6,829
2009	668	708	1,264	589	186	3,413	40	77	10	3,540	4,805
2010	914	961	1,417	868	225	4,385	40	95	11	4,531	5,864
2011	1,407	1,363	1,944	1,062	249	6,026	29	117	13	6,184	7,683
2012	1,471	1,379	1,940	1,079	211	6,080	33	122	12	6,247	7,846
2013	1,451	1,272	1,893	996	237	5,849	32	118	14	6,014	7,684
2014	1,542	1,150	1,846	692	241	5,471	45	117	15	5,648	7,434
2015	939	593	1,546	606	172	3,855	52	91	13	4,010	5,709
2016	769	461	1,365	532	135	3,262	51	81	9	3,403	5,038

In 2016, petroleum accounted for almost all the total primary energy expenditures (95.9%) in Hawaii. The remaining share included coal, natural gas, and biomass, which combined comprised about 4 percent of the total primary energy expenditures.

Table 3.1. Hawaii's Energy Expenditures by Source - Continued

	% of Primary Energy Expenditures								
	Petroleum								
Year	Jet Fuel	Residual Fuel	Motor Gasoline	Distillate Fuel	Other Petroleum	Total Petroleum	Coal	Natural Gas	Biomass
1970	28.7	12.1	48.7	4.9	5.5	99.9	-	-	0.1
1975	32.8	20.9	37.3	4.9	3.9	99.9	-	-	0.1
1980	32.0	20.0	26.7	14.9	3.2	96.8	-	2.6	0.6
1985	29.0	24.8	27.9	13.0	2.1	96.7	0.2	2.4	0.7
1990	23.5	25.9	29.5	16.4	2.3	97.6	0.1	2.0	0.3
1995	17.0	18.1	38.4	16.7	4.5	94.7	2.0	2.6	0.6
2000	20.0	22.3	34.9	14.8	3.7	95.7	1.4	2.5	0.3
2001	15.6	21.2	38.9	16.7	3.5	95.9	1.2	2.5	0.4
2002	16.7	20.0	35.8	19.7	3.4	95.5	1.5	2.5	0.5
2003	20.2	15.3	35.8	21.4	2.2	94.9	2.2	2.3	0.6
2004	24.7	14.0	33.3	22.3	2.0	96.4	1.2	2.0	0.4
2005	30.8	17.2	30.4	17.2	1.7	97.3	0.6	1.8	0.3
2006	29.0	18.9	31.6	16.3	1.6	97.4	0.6	1.7	0.2
2007	23.5	22.1	28.7	21.8	1.4	97.5	0.7	1.6	0.3
2008	25.7	23.1	30.3	15.7	2.3	97.0	0.8	1.9	0.3
2009	18.9	20.0	35.7	16.6	5.2	96.4	1.1	2.2	0.3
2010	20.2	21.2	31.3	19.2	5.0	96.8	0.9	2.1	0.2
2011	22.8	22.0	31.4	17.2	4.0	97.4	0.5	1.9	0.2
2012	23.6	22.1	31.1	17.3	3.4	97.3	0.5	2.0	0.2
2013	24.1	21.1	31.5	16.6	3.9	97.3	0.5	2.0	0.2
2014	27.3	20.4	32.7	12.3	4.3	96.9	0.8	2.1	0.3
2015	23.4	14.8	38.6	15.1	4.3	96.1	1.3	2.3	0.3
2016	22.6	13.6	40.1	15.6	4.0	95.9	1.5	2.4	0.3

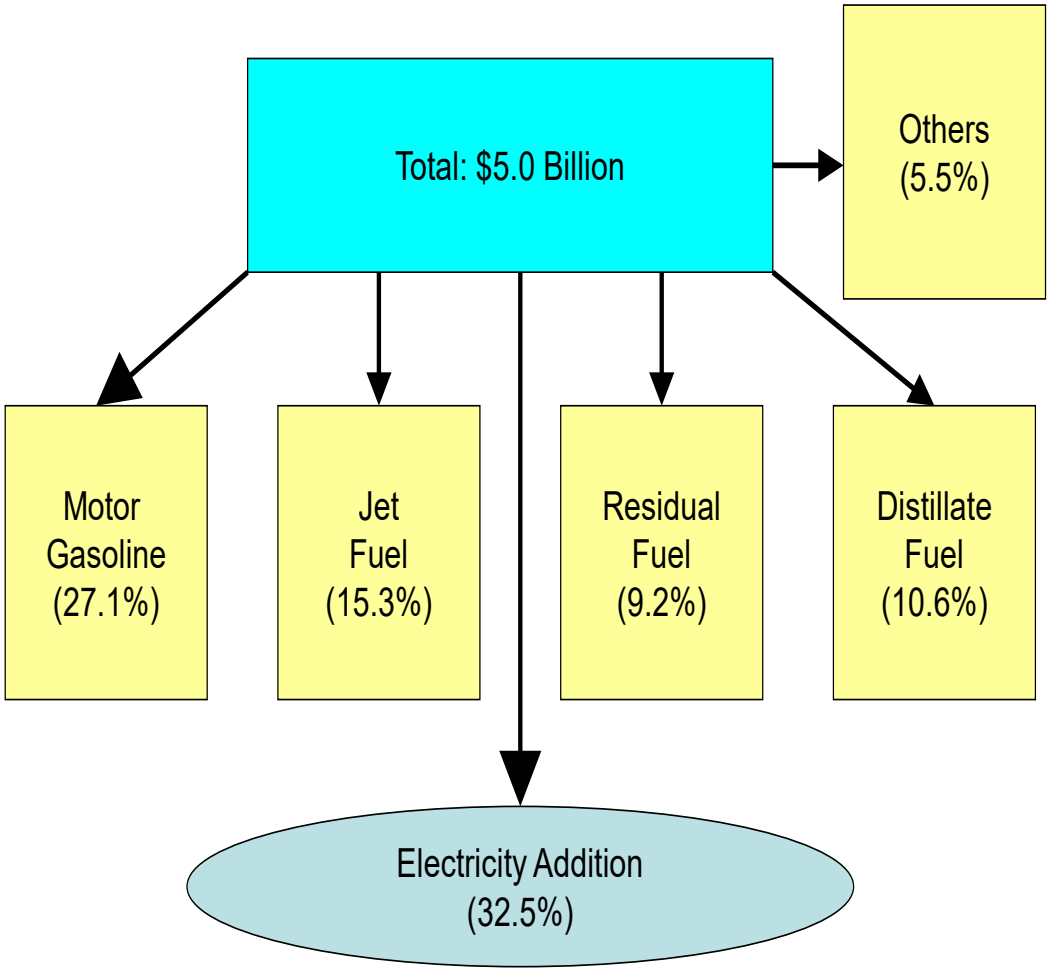
In 2016, primary energy expenditures were mainly for motor gasoline, jet fuel, distillate fuel, and residual fuel; these expenditures accounted for 40.1 percent, 22.6 percent, 15.6 percent, and 13.6 percent of the total primary energy expenditures, respectively.

Table 3.1. Hawaii's Energy Expenditures by Source - Continued

	% of Total Energy Expenditures									
	Petroleum									
Year	Jet Fuel	Residual Fuel	Motor Gasoline	Distillate Fuel	Other Petroleum	Total Petroleum	Coal	Natural Gas	Biomass	Electricity Conversion
1970	21.3	9.0	36.2	3.6	4.1	74.3	-	-	0.1	25.6
1975	26.1	16.7	29.7	3.9	3.1	79.5	-	-	0.1	20.4
1980	28.6	17.9	23.9	13.3	2.9	86.6	-	2.3	0.6	10.5
1985	24.2	20.7	23.3	10.9	1.7	80.9	0.1	2.0	0.6	16.4
1990	20.1	22.1	25.2	14.0	1.9	83.3	0.1	1.7	0.2	14.7
1995	11.4	12.1	25.6	11.2	3.0	63.2	1.3	1.8	0.4	33.3
2000	13.8	15.4	24.0	10.2	2.6	65.9	1.0	1.7	0.2	31.1
2001	10.6	14.4	26.5	11.4	2.4	65.2	0.8	1.7	0.3	32.0
2002	11.7	14.0	25.1	13.8	2.4	66.9	1.0	1.8	0.3	30.0
2003	14.2	10.8	25.1	15.0	1.5	66.6	1.5	1.6	0.4	29.8
2004	17.7	10.1	23.9	16.0	1.4	69.1	0.8	1.4	0.3	28.3
2005	24.0	13.4	23.6	13.4	1.3	75.8	0.5	1.4	0.3	22.1
2006	22.9	15.0	25.0	12.9	1.3	77.1	0.5	1.4	0.2	20.8
2007	19.0	17.8	23.2	17.6	1.2	78.9	0.5	1.3	0.2	19.1
2008	19.9	17.9	23.5	12.2	1.8	75.3	0.6	1.5	0.2	22.4
2009	13.9	14.7	26.3	12.3	3.9	71.0	0.8	1.6	0.2	26.3
2010	15.6	16.4	24.2	14.8	3.8	74.8	0.7	1.6	0.2	22.7
2011	18.3	17.7	25.3	13.8	3.2	78.4	0.4	1.5	0.2	19.5
2012	18.8	17.6	24.7	13.7	2.7	77.5	0.4	1.6	0.2	20.4
2013	18.9	16.5	24.6	13.0	3.1	76.1	0.4	1.5	0.2	21.7
2014	20.7	15.5	24.8	9.3	3.2	73.6	0.6	1.6	0.2	24.0
2015	16.4	10.4	27.1	10.6	3.0	67.5	0.9	1.6	0.2	29.8
2016	15.3	9.2	27.1	10.6	2.7	64.7	1.0	1.6	0.2	32.5

Source: Energy Information Administration, State Energy Data System

Figure 3.1. 2016 Hawaii Total Energy Expenditures



3.2. Total Energy Expenditures by Sector

Table 3.2 shows Hawaii's total energy expenditures by the four major sectors; expenditures include electricity expenditures. In 2016, total energy expenditures in Hawaii were about $5.0 billion, with the transportation sector accounting for almost half of total energy expenditures in Hawaii. The three remaining sectors were residential at 15.3 percent, commercial at 17.9 percent, and industrial at 17.3 percent of total energy expenditures.

Table 3.2. Hawaii's Energy Expenditures by Sector

	Expenditure in $ Million				
Year	Residential	Commercial	Industrial	Transportation	Total
1970	39	31	36	168	274
1975	86	69	110	387	652
1980	176	176	283	1,086	1,721
1985	227	227	337	1,116	1,907
1990	252	297	343	1,226	2,118
1995	361	381	432	1,029	2,203
1996	396	409	468	1,033	2,306
1997	415	424	451	983	2,273
1998	402	423	399	869	2,093
1999	409	418	395	942	2,163
2000	486	515	498	1,205	2,705
2001	492	529	477	1,282	2,779
2002	487	514	445	1,243	2,688
2003	538	588	501	1,710	3,336
2004	604	669	563	2,190	4,025
2005	692	760	674	2,871	4,997
2006	785	863	756	3,325	5,729
2007	811	876	776	3,714	6,177
2008	1,077	1,186	1,057	3,509	6,829
2009	802	860	790	2,352	4,805
2010	917	1,011	932	3,004	5,864
2011	1,090	1,281	1,181	4,131	7,683
2012	1,112	1,301	1,240	4,193	7,846
2013	1,037	1,281	1,288	4,079	7,684
2014	1,035	1,275	1,318	3,806	7,434
2015	828	1,011	1,010	2,859	5,709
2016	768	901	872	2,497	5,038

Table 3.2. Hawaii's Energy Expenditures by Sector - Continued

	% of Total Expenditures				
Year	Residential	Commercial	Industrial	Transportation	Total
1970	14.3	11.4	13.0	61.3	100.0
1975	13.2	10.6	16.9	59.3	100.0
1980	10.2	10.2	16.4	63.1	100.0
1985	11.9	11.9	17.7	58.5	100.0
1990	11.9	14.0	16.2	57.9	100.0
1995	16.4	17.3	19.6	46.7	100.0
1996	17.2	17.7	20.3	44.8	100.0
1997	18.3	18.6	19.9	43.2	100.0
1998	19.2	20.2	19.0	41.5	100.0
1999	18.9	19.3	18.2	43.5	100.0
2000	18.0	19.1	18.4	44.6	100.0
2001	17.7	19.0	17.1	46.1	100.0
2002	18.1	19.1	16.5	46.2	100.0
2003	16.1	17.6	15.0	51.2	100.0
2004	15.0	16.6	14.0	54.4	100.0
2005	13.8	15.2	13.5	57.5	100.0
2006	13.7	15.1	13.2	58.0	100.0
2007	13.1	14.2	12.6	60.1	100.0
2008	15.8	17.4	15.5	51.4	100.0
2009	16.7	17.9	16.4	49.0	100.0
2010	15.6	17.2	15.9	51.2	100.0
2011	14.2	16.7	15.4	53.8	100.0
2012	14.2	16.6	15.8	53.4	100.0
2013	13.5	16.7	16.8	53.1	100.0
2014	13.9	17.2	17.7	51.2	100.0
2015	14.5	17.7	17.7	50.1	100.0
2016	15.3	17.9	17.3	49.6	100.0

Source: Energy Information Administration, State Energy Data System

3.3. Primary Energy Expenditures by Sector

In 2016, Hawaii's total primary energy expenditure was about $3.4 billion. The fuel cost of electricity generation accounted for 17.9 percent; the transportation sector accounted for 73.4 percent; and the remaining three sectors together accounted for only 8.8 percent of total primary energy expenditures.

Table 3.3. Hawaii's Primary Energy Expenditures by Sector

	Expenditure in $ Million					
Year	Residential	Commercial	Industrial	Transportation	Electricity	Total
1970	3	5	10	168	17	204
1975	3	7	30	387	92	519
1980	27	44	106	1,086	276	1,540
1985	14	38	85	1,116	343	1,595
1990	13	69	77	1,226	423	1,808
1991	17	54	72	1,118	280	1,540
1992	22	75	67	1,018	291	1,473
1993	12	43	81	977	285	1,398
1994	13	48	97	1,027	257	1,442
1995	14	43	99	1,029	285	1,470
1996	15	43	95	1,033	346	1,533
1997	20	47	70	983	336	1,456
1998	37	74	58	869	259	1,297
1999	24	43	48	942	323	1,380
2000	32	57	69	1,205	499	1,863
2001	34	55	55	1,282	465	1,891
2002	34	57	54	1,243	495	1,883
2003	32	59	57	1,710	484	2,341
2004	32	81	67	2,190	517	2,886
2005	37	101	90	2,871	793	3,892
2006	42	116	94	3,325	959	4,536
2007	39	105	106	3,714	1,031	4,995
2008	74	146	122	3,509	1,447	5,297
2009	63	120	158	2,352	847	3,540
2010	77	141	169	3,004	1,140	4,531
2011	74	191	196	4,131	1,592	6,184
2012	89	171	174	4,193	1,620	6,247
2013	72	167	213	4,079	1,483	6,014
2014	78	180	212	3,806	1,373	5,648
2015	47	156	172	2,859	776	4,010
2016	51	135	113	2,497	608	3,403

Table 3.3. Hawaii's Primary Energy Expenditures by Sector - Continued

	% of Total Expenditures					
Year	Residential	Commercial	Industrial	Transportation	Electricity	Total
1970	1.5	2.5	5.1	82.4	8.5	100.0
1975	0.7	1.3	5.7	74.5	17.8	100.0
1980	1.8	2.9	6.9	70.6	17.9	100.0
1985	0.9	2.4	5.3	70.0	21.5	100.0
1990	0.7	3.8	4.3	67.8	23.4	100.0
1991	1.1	3.5	4.7	72.6	18.2	100.0
1992	1.5	5.1	4.6	69.1	19.8	100.0
1993	0.9	3.1	5.8	69.9	20.4	100.0
1994	0.9	3.4	6.7	71.2	17.8	100.0
1995	0.9	2.9	6.8	70.0	19.4	100.0
1996	1.0	2.8	6.2	67.4	22.6	100.0
1997	1.4	3.2	4.8	67.5	23.1	100.0
1998	2.8	5.7	4.5	67.0	19.9	100.0
1999	1.8	3.1	3.4	68.2	23.4	100.0
2000	1.7	3.1	3.7	64.7	26.8	100.0
2001	1.8	2.9	2.9	67.8	24.6	100.0
2002	1.8	3.0	2.9	66.0	26.3	100.0
2003	1.4	2.5	2.4	73.0	20.7	100.0
2004	1.1	2.8	2.3	75.9	17.9	100.0
2005	0.9	2.6	2.3	73.8	20.4	100.0
2006	0.9	2.5	2.1	73.3	21.1	100.0
2007	0.8	2.1	2.1	74.4	20.6	100.0
2008	1.4	2.8	2.3	66.2	27.3	100.0
2009	1.8	3.4	4.5	66.5	23.9	100.0
2010	1.7	3.1	3.7	66.3	25.2	100.0
2011	1.2	3.1	3.2	66.8	25.7	100.0
2012	1.4	2.7	2.8	67.1	25.9	100.0
2013	1.2	2.8	3.5	67.8	24.7	100.0
2014	1.4	3.2	3.7	67.4	24.3	100.0
2015	1.2	3.9	4.3	71.3	19.4	100.0
2016	1.5	4.0	3.3	73.4	17.9	100.0

Source: Energy Information Administration, State Energy Data System

3.4. Electricity Expenditures by Sector

In 2016, Hawaii's total electricity expenditure (including about $0.6 billion in fuel expenditures for electricity generation) was about $2.2 billion (Table 3.4). The residential, commercial, and industrial sectors each accounted for about one-third of the total electricity expenditure in Hawaii.

Table 3.4. Hawaii's Electricity Expenditures by Sector

	Expenditure in $ Million				% of Total Electricity Expenditures			
Year	Residential	Commercial	Industrial	Total	Residential	Commercial	Industrial	Total
1970	36	26	25	87	41.2	29.9	28.9	100.0
1975	83	63	80	225	36.7	27.7	35.6	100.0
1980	149	132	177	457	32.5	28.8	38.7	100.0
1985	213	189	252	655	32.6	28.9	38.5	100.0
1990	238	229	266	733	32.5	31.2	36.3	100.0
1995	347	338	333	1,018	34.1	33.2	32.7	100.0
1996	382	366	372	1,120	34.1	32.7	33.2	100.0
1997	395	376	382	1,153	34.3	32.6	33.1	100.0
1998	365	349	341	1,054	34.6	33.1	32.3	100.0
1999	385	375	347	1,107	34.7	33.9	31.4	100.0
2000	454	458	429	1,341	33.8	34.2	32.0	100.0
2001	458	474	422	1,354	33.8	35.0	31.1	100.0
2002	453	456	391	1,300	34.9	35.1	30.1	100.0
2003	507	528	444	1,479	34.3	35.7	30.0	100.0
2004	571	588	496	1,655	34.5	35.5	30.0	100.0
2005	655	659	584	1,898	34.5	34.7	30.7	100.0
2006	743	748	662	2,152	34.5	34.7	30.7	100.0
2007	772	771	670	2,213	34.9	34.8	30.3	100.0
2008	1,003	1,040	935	2,978	33.7	34.9	31.4	100.0
2009	739	741	632	2,112	35.0	35.1	29.9	100.0
2010	840	870	763	2,473	34.0	35.2	30.9	100.0
2011	1,016	1,090	984	3,091	32.9	35.3	31.9	100.0
2012	1,023	1,130	1,067	3,219	31.8	35.1	33.1	100.0
2013	965	1,114	1,075	3,154	30.6	35.3	34.1	100.0
2014	957	1,096	1,107	3,159	30.3	34.7	35.0	100.0
2015	782	855	838	2,475	31.6	34.5	33.9	100.0
2016	717	767	759	2,243	32.0	34.2	33.8	100.0

Source: Energy Information Administration, State Energy Data System

3.5. Average Energy Expenditures and Energy Prices

The average energy expenditures and energy prices from 1970 to 2016 are listed by source in Tables 3.5 and 3.6. Average petroleum expenditures and petroleum prices both increased substantially during the 1970s, remained relatively stable from 1980 to 1999, increased substantially from 1999 to 2012, and then decreased since 2012.

Table 3.5. Hawaii's Average Energy Expenditures by Source

	Petroleum								
Year	Jet Fuel $/BBL	Residual Fuel $/BBL	Motor Gasoline $/BBL	Distillate Fuel $/BBL	Other Petroleum $/BBL	Total Petroleum $/BBL	Coal $/ST	Natural Gas $/TCF	Retail Electricity $/kWh
1970	4.1	2.4	17.4	5.8	4.9	6.0	NA	NA	0.023
1975	11.5	9.6	28.6	13.1	8.9	14.0	NA	NA	0.042
1980	34.9	23.4	56.8	38.2	16.5	34.2	NA	12.6	0.072
1985	34.8	30.0	58.5	45.8	22.9	38.5	56.5	15.3	0.099
1990	33.6	24.6	61.5	45.8	12.9	35.3	44.8	13.1	0.088
1995	25.2	18.4	59.9	42.5	15.5	31.8	32.8	14.0	0.111
1999	27.1	19.9	59.0	41.0	16.7	33.0	32.2	14.0	0.118
2000	39.6	30.7	70.0	54.1	21.3	43.9	32.2	16.6	0.138
2001	33.3	30.1	75.7	52.3	18.6	43.7	26.3	17.1	0.138
2002	30.9	29.5	64.6	45.9	19.1	40.2	36.8	17.3	0.131
2003	37.3	29.7	79.0	61.1	15.6	47.4	65.6	19.6	0.142
2004	53.4	30.9	89.6	74.6	17.5	56.7	42.0	21.0	0.154
2005	73.3	50.7	107.6	91.4	19.6	73.8	33.2	24.8	0.180
2006	85.6	58.4	124.4	110.6	22.0	85.7	38.8	28.3	0.204
2007	92.0	67.5	126.5	117.1	22.6	92.1	43.3	27.2	0.209
2008	127.0	98.4	150.5	150.9	38.9	121.2	49.3	37.5	0.287
2009	71.8	57.1	116.6	97.3	47.6	80.4	50.3	29.5	0.209
2010	92.9	80.9	141.8	126.7	53.8	102.6	49.4	36.0	0.247
2011	128.5	116.4	174.4	168.3	58.4	135.8	37.5	44.6	0.310
2012	130.1	128.5	183.2	176.9	52.2	142.1	41.5	45.3	0.334
2013	128.1	122.5	176.2	174.1	56.9	138.2	43.0	41.4	0.332
2014	119.3	116.5	170.4	158.6	60.5	130.4	53.8	40.0	0.333
2015	69.9	60.8	139.9	128.0	44.7	90.1	68.9	31.1	0.260
2016	58.7	47.7	121.7	117.2	36.3	77.2	64.5	26.8	0.237

Source: Energy Information Administration, State Energy Data System

Table 3.6. Hawaii's Energy Price by Source

	Petroleum							
Year	Jet Fuel $/MBTU	Residual Fuel $/MBTU	Motor Gasoline $/MBTU	Distillate Fuel $/MBTU	Total Petroleum $/MBTU	Coal $/MBTU	Natural Gas $/MBTU	Retail Electricity $/MBTU
1970	0.7	0.4	3.3	1.0	1.1	-	-	6.98
1975	2.0	1.6	5.4	2.3	2.5	-	-	12.80
1980	6.2	3.8	10.8	6.6	6.2	-	13.06	22.01
1985	6.2	4.8	11.1	7.9	6.8	2.3	14.20	29.81
1990	6.0	4.0	11.7	7.9	6.4	1.8	12.24	26.56
1991	5.2	3.2	10.4	7.9	5.9	1.8	14.16	27.14
1992	4.9	2.8	11.0	7.2	5.5	1.4	13.33	27.79
1993	4.8	3.0	11.1	7.5	6.0	1.4	13.05	31.37
1994	4.3	2.7	11.3	7.4	5.7	1.4	12.68	31.44
1995	4.4	3.0	11.5	7.3	5.9	1.5	13.30	33.24
1996	5.2	3.5	12.2	7.7	6.6	1.6	14.66	35.65
1997	5.0	3.6	12.3	6.4	6.5	1.6	15.88	36.71
1998	3.7	2.6	12.0	5.8	5.6	1.5	13.71	33.99
1999	4.8	3.2	11.3	7.1	6.1	1.5	13.54	35.21
2000	7.0	5.0	13.4	9.3	8.0	1.5	16.18	41.24
2001	5.9	4.8	14.5	9.0	8.1	1.2	16.85	41.30
2002	5.5	4.9	12.4	7.9	7.5	1.7	16.67	39.42
2003	6.6	4.9	15.2	10.5	8.8	2.9	19.03	42.55
2004	9.4	5.1	17.2	12.8	10.5	1.9	20.33	46.16
2005	12.9	8.5	20.7	15.7	13.8	1.5	24.30	53.88
2006	15.1	9.8	24.0	19.1	16.0	1.7	27.54	60.91
2007	16.2	11.0	24.5	20.3	17.0	1.9	26.83	62.57
2008	22.4	16.2	29.4	26.1	22.7	2.3	36.73	85.78
2009	12.7	9.4	22.9	16.8	15.1	2.3	28.82	62.36
2010	16.4	13.4	27.9	21.9	19.3	2.3	35.29	73.80
2011	22.7	19.2	34.4	29.2	25.7	1.8	43.43	92.78
2012	22.9	21.0	36.2	30.7	27.0	2.0	44.19	99.96
2013	22.6	19.9	34.8	30.2	26.1	2.1	41.19	97.51
2014	21.0	19.0	33.7	27.5	24.6	2.6	41.67	98.00
2015	12.3	10.0	27.7	22.2	17.0	3.3	31.65	76.75
2016	10.4	7.7	24.1	20.4	14.6	3.1	27.30	70.01

Source: Energy Information Administration, State Energy Data System

3.6. Average Electricity and Gas Prices by Sector

Table 3.7 shows Hawaii's average electricity and gas prices in both nominal values and constant 2017 dollars. From 1960 to 2017, residential electricity prices in 2017 constant dollars increased 0.3 percent per year on average, while other electricity prices increased 0.5 percent per year. Residential and other gas prices both increased 0.6 percent per year on average.

Table 3.7. Hawaii's Average Electricity and Gas Prices

		Average Electricity Price				Average Gas Price			
		In Nominal Value		In Constant 2017 Dollar		In Nominal Value		In Constant 2017 Dollar	
Year	Honolulu CPI-U	Residential $/kWh	Other $/kWh	Residential 2017$/kWh	Other 2017$/kWh	Residential $/Therm	Other $/Therm	Residential 2017$/Therm	Other 2017$/Therm
1960	31.30	0.0297	0.0216	0.2583	0.1874	0.3619	0.2280	3.1451	1.9814
1970	41.50	0.0268	0.0201	0.1757	0.1318	0.3619	0.2227	2.3721	1.4597
1975	56.30	0.0459	0.0379	0.2216	0.1833	0.8172	0.6358	3.9485	3.0720
1980	83.00	0.0790	0.0696	0.2589	0.2282	1.4658	1.2595	4.8039	4.1278
1985	106.80	0.1136	0.0965	0.2894	0.2459	1.7693	1.3382	4.5064	3.4084
1990	138.10	0.1026	0.0854	0.2021	0.1683	1.6285	1.1483	3.2076	2.2619
1995	168.10	0.1334	0.1049	0.2158	0.1697	1.7967	1.2516	2.9074	2.0253
1996	170.70	0.1427	0.1127	0.2274	0.1796	2.1040	1.3358	3.3528	2.1286
1997	171.90	0.1484	0.1158	0.2348	0.1833	2.2908	1.4001	3.6249	2.2156
1998	171.50	0.1388	0.1068	0.2202	0.1694	2.1624	1.2593	3.4297	1.9974
1999	173.30	0.1431	0.1104	0.2246	0.1732	2.1727	1.2403	3.4102	1.9467
2000	176.30	0.1641	0.1308	0.2532	0.2019	2.4536	1.4856	3.7856	2.2921
2001	178.40	0.1634	0.1310	0.2491	0.1997	2.5923	1.5630	3.9525	2.3831
2002	180.30	0.1570	0.1251	0.2369	0.1887	2.8700	1.5100	4.3299	2.2781
2003	184.50	0.1674	0.1363	0.2468	0.2009	3.0600	1.7100	4.5115	2.5211
2004	190.60	0.1803	0.1479	0.2573	0.2111	3.2300	1.8800	4.6097	2.6830
2005	197.80	0.2066	0.1728	0.2841	0.2376	3.6400	2.2700	5.0057	3.1217
2006	209.35	0.2335	0.1960	0.3034	0.2546	3.8700	2.4600	5.0284	3.1963
2007	219.50	0.2412	0.2006	0.2989	0.2486	3.9400	2.5300	4.8825	3.1352
2008	228.86	0.3250	0.2781	0.3862	0.3305	4.8900	3.4700	5.8120	4.1243
2009	230.05	0.2420	0.1992	0.2862	0.2356	4.1900	2.6800	4.9544	3.1689
2010	234.87	0.2810	0.2386	0.3255	0.2763	4.9900	3.2700	5.7792	3.7872
2011	243.62	0.3468	0.3030	0.3872	0.3384	6.0500	4.0200	6.7551	4.4885
2012	249.47	0.3734	0.3273	0.4072	0.3568	5.6100	4.2800	6.1169	4.6667
2013	253.92	0.3681	0.3174	0.3944	0.3400	5.4500	3.9100	5.8383	4.1886
2014	257.59	0.3734	0.3213	0.3943	0.3392	5.4800	3.8900	5.7869	4.1078
2015	260.17	0.2992	0.2491	0.3128	0.2604	4.6800	2.9400	4.8931	3.0739
2016	265.28	0.2782	0.2256	0.2852	0.2313	4.3100	2.5000	4.4194	2.5634
2017	272.01	0.2997	0.2480	0.2997	0.2480	4.5300	2.7400	4.5300	2.7400

Source: The State of Hawaii Data Book.

3.7. Average Petroleum Product Prices in Constant Dollars

Table 3.8 shows average petroleum prices in 2017 constant dollars for each category. From 1970 to 2016, the average petroleum price in 2017 constant dollars increased 1.6 percent per year. In looking at the types of fuel, the average real price increase was the highest for distillate fuel at 2.5 percent per year, followed by residual fuel at 2.4 percent, jet fuel at 1.7 percent, and motor gasoline at 0.3 percent.

Table 3.8. Hawaii's Average Petroleum Prices in Constant 2017 Dollars

Year	Jet Fuel $/MBTU	Residual Fuel $/MBTU	Motor Gasoline $/MBTU	Distillate Fuel $/MBTU	Total Petroleum $/MBTU	Motor Gasoline $/Gallon
1970	4.7848	2.6218	21.7611	6.8167	7.0789	2.90
1975	9.8563	7.6821	26.2834	11.1125	12.1754	3.50
1980	20.3519	12.4537	35.4274	21.5645	20.1880	4.72
1985	15.8165	12.2508	28.3730	20.0190	17.2938	3.78
1990	11.7984	7.9378	23.0651	15.4818	12.6060	3.08
1995	7.1847	4.8221	18.5766	11.8288	9.5310	2.48
1996	8.3500	5.6251	19.3613	12.3339	10.5810	2.58
1997	7.9595	5.7599	19.3844	10.1906	10.2539	2.58
1998	5.8209	4.1238	19.0013	9.2310	8.8821	2.53
1999	7.5184	5.0385	17.7523	11.0658	9.5119	2.37
2000	10.7695	7.6991	20.7058	14.3490	12.4049	2.76
2001	8.9502	7.3035	22.1393	13.7227	12.2894	2.95
2002	8.2223	7.3322	18.7076	11.9034	11.2849	2.49
2003	9.7011	7.1800	22.3951	15.4952	13.0183	2.99
2004	13.4294	7.2214	24.5755	18.3246	14.9850	3.28
2005	17.7813	11.7167	28.4803	21.6181	18.9502	3.80
2006	19.6198	12.6684	31.1319	24.7782	20.7892	4.15
2007	20.1002	13.6686	30.4105	25.0942	21.0544	4.05
2008	26.6237	19.1952	34.9080	31.0451	27.0159	4.65
2009	14.9695	11.1621	27.0302	19.9002	17.8428	3.60
2010	18.9821	15.4845	32.3356	25.4099	22.3639	4.31
2011	25.3120	21.4488	38.4202	32.5583	28.6393	5.12
2012	25.0126	22.9300	39.4597	33.4301	29.3849	5.26
2013	24.2101	21.2856	37.2899	32.3836	27.9487	4.97
2014	22.2182	20.0851	35.5660	29.0822	25.9987	4.74
2015	12.8916	10.4241	28.9093	23.2529	17.7952	3.85
2016	10.6126	7.9261	24.6602	20.8868	14.9807	3.29

Source: Energy Information Administration, State Energy Data System

4. HAWAII'S ENERGY EFFICIENCY AND INTENSITY

4.1. Energy Consumption per Thousand Dollars of Real GDP

From 1970 to 2016, in terms of energy consumption per thousand dollars of real GDP, Hawaii's total energy consumption decreased 52.5 percent, total petroleum consumption decreased about 59.0 percent, and electricity consumption decreased 17.2 percent. During the same period, the U.S. total energy consumption per dollar of real GDP decreased 59.7 percent.

Table 4.1. Energy Consumption per Thousand Dollars of Real GDP

		Energy Consumption per 1000 Dollar of Real GDP				Energy Intensity Index		
Year	Hawaii Real GDP in 2009 $M	Hawaii Total Energy Mbtu/$1000	U.S. Total Energy Mbtu/$1000	Hawaii Petroleum BBL/$1000	Hawaii Electricity kWh/$1000	Hawaii Total Energy 1970=100	Hawaii Petroleum 1970=100	Hawaii Electricity 1970=100
1970	24,564	8.02	14.57	1.39	154	100.0	100.0	100.0
1975	30,891	6.94	13.58	1.20	172	86.6	86.5	111.8
1980	36,419	7.21	12.30	1.20	174	89.9	86.1	113.1
1985	40,648	6.11	10.24	0.98	163	76.3	70.9	106.2
1990	53,260	6.03	9.61	0.94	156	75.3	67.6	101.5
1995	53,771	5.52	9.13	0.82	171	68.9	58.7	111.2
1996	53,200	5.32	9.08	0.78	176	66.4	56.4	114.7
1997	53,108	5.15	8.76	0.75	176	64.2	54.0	114.7
1998	51,723	5.29	8.41	0.78	179	65.9	56.4	116.5
1999	52,524	5.13	8.16	0.76	179	64.0	54.4	116.2
2000	53,710	5.09	8.01	0.76	180	63.5	54.4	117.4
2001	53,669	5.04	7.72	0.77	182	62.8	55.7	118.6
2002	55,358	5.14	7.71	0.81	179	64.2	58.3	116.2
2003	58,100	5.18	7.51	0.81	179	64.6	58.1	116.3
2004	61,606	5.11	7.40	0.80	174	63.7	57.4	113.3
2005	64,824	5.01	7.15	0.79	163	62.5	57.0	105.8
2006	66,313	4.93	6.90	0.78	159	61.5	56.0	103.7
2007	67,421	5.01	6.88	0.78	157	62.5	56.5	102.1
2008	67,721	4.09	6.75	0.63	153	50.9	45.1	99.8
2009	65,382	4.22	6.59	0.65	155	52.6	46.8	100.7
2010	67,403	4.11	6.66	0.63	149	51.3	45.7	96.7
2011	67,971	4.20	6.51	0.65	147	52.4	47.0	95.3
2012	68,913	4.03	6.21	0.62	140	50.3	44.7	91.0
2013	69,676	4.00	6.28	0.61	136	49.8	43.8	88.7
2014	70,306	3.97	6.20	0.60	135	49.5	43.0	87.7
2015	72,816	3.89	5.97	0.59	131	48.5	42.3	85.0
2016	74,241	3.81	5.87	0.57	127	47.5	41.0	82.8

Source: U.S. EIA and BEA.

4.2. Energy Consumption per Capita

Energy consumption per capita can be measured based on both resident population and de facto population (includes non-residents). Tables 4.2 and 4.3 provide total energy, petroleum, and electricity consumption per capita of resident population and of de facto population, respectively.

Table 4.2. Hawaii's Energy Consumption per Capita of Resident Population

		Energy Consumption per Capita			Energy Intensity Index		
Year	Resident Population	Total Energy Mbtu/Capita	Petroleum BBL/Capita	Electricity kWh/Capita	Total Energy 1970=100	Petroleum 1970=100	Electricity 1970=100
1970	771,700	255	44	4,893	100.0	100.0	100.0
1975	886,200	242	42	5,992	94.8	94.7	122.5
1980	968,500	271	45	6,537	106.2	101.8	133.6
1985	1,039,698	239	38	6,382	93.7	87.1	130.4
1990	1,113,491	289	45	7,464	113.1	101.6	152.5
1995	1,196,854	248	37	7,677	97.2	82.9	156.9
1996	1,203,755	235	35	7,791	92.2	78.3	159.2
1997	1,211,640	226	33	7,728	88.5	74.4	157.9
1998	1,215,233	225	33	7,621	88.2	75.4	155.7
1999	1,210,300	223	33	7,751	87.2	74.2	158.4
2000	1,213,519	225	33	7,986	88.3	75.7	163.2
2001	1,225,948	220	34	7,982	86.4	76.6	163.1
2002	1,239,613	230	36	7,980	90.0	81.7	163.1
2003	1,251,154	241	37	8,305	94.2	84.7	169.7
2004	1,273,569	247	39	8,427	96.8	87.2	172.2
2005	1,292,729	251	40	8,153	98.4	89.7	166.6
2006	1,309,731	250	39	8,069	97.9	89.1	164.9
2007	1,315,675	257	40	8,045	100.6	91.0	164.4
2008	1,332,213	208	32	7,799	81.4	72.0	159.4
2009	1,346,717	205	32	7,519	80.3	71.4	153.7
2010	1,363,817	203	31	7,345	79.6	70.9	150.1
2011	1,378,323	207	32	7,228	81.2	72.9	147.7
2012	1,392,772	200	31	6,921	78.2	69.5	141.4
2013	1,408,038	198	30	6,749	77.5	68.0	137.9
2014	1,417,710	197	30	6,683	77.2	67.0	136.6
2015	1,426,320	199	30	6,668	77.8	67.9	136.3
2016	1,428,683	198	30	6,611	77.6	66.9	135.1

Source: U.S. EIA and Census.

Table 4.3. Hawaii's Energy Consumption per Capita of De Facto Population

		Energy Consumption per Capita			Energy Intensity Index		
Year	De Facto Population	Total Energy Mbtu/Capita	Petroleum BBL/Capita	Electricity kWh/Capita	Total Energy 1970=100	Petroleum 1970=100	Electricity 1970=100
1970	798,600	247	43	4,728	100.0	100.0	100.0
1975	943,500	227	39	5,628	92.1	92.1	119.0
1980	1,054,218	249	41	6,005	100.9	96.8	127.0
1985	1,136,160	219	35	5,840	88.7	82.5	123.5
1990	1,257,319	256	40	6,610	103.6	93.1	139.8
1991	1,252,265	236	37	6,807	95.6	85.6	144.0
1992	1,271,662	241	37	6,815	97.6	85.9	144.1
1993	1,267,849	223	33	6,829	90.5	76.4	144.4
1994	1,289,804	232	35	6,937	94.1	81.4	146.7
1995	1,298,096	229	34	7,078	92.8	79.1	149.7
1996	1,303,915	217	32	7,193	88.1	74.8	152.1
1997	1,327,930	206	30	7,051	83.5	70.2	149.1
1998	1,334,125	205	30	6,942	83.1	71.1	146.8
1999	1,332,442	202	30	7,040	82.0	69.7	148.9
2000	1,336,005	205	30	7,254	83.0	71.1	153.4
2001	1,337,629	202	31	7,315	81.9	72.6	154.7
2002	1,353,051	210	33	7,311	85.3	77.5	154.6
2003	1,358,755	222	34	7,647	89.8	80.8	161.7
2004	1,387,569	227	35	7,734	92.0	82.9	163.6
2005	1,412,500	230	36	7,461	93.2	85.0	157.8
2006	1,430,516	229	36	7,388	92.7	84.4	156.2
2007	1,433,461	236	37	7,384	95.5	86.4	156.2
2008	1,432,620	193	30	7,252	78.3	69.3	153.4
2009	1,442,556	191	29	7,019	77.6	68.9	148.5
2010	1,468,549	189	29	6,821	76.5	68.2	144.3
2011	1,490,284	192	30	6,685	77.7	69.7	141.4
2012	1,518,054	183	28	6,350	74.2	66.0	134.3
2013	1,541,968	181	27	6,163	73.2	64.3	130.3
2014	1,559,029	179	27	6,078	72.6	63.0	128.5
2015	1,577,865	179	27	6,028	72.8	63.5	127.5
2016	1,583,265	179	27	5,966	72.4	62.5	126.2

Source: U.S. EIA and State of Hawaii Data Book.

4.3. Energy Expenditures in Constant Dollars per Dollar of Real GDP

Table 4.4 provides energy expenditures in 2017 constant dollars. The Honolulu CPI-U was used to convert current dollar energy expenses to constant dollar expenses. From 1970 to 2016, total energy expenditures in 2017 constant dollars increased 187.7 percent in Hawaii, with petroleum and electricity expenditures increasing at 150.7 percent and 264.8 percent, respectively.

Table 4.4. Hawaii's Energy Expenditures in Constant 2017 Dollars

Year	Honolulu CPI-U	Total Energy $Million	Petroleum $Million	Electricity* $Million
1970	42	1,795	1,334	459
1975	56	3,148	2,503	642
1980	83	5,639	4,884	593
1985	107	4,857	3,927	795
1990	138	4,172	3,476	611
1995	168	3,564	2,254	1,185
1996	171	3,674	2,316	1,232
1997	172	3,596	2,177	1,293
1998	172	3,319	1,945	1,262
1999	173	3,395	2,056	1,230
2000	176	4,174	2,752	1,299
2001	178	4,238	2,765	1,354
2002	180	4,056	2,714	1,215
2003	185	4,918	3,278	1,466
2004	191	5,744	3,971	1,625
2005	198	6,872	5,206	1,519
2006	209	7,444	5,741	1,550
2007	220	7,655	6,036	1,465
2008	229	8,116	6,108	1,820
2009	230	5,681	4,036	1,495
2010	235	6,791	5,079	1,544
2011	244	8,578	6,728	1,673
2012	249	8,555	6,629	1,743
2013	254	8,232	6,266	1,790
2014	258	7,850	5,778	1,886
2015	260	5,969	4,030	1,776
2016	265	5,166	3,345	1,676

* Excluding fuel cost of electricity generation.

Source: U.S. EIA and State of Hawaii Data Book.

Table 4.5 shows that Hawaii's energy expenditures per dollar of real GDP decreased 4.8 percent from 1970 to 2016. During the same period, Petroleum expenditures per dollar of real GDP decreased 17.0 percent but electricity expenditures per dollar of real GDP increased 20.7 percent.

Table 4.5. Hawaii's Energy Expenditures per Dollar of Real GDP

	Expenditures per Dollar of Real GDP*			Index		
Year	Total Energy Cents/$GDP	Petroleum Cents/$GDP	Electricity** Cents/$GDP	Total Energy 1970=100	Petroleum 1970=100	Electricity 1970=100
1970	7.3	5.4	1.9	100.0	100.0	100.0
1975	10.2	8.1	2.1	139.4	149.2	111.1
1980	15.5	13.4	1.6	211.9	247.0	87.1
1985	11.9	9.7	2.0	163.5	177.9	104.6
1990	7.8	6.5	1.1	107.2	120.2	61.3
1995	6.6	4.2	2.2	90.7	77.2	117.8
1996	6.9	4.4	2.3	94.5	80.2	123.8
1997	6.8	4.1	2.4	92.6	75.5	130.1
1998	6.4	3.8	2.4	87.8	69.3	130.5
1999	6.5	3.9	2.3	88.4	72.1	125.2
2000	7.8	5.1	2.4	106.3	94.4	129.3
2001	7.9	5.2	2.5	108.0	94.9	134.9
2002	7.3	4.9	2.2	100.2	90.3	117.4
2003	8.5	5.6	2.5	115.8	103.9	134.9
2004	9.3	6.4	2.6	127.6	118.7	141.0
2005	10.6	8.0	2.3	145.0	147.9	125.3
2006	11.2	8.7	2.3	153.6	159.4	125.0
2007	11.4	9.0	2.2	155.3	164.9	116.2
2008	12.0	9.0	2.7	164.0	166.1	143.7
2009	8.7	6.2	2.3	118.9	113.7	122.3
2010	10.1	7.5	2.3	137.9	138.8	122.4
2011	12.6	9.9	2.5	172.7	182.3	131.6
2012	12.4	9.6	2.5	169.8	177.1	135.3
2013	11.8	9.0	2.6	161.6	165.6	137.3
2014	11.2	8.2	2.7	152.8	151.3	143.4
2015	8.2	5.5	2.4	112.2	101.9	130.4
2016	7.0	4.5	2.3	95.2	83.0	120.7

* Expenditures in constant 2017 dollar.

** Excluding fuel cost of electricity generation.

Source: U.S. EIA and BEA.

4.4. Energy Expenditures in Constant Dollars per Capita

Hawaii's energy expenditures per capita of resident population, in constant 2017 dollars, increased 55.4 percent from 1970 to 2016 (Table 4.6). During this same period, petroleum and electricity expenditures per capita of residential population increased 35.4 percent and 97.1 percent, respectively.

Table 4.6. Hawaii's Energy Expenditures per Capita of Resident Population

	Energy Expenditures per Capita*			Index		
Year	Total Energy $/Capita	Petroleum $/Capita	Electricity** $/Capita	Total Energy 1970=100	Petroleum 1970=100	Electricity 1970=100
1970	2,326	1,728	595	100.0	100.0	100.0
1975	3,552	2,825	725	152.7	163.4	121.7
1980	5,823	5,043	612	250.3	291.8	102.9
1985	4,671	3,777	765	200.8	218.5	128.4
1990	3,746	3,122	549	161.0	180.6	92.2
1995	2,978	1,883	990	128.0	108.9	166.3
2000	3,439	2,268	1,071	147.8	131.2	179.8
2001	3,457	2,255	1,105	148.6	130.5	185.5
2002	3,272	2,189	980	140.6	126.7	164.7
2003	3,931	2,620	1,172	169.0	151.6	196.8
2004	4,510	3,118	1,276	193.9	180.4	214.2
2005	5,316	4,027	1,175	228.5	233.0	197.4
2006	5,684	4,384	1,184	244.3	253.6	198.8
2007	5,818	4,588	1,114	250.1	265.4	187.0
2008	6,092	4,585	1,366	261.9	265.3	229.4
2009	4,219	2,997	1,110	181.3	173.4	186.5
2010	4,979	3,724	1,132	214.0	215.5	190.1
2011	6,223	4,881	1,214	267.5	282.4	203.8
2012	6,142	4,759	1,252	264.0	275.4	210.2
2013	5,846	4,450	1,271	251.3	257.5	213.5
2014	5,537	4,075	1,330	238.0	235.8	223.4
2015	4,185	2,826	1,245	179.9	163.5	209.1
2016	3,616	2,341	1,173	155.4	135.4	197.1

* Expenditures in constant 2017 dollar.

** Excluding fuel cost of electricity generation.

Source: U.S. EIA and State of Hawaii Data Book.

From 1970 to 2016, Hawaii's energy expenditure per capita of the de facto population (includes non-residents) increased 45.1 percent, from $2,248 to $3,263 in 2017 constant dollars. During the same period, petroleum expenditures per capita increased 26.5 percent from $1,670 to $2,112, and electricity expenditures per capita increased 84.0 percent from $575 to $1,059.

Table 4.7. Hawaii's Energy Expenditures per Capita of De Facto Population

	Energy Expenditures per Capita*			Index		
Year	Total Energy $/Capita	Petroleum $/Capita	Electricity** $/Capita	Total Energy 1970=100	Petroleum 1970=100	Electricity 1970=100
1970	2,248	1,670	575	100.0	100.0	100.0
1975	3,336	2,653	681	148.4	158.8	118.3
1980	5,349	4,633	563	237.9	277.4	97.8
1985	4,275	3,457	700	190.2	207.0	121.6
1990	3,318	2,765	486	147.6	165.5	84.5
1995	2,746	1,736	913	122.1	104.0	158.7
2000	3,124	2,060	973	139.0	123.3	169.0
2001	3,168	2,067	1,012	140.9	123.8	176.0
2002	2,997	2,006	898	133.3	120.1	156.1
2003	3,620	2,412	1,079	161.0	144.4	187.6
2004	4,139	2,862	1,171	184.1	171.3	203.5
2005	4,865	3,685	1,076	216.4	220.7	186.9
2006	5,204	4,013	1,084	231.5	240.3	188.4
2007	5,340	4,211	1,022	237.5	252.1	177.6
2008	5,665	4,263	1,270	252.0	255.3	220.8
2009	3,938	2,798	1,037	175.2	167.5	180.2
2010	4,624	3,458	1,051	205.7	207.1	182.7
2011	5,756	4,514	1,122	256.0	270.3	195.1
2012	5,635	4,367	1,148	250.7	261.4	199.6
2013	5,339	4,063	1,161	237.5	243.3	201.8
2014	5,035	3,706	1,210	224.0	221.9	210.3
2015	3,783	2,554	1,125	168.3	152.9	195.6
2016	3,263	2,112	1,059	145.1	126.5	184.0

* Expenditures in constant 2017 dollar.

** Excluding fuel cost of electricity generation.

Source: U.S. EIA and State of Hawaii Data Book.

5. SECTOR TRENDS IN ENERGY CONSUMPTION AND INTENSITY

5.1. Transportation Sector

Hawaii's transportation sector consumed about 146 trillion Btu or 26.8 million barrels of petroleum products in 2016. Jet fuel accounted for 50.8 percent of the total transportation fuel consumption, followed by motor gasoline (36.8%), distillate fuel (8.6%), and residual fuel (3.5%).

Table 5.1. Transportation End-Use Energy Consumption by Fuel Type

		% of Total Transportation Energy Consumption						
Year	Total Billion Btu	Jet Fuel	Motor Gasoline	Distillate Fuel	Residual Fuel	Aviation Gasoline	Other Fuels	Total
1960	61,778	38.1	28.0	2.3	9.9	21.6	0.2	100.0
1970	125,344	63.9	23.1	3.4	8.7	0.5	0.4	100.0
1975	130,543	63.9	26.6	3.7	4.9	0.4	0.4	100.0
1980	146,713	54.0	25.5	13.2	6.2	0.7	0.4	100.0
1985	142,887	52.1	27.4	13.0	6.7	0.5	0.3	100.0
1990	154,545	46.0	28.8	13.2	10.8	0.9	0.3	100.0
1995	138,169	40.8	34.6	11.3	12.2	0.8	0.3	100.0
1996	121,597	47.0	39.1	9.2	3.6	0.7	0.4	100.0
1997	117,273	49.4	40.5	6.6	2.6	0.5	0.4	100.0
1998	114,627	49.5	41.2	6.3	2.1	0.5	0.4	100.0
1999	123,086	43.6	37.2	9.8	8.7	0.2	0.4	100.0
2000	125,215	42.7	38.0	7.6	11.2	0.2	0.4	100.0
2001	132,038	38.2	37.8	10.8	12.7	0.2	0.3	100.0
2002	140,172	41.2	38.2	13.8	6.4	0.1	0.3	100.0
2003	162,853	44.2	33.4	18.5	3.5	0.0	0.3	100.0
2004	171,951	44.1	31.9	18.1	5.5	0.1	0.2	100.0
2005	179,134	51.8	31.4	12.4	3.9	0.1	0.3	100.0
2006	181,261	48.0	32.6	10.8	8.2	0.1	0.2	100.0
2007	194,357	37.2	29.4	18.6	14.4	0.1	0.2	100.0
2008	136,519	44.4	39.1	11.6	4.5	0.1	0.3	100.0
2009	132,958	39.7	40.6	13.6	5.7	0.1	0.3	100.0
2010	136,386	40.9	36.6	17.0	5.0	0.1	0.4	100.0
2011	144,448	43.0	38.5	13.6	4.4	0.1	0.4	100.0
2012	142,196	45.1	37.2	13.3	4.0	0.1	0.3	100.0
2013	141,660	45.3	37.9	12.5	3.9	0.1	0.4	100.0
2014	142,241	51.5	37.9	6.5	3.7	0.1	0.3	100.0
2015	145,752	52.2	36.3	8.1	3.0	0.0	0.3	100.0
2016	146,180	50.8	36.8	8.6	3.5	0.0	0.3	100.0

Source: Energy Information Administration, State Energy Data System

Table 5.2. Transportation Fuel Consumption in Barrels

	Units: 1000 BBL						
Year	Jet Fuel	Motor Gasoline	Distillate Fuel	Residual Fuel	Aviation Gasoline	Other Fuels	Total
1960	4,321	3,290	247	968	2,640	21	11,487
1965	7,618	3,947	844	1,195	613	77	14,294
1970	14,273	5,508	722	1,744	133	93	22,473
1975	14,849	6,615	831	1,013	116	96	23,520
1980	14,116	7,129	3,331	1,441	199	101	26,317
1985	13,260	7,443	3,184	1,526	155	73	25,641
1990	12,646	8,477	3,498	2,657	272	89	27,639
1991	11,123	8,771	4,201	2,594	261	84	27,034
1992	9,993	8,674	2,860	3,756	243	105	25,631
1993	8,891	8,808	2,674	2,654	198	80	23,305
1994	9,472	9,088	3,223	2,936	210	88	25,017
1995	9,940	9,160	2,683	2,677	218	81	24,759
1996	10,087	9,104	1,928	702	165	72	22,058
1997	10,221	9,104	1,322	489	121	77	21,334
1998	9,999	9,065	1,242	383	107	80	20,876
1999	9,474	8,786	2,071	1,708	58	80	22,177
2000	9,438	9,118	1,627	2,226	45	78	22,532
2001	8,895	9,576	2,455	2,658	48	72	23,704
2002	10,189	10,262	3,329	1,437	18	71	25,306
2003	12,708	10,448	5,186	914	15	76	29,347
2004	13,379	10,560	5,359	1,493	39	67	30,897
2005	16,372	10,833	3,827	1,121	44	81	32,278
2006	15,334	11,379	3,387	2,375	41	81	32,597
2007	12,756	11,092	6,246	4,465	41	78	34,678
2008	10,702	10,416	2,729	978	28	64	24,917
2009	9,303	10,588	3,124	1,214	30	61	24,320
2010	9,837	9,838	4,019	1,075	37	83	24,889
2011	10,948	10,985	3,409	1,002	35	91	26,470
2012	11,311	10,434	3,274	906	31	83	26,039
2013	11,323	10,595	3,060	880	27	84	25,969
2014	12,922	10,648	1,591	848	28	75	26,112
2015	13,421	10,460	2,049	699	9	79	26,717
2016	13,104	10,626	2,179	810	6	73	26,798

Source: Energy Information Administration, State Energy Data System

Table 5.3 shows that the transportation sector accounted for 63.4 percent of the total petroleum consumption in Hawaii in 2016. All the jet fuel and aviation gasoline and almost all of the motor gasoline were consumed by the transportation sector. About 48.0 percent of the distillate fuel and 8.4 percent of residual fuel were also consumed by the transportation sector in 2016.

Table 5.3. Percentage of Transportation Petroleum Consumption

	% of Total BBL Consumption						
Year	Jet Fuel	Motor Gasoline	Distillate Fuel	Residual Fuel	Aviation Gasoline	Others	Petroleum Total
1960	100.0	95.9	27.9	20.3	100.0	2.6	68.2
1965	100.0	96.7	52.4	16.5	100.0	5.8	63.6
1970	100.0	96.8	42.6	17.2	100.0	4.3	65.9
1975	100.0	97.8	42.7	9.0	100.0	4.4	63.4
1980	100.0	98.6	55.6	10.9	100.0	3.6	60.4
1985	100.0	98.0	70.3	11.6	100.0	5.7	64.1
1990	100.0	97.8	53.9	13.9	100.0	3.1	55.3
1995	100.0	97.3	46.4	18.5	100.0	2.0	56.5
1996	100.0	97.1	38.9	5.5	100.0	1.6	53.0
1997	100.0	97.3	28.5	4.0	100.0	2.4	53.6
1998	100.0	97.0	27.9	2.9	100.0	2.4	51.6
1999	100.0	98.1	39.0	13.2	100.0	2.7	55.9
2000	100.0	98.2	31.9	16.5	100.0	2.4	55.5
2001	100.0	98.6	40.6	20.0	100.0	2.1	57.1
2002	100.0	98.5	41.2	11.3	100.0	2.1	56.5
2003	100.0	98.6	63.2	7.6	100.0	2.3	62.6
2004	100.0	98.3	62.1	11.4	100.0	2.1	62.9
2005	100.0	98.7	52.4	8.5	100.0	2.4	63.0
2006	100.0	98.7	50.6	16.2	100.0	2.5	63.2
2007	100.0	97.7	67.2	27.4	100.0	2.5	65.5
2008	100.0	97.6	49.6	7.9	100.0	2.1	58.8
2009	100.0	97.7	51.6	9.8	100.0	1.6	57.3
2010	100.0	98.4	58.6	9.0	100.0	2.0	58.2
2011	100.0	98.6	54.0	8.6	100.0	2.2	59.6
2012	100.0	98.6	53.7	8.4	100.0	2.1	60.9
2013	100.0	98.6	53.5	8.5	100.0	2.0	61.3
2014	100.0	98.3	36.5	8.6	100.0	1.9	62.2
2015	100.0	94.6	43.3	7.2	100.0	2.1	62.4
2016	100.0	94.7	48.0	8.4	100.0	2.0	63.4

Source: Energy Information Administration, State Energy Data System

Table 5.4 provides selected motor vehicle fuel consumption intensity measures. From 1960 to 2016, Hawaii's average motor vehicle fuel consumption per vehicle decreased from 616 gallons per vehicle to 431 gallons per vehicle. The average miles per gallon of fuel increased from 14.0 miles/gallon in 1960 to 20.9 miles/gallon in 2016. From 1970 to 2016 fuel cost per mile decreased from about 21 cents per mile to 16 cents per mile in constant dollars. Due to substantial increases in vehicle miles traveled per capita, total land transportation fuel cost per capita increased from $915 in 1970 to $1,224 in 2016.

Table 5.4. Motor Vehicle Fuel Consumption Intensity

Year	Total Motor Vehicle Registration	Highway Fuel Consumption 1000 Gal	Average Fuel Consumption Gal/Vehicle	Vehicle Miles Millions	Average Annual Miles Miles/Vehicle	Vehicle Miles Traveled per Capita	Average Miles per Gallon	Fuel Cost* Per Mile Cents/Mile	Fuel Cost* Per Capita $/Capita
1960	230,709	142,117	616	1,990	8,624	3,101	14.0	NA	NA
1965	309,155	174,982	566	2,450	7,924	3,481	14.0	NA	NA
1970	412,930	243,482	590	3,409	8,255	4,417	14.0	21	915
1975	506,434	296,160	585	4,146	8,187	4,679	14.0	25	1,171
1980	617,571	330,734	536	5,570	9,019	5,751	16.8	28	1,613
1985	749,034	345,672	461	6,762	9,027	6,503	19.6	19	1,258
1990	889,096	395,185	444	8,065	9,071	7,243	20.4	15	1,091
1995	877,756	422,884	482	7,944	9,050	6,637	18.8	13	875
2000	941,242	428,425	455	8,526	9,058	7,026	19.9	14	975
2001	967,146	445,558	461	8,754	9,052	7,141	19.6	15	1,073
2002	987,598	477,518	484	8,937	9,050	7,210	18.7	13	961
2003	1,030,845	483,232	469	9,325	9,046	7,453	19.3	15	1,153
2004	1,072,211	498,816	465	9,735	9,079	7,644	19.5	17	1,283
2005	1,119,838	505,418	451	10,129	9,045	7,835	20.0	19	1,485
2006	1,127,467	531,505	471	10,196	9,044	7,785	19.2	22	1,684
2007	1,134,542	541,956	478	10,260	9,043	7,798	18.9	21	1,670
2008	1,127,567	540,910	480	10,189	9,036	7,648	18.8	25	1,890
2009	1,117,790	545,413	488	10,095	9,031	7,496	18.5	19	1,460
2010	1,120,080	500,987	447	10,111	9,027	7,414	20.2	21	1,584
2011	1,181,148	546,247	462	10,654	9,020	7,730	19.5	26	2,030
2012	1,278,233	520,544	407	11,518	9,011	8,270	22.1	24	1,966
2013	1,341,152	523,856	391	12,078	9,006	8,578	23.1	22	1,850
2014	1,284,193	524,642	409	10,174	7,922	7,176	19.4	24	1,755
2015	1,233,523	540,559	438	11,130	9,023	7,803	20.6	19	1,461
2016	1,232,731	531,740	431	11,132	9,030	7,792	20.9	16	1,224

* Fuel cost in Constant 2017 dollar.

Source: Hawaii State Department of Transportation and State of Hawaii Data Book.

Table 5.5 shows that Hawaii's average aviation fuel (jet fuel and aviation gasoline) per landing passenger decreased in the 1980s, remained low for most of the 1990s, increased from 2001 to 2005, and then decreased from 2005 to 2016.

Table 5.5. Air Transportation Fuel Consumption per Passenger

	Aviation Fuel	Passengers Landing			Visitor Arrival			Aviation Fuel per	
	Consumption	Total	Domestic	International	Total	Domestic	International	Passenger	Visitor
Year	T BBL							BBL/Passenger	BBL/Visitor
1960	6,961	NA	NA	NA	296,517	NA	NA	NA	23.5
1965	8,231	NA	NA	NA	686,314	539,211	147,103	NA	12.0
1970	14,406	NA	NA	NA	1,745,904	1,273,639	472,265	NA	8.3
1975	14,965	NA	NA	NA	2,818,082	2,028,068	790,014	NA	5.3
1980	14,315	4,172,640	914,787	3,257,853	3,928,789	2,793,101	1,135,688	3.4	3.6
1985	13,415	5,338,170	1,200,340	4,137,830	4,843,414	3,522,126	1,321,288	2.5	2.8
1990	12,918	7,453,550	5,127,690	2,325,860	6,723,530	4,315,159	2,408,371	1.7	1.9
1995	10,158	7,466,710	4,725,150	2,741,560	6,546,762	3,743,477	2,803,285	1.4	1.6
1996	10,252	7,648,880	4,801,570	2,847,310	6,723,150	3,794,122	2,929,028	1.3	1.5
1997	10,342	7,723,580	4,907,620	2,815,960	6,761,148	3,890,811	2,870,337	1.3	1.5
1998	10,106	7,545,230	5,033,100	2,512,130	6,595,790	4,014,140	2,581,650	1.3	1.5
1999	9,532	7,708,206	5,088,781	2,619,425	6,741,037	4,255,621	2,485,416	1.2	1.4
2000	9,483	7,981,480	5,318,419	2,663,061	6,948,595	4,446,936	2,501,659	1.2	1.4
2001	8,943	7,318,235	5,071,551	2,246,684	6,303,791	4,224,321	2,079,470	1.2	1.4
2002	10,207	7,424,621	5,253,652	2,170,969	6,389,058	4,358,850	2,030,208	1.4	1.6
2003	12,723	7,438,045	5,461,554	1,976,491	6,380,439	4,531,289	1,849,150	1.7	2.0
2004	13,418	8,101,166	5,911,004	2,190,162	6,912,094	4,892,960	2,019,134	1.7	1.9
2005	16,416	8,713,112	6,436,275	2,276,837	7,416,574	5,313,281	2,103,293	1.9	2.2
2006	15,375	8,937,555	6,772,702	2,164,853	7,528,106	5,550,125	1,977,981	1.7	2.0
2007	12,797	8,910,672	6,791,906	2,118,766	7,496,820	5,582,530	1,914,290	1.4	1.7
2008	10,730	8,021,780	6,005,133	2,016,647	6,713,436	4,901,893	1,811,543	1.3	1.6
2009	9,333	7,709,202	5,748,379	1,960,823	6,420,448	4,672,001	1,748,447	1.2	1.5
2010	9,874	8,255,465	6,083,060	2,172,405	6,916,894	4,957,352	1,959,542	1.2	1.4
2011	10,983	8,510,128	6,258,790	2,251,338	7,174,397	5,127,291	2,047,106	1.3	1.5
2012	11,342	9,216,594	6,551,222	2,665,372	7,867,143	5,403,025	2,464,118	1.2	1.4
2013	11,350	9,283,117	6,527,077	2,756,040	8,003,474	5,405,300	2,598,174	1.2	1.4
2014	12,950	9,458,694	6,647,828	2,810,866	8,196,342	5,486,059	2,710,283	1.4	1.6
2015	13,430	9,901,349	7,010,549	2,890,800	8,563,018	5,782,140	2,780,878	1.4	1.6
2016	13,110	10,222,915	7,221,908	3,001,007	8,821,802	5,968,779	2,853,023	1.3	1.5

Source: U.S. EIA and State of Hawaii Data Book.

5.2. Residential Sector

The residential sector consumed about 33 trillion Btu or about 11.6 percent of Hawaii's total energy in 2016. Electricity (both retail electricity and allocated electric system losses) accounted for about 77.6 percent of total residential energy consumption, followed by solar/PV energy (19.4%) and petroleum which was mostly LPG (2.1%).

Table 5.6. Residential Energy Consumption by Source

		% of Total Residential Energy Consumption					
Year	Total Billion Btu	Natural Gas	Petroleum	Solar/PV	Wood	Retail Electricity	Electrical System Losses
1960	7,144	0.0	1.4	0.0	0.0	24.6	74.0
1965	9,875	0.0	2.0	0.0	0.0	29.8	68.3
1970	15,460	0.0	5.0	0.0	0.0	28.4	66.7
1975	18,957	0.0	2.9	0.0	0.0	29.9	67.2
1980	21,020	0.0	3.5	0.0	0.0	29.9	66.6
1985	19,928	0.0	0.9	0.0	0.0	32.2	67.0
1990	30,724	0.0	0.7	2.9	0.0	25.8	70.6
1995	31,255	0.0	0.5	3.7	0.0	28.5	67.3
2000	32,983	0.0	2.3	3.9	0.0	28.6	65.2
2001	32,162	0.1	2.3	3.8	0.0	29.7	64.0
2002	34,518	0.1	2.2	3.6	0.0	28.6	65.5
2003	31,774	0.1	1.8	3.9	0.0	32.5	61.7
2004	32,637	0.1	1.8	3.9	0.0	33.1	61.2
2005	33,335	0.1	1.8	3.9	0.5	32.4	61.4
2006	33,679	0.1	1.8	4.0	0.5	32.2	61.4
2007	34,099	0.1	1.5	4.2	0.5	32.0	61.7
2008	33,423	0.1	3.1	4.9	0.6	31.5	59.9
2009	33,308	0.1	2.8	5.3	1.0	31.3	59.5
2010	32,613	0.1	2.8	5.9	0.9	31.3	59.0
2011	32,457	0.1	2.6	6.8	0.9	30.8	58.8
2012	31,518	0.1	4.0	9.6	0.9	29.7	55.8
2013	30,856	0.1	2.7	13.7	1.3	28.8	53.3
2014	31,399	0.1	2.7	15.9	1.3	28.1	51.9
2015	31,824	0.1	1.6	17.4	0.9	28.3	51.6
2016	32,689	0.1	2.1	19.4	0.7	27.3	50.4

Source: Energy Information Administration, State Energy Data System

In 2016, Hawaii's residential sector consumed about 571 million cubic feet (MCF) of natural gas, about 180 thousand barrels (TBBL) of petroleum products (mostly LPG), and about 2,612 million kWh of electricity.

Table 5.7. Residential Energy Consumption in Physical Units

Year	Natural Gas MCF	Petroleum TBBL	Electricity Million kWh
1960	-	26	514
1965	-	51	861
1970	-	200	1,285
1975	-	143	1,663
1980	1,416	192	1,841
1985	625	45	1,879
1990	565	57	2,324
1995	574	40	2,606
1996	540	48	2,676
1997	517	88	2,668
1998	535	250	2,641
1999	524	142	2,689
2000	535	194	2,765
2001	537	197	2,802
2002	539	197	2,898
2003	537	146	3,028
2004	524	149	3,162
2005	516	152	3,164
2006	518	159	3,182
2007	509	128	3,201
2008	499	267	3,085
2009	510	242	3,055
2010	509	239	2,989
2011	486	222	2,929
2012	481	326	2,739
2013	582	218	2,609
2014	583	220	2,584
2015	572	132	2,641
2016	571	180	2,612

Source: Energy Information Administration, State Energy Data System

Table 5.8 shows the residential energy consumption per household in Hawaii. From 1960 to 2016, residential energy consumption per household increased about 43 percent from 47 million British Thermal Units (MBTU) per household to 67 MBTU. During the same period, residential electricity consumption per household increased about 58 percent from 3,381 kWh per household to 5,357 kWh per household.

Table 5.8. Residential Energy Consumption per Household

	Hawaii	Residential Energy Consumption per Household					
	State	Total		Other	Index		
	Household	Energy	Electricity	Energy	Total Energy	Electricity	Others
Year	HH	MBTU/HH	kWh/HH	MBTU/HH	1970=100	1970=100	1970=100
1960	152,014	47	3,381	1	62.2	53.8	17.5
1965	174,998	56	4,920	1	74.6	78.3	29.8
1970	204,505	76	6,283	4	100.0	100.0	100.0
1975	251,986	75	6,600	2	99.5	105.0	57.9
1980	296,074	71	6,218	7	93.9	99.0	188.8
1985	322,687	62	5,823	3	81.7	92.7	70.0
1990	356,267	86	6,523	5	114.1	103.8	127.4
1995	382,340	82	6,816	5	108.1	108.5	133.8
2000	404,391	82	6,837	6	107.9	108.8	169.7
2001	409,863	78	6,836	6	103.8	108.8	164.9
2002	415,228	83	6,979	6	110.0	111.1	164.0
2003	421,614	75	7,182	6	99.7	114.3	149.7
2004	427,125	76	7,403	6	101.1	117.8	148.4
2005	432,097	77	7,322	6	102.0	116.5	158.7
2006	435,287	77	7,310	6	102.3	116.3	162.3
2007	447,509	76	7,153	6	100.8	113.8	156.8
2008	453,134	74	6,808	7	97.6	108.3	198.5
2009	458,067	73	6,669	8	96.2	106.1	206.5
2010	465,467	70	6,422	8	92.7	102.2	209.1
2011	470,417	69	6,226	8	91.3	99.1	219.1
2012	475,349	66	5,762	11	87.7	91.7	282.7
2013	480,559	64	5,429	13	84.9	86.4	335.0
2014	483,860	65	5,340	14	85.8	85.0	373.7
2015	486,799	65	5,425	14	86.5	86.3	377.6
2016	487,605	67	5,357	16	88.7	85.3	427.5

Source: Energy Information Administration, State Energy Data System

* Does not include roof-top PV

Residential energy expenditures per household, both in current and constant 2017 dollars, are provided in Table 5.9. In 2016, the average energy expenditures per household in constant 2017 dollars reached $1,576. From 1970 to 2016 in constant dollars, Hawaii's average residential energy expenditures and the average residential electricity expenditures increased 29 percent and 31 percent, respectively.

Table 5.9. Residential Energy Expenditures per Household

		Residential Energy Expenditures per Household					
		Total	Electricity	Total	Electricity	Constant $ Index	
	Honolulu	Current $	Current $	Constant $	Constant $	Total Energy	Electricity
Year	CPI-U	$/HH	$/HH	2017$/HH	2017$/HH	1970=100	1970=100
1970	41.50	191	176	1,253	1,154	100.0	100.0
1975	56.30	342	328	1,651	1,586	131.7	137.4
1980	83.00	593	502	1,943	1,644	155.0	142.5
1985	106.80	704	661	1,794	1,684	143.2	146.0
1990	138.10	706	669	1,391	1,318	111.0	114.2
1991	148.00	743	697	1,366	1,282	109.0	111.1
1992	155.10	784	724	1,375	1,270	109.7	110.1
1993	160.10	850	817	1,445	1,388	115.3	120.3
1994	164.50	882	848	1,459	1,402	116.4	121.5
1995	168.10	943	908	1,527	1,469	121.8	127.4
1996	170.70	1,019	981	1,625	1,563	129.6	135.5
1997	171.90	1,060	1,008	1,677	1,596	133.8	138.3
1998	171.50	1,017	923	1,613	1,465	128.7	126.9
1999	173.30	1,023	962	1,605	1,510	128.1	130.9
2000	176.30	1,202	1,122	1,854	1,731	148.0	150.0
2001	178.40	1,199	1,117	1,829	1,703	145.9	147.6
2002	180.30	1,173	1,091	1,769	1,647	141.2	142.7
2003	184.50	1,277	1,201	1,882	1,771	150.2	153.5
2004	190.60	1,413	1,337	2,017	1,909	160.9	165.4
2005	197.80	1,601	1,516	2,202	2,085	175.7	180.7
2006	209.35	1,804	1,707	2,344	2,218	187.0	192.2
2007	219.50	1,812	1,725	2,246	2,138	179.2	185.3
2008	228.86	2,376	2,213	2,824	2,630	225.3	227.9
2009	230.05	1,751	1,614	2,071	1,909	165.3	165.4
2010	234.87	1,969	1,805	2,281	2,090	182.0	181.2
2011	243.62	2,316	2,159	2,586	2,411	206.4	208.9
2012	249.47	2,339	2,152	2,550	2,347	203.5	203.4
2013	253.92	2,158	2,008	2,312	2,151	184.5	186.4
2014	257.59	2,139	1,978	2,259	2,089	180.2	181.0
2015	260.17	1,702	1,606	1,779	1,679	142.0	145.5
2016	265.28	1,576	1,471	1,616	1,509	128.9	130.7

Source: Energy Information Administration, State Energy Data System

5.3. Commercial Sector

In 2016, the commercial sector consumed about 42 trillion Btu or about 14.7 percent of Hawaii's total primary energy. Electricity accounted for 72.8 percent of total commercial energy consumption, followed by petroleum (11.6%), and biomass (9.1%). Natural gas consumed in the commercial sector is mainly supplemental gaseous fuels, which are not sources of primary energy.

Table 5.10. Commercial Energy Consumption by Source

		% of Total Commercial Energy Consumption					
Year	Total Energy Billion Btus	Natural Gas	Petroleum	Biomass	Solar/PV	Retail Electricity	Electrical System Losses
1960	5,300	0.0	21.0	0.0	0.0	19.7	59.3
1965	7,024	0.0	20.8	0.0	0.0	24.0	55.2
1970	12,519	0.0	29.6	0.0	0.0	21.0	49.4
1975	14,533	0.0	15.5	0.0	0.0	26.0	58.4
1980	20,073	0.0	19.8	0.0	0.0	24.8	55.4
1985	18,392	0.0	7.8	0.0	0.0	29.9	62.3
1990	37,211	0.0	22.8	0.0	0.0	20.7	56.5
1995	34,606	0.0	7.8	0.0	0.0	27.4	64.8
2000	37,281	0.1	7.0	0.0	0.0	28.3	64.5
2001	36,571	0.2	5.8	0.0	0.0	29.8	64.1
2002	39,354	0.2	7.9	0.0	0.0	27.9	63.9
2003	37,507	0.2	7.0	0.0	0.0	32.0	60.7
2004	41,259	0.2	7.9	6.2	0.0	30.0	55.6
2005	39,901	0.3	8.2	5.7	0.0	29.6	56.1
2006	40,677	0.3	8.2	6.4	0.1	29.3	55.7
2007	40,238	0.3	6.3	5.8	0.2	29.8	57.5
2008	40,855	0.2	7.1	7.5	0.4	29.2	55.6
2009	40,669	0.3	9.1	7.5	0.6	28.4	54.1
2010	40,090	0.3	9.0	7.3	0.9	28.6	53.9
2011	41,124	0.3	10.2	6.8	1.4	27.9	53.3
2012	39,119	0.3	9.5	5.7	3.1	28.2	53.2
2013	40,593	0.3	9.4	7.9	4.0	27.5	50.8
2014	41,138	0.3	10.8	8.0	5.3	26.6	49.1
2015	41,383	0.3	12.5	7.8	5.5	26.2	47.7
2016	41,521	0.2	11.6	9.1	6.2	25.6	47.3

Source: Energy Information Administration, State Energy Data System

In 2016, Hawaii's commercial sector consumed about 1,926 MCF of natural gas, about 1,076 TBBL of petroleum products (mostly LPG), and about 3,111 million kWh of electricity.

Table 5.11. Commercial Energy Consumption in Physical Units

Year	Natural Gas MCF	Petroleum						Electricity Million kWh
		Total Petroleum TBBL	Distillate Fuels TBBL	Motor Gasoline TBBL	Residual Fuel TBBL	LPG TBBL	Other Petroleum TBBL	
1960	-	209	48	55	41	42	23	306
1965	-	283	71	59	31	83	39	495
1970	-	760	174	133	38	328	87	771
1975	-	477	84	98	15	235	45	1,109
1980	1,715	792	398	54	25	315	-	1,462
1985	1,858	275	132	47	21	74	-	1,612
1990	2,223	1,430	453	59	825	93	-	2,253
1991	2,148	773	610	49	18	96	-	2,355
1992	2,144	1,897	498	45	1,052	303	-	2,417
1993	2,123	524	414	11	34	64	-	2,419
1994	2,200	899	389	11	433	66	-	2,601
1995	2,199	480	343	11	62	63	-	2,779
1996	2,132	326	224	11	13	78	-	2,819
1997	1,751	560	392	11	11	145	-	2,839
1998	1,747	2,338	211	11	1,704	413	-	2,833
1999	1,749	511	260	11	6	234	-	2,944
2000	1,771	558	218	11	8	320	-	3,092
2001	1,749	478	136	12	5	324	-	3,192
2002	1,720	648	310	12	-	326	-	3,223
2003	1,751	536	282	12	-	241	-	3,517
2004	1,803	644	382	12	4	246	-	3,632
2005	1,838	651	384	12	3	251	-	3,463
2006	1,813	662	392	12	1	257	-	3,490
2007	1,836	517	282	12	-	223	-	3,520
2008	1,769	636	221	12	-	403	-	3,501
2009	1,752	825	272	12	-	540	-	3,388
2010	1,777	808	265	12	-	531	-	3,355
2011	1,768	943	299	12	-	631	-	3,368
2012	1,850	833	266	12	-	554	-	3,238
2013	1,873	867	255	13	-	599	-	3,271
2014	1,931	987	323	12	-	652	-	3,202
2015	1,908	1,138	225	309	-	604	-	3,174
2016	1,926	1,076	157	314	-	606	-	3,111

Source: Energy Information Administration, State Energy Data System

Table 5.12 shows the commercial sector's energy consumption per million dollars of real commercial GDP in Hawaii.[1] From 1990 to 2016, total commercial energy consumption per million dollars of real commercial GDP decreased 23.1 percent. The commercial electricity consumption per million dollars of real GDP decreased 4.8 percent, and the other energy consumption per million dollars of real commercial GDP decreased 33.5 percent.

Table 5.12. Energy Consumption per Million Dollar of Commercial Real GDP

	Hawaii	Energy Consumption per $M Real GDP			Index		
	Commercial	Total		Other			
	Real GDP	Energy	Electricity	Energy	Total Energy	Electricity	Others
Year	2009$M	MBTU/$M	kWh/$M	MBTU/$M	1990=100	1990=100	1990=100
1990	45,538	817	49,476	239	100.0	100.0	100.0
1995	46,749	740	59,446	107	90.6	120.2	44.8
1996	46,657	729	60,420	86	89.3	122.1	35.9
1997	47,010	755	60,391	101	92.4	122.1	42.5
1998	46,030	997	61,547	335	122.0	124.4	140.3
1999	46,619	771	63,150	93	94.4	127.6	39.1
2000	47,395	787	65,239	94	96.3	131.9	39.5
2001	47,623	768	67,026	83	94.0	135.5	34.7
2002	49,061	802	65,694	101	98.2	132.8	42.2
2003	51,304	731	68,552	87	89.5	138.6	36.4
2004	54,555	756	66,575	141	92.6	134.6	59.0
2005	57,289	696	60,448	130	85.2	122.2	54.5
2006	58,604	694	59,552	134	84.9	120.4	56.0
2007	59,545	676	59,115	114	82.7	119.5	47.9
2008	59,637	685	58,705	131	83.8	118.7	54.8
2009	57,891	703	58,524	148	86.0	118.3	62.1
2010	60,221	666	55,711	140	81.5	112.6	58.6
2011	60,962	675	55,248	145	82.6	111.7	60.8
2012	62,158	629	52,093	127	77.0	105.3	53.1
2013	62,871	646	52,027	142	79.0	105.2	59.5
2014	63,361	649	50,536	151	79.5	102.1	63.3
2015	65,394	633	48,537	157	77.4	98.1	65.9
2016	66,081	628	47,079	159	76.9	95.2	66.5

Source: Energy Information Administration, State Energy Data System

[1] The commercial sector GDP is calculated using total GDP provided by the U.S. BEA minus the industrial GDP. The industrial GDP includes GDP from the following five sectors: (1) Agriculture, (2) Mining, (3) Construction, (4) Utility, and (5) Manufacture.

The commercial sector's energy expenditures per dollar of real GDP (both in current and in constant 2017 dollars) are provided in Table 5.13. From 1990 to 2016 in constant dollars, Hawaii's average commercial energy expenditures per dollar of real GDP increased 8.7 percent and the average commercial electricity expenditures increased 20.2 percent.

Table 5.13. Energy Expenditures per Dollar of Commercial Real GDP

		Energy Expenditures per $ Real Commercial GDP					
		Total	Electricity	Total	Electricity	Constant $ Index	
	Honolulu	Current $	Current $	Constant 2017$	Constant 2017$	Total Energy	Electricity
Year	CPI-U	Cents/$GDP	Cents/$GDP	Cents/$GDP	Cents/$GDP	1990=100	1990=100
1990	138.10	0.65	0.50	1.29	0.99	100.0	100.0
1991	148.00	0.65	0.53	1.19	0.97	92.2	98.2
1992	155.10	0.69	0.53	1.21	0.94	94.2	94.5
1993	160.10	0.70	0.60	1.18	1.02	91.9	103.6
1994	164.50	0.74	0.64	1.23	1.06	95.7	107.2
1995	168.10	0.81	0.72	1.32	1.17	102.5	118.2
1996	170.70	0.88	0.78	1.40	1.25	108.5	126.3
1997	171.90	0.90	0.80	1.43	1.27	110.8	128.0
1998	171.50	0.92	0.76	1.46	1.20	113.2	121.4
1999	173.30	0.90	0.80	1.41	1.26	109.5	127.6
2000	176.30	1.09	0.97	1.68	1.49	130.4	150.7
2001	178.40	1.11	1.00	1.69	1.52	131.7	153.4
2002	180.30	1.05	0.93	1.58	1.40	122.8	141.8
2003	184.50	1.15	1.03	1.69	1.52	131.3	153.4
2004	190.60	1.23	1.08	1.75	1.54	136.0	155.5
2005	197.80	1.33	1.15	1.82	1.58	141.9	159.9
2006	209.35	1.47	1.28	1.91	1.66	148.8	167.5
2007	219.50	1.47	1.30	1.82	1.60	141.8	162.2
2008	228.86	1.99	1.74	2.36	2.07	183.8	209.5
2009	230.05	1.49	1.28	1.76	1.51	136.6	152.8
2010	234.87	1.68	1.44	1.94	1.67	151.1	169.0
2011	243.62	2.10	1.79	2.35	2.00	182.4	201.8
2012	249.47	2.09	1.82	2.28	1.98	177.4	200.2
2013	253.92	2.04	1.77	2.18	1.90	169.6	191.8
2014	257.59	2.01	1.73	2.13	1.83	165.2	184.5
2015	260.17	1.55	1.31	1.62	1.37	125.7	138.1
2016	265.28	1.36	1.16	1.40	1.19	108.7	120.2

Source: Energy Information Administration, State Energy Data System

5.4. Industrial Sector

The industrial sector consumed about 63 trillion Btu or about 22.1 percent of Hawaii's total energy in 2016. Electricity accounted for about 57.9 percent of total industrial energy consumption, followed by petroleum (35.7%), and biomass (5.4%).

Table 5.14. Industrial Energy Consumption by Source

		% of Total Industrial Energy Consumption						
Year	Total Billion Btu	Primary Natural Gas	Coal	Petroleum	Retail Electricity	Electrical System Losses	Biomass	Hydro & Geothermal
1960	20,633	-	-	69.11	7.69	23.20	-	-
1965	34,710	-	-	61.51	10.78	24.73	0.50	2.49
1970	43,657	-	-	52.48	13.44	31.61	0.39	2.07
1975	50,397	-	-	42.17	17.18	38.56	0.62	1.47
1980	74,651	-	-	38.43	13.84	30.85	15.95	0.93
1985	67,347	-	1.67	27.50	15.92	33.15	20.72	1.03
1990	98,941	-	0.70	32.25	12.88	35.23	18.35	0.60
1995	93,006	-	4.43	33.65	13.95	33.01	14.25	0.71
2000	77,952	0.02	2.74	28.73	16.78	38.27	12.66	0.79
2001	69,474	0.04	2.94	30.21	18.61	40.08	7.37	0.75
2002	70,758	0.04	0.93	31.24	18.18	41.57	7.18	0.87
2003	68,843	0.03	2.00	32.20	19.06	36.18	9.80	0.74
2004	68,913	0.04	1.82	32.15	19.49	36.10	9.86	0.53
2005	72,371	0.04	1.95	35.93	18.44	34.95	8.21	0.47
2006	71,570	0.04	2.29	35.17	18.57	35.36	8.04	0.53
2007	69,049	0.04	2.60	33.05	19.10	36.78	7.89	0.54
2008	65,848	0.04	3.51	30.56	19.71	37.47	8.13	0.59
2009	69,100	0.03	2.94	36.29	18.19	34.58	7.46	0.50
2010	68,039	0.03	2.08	37.66	18.42	34.76	6.46	0.60
2011	67,520	0.03	1.93	38.06	18.52	35.34	5.42	0.70
2012	65,101	0.04	1.75	36.24	19.19	36.11	5.80	0.86
2013	65,399	0.04	2.08	37.24	18.90	34.93	6.17	0.65
2014	64,543	0.04	2.12	36.19	19.51	36.08	5.29	0.77
2015	64,228	0.05	1.77	36.98	19.63	35.78	4.93	0.85
2016	62,523	0.05	0.43	35.70	20.31	37.54	5.37	0.56

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.15, Hawaii's industrial sector consumed about 12,000 short tons (ST) of coal, 542 MCF of natural gas, about 3,694 TBBL of petroleum products, and about 3,722 million kWh of electricity in 2016.

Table 5.15. Industrial Energy Consumption in Physical Units

	Industrial Energy Consumption By Source				Industrial Sector % of Total Consumption					
Year	Coal 1000 ST	Natural Gas MCF	Petroleum TBBL	Electricity Million kWh	Coal	Natural Gas	Petroleum	Electricity	Biomass	Hydro & Geothermal
1960	0	0	2,367	465	NA	NA	14.1	36.2	NA	0.0
1965	0	0	3,497	1,096	NA	NA	15.6	44.7	100.0	79.0
1970	0	0	3,874	1,720	NA	NA	11.4	45.6	40.1	79.9
1975	0	0	3,648	2,538	NA	NA	9.8	47.8	54.5	79.5
1980	0	0	5,135	3,028	NA	0.0	11.8	47.8	100.0	77.2
1985	46	0	2,997	3,143	100.0	0.0	7.5	47.4	98.2	63.9
1990	28	0	5,231	3,734	96.6	0.0	10.5	44.9	70.0	71.5
1995	192	0	5,643	3,803	21.5	0.0	12.9	41.4	66.9	19.2
1996	169	0	5,880	3,884	18.2	0.0	14.1	41.4	74.2	18.8
1997	166	342	4,672	3,856	17.8	13.1	11.7	41.2	67.8	18.5
1998	146	373	3,765	3,787	17.8	14.1	9.3	40.9	67.2	21.0
1999	117	463	3,380	3,748	14.6	16.9	8.5	40.0	68.1	21.5
2000	110	536	3,685	3,834	13.5	18.9	9.1	39.6	65.0	16.5
2001	113	532	3,513	3,790	13.6	18.9	8.5	38.7	64.4	16.4
2002	50	475	3,779	3,770	6.7	17.4	8.4	38.1	68.0	35.7
2003	52	444	3,733	3,846	6.6	16.3	8.0	37.0	72.5	18.6
2004	53	446	3,704	3,937	6.6	16.1	7.5	36.7	72.8	11.9
2005	59	439	4,298	3,912	8.0	15.7	8.4	37.1	62.1	10.6
2006	59	451	4,194	3,896	8.3	16.2	8.1	36.9	58.2	11.5
2007	72	502	3,844	3,864	9.4	17.6	7.3	36.5	56.1	11.7
2008	99	431	3,367	3,804	11.8	16.0	7.9	36.6	45.2	12.3
2009	88	344	4,131	3,683	11.1	13.2	9.7	36.4	42.0	12.6
2010	61	339	4,208	3,672	7.6	12.9	9.8	36.7	42.0	15.4
2011	58	362	4,225	3,665	7.4	13.8	9.5	36.8	34.6	15.3
2012	50	355	3,894	3,662	6.2	13.2	9.1	38.0	39.3	15.6
2013	61	388	3,987	3,623	8.1	13.6	9.4	38.1	36.1	12.5
2014	61	401	3,833	3,690	7.3	13.8	9.1	38.9	31.0	15.0
2015	50	442	3,919	3,696	6.7	15.1	9.2	38.9	27.5	16.6
2016	12	542	3,694	3,722	1.5	17.8	8.7	39.4	27.0	10.7

Source: Energy Information Administration, State Energy Data System

NA: Not applicable due to total consumption equals to zero.

Table 5.16 shows that petroleum products consumed in 2016 included 408 TBBL of residual fuel, 163 TBBL of distillate fuel, 281 TBBL of motor gasoline, and 2,842 TBBL of other petroleum products (mostly still gas used in refineries and petroleum coke).

Table 5.16. Industrial Petroleum Consumption by Fuel Type

	Fuel Type					% of Total Industrial Petroleum Consumption			
Year	Residual Fuel T BBL	Distillate Fuel T BBL	Motor Gasoline T BBL	Other Petroleum T BBL	Petroleum Total T BBL	Residual Fuel	Distillate Fuel	Motor Gasoline	Other Petroleum
1960	1,038	554	83	692	2,367	43.9	23.4	3.5	29.2
1965	1,712	635	76	1,074	3,497	49.0	18.2	2.2	30.7
1970	1,671	701	49	1,453	3,874	43.1	18.1	1.3	37.5
1975	1,346	603	53	1,646	3,648	36.9	16.5	1.5	45.1
1980	1,491	1,369	49	2,226	5,135	29.0	26.7	1.0	43.3
1985	1,344	458	104	1,091	2,997	44.8	15.3	3.5	36.4
1990	1,740	725	133	2,633	5,231	33.3	13.9	2.5	50.3
1995	1,024	548	245	3,826	5,643	18.1	9.7	4.3	67.8
1996	957	475	259	4,189	5,880	16.3	8.1	4.4	71.2
1997	845	623	242	2,962	4,672	18.1	13.3	5.2	63.4
1998	305	584	266	2,610	3,765	8.1	15.5	7.1	69.3
1999	332	427	155	2,466	3,380	9.8	12.6	4.6	73.0
2000	438	473	160	2,614	3,685	11.9	12.8	4.3	70.9
2001	8	473	122	2,910	3,513	0.2	13.5	3.5	82.8
2002	446	459	145	2,729	3,779	11.8	12.1	3.8	72.2
2003	364	439	137	2,793	3,733	9.8	11.8	3.7	74.8
2004	395	407	169	2,733	3,704	10.7	11.0	4.6	73.8
2005	781	512	133	2,872	4,298	18.2	11.9	3.1	66.8
2006	811	456	141	2,786	4,194	19.3	10.9	3.4	66.4
2007	428	451	244	2,721	3,844	11.1	11.7	6.3	70.8
2008	434	347	247	2,339	3,367	12.9	10.3	7.3	69.5
2009	466	404	234	3,027	4,131	11.3	9.8	5.7	73.3
2010	451	326	143	3,288	4,208	10.7	7.7	3.4	78.1
2011	454	342	147	3,282	4,225	10.7	8.1	3.5	77.7
2012	326	376	140	3,052	3,894	8.4	9.7	3.6	78.4
2013	283	325	138	3,241	3,987	7.1	8.2	3.5	81.3
2014	257	392	171	3,013	3,833	6.7	10.2	4.5	78.6
2015	298	321	284	3,016	3,919	7.6	8.2	7.2	77.0
2016	408	163	281	2,842	3,694	11.0	4.4	7.6	76.9

Source: Energy Information Administration, State Energy Data System

Table 5.17 provides the industrial sector's energy consumption per million dollars of real industrial GDP in Hawaii. From 1990 to 2016, total industrial energy consumption per million dollars of real industrial GDP decreased by 40.2 percent. The industrial electricity and other energy consumption per million dollars of real GDP decreased 5.7 percent and 51.4 percent, respectively.

Table 5.17. Energy Consumption per Million Dollar of Industrial Real GDP

	Hawaii	Energy Consumption per $M Real GDP			Index		
	Industrial	Total		Other			
	Real GDP	Energy	Electricity	Energy	Total Energy	Electricity	Others
Year	2009$M	MBTU/$M	kWh/$M	MBTU/$M	1990=100	1990=100	1990=100
1990	7,723	12,812	483,508	6,649	100.0	100.0	100.0
1991	8,115	10,972	464,969	6,132	85.6	96.2	92.2
1992	7,889	11,871	483,106	6,334	92.7	99.9	95.3
1993	7,773	11,879	484,991	6,306	92.7	100.3	94.8
1994	7,192	13,042	527,086	7,018	101.8	109.0	105.5
1995	7,023	13,243	541,523	7,025	103.4	112.0	105.6
1996	6,544	14,607	593,539	7,807	114.0	122.8	117.4
1997	6,098	14,540	632,338	7,293	113.5	130.8	109.7
1998	5,693	14,169	665,203	6,581	110.6	137.6	99.0
1999	5,905	13,214	634,716	6,004	103.1	131.3	90.3
2000	6,315	12,344	607,126	5,548	96.3	125.6	83.4
2001	6,046	11,491	626,861	4,747	89.7	129.6	71.4
2002	6,297	11,237	598,698	4,523	87.7	123.8	68.0
2003	6,796	10,130	565,921	4,534	79.1	117.0	68.2
2004	7,051	9,774	558,361	4,340	76.3	115.5	65.3
2005	7,535	9,605	519,177	4,476	75.0	107.4	67.3
2006	7,709	9,284	505,383	4,277	72.5	104.5	64.3
2007	7,876	8,767	490,604	3,868	68.4	101.5	58.2
2008	8,084	8,145	470,559	3,488	63.6	97.3	52.5
2009	7,491	9,224	491,657	4,357	72.0	101.7	65.5
2010	7,182	9,474	511,278	4,436	73.9	105.7	66.7
2011	7,009	9,633	522,899	4,445	75.2	108.1	66.8
2012	6,755	9,637	542,117	4,307	75.2	112.1	64.8
2013	6,805	9,610	532,403	4,437	75.0	110.1	66.7
2014	6,945	9,293	531,317	4,127	72.5	109.9	62.1
2015	7,422	8,654	497,979	3,859	67.5	103.0	58.0
2016	8,160	7,662	456,127	3,229	59.8	94.3	48.6

Source: Energy Information Administration, State Energy Data System

The industrial sector's energy expenditures per dollar of real GDP (both in current and in constant 2017 dollars) are provided in Table 5.18. From 1990 to 2016 in constant dollars, Hawaii's average industrial energy expenditures per dollar of real GDP increased 25.2 percent and the average industrial electricity expenditures per dollar of real GDP increased 40.6 percent.

Table 5.18. Energy Expenditures per Dollar of Industrial Real GDP

	Energy Expenditures per $ Real Industrial GDP					
	Total	Electricity	Total	Electricity	Constant $ Index	
	Current $	Current $	Constant 2017$	Constant 2017$	Total Energy	Electricity
Year	Cents/$GDP	Cents/$GDP	Cents/$GDP	Cents/$GDP	1990=100	1990=100
1990	4.44	3.44	8.75	6.78	100.0	100.0
1991	4.27	3.38	7.84	6.21	89.6	91.6
1992	4.44	3.58	7.78	6.28	88.9	92.7
1993	5.13	4.09	8.72	6.95	99.7	102.6
1994	5.73	4.39	9.47	7.25	108.2	107.0
1995	6.15	4.73	9.95	7.66	113.7	113.1
1996	7.14	5.69	11.38	9.06	130.1	133.7
1997	7.40	6.26	11.71	9.90	133.9	146.1
1998	7.00	5.98	11.11	9.49	126.9	140.1
1999	6.68	5.88	10.49	9.23	119.9	136.1
2000	7.89	6.80	12.17	10.49	139.1	154.8
2001	7.88	6.97	12.02	10.63	137.3	156.9
2002	7.06	6.21	10.65	9.36	121.7	138.2
2003	7.36	6.53	10.86	9.63	124.1	142.1
2004	7.98	7.03	11.39	10.03	130.1	148.1
2005	8.94	7.74	12.30	10.65	140.5	157.1
2006	9.81	8.58	12.74	11.15	145.6	164.5
2007	9.86	8.51	12.21	10.54	139.6	155.6
2008	13.07	11.57	15.54	13.75	177.5	202.9
2009	10.54	8.43	12.47	9.97	142.4	147.1
2010	12.98	10.63	15.03	12.31	171.8	181.7
2011	16.84	14.04	18.81	15.68	214.9	231.4
2012	18.36	15.79	20.02	17.22	228.8	254.1
2013	18.93	15.79	20.27	16.92	231.7	249.6
2014	18.98	15.94	20.04	16.83	229.1	248.3
2015	13.61	11.29	14.23	11.81	162.6	174.3
2016	10.68	9.30	10.95	9.53	125.2	140.6

Source: Energy Information Administration, State Energy Data System

5.5. Electricity Generation

Prior to 1990, Hawaii's electricity was almost exclusively generated from petroleum products. Since 1990, electricity generated from waste, coal and geothermal energy has become significant. From 1990 to 2016, the waste share of total energy consumption used for electricity generation decreased from 7.3 percent to a mere 1.2 percent. The shares of both coal and geothermal increased from about zero percent to 17.6 percent and 2.6 percent, respectively. In 2016, about 92 trillion Btu or 32.4 percent of Hawaii's total energy was used to generate electricity. Fossil fuel accounted for about 88.4 percent of total energy consumption, and renewable energy accounted for about 11.6 percent of the total electric power sector energy consumption.

Table 5.19. Electric Power Sector Energy Consumption by Source

	Total Energy Consumption	% of Total Electric Power Energy Consumption							
Year	Billion Btu	Residual Fuel	Distillate Fuel Oil	Coal	Waste Biomass	Geothermal	Hydro	Wind	Solar/PV
1960	17,603	97.11	1.24	-	-	-	1.66	-	-
1965	27,568	97.88	1.29	-	-	-	0.83	-	-
1970	43,176	97.59	1.29	-	0.60	-	0.53	-	-
1975	58,778	94.98	4.25	-	0.44	-	0.32	-	-
1980	69,749	92.29	7.41	-	-	-	0.29	-	-
1985	69,758	92.78	6.28	-	0.38	0.28	0.28	-	-
1990	105,928	82.17	9.97	0.02	7.33	-	0.22	0.28	-
1995	105,520	63.81	12.20	14.97	6.20	2.29	0.33	0.20	-
2000	108,477	62.87	14.89	14.30	4.91	2.46	0.41	0.16	-
2001	105,273	63.38	16.44	14.94	2.69	2.03	0.49	0.02	-
2002	110,917	61.53	20.92	14.39	2.16	0.67	0.32	0.01	-
2003	102,736	66.10	13.01	16.23	2.49	1.76	0.40	0.02	-
2004	104,437	67.53	13.85	15.95	-	2.05	0.55	0.07	-
2005	104,105	68.27	14.44	14.50	-	2.13	0.60	0.06	-
2006	104,703	69.05	13.60	13.82	-	2.01	0.77	0.75	-
2007	105,688	67.97	12.66	14.49	-	2.15	0.51	2.23	-
2008	102,831	67.31	12.36	15.35	-	2.25	0.43	2.30	-
2009	100,256	67.13	12.97	15.01	0.04	1.63	0.75	2.45	0.01
2010	98,675	66.03	13.15	15.91	0.04	1.98	0.28	2.58	0.02
2011	98,850	65.22	13.22	14.95	0.59	2.20	0.44	3.35	0.04
2012	94,780	62.97	13.29	16.28	0.43	2.62	0.56	3.80	0.05
2013	92,335	62.75	12.99	15.11	0.56	2.84	0.35	5.20	0.20
2014	92,140	59.82	12.87	17.23	0.66	2.62	0.43	5.97	0.40
2015	91,592	60.03	13.44	15.83	0.93	2.34	0.64	6.23	0.55
2016	91,788	57.96	12.80	17.61	1.17	2.62	0.53	6.43	0.89

Source: Energy Information Administration, State Energy Data System

Table 5.20 shows the fossil fuel consumption by the electric power sector in physical units. Residual fuel oil used for electricity generation increased from 2,719 TBBLs in 1960 to a peak of 13,844 TBBLs in 1990, stabilized at about 11,000 TBBLs from 1991 to 2008, and then decreased steadily to 8,461 TBBLs in 2016. Distillate fuel oil used for electricity generation increased from 37 TBBLs in 1960 to almost 4,000 TBBLs in 2002 and then decreased to 2,037 TBBLs in 2016. Coal has been used for electricity generation since 1990. Since 1993, coal used for electricity generation has stabilized between 600 and 800 thousand short tons (ST).

Table 5.20. Electric Power Sector Energy Consumption in Physical Units

	Electric Power Energy Consumption			% of Total Consumption		
Year	Residual Fuel T BBL	Distillate Fuel T BBL	Coal T ST	Residual Fuel	Distillate Fuel	Coal
1960	2,719	37	-	57.0	4.2	-
1965	4,292	61	-	59.4	3.8	-
1970	6,702	96	-	66.0	5.7	-
1975	8,880	429	-	78.9	22.0	-
1980	10,239	888	-	77.6	14.8	-
1985	10,295	752	-	78.1	16.6	-
1990	13,844	1,813	1	72.6	27.9	3.4
1995	10,709	2,211	703	74.0	38.2	78.5
2000	10,848	2,775	706	80.2	54.5	86.5
2001	10,613	2,975	716	79.9	49.3	86.4
2002	10,855	3,987	698	85.2	49.3	93.3
2003	10,801	2,297	732	89.4	28.0	93.4
2004	11,218	2,486	744	85.6	28.8	93.4
2005	11,304	2,584	680	85.6	35.4	91.9
2006	11,499	2,453	655	78.3	36.7	91.7
2007	11,426	2,313	692	70.0	24.9	90.6
2008	11,009	2,199	741	88.6	40.0	88.2
2009	10,704	2,250	703	86.4	37.2	88.9
2010	10,364	2,246	742	87.2	32.8	92.4
2011	10,255	2,264	724	87.6	35.9	92.5
2012	9,494	2,183	753	88.5	35.8	93.8
2013	9,216	2,079	692	88.8	36.4	91.9
2014	8,767	2,055	769	88.8	47.1	92.5
2015	8,746	2,134	697	89.8	45.1	93.3
2016	8,461	2,037	775	87.4	44.9	98.5

Source: Energy Information Administration, State Energy Data System

Table 5.21 shows electricity generated by selected renewable energy sources (excluding waste). From 1960 to 2016, total electricity generated from selected renewable energy sources increased from 27 million kWh to 1,041 million kWh. As a percentage of total electricity consumption, electricity generated from selected renewable energy sources increased from 2.1 percent to 11.0 percent during the same period. The increased share of renewable electricity is mainly due to increased wind generated electricity since 2007.

Table 5.21. Electricity Generated by Selected Renewable Energy Sources

	Renewable Energy Source Units: Million kWh					Total Electricity Consumption	% of Selected Renewable of Total
Year	Geothermal	Hydro	Wind	Solar/PV*	Sum	Million kWh	Consumption
1960	0	27	0	0	27	1,285	2.1
1965	0	22	0	0	22	2,452	0.9
1970	0	22	0	0	22	3,776	0.6
1975	0	18	0	0	18	5,310	0.3
1980	0	20	0	0	20	6,331	0.3
1985	19	19	0	0	38	6,635	0.6
1990	0	23	29	0	52	8,311	0.6
1995	235	34	20	0	289	9,188	3.1
2000	262	43	17	0	322	9,691	3.3
2001	207	50	2	0	259	9,785	2.6
2002	73	35	2	0	110	9,892	1.1
2003	178	40	2	0	220	10,391	2.1
2004	213	57	7	0	277	10,732	2.6
2005	222	62	7	0	291	10,539	2.8
2006	212	82	80	0	374	10,568	3.5
2007	230	55	238	0	523	10,585	4.9
2008	234	45	240	0	519	10,390	5.0
2009	168	77	251	1	497	10,126	4.9
2010	201	29	261	2	493	10,017	4.9
2011	224	45	341	4	614	9,962	6.2
2012	261	56	378	5	700	9,639	7.3
2013	275	34	503	19	831	9,503	8.7
2014	254	42	579	39	914	9,475	9.6
2015	230	63	613	54	960	9,511	10.1
2016	260	53	639	89	1,041	9,445	11.0

Source: Energy Information Administration, State Energy Data System

* Does not include roof-top PV.

Electricity consumed in Hawaii is generated by 5 types of producers: (1) Electric Utility, (2) Independent Power Producers (IPP), (3) Combined Heat and Power (CHP) – Electric Power, (4) CHP – Industrial Power, and (5) CHP – Commercial Power. Tables 5.22 to 5.27 show electricity generation by type of fuel for the total electric power industry and each type of electricity producers in Hawaii.

Table 5.22. Electricity Generation by Source: Total Electric Power Industry

Year	Total Electricity Generation MWH	% of Total Electricity Generation									
		Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
1990	9,702,752	0.0	90.0	0.2	8.7	-	-	0.8	0.3	-	-
1991	8,703,235	0.1	88.6	0.6	9.5	-	-	0.8	0.4	-	-
1992	9,844,461	5.7	84.7	0.6	8.2	0.0	0.0	0.6	0.2	-	-
1993	9,943,687	14.9	74.4	0.6	7.8	0.0	1.5	0.6	0.2	-	-
1994	10,108,902	13.1	75.6	0.7	7.2	0.0	1.8	1.4	0.2	-	-
1995	10,303,983	15.2	74.5	0.7	6.2	0.0	2.3	0.9	0.2	-	0.0
1996	10,627,894	15.5	74.9	0.6	5.6	0.0	2.3	1.0	0.2	-	-
1997	10,312,247	15.3	74.6	0.6	5.9	0.0	2.4	1.1	0.2	-	-
1998	10,228,082	14.0	76.8	0.6	4.9	-	2.3	1.2	0.2	-	-
1999	10,403,926	13.8	76.8	0.5	5.5	-	2.0	1.1	0.2	-	-
2000	10,593,403	14.9	76.0	0.4	5.1	-	2.5	1.0	0.2	-	-
2001	10,633,093	15.1	77.3	0.4	2.7	-	1.9	0.9	0.0	-	1.6
2002	11,663,070	13.3	81.2	0.3	2.5	-	0.6	0.8	0.0	-	1.2
2003	10,976,371	15.0	77.5	0.4	3.2	-	1.6	0.8	0.0	-	1.6
2004	11,410,403	14.1	78.4	0.4	2.9	-	1.9	0.8	0.1	-	1.5
2005	11,522,805	14.2	78.7	0.4	2.7	-	1.9	0.8	0.1	-	1.3
2006	11,559,174	13.4	78.3	0.4	2.8	-	1.8	1.0	0.7	-	1.5
2007	11,533,350	13.7	77.3	0.4	2.5	-	2.0	0.8	2.1	-	1.3
2008	11,376,385	14.5	76.2	0.3	2.7	-	2.1	0.7	2.1	0.0	1.4
2009	11,010,533	13.6	75.3	0.2	2.6	-	1.5	1.0	2.3	0.0	3.5
2010	10,836,036	14.3	74.6	0.2	2.6	0.0	1.9	0.6	2.4	0.0	3.4
2011	10,723,333	13.3	73.9	0.3	2.9	-	2.1	0.9	3.2	0.0	3.4
2012	10,469,269	14.7	71.5	0.4	2.7	-	2.5	1.1	3.6	0.0	3.5
2013	10,267,052	13.7	70.3	0.4	3.2	-	2.7	0.8	4.9	0.2	3.8
2014	10,204,158	14.8	67.9	0.6	3.3	-	2.5	0.9	5.7	0.4	4.0
2015	10,119,500	13.2	69.4	0.5	3.2	-	2.3	1.2	6.1	0.5	3.6
2016	9,948,845	15.1	66.7	0.5	3.6	-	2.6	0.9	6.4	0.9	3.2
2017	9,812,050	14.0	67.6	0.5	3.0	-	3.3	0.7	5.4	1.8	3.7

1. Other gases includes blast furnace gas, propane gas, and other manufactured and waste gases derived from fossil fuels.
Source: Energy Information Administration, Electricity, Detailed State Data
* Does not include roof-top PV

For the total electric power industry, from 1990 to 2017, the share of petroleum generated electricity decreased from 90.0 percent to 67.6 percent; the share of other biomass generated electricity decreased from 8.7 percent to 3.0 percent; the share of coal generated electricity increased from 0.0 percent to 14.0 percent; the share of wind generated electricity increased from 0.3 percent to 5.4 percent; the share of geothermal generated electricity increased from 0.0 percent to 3.3 percent, and the share of solar generated electricity increased from 0.0 percent to 1.8 percent.

For the electric utilities, from 1990 to 2017, the share of petroleum generated electricity only decreased slightly from 99.6 percent to 94.5 percent.

Table 5.23. Electricity Generation by Source: Electric Utilities

	Total Electricity Generation	% of Total Electricity Generation									
Year	MWH	Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
1990	7,996,096	-	99.6	-	0.1	-	-	0.3	-	-	-
1991	7,333,192	-	99.7	-	-	-	-	0.3	-	-	-
1992	6,861,255	-	99.9	-	-	-	-	0.1	-	-	-
1993	6,083,815	-	99.8	-	-	-	-	0.2	-	-	-
1994	6,055,087	-	99.7	-	-	-	-	0.3	-	-	-
1995	6,190,584	-	99.7	-	-	-	-	0.3	-	-	-
1996	6,420,195	-	99.7	-	-	-	-	0.3	-	-	-
1997	6,212,643	-	99.7	-	-	-	-	0.3	-	-	-
1998	6,301,169	-	99.8	-	-	-	-	0.2	0.0	-	-
1999	6,452,068	-	99.6	-	-	-	-	0.3	0.1	-	-
2000	6,534,692	-	99.7	-	-	-	-	0.2	0.0	-	-
2001	6,383,088	-	99.7	-	-	-	-	0.3	0.0	-	-
2002	7,513,051	-	99.9	-	-	-	-	0.1	0.0	-	-
2003	6,493,205	-	99.9	-	-	-	-	0.0	0.0	-	-
2004	6,982,469	-	99.8	-	-	-	-	0.1	0.0	-	-
2005	6,915,159	-	99.8	-	-	-	-	0.1	0.0	-	-
2006	7,040,473	-	99.7	-	-	-	-	0.3	0.0	-	-
2007	6,928,397	-	99.8	-	-	-	-	0.2	0.0	-	-
2008	6,700,636	-	99.7	-	-	-	-	0.3	0.0	-	-
2009	6,509,550	-	96.2	-	0.1	-	-	0.4	0.0	-	3.3
2010	6,416,068	-	96.3	-	0.0	-	-	0.3	-	-	3.4
2011	6,376,331	-	95.8	-	0.6	-	-	0.3	-	-	3.3
2012	6,012,748	-	95.6	-	0.4	-	-	0.5	-	-	3.6
2013	5,748,256	-	95.6	-	0.5	-	-	0.3	-	-	3.6
2014	5,517,389	-	94.9	-	0.7	-	-	0.4	-	0.2	3.8
2015	5,492,172	-	94.9	-	1.0	-	-	0.4	-	0.5	3.3
2016	5,218,132	-	96.0	-	0.7	-	-	0.3	-	0.8	2.2
2017	5,222,562	-	94.5	-	1.1	-	-	0.2	-	0.8	3.4

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

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.24. Electricity Generation by Source: IPP

Year	Total Electricity Generation MWH	% of Total Electricity Generation									
		Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
1990	385,510	-	3.6	-	88.9	-	-	-	7.5	-	-
1991	376,591	-	-	-	90.5	-	-	-	9.5	-	-
1992	408,419	-	4.8	-	89.1	-	0.5	-	5.6	-	-
1993	512,344	-	-	-	66.0	-	29.7	-	4.3	-	-
1994	622,693	-	-	-	59.9	-	29.8	7.1	3.3	-	-
1995	641,018	-	-	-	57.4	-	36.6	2.8	3.2	-	-
1996	606,406	-	0.3	-	52.5	-	39.9	3.5	3.7	-	-
1997	656,259	-	0.3	-	55.4	-	37.4	4.5	2.4	-	-
1998	647,103	-	0.4	-	55.1	-	36.6	5.0	2.9	-	-
1999	602,820	-	0.4	-	58.2	-	35.0	4.3	2.1	-	-
2000	656,303	-	0.3	-	53.3	-	39.9	4.3	2.2	-	-
2001	521,236	-	-	-	31.5	-	39.6	6.2	0.0	-	22.7
2002	400,254	-	-	-	42.3	-	18.2	6.6	0.0	-	32.9
2003	551,293	-	0.1	-	33.3	-	32.3	7.0	0.0	-	27.2
2004	266,841	-	-	-	-	-	79.9	17.8	2.3	-	-
2005	279,684	-	-	-	-	-	79.2	19.0	1.8	-	-
2006	349,246	-	-	-	-	-	60.8	16.6	22.6	-	-
2007	507,515	-	-	-	-	-	45.3	7.9	46.8	-	-
2008	900,933	-	44.3	-	-	-	26.0	3.0	26.6	0.0	-
2009	803,741	-	41.7	-	-	-	20.9	6.1	31.3	0.2	-
2010	761,548	-	37.6	-	-	-	26.3	1.6	34.3	0.2	-
2011	808,653	-	26.7	-	-	-	27.7	3.0	42.1	0.4	-
2012	902,627	-	25.7	-	-	-	28.9	3.0	41.9	0.5	-
2013	983,145	-	17.3	-	-	-	28.0	1.5	51.2	2.0	-
2014	1,062,111	-	17.2	-	-	-	23.9	1.7	54.5	2.7	-
2015	1,137,735	-	19.7	-	-	-	20.2	3.6	53.9	2.6	-
2016	1,162,788	-	11.3	-	4.4	-	22.4	3.1	55.0	3.9	(0.0)
2017	1,198,841	-	12.2	-	4.1	-	26.9	1.6	44.4	10.9	(0.1)

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

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.25. Electricity Generation by Source: CHP-Electric Power

Year	Total Electricity Generation MWH	% of Total Electricity Generation									
		Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
1990	542,290	0.2	84.4	-	15.3	-	-	-	-	-	-
1991	145,717	4.6	41.8	-	53.5	-	-	-	-	-	-
1992	1,760,037	29.9	67.0	-	3.1	-	-	-	-	-	-
1993	2,584,600	56.5	40.8	-	2.7	-	-	-	-	-	-
1994	2,713,003	47.9	50.7	-	1.5	-	-	-	-	-	-
1995	2,808,818	53.5	46.5	-	-	-	-	-	-	-	-
1996	2,931,878	54.0	46.0	-	0.0	-	-	-	-	-	-
1997	2,868,654	52.8	47.0	-	0.2	-	-	-	-	-	-
1998	2,789,931	50.8	49.0	-	0.3	-	-	-	-	-	-
1999	2,782,035	51.2	48.4	-	0.4	-	-	-	-	-	-
2000	2,859,573	53.7	46.3	-	-	-	-	-	-	-	-
2001	3,224,983	48.4	51.6	-	-	-	-	-	-	-	-
2002	3,288,683	46.2	53.5	-	-	-	-	-	-	-	0.4
2003	3,640,052	45.2	50.0	-	4.3	-	-	-	-	-	0.6
2004	3,568,387	44.9	50.4	-	3.9	-	-	-	-	-	0.7
2005	3,769,263	43.3	52.6	-	3.5	-	-	-	-	-	0.6
2006	3,566,361	43.4	52.2	-	3.6	-	-	-	-	-	0.8
2007	3,524,900	44.8	51.6	-	3.1	-	-	-	-	-	0.5
2008	3,190,375	51.6	44.4	-	3.5	-	-	-	-	-	0.5
2009	3,121,676	48.1	48.3	-	2.9	-	-	-	-	-	0.8
2010	2,945,122	50.8	48.9	-	-	-	-	-	-	-	0.3
2011	2,827,766	48.7	51.3	-	-	-	-	-	-	-	-
2012	2,826,474	53.0	47.0	-	-	-	-	-	-	-	0.0
2013	2,789,803	48.7	50.9	-	-	-	-	-	-	-	0.5
2014	2,791,485	52.5	47.2	-	-	-	-	-	-	-	0.3
2015	2,688,088	48.5	51.2	-	-	-	-	-	-	-	0.3
2016	2,808,236	53.1	46.4	-	-	-	-	-	-	-	0.4
2017	2,725,444	50.5	49.4	-	-	-	-	-	-	-	0.1

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

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.26. Electricity Generation by Source: CHP-Industrial Power

Year	Total Electricity Generation MWH	% of Total Electricity Generation									
		Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
1990	778,856	0.2	38.1	2.1	52.4	-	-	7.3	-	-	-
1991	847,735	0.1	40.2	6.1	47.7	-	-	6.0	-	-	-
1992	814,750	3.6	34.9	7.7	47.5	0.0	-	6.3	-	-	-
1993	762,928	2.5	35.3	8.3	48.3	0.0	-	5.6	-	-	-
1994	718,119	3.9	32.1	9.2	44.2	0.0	-	10.7	-	-	-
1995	663,563	9.0	29.7	10.4	40.8	0.2	-	9.6	-	-	0.3
1996	669,415	8.9	31.6	9.0	40.7	0.1	-	9.7	-	-	-
1997	574,691	10.4	25.2	11.4	41.4	0.1	-	11.6	-	-	-
1998	489,879	3.9	39.9	12.3	28.5	-	-	15.4	-	-	-
1999	567,003	2.9	38.4	8.7	37.6	-	-	12.4	-	-	-
2000	542,835	7.8	38.6	7.8	34.7	-	-	11.1	-	-	-
2001	503,786	8.9	38.9	7.5	24.5	-	-	10.0	-	-	10.2
2002	461,082	5.9	44.6	8.9	27.6	-	-	13.1	-	-	-
2003	291,822	-	66.1	13.8	3.0	-	-	17.1	-	-	-
2004	267,450	-	64.6	17.9	3.8	-	-	13.7	-	-	-
2005	265,767	-	66.9	15.5	4.9	-	-	12.7	-	-	-
2006	264,445	-	66.5	16.2	2.8	-	-	14.5	-	-	-
2007	268,417	-	66.6	16.8	2.5	-	-	14.1	-	-	-
2008	254,554	-	67.0	15.2	2.4	-	-	15.4	-	-	-
2009	252,535	-	73.0	8.8	4.1	-	-	14.0	-	-	-
2010	400,491	12.3	44.9	5.5	26.8	0.0	-	10.4	-	-	-
2011	392,857	12.0	38.0	9.0	28.6	-	-	12.4	-	-	-
2012	426,224	9.3	40.9	11.0	25.0	-	-	13.8	-	-	-
2013	386,071	12.0	35.2	10.7	30.6	-	-	11.4	-	-	-
2014	450,567	10.1	41.6	13.8	22.9	-	-	11.6	-	-	-
2015	426,852	8.1	47.9	11.7	18.5	-	-	13.7	-	-	-
2016	354,539	1.6	54.9	14.4	18.6	-	-	10.6	-	-	-
2017	292,364	-	69.6	17.8	-	-	-	12.6	-	-	-

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

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.27. Electricity Generation by Source: CHP-Commercial Power

Year	Total Electricity Generation MWH	% of Total Electricity Generation									
		Coal	Petroleum	Other Gases 1/	Other Biomass	Wood	Geothermal	Hydro	Wind	Solar*	Other
2004	325,256	-	0.4	-	54.8	-	-	-	-	-	44.8
2005	292,932	-	0.6	-	55.6	-	-	-	-	-	43.7
2006	338,649	-	0.3	-	55.9	-	-	-	-	-	43.9
2007	304,121	-	0.5	-	55.7	-	-	-	-	-	43.8
2008	329,887	-	0.4	-	55.8	-	-	-	-	-	43.8
2009	323,031	-	0.5	-	55.7	-	-	-	-	-	43.8
2010	312,807	-	0.4	-	55.8	-	-	-	-	-	43.8
2011	317,726	-	0.4	-	50.8	-	-	-	-	-	48.8
2012	301,196	-	0.5	-	50.8	-	-	-	-	-	48.8
2013	359,777	-	0.5	-	50.7	-	-	-	-	-	48.8
2014	382,607	-	0.5	-	50.7	-	-	-	-	-	48.8
2015	374,653	-	0.9	-	50.6	-	-	-	-	-	48.6
2016	405,150	-	0.8	-	50.6	-	-	-	-	-	48.6
2017	372,839	-	0.6	-	50.7	-	-	-	-	-	48.7

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

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Tables 5.28 to 5.31 show electricity generation by type of electricity producers for major types of energy sources in Hawaii. From 1990 to 2017, the share of utility generated electricity decreased from 82.4 percent to 53.2 percent; the share of IPP generated electricity increased from 4.0 percent to 12.2 percent; and the share of CHP generated electricity increased from 13.6 percent to 34.6 percent.

Table 5.28. Electricity Generation by Producer

	Electricity Generation Units: MWH						% of Total Generation Units: %				
			CHP						CHP		
Year	Utility	IPP	Electric	Industry	Commercial	Total	Utility	IPP	Electric	Industry	Commercial
1990	7,996,096	385,510	542,290	778,856	-	9,702,752	82.4	4.0	5.6	8.0	-
1991	7,333,192	376,591	145,717	847,735	-	8,703,235	84.3	4.3	1.7	9.7	-
1992	6,861,255	408,419	1,760,037	814,750	-	9,844,461	69.7	4.1	17.9	8.3	-
1993	6,083,815	512,344	2,584,600	762,928	-	9,943,687	61.2	5.2	26.0	7.7	-
1994	6,055,087	622,693	2,713,003	718,119	-	10,108,902	59.9	6.2	26.8	7.1	-
1995	6,190,584	641,018	2,808,818	663,563	-	10,303,983	60.1	6.2	27.3	6.4	-
1996	6,420,195	606,406	2,931,878	669,415	-	10,627,894	60.4	5.7	27.6	6.3	-
1997	6,212,643	656,259	2,868,654	574,691	-	10,312,247	60.2	6.4	27.8	5.6	-
1998	6,301,169	647,103	2,789,931	489,879	-	10,228,082	61.6	6.3	27.3	4.8	-
1999	6,452,068	602,820	2,782,035	567,003	-	10,403,926	62.0	5.8	26.7	5.4	-
2000	6,534,692	656,303	2,859,573	542,835	-	10,593,403	61.7	6.2	27.0	5.1	-
2001	6,383,088	521,236	3,224,983	503,786	-	10,633,093	60.0	4.9	30.3	4.7	-
2002	7,513,051	400,254	3,288,683	461,082	-	11,663,070	64.4	3.4	28.2	4.0	-
2003	6,493,205	551,293	3,640,052	291,822	-	10,976,372	59.2	5.0	33.2	2.7	-
2004	6,982,469	266,841	3,568,387	267,450	325,256	11,410,403	61.2	2.3	31.3	2.3	2.9
2005	6,915,159	279,684	3,769,263	265,767	292,932	11,522,805	60.0	2.4	32.7	2.3	2.5
2006	7,040,473	349,246	3,566,361	264,445	338,649	11,559,174	60.9	3.0	30.9	2.3	2.9
2007	6,928,397	507,515	3,524,900	268,417	304,121	11,533,350	60.1	4.4	30.6	2.3	2.6
2008	6,700,636	900,933	3,190,375	254,554	329,887	11,376,385	58.9	7.9	28.0	2.2	2.9
2009	6,509,550	803,741	3,121,676	252,535	323,031	11,010,533	59.1	7.3	28.4	2.3	2.9
2010	6,416,068	761,548	2,945,122	400,491	312,807	10,836,036	59.2	7.0	27.2	3.7	2.9
2011	6,376,331	808,653	2,827,766	392,857	317,726	10,723,333	59.5	7.5	26.4	3.7	3.0
2012	6,012,748	902,627	2,826,474	426,224	301,196	10,469,269	57.4	8.6	27.0	4.1	2.9
2013	5,748,256	983,145	2,789,803	386,071	359,777	10,267,052	56.0	9.6	27.2	3.8	3.5
2014	5,517,389	1,062,111	2,791,485	450,567	382,607	10,204,158	54.1	10.4	27.4	4.4	3.7
2015	5,492,172	1,137,735	2,688,088	426,852	374,653	10,119,500	54.3	11.2	26.6	4.2	3.7
2016	5,218,132	1,162,788	2,808,236	354,539	405,150	9,948,845	52.4	11.7	28.2	3.6	4.1
2017	5,222,562	1,198,841	2,725,444	292,364	372,839	9,812,050	53.2	12.2	27.8	3.0	3.8

Source: Energy Information Administration, Electricity, Detailed State Data

From 1990 to 2017, for petroleum generated electricity, the share of utility decreased from 91.2 percent to 74.4 percent; the share of IPP increased from 0.2 percent to 2.2 percent; and the share of CHP increased from 8.6 percent to 23.4 percent.

Table 5.29. Petroleum Generated Electricity by Producer

	Electricity Generation Units: MWH						% of Total Generation Units: %				
			CHP						CHP		
Year	Utility	IPP	Electric	Industry	Commercial	Total	Utility	IPP	Electric	Industry	Commercial
1990	7,967,354	13,834	457,941	296,733	-	8,735,862	91.2	0.2	5.2	3.4	-
1991	7,312,791	-	60,977	340,685	-	7,714,453	94.8	-	0.8	4.4	-
1992	6,851,432	19,520	1,179,093	284,158	-	8,334,203	82.2	0.2	14.1	3.4	-
1993	6,070,063	-	1,054,286	269,632	-	7,393,981	82.1	-	14.3	3.6	-
1994	6,036,282	-	1,374,306	230,325	-	7,640,913	79.0	-	18.0	3.0	-
1995	6,174,627	-	1,307,279	197,089	-	7,678,995	80.4	-	17.0	2.6	-
1996	6,402,329	2,004	1,347,448	211,336	-	7,963,117	80.4	0.0	16.9	2.7	-
1997	6,193,852	1,783	1,348,788	144,717	-	7,689,140	80.6	0.0	17.5	1.9	-
1998	6,287,107	2,542	1,365,972	195,447	-	7,851,068	80.1	0.0	17.4	2.5	-
1999	6,429,429	2,260	1,345,863	217,770	-	7,995,322	80.4	0.0	16.8	2.7	-
2000	6,516,929	1,890	1,323,560	209,403	-	8,051,782	80.9	0.0	16.4	2.6	-
2001	6,362,846	-	1,665,045	195,933	-	8,223,824	77.4	-	20.2	2.4	-
2002	7,502,913	-	1,758,336	205,741	-	9,466,990	79.3	-	18.6	2.2	-
2003	6,489,565	784	1,819,298	192,903	-	8,502,550	76.3	0.0	21.4	2.3	-
2004	6,971,259	-	1,799,282	172,803	1,353	8,944,697	77.9	-	20.1	1.9	0.0
2005	6,904,293	-	1,983,609	177,835	1,855	9,067,592	76.1	-	21.9	2.0	0.0
2006	7,015,977	-	1,861,682	175,954	860	9,054,473	77.5	-	20.6	1.9	0.0
2007	6,913,231	-	1,820,576	178,868	1,532	8,914,207	77.6	-	20.4	2.0	0.0
2008	6,682,593	399,529	1,415,939	170,566	1,308	8,669,935	77.1	4.6	16.3	2.0	0.0
2009	6,262,182	334,767	1,506,250	184,424	1,484	8,289,107	75.5	4.0	18.2	2.2	0.0
2010	6,178,666	286,176	1,441,233	179,961	1,300	8,087,336	76.4	3.5	17.8	2.2	0.0
2011	6,106,617	215,791	1,450,964	149,341	1,212	7,923,925	77.1	2.7	18.3	1.9	0.0
2012	5,746,390	231,855	1,328,912	174,172	1,431	7,482,760	76.8	3.1	17.8	2.3	0.0
2013	5,495,371	170,399	1,419,380	135,797	1,819	7,222,766	76.1	2.4	19.7	1.9	0.0
2014	5,236,160	182,618	1,317,862	187,340	1,939	6,925,919	75.6	2.6	19.0	2.7	0.0
2015	5,213,487	224,284	1,377,602	204,528	3,248	7,023,149	74.2	3.2	19.6	2.9	0.0
2016	5,007,241	131,172	1,304,008	194,504	3,391	6,640,316	75.4	2.0	19.6	2.9	0.1
2017	4,934,461	145,781	1,347,603	203,518	2,232	6,633,595	74.4	2.2	20.3	3.1	0.0

Source: Energy Information Administration, Electricity, Detailed State Data

Coal generated electricity was all generated by CHP.

Table 5.30. Coal Generated Electricity by Producer

	Electricity Generation Units: MWH						% of Total Generation Units: %				
			CHP						CHP		
Year	Utility	IPP	Electric	Industry	Commercial	Total	Utility	IPP	Electric	Industry	Commercial
1990	-	-	1,185	1,196	-	2,381	-	-	49.8	50.2	-
1991	-	-	6,771	841	-	7,612	-	-	89.0	11.0	-
1992	-	-	527,080	29,548	-	556,628	-	-	94.7	5.3	-
1993	-	-	1,459,821	19,253	-	1,479,074	-	-	98.7	1.3	-
1994	-	-	1,298,733	28,009	-	1,326,742	-	-	97.9	2.1	-
1995	-	-	1,501,539	59,665	-	1,561,204	-	-	96.2	3.8	-
1996	-	-	1,583,438	59,665	-	1,643,103	-	-	96.4	3.6	-
1997	-	-	1,515,066	59,665	-	1,574,731	-	-	96.2	3.8	-
1998	-	-	1,415,985	18,883	-	1,434,868	-	-	98.7	1.3	-
1999	-	-	1,423,825	16,420	-	1,440,245	-	-	98.9	1.1	-
2000	-	-	1,536,013	42,572	-	1,578,585	-	-	97.3	2.7	-
2001	-	-	1,559,938	44,826	-	1,604,764	-	-	97.2	2.8	-
2002	-	-	1,518,723	27,074	-	1,545,797	-	-	98.2	1.8	-
2003	-	-	1,644,137	-	-	1,644,137	-	-	100.0	-	-
2004	-	-	1,603,751	-	-	1,603,751	-	-	100.0	-	-
2005	-	-	1,630,918	-	-	1,630,918	-	-	100.0	-	-
2006	-	-	1,548,595	-	-	1,548,595	-	-	100.0	-	-
2007	-	-	1,578,931	-	-	1,578,931	-	-	100.0	-	-
2008	-	-	1,647,592	-	-	1,647,592	-	-	100.0	-	-
2009	-	-	1,500,166	-	-	1,500,166	-	-	100.0	-	-
2010	-	-	1,496,139	49,375	-	1,545,514	-	-	96.8	3.2	-
2011	-	-	1,376,802	47,234	-	1,424,036	-	-	96.7	3.3	-
2012	-	-	1,497,519	39,821	-	1,537,340	-	-	97.4	2.6	-
2013	-	-	1,357,312	46,442	-	1,403,754	-	-	96.7	3.3	-
2014	-	-	1,465,838	45,346	-	1,511,184	-	-	97.0	3.0	-
2015	-	-	1,302,898	34,514	-	1,337,412	-	-	97.4	2.6	-
2016	-	-	1,491,854	5,526	-	1,497,380	-	-	99.6	0.4	-
2017	-	-	1,375,724	-	-	1,375,724	-	-	100.0	-	-

Source: Energy Information Administration, Electricity, Detailed State Data

Electricity from other energy sources was mainly generated by non-utility producers in Hawaii. From 1990 to 2017, for electricity generated by other energy sources, the share of utility increased from 3.0 percent to 16.0 percent, the share of IPP increased from 38.5 percent to 58.4 percent; and the share of CHP decreased from 58.5 percent to 25.6 percent.

Table 5.31. Other Energy Source Generated Electricity by Producer

	Electricity Generation Units: MWH						% of Total Generation Units: %				
			CHP						CHP		
Year	Utility	IPP	Electric	Industry	Commercial	Total	Utility	IPP	Electric	Industry	Commercial
1990	28,742	371,676	83,164	480,927	-	964,509	3.0	38.5	8.6	49.9	-
1991	20,401	376,591	77,969	506,209	-	981,170	2.1	38.4	7.9	51.6	-
1992	9,823	388,899	53,864	501,044	-	953,630	1.0	40.8	5.6	52.5	-
1993	13,752	512,344	70,493	474,043	-	1,070,632	1.3	47.9	6.6	44.3	-
1994	18,805	622,693	39,964	459,785	-	1,141,247	1.6	54.6	3.5	40.3	-
1995	15,957	641,018	-	406,809	-	1,063,784	1.5	60.3	-	38.2	-
1996	17,866	604,402	992	398,414	-	1,021,674	1.7	59.2	0.1	39.0	-
1997	18,791	654,476	4,800	370,309	-	1,048,376	1.8	62.4	0.5	35.3	-
1998	14,062	644,561	7,974	275,549	-	942,146	1.5	68.4	0.8	29.2	-
1999	22,639	600,560	12,347	332,813	-	968,359	2.3	62.0	1.3	34.4	-
2000	17,763	654,413	-	290,860	-	963,036	1.8	68.0	-	30.2	-
2001	20,242	521,236	-	263,027	-	804,505	2.5	64.8	-	32.7	-
2002	10,138	400,254	11,624	228,267	-	650,283	1.6	61.6	1.8	35.1	-
2003	3,640	550,509	176,617	98,919	-	829,685	0.4	66.4	21.3	11.9	-
2004	11,210	266,841	165,354	94,647	323,903	861,955	1.3	31.0	19.2	11.0	37.6
2005	10,866	279,684	154,736	87,932	291,077	824,295	1.3	33.9	18.8	10.7	35.3
2006	24,496	349,246	156,084	88,491	337,789	956,106	2.6	36.5	16.3	9.3	35.3
2007	15,166	507,515	125,393	89,549	302,589	1,040,212	1.5	48.8	12.1	8.6	29.1
2008	18,043	501,404	126,844	83,988	328,579	1,058,858	1.7	47.4	12.0	7.9	31.0
2009	247,368	468,974	115,260	68,111	321,547	1,221,260	20.3	38.4	9.4	5.6	26.3
2010	237,402	475,372	7,750	171,155	311,507	1,203,186	19.7	39.5	0.6	14.2	25.9
2011	269,714	592,862	-	196,282	316,514	1,375,372	19.6	43.1	-	14.3	23.0
2012	266,358	670,772	43	212,231	299,765	1,449,169	18.4	46.3	0.0	14.6	20.7
2013	252,885	812,746	13,111	203,833	357,958	1,640,533	15.4	49.5	0.8	12.4	21.8
2014	281,229	879,493	7,786	217,880	380,668	1,767,056	15.9	49.8	0.4	12.3	21.5
2015	278,685	913,451	7,588	187,810	371,405	1,758,939	15.8	51.9	0.4	10.7	21.1
2016	210,891	1,031,616	12,374	154,509	401,759	1,811,149	11.6	57.0	0.7	8.5	22.2
2017	288,101	1,053,060	2,117	88,846	370,607	1,802,731	16.0	58.4	0.1	4.9	20.6

Source: Energy Information Administration, Electricity, Detailed State Data

Tables 5.32 to 5.37 show fossil fuel consumptions and consumption per unit of electricity generation by types of electricity producers. From 1990 to 2017, for all electricity producers in Hawaii, petroleum consumption decreased from 16,033,262 BBL to 10,859,057 BBL; coal consumption increased from 2,013 ST to 759,057 ST; petroleum consumption per MWH decreased from 1.84 BBL to 1.64 BBL; coal consumption per MWH decreased from 0.85 ST to 0.55 ST.

Table 5.32. Fossil Fuel Consumption by All Electricity Producers

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
1990	16,033,262	2,013	211	1.84	0.85	0.01	11.45	21.98	13.05
1991	13,464,028	5,555	729	1.75	0.73	0.01	10.87	13.14	14.16
1992	14,220,256	265,043	1,027	1.71	0.48	0.02	10.61	10.38	16.46
1993	12,605,395	603,669	1,044	1.70	0.41	0.02	10.59	9.09	16.55
1994	12,933,103	596,431	913	1.69	0.45	0.01	10.52	10.10	13.89
1995	13,034,983	688,499	663	1.70	0.44	0.01	10.55	9.91	9.57
1996	13,451,479	742,026	1,027	1.69	0.45	0.02	10.49	9.93	17.01
1997	13,226,872	754,453	622	1.72	0.48	0.01	10.68	10.48	9.51
1998	13,262,910	638,057	811	1.69	0.44	0.01	10.49	9.77	13.42
1999	13,544,370	646,215	447	1.69	0.45	0.01	10.51	9.84	9.03
2000	13,754,387	691,513	388	1.71	0.44	0.01	10.59	9.63	9.20
2001	13,661,310	717,290	315	1.66	0.45	0.01	10.28	9.82	8.32
2002	15,661,770	706,734	325	1.65	0.46	0.01	10.20	10.46	7.96
2003	13,133,452	751,987	361	1.54	0.46	0.01	9.59	10.42	8.97
2004	13,995,473	702,545	269	1.56	0.44	0.01	9.71	9.81	5.62
2005	14,131,327	703,865	231	1.56	0.43	0.01	9.67	9.58	5.62
2006	14,211,287	674,909	240	1.57	0.44	0.01	9.74	9.62	5.62
2007	13,943,232	689,627	254	1.56	0.44	0.01	9.71	9.67	5.62
2008	13,407,277	746,642	213	1.55	0.45	0.01	9.60	9.65	5.51
2009	12,739,777	663,171	126	1.54	0.44	0.01	9.54	9.46	5.62
2010	12,334,599	733,480	123	1.53	0.47	0.01	9.46	10.04	5.62
2011	12,089,799	709,440	198	1.53	0.50	0.01	9.46	10.17	5.62
2012	11,199,945	756,726	265	1.50	0.49	0.01	9.28	10.09	5.63
2013	10,765,251	701,013	228	1.49	0.50	0.01	9.24	10.07	5.51
2014	10,388,099	743,893	350	1.50	0.49	0.01	9.29	10.16	5.62
2015	10,510,012	653,257	276	1.50	0.49	0.01	9.27	10.08	5.50
2016	10,796,701	779,186	242	1.63	0.52	0.00	10.07	10.74	4.74
2017	10,859,057	759,018	247	1.64	0.55	0.00	10.14	11.39	4.75

Source: Energy Information Administration, Electricity, Detailed State Data

For electric utility, from 1990 to 2017, petroleum consumption per MWH remained about the same at 1.73 BBL.

Table 5.33. Fossil Fuel Consumption by Electric Utility

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
1990	13,769,448	-	-	1.73	-	-	10.78	-	-
1991	12,695,906	-	-	1.74	-	-	10.82	-	-
1992	11,988,722	-	-	1.75	-	-	10.88	-	-
1993	10,656,101	-	-	1.76	-	-	10.90	-	-
1994	10,409,083	-	-	1.72	-	-	10.71	-	-
1995	10,712,608	-	-	1.73	-	-	10.78	-	-
1996	10,980,227	-	-	1.72	-	-	10.65	-	-
1997	10,792,923	-	-	1.74	-	-	10.82	-	-
1998	10,864,385	-	-	1.73	-	-	10.73	-	-
1999	11,195,221	-	-	1.74	-	-	10.80	-	-
2000	11,439,206	-	-	1.76	-	-	10.88	-	-
2001	11,055,880	-	-	1.74	-	-	10.76	-	-
2002	12,825,449	-	-	1.71	-	-	10.54	-	-
2003	11,099,634	-	-	1.71	-	-	10.62	-	-
2004	12,046,236	-	-	1.73	-	-	10.73	-	-
2005	12,039,252	-	-	1.74	-	-	10.82	-	-
2006	12,238,861	-	-	1.74	-	-	10.83	-	-
2007	12,027,927	-	-	1.74	-	-	10.80	-	-
2008	11,516,852	-	-	1.72	-	-	10.70	-	-
2009	10,859,417	-	-	1.73	-	-	10.76	-	-
2010	10,601,260	-	-	1.72	-	-	10.64	-	-
2011	10,471,897	-	-	1.71	-	-	10.63	-	-
2012	9,646,276	-	-	1.68	-	-	10.40	-	-
2013	9,267,226	-	-	1.69	-	-	10.45	-	-
2014	8,892,659	-	-	1.70	-	-	10.52	-	-
2015	8,877,217	-	-	1.70	-	-	10.55	-	-
2016	8,586,750	-	-	1.71	-	-	10.62	-	-
2017	8,558,609	-	-	1.73	-	-	10.74	-	-

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.34. Fossil Fuel Consumption by CHP-Electric Power

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
1990	1,629,135	839	-	3.56	0.71	-	22.19	18.41	-
1991	123,869	4,975	-	2.03	0.73	-	12.66	13.23	-
1992	1,631,993	242,989	-	1.38	0.46	-	8.61	10.05	-
1993	1,423,808	588,420	-	1.35	0.40	-	8.39	8.98	-
1994	2,120,369	578,365	-	1.54	0.45	-	9.59	10.01	-
1995	2,001,923	649,495	-	1.53	0.43	-	9.51	9.72	-
1996	2,128,745	703,022	-	1.58	0.44	-	9.81	9.76	-
1997	2,167,435	715,449	-	1.61	0.47	-	9.98	10.33	-
1998	2,133,250	628,405	-	1.56	0.44	-	9.69	9.75	-
1999	2,010,925	638,812	-	1.49	0.45	-	9.27	9.84	-
2000	2,057,145	672,330	-	1.55	0.44	-	9.63	9.62	-
2001	2,357,310	697,330	-	1.42	0.45	-	8.76	9.82	-
2002	2,565,805	684,122	-	1.46	0.45	-	9.00	10.30	-
2003	1,841,363	751,987	-	1.01	0.46	-	6.29	10.42	-
2004	1,785,942	702,545	-	0.99	0.44	-	6.16	9.81	-
2005	1,923,500	703,865	-	0.97	0.43	-	6.02	9.58	-
2006	1,807,204	674,909	-	0.97	0.44	-	6.03	9.62	-
2007	1,755,828	689,627	-	0.96	0.44	-	5.99	9.67	-
2008	1,088,137	746,642	-	0.77	0.45	-	4.77	9.65	-
2009	1,160,328	663,171	-	0.77	0.44	-	4.78	9.46	-
2010	1,084,478	712,312	-	0.75	0.48	-	4.67	10.08	-
2011	1,096,993	688,264	-	0.76	0.50	-	4.69	10.20	-
2012	1,004,288	739,310	-	0.76	0.49	-	4.68	10.12	-
2013	1,079,137	680,192	-	0.76	0.50	-	4.71	10.10	-
2014	1,007,201	723,609	-	0.76	0.49	-	4.73	10.19	-
2015	1,049,584	637,955	-	0.76	0.49	-	4.72	10.11	-
2016	1,774,037	775,452	-	1.36	0.52	-	8.43	10.73	-
2017	1,830,060	759,018	-	1.36	0.55	-	8.41	11.39	-

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.35. Fossil Fuel Consumption by IPP

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
1990	34,680	-	-	2.51	-	-	15.64	-	-
1991	-	-	-	-	-	-	-	-	-
1992	34,680	-	-	1.78	-	-	11.05	-	-
1993	-	-	-	-	-	-	-	-	-
1994	-	-	-	-	-	-	-	-	-
1995	-	-	-	-	-	-	-	-	-
1996	6,180	-	-	3.08	-	-	19.15	-	-
1997	5,500	-	-	3.08	-	-	19.16	-	-
1998	7,680	-	-	3.02	-	-	18.75	-	-
1999	6,800	-	-	3.01	-	-	18.67	-	-
2000	5,750	-	-	3.04	-	-	18.85	-	-
2001	-	-	-	-	-	-	-	-	-
2002	-	-	-	-	-	-	-	-	-
2003	1,933	-	-	2.47	-	-	15.31	-	-
2004	-	-	-	-	-	-	-	-	-
2005	-	-	-	-	-	-	-	-	-
2006	-	-	-	-	-	-	-	-	-
2007	-	-	-	-	-	-	-	-	-
2008	657,789	-	-	1.65	-	-	10.22	-	-
2009	555,860	-	-	1.66	-	-	10.30	-	-
2010	486,952	-	-	1.70	-	-	10.55	-	-
2011	377,787	-	-	1.75	-	-	10.85	-	-
2012	378,019	-	-	1.63	-	-	10.10	-	-
2013	281,123	-	-	1.65	-	-	10.23	-	-
2014	307,049	-	-	1.68	-	-	10.42	-	-
2015	381,305	-	-	1.70	-	-	10.53	-	-
2016	241,194	-	-	1.84	-	-	11.39	-	-
2017	271,726	-	-	1.86	-	-	11.55	-	-

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.36. Fossil Fuel Consumption by CHP-Industrial Power

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
1990	599,999	1,174	211	2.02	0.98	0.0131	12.61	25.52	13.05
1991	644,253	580	729	1.89	0.69	0.0142	11.78	12.41	14.16
1992	564,861	22,054	1,027	1.99	0.75	0.0165	12.36	16.28	16.46
1993	525,486	15,249	1,044	1.95	0.79	0.0166	12.10	17.64	16.55
1994	403,651	18,066	913	1.75	0.65	0.0139	10.89	14.50	13.89
1995	320,452	39,004	663	1.63	0.65	0.0096	10.10	14.69	9.57
1996	336,327	39,004	1,027	1.59	0.65	0.0170	9.88	14.37	17.01
1997	261,014	39,004	622	1.80	0.65	0.0095	11.20	14.30	9.51
1998	257,595	9,652	811	1.32	0.51	0.0134	8.18	11.24	13.42
1999	331,424	7,403	447	1.52	0.45	0.0090	9.44	9.89	9.03
2000	252,286	19,183	388	1.20	0.45	0.0092	7.47	9.90	9.20
2001	248,120	19,960	315	1.27	0.45	0.0083	7.84	9.78	8.32
2002	270,516	22,611	325	1.31	0.84	0.0080	8.11	19.10	7.96
2003	190,522	-	361	0.99	-	0.0090	6.13	-	8.97
2004	159,838	-	269	0.92	-	0.0056	5.74	-	5.62
2005	164,246	-	231	0.92	-	0.0056	5.73	-	5.62
2006	163,225	-	240	0.93	-	0.0056	5.76	-	5.62
2007	155,832	-	254	0.87	-	0.0056	5.41	-	5.62
2008	140,804	-	213	0.83	-	0.0055	5.13	-	5.51
2009	159,962	-	126	0.87	-	0.0056	5.38	-	5.62
2010	158,213	21,168	123	0.88	0.43	0.0056	5.45	9.07	5.62
2011	139,618	21,176	198	0.93	0.45	0.0056	5.80	9.15	5.62
2012	167,811	17,416	265	0.96	0.44	0.0056	5.97	8.96	5.63
2013	132,523	20,821	228	0.98	0.45	0.0055	6.05	9.04	5.51
2014	175,572	20,284	350	0.94	0.45	0.0056	5.81	9.23	5.62
2015	192,562	15,302	276	0.94	0.44	0.0055	5.83	9.15	5.50
2016	184,247	3,734	242	0.95	0.68	0.0047	5.87	13.95	4.74
2017	191,387	-	247	0.94	-	0.0047	5.83	-	4.75

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.37. Fossil Fuel Consumption by CHP-Commercial Power

	Consumption			Consumption Per MWH			Consumption Per KWH		
Year	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BBL	Coal ST	Other Gases Billion BTU	Petroleum BTU	Coal BTU	Other Gases BTU
2004	3,457	-	-	2.56	-	-	15.86	-	-
2005	4,329	-	-	2.33	-	-	14.48	-	-
2006	1,998	-	-	2.32	-	-	14.42	-	-
2007	3,645	-	-	2.38	-	-	14.77	-	-
2008	3,695	-	-	2.82	-	-	17.54	-	-
2009	4,210	-	-	2.84	-	-	17.60	-	-
2010	3,696	-	-	2.84	-	-	17.63	-	-
2011	3,504	-	-	2.89	-	-	17.93	-	-
2012	3,551	-	-	2.48	-	-	15.38	-	-
2013	5,242	-	-	2.88	-	-	17.86	-	-
2014	5,618	-	-	2.90	-	-	17.95	-	-
2015	9,344	-	-	2.88	-	-	17.82	-	-
2016	10,473	-	-	3.09	-	-	19.13	-	-
2017	7,275	-	-	3.26	-	-	20.19	-	-

Source: Energy Information Administration, Electricity, Detailed State Data

Tables 5.38 to 5.43 show power generating capacity by types of electricity producers. From 1990 to 2017, generating capacity for the total electric power industry increased 990 MW, from 1,976 MW to 2,967 MW. By category, petroleum capacity increased the most at 371 MW (from 1,692 MW to 2,063 MW); followed by wind which increased 183 MW (from 23 MW to 206 MW), coal increased 179 MW (from 24 MW to 203 MW); other capacity increased 84 MW (from zero to 84 MW), geothermal increased 51 MW (from zero to 51 MW); other biomass increased 19 MW (from 211 MW to 230 MW); and solar increased 98 MW from zero to 98 MW (Table 5.38).

Table 5.38. Total Power Generating Capacity by Source

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	1,692	24	9	211		18	23	-	-	1,976
1991	1,910	24	9	204		18	23	-	-	2,187
1992	1,947	228	9	230	30	18	23	-	-	2,484
1993	1,976	228	9	222	30	18	23	-	-	2,505
1994	1,976	228	9	206	30	28	23	-	-	2,498
1995	1,976	228	9	193	35	29	22	-	-	2,491
1996	1,984	228	9	193	35	29	22	-	-	2,500
1997	1,972	228	9	178	35	29	20	-	-	2,471
1998	1,997	228	9	164	35	29	20	-	-	2,482
1999	2,007	228	9	156	35	28	9	-	-	2,473
2000	2,091	228	9	155	35	27	12	-	-	2,556
2001	2,093	227	9	151	35	26	11	-	-	2,552
2002	2,093	227	9	110	35	25	11	-	-	2,509
2003	2,089	227	9	114	35	23	11	-	-	2,508
2004	2,178	203	9	114	35	23	11	-	-	2,573
2005	2,192	203	9	114	35	25	11	-	-	2,589
2006	2,220	203	9	114	35	25	43	-	-	2,648
2007	2,224	203	9	114	35	25	64	-	-	2,674
2008	2,224	203	9	114	35	25	64	1	-	2,675
2009	2,242	203	9	227	35	25	64	1	-	2,805
2010	2,214	203	9	227	35	25	62	2	-	2,776
2011	2,214	203	12	227	35	25	92	2	-	2,810
2012	2,181	203	6	227	51	26	206	7	75	2,982
2013	2,181	203	6	260	51	26	206	15	60	3,008
2014	2,077	203	6	256	51	26	206	32	60	2,917
2015	2,060	203	9	256	51	26	206	44	66	2,921
2016	2,063	203	6	220	51	27	206	51	68	2,893
2017	2,063	203	6	230	51	27	206	98	84	2,967

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

For electric utilities, from 1990 to 2017, total generating capacity increased 328 MW from 1,542 MW to 1,870 MW. By category petroleum capacity increased the most at 131 MW (from 1,538 MW to 1,669 MW); followed by other biomass which increased 123 MW (from zero to 123 MW); other capacity increased 50 MW (from zero to 50 MW), and solar increased 24 MW from zero to 24 MW (Table 5.39).

Table 5.39. Power Generating Capacity by Source: Electric Utility

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	1,538	-	-	-	-	3	-	-	-	1,542
1991	1,574	-	-	-	-	3	-	-	-	1,577
1992	1,617	-	-	-	-	3	-	-	-	1,621
1993	1,655	-	-	-	-	3	-	-	-	1,659
1994	1,655	-	-	-	-	3	-	-	-	1,659
1995	1,655	-	-	-	-	3	-	-	-	1,659
1996	1,664	-	-	-	-	3	-	-	-	1,667
1997	1,652	-	-	-	-	3	-	-	-	1,655
1998	1,677	-	-	-	-	3	-	-	-	1,680
1999	1,687	-	-	-	-	3	-	-	-	1,690
2000	1,705	-	-	-	-	3	2	-	-	1,711
2001	1,703	-	-	-	-	3	2	-	-	1,708
2002	1,702	-	-	-	-	2	2	-	-	1,706
2003	1,702	-	-	-	-	2	2	-	-	1,706
2004	1,791	-	-	-	-	2	2	-	-	1,795
2005	1,806	-	-	-	-	4	2	-	-	1,812
2006	1,833	-	-	-	-	4	2	-	-	1,840
2007	1,838	-	-	-	-	4	2	-	-	1,845
2008	1,838	-	-	-	-	4	2	-	-	1,845
2009	1,856	-	-	113	-	4	2	-	-	1,976
2010	1,827	-	-	113	-	4	-	-	-	1,945
2011	1,827	-	-	113	-	4	-	-	-	1,945
2012	1,788	-	-	113	-	4	-	-	39	1,945
2013	1,788	-	-	113	-	4	-	-	39	1,945
2014	1,684	-	-	113	-	4	-	12	39	1,852
2015	1,669	-	-	113	-	4	-	24	45	1,855
2016	1,669	-	-	113	-	4	-	24	47	1,857
2017	1,669	-	-	123	-	4	-	24	50	1,870

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.40. Power Generating Capacity by Source: CHP-Electric Power

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	119	24	-	-	-	-	-	-	-	143
1991	299	24	-	-	-	-	-	-	-	323
1992	299	228	-	-	-	-	-	-	-	527
1993	299	228	-	-	-	-	-	-	-	527
1994	299	228	-	-	-	-	-	-	-	527
1995	299	228	-	-	-	-	-	-	-	527
1996	299	228	-	-	-	-	-	-	-	527
1997	299	228	-	-	-	-	-	-	-	527
1998	299	228	-	-	-	-	-	-	-	527
1999	299	228	-	-	-	-	-	-	-	527
2000	364	228	-	-	-	-	-	-	-	592
2001	365	203	-	62.00	-	1.00	-	-	-	631
2002	365	203	-	46.00	-	-	-	-	-	615
2003	365	227	-	46.00	-	-	-	-	-	638
2004	365	203	-	46.00	-	-	-	-	-	615
2005	365	203	-	46.00	-	-	-	-	-	615
2006	365	203	-	46.00	-	-	-	-	-	615
2007	299	203	-	46.00	-	-	-	-	-	549
2008	299	203	-	46.00	-	-	-	-	-	549
2009	299	203	-	46.00	-	-	-	-	-	549
2010	299	203	-	-	-	-	-	-	-	502
2011	299	203	-	-	-	-	-	-	-	502
2012	299	203	-	-	-	-	-	-	-	502
2013	299	203	-	-	-	-	-	-	-	502
2014	299	203	-	-	-	-	-	-	-	502
2015	299	203	-	-	-	-	-	-	-	502
2016	299	203	-	-	-	-	-	-	-	502
2017	299	203	-	-	-	-	-	-	-	502

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.41. Power Generating Capacity by Source: IPP

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	3	-	-	67	-	-	23	-	-	93
1991	-	-	-	64	-	-	23	-	-	86
1992	4	-	-	67	30	-	23	-	-	123
1993	-	-	-	67	30	-	23	-	-	119
1994	-	-	-	67	30	10	23	-	-	130
1995	-	-	-	67	35	10	22	-	-	134
1996	-	-	-	67	35	10	22	-	-	134
1997	-	-	-	67	35	10	20	-	-	132
1998	-	-	-	67	35	10	20	-	-	132
1999	-	-	-	67	35	10	9	-	-	121
2000	-	-	-	67	35	10	9	-	-	121
2001	-	24	-	67	35	15	9	-	-	150
2002	-	24	-	64	35	16	9	-	-	148
2003	-	-	-	64	35	16	9	-	-	124
2004	-	-	-	-	35	16	9	-	-	60
2005	-	-	-	-	35	15	9	-	-	59
2006	-	-	-	-	35	15	41	-	-	91
2007	66	-	-	-	35	15	62	-	-	178
2008	66	-	-	-	35	15	62	1	-	179
2009	66	-	-	-	35	15	62	1	-	179
2010	66	-	-	-	35	10	62	2	-	175
2011	66	-	-	-	35	10	92	2	-	205
2012	66	-	-	-	51	10	206	7	36	376
2013	66	-	-	-	51	10	206	15	21	369
2014	66	-	-	-	51	10	206	20	21	374
2015	67	-	-	-	51	10	206	20	21	375
2016	67	-	-	9	51	10	206	27	21	391
2017	67	-	-	9	51	10	206	74	34	452

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.42. Power Generating Capacity by Source: CHP-Industrial Power

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	32	-	9	144	-	15	-	-	-	199
1991	37	-	9	140	-	15	-	-	-	201
1992	26	-	9	163	-	15	-	-	-	213
1993	21	-	9	155	-	15	-	-	-	200
1994	21	-	9	139	-	14	-	-	-	182
1995	21	-	9	126	-	15	-	-	-	171
1996	21	-	9	126	-	15	-	-	-	171
1997	21	-	9	111	-	15	-	-	-	157
1998	21	-	9	97	-	15	-	-	-	142
1999	21	-	9	89	-	15	-	-	-	134
2000	21	-	9	88	-	13	-	-	-	131
2001	25	-	9	22	-	7	-	-	-	63
2002	25	-	9	-	-	7	-	-	-	41
2003	21	-	9	4	-	6	-	-	-	40
2004	21	-	9	4	-	6	-	-	-	40
2005	21	-	9	4	-	6	-	-	-	40
2006	21	-	9	4	-	6	-	-	-	40
2007	21	-	9	4	-	6	-	-	-	40
2008	21	-	9	4	-	6	-	-	-	40
2009	20	-	9	4	-	6	-	-	-	39
2010	21	-	9	50	-	10	-	-	-	91
2011	21	-	12	50	-	10	-	-	-	94
2012	27	-	6	50	-	12	-	-	-	95
2013	27	-	6	50	-	12	-	-	-	95
2014	27	-	6	46	-	12	-	-	-	91
2015	24	-	9	46	-	12	-	-	-	91
2016	27	-	6	-	-	13	-	-	-	46
2017	27	-	6	-	-	13	-	-	-	46

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.43. Power Generating Capacity by Source: CHP-Commercial Power

	Power Generating Capacity Units: MW									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
2004	-	-	-	64	-	-	-	-	-	64
2005	-	-	-	64	-	-	-	-	-	64
2006	-	-	-	64	-	-	-	-	-	64
2007	-	-	-	64	-	-	-	-	-	64
2008	-	-	-	64	-	-	-	-	-	64
2009	-	-	-	64	-	-	-	-	-	64
2010	-	-	-	64	-	-	-	-	-	64
2011	-	-	-	64	-	-	-	-	-	64
2012	-	-	-	64	-	-	-	-	-	64
2013	-	-	-	97	-	-	-	-	-	97
2014	-	-	-	97	-	-	-	-	-	97
2015	-	-	-	97	-	-	-	-	-	97
2016	-	-	-	97	-	-	-	-	-	97
2017	-	-	-	97	-	-	-	-	-	97

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Tables 5.44 to 5.49 show the average annual operating hours by type of electricity producers and by type of energy source. As shown in Table 5.44, for the total electric power industry, from 1990 to 2017, average total annual operating hours decreased 32.6 percent from 4,909 hours to 3,307 hours; petroleum operating hours decreased 37.7 percent from 5,163 hours to 3,216 hours. In 2017, the annual operating hour was the highest for other gases; followed by coal-fired capacity, geothermal, other capacity, petroleum, wind, hydro, solar, and other biomass.

Table 5.44. Average Operating Hours: Total Electric Power Industry

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind*	Solar	Other	Total
1990	5,163	100	1,796	3,990	-	4,418	1,245	-	-	4,909
1991	4,038	320	5,720	4,044	-	3,944	1,580	-	-	3,979
1992	4,281	2,443	6,933	3,508	71	3,396	1,006	-	-	3,964
1993	3,743	6,493	7,008	3,500	5,075	3,125	973	-	-	3,970
1994	3,868	5,824	7,302	3,553	6,177	5,052	902	-	-	4,047
1995	3,887	6,853	7,701	3,308	6,701	3,384	932	-	-	4,136
1996	4,014	7,213	6,707	3,066	6,914	3,600	1,023	-	-	4,252
1997	3,899	6,913	7,265	3,403	7,011	3,950	792	-	-	4,173
1998	3,931	6,299	6,716	3,073	6,774	4,196	952	-	-	4,121
1999	3,983	6,322	5,501	3,696	6,024	4,046	1,783	-	-	4,208
2000	3,851	6,924	4,686	3,473	7,487	3,832	1,417	-	-	4,145
2001	3,929	7,069	4,206	1,905	5,903	3,875	193	-	-	4,167
2002	4,523	6,810	4,535	2,696	2,079	3,803	147	-	-	4,648
2003	4,070	7,243	4,472	3,045	5,094	3,935	143	-	-	4,377
2004	4,107	7,900	5,323	2,884	6,094	4,083	681	-	-	4,435
2005	4,137	8,034	4,570	2,717	6,331	3,848	603	-	-	4,451
2006	4,079	7,629	4,751	2,857	6,065	4,803	1,853	-	-	4,365
2007	4,008	7,778	5,025	2,502	6,568	3,694	3,722	-	-	4,313
2008	3,898	8,116	4,286	2,653	6,695	3,374	3,750	18	-	4,253
2009	3,697	7,390	2,483	1,253	4,788	4,506	3,929	1,390	-	3,925
2010	3,653	7,613	2,435	1,249	5,731	2,817	4,212	885	-	3,903
2011	3,579	7,015	2,889	1,378	6,397	3,741	3,721	1,633	-	3,817
2012	3,431	7,573	7,839	1,239	5,118	4,373	1,840	640	4,830	3,511
2013	3,312	6,915	6,888	1,265	5,389	2,988	2,448	1,281	6,555	3,413
2014	3,335	7,444	10,367	1,303	4,977	3,591	2,814	1,219	6,739	3,498
2015	3,410	6,588	5,573	1,252	4,516	4,625	2,980	1,231	5,585	3,464
2016	3,220	7,376	8,501	1,637	5,100	3,352	3,109	1,746	4,765	3,439
2017	3,216	6,777	8,670	1,275	6,325	2,438	2,588	1,771	4,344	3,307

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

For electric utility, from 1990 to 2017, average total annual operating hours decreased 46.1 percent from 5,187 hours to 2,793 hours; petroleum capacity operating hours decreased 42.9 percent from 5,180 hours to 2,957 hours.

Table 5.45. Average Operating Hours: Electric Utilities

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	5,180	-	-	-	-	6,789	-	-	-	5,187
1991	4,647	-	-	-	-	6,090	-	-	-	4,650
1992	4,236	-	-	-	-	2,932	-	-	-	4,233
1993	3,667	-	-	-	-	4,105	-	-	-	3,668
1994	3,646	-	-	-	-	5,613	-	-	-	3,650
1995	3,730	-	-	-	-	4,763	-	-	-	3,732
1996	3,848	-	-	-	-	5,333	-	-	-	3,851
1997	3,749	-	-	-	-	5,609	-	-	-	3,753
1998	3,749	-	-	-	-	4,104	-	-	-	3,750
1999	3,811	-	-	-	-	5,625	-	-	-	3,817
2000	3,822	-	-	-	-	5,038	1,325	-	-	3,819
2001	3,736	-	-	-	-	6,044	1,055	-	-	3,737
2002	4,408	-	-	-	-	4,267	803	-	-	4,404
2003	3,813	-	-	-	-	1,039	781	-	-	3,806
2004	3,892	-	-	-	-	4,862	743	-	-	3,890
2005	3,823	-	-	-	-	2,292	849	-	-	3,816
2006	3,828	-	-	-	-	5,914	420	-	-	3,826
2007	3,761	-	-	-	-	3,682	219	-	-	3,755
2008	3,636	-	-	-	-	4,468	86	-	-	3,632
2009	3,374	-	-	29	-	7,152	43	-	-	3,294
2010	3,382	-	-	14	-	4,180	-	-	-	3,299
2011	3,342	-	-	343	-	4,878	-	-	-	3,279
2012	3,213	-	-	191	-	7,059	-	-	5,519	3,092
2013	3,073	-	-	252	-	4,625	-	-	5,254	2,956
2014	3,110	-	-	324	-	5,742	-	868	5,389	2,979
2015	3,124	-	-	464	-	5,301	-	1,039	3,982	2,961
2016	3,000	-	-	332	-	4,108	-	1,820	2,423	2,811
2017	2,957	-	-	446	-	2,387	-	1,806	3,632	2,793

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.46. Average Operating Hours: CHP-Electric Power

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	3,842	50	-	-	-	-	-	-	-	3,792
1991	204	284	-	-	-	-	-	-	-	451
1992	3,937	2,314	-	-	-	-	-	-	-	3,338
1993	3,521	6,408	-	-	-	-	-	-	-	4,902
1994	4,589	5,701	-	-	-	-	-	-	-	5,145
1995	4,365	6,591	-	-	-	-	-	-	-	5,327
1996	4,500	6,951	-	-	-	-	-	-	-	5,561
1997	4,504	6,651	-	-	-	-	-	-	-	5,441
1998	4,561	6,216	-	-	-	-	-	-	-	5,291
1999	4,494	6,250	-	-	-	-	-	-	-	5,276
2000	3,636	6,737	-	-	-	-	-	-	-	4,830
2001	4,562	7,684	-	-	-	-	-	-	-	5,111
2002	4,817	7,481	-	-	-	-	-	-	-	5,347
2003	4,984	7,243	-	3,368	-	-	-	-	-	5,705
2004	4,930	7,900	-	3,056	-	-	-	-	-	5,802
2005	5,435	8,034	-	2,909	-	-	-	-	-	6,129
2006	5,100	7,629	-	2,806	-	-	-	-	-	5,799
2007	6,089	7,778	-	2,375	-	-	-	-	-	6,421
2008	4,736	8,116	-	2,441	-	-	-	-	-	5,811
2009	5,038	7,390	-	1,972	-	-	-	-	-	5,686
2010	4,820	7,370	-	-	-	-	-	-	-	5,867
2011	4,846	6,782	-	-	-	-	-	-	-	5,629
2012	4,439	7,377	-	-	-	-	-	-	-	5,626
2013	4,741	6,686	-	-	-	-	-	-	-	5,553
2014	4,402	7,221	-	-	-	-	-	-	-	5,556
2015	4,601	6,418	-	-	-	-	-	-	-	5,350
2016	4,355	7,349	-	-	-	-	-	-	-	5,590
2017	4,501	6,777	-	-	-	-	-	-	-	5,425

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.47. Average Operating Hours: IPP

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	5,124	-	-	5,136	-	-	1,245	-	-	4,163
1991	-	-	-	5,349	-	-	1,580	-	-	4,364
1992	5,422	-	-	5,455	71	-	1,006	-	-	3,323
1993	-	-	-	5,066	5,075	-	973	-	-	4,295
1994	-	-	-	5,587	6,177	4,238	902	-	-	4,801
1995	-	-	-	5,515	6,701	1,735	932	-	-	4,784
1996	-	-	-	4,774	6,914	2,043	1,023	-	-	4,520
1997	-	-	-	5,443	7,011	2,862	792	-	-	4,957
1998	-	-	-	5,338	6,774	3,095	937	-	-	4,887
1999	-	-	-	5,260	6,024	2,491	1,373	-	-	4,966
2000	-	-	-	5,222	7,487	2,810	1,595	-	-	5,424
2001	-	-	-	2,451	5,903	2,143	1	-	-	3,475
2002	-	-	-	2,646	2,079	1,644	1	-	-	2,704
2003	-	-	-	2,869	5,094	2,399	1	-	-	4,446
2004	-	-	-	-	6,094	2,972	668	-	-	4,447
2005	-	-	-	-	6,331	3,543	548	-	-	4,740
2006	-	-	-	-	6,065	3,876	1,923	-	-	3,838
2007	-	-	-	-	6,568	2,659	3,835	-	-	2,851
2008	6,053	-	-	-	6,695	1,813	3,869	18	-	5,033
2009	5,072	-	-	-	4,788	3,243	4,054	1,390	-	4,490
2010	4,336	-	-	-	5,731	1,189	4,212	885	-	4,352
2011	3,270	-	-	-	6,397	2,362	3,721	1,633	-	3,941
2012	3,513	-	-	-	5,118	2,590	1,840	640	-	2,399
2013	2,582	-	-	-	5,389	1,455	2,448	1,281	-	2,663
2014	2,767	-	-	-	4,977	1,749	2,814	1,428	-	2,838
2015	3,348	-	-	-	4,516	3,931	2,980	1,458	-	3,032
2016	1,958	-	-	-	5,100	3,489	3,109	1,680	-	2,974
2017	2,176	-	-	-	6,325	1,872	2,588	1,760	-	2,655

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.48. Average Operating Hours: CHP-Industrial Power

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
1990	9,331	-	1,796	2,838	-	3,875	-	-	-	3,910
1991	9,158	-	5,720	2,892	-	3,453	-	-	-	4,226
1992	10,846	-	6,933	2,378	-	3,502	-	-	-	3,832
1993	12,963	-	7,008	2,373	-	2,900	-	-	-	3,820
1994	11,073	-	7,302	2,286	-	5,527	-	-	-	3,937
1995	9,475	-	7,701	2,142	-	4,212	-	-	-	3,876
1996	10,160	-	6,707	2,155	-	4,285	-	-	-	3,910
1997	6,958	-	7,265	2,137	-	4,322	-	-	-	3,672
1998	9,396	-	6,716	1,437	-	4,973	-	-	-	3,445
1999	10,470	-	5,501	2,388	-	4,789	-	-	-	4,241
2000	9,972	-	4,686	2,141	-	4,634	-	-	-	4,144
2001	7,837	-	4,206	5,614	-	7,210	-	-	-	7,997
2002	8,230	-	4,535	-	-	8,604	-	-	-	11,246
2003	9,186	-	4,472	2,157	-	8,340	-	-	-	7,296
2004	8,229	-	5,323	2,527	-	6,106	-	-	-	6,686
2005	8,468	-	4,570	3,233	-	5,645	-	-	-	6,644
2006	8,379	-	4,751	1,860	-	6,383	-	-	-	6,611
2007	8,518	-	5,025	1,648	-	6,289	-	-	-	6,710
2008	8,122	-	4,286	1,537	-	6,545	-	-	-	6,364
2009	9,221	-	2,483	2,594	-	5,898	-	-	-	6,475
2010	8,570	-	2,435	2,148	-	4,182	-	-	-	4,401
2011	7,111	-	2,889	2,245	-	4,670	-	-	-	4,193
2012	6,403	-	7,839	2,125	-	5,018	-	-	-	4,487
2013	4,993	-	6,888	2,361	-	3,778	-	-	-	4,064
2014	6,887	-	8,639	2,241	-	4,475	-	-	-	4,951
2015	8,452	-	8,640	1,716	-	5,005	-	-	-	4,691
2016	7,151	-	8,641	-	-	2,994	-	-	-	7,741
2017	7,482	-	8,642	-	-	2,922	-	-	-	6,383

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.49. Average Operating Hours: CHP-Commercial Power

	Average Operating Hours Units: Hours/Year									
Year	Petroleum	Coal	Other Gases	Other Biomass	Geothermal	Hydro	Wind	Solar*	Other	Total
2004	-	-	-	2,784	-	-	-	-	-	2,784
2005	-	-	-	2,547	-	-	-	-	-	2,547
2006	-	-	-	2,956	-	-	-	-	-	2,956
2007	-	-	-	2,648	-	-	-	-	-	2,648
2008	-	-	-	2,875	-	-	-	-	-	2,875
2009	-	-	-	2,814	-	-	-	-	-	2,814
2010	-	-	-	2,726	-	-	-	-	-	2,726
2011	-	-	-	2,534	-	-	-	-	-	2,534
2012	-	-	-	2,400	-	-	-	-	-	2,400
2013	-	-	-	1,876	-	-	-	-	-	1,876
2014	-	-	-	1,995	-	-	-	-	-	1,995
2015	-	-	-	1,947	-	-	-	-	-	3,850
2016	-	-	-	2,106	-	-	-	-	-	4,164
2017	-	-	-	1,943	-	-	-	-	-	3,832

Source: Energy Information Administration, Electricity, Detailed State Data

* Does not include roof-top PV

Table 5.50 shows the average electricity price by sector in Hawaii. From 1990 to 2017, the average price of electricity in Hawaii increased 4.0 percent per year from 9.02 cents/kWh to 26.05 cents/kWh; residential price increased 4.0 percent per year from 10.26 cents/kWh to 29.50 cents/kWh; commercial price increased 3.6 percent per year from 10.18 cents/kWh to 26.77 cents/kWh; and industrial price increased 4.2 percent per year from 7.57 cents/kWh to 22.92 cents/kWh.

Table 5.50. Average Electricity Price by Sector in Hawaii

Year	Residential Cents/kWh	Commercial Cents/kWh	Industrial Cents/kWh	Other Cents/kWh	Total Cents/kWh
1990	10.26	10.18	7.57	9.40	9.02
1991	10.52	10.33	7.71	9.56	9.22
1992	10.90	10.53	7.83	9.71	9.44
1993	12.28	11.68	8.95	11.26	10.66
1994	12.45	11.67	8.82	11.21	10.68
1995	13.32	12.16	9.27	12.11	11.29
1996	14.26	12.99	10.03	12.91	12.12
1997	14.80	13.26	10.32	13.20	12.49
1998	13.82	12.31	9.41	12.28	11.56
1999	14.30	12.74	9.70	12.66	11.97
2000	16.41	14.81	11.69	14.76	14.03
2001	16.34	14.81	11.68	16.81	14.05
2002	15.63	14.11	11.02	16.85	13.39
2003	16.73	15.02	12.20	NA	14.47
2004	18.06	16.19	13.35	NA	15.70
2005	20.70	19.04	15.79	NA	18.33
2006	23.35	21.42	17.96	NA	20.72
2007	24.12	21.91	18.38	NA	21.29
2008	32.50	29.72	26.05	NA	29.20
2009	24.20	21.86	18.14	NA	21.21
2010	28.10	25.93	21.94	NA	25.12
2011	34.68	32.37	28.40	NA	31.59
2012	37.34	34.88	30.82	NA	34.04
2013	36.98	34.05	29.87	NA	33.26
2014	37.04	34.21	30.22	NA	33.43
2015	29.60	26.93	23.06	NA	26.17
2016	27.47	24.64	20.69	NA	23.87
2017	29.50	26.77	22.92	NA	26.05

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.51 shows retail electricity sales by sector in Hawaii. From 1990 to 2017, total retail electricity sales in Hawaii increased 12.2 percent from 8,311 GWH to 9,324 GWH; the share of residential sales increased 0.2 of a percentage point from 28.0 percent to 28.2 percent; the share of industrial sales decreased 6.2 percentage points from 44.9 percent to 38.7 percent; and the share of commercial sales increased 6.6 percentage points from 26.4 percent to 33.0 percent.

Table 5.51. Retail Electricity Sales by Sector in Hawaii

Year	Residential GWH	Commercial GWH	Industrial GWH	Other GWH	Total GWH	Residential %	Commercial %	Industrial %
1990	2,324	2,194	3,734	58	8,311	28.0	26.4	44.9
1991	2,396	2,298	3,773	58	8,524	28.1	27.0	44.3
1992	2,438	2,356	3,811	61	8,667	28.1	27.2	44.0
1993	2,469	2,363	3,770	56	8,658	28.5	27.3	43.5
1994	2,557	2,543	3,791	58	8,948	28.6	28.4	42.4
1995	2,606	2,721	3,803	57	9,188	28.4	29.6	41.4
1996	2,676	2,761	3,884	58	9,379	28.5	29.4	41.4
1997	2,668	2,782	3,856	57	9,363	28.5	29.7	41.2
1998	2,641	2,776	3,787	57	9,261	28.5	30.0	40.9
1999	2,689	2,887	3,748	57	9,381	28.7	30.8	39.9
2000	2,765	3,036	3,834	56	9,691	28.5	31.3	39.6
2001	2,802	3,129	3,790	63	9,785	28.6	32.0	38.7
2002	2,898	3,168	3,770	55	9,892	29.3	32.0	38.1
2003	3,028	3,517	3,846	NA	10,391	29.1	33.8	37.0
2004	3,162	3,632	3,937	NA	10,732	29.5	33.8	36.7
2005	3,164	3,463	3,912	NA	10,539	30.0	32.9	37.1
2006	3,182	3,490	3,896	NA	10,568	30.1	33.0	36.9
2007	3,201	3,520	3,864	NA	10,585	30.2	33.3	36.5
2008	3,085	3,501	3,804	NA	10,390	29.7	33.7	36.6
2009	3,055	3,388	3,683	NA	10,126	30.2	33.5	36.4
2010	2,989	3,355	3,672	NA	10,017	29.8	33.5	36.7
2011	2,929	3,368	3,665	NA	9,962	29.4	33.8	36.8
2012	2,739	3,238	3,662	NA	9,639	28.4	33.6	38.0
2013	2,609	3,271	3,623	NA	9,503	27.5	34.4	38.1
2014	2,584	3,202	3,690	NA	9,475	27.3	33.8	38.9
2015	2,641	3,174	3,696	NA	9,511	27.8	33.4	38.9
2016	2,612	3,111	3,722	NA	9,445	27.7	32.9	39.4
2017	2,630	3,082	3,613	NA	9,324	28.2	33.0	38.7

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.52 shows revenues from retail electricity sales by sector in Hawaii. From 1990 to 2017, total retail electricity revenue in Hawaii increased $1,679 million from $750 million to $2,429 million; the share of residential revenue increased 0.1 of a percentage point from 31.8 percent to 31.9 percent; the share of industrial revenue decreased 3.6 percentage points from 37.7 percent to 34.1 percent; and the share of commercial revenue increased 4.2 percentage points from 29.8 percent to 34.0 percent.

Table 5.52. Revenue from Retail Electricity Sales by Sector in Hawaii

Year	Residential $M	Commercial $M	Industrial $M	Other $M	Total $M	Residential %	Commercial %	Industrial %
1990	238	223	283	5	750	31.8	29.8	37.7
1991	252	237	291	6	786	32.1	30.2	37.0
1992	266	248	299	6	819	32.5	30.3	36.5
1993	303	276	337	6	923	32.9	29.9	36.5
1994	318	297	334	7	956	33.3	31.1	35.0
1995	347	331	352	7	1,038	33.5	31.9	34.0
1996	382	359	390	7	1,137	33.6	31.5	34.3
1997	395	369	398	8	1,169	33.8	31.5	34.0
1998	365	342	357	7	1,070	34.1	31.9	33.3
1999	384	368	364	7	1,123	34.2	32.7	32.4
2000	454	450	448	8	1,360	33.4	33.1	33.0
2001	458	464	443	11	1,374	33.3	33.7	32.2
2002	453	447	415	9	1,325	34.2	33.7	31.4
2003	507	528	469	NA	1,504	33.7	35.1	31.2
2004	571	588	526	NA	1,685	33.9	34.9	31.2
2005	655	659	618	NA	1,932	33.9	34.1	32.0
2006	743	748	700	NA	2,190	33.9	34.1	31.9
2007	772	771	710	NA	2,253	34.3	34.2	31.5
2008	1,003	1,040	991	NA	3,034	33.0	34.3	32.7
2009	739	741	668	NA	2,148	34.4	34.5	31.1
2010	840	870	806	NA	2,516	33.4	34.6	32.0
2011	1,016	1,090	1,041	NA	3,147	32.3	34.7	33.1
2012	1,023	1,130	1,129	NA	3,281	31.2	34.4	34.4
2013	965	1,114	1,082	NA	3,161	30.5	35.2	34.2
2014	957	1,095	1,115	NA	3,167	30.2	34.6	35.2
2015	782	855	852	NA	2,489	31.4	34.3	34.2
2016	717	767	770	NA	2,254	31.8	34.0	34.2
2017	776	825	828	NA	2,429	31.9	34.0	34.1

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.53 shows the number of electricity retail customers by sector in Hawaii. From 1990 to 2017, total retail electricity customers in Hawaii increased 35.0 percent from 366,698 customers to 494,970 customers; the share of residential customers increased 1.2 percentage point from 86.3 percent to 87.5 percent; the share of industrial customers remained about the same at 0.2 percent; and the share of commercial customers decreased 0.7 of a percentage point from 13.1 percent to 12.4 percent.

Table 5.53. Number of Retail Customers by Sector in Hawaii

Year	Residential Customers	Commercial Customers	Industrial Customers	Other Customers	Total Customers	Residential %	Commercial %	Industrial %
1990	316,459	47,997	705	1,537	366,698	86.3	13.1	0.2
1991	325,703	49,572	727	1,531	377,533	86.3	13.1	0.2
1992	331,347	49,756	744	1,954	383,801	86.3	13.0	0.2
1993	337,364	50,603	753	1,560	390,280	86.4	13.0	0.2
1994	345,551	51,208	711	4,301	401,771	86.0	12.7	0.2
1995	350,644	52,276	684	4,362	407,966	85.9	12.8	0.2
1996	354,421	52,424	693	4,153	411,691	86.1	12.7	0.2
1997	357,329	52,367	685	4,184	414,565	86.2	12.6	0.2
1998	359,986	52,438	683	4,237	417,344	86.3	12.6	0.2
1999	363,680	52,986	661	4,254	421,581	86.3	12.6	0.2
2000	368,361	53,782	661	4,304	427,108	86.2	12.6	0.2
2001	375,021	54,809	654	4,378	434,862	86.2	12.6	0.2
2002	375,668	54,571	643	3,926	434,808	86.4	12.6	0.1
2003	385,827	61,088	669	NA	447,584	86.2	13.6	0.1
2004	389,411	62,107	673	NA	452,191	86.1	13.7	0.1
2005	395,079	60,147	684	NA	455,910	86.7	13.2	0.2
2006	401,592	61,334	689	NA	463,615	86.6	13.2	0.1
2007	407,146	62,001	682	NA	469,829	86.7	13.2	0.1
2008	409,668	61,684	673	NA	472,025	86.8	13.1	0.1
2009	412,843	60,869	688	NA	474,400	87.0	12.8	0.1
2010	414,568	60,479	686	NA	475,733	87.1	12.7	0.1
2011	417,531	60,043	698	NA	478,272	87.3	12.6	0.1
2012	419,612	60,109	706	NA	480,427	87.3	12.5	0.1
2013	422,386	60,467	694	NA	483,547	87.4	12.5	0.1
2014	425,168	60,679	716	NA	486,563	87.4	12.5	0.1
2015	428,339	60,631	740	NA	489,710	87.5	12.4	0.2
2016	430,941	60,836	801	NA	492,578	87.5	12.4	0.2
2017	432,952	61,236	782	NA	494,970	87.5	12.4	0.2

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.54 shows the average revenue per retail electricity customers by sector in Hawaii. From 1990 to 2017, the average revenue per customer for all sectors in Hawaii increased 140 percent from $2,045 to $4,907; residential revenue per customer increased 138 percent from $753 to $1,792; commercial revenue per customer increased 190 percent from $4,653 to $13,473; and industrial revenue per customer increased 164 percent from $400,892 to $1,058,918.

Table 5.54. Revenue per Retail Customers by Sector in Hawaii

Year	Residential $/Customer	Commercial $/Customer	Industrial $/Customer	Other $/Customer	Total $/Customer
1990	753	4,653	400,892	3,573	2,045
1991	774	4,790	400,197	3,594	2,082
1992	802	4,988	401,337	3,027	2,133
1993	899	5,455	447,859	4,060	2,364
1994	921	5,798	469,982	1,511	2,379
1995	990	6,332	515,310	1,596	2,544
1996	1,077	6,840	562,063	1,788	2,762
1997	1,105	7,043	581,020	1,796	2,820
1998	1,014	6,518	521,981	1,650	2,564
1999	1,057	6,942	550,203	1,693	2,664
2000	1,232	8,362	677,885	1,932	3,184
2001	1,221	8,459	676,661	2,409	3,161
2002	1,206	8,191	646,079	2,357	3,047
2003	1,313	8,648	701,158	NA	3,360
2004	1,467	9,469	780,981	NA	3,726
2005	1,658	10,961	902,899	NA	4,237
2006	1,850	12,189	1,015,321	NA	4,724
2007	1,896	12,439	1,041,306	NA	4,796
2008	2,447	16,868	1,472,416	NA	6,428
2009	1,791	12,167	971,129	NA	4,528
2010	2,026	14,382	1,174,818	NA	5,288
2011	2,433	18,161	1,491,119	NA	6,580
2012	2,438	18,792	1,598,541	NA	6,829
2013	2,284	18,423	1,559,357	NA	6,537
2014	2,251	18,054	1,557,187	NA	6,510
2015	1,825	14,098	1,151,464	NA	5,082
2016	1,665	12,603	961,719	NA	4,577
2017	1,792	13,473	1,058,918	NA	4,907

Source: Energy Information Administration, Electricity, Detailed State Data

Table 5.55 provides selected major operating indicators of electric utilities in Hawaii from 2005 to 2017.

Table 5.55. State of Hawaii Electric Utility Major Operating Indicators

	Units	2005 Annual	2007 Annual	2009 Annual	2011 Annual	2013 Annual	2015 Annual	2016 Annual	2017 Annual	Average 05 to 17	Growth 2017
Total Operating Revenues	$M	1,934	2,260	2,156	3,156	3,164	2,477	2,235	2,404	2,616	7.6%
Total Operating Expenses	$M	1,800	2,139	2,028	2,983	2,972	2,273	2,029	2,222	2,449	9.6%
Operating Income	$M	134	121	129	173	192	203	206	182	166	-11.9%
Operating Income as % of Revenue	%	7	5	6	5	6	8	9	8	6	-18.1%
% of Total Operating Expenses		-									
Fuel Cost	%	39	40	36	45	43	31	24	28	38	16.4%
Purchased Power	%	26	25	25	23	24	27	29	28	25	-4.8%
Fuel and Purchased Power	%	64	65	61	69	67	58	53	56	64	4.8%
Operation and Maintenance	%	6	6	7	5	5	6	7	6	6	-6.8%
Transmission Expenses	%	1	1	1	1	1	1	1	1	1	-17.6%
Distribution Expenses	%	2	2	2	2	2	3	3	3	2	-5.9%
Customer Accounts Expenses	%	1	1	1	1	2	2	2	2	1	-11.0%
Customer Service Expenses	%	1	1	2	0	1	1	1	1	1	-15.9%
Admin & Gen Expenses	%	5	5	6	5	5	7	7	7	6	-1.4%
Sub-Total Utility Operating Expense	%	80	81	80	83	82	77	75	76	80	1.6%
Depreciation and Amortization	%	8	7	8	5	6	8	10	10	7	-5.0%
Taxes	%	12	11	12	12	12	14	15	14	13	-4.5%
Other Expense	%	0	0	0	0	0	0	0	0	0	-88.2%
Total Electricity Sold	GWh	10,539	10,585	10,126	9,962	9,501	9,389	9,284	9,136	9,887	-1.6%
Generated by Utility	GWh	6,336	6,330	5,972	5,915	5,257	4,986	4,776	4,719	5,639	-1.2%
Electricity Purchased	GWh	4,202	4,255	4,154	4,046	4,244	4,402	4,508	4,416	4,248	-2.0%
% of Electricity Purchased	%	40	40	41	41	45	47	49	48	43	-0.4%
Average Revenue per kWh Sold	$/kWh	0.184	0.214	0.213	0.317	0.333	0.264	0.241	0.263	0.266	9.3%
Fuel	$/kWh	0.103	0.123	0.112	0.196	0.198	0.128	0.103	0.122	0.149	18.6%
Operation and Maintenance	$/kWh	0.016	0.021	0.023	0.025	0.028	0.026	0.028	0.029	0.024	3.3%
Transmission Expenses	$/kWh	0.001	0.002	0.002	0.002	0.003	0.003	0.003	0.002	0.002	-8.3%
Distribution Expenses	$/kWh	0.004	0.004	0.005	0.006	0.007	0.007	0.008	0.008	0.006	4.8%
Customer Accounts Expenses	$/kWh	0.002	0.002	0.003	0.003	0.005	0.004	0.004	0.004	0.003	-0.9%
Customer Service Expenses	$/kWh	0.002	0.003	0.003	0.001	0.002	0.002	0.002	0.002	0.002	-6.3%
Admin & Gen Expenses	$/kWh	0.008	0.011	0.012	0.014	0.014	0.017	0.016	0.018	0.014	9.8%
Depreciation and Amortization	$/kWh	0.013	0.014	0.016	0.015	0.017	0.020	0.022	0.023	0.017	5.8%
Taxes	$/kWh	0.021	0.023	0.025	0.036	0.038	0.034	0.032	0.034	0.031	6.3%
Other Expense	$/kWh	0.001	0.000	0.000	0.000	0.001	0.001	0.000	0.000	0.001	-86.8%
Net Income	$/kWh	0.013	0.011	0.013	0.017	0.020	0.022	0.022	0.020	0.017	-10.5%
Average Cost of Purchased KWH	$/kWh	0.110	0.127	0.121	0.172	0.170	0.138	0.131	0.140	0.144	6.5%
Average Fuel Cost of Net Generated KWH	$/kWh	0.100	0.123	0.111	0.211	0.222	0.129	0.093	0.120	0.156	28.9%
Cost of Fuel Oil / KWH Generated	$/kWh	0.082	0.110	0.104	0.205	0.216	0.117	0.084	0.112	0.147	32.8%
Cost of Diesel Oil / KWH Generated	$/kWh	0.114	0.172	0.140	0.232	0.252	0.186	0.136	0.148	0.188	8.9%
Fuel Oil Consumed	TBBL	9,121	9,358	8,618	8,264	7,208	6,766	6,573	6,486	7,973	-1.3%
Diesel Oil Consumed	TBBL	2,926	2,687	2,627	2,692	2,523	2,624	2,446	2,564	2,621	4.8%
Total Oil Consumed	TBBL	12,047	12,045	11,245	10,956	9,731	9,390	9,019	9,049	10,594	0.3%
Total Cost of Oil	$M	694	850	724	1,356	1,277	706	489	624	959	27.5%
Total Cost of Fuel Oil	$M	467	592	519	993	922	465	323	418	683	29.5%
Total Cost of Diesel Oil	$M	226	258	205	363	356	241	167	206	277	23.7%
Average Cost of Fuel Oil	$/BBL	51	63	60	120	128	69	49	64	86	31.3%
Average Cost of Diesel Oil	$/BBL	77	96	78	135	141	92	68	80	106	18.0%

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Tables 5.56 to 5.68 provide major operating indicators of electric utilities by county.

Table 5.56. County Electric Utility Major Operating Indicators – 2017

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,404	1,598	333	326	148
Total Operating Expenses	$M	2,222	1,487	302	300	134
Operating Income	$M	182	110	32	26	14
Operating Income as % of Revenue	%	8	7	9	8	10
% of Total Operating Expenses			-	-	-	-
Fuel Cost (Utility Only)	%	28	27	21	39	27
Purchased Power	%	28	31	29	15	22
Fuel and Purchased Power	%	56	58	50	53	49
Operation and Maintenance	%	6	5	6	11	7
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	3	3	5	3	4
Customer Accounts Expenses	%	2	1	3	2	2
Customer Service Expenses	%	1	1	0	1	0
Admin & Gen Expenses	%	7	7	7	6	13
Sub-Total Utility Operating Expense	%	76	77	72	78	76
Depreciation and Amortization	%	10	9	13	8	14
Taxes	%	14	14	15	15	9
Other Expense	%	0	(0)	(0)	-	0
Total Electricity Sold	GWH	9,136	6,549	1,047	1,095	445
Generated by Utility	GWH	4,719	3,145	445	853	276
Electricity Purchased	GWH	4,416	3,403	602	242	169
% of Electricity Purchased	%	48	52	57	22	38
Average Revenue per kWh Sold	$/kWh	0.263	0.244	0.318	0.297	0.332
Fuel (All)	$/kWh	0.122	0.119	0.121	0.138	0.135
Operation and Maintenance	$/kWh	0.029	0.024	0.042	0.039	0.036
Transmission Expenses	$/kWh	0.002	0.002	0.003	0.002	0.002
Distribution Expenses	$/kWh	0.008	0.007	0.013	0.009	0.011
Customer Accounts Expenses	$/kWh	0.004	0.003	0.008	0.006	0.005
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.002	0.001
Admin & Gen Expenses	$/kWh	0.018	0.016	0.020	0.017	0.040
Depreciation and Amortization	$/kWh	0.023	0.020	0.037	0.021	0.043
Taxes	$/kWh	0.034	0.033	0.043	0.040	0.028
Other Expense	$/kWh	0.000	(0.000)	(0.000)	-	0.000
Net Income	$/kWh	0.020	0.017	0.030	0.024	0.032
Average Cost of Purchased KWH	$/kWh	0.140	0.133	0.146	0.186	0.176
Average Fuel Cost of Utility	$/kWh	0.120	0.118	0.122	0.126	0.123
Cost of Fuel Oil / KWH Generated	$/kWh	0.112	0.113	0.106	0.108	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.148	0.237	0.161	0.124	0.123
Fuel Oil Consumed	TBBL	6,486	5,710	400	376	-
Diesel Oil Consumed	TBBL	2,564	297	540	1,224	503
Total Cost of Fuel Oil	$M	418	378	21	18	-
Total Cost of Diesel Oil	$M	206	30	43	97	36
Average Cost of Fuel Oil	$/BBL	64	66	52	49	-
Average Cost of Diesel Oil	$/BBL	80	101	80	79	72

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.57. County Electric Utility Major Operating Indicators – 2016

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,235	1,472	311	309	143
Total Operating Expenses	$M	2,029	1,339	279	279	131
Operating Income	$M	206	133	32	29	12
Operating Income as % of Revenue	%	9	9	10	9	9
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	24	23	20	34	26
Purchased Power	%	29	32	29	18	22
Fuel and Purchased Power	%	53	55	49	52	48
Operation and Maintenance	%	7	6	6	10	8
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	3	3	5	3	3
Customer Accounts Expenses	%	2	2	3	2	2
Customer Service Expenses	%	1	1	1	1	0
Admin & Gen Expenses	%	7	7	7	6	13
Sub-Total Utility Operating Expense	%	75	75	72	76	76
Depreciation and Amortization	%	10	9	14	8	13
Taxes	%	15	15	15	15	10
Other Expense	%	0	0	0	(0)	1
Total Electricity Sold	GWH	9,284	6,660	1,067	1,118	439
Generated by Utility	GWH	4,776	3,182	489	825	280
Electricity Purchased	GWH	4,508	3,478	578	292	159
% of Electricity Purchased	%	49	52	54	26	36
Average Revenue per kWh Sold	$/kWh	0.241	0.221	0.291	0.276	0.327
Fuel (All)	$/kWh	0.103	0.098	0.108	0.121	0.129
Operation and Maintenance	$/kWh	0.028	0.024	0.036	0.035	0.039
Transmission Expenses	$/kWh	0.003	0.002	0.004	0.003	0.002
Distribution Expenses	$/kWh	0.008	0.007	0.012	0.008	0.010
Customer Accounts Expenses	$/kWh	0.004	0.003	0.008	0.006	0.005
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.003	0.001
Admin & Gen Expenses	$/kWh	0.016	0.015	0.018	0.015	0.039
Depreciation and Amortization	$/kWh	0.022	0.019	0.035	0.021	0.040
Taxes	$/kWh	0.032	0.031	0.039	0.038	0.029
Other Expense	$/kWh	0.000	0.000	0.000	(0.000)	0.003
Net Income	$/kWh	0.022	0.020	0.030	0.026	0.028
Average Cost of Purchased KWH	$/kWh	0.131	0.124	0.140	0.175	0.177
Average Fuel Cost of Utility	$/kWh	0.093	0.088	0.097	0.106	0.116
Cost of Fuel Oil / KWH Generated	$/kWh	0.084	0.085	0.075	0.084	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.136	0.370	0.143	0.105	0.115
Fuel Oil Consumed	TBBL	6,573	5,769	510	295	-
Diesel Oil Consumed	TBBL	2,446	183	525	1,220	518
Total Cost of Fuel Oil	$M	323	292	19	11	-
Total Cost of Diesel Oil	$M	167	13	36	83	35
Average Cost of Fuel Oil	$/BBL	49	51	37	38	-
Average Cost of Diesel Oil	$/BBL	68	71	69	68	67

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.58. County Electric Utility Major Operating Indicators – 2015

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,477	1,643	345	345	143
Total Operating Expenses	$M	2,273	1,514	314	314	131
Operating Income	$M	203	129	31	31	12
Operating Income as % of Revenue	%	8	8	9	9	8
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	31	30	23	40	39
Purchased Power	%	27	29	31	18	11
Fuel and Purchased Power	%	58	59	54	57	50
Operation and Maintenance	%	6	5	5	8	8
Transmission Expenses	%	1	1	2	1	1
Distribution Expenses	%	3	3	4	3	3
Customer Accounts Expenses	%	2	1	2	2	2
Customer Service Expenses	%	1	1	0	1	0
Admin & Gen Expenses	%	7	7	6	6	13
Sub-Total Utility Operating Expense	%	77	78	74	78	77
Depreciation and Amortization	%	8	8	12	7	13
Taxes	%	14	14	14	15	9
Other Expense	%	0	0	0	0	1
Total Electricity Sold	GWH	9,389	6,754	1,065	1,138	432
Generated by Utility	GWH	4,986	3,402	434	813	338
Electricity Purchased	GWH	4,402	3,352	631	325	94
% of Electricity Purchased	%	47	50	59	29	22
Average Revenue per kWh Sold	$/kWh	0.264	0.243	0.324	0.304	0.332
Fuel (All)	$/kWh	0.128	0.121	0.138	0.149	0.144
Operation and Maintenance	$/kWh	0.026	0.023	0.036	0.032	0.031
Transmission Expenses	$/kWh	0.003	0.003	0.005	0.003	0.002
Distribution Expenses	$/kWh	0.007	0.007	0.011	0.007	0.010
Customer Accounts Expenses	$/kWh	0.004	0.003	0.007	0.005	0.005
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.002	0.001
Admin & Gen Expenses	$/kWh	0.017	0.015	0.019	0.017	0.039
Depreciation and Amortization	$/kWh	0.020	0.017	0.035	0.019	0.039
Taxes	$/kWh	0.034	0.031	0.042	0.041	0.028
Other Expense	$/kWh	0.001	0.001	0.001	0.001	0.003
Net Income	$/kWh	0.022	0.019	0.029	0.028	0.028
Average Cost of Purchased KWH	$/kWh	0.138	0.132	0.154	0.172	0.152
Average Fuel Cost of Utility	$/kWh	0.129	0.123	0.140	0.142	0.142
Cost of Fuel Oil / KWH Generated	$/kWh	0.117	0.117	0.122	0.125	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.186	0.430	0.188	0.138	0.143
Fuel Oil Consumed	TBBL	6,766	6,140	387	239	-
Diesel Oil Consumed	TBBL	2,624	235	522	1,239	628
Total Cost of Fuel Oil	$M	465	428	24	13	-
Total Cost of Diesel Oil	$M	241	30	48	111	51
Average Cost of Fuel Oil	$/BBL	69	70	61	56	-
Average Cost of Diesel Oil	$/BBL	92	129	93	90	81

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.59. County Electric Utility Major Operating Indicators – 2014

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	3,165	2,140	422	423	179
Total Operating Expenses	$M	2,959	2,011	393	391	164
Operating Income	$M	206	129	29	32	15
Operating Income as % of Revenue	%	7	6	7	8	8
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	41	41	30	49	51
Purchased Power	%	25	27	31	16	7
Fuel and Purchased Power	%	66	68	61	65	59
Operation and Maintenance	%	5	4	5	6	8
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	4	2	2
Customer Accounts Expenses	%	1	1	2	2	2
Customer Service Expenses	%	1	1	0	0	0
Admin & Gen Expenses	%	5	5	5	4	10
Sub-Total Utility Operating Expense	%	81	82	78	81	82
Depreciation and Amortization	%	6	5	9	5	9
Taxes	%	13	13	13	14	9
Other Expense	%	0	0	0	0	-
Total Electricity Sold	GWH	9,406	6,782	1,063	1,132	430
Generated by Utility	GWH	5,035	3,402	468	799	365
Electricity Purchased	GWH	4,371	3,379	595	333	65
% of Electricity Purchased	%	46	50	56	29	15
Average Revenue per kWh Sold	$/kWh	0.336	0.316	0.397	0.374	0.417
Fuel (All)	$/kWh	0.195	0.189	0.201	0.216	0.218
Operation and Maintenance	$/kWh	0.027	0.023	0.045	0.029	0.038
Transmission Expenses	$/kWh	0.003	0.003	0.003	0.003	0.002
Distribution Expenses	$/kWh	0.008	0.007	0.014	0.008	0.009
Customer Accounts Expenses	$/kWh	0.005	0.004	0.007	0.006	0.006
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.001	0.001
Admin & Gen Expenses	$/kWh	0.016	0.015	0.017	0.015	0.038
Depreciation and Amortization	$/kWh	0.019	0.016	0.033	0.019	0.034
Taxes	$/kWh	0.040	0.038	0.047	0.047	0.035
Other Expense	$/kWh	0.001	0.001	0.001	0.001	-
Net Income	$/kWh	0.022	0.019	0.028	0.028	0.035
Average Cost of Purchased KWH	$/kWh	0.168	0.159	0.207	0.184	0.184
Average Fuel Cost of Utility	$/kWh	0.221	0.221	0.215	0.224	0.221
Cost of Fuel Oil / KWH Generated	$/kWh	0.215	0.215	0.208	0.220	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.158	0.555	0.275	-	0.223
Fuel Oil Consumed	TBBL	6,867	6,113	458	297	-
Diesel Oil Consumed	TBBL	2,514	170	507	1,184	652
Total Cost of Fuel Oil	$M	868	790	48	30	-
Total Cost of Diesel Oil	$M	348	31	69	164	84
Average Cost of Fuel Oil	$/BBL	126	129	104	100	-
Average Cost of Diesel Oil	$/BBL	138	181	137	138	129

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.60. County Electric Utility Major Operating Indicators - 2013

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	3,164	2,123	431	425	185
Total Operating Expenses	$M	2,971	2,008	401	395	169
Operating Income	$M	192	115	31	30	16
Operating Income as % of Revenu	%	6	5	7	7	9
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	43	42	31	53	54
Purchased Power	%	24	26	32	14	6
Fuel and Purchased Power	%	67	69	63	67	60
Operation and Maintenance	%	5	4	5	6	10
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	3	2	2
Customer Accounts Expenses	%	2	2	2	2	2
Customer Service Expenses	%	1	1	0	0	0
Admin & Gen Expenses	%	5	4	5	3	8
Sub-Total Utility Operating Expens	%	82	83	79	81	83
Depreciation and Amortization	%	6	5	8	5	8
Taxes	%	12	12	13	13	9
Other Expense	%	0	0	0	0	-
Total Electricity Sold	GWH	9,501	6,859	1,076	1,135	431
Generated by Utility	GWH	5,257	3,578	457	839	383
Electricity Purchased	GWH	4,244	3,281	619	296	49
% of Electricity Purchased	%	45	48	57	26	11
Average Revenue per kWh Sold	$/kWh	0.333	0.310	0.401	0.374	0.428
Fuel (All)	$/kWh	0.198	0.190	0.212	0.224	0.230
Operation and Maintenance	$/kWh	0.028	0.024	0.042	0.030	0.042
Transmission Expenses	$/kWh	0.003	0.003	0.002	0.002	0.002
Distribution Expenses	$/kWh	0.007	0.006	0.010	0.008	0.009
Customer Accounts Expenses	$/kWh	0.005	0.005	0.008	0.006	0.006
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.001	0.002
Admin & Gen Expenses	$/kWh	0.014	0.013	0.017	0.012	0.032
Depreciation and Amortization	$/kWh	0.017	0.014	0.031	0.017	0.032
Taxes	$/kWh	0.038	0.035	0.047	0.046	0.036
Other Expense	$/kWh	0.001	0.001	0.001	0.001	-
Net Income	$/kWh	0.020	0.017	0.029	0.027	0.037
Average Cost of Purchased KWH	$/kWh	0.170	0.161	0.207	0.185	0.196
Average Fuel Cost of Utility	$/kWh	0.222	0.218	0.232	0.231	0.228
Cost of Fuel Oil / KWH Generated	$/kWh	0.216	0.215	0.223	0.238	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.143	0.507	0.292	-	0.232
Fuel Oil Consumed	TBBL	7,208	6,391	533	283	-
Diesel Oil Consumed	TBBL	2,523	115	464	1,256	688
Total Cost of Fuel Oil	$M	922	831	60	31	-
Total Cost of Diesel Oil	$M	356	20	66	178	92
Average Cost of Fuel Oil	$/BBL	128	130	112	109	-
Average Cost of Diesel Oil	$/BBL	141	176	142	142	133

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.61. County Electric Utility Major Operating Indicators - 2012

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	3,290	2,222	440	440	188
Total Operating Expenses	$M	3,100	2,105	409	416	170
Operating Income	$M	191	117	31	24	19
Operating Income as % of Revenu	%	6	5	7	5	10
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	45	45	29	57	55
Purchased Power	%	24	26	36	9	5
Fuel and Purchased Power	%	69	71	64	66	60
Operation and Maintenance	%	5	4	5	6	9
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	2	3	2
Customer Accounts Expenses	%	1	1	2	2	2
Customer Service Expenses	%	1	1	0	0	0
Admin & Gen Expenses	%	5	4	4	5	9
Sub-Total Utility Operating Expen:	%	82	83	79	83	83
Depreciation and Amortization	%	5	4	8	5	8
Taxes	%	12	12	13	12	9
Other Expense	%	0	0	0	0	0
Total Electricity Sold	GWH	9,639	6,976	1,085	1,145	433
Generated by Utility	GWH	5,508	3,786	404	923	395
Electricity Purchased	GWH	4,131	3,190	681	222	38
% of Electricity Purchased	%	43	46	63	19	9
Average Revenue per kWh Sold	$/kWh	0.341	0.319	0.406	0.384	0.435
Fuel (All)	$/kWh	0.209	0.202	0.212	0.233	0.231
Operation and Maintenance	$/kWh	0.027	0.023	0.048	0.029	0.038
Transmission Expenses	$/kWh	0.002	0.002	0.003	0.003	0.002
Distribution Expenses	$/kWh	0.007	0.005	0.009	0.010	0.009
Customer Accounts Expenses	$/kWh	0.004	0.003	0.008	0.006	0.006
Customer Service Expenses	$/kWh	0.002	0.002	0.001	0.002	0.001
Admin & Gen Expenses	$/kWh	0.015	0.013	0.017	0.018	0.034
Depreciation and Amortization	$/kWh	0.016	0.013	0.030	0.018	0.031
Taxes	$/kWh	0.039	0.037	0.049	0.044	0.036
Other Expense	$/kWh	0.001	0.001	0.001	0.001	0.001
Net Income	$/kWh	0.020	0.017	0.029	0.021	0.044
Average Cost of Purchased KWH	$/kWh	0.177	0.170	0.213	0.173	0.215
Average Fuel Cost of Utility	$/kWh	0.231	0.229	0.239	0.237	0.227
Cost of Fuel Oil / KWH Generated	$/kWh	0.228	0.226	0.244	0.249	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.128	0.423	0.294	-	0.231
Fuel Oil Consumed	TBBL	7,612	6,704	533	375	-
Diesel Oil Consumed	TBBL	2,490	90	371	1,323	706
Total Cost of Fuel Oil	$M	1,033	924	65	44	-
Total Cost of Diesel Oil	$M	358	21	52	191	94
Average Cost of Fuel Oil	$/BBL	136	138	121	117	-
Average Cost of Diesel Oil	$/BBL	144	233	141	145	133

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.62. County Electric Utility Major Operating Indicators - 2011

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	3,156	2,110	444	419	183
Total Operating Expenses	$M	2,983	2,020	406	393	165
Operating Income	$M	173	90	38	27	18
Operating Income as % of Revenu	%	5	4	9	6	10
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	45	45	30	60	55
Purchased Power	%	23	26	34	8	5
Fuel and Purchased Power	%	69	71	64	67	60
Operation and Maintenance	%	5	4	5	6	9
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	3	2	2
Customer Accounts Expenses	%	1	1	1	1	2
Customer Service Expenses	%	0	1	0	0	0
Admin & Gen Expenses	%	5	5	4	4	9
Sub-Total Utility Operating Expens	%	83	84	78	82	83
Depreciation and Amortization	%	5	4	8	5	8
Taxes	%	12	11	14	13	9
Other Expense	%	0	0	0	0	0
Total Electricity Sold	GWH	9,962	7,242	1,104	1,181	435
Generated by Utility	GWH	5,915	4,055	472	990	398
Electricity Purchased	GWH	4,046	3,187	631	191	37
% of Electricity Purchased	%	41	44	57	16	8
Average Revenue per kWh Sold	$/kWh	0.317	0.291	0.403	0.355	0.420
Fuel (All)	$/kWh	0.196	0.188	0.212	0.219	0.223
Operation and Maintenance	$/kWh	0.025	0.022	0.040	0.025	0.037
Transmission Expenses	$/kWh	0.002	0.002	0.002	0.002	0.002
Distribution Expenses	$/kWh	0.006	0.005	0.010	0.007	0.009
Customer Accounts Expenses	$/kWh	0.003	0.002	0.004	0.004	0.006
Customer Service Expenses	$/kWh	0.001	0.001	0.001	0.001	0.001
Admin & Gen Expenses	$/kWh	0.014	0.013	0.016	0.013	0.034
Depreciation and Amortization	$/kWh	0.015	0.012	0.029	0.017	0.031
Taxes	$/kWh	0.036	0.032	0.052	0.043	0.035
Other Expense	$/kWh	0.000	0.000	0.000	0.001	0.000
Net Income	$/kWh	0.017	0.012	0.035	0.023	0.041
Average Cost of Purchased KWH	$/kWh	0.172	0.164	0.218	0.157	0.209
Average Fuel Cost of Utility	$/kWh	0.229	0.206	0.219	0.221	0.217
Cost of Fuel Oil / KWH Generated	$/kWh	0.205	0.203	0.214	0.226	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.121	0.354	0.271	-	0.226
Fuel Oil Consumed	TBBL	8,264	7,285	577	402	-
Diesel Oil Consumed	TBBL	2,692	110	455	1,405	722
Total Cost of Fuel Oil	$M	993	889	62	42	-
Total Cost of Diesel Oil	$M	363	20	60	192	91
Average Cost of Fuel Oil	$/BBL	120	122	107	105	-
Average Cost of Diesel Oil	$/BBL	135	184	132	137	125

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.63. County Electric Utility Major Operating Indicators - 2010

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,523	1,650	373	345	155
Total Operating Expenses	$M	2,388	1,575	346	327	140
Operating Income	$M	135	75	27	18	15
Operating Income as % of Rever	%	5	5	7	5	10
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	41	40	27	54	49
Purchased Power	%	23	26	33	7	3
Fuel and Purchased Power	%	64	66	60	61	52
Operation and Maintenance	%	6	5	7	10	10
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	2	3	3
Customer Accounts Expenses	%	1	1	1	1	2
Customer Service Expenses	%	1	1	1	0	1
Admin & Gen Expenses	%	6	6	5	5	10
Total Utility Operating Expense	%	81	83	76	80	78
Depreciation and Amortization	%	7	5	10	8	10
Taxes	%	12	12	13	12	9
Other Expense	%	0	0	0	0	0
Total Electricity Sold	GWH	10,013	7,277	1,110	1,192	435
Generated by Utility	GWH	5,923	4,047	468	1,001	407
Electricity Purchased	GWH	4,090	3,231	641	191	27
% of Electricity Purchased	%	41	44	58	16	6
Average Revenue per kWh Sold	$/kWh	0.252	0.227	0.336	0.290	0.357
Fuel (All)	$/kWh	0.142	0.134	0.156	0.162	0.174
Operation and Maintenance	$/kWh	0.026	0.021	0.052	0.033	0.033
Transmission Expenses	$/kWh	0.002	0.002	0.002	0.002	0.002
Distribution Expenses	$/kWh	0.006	0.005	0.008	0.008	0.009
Customer Accounts Expenses	$/kWh	0.002	0.002	0.003	0.003	0.006
Customer Service Expenses	$/kWh	0.001	0.002	0.002	0.000	0.002
Admin & Gen Expenses	$/kWh	0.015	0.014	0.016	0.012	0.033
Depreciation and Amortization	$/kWh	0.016	0.012	0.032	0.022	0.034
Taxes	$/kWh	0.028	0.025	0.040	0.032	0.030
Other Expense	$/kWh	0.001	0.001	0.001	0.000	0.000
Net Income	$/kWh	0.014	0.010	0.024	0.015	0.035
Average Cost of Purchased KWH	$/kWh	0.135	0.128	0.176	0.124	0.162
Average Fuel Cost of Utility	$/kWh	0.164	0.143	0.169	0.164	0.162
Cost of Fuel Oil / KWH Generated	$/kWh	0.145	0.141	0.169	0.171	-
Cost of Diesel Oil / KWH Generate	$/kWh	0.087	0.352	0.200	-	0.165
Fuel Oil Consumed	TBBL	8,358	7,307	613	438	-
Diesel Oil Consumed	TBBL	2,641	75	434	1,409	723
Total Cost of Fuel Oil	$M	708	623	50	35	-
Total Cost of Diesel Oil	$M	261	8	43	141	69
Average Cost of Fuel Oil	$/BBL	85	85	82	79	-
Average Cost of Diesel Oil	$/BBL	99	107	100	100	95

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.64. County Electric Utility Major Operating Indicators - 2009

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,156	1,385	344	298	130
Total Operating Expenses	$M	2,028	1,314	320	278	115
Operating Income	$M	129	71	24	19	14
Operating Income as % of Revenue	%	6	5	7	7	11
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	36	35	23	49	45
Purchased Power	%	25	28	35	7	3
Fuel and Purchased Power	%	61	63	58	57	48
Operation and Maintenance	%	7	6	7	10	11
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	3	3	3
Customer Accounts Expenses	%	1	1	2	1	2
Customer Service Expenses	%	2	2	1	1	1
Admin & Gen Expenses	%	6	6	5	5	10
Sub-Total Utility Operating Expens	%	80	81	77	77	76
Depreciation and Amortization	%	8	6	10	10	14
Taxes	%	12	13	13	12	9
Other Expense	%	0	0	0	0	0
Total Electricity Sold	GWH	10,126	7,378	1,120	1,192	436
Generated by Utility	GWH	5,972	4,111	451	1,008	402
Electricity Purchased	GWH	4,154	3,267	669	185	34
% of Electricity Purchased	%	41	44	60	15	8
Average Revenue per kWh Sold	$/kWh	0.213	0.188	0.307	0.250	0.297
Fuel (All)	$/kWh	0.112	0.104	0.137	0.128	0.125
Operation and Maintenance	$/kWh	0.023	0.018	0.051	0.026	0.032
Transmission Expenses	$/kWh	0.002	0.002	0.002	0.002	0.002
Distribution Expenses	$/kWh	0.005	0.004	0.008	0.006	0.008
Customer Accounts Expenses	$/kWh	0.003	0.002	0.005	0.003	0.005
Customer Service Expenses	$/kWh	0.003	0.003	0.002	0.002	0.002
Admin & Gen Expenses	$/kWh	0.012	0.011	0.014	0.012	0.026
Depreciation and Amortization	$/kWh	0.016	0.011	0.029	0.024	0.038
Taxes	$/kWh	0.025	0.022	0.038	0.029	0.025
Other Expense	$/kWh	0.000	0.000	0.000	0.000	0.000
Net Income	$/kWh	0.013	0.010	0.021	0.016	0.032
Average Cost of Purchased KWH	$/kWh	0.121	0.112	0.168	0.109	0.113
Average Fuel Cost of Utility	$/kWh	0.121	0.102	0.144	0.127	0.122
Cost of Fuel Oil / KWH Generated	$/kWh	0.104	0.101	0.128	0.129	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.075	0.268	0.176	-	0.127
Fuel Oil Consumed	TBBL	8,618	7,412	735	471	-
Diesel Oil Consumed	TBBL	2,627	143	355	1,398	730
Total Cost of Fuel Oil	$M	519	447	44	28	-
Total Cost of Diesel Oil	$M	205	13	30	110	52
Average Cost of Fuel Oil	$/BBL	60	60	60	59	-
Average Cost of Diesel Oil	$/BBL	78	90	86	78	71

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.65. County Electric Utility Major Operating Indicators - 2008

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	3,043	1,955	446	453	190
Total Operating Expenses	$M	2,895	1,878	420	426	171
Operating Income	$M	148	76	26	27	18
Operating Income as % of Revenue	%	5	4	6	6	10
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	46	46	26	59	57
Purchased Power	%	24	25	42	9	4
Fuel and Purchased Power	%	70	71	68	68	61
Operation and Maintenance	%	5	4	4	5	8
Transmission Expenses	%	1	1	1	0	1
Distribution Expenses	%	2	1	2	2	2
Customer Accounts Expenses	%	1	1	1	1	1
Customer Service Expenses	%	1	2	1	1	1
Admin & Gen Expenses	%	4	4	3	3	7
Sub-Total Utility Operating Expens	%	83	84	80	81	81
Depreciation and Amortization	%	5	4	7	6	10
Taxes	%	11	11	12	12	9
Other Expense	%	0	0	0	0	0
Total Electricity Sold	GWH	10,390	7,556	1,141	1,239	454
Generated by Utility	GWH	6,113	4,290	360	1,038	425
Electricity Purchased	GWH	4,277	3,266	781	201	29
% of Electricity Purchased	%	41	43	68	16	6
Average Revenue per kWh Sold	$/kWh	0.293	0.259	0.391	0.365	0.418
Fuel (All)	$/kWh	0.186	0.170	0.215	0.231	0.229
Operation and Maintenance	$/kWh	0.022	0.018	0.052	0.022	0.032
Transmission Expenses	$/kWh	0.002	0.001	0.002	0.002	0.002
Distribution Expenses	$/kWh	0.004	0.003	0.006	0.006	0.008
Customer Accounts Expenses	$/kWh	0.003	0.002	0.005	0.003	0.005
Customer Service Expenses	$/kWh	0.004	0.004	0.003	0.004	0.002
Admin & Gen Expenses	$/kWh	0.011	0.010	0.012	0.010	0.027
Depreciation and Amortization	$/kWh	0.015	0.011	0.027	0.022	0.036
Taxes	$/kWh	0.032	0.028	0.046	0.042	0.035
Other Expense	$/kWh	0.000	0.000	0.001	0.001	0.000
Net Income	$/kWh	0.014	0.010	0.023	0.022	0.041
Average Cost of Purchased KWH	$/kWh	0.163	0.145	0.226	0.191	0.226
Average Fuel Cost of Utility	$/kWh	0.217	0.185	0.236	0.227	0.220
Cost of Fuel Oil / KWH Generated	$/kWh	0.188	0.184	0.213	0.212	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.101	0.333	0.290	-	0.229
Fuel Oil Consumed	TBBL	8,971	7,747	758	466	-
Diesel Oil Consumed	TBBL	2,546	70	248	1,445	783
Total Cost of Fuel Oil	$M	979	858	76	45	-
Total Cost of Diesel Oil	$M	348	9	34	207	98
Average Cost of Fuel Oil	$/BBL	109.2	111	100	97	-
Average Cost of Diesel Oil	$/BBL	136.7	122	137	143	125

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.66. County Electric Utility Major Operating Indicators - 2007

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,260	1,385	361	350	163
Total Operating Expenses	$M	2,139	1,331	336	329	142
Operating Income	$M	121	54	25	21	21
Operating Income as % of Revenue	%	5	4	7	6	13
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	40	39	22	53	54
Purchased Power	%	25	28	40	10	3
Fuel and Purchased Power	%	65	67	62	63	57
Operation and Maintenance	%	6	5	7	8	8
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	2	2	2
Customer Accounts Expenses	%	1	1	1	1	2
Customer Service Expenses	%	1	2	1	1	1
Admin & Gen Expenses	%	5	5	5	4	8
Sub-Total Utility Operating Expens	%	81	83	78	80	79
Depreciation and Amortization	%	7	6	9	8	11
Taxes	%	11	11	13	12	10
Other Expense	%	0	0	0	0	-
Total Electricity Sold	GWH	10,585	7,675	1,163	1,280	467
Generated by Utility	GWH	6,330	4,437	394	1,059	440
Electricity Purchased	GWH	4,255	3,238	769	221	27
% of Electricity Purchased	%	40	42	66	17	6
Average Revenue per kWh Sold	$/kWh	0.214	0.180	0.311	0.274	0.349
Fuel (All)	$/kWh	0.123	0.110	0.144	0.157	0.172
Operation and Maintenance	$/kWh	0.021	0.016	0.056	0.025	0.027
Transmission Expenses	$/kWh	0.002	0.001	0.002	0.002	0.003
Distribution Expenses	$/kWh	0.004	0.003	0.006	0.005	0.008
Customer Accounts Expenses	$/kWh	0.002	0.002	0.003	0.002	0.006
Customer Service Expenses	$/kWh	0.003	0.003	0.002	0.003	0.002
Admin & Gen Expenses	$/kWh	0.011	0.009	0.014	0.010	0.024
Depreciation and Amortization	$/kWh	0.014	0.010	0.025	0.021	0.035
Taxes	$/kWh	0.023	0.019	0.037	0.030	0.029
Other Expense	$/kWh	0.000	0.000	0.001	0.001	-
Net Income	$/kWh	0.011	0.007	0.021	0.017	0.044
Average Cost of Purchased KWH	$/kWh	0.127	0.114	0.175	0.151	0.175
Average Fuel Cost of Utility	$/kWh	0.134	0.108	0.153	0.153	0.165
Cost of Fuel Oil / KWH Generated	$/kWh	0.110	0.107	0.130	0.130	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.087	0.411	0.205	-	0.172
Fuel Oil Consumed	TBBL	9,358	8,098	787	473	-
Diesel Oil Consumed	TBBL	2,687	97	280	1,487	823
Total Cost of Fuel Oil	$M	592	516	48	28	-
Total Cost of Diesel Oil	$M	258	9	27	145	76
Average Cost of Fuel Oil	$/BBL	63.3	64	60	60	-
Average Cost of Diesel Oil	$/BBL	96.1	96	98	98	93

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.67. County Electric Utility Major Operating Indicators - 2006

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	2,196	1,366	340	345	146
Total Operating Expenses	$M	2,061	1,290	323	320	128
Operating Income	$M	135	75	17	25	18
Operating Income as % of Revenue	%	6	6	5	7	12
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	41	40	26	56	50
Purchased Power	%	25	28	38	8	4
Fuel and Purchased Power	%	66	68	64	65	54
Operation and Maintenance	%	6	5	7	6	10
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	2	2	3
Customer Accounts Expenses	%	1	1	1	1	2
Customer Service Expenses	%	1	1	1	1	1
Admin & Gen Expenses	%	5	5	4	3	8
Sub-Total Utility Operating Expense	%	81	82	80	78	78
Depreciation and Amortization	%	7	6	9	8	12
Taxes	%	12	12	11	13	10
Other Expense	%	0	0	0	1	-
Total Electricity Sold	GWH	10,568	7,701	1,149	1,266	452
Generated by Utility	GWH	6,439	4,451	460	1,111	418
Electricity Purchased	GWH	4,129	3,250	689	156	34
% of Electricity Purchased	%	39	42	60	12	8
Average Revenue per kWh Sold	$/kWh	0.208	0.177	0.296	0.273	0.323
Fuel (All)	$/kWh	0.121	0.108	0.152	0.161	0.151
Operation and Maintenance	$/kWh	0.018	0.014	0.048	0.018	0.030
Transmission Expenses	$/kWh	0.001	0.001	0.002	0.001	0.002
Distribution Expenses	$/kWh	0.004	0.003	0.006	0.004	0.008
Customer Accounts Expenses	$/kWh	0.002	0.002	0.003	0.002	0.005
Customer Service Expenses	$/kWh	0.002	0.002	0.002	0.003	0.002
Admin & Gen Expenses	$/kWh	0.009	0.008	0.010	0.008	0.024
Depreciation and Amortization	$/kWh	0.014	0.010	0.025	0.020	0.035
Taxes	$/kWh	0.023	0.020	0.031	0.034	0.027
Other Expense	$/kWh	0.001	0.000	0.001	0.001	-
Net Income	$/kWh	0.013	0.010	0.015	0.020	0.040
Average Cost of Purchased KWH	$/kWh	0.124	0.110	0.178	0.170	0.161
Average Fuel Cost of Utility	$/kWh	0.131	0.106	0.151	0.151	0.144
Cost of Fuel Oil / KWH Generated	$/kWh	0.108	0.105	0.125	0.123	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.075	0.330	0.203	-	0.150
Fuel Oil Consumed	TBBL	9,442	8,077	844	521	-
Diesel Oil Consumed	TBBL	2,795	74	370	1,588	763
Total Cost of Fuel Oil	$M	588	509	49	30	-
Total Cost of Diesel Oil	$M	258	7	36	151	64
Average Cost of Fuel Oil	$/BBL	62.3	63	58	57	-
Average Cost of Diesel Oil	$/BBL	92.1	95	97	95	84

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

Table 5.68. County Electric Utility Major Operating Indicators - 2005

	Units	State	Honolulu County	Hawaii County	Maui County	Kauai County
Total Operating Revenues	$M	1,934	1,204	294	303	132
Total Operating Expenses	$M	1,803	1,139	273	276	115
Operating Income	$M	131	65	22	27	17
Operating Income as % of Revenue	%	7	5	7	9	13
% of Total Operating Expenses						
Fuel Cost (Utility Only)	%	38	37	24	56	47
Purchased Power	%	26	30	38	6	4
Fuel and Purchased Power	%	64	67	62	62	51
Operation and Maintenance	%	6	5	7	7	9
Transmission Expenses	%	1	1	1	1	1
Distribution Expenses	%	2	2	2	2	2
Customer Accounts Expenses	%	1	1	1	1	2
Customer Service Expenses	%	1	1	1	1	0
Admin & Gen Expenses	%	5	5	4	4	8
Sub-Total Utility Operating Expense	%	80	82	77	77	73
Depreciation and Amortization	%	8	6	10	9	14
Taxes	%	12	12	12	14	9
Other Expense	%	0	0	1	0	-
Total Electricity Sold	GWH	10,539	7,721	1,116	1,252	449
Generated by Utility	GWH	6,336	4,338	429	1,155	414
Electricity Purchased	GWH	4,202	3,383	688	97	35
% of Electricity Purchased	%	40	44	62	8	8
Average Revenue per kWh Sold	$/kWh	0.184	0.156	0.264	0.242	0.295
Fuel (All)	$/kWh	0.104	0.093	0.124	0.135	0.137
Operation and Maintenance	$/kWh	0.016	0.013	0.042	0.016	0.024
Transmission Expenses	$/kWh	0.001	0.001	0.002	0.001	0.002
Distribution Expenses	$/kWh	0.004	0.003	0.006	0.004	0.006
Customer Accounts Expenses	$/kWh	0.002	0.001	0.003	0.002	0.004
Customer Service Expenses	$/kWh	0.002	0.002	0.002	0.002	0.001
Admin & Gen Expenses	$/kWh	0.008	0.008	0.009	0.008	0.021
Depreciation and Amortization	$/kWh	0.013	0.009	0.024	0.020	0.037
Taxes	$/kWh	0.021	0.018	0.030	0.031	0.024
Other Expense	$/kWh	0.001	0.000	0.002	0.000	-
Net Income	$/kWh	0.012	0.008	0.019	0.021	0.038
Average Cost of Purchased KWH	$/kWh	0.110	0.100	0.149	0.167	0.144
Average Fuel Cost of Utility	$/kWh	0.100	0.089	0.123	0.125	0.124
Cost of Fuel Oil / KWH Generated	$/kWh	0.082	0.088	-	0.095	-
Cost of Diesel Oil / KWH Generated	$/kWh	0.041	0.275	-	-	0.126
Fuel Oil Consumed	TBBL	9,121	7,875	727	519	-
Diesel Oil Consumed	TBBL	2,926	118	409	1,651	747
Total Cost of Fuel Oil	$M	467	412	33	22	-
Total Cost of Diesel Oil	$M	226	9	32	132	54
Average Cost of Fuel Oil	$/BBL	51.2	52	46	43	-
Average Cost of Diesel Oil	$/BBL	77.4	76	78	80	72

Source: HECO, MECO, HELCO, and Kauai Island Utility Cooperative Monthly Financial Reports.

6. EMISSIONS OF HAWAII'S ELECTRIC POWER INDUSTRY

The estimated emissions of Hawaii's electric power industry from 1990 to 2016 are provided in Table 6.1. Total CO_2 emission in the electric power industry decreased 10.0 percent from 1990 to 2016, while NOX emissions from the electric power sector increased 9.4 percent. In contrast, SO_2 emissions decreased 49.5 percent over the same period.

Table 6.1. Emissions of Electric Power Industry

	Total Electric Power Industry In Thousand Metric Tons			% of Petroleum In Total Emission			% of Coal In Total Emission		
Year	CO2	SO2	NOX	CO2	SO2	NOX	CO2	SO2	NOX
1990	8,064	35	15	97	100	95	0	0	0
1991	6,888	27	11	96	99	94	0	1	1
1992	7,835	28	14	89	93	77	8	7	18
1993	7,770	22	15	80	86	61	17	13	35
1994	7,967	21	15	80	84	60	17	16	35
1995	8,350	39	27	77	89	76	19	10	16
1996	8,532	44	28	78	89	77	20	10	16
1997	8,460	44	27	77	89	76	20	10	17
1998	8,363	46	28	79	91	77	18	8	14
1999	8,386	44	28	80	92	80	17	7	14
2000	8,679	51	26	79	76	83	19	22	11
2001	8,806	26	27	77	95	90	19	5	6
2002	9,347	23	32	81	91	87	17	9	8
2003	8,750	23	28	78	94	89	20	6	5
2004	9,203	24	29	79	94	90	19	6	5
2005	9,132	21	30	80	94	91	18	5	4
2006	9,138	22	29	81	95	92	17	4	4
2007	9,026	22	23	80	95	90	18	4	5
2008	9,048	21	22	79	92	86	18	7	7
2009	8,661	22	22	79	93	87	18	7	6
2010	8,287	17	21	78	92	87	19	8	6
2011	8,100	17	20	79	91	86	19	7	6
2012	7,625	15	19	77	89	86	20	9	6
2013	7,428	18	22	77	90	96	19	11	6
2014	7,448	17	18	75	121	133	22	5	8
2015	7,356	20	17	76	104	138	22	4	8
2016	7,257	18	16	77	115	148	22	4	9

Source: Energy Information Administration, Electricity, Detailed State Data