



Hawaii's Petroleum Consumption and Expenditures by Product and by Sector



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Executive Summary

Hawaii is heavily dependent on imported petroleum to meet its energy needs. Before 1980, Hawaii's primary energy consumption was almost entirely dependent on imported petroleum. However, diversification away from petroleum has been an important energy strategy for Hawaii since 1980s. From 1979 to 1989, the petroleum share of total primary energy consumption decreased 9.1 percentage points from 99.5% to 90.4%, mainly due to increased consumption of wood and waste (W&W).

During the 1989-2002 period, the share of coal increased about 5.6 percentage points; however, the increased share of coal was offset by a decreased share of renewables. Reduced W&W consumption from 1989 to 2002 was one of the causes of the renewable energy decline from 9.3% in 1989 to 3.7% in 2002. As a result, the share of petroleum consumption remained about the same from 1989 to 2002.

From 2002 to 2016, the share of coal was relatively stable. However, the share of renewables increased from 3.7% to 11.1%, mainly due to increased solar, wind, and fuel ethanol consumption. As a result, the share of petroleum decreased from 90.4% to 83.0% during this period.

Hawaii's petroleum consumption increased from 1960 to 1990, but decreased from 1990 to 2016. From 1990 to 2016, Hawaii's total primary energy consumption decreased 0.5% per year on average; total petroleum consumption decreased 0.8% per year on average. During this period, total energy per capita decreased 1.4% per year, and petroleum consumption per capita decreased 1.7% per year.

In 2016, Hawaii consumed about 238,946 billion BTUs (BBTUs) or 42,246 thousand BBLs (TBBLs) of petroleum products. Jet fuel accounted for about 31.0% of total petroleum consumption; followed by motor gasoline (26.6%), residual fuel oil (22.9%), distillate fuel oil (10.7%), and other petroleum products (8.8%). Other petroleum products mainly include: still gas (4.9%), LPG/HGL (1.9%), asphalt and road oil (1.0%), and petroleum coke (0.8%).

From 1960 to 1990, the consumption of all four major petroleum products increased. From 1990 to 2016, residual fuel oil and distillate fuel oil consumption decreased, while the consumption of other products increased. About 61% of the reduced petroleum consumption from 1990 to 2016 was due to reduced consumption within the electricity sector.

Jet fuel consumption increased in the 1960s and then decreased from 1970 to 2016. Decreased jet fuel consumption was due to improved energy efficiency, especially before 1995. From 1995 to 2016, jet fuel consumption per passenger was relatively stable.

In 2016, the transportation sector accounted for 63.4% of total petroleum consumption in Hawaii; followed by the electricity sector (24.8%), the industrial sector (8.7%), the commercial sector (2.5%), and the residential sector (0.4%). From 1990 to 2016, the share of the electricity sector decreased 6.5 percentage points; while the share of the transportation sector increased 8.2 percentage points.

The reduced petroleum consumption for the electricity sector from 1990 to 2016 was due to an increased efficiency from electricity generation and substitution of non-petroleum sources of energy. From 1990 to 2016, total petroleum consumption in the electricity sector decreased 32,658 BBTUs or 33.5%.

In 2016, petroleum accounted for 95.9% of Hawaii's primary energy expenditures and about 64.7% of total energy expenditures. Due to fluctuations of petroleum prices, the petroleum share of total energy expenditures increased from 74.3% in 1970 to 86.6% in 1980, decreased to 58.6% in 1998, increased to 78.9% in 2007, and decreased to 64.7% in 2016.

Petroleum expenditures are mainly affected by petroleum price. From 1970 to 2016, Hawaii's total petroleum expenditures increased \$3,058.3 million or 6.2% per year on average; the average petroleum expenditure increased \$71.2/BBL or 5.7% per year. Among the four major petroleum products, the average expenditure of distillate fuel oil increased the most at 6.73% per year; followed by residual fuel oil at 6.68%, jet fuel at 5.96%, and motor gasoline at 4.31%.

The average petroleum expenditure reached a peak of \$142.1/BBL in 2012. In 2016, among the four major petroleum products consumed in Hawaii, the average expenditure of motor gasoline was the highest at \$121.7/BBL; followed by distillate fuel oil at \$117.2/BBL, jet fuel at \$58.7/BBL, and residual fuel oil at \$47.7/BBL.

In 2016, the total petroleum expenditure in Hawaii was about \$3.3 billion. Motor gasoline accounted for the most at 41.9%; this was followed by jet fuel at 23.6%, distillate fuel oil at 16.3%, residual fuel oil at 14.1%, and other petroleum products at 4.1%. Expenditures for other petroleum products mainly include expenditures on LPG/HGL (1.8%), lubricants (1.2%), and asphalt and road oil (1.1%). Expenditures for aviation gasoline was only \$0.7 million in 2016.

Among the five sectors, in 2016, petroleum expenditures of the transportation sector accounted for the most at 76.5%; followed by the electricity sector at 17.0%, industrial sector at 3.1%, commercial sector at 2.4%, and the residential sector at 0.9%.

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1 Introduction

Hawaii is heavily dependent on imported petroleum to meet its energy needs. Before 1980, Hawaii's primary energy consumption was almost entirely comprised of imported petroleum, with renewable energy accounting for less than 1% of total primary energy consumption. During this period, there were no other types of fossil fuel energy in Hawaii.

Diversification away from petroleum has been an important energy strategy for Hawaii. From 1979 to 1989, the petroleum share of total energy consumption decreased about 9.1 percentage points from 99.5% to 90.4%, mainly due to increased consumption of wood and waste (W&W).

Between 1989 and 2002, the share of coal increased about 5.6 percentage points; however, increased share of coal was completely offset by a decreased share of renewables. Reduced W&W consumption from 1989 to 2002 caused the share of renewable energy to decrease from 9.3% in 1989 to 3.7% in 2002. As a result, the share of petroleum consumption remained about the same from 1989 to 2002.

From 2002 to 2016, the share of coal was relatively stable, but the share of renewable increased from 3.7% to 11.1%, mainly due to increased solar, wind, and fuel ethanol consumption. As a result, the share of petroleum decreased from 90.4% to 83.0%.

This study examines the historical trend of Hawaii's petroleum consumption by products and by sector. This study attempts to answer the following questions:

- What kind of petroleum products are consumed in Hawaii?
- Who are the main consumers of petroleum products in Hawaii?
- How the consumption of petroleum products changed over time?
- What kind of petroleum products can be substituted by other types of energy?
- What is the cost of petroleum consumed in Hawaii?
- How the cost of petroleum changed over time?

The major data source for this report is the U.S. Energy Information Administration (EIA). The EIA data include two parts, data from the State Energy Data System (SEDS) and data from Detailed State Data in the Electricity (DSDE) section.

2 An Overview of Hawaii Total Primary Energy and Petroleum Consumption

Over the past 56 years from 1960 to 2016, Hawaii's total primary energy consumption increased 2.0% per year on average, while total petroleum consumption increased at 1.6% per year on average. Increased energy consumption was mainly due to population and tourist growth. On a per capita basis, total primary energy per capita increased only 0.4% per year; and petroleum consumption per capita was almost unchanged.

As shown in Table 2.1, increased total primary energy and petroleum consumption over the past 56 years was mainly due to increases from 1960 to 1990. From 1960 to 1990, Hawaii's total primary energy consumption increased 4.2% per year on average; total petroleum consumption increased 3.8% per year on average. During this period, total primary energy per capita increased 1.9% per year, and petroleum consumption per capita increased 1.6% per year.

From 1990 to 2016, Hawaii's total primary energy consumption decreased 0.5% per year on average; from 1990 to 2001, total primary energy consumption decreased 1.6% per year; from 2001 to 2007, total primary energy consumption increased 3.8% per year; and from 2007 to 2016, total primary energy consumption decreased 1.9% per year. Total petroleum consumption followed a similar pattern during this period. From 1990 to 2016, Hawaii's petroleum consumption decreased 0.8% per year on average; from 1990 to 2001, it decreased 1.8% per year; from 2001 to 2007, it increased 4.0% per year; and from 2007 to 2016, it decreased 2.8% per year. From 1990 to 2016, total primary energy per capita decreased 1.4% per year, and petroleum consumption per capita decreased 1.7% per year.

In 2016, Hawaii consumed about 283 trillion BTUs of total primary energy and about 235 trillion BTUs of petroleum. Petroleum consumption accounted for about 83.0% of total primary energy consumption in 2016. Total primary energy consumption per capita was about 179 million BTUs, and total petroleum consumption per capita was about 148 million BTUs.

As shown in Table 2.2, from 1960 to 1990, the consumption of all major types of petroleum products increased. Distillate fuel oil increased the most at 6.9% per year; followed by residual fuel oil at 4.7%, jet fuel at 3.8%, motor gasoline at 3.1%, and other petroleum products at 0.1%. From 1990 to 2016, the consumption of residual fuel oil and distillate fuel oil decreased 2.6% and 1.4% per year, respectively; the consumption of other major petroleum products increased slightly.

Table 2.1 Hawaii Total Primary Energy and Petroleum Consumption

Year	Total Primary Energy BBTUs	Petroleum Consumption Total* BBTUs	% of Petroleum Consumption	De facto Population Person	Primary Energy Per Capita MBTUs/Capita	Petroleum Consumption Per Capita MBTUs/Capita
1960	94,855	94,563	99.7%	651,200	146	145
1965	130,589	129,324	99.0%	715,400	183	181
1970	196,979	195,419	99.2%	798,600	247	245
1975	214,429	212,931	99.3%	943,500	227	226
1980	262,456	249,648	95.1%	1,054,218	249	237
1985	248,555	232,124	93.4%	1,136,160	219	204
1990	321,421	292,763	91.1%	1,257,319	256	233
1995	297,037	252,515	85.0%	1,298,096	229	195
2000	273,430	235,315	86.1%	1,336,005	205	176
2001	270,245	239,948	88.8%	1,337,629	202	179
2002	284,802	257,593	90.4%	1,353,051	210	190
2003	300,977	269,486	89.5%	1,358,755	222	198
2004	314,760	282,923	89.9%	1,387,569	227	204
2005	324,741	293,913	90.5%	1,412,500	230	208
2006	327,187	295,546	90.3%	1,430,516	229	207
2007	337,743	303,693	89.9%	1,433,461	236	212
2008	276,646	239,265	86.5%	1,432,620	193	167
2009	276,035	239,296	86.7%	1,442,556	191	166
2010	277,128	241,897	87.3%	1,468,677	189	165
2011	285,548	249,512	87.4%	1,489,825	192	167
2012	277,935	240,114	86.4%	1,517,102	183	158
2013	278,508	237,575	85.3%	1,540,411	181	154
2014	279,321	234,532	84.0%	1,557,668	179	151
2015	283,187	238,504	84.2%	1,576,702	180	151
2016	282,912	234,946	83.0%	1,583,139	179	148
Annual Average Growth Rate (%)						
1960-1970	7.6%	7.5%	0.0%	2.1%	5.4%	5.4%
1970-1980	2.9%	2.5%	-0.4%	2.8%	0.1%	-0.3%
1980-1990	2.0%	1.6%	-0.4%	1.8%	0.3%	-0.2%
1990-2000	-1.6%	-2.2%	-0.6%	0.6%	-2.2%	-2.8%
2000-2010	0.1%	0.3%	0.1%	1.0%	-0.8%	-0.7%
2010-2016	0.3%	-0.5%	-0.8%	1.3%	-0.9%	-1.7%
1960-1990	4.2%	3.8%	-0.3%	2.2%	1.9%	1.6%
1990-2016	-0.5%	-0.8%	-0.4%	0.9%	-1.4%	-1.7%
1960-2016	2.0%	1.6%	-0.3%	1.6%	0.4%	0.0%

* Dose not include fuel ethanol.

Source: Energy Information Administration, State Energy Data System

Table 2.2 Hawaii Petroleum Consumption by Product in Heat Content

Year	Petroleum Consumption in Billion Btus						Share of Petroleum				
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total*	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	23,519	29,961	18,011	5,161	17,911	94,563	24.9%	31.7%	19.0%	5.5%	18.9%
1965	42,262	45,454	21,444	9,390	10,774	129,324	32.7%	35.1%	16.6%	7.3%	8.3%
1970	80,060	63,841	29,893	9,871	11,754	195,419	41.0%	32.7%	15.3%	5.1%	6.0%
1975	83,464	70,758	35,542	11,347	11,820	212,931	39.2%	33.2%	16.7%	5.3%	5.6%
1980	79,244	82,963	37,985	34,875	14,581	249,648	31.7%	33.2%	15.2%	14.0%	5.8%
1985	74,436	82,895	39,891	26,361	8,541	232,124	32.1%	35.7%	17.2%	11.4%	3.7%
1990	71,051	119,872	45,542	37,796	18,502	292,763	24.3%	40.9%	15.6%	12.9%	6.3%
1995	56,358	90,994	49,131	33,682	22,350	252,515	22.3%	36.0%	19.5%	13.3%	8.9%
2000	53,511	85,000	48,435	29,642	18,727	235,315	22.7%	36.1%	20.6%	12.6%	8.0%
2001	50,437	83,518	50,626	35,145	20,222	239,948	21.0%	34.8%	21.1%	14.6%	8.4%
2002	57,774	80,087	54,292	47,051	18,389	257,593	22.4%	31.1%	21.1%	18.3%	7.1%
2003	72,056	75,939	55,134	47,749	18,608	269,486	26.7%	28.2%	20.5%	17.7%	6.9%
2004	75,861	82,423	55,864	50,234	18,541	282,923	26.8%	29.1%	19.7%	17.8%	6.6%
2005	92,831	83,049	57,064	42,513	19,647	295,104	31.5%	28.1%	19.3%	14.4%	6.7%
2006	86,945	92,335	59,865	38,830	18,932	296,907	29.3%	31.1%	20.2%	13.1%	6.4%
2007	72,329	102,594	58,497	53,756	18,255	305,431	23.7%	33.6%	19.2%	17.6%	6.0%
2008	60,679	78,093	54,721	31,794	17,203	242,490	25.0%	32.2%	22.6%	13.1%	7.1%
2009	52,748	77,860	55,263	34,989	22,124	242,984	21.7%	32.0%	22.7%	14.4%	9.1%
2010	55,775	74,747	50,743	39,607	23,814	244,686	22.8%	30.5%	20.7%	16.2%	9.7%
2011	62,077	73,623	56,482	36,458	24,108	252,748	24.6%	29.1%	22.3%	14.4%	9.5%
2012	64,135	67,436	53,598	35,199	22,683	243,051	26.4%	27.7%	22.1%	14.5%	9.3%
2013	64,201	65,250	54,394	32,991	23,771	240,607	26.7%	27.1%	22.6%	13.7%	9.9%
2014	73,270	62,059	54,804	25,161	22,547	237,841	30.8%	26.1%	23.0%	10.6%	9.5%
2015	76,095	61,257	55,929	27,284	21,921	242,486	31.4%	25.3%	23.1%	11.3%	9.0%
2016	74,301	60,853	56,763	26,158	20,871	238,946	31.1%	25.5%	23.8%	10.9%	8.7%
Annual Average Growth Rate (%)											
1960-1970	13.0%	7.9%	5.2%	6.7%	-4.1%	7.5%	5.1%	0.3%	-2.2%	-0.8%	-10.8%
1970-1980	-0.1%	2.7%	2.4%	13.5%	2.2%	2.5%	-2.5%	0.2%	-0.1%	10.7%	-0.3%
1980-1990	-1.1%	3.7%	1.8%	0.8%	2.4%	1.6%	-2.6%	2.1%	0.2%	-0.8%	0.8%
1990-2000	-2.8%	-3.4%	0.6%	-2.4%	0.1%	-2.2%	-0.6%	-1.2%	2.8%	-0.2%	2.3%
2000-2010	0.4%	-1.3%	0.5%	2.9%	2.4%	0.4%	0.0%	-1.7%	0.1%	2.5%	2.0%
2010-2016	4.9%	-3.4%	1.9%	-6.7%	-2.2%	-0.4%	5.3%	-3.0%	2.3%	-6.3%	-1.8%
1960-1990	3.8%	4.7%	3.1%	6.9%	0.1%	3.8%	-0.1%	0.9%	-0.7%	2.9%	-3.6%
1990-2016	0.2%	-2.6%	0.9%	-1.4%	0.5%	-0.8%	1.0%	-1.8%	1.6%	-0.6%	1.3%
1960-2016	2.1%	1.3%	2.1%	2.9%	0.3%	1.7%	0.4%	-0.4%	0.4%	1.3%	-1.4%

* Include fuel ethanol since 2005.

Source: Energy Information Administration, State Energy Data System

As shown in Table 2.3, from 1960 to 2016, Hawaii's total petroleum consumption increased from about 16.8 million barrels (MBBLs) to 42.2 MBBLs. The share of motor gasoline increased the most at 6.2 percentage points from 20.4% to 26.6%; followed by distillate fuel oil at 5.5 percentage points, and jet fuel at 5.4 percentage points. The shares of residual fuel oil and other petroleum products decreased 5.4 percentage points and 11.7 percentage points, respectively.

Table 2.3 Hawaii Petroleum Consumption by Product in Physical Unit

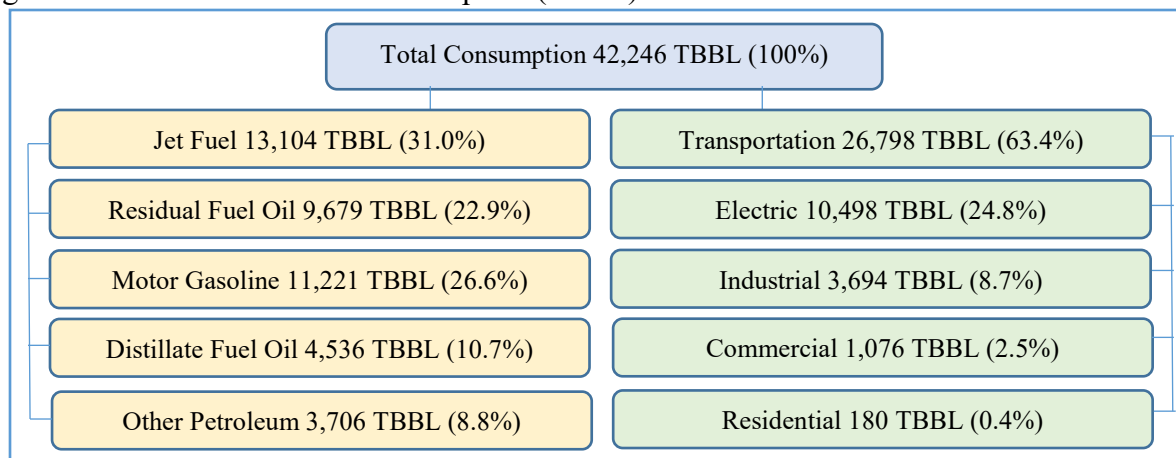
Year	Petroleum Consumption in Thousand Barrels						Share of Petroleum				
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	4,321	4,766	3,428	886	3,444	16,845	25.7%	28.3%	20.4%	5.3%	20.4%
1965	7,618	7,230	4,082	1,612	1,936	22,478	33.9%	32.2%	18.2%	7.2%	8.6%
1970	14,273	10,155	5,690	1,694	2,293	34,105	41.9%	29.8%	16.7%	5.0%	6.7%
1975	14,849	11,254	6,766	1,948	2,280	37,097	40.0%	30.3%	18.2%	5.3%	6.1%
1980	14,116	13,196	7,232	5,987	3,032	43,563	32.4%	30.3%	16.6%	13.7%	7.0%
1985	13,260	13,186	7,594	4,526	1,439	40,005	33.1%	33.0%	19.0%	11.3%	3.6%
1990	12,646	19,066	8,669	6,489	3,144	50,014	25.3%	38.1%	17.3%	13.0%	6.3%
1995	9,940	14,472	9,416	5,787	4,228	43,843	22.7%	33.0%	21.5%	13.2%	9.6%
2000	9,438	13,520	9,289	5,093	3,252	40,592	23.3%	33.3%	22.9%	12.5%	8.0%
2001	8,895	13,284	9,710	6,039	3,552	41,480	21.4%	32.0%	23.4%	14.6%	8.6%
2002	10,189	12,738	10,419	8,085	3,341	44,772	22.8%	28.5%	23.3%	18.1%	7.5%
2003	12,708	12,079	10,597	8,204	3,272	46,860	27.1%	25.8%	22.6%	17.5%	7.0%
2004	13,379	13,110	10,741	8,634	3,234	49,098	27.2%	26.7%	21.9%	17.6%	6.6%
2005	16,372	13,209	10,978	7,307	3,401	51,267	31.9%	25.8%	21.4%	14.3%	6.6%
2006	15,334	14,686	11,532	6,691	3,321	51,564	29.7%	28.5%	22.4%	13.0%	6.4%
2007	12,756	16,319	11,348	9,295	3,187	52,905	24.1%	30.8%	21.4%	17.6%	6.0%
2008	10,702	12,421	10,675	5,501	3,097	42,396	25.2%	29.3%	25.2%	13.0%	7.3%
2009	9,303	12,384	10,834	6,053	3,898	42,472	21.9%	29.2%	25.5%	14.3%	9.2%
2010	9,837	11,890	9,993	6,856	4,178	42,754	23.0%	27.8%	23.4%	16.0%	9.8%
2011	10,948	11,711	11,144	6,314	4,261	44,378	24.7%	26.4%	25.1%	14.2%	9.6%
2012	11,311	10,726	10,586	6,099	4,047	42,769	26.4%	25.1%	24.8%	14.3%	9.5%
2013	11,323	10,379	10,746	5,719	4,169	42,336	26.7%	24.5%	25.4%	13.5%	9.8%
2014	12,922	9,872	10,831	4,361	3,988	41,974	30.8%	23.5%	25.8%	10.4%	9.5%
2015	13,421	9,743	11,053	4,729	3,840	42,786	31.4%	22.8%	25.8%	11.1%	9.0%
2016	13,104	9,679	11,221	4,536	3,706	42,246	31.0%	22.9%	26.6%	10.7%	8.8%
Annual Average Growth Rate (%)											
1960-1970	12.7%	7.9%	5.2%	6.7%	-4.0%	7.3%	5.0%	0.5%	-2.0%	-0.6%	-10.5%
1970-1980	-0.1%	2.7%	2.4%	13.5%	2.8%	2.5%	-2.5%	0.2%	0.0%	10.7%	0.3%
1980-1990	-1.1%	3.7%	1.8%	0.8%	0.4%	1.4%	-2.5%	2.3%	0.4%	-0.6%	-1.0%
1990-2000	-2.9%	-3.4%	0.7%	-2.4%	0.3%	-2.1%	-0.8%	-1.3%	2.8%	-0.3%	2.5%
2000-2010	0.4%	-1.3%	0.7%	3.0%	2.5%	0.5%	-0.1%	-1.8%	0.2%	2.5%	2.0%
2010-2016	4.9%	-3.4%	2.0%	-6.7%	-2.0%	-0.2%	5.1%	-3.2%	2.2%	-6.5%	-1.8%
1960-1990	3.6%	4.7%	3.1%	6.9%	-0.3%	3.7%	0.0%	1.0%	-0.5%	3.1%	-3.9%
1990-2016	0.1%	-2.6%	1.0%	-1.4%	0.6%	-0.6%	0.8%	-1.9%	1.7%	-0.7%	1.3%
1960-2016	2.0%	1.3%	2.1%	3.0%	0.1%	1.7%	0.3%	-0.4%	0.5%	1.3%	-1.5%

Source: Energy Information Administration, State Energy Data System

As shown in Figure 2.1, in 2016, Hawaii consumed about 42.2 MBBLS of petroleum products. Jet fuel accounted for about 31.0% of total petroleum consumption; followed by motor gasoline (26.6%), residual fuel oil (22.9%), distillate fuel oil (10.7%), and other petroleum products (8.8%). Other petroleum products mainly include: still gas (4.9%), LPG/HGL (1.9%), asphalt and road oil (1.0%), petroleum coke (0.8%), and lubricants (0.2%).

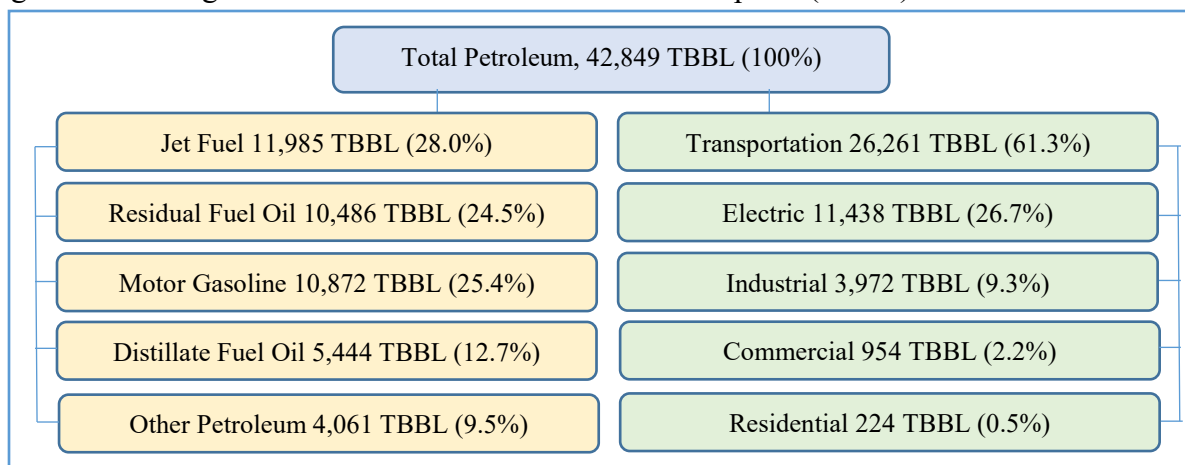
Hawaii's petroleum products were mainly consumed in the transportation and electric power sector. In 2016, the two sectors accounted for 63.4% and 24.8% of total petroleum consumption, respectively. The three other sectors together only accounted for 11.7% of total petroleum consumption.

Figure 2.1 Hawaii Petroleum Consumption (TBBL): 2016



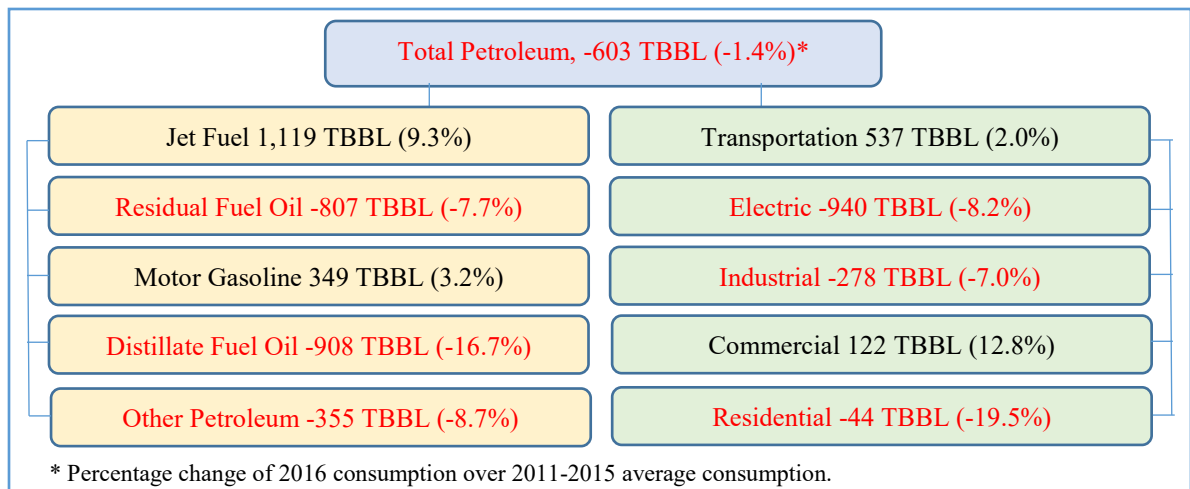
In recent years, total petroleum consumption was relatively stable. Reduced consumption of residual fuel oil, distillate fuel oil, and other petroleum products were mostly offset by increased consumption of jet fuel and motor gasoline. As shown in Figure 2.2, from 2011 to 2015, the average total petroleum consumption in Hawaii was about 42.8 MBBLS. Jet fuel accounted for about 28.0% of total petroleum consumption; followed by motor gasoline (25.4%), residual fuel oil (24.5%), distillate fuel oil (12.7%), and other petroleum products (9.5%).

Figure 2.2 Average 2011-2015 Hawaii Petroleum Consumption (TBBL)



As shown in Figure 2.3, Hawaii's total petroleum consumption in 2016 decreased a mere 1.4% from the average consumption of the previous five years. Compared with the five-year average, the 2016 consumption decreased the most for distillate fuel (16.7%); followed by other petroleum products (8.7%), and residual fuel (7.7%). The consumption of jet fuel and motor gasoline increased 9.3% and 3.2%, respectively, in 2016 compared with the average consumption of the five previous years.

Figure 2.3 Changes of Hawaii Petroleum Consumption: 2016 over 2011-2015 Average



3 Hawaii Total Petroleum Consumption by Sector

Petroleum products are consumed in five sectors: residential, commercial, industrial, transportation, and electric power sector. The transportation sector accounted for a majority of the petroleum consumption in Hawaii. The electric power sector is the second largest petroleum consumer.

Tables 3.1-3.2 shows Hawaii's total petroleum consumption in heat content by sectors. In 2016, the transportation sector accounted for about 61.2% of total petroleum consumption; followed by the electricity sector (27.2%), the industrial sector (9.3%), the commercial sector (2.0%), and the residential sector (0.3%).

From 1960 to 2016, the share of the electric power sector increased the most at 8.9 percentage points; followed by the commercial sector at 0.8 of a percentage point, and the residential sector at 0.2 of a percentage point. The shares of the transportation sector and the industrial sector decreased 4.2 percentage points and 5.7 percentage points, respectively. Increased share of the electric power sector from 1960 to 2016 was due to increases before 1990. From 1990 to 2016, the share of the electricity sector decreased 6.2 percentage points; while the share of the transportation sector increased 8.4 percentage points.

Tables 3.3-3.4 shows Hawaii's total petroleum consumption in physical units by sectors. In 2016, the transportation sector consumed about 26.8 MBBLs of total petroleum; followed by the electric power sector (10.5 MBBLs), the industrial sector (3.7 MBBLs), the commercial sector (1.1 MBBLs), and the residential sector (0.2 MBBLs).

From 1960 to 2016, total petroleum consumption in Hawaii increased about 25.4 MBBLs; consumption in the transportation sector increased the most at 15.3 MBBLs; consumption in the electric power sector increased 7.7 MBBLs; consumption in the industrial sector increased 1.3 MBBLs; consumption in the commercial sector increased 0.9 MBBLs; and consumption in the residential sector increased 0.2 MBBLs.

The increased petroleum consumption in the transportation and the power sector from 1960 to 2016 was due to the increases in the period from 1960 to 1990. During this period, petroleum consumption in the transportation sector increased 16.2 MBBLs; and petroleum consumption in the electric power sector increased 12.9 MBBLs. From 1990 to 2016, petroleum consumption in the transportation sector and electric power sector decreased 0.8 MBBLs and 5.2 MBBLs, respectively.

Table 3.1 Hawaii Petroleum Consumption by Sector in Heat Content

Units: Billion Btu						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	100	1,115	14,259	61,778	17,311	94,563
1965	196	1,460	21,350	78,979	27,339	129,324
1970	769	3,701	22,913	125,344	42,693	195,419
1975	549	2,257	21,254	130,543	58,328	212,931
1980	738	3,966	28,689	146,713	69,543	249,648
1985	173	1,439	18,522	142,887	69,102	232,124
1990	219	8,494	31,904	154,545	97,601	292,763
1995	157	2,691	31,298	138,169	80,199	252,515
2000	744	2,610	22,395	125,215	84,350	235,315
2001	755	2,132	20,988	132,038	84,037	239,948
2002	758	3,115	22,102	140,172	91,446	257,593
2003	562	2,630	22,166	162,853	81,275	269,486
2004	573	3,253	22,157	171,949	84,992	282,923
2005	584	3,281	26,003	179,131	86,104	295,104
2006	616	3,328	25,172	181,259	86,531	296,907
2007	498	2,550	22,819	194,355	85,210	305,431
2008	1,036	2,886	20,123	136,517	81,928	242,490
2009	935	3,710	25,079	132,956	80,305	242,984
2010	918	3,627	25,624	136,384	78,132	244,686
2011	854	4,211	25,695	144,446	77,542	252,748
2012	1,252	3,726	23,593	142,193	72,287	243,051
2013	838	3,835	24,354	141,649	69,932	240,607
2014	846	4,425	23,361	142,240	66,970	237,841
2015	506	5,179	23,754	145,750	67,297	242,486
2016	690	4,815	22,320	146,178	64,943	238,946
Annual Average Growth Rate (%)						
1960-1970	22.6%	12.7%	4.9%	7.3%	9.4%	7.5%
1970-1980	-0.4%	0.7%	2.3%	1.6%	5.0%	2.5%
1980-1990	-11.4%	7.9%	1.1%	0.5%	3.4%	1.6%
1990-2000	13.0%	-11.1%	-3.5%	-2.1%	-1.4%	-2.2%
2000-2010	2.1%	3.3%	1.4%	0.9%	-0.8%	0.4%
2010-2016	-4.6%	4.8%	-2.3%	1.2%	-3.0%	-0.4%
1960-2016	3.5%	2.6%	0.8%	1.5%	2.4%	1.7%

Source: Energy Information Administration, State Energy Data System

Table 3.2 Percent of Hawaii Petroleum Consumption by Sector in Heat Content

Units: % of Total Consumption						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.1%	1.2%	15.1%	65.3%	18.3%	100.0%
1965	0.2%	1.1%	16.5%	61.1%	21.1%	100.0%
1970	0.4%	1.9%	11.7%	64.1%	21.8%	100.0%
1975	0.3%	1.1%	10.0%	61.3%	27.4%	100.0%
1980	0.3%	1.6%	11.5%	58.8%	27.9%	100.0%
1985	0.1%	0.6%	8.0%	61.6%	29.8%	100.0%
1990	0.1%	2.9%	10.9%	52.8%	33.3%	100.0%
1995	0.1%	1.1%	12.4%	54.7%	31.8%	100.0%
2000	0.3%	1.1%	9.5%	53.2%	35.8%	100.0%
2001	0.3%	0.9%	8.7%	55.0%	35.0%	100.0%
2002	0.3%	1.2%	8.6%	54.4%	35.5%	100.0%
2003	0.2%	1.0%	8.2%	60.4%	30.2%	100.0%
2004	0.2%	1.1%	7.8%	60.8%	30.0%	100.0%
2005	0.2%	1.1%	8.8%	60.7%	29.2%	100.0%
2006	0.2%	1.1%	8.5%	61.0%	29.1%	100.0%
2007	0.2%	0.8%	7.5%	63.6%	27.9%	100.0%
2008	0.4%	1.2%	8.3%	56.3%	33.8%	100.0%
2009	0.4%	1.5%	10.3%	54.7%	33.0%	100.0%
2010	0.4%	1.5%	10.5%	55.7%	31.9%	100.0%
2011	0.3%	1.7%	10.2%	57.2%	30.7%	100.0%
2012	0.5%	1.5%	9.7%	58.5%	29.7%	100.0%
2013	0.3%	1.6%	10.1%	58.9%	29.1%	100.0%
2014	0.4%	1.9%	9.8%	59.8%	28.2%	100.0%
2015	0.2%	2.1%	9.8%	60.1%	27.8%	100.0%
2016	0.3%	2.0%	9.3%	61.2%	27.2%	100.0%

Source: Energy Information Administration, State Energy Data System

Table 3.3 Hawaii Petroleum Consumption by Sector in Physical Unit

Year	Units: Thousand Barrels					Total
	Residential	Commercial	Industrial	Transportation	Electric	
1960	26	209	2,367	11,487	2,756	16,845
1965	51	283	3,497	14,294	4,353	22,478
1970	200	760	3,874	22,473	6,798	34,105
1975	143	477	3,648	23,520	9,309	37,097
1980	192	792	5,135	26,317	11,127	43,563
1985	45	275	2,997	25,641	11,047	40,005
1990	57	1,430	5,231	27,639	15,657	50,014
1995	40	480	5,643	24,759	12,921	43,843
2000	194	558	3,685	22,532	13,623	40,592
2001	197	478	3,513	23,704	13,588	41,480
2002	197	648	3,779	25,306	14,842	44,772
2003	146	536	3,733	29,347	13,098	46,860
2004	149	644	3,704	30,897	13,704	49,098
2005	152	651	4,298	32,278	13,888	51,267
2006	159	662	4,194	32,597	13,952	51,564
2007	128	517	3,844	34,678	13,738	52,905
2008	267	636	3,367	24,917	13,209	42,396
2009	242	825	4,131	24,320	12,954	42,472
2010	239	808	4,208	24,889	12,610	42,754
2011	222	943	4,225	26,470	12,518	44,378
2012	326	833	3,894	26,039	11,677	42,769
2013	218	867	3,987	25,969	11,295	42,336
2014	220	987	3,833	26,112	10,822	41,974
2015	132	1,138	3,919	26,717	10,880	42,786
2016	180	1,076	3,694	26,798	10,498	42,246
Annual Average Growth Rate (%)						
1960-1970	22.6%	13.8%	5.1%	6.9%	9.4%	7.3%
1970-1980	-0.4%	0.4%	2.9%	1.6%	5.1%	2.5%
1980-1990	-11.4%	6.1%	0.2%	0.5%	3.5%	1.4%
1990-2000	13.0%	-9.0%	-3.4%	-2.0%	-1.4%	-2.1%
2000-2010	2.1%	3.8%	1.3%	1.0%	-0.8%	0.5%
2010-2016	-4.6%	4.9%	-2.1%	1.2%	-3.0%	-0.2%
1960-2016	3.5%	3.0%	0.8%	1.5%	2.4%	1.7%

Source: Energy Information Administration, State Energy Data System

Table 3.4 Percent of Hawaii Petroleum Consumption by Sector in Physical Unit

Year	Units: % of Total Consumption					Total
	Residential	Commercial	Industrial	Transportation	Electric	
1960	0.2%	1.2%	14.1%	68.2%	16.4%	100.0%
1965	0.2%	1.3%	15.6%	63.6%	19.4%	100.0%
1970	0.6%	2.2%	11.4%	65.9%	19.9%	100.0%
1975	0.4%	1.3%	9.8%	63.4%	25.1%	100.0%
1980	0.4%	1.8%	11.8%	60.4%	25.5%	100.0%
1985	0.1%	0.7%	7.5%	64.1%	27.6%	100.0%
1990	0.1%	2.9%	10.5%	55.3%	31.3%	100.0%
1995	0.1%	1.1%	12.9%	56.5%	29.5%	100.0%
2000	0.5%	1.4%	9.1%	55.5%	33.6%	100.0%
2001	0.5%	1.2%	8.5%	57.1%	32.8%	100.0%
2002	0.4%	1.4%	8.4%	56.5%	33.2%	100.0%
2003	0.3%	1.1%	8.0%	62.6%	28.0%	100.0%
2004	0.3%	1.3%	7.5%	62.9%	27.9%	100.0%
2005	0.3%	1.3%	8.4%	63.0%	27.1%	100.0%
2006	0.3%	1.3%	8.1%	63.2%	27.1%	100.0%
2007	0.2%	1.0%	7.3%	65.5%	26.0%	100.0%
2008	0.6%	1.5%	7.9%	58.8%	31.2%	100.0%
2009	0.6%	1.9%	9.7%	57.3%	30.5%	100.0%
2010	0.6%	1.9%	9.8%	58.2%	29.5%	100.0%
2011	0.5%	2.1%	9.5%	59.6%	28.2%	100.0%
2012	0.8%	1.9%	9.1%	60.9%	27.3%	100.0%
2013	0.5%	2.0%	9.4%	61.3%	26.7%	100.0%
2014	0.5%	2.4%	9.1%	62.2%	25.8%	100.0%
2015	0.3%	2.7%	9.2%	62.4%	25.4%	100.0%
2016	0.4%	2.5%	8.7%	63.4%	24.8%	100.0%

Source: Energy Information Administration, State Energy Data System

The reduced petroleum consumption in the electric power sector from 1990 to 2016 was due to both increased efficiency in electricity generation and increased electricity generation from non-petroleum sources of energy. As shown in Table 3.5, from 1990 to 2016, total electricity generation in Hawaii increased 246 GWh or 2.5%. However, total energy consumed in electricity generation decreased 14,140 BBTUs or 13.3%. Increased electricity generation with less energy represents efficiency gains. During this period, total electricity generated from non-petroleum sources of energy increased 2,341 GWh or 242.1%. As a result, total petroleum generated electricity decreased 2,096 GWh or 24.0%; and total petroleum consumed in the electricity sector decreased 32,657 BBTUs or 33.5%.

Table 3.5 Hawaii Petroleum Consumption and Electricity Generation in the Electricity Sector

		1990	2016	Change	% Change
Fuel for Electricity Generation					
Residual Fuel Oil	Billion BTUs	87,038	53,197	-33,841	-38.9%
Distillate Fuel Oil	Billion BTUs	10,562	11,746	1,184	11.2%
Total Petroleum	Billion BTUs	97,600	64,943	-32,657	-33.5%
Total Energy for Electricity Generation	Billion BTUs	105,928	91,788	-14,140	-13.3%
All Other Energy Sources	Billion BTUs	8,328	26,845	18,517	222.3%
% of Reduced Petroleum Due to Efficiency Gain	%			43.3%	
% of Reduced Petroleum Due to Increased Others	%			56.7%	
Total Electricity Generation	GWH	9,703	9,949	246	2.5%
Petroleum Generated Electricity	GWH	8,736	6,640	-2,096	-24.0%
Other Sources Generated Electricity	GWH	967	3,309	2,341	242.1%

Source: Energy Information Administration, State Energy Data System and State Electricity Data

4 Petroleum Product Analysis

Petroleum consumed in Hawaii can be classified into five major groups based on the EIA data: (1) jet fuel, (2) residual fuel oil, (3) motor gasoline, (4) distillate fuel oil, and (5) other petroleum products. Other petroleum products consumed in Hawaii include still gas, asphalt and road oil, LPG/HGL, petroleum coke, lubricants, and aviation gasoline. This section examines the petroleum consumption by sector for each petroleum product.

All jet fuel in Hawaii was consumed by the transportation sector. From 1960 to 2016, jet fuel consumption increased 50,782 BBTUs or 2.1% per year on average. All the increase was in the 1960s. From 1960 to 1970, jet fuel consumption increased 56,541 BBTUs or 13.0% per year. From 1970 to 2016, jet fuel consumption decreased 5,759 BBTUs. Decreased jet fuel consumption was mainly due to improved energy efficiency in air transportation. As shown in Table 4.1, from 1960 to 2016, total passengers to Hawaii increased 5.5% per year, while jet fuel consumption increased only 2.1% per year. However, improved energy efficiency mainly occurred before 2000. From 1960 to 2000, jet fuel consumption per passenger decreased from 44.2 MBTUs to 6.6 MBTUs. From 2000 to 2016, jet fuel consumption per passenger was relatively stable.

Table 4.1 Hawaii Jet Fuel Consumption

Year	Transportation Sector Jet Fuel Consumption		Total Overseas Passengers	Jet Fuel Per Passenger MBTUs
	BBTUs	TBBLs		
1960	23,519	4,321	532,547	44.2
1965	42,262	7,618	1,064,657	39.7
1970	80,060	14,273	2,219,559	36.1
1975	83,464	14,849	3,849,525	21.7
1980	79,244	14,116	5,380,383	14.7
1985	74,436	13,260	6,314,290	11.8
1990	71,051	12,646	8,507,330	8.4
1995	56,358	9,940	7,957,220	7.1
2000	53,511	9,438	8,105,368	6.6
2001	50,437	8,895	7,447,521	6.8
2002	57,774	10,189	7,628,983	7.6
2003	72,056	12,708	7,557,861	9.5
2004	75,861	13,379	8,225,648	9.2
2005	92,831	16,372	8,840,063	10.5
2006	86,945	15,334	9,049,713	9.6
2007	72,329	12,756	9,011,455	8.0
2008	60,679	10,702	8,034,872	7.6
2009	52,748	9,303	7,718,206	6.8
2010	55,775	9,837	8,258,740	6.8
2011	62,077	10,948	8,556,041	7.3
2012	64,135	11,311	9,232,172	6.9
2013	64,201	11,323	9,513,611	6.7
2014	73,270	12,922	9,691,996	7.6
2015	76,095	13,421	10,132,074	7.5
2016	74,301	13,104	10,462,968	7.1
Annual Average Growth Rate				
1960-1970	13.0%	12.7%	15.3%	-2.0%
1970-1980	-0.1%	-0.1%	9.3%	-8.6%
1980-1990	-1.1%	-1.1%	4.7%	-5.5%
1990-2000	-2.8%	-2.9%	-0.5%	-2.3%
2000-2010	0.4%	0.4%	0.2%	0.2%
2010-2016	4.9%	4.9%	4.0%	0.8%
1960-2016	2.1%	2.0%	5.5%	-3.2%

Source: EIA State Energy Data System and State of Hawaii Data Book

Residual fuel oil is mainly used to generate electricity and supply heat. In 2016, 60,853 BBTUs of residual fuel oil was consumed in Hawaii; about 87.4% was consumed in the electric power sector; transportation and industrial sector consumed about 8.4% and 4.2%, respectively. From 1960 to 2016, the share of the electricity sector increased 30.4 percentage points; the share of the commercial sector decreased 12.0 percentage points; and the share of the industrial sector decreased 17.6 percentage points.

Table 4.2 Hawaii Residual Fuel Oil Consumption by Sector in Heat Content

Residual Fuel Oil Consumption By Sector						
Units: Billion Btu						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	-	255	6,525	6,087	17,094	29,961
1965	-	195	10,763	7,512	26,984	45,454
1970	-	236	10,506	10,963	42,136	63,841
1975	-	95	8,463	6,370	55,830	70,758
1980	-	157	9,374	9,060	64,372	82,963
1985	-	131	8,449	9,591	64,724	82,895
1990	-	5,189	10,942	16,703	87,038	119,872
1995	-	392	6,441	16,832	67,329	90,994
2000	-	52	2,751	13,995	68,202	85,000
2001	-	34	50	16,709	66,725	83,518
2002	-	-	2,805	9,035	68,247	80,087
2003	-	-	2,287	5,745	67,907	75,939
2004	-	27	2,481	9,388	70,527	82,423
2005	-	18	4,912	7,049	71,070	83,049
2006	-	5	5,102	14,933	72,295	92,335
2007	-	3	2,690	28,069	71,832	102,594
2008	-	-	2,730	6,146	69,217	78,093
2009	-	-	2,930	7,633	67,297	77,860
2010	-	-	2,834	6,756	65,157	74,747
2011	-	-	2,852	6,300	64,471	73,623
2012	-	-	2,051	5,699	59,686	67,436
2013	-	-	1,780	5,530	57,940	65,250
2014	-	-	1,614	5,330	55,115	62,059
2015	-	-	1,876	4,394	54,987	61,257
2016	-	-	2,565	5,091	53,197	60,853
Annual Average Growth Rate (%)						
1960-1970	NA	-0.8%	4.9%	6.1%	9.4%	7.9%
1970-1980	NA	-4.0%	-1.1%	-1.9%	4.3%	2.7%
1980-1990	NA	41.9%	1.6%	6.3%	3.1%	3.7%
1990-2000	NA	-36.9%	-12.9%	-1.8%	-2.4%	-3.4%
2000-2010	NA	-100.0%	0.3%	-7.0%	-0.5%	-1.3%
2010-2016	NA	NA	-1.6%	-4.6%	-3.3%	-3.4%
1960-2016	NA	NA	-1.7%	-0.3%	2.0%	1.3%

Source: Energy Information Administration, State Energy Data System

Table 4.3 Percent of Hawaii Residual Fuel Oil Consumption by Sector in Heat Content

Residual Fuel Oil Consumption By Sector						
Units: % of Total Residual Fuel Oil						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	0.9%	21.8%	20.3%	57.1%	100.0%
1965	0.0%	0.4%	23.7%	16.5%	59.4%	100.0%
1970	0.0%	0.4%	16.5%	17.2%	66.0%	100.0%
1975	0.0%	0.1%	12.0%	9.0%	78.9%	100.0%
1980	0.0%	0.2%	11.3%	10.9%	77.6%	100.0%
1985	0.0%	0.2%	10.2%	11.6%	78.1%	100.0%
1990	0.0%	4.3%	9.1%	13.9%	72.6%	100.0%
1995	0.0%	0.4%	7.1%	18.5%	74.0%	100.0%
2000	0.0%	0.1%	3.2%	16.5%	80.2%	100.0%
2001	0.0%	0.0%	0.1%	20.0%	79.9%	100.0%
2002	0.0%	0.0%	3.5%	11.3%	85.2%	100.0%
2003	0.0%	0.0%	3.0%	7.6%	89.4%	100.0%
2004	0.0%	0.0%	3.0%	11.4%	85.6%	100.0%
2005	0.0%	0.0%	5.9%	8.5%	85.6%	100.0%
2006	0.0%	0.0%	5.5%	16.2%	78.3%	100.0%
2007	0.0%	0.0%	2.6%	27.4%	70.0%	100.0%
2008	0.0%	0.0%	3.5%	7.9%	88.6%	100.0%
2009	0.0%	0.0%	3.8%	9.8%	86.4%	100.0%
2010	0.0%	0.0%	3.8%	9.0%	87.2%	100.0%
2011	0.0%	0.0%	3.9%	8.6%	87.6%	100.0%
2012	0.0%	0.0%	3.0%	8.5%	88.5%	100.0%
2013	0.0%	0.0%	2.7%	8.5%	88.8%	100.0%
2014	0.0%	0.0%	2.6%	8.6%	88.8%	100.0%
2015	0.0%	0.0%	3.1%	7.2%	89.8%	100.0%
2016	0.0%	0.0%	4.2%	8.4%	87.4%	100.0%

Source: Energy Information Administration, State Energy Data System

As shown in Table 4.4, from 1960 to 2016, total residual fuel oil consumption in Hawaii increased about 4.9 MBBLS; the electric power sector increased about 5.7 MBBLS; the transportation and industrial sector decreased about 0.8 MBBLS. Higher rates of residual fuel oil consumption occurred before 1990. From 1960 to 1990, total residual fuel oil consumption increased 14.3 MBBLS; the electric power sector increased 11.1 MBBLS; the transportation sector increased 1.7 MBBLS, and the industrial sector increased 0.7 MBBLS. From 1990 to 2016, total residual fuel oil consumption decreased 9.4 MBBLS; the electric power sector decreased 5.4 MBBLS; the transportation sector decreased 1.8 MBBLS, and the industrial sector decreased 1.3 MBBLS.

Table 4.4 Hawaii Residual Fuel Oil Consumption by Sector in Physical Unit

Residual Fuel Oil Consumption By Sector						
Units: Thousand Barrels						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	-	41	1,038	968	2,719	4,766
1965	-	31	1,712	1,195	4,292	7,230
1970	-	38	1,671	1,744	6,702	10,155
1975	-	15	1,346	1,013	8,880	11,254
1980	-	25	1,491	1,441	10,239	13,196
1985	-	21	1,344	1,526	10,295	13,186
1990	-	825	1,740	2,657	13,844	19,066
1995	-	62	1,024	2,677	10,709	14,472
2000	-	8	438	2,226	10,848	13,520
2001	-	5	8	2,658	10,613	13,284
2002	-	-	446	1,437	10,855	12,738
2003	-	-	364	914	10,801	12,079
2004	-	4	395	1,493	11,218	13,110
2005	-	3	781	1,121	11,304	13,209
2006	-	1	811	2,375	11,499	14,686
2007	-	-	428	4,465	11,426	16,319
2008	-	-	434	978	11,009	12,421
2009	-	-	466	1,214	10,704	12,384
2010	-	-	451	1,075	10,364	11,890
2011	-	-	454	1,002	10,255	11,711
2012	-	-	326	906	9,494	10,726
2013	-	-	283	880	9,216	10,379
2014	-	-	257	848	8,767	9,872
2015	-	-	298	699	8,746	9,743
2016	-	-	408	810	8,461	9,679
Annual Average Growth Rate (%)						
1960-1970	NA	-0.8%	4.9%	6.1%	9.4%	7.9%
1970-1980	NA	-4.1%	-1.1%	-1.9%	4.3%	2.7%
1980-1990	NA	41.9%	1.6%	6.3%	3.1%	3.7%
1990-2000	NA	-37.1%	-12.9%	-1.8%	-2.4%	-3.4%
2000-2010	NA	-100.0%	0.3%	-7.0%	-0.5%	-1.3%
2010-2016	NA	NA	-1.7%	-4.6%	-3.3%	-3.4%
1960-2016	NA	NA	-1.7%	-0.3%	2.0%	1.3%

Source: Energy Information Administration, State Energy Data System

Table 4.5 Percent of Hawaii Residual Fuel Oil Consumption by Sector in Physical Unit

Residual Fuel Oil Consumption By Sector						
Units: % of Total Residual Fuel Oil						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	0.9%	21.8%	20.3%	57.0%	100.0%
1965	0.0%	0.4%	23.7%	16.5%	59.4%	100.0%
1970	0.0%	0.4%	16.5%	17.2%	66.0%	100.0%
1975	0.0%	0.1%	12.0%	9.0%	78.9%	100.0%
1980	0.0%	0.2%	11.3%	10.9%	77.6%	100.0%
1985	0.0%	0.2%	10.2%	11.6%	78.1%	100.0%
1990	0.0%	4.3%	9.1%	13.9%	72.6%	100.0%
1995	0.0%	0.4%	7.1%	18.5%	74.0%	100.0%
2000	0.0%	0.1%	3.2%	16.5%	80.2%	100.0%
2001	0.0%	0.0%	0.1%	20.0%	79.9%	100.0%
2002	0.0%	0.0%	3.5%	11.3%	85.2%	100.0%
2003	0.0%	0.0%	3.0%	7.6%	89.4%	100.0%
2004	0.0%	0.0%	3.0%	11.4%	85.6%	100.0%
2005	0.0%	0.0%	5.9%	8.5%	85.6%	100.0%
2006	0.0%	0.0%	5.5%	16.2%	78.3%	100.0%
2007	0.0%	0.0%	2.6%	27.4%	70.0%	100.0%
2008	0.0%	0.0%	3.5%	7.9%	88.6%	100.0%
2009	0.0%	0.0%	3.8%	9.8%	86.4%	100.0%
2010	0.0%	0.0%	3.8%	9.0%	87.2%	100.0%
2011	0.0%	0.0%	3.9%	8.6%	87.6%	100.0%
2012	0.0%	0.0%	3.0%	8.4%	88.5%	100.0%
2013	0.0%	0.0%	2.7%	8.5%	88.8%	100.0%
2014	0.0%	0.0%	2.6%	8.6%	88.8%	100.0%
2015	0.0%	0.0%	3.1%	7.2%	89.8%	100.0%
2016	0.0%	0.0%	4.2%	8.4%	87.4%	100.0%

Source: Energy Information Administration, State Energy Data System

Distillate fuel oil (including diesel oil) is mainly used to generate electricity and drive diesel engines. As shown in Tables 4.6-4.7, in 2016, Hawaii consumed 26,158 BBTUs of distillate fuel oil; about 48.0% of distillate fuel oil was consumed in the transportation sector; followed by the electric power sector (44.9%), industrial sector (3.6%), and commercial sector (3.5%). From 1960 to 2016, the share of the electric power sector increased 40.7 percentage points; the share of the transportation sector increased 20.2 percentage points; the share of the industrial sector decreased 58.9 percentage points; and the share of the commercial sector decreased 1.9 percentage point.

Table 4.6 Hawaii Distillate Fuel Oil Consumption by Sector in Heat Content

Distillate Fuel Oil Consumption By Sector						
Units: Billion Btu						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	2	277	3,225	1,439	218	5,161
1965	3	416	3,697	4,919	355	9,390
1970	8	1,012	4,086	4,208	557	9,871
1975	4	491	3,512	4,842	2,498	11,347
1980	6	2,317	7,976	19,405	5,171	34,875
1985	2	768	2,665	18,548	4,378	26,361
1990	2	2,636	4,222	20,374	10,562	37,796
1995	10	1,998	3,191	15,613	12,870	33,682
2000	2	1,271	2,751	9,470	16,148	29,642
2001	2	793	2,751	14,287	17,312	35,145
2002	2	1,805	2,673	19,372	23,199	47,051
2003	2	1,644	2,557	30,179	13,367	47,749
2004	2	2,220	2,367	31,181	14,464	50,234
2005	1	2,237	2,977	22,263	15,035	42,513
2006	19	2,274	2,648	19,653	14,236	38,830
2007	19	1,629	2,606	36,125	13,377	53,756
2008	30	1,277	2,003	15,772	12,712	31,794
2009	16	1,574	2,334	18,057	13,008	34,989
2010	1	1,528	1,883	23,219	12,976	39,607
2011	1	1,729	1,973	19,684	13,071	36,458
2012	-	1,538	2,167	18,893	12,601	35,199
2013	-	1,473	1,875	17,651	11,992	32,991
2014	-	1,864	2,263	9,179	11,855	25,161
2015	2	1,299	1,853	11,820	12,310	27,284
2016	-	905	941	12,566	11,746	26,158
Annual Average Growth Rate (%)						
1960-1970	14.9%	13.8%	2.4%	11.3%	9.8%	6.7%
1970-1980	-2.8%	8.6%	6.9%	16.5%	25.0%	13.5%
1980-1990	-10.4%	1.3%	-6.2%	0.5%	7.4%	0.8%
1990-2000	0.0%	-7.0%	-4.2%	-7.4%	4.3%	-2.4%
2000-2010	-6.7%	1.9%	-3.7%	9.4%	-2.2%	2.9%
2010-2016	NA	-8.4%	-10.9%	-9.7%	-1.6%	-6.7%
1960-2016	NA	2.1%	-2.2%	3.9%	7.4%	2.9%

Source: Energy Information Administration, State Energy Data System

Table 4.7 Percent of Hawaii Distillate Fuel Oil Consumption by Sector in Heat Content

Distillate Fuel Oil Consumption By Sector						
Units: % of Total Distillate Fuel Oil						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	5.4%	62.5%	27.9%	4.2%	100.0%
1965	0.0%	4.4%	39.4%	52.4%	3.8%	100.0%
1970	0.1%	10.3%	41.4%	42.6%	5.6%	100.0%
1975	0.0%	4.3%	31.0%	42.7%	22.0%	100.0%
1980	0.0%	6.6%	22.9%	55.6%	14.8%	100.0%
1985	0.0%	2.9%	10.1%	70.4%	16.6%	100.0%
1990	0.0%	7.0%	11.2%	53.9%	27.9%	100.0%
1995	0.0%	5.9%	9.5%	46.4%	38.2%	100.0%
2000	0.0%	4.3%	9.3%	31.9%	54.5%	100.0%
2001	0.0%	2.3%	7.8%	40.7%	49.3%	100.0%
2002	0.0%	3.8%	5.7%	41.2%	49.3%	100.0%
2003	0.0%	3.4%	5.4%	63.2%	28.0%	100.0%
2004	0.0%	4.4%	4.7%	62.1%	28.8%	100.0%
2005	0.0%	5.3%	7.0%	52.4%	35.4%	100.0%
2006	0.0%	5.9%	6.8%	50.6%	36.7%	100.0%
2007	0.0%	3.0%	4.8%	67.2%	24.9%	100.0%
2008	0.1%	4.0%	6.3%	49.6%	40.0%	100.0%
2009	0.0%	4.5%	6.7%	51.6%	37.2%	100.0%
2010	0.0%	3.9%	4.8%	58.6%	32.8%	100.0%
2011	0.0%	4.7%	5.4%	54.0%	35.9%	100.0%
2012	0.0%	4.4%	6.2%	53.7%	35.8%	100.0%
2013	0.0%	4.5%	5.7%	53.5%	36.3%	100.0%
2014	0.0%	7.4%	9.0%	36.5%	47.1%	100.0%
2015	0.0%	4.8%	6.8%	43.3%	45.1%	100.0%
2016	0.0%	3.5%	3.6%	48.0%	44.9%	100.0%

Source: Energy Information Administration, State Energy Data System

As shown in Table 4.8, from 1960 to 2016, total distillate fuel oil consumption in Hawaii increased about 3.7 MBBLs; the electric power sector increased about 2.0 MBBLs; and the transportation sector increased about 1.9 MBBLs. Higher growth rates of distillate fuel oil consumption occurred before 1990. From 1960 to 1990, total distillate fuel oil consumption increased 5.6 MBBLs; the electric power sector increased 1.8 MBBLs; and the transportation sector increased 3.3 MBBLs. From 1990 to 2016, total distillate fuel oil consumption decreased 2.0 MBBLs, mainly decreased in the transportation sector.

Table 4.8 Hawaii Distillate Fuel Oil Consumption by Sector in Physical Unit

Distillate Fuel Oil Consumption By Sector						
Units: Thousand Barrels						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	-	48	554	247	37	886
1965	1	71	635	844	61	1,612
1970	1	174	701	722	96	1,694
1975	1	84	603	831	429	1,948
1980	1	398	1,369	3,331	888	5,987
1985	-	132	458	3,184	752	4,526
1990	-	453	725	3,498	1,813	6,489
1995	2	343	548	2,683	2,211	5,787
2000	-	218	473	1,627	2,775	5,093
2001	-	136	473	2,455	2,975	6,039
2002	-	310	459	3,329	3,987	8,085
2003	-	282	439	5,186	2,297	8,204
2004	-	382	407	5,359	2,486	8,634
2005	-	384	512	3,827	2,584	7,307
2006	3	392	456	3,387	2,453	6,691
2007	3	282	451	6,246	2,313	9,295
2008	5	221	347	2,729	2,199	5,501
2009	3	272	404	3,124	2,250	6,053
2010	-	265	326	4,019	2,246	6,856
2011	-	299	342	3,409	2,264	6,314
2012	-	266	376	3,274	2,183	6,099
2013	-	255	325	3,060	2,079	5,719
2014	-	323	392	1,591	2,055	4,361
2015	-	225	321	2,049	2,134	4,729
2016	-	157	163	2,179	2,037	4,536
Annual Average Growth Rate (%)						
1960-1970	NA	13.7%	2.4%	11.3%	10.0%	6.7%
1970-1980	NA	8.6%	6.9%	16.5%	24.9%	13.5%
1980-1990	NA	1.3%	-6.2%	0.5%	7.4%	0.8%
1990-2000	NA	-7.1%	-4.2%	-7.4%	4.3%	-2.4%
2000-2010	NA	2.0%	-3.7%	9.5%	-2.1%	3.0%
2010-2016	NA	-8.4%	-10.9%	-9.7%	-1.6%	-6.7%
1960-2016	NA	2.1%	-2.2%	4.0%	7.4%	3.0%

Source: Energy Information Administration, State Energy Data System

Table 4.9 Percent of Hawaii Distillate Fuel Oil Consumption by Sector in Physical Unit

Distillate Fuel Oil Consumption By Sector						
Units: % of Total Distillate Fuel Oil						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	5.4%	62.5%	27.9%	4.2%	100.0%
1965	0.1%	4.4%	39.4%	52.4%	3.8%	100.0%
1970	0.1%	10.3%	41.4%	42.6%	5.7%	100.0%
1975	0.1%	4.3%	31.0%	42.7%	22.0%	100.0%
1980	0.0%	6.6%	22.9%	55.6%	14.8%	100.0%
1985	0.0%	2.9%	10.1%	70.3%	16.6%	100.0%
1990	0.0%	7.0%	11.2%	53.9%	27.9%	100.0%
1995	0.0%	5.9%	9.5%	46.4%	38.2%	100.0%
2000	0.0%	4.3%	9.3%	31.9%	54.5%	100.0%
2001	0.0%	2.3%	7.8%	40.7%	49.3%	100.0%
2002	0.0%	3.8%	5.7%	41.2%	49.3%	100.0%
2003	0.0%	3.4%	5.4%	63.2%	28.0%	100.0%
2004	0.0%	4.4%	4.7%	62.1%	28.8%	100.0%
2005	0.0%	5.3%	7.0%	52.4%	35.4%	100.0%
2006	0.0%	5.9%	6.8%	50.6%	36.7%	100.0%
2007	0.0%	3.0%	4.9%	67.2%	24.9%	100.0%
2008	0.1%	4.0%	6.3%	49.6%	40.0%	100.0%
2009	0.0%	4.5%	6.7%	51.6%	37.2%	100.0%
2010	0.0%	3.9%	4.8%	58.6%	32.8%	100.0%
2011	0.0%	4.7%	5.4%	54.0%	35.9%	100.0%
2012	0.0%	4.4%	6.2%	53.7%	35.8%	100.0%
2013	0.0%	4.5%	5.7%	53.5%	36.4%	100.0%
2014	0.0%	7.4%	9.0%	36.5%	47.1%	100.0%
2015	0.0%	4.8%	6.8%	43.3%	45.1%	100.0%
2016	0.0%	3.5%	3.6%	48.0%	44.9%	100.0%

Source: Energy Information Administration, State Energy Data System

Motor gasoline is mainly consumed in the transportation sector. As shown in Tables 4.10-4.11, in 2016, Hawaii consumed 56,763 BBTUs of motor gasoline (including 4,000 BBTUs of fuel ethanol); about 94.7% of motor gasoline was consumed in the transportation sector. The commercial and industrial sector together accounted for about 5.3% of motor gasoline consumption in Hawaii. From 1960 to 2016, the transportation sectors share decreased only 1.3 percentage point. Motor gasoline consumption was relatively stable since 2002.

Table 4.10 Hawaii Motor Gasoline Consumption by Sector in Heat Content

Motor Gasoline Consumption By Sector						
Units: Billion Btu						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	-	290	438	17,283	-	18,011
1965	-	309	401	20,734	-	21,444
1970	-	701	260	28,932	-	29,893
1975	-	517	278	34,747	-	35,542
1980	-	282	255	37,448	-	37,985
1985	-	249	546	39,096	-	39,891
1990	-	310	701	44,531	-	45,542
1995	-	58	1,277	47,796	-	49,131
2000	-	59	834	47,542	-	48,435
2001	-	60	636	49,930	-	50,626
2002	-	60	756	53,476	-	54,292
2003	-	61	714	54,359	-	55,134
2004	-	62	879	54,923	-	55,864
2005	-	63	691	56,310	-	57,064
2006	-	62	733	59,070	-	59,865
2007	-	62	1,256	57,179	-	58,497
2008	-	62	1,266	53,393	-	54,721
2009	-	62	1,191	54,010	-	55,263
2010	-	61	726	49,956	-	50,743
2011	-	61	747	55,674	-	56,482
2012	-	61	710	52,827	-	53,598
2013	-	63	699	53,632	-	54,394
2014	-	60	865	53,879	-	54,804
2015	-	1,564	1,438	52,927	-	55,929
2016	-	1,586	1,421	53,756	-	56,763
Annual Average Growth Rate (%)						
1960-1970	NA	9.2%	-5.1%	5.3%	NA	5.2%
1970-1980	NA	-8.7%	-0.2%	2.6%	NA	2.4%
1980-1990	NA	1.0%	10.6%	1.7%	NA	1.8%
1990-2000	NA	-15.3%	1.8%	0.7%	NA	0.6%
2000-2010	NA	0.3%	-1.4%	0.5%	NA	0.5%
2010-2016	NA	72.1%	11.8%	1.2%	NA	1.9%
1960-2016	NA	3.1%	2.1%	2.0%	NA	2.1%

Source: Energy Information Administration, State Energy Data System

Table 4.11 Percent of Hawaii Motor Gasoline Consumption by Sector in Heat Content

Motor Gasoline Consumption By Sector						
Units: % of Total Motor Gasoline						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	1.6%	2.4%	96.0%	0.0%	100.0%
1965	0.0%	1.4%	1.9%	96.7%	0.0%	100.0%
1970	0.0%	2.3%	0.9%	96.8%	0.0%	100.0%
1975	0.0%	1.5%	0.8%	97.8%	0.0%	100.0%
1980	0.0%	0.7%	0.7%	98.6%	0.0%	100.0%
1985	0.0%	0.6%	1.4%	98.0%	0.0%	100.0%
1990	0.0%	0.7%	1.5%	97.8%	0.0%	100.0%
1995	0.0%	0.1%	2.6%	97.3%	0.0%	100.0%
2000	0.0%	0.1%	1.7%	98.2%	0.0%	100.0%
2001	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2002	0.0%	0.1%	1.4%	98.5%	0.0%	100.0%
2003	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2004	0.0%	0.1%	1.6%	98.3%	0.0%	100.0%
2005	0.0%	0.1%	1.2%	98.7%	0.0%	100.0%
2006	0.0%	0.1%	1.2%	98.7%	0.0%	100.0%
2007	0.0%	0.1%	2.1%	97.7%	0.0%	100.0%
2008	0.0%	0.1%	2.3%	97.6%	0.0%	100.0%
2009	0.0%	0.1%	2.2%	97.7%	0.0%	100.0%
2010	0.0%	0.1%	1.4%	98.4%	0.0%	100.0%
2011	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2012	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2013	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2014	0.0%	0.1%	1.6%	98.3%	0.0%	100.0%
2015	0.0%	2.8%	2.6%	94.6%	0.0%	100.0%
2016	0.0%	2.8%	2.5%	94.7%	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

As shown in Table 4.12, from 1960 to 2016, total motor gasoline consumption in Hawaii increased about 7.8 MBBLs. Increased motor gasoline consumption was mainly occurred before 2002. From 1960 to 2002, total motor gasoline consumption increased 7.0 MBBLs. Motor gasoline consumption after 2002 was rather stable.

Table 4.12 Hawaii Motor Gasoline Consumption by Sector in Physical Unit

Motor Gasoline Consumption By Sector						
Units: Thousand Barrels						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	-	55	83	3,290	-	3,428
1965	-	59	76	3,947	-	4,082
1970	-	133	49	5,508	-	5,690
1975	-	98	53	6,615	-	6,766
1980	-	54	49	7,129	-	7,232
1985	-	47	104	7,443	-	7,594
1990	-	59	133	8,477	-	8,669
1995	-	11	245	9,160	-	9,416
2000	-	11	160	9,118	-	9,289
2001	-	12	122	9,576	-	9,710
2002	-	12	145	10,262	-	10,419
2003	-	12	137	10,448	-	10,597
2004	-	12	169	10,560	-	10,741
2005	-	12	133	10,833	-	10,978
2006	-	12	141	11,379	-	11,532
2007	-	12	244	11,092	-	11,348
2008	-	12	247	10,416	-	10,675
2009	-	12	234	10,588	-	10,834
2010	-	12	143	9,838	-	9,993
2011	-	12	147	10,985	-	11,144
2012	-	12	140	10,434	-	10,586
2013	-	13	138	10,595	-	10,746
2014	-	12	171	10,648	-	10,831
2015	-	309	284	10,460	-	11,053
2016	-	314	281	10,626	-	11,221
Annual Average Growth Rate (%)						
1960-1970	NA	9.2%	-5.1%	5.3%	NA	5.2%
1970-1980	NA	-8.6%	0.0%	2.6%	NA	2.4%
1980-1990	NA	0.9%	10.5%	1.7%	NA	1.8%
1990-2000	NA	-15.5%	1.9%	0.7%	NA	0.7%
2000-2010	NA	0.9%	-1.1%	0.8%	NA	0.7%
2010-2016	NA	72.3%	11.9%	1.3%	NA	2.0%
1960-2016	NA	3.2%	2.2%	2.1%	NA	2.1%

Source: Energy Information Administration, State Energy Data System

Table 4.13 Percent of Hawaii Motor Gasoline Consumption by Sector in Physical Unit

Motor Gasoline Consumption By Sector						
Units: % of Total Motor Gasoline						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	0.0%	1.6%	2.4%	96.0%	0.0%	100.0%
1965	0.0%	1.4%	1.9%	96.7%	0.0%	100.0%
1970	0.0%	2.3%	0.9%	96.8%	0.0%	100.0%
1975	0.0%	1.4%	0.8%	97.8%	0.0%	100.0%
1980	0.0%	0.7%	0.7%	98.6%	0.0%	100.0%
1985	0.0%	0.6%	1.4%	98.0%	0.0%	100.0%
1990	0.0%	0.7%	1.5%	97.8%	0.0%	100.0%
1995	0.0%	0.1%	2.6%	97.3%	0.0%	100.0%
2000	0.0%	0.1%	1.7%	98.2%	0.0%	100.0%
2001	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2002	0.0%	0.1%	1.4%	98.5%	0.0%	100.0%
2003	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2004	0.0%	0.1%	1.6%	98.3%	0.0%	100.0%
2005	0.0%	0.1%	1.2%	98.7%	0.0%	100.0%
2006	0.0%	0.1%	1.2%	98.7%	0.0%	100.0%
2007	0.0%	0.1%	2.2%	97.7%	0.0%	100.0%
2008	0.0%	0.1%	2.3%	97.6%	0.0%	100.0%
2009	0.0%	0.1%	2.2%	97.7%	0.0%	100.0%
2010	0.0%	0.1%	1.4%	98.4%	0.0%	100.0%
2011	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2012	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2013	0.0%	0.1%	1.3%	98.6%	0.0%	100.0%
2014	0.0%	0.1%	1.6%	98.3%	0.0%	100.0%
2015	0.0%	2.8%	2.6%	94.6%	0.0%	100.0%
2016	0.0%	2.8%	2.5%	94.7%	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

As shown in Table 4.14, from 1960 to 2016, Hawaii's total motor gasoline consumption increased 2.1% per year on average; while total vehicle registration increased 3.0% per year, and total vehicle miles increased 3.1% per year. The slower growth of motor gasoline consumption relative to vehicle registration and vehicle miles was due to improved energy efficiency of vehicles. However, more than 80% of the efficiency gain was occurred before 1990. Efficiency gain after 1990 were relatively small.

Table 4.14 Hawaii Motor Gasoline Consumption and Energy Efficiency

Year	Total Motor Gasoline Consumption		Motor Vehicle Registration Total	Vehical Miles Millions	Motor Gasoline Per Vehicle MBTUs	Motor Gasoline Per 100 Mile Gal
	BBTUs	TBBLs				
1960	18,011	3,429	230,709	1,990	78.1	7.2
1965	21,444	4,082	309,155	2,450	69.4	7.0
1970	29,892	5,691	412,930	3,409	72.4	7.0
1975	35,542	6,766	506,434	4,146	70.2	6.9
1980	37,985	7,231	617,571	5,570	61.5	5.5
1985	39,890	7,594	749,034	6,762	53.3	4.7
1990	45,543	8,670	889,096	8,065	51.2	4.5
1995	49,132	9,416	877,756	7,944	56.0	5.0
2000	48,435	9,289	941,242	8,526	51.5	4.6
2001	50,626	9,710	967,146	8,754	52.3	4.7
2002	54,292	10,419	987,598	8,937	55.0	4.9
2003	55,134	10,597	1,030,845	9,325	53.5	4.8
2004	55,863	10,741	1,072,211	9,735	52.1	4.6
2005	57,064	10,978	1,119,838	10,129	51.0	4.6
2006	59,866	11,533	1,127,467	10,196	53.1	4.8
2007	58,497	11,348	1,134,542	10,260	51.6	4.6
2008	54,722	10,675	1,127,567	10,189	48.5	4.4
2009	55,263	10,834	1,117,790	10,095	49.4	4.5
2010	50,743	9,993	1,120,080	10,111	45.3	4.2
2011	56,482	11,145	1,181,148	10,654	47.8	4.4
2012	53,599	10,586	1,278,233	11,518	41.9	3.9
2013	54,394	10,746	1,341,152	12,078	40.6	3.7
2014	54,804	10,831	1,284,193	10,173	42.7	4.5
2015	55,928	11,053	1,233,523	11,130	45.3	4.2
2016	56,763	11,220	1,226,667	11,132	46.3	4.2
Annual Average Growth Rate						
1960-1970	5.2%	5.2%	6.0%	5.5%	-0.8%	-0.3%
1970-1980	2.4%	2.4%	4.1%	5.0%	-1.6%	-2.5%
1980-1990	1.8%	1.8%	3.7%	3.8%	-1.8%	-1.9%
1990-2000	0.6%	0.7%	0.6%	0.6%	0.0%	0.1%
2000-2010	0.5%	0.7%	1.8%	1.7%	-1.3%	-1.0%
2010-2016	1.9%	1.9%	1.5%	1.6%	0.4%	0.3%
1960-2016	2.1%	2.1%	3.0%	3.1%	-0.9%	-1.0%

Source: Energy Information Administration, State Energy Data System and State of Hawaii Data Book.

Other petroleum products consumed in Hawaii mainly include still gas, LPG/HGL, asphalt and road oil, petroleum coke, lubricants, and aviation gasoline. In 2016, Hawaii consumed 20,871 BBTUs or 3.7 MBBLs of other petroleum products, which accounted for about 8.8% of total petroleum consumption.

In 2016, still gas accounted for 4.9% of total petroleum consumption based on physical units. Still gas was all consumed in the industrial sector in Hawaii without charges. From 1960 to 2016, still gas consumption increased 9,722 BBTUs (1,621 TBBLs) or about 2.8% per year on average.

In 2016, asphalt and road oil accounted 1.0% of total petroleum consumption based on physical units. All asphalt and road oil was consumed in the industrial sector. From 1960 to 2016, total asphalt and road oil consumption increased about 2,546 BBTUs (384 TBBLs) or 4.9% per year.

In 2016, petroleum coke accounted for 0.8% of total petroleum consumption based on physical units. All petroleum coke was consumed in the industrial sector without charges. From 1960 to 2016, total petroleum coke consumption increased about 1,529 BBTUs (239 TBBLs) or 2.2% per year.

In 2016, LPG/HGL accounted for 1.9% of total petroleum consumption based on physical units. As shown in Tables 4.15-4.18, in 2016, about 75.8% of LPG/HGL was consumed in the commercial sector; followed by the residential sector (22.5%). The transportation sector and the industrial sector also consumed a small amount of LPG/HGL. LPG/HGL consumption was switched from the industrial sector to the commercial sector over time. From 1960 to 2016, total LPG/HGL consumption increased about 2,620 BBTUs (687 TBBLs) or 3.5% per year. During this period, the share of the commercial sector increased 39.6 percentage points; while the share of the industrial sector decreased 38.9 percentage points.

Other petroleum products consumed in Hawaii also include a small amount of lubricants and aviation gasoline. From 1960 to 2016, the consumption of lubricants increased from 228 BBTUs (38 TBBLs) to 584 BBTUs (96 TBBLs); while the consumption of aviation gasoline decreased from 13,326 BBTUs (2,640 TBBLs) to only 31 BBTUs (6 TBBLs). All of the aviation gasoline was consumed in the transportation sector. In 2016, 71.9% of lubricants was consumed in the transportation sector, 28.1% consumed in the industrial sector.

Table 4.15 Hawaii LPG/HGL Consumption by Sector in Heat Content

LPG (HGL) Consumption By Sector						
Units: Billion Btu						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	98	161	178	7	-	444
1965	193	319	339	13	-	864
1970	761	1,258	1,443	99	-	3,561
1975	545	901	1,722	86	-	3,254
1980	732	1,209	3,781	100	-	5,822
1985	171	283	31	23	-	508
1990	217	358	55	49	-	679
1995	147	242	4,310	30	-	4,729
2000	742	1,227	172	-	-	2,141
2001	753	1,244	216	-	-	2,213
2002	756	1,249	877	-	-	2,882
2003	560	926	333	43	-	1,862
2004	572	945	239	-	-	1,756
2005	583	963	50	57	-	1,653
2006	597	987	146	64	-	1,794
2007	479	856	205	48	-	1,588
2008	1,006	1,547	17	14	-	2,584
2009	918	2,073	112	25	-	3,128
2010	918	2,038	186	25	-	3,167
2011	853	2,421	154	26	-	3,454
2012	1,252	2,126	-	31	-	3,409
2013	837	2,299	-	24	-	3,160
2014	846	2,501	16	16	-	3,379
2015	504	2,316	28	16	-	2,864
2016	690	2,324	36	14	-	3,064
Annual Average Growth Rate (%)						
1960-1970	22.7%	22.8%	23.3%	30.3%	NA	23.1%
1970-1980	-0.4%	-0.4%	10.1%	0.1%	NA	5.0%
1980-1990	-11.4%	-11.5%	-34.5%	-6.9%	NA	-19.3%
1990-2000	13.1%	13.1%	12.1%	-100.0%	NA	12.2%
2000-2010	2.2%	5.2%	0.8%	NA	NA	4.0%
2010-2016	-4.6%	2.2%	-23.9%	-9.2%	NA	-0.5%
1960-2016	3.5%	4.9%	-2.8%	1.2%	NA	3.5%

Source: Energy Information Administration, State Energy Data System

Table 4.16 Percent of Hawaii LPG/HGL Consumption by Sector in Heat Content

LPG/HGL Consumption By Sector						
Units: % of Total LPG/HGL						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	22.1%	36.3%	40.1%	1.6%	0.0%	100.0%
1965	22.3%	36.9%	39.2%	1.5%	0.0%	100.0%
1970	21.4%	35.3%	40.5%	2.8%	0.0%	100.0%
1975	16.7%	27.7%	52.9%	2.6%	0.0%	100.0%
1980	12.6%	20.8%	64.9%	1.7%	0.0%	100.0%
1985	33.7%	55.7%	6.1%	4.5%	0.0%	100.0%
1990	32.0%	52.7%	8.1%	7.2%	0.0%	100.0%
1995	3.1%	5.1%	91.1%	0.6%	0.0%	100.0%
2000	34.7%	57.3%	8.0%	0.0%	0.0%	100.0%
2001	34.0%	56.2%	9.8%	0.0%	0.0%	100.0%
2002	26.2%	43.3%	30.4%	0.0%	0.0%	100.0%
2003	30.1%	49.7%	17.9%	2.3%	0.0%	100.0%
2004	32.6%	53.8%	13.6%	0.0%	0.0%	100.0%
2005	35.3%	58.3%	3.0%	3.4%	0.0%	100.0%
2006	33.3%	55.0%	8.1%	3.6%	0.0%	100.0%
2007	30.2%	53.9%	12.9%	3.0%	0.0%	100.0%
2008	38.9%	59.9%	0.7%	0.5%	0.0%	100.0%
2009	29.3%	66.3%	3.6%	0.8%	0.0%	100.0%
2010	29.0%	64.4%	5.9%	0.8%	0.0%	100.0%
2011	24.7%	70.1%	4.5%	0.8%	0.0%	100.0%
2012	36.7%	62.4%	0.0%	0.9%	0.0%	100.0%
2013	26.5%	72.8%	0.0%	0.8%	0.0%	100.0%
2014	25.0%	74.0%	0.5%	0.5%	0.0%	100.0%
2015	17.6%	80.9%	1.0%	0.6%	0.0%	100.0%
2016	22.5%	75.8%	1.2%	0.5%	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

Table 4.17 Hawaii LPG/HGL Consumption by Sector in Physical Unit

LPG/HGL Consumption By Sector						
Units: Thousand Barrels						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	25	42	43	2	-	112
1965	50	83	82	4	-	219
1970	198	328	386	26	-	938
1975	142	235	472	22	-	871
1980	191	315	1,041	26	-	1,573
1985	45	74	9	6	-	134
1990	57	93	15	13	-	178
1995	38	63	1,207	8	-	1,316
2000	194	320	49	-	-	563
2001	196	324	61	-	-	581
2002	197	326	247	-	-	770
2003	146	241	94	11	-	492
2004	149	246	67	-	-	462
2005	152	251	14	15	-	432
2006	156	257	41	17	-	471
2007	125	223	58	12	-	418
2008	262	403	5	4	-	674
2009	239	540	32	6	-	817
2010	239	531	49	7	-	826
2011	222	631	40	7	-	900
2012	326	554	-	8	-	888
2013	218	599	-	6	-	823
2014	220	652	4	4	-	880
2015	131	604	7	4	-	746
2016	180	606	9	4	-	799
Annual Average Growth Rate (%)						
1960-1970	NA	22.8%	24.5%	29.2%	NA	23.7%
1970-1980	NA	-0.4%	10.4%	0.0%	NA	5.3%
1980-1990	NA	-11.5%	-34.6%	-6.7%	NA	-19.6%
1990-2000	NA	13.2%	12.6%	-100.0%	NA	12.2%
2000-2010	NA	5.2%	0.0%	NA	NA	3.9%
2010-2016	-4.6%	2.2%	-24.6%	-8.9%	NA	-0.6%
1960-2016	3.6%	4.9%	-2.8%	1.2%	NA	3.6%

Source: Energy Information Administration, State Energy Data System

Table 4.18 Percent of Hawaii LPG/HGL Consumption by Sector in Physical Unit

LPG/HGL Consumption By Sector						
Units: % of Total LPG/HGL						
Year	Residential	Commercial	Industrial	Transportation	Electric	Total
1960	22.3%	37.5%	38.4%	1.8%	0.0%	100.0%
1965	22.8%	37.9%	37.4%	1.8%	0.0%	100.0%
1970	21.1%	35.0%	41.2%	2.8%	0.0%	100.0%
1975	16.3%	27.0%	54.2%	2.5%	0.0%	100.0%
1980	12.1%	20.0%	66.2%	1.7%	0.0%	100.0%
1985	33.6%	55.2%	6.7%	4.5%	0.0%	100.0%
1990	32.0%	52.2%	8.4%	7.3%	0.0%	100.0%
1995	2.9%	4.8%	91.7%	0.6%	0.0%	100.0%
2000	34.5%	56.8%	8.7%	0.0%	0.0%	100.0%
2001	33.7%	55.8%	10.5%	0.0%	0.0%	100.0%
2002	25.6%	42.3%	32.1%	0.0%	0.0%	100.0%
2003	29.7%	49.0%	19.1%	2.2%	0.0%	100.0%
2004	32.3%	53.2%	14.5%	0.0%	0.0%	100.0%
2005	35.2%	58.1%	3.2%	3.5%	0.0%	100.0%
2006	33.1%	54.6%	8.7%	3.6%	0.0%	100.0%
2007	29.9%	53.3%	13.9%	2.9%	0.0%	100.0%
2008	38.9%	59.8%	0.7%	0.6%	0.0%	100.0%
2009	29.3%	66.1%	3.9%	0.7%	0.0%	100.0%
2010	28.9%	64.3%	5.9%	0.8%	0.0%	100.0%
2011	24.7%	70.1%	4.4%	0.8%	0.0%	100.0%
2012	36.7%	62.4%	0.0%	0.9%	0.0%	100.0%
2013	26.5%	72.8%	0.0%	0.7%	0.0%	100.0%
2014	25.0%	74.1%	0.5%	0.5%	0.0%	100.0%
2015	17.6%	81.0%	0.9%	0.5%	0.0%	100.0%
2016	22.5%	75.8%	1.1%	0.5%	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

5 Consumption Sector Analysis

Table 5.1 through Table 5.10 summarize the types of petroleum products consumed by each sector in heat content (BBTUs) and in physical unit (TBBBLs).

As shown in Table 5.1, in 2016, the transportation sector consumed 146,178 BBTUs of petroleum products. Based on heat content, petroleum consumed in the transportation sector was mainly jet fuel (50.8%) in 2016; followed by motor gasoline (36.8%), distillate fuel oil (8.6%), residual fuel oil (3.5%), and other petroleum products (0.3%). From 1960 to 2016, total petroleum consumption of the transportation sector increased 84,400 BBTUs or 1.5% per year. During this period, the share of jet fuel increased 12.8 percentage points; the share of motor gasoline increased 8.8 percentage points; the share of distillate fuel oil increased 6.3 percentage points; the share of residual fuel oil decreased 6.4 percentage points; and the share of other petroleum products (mainly aviation gasoline) decreased 21.5 percentage points.

Increased petroleum consumption in the transportation sector from 1960 to 2016 was due to the increase from 1960 to 1990. From 1990 to 2016, total petroleum consumption in the transportation sector decreased 8,367 BBTUs or 5.4%. The increased jet fuel and motor gasoline consumptions were more than offset by decreased consumptions of residual fuel oil, distillate fuel oil, and other petroleum products. From 1990 to 2016, jet fuel consumption increased 3,250 BBTUs or about 4.6%; motor gasoline consumption increased 9,225 BBTUs or 20.7%. On the other hand, residual fuel oil consumption in the transportation sector decreased 11,612 BBTUs or 69.5%; distillate fuel oil consumption decreased 7,808 BBTUs or 38.3%; and other petroleum products consumption decreased 1,422 BBTUs or 75.4%.

Table 5.1 Petroleum Consumption by the Transportation Sector in Heat Content

Year	Consumption in Billion Btu						% of Transportation Sector Petroleum Consumption				
	Jet Fuel	Resi- dual Fuel Oil	Motor Gasoline	Disti- llate Fuel Oil	Other Petro- leum	Petro- leum Total	Jet Fuel	Resi- dual Fuel Oil	Motor Gasoline	Disti- llate Fuel Oil	Other Petro- leum
1960	23,519	6,087	17,283	1,439	13,450	61,778	38.1%	9.9%	28.0%	2.3%	21.8%
1965	42,262	7,512	20,734	4,919	3,552	78,979	53.5%	9.5%	26.3%	6.2%	4.5%
1970	80,060	10,963	28,932	4,208	1,181	125,344	63.9%	8.7%	23.1%	3.4%	0.9%
1975	83,464	6,370	34,747	4,842	1,120	130,543	63.9%	4.9%	26.6%	3.7%	0.9%
1980	79,244	9,060	37,448	19,405	1,556	146,713	54.0%	6.2%	25.5%	13.2%	1.1%
1985	74,436	9,591	39,096	18,548	1,216	142,887	52.1%	6.7%	27.4%	13.0%	0.9%
1990	71,051	16,703	44,531	20,374	1,886	154,545	46.0%	10.8%	28.8%	13.2%	1.2%
1991	62,557	16,309	46,076	24,473	1,786	151,201	41.4%	10.8%	30.5%	16.2%	1.2%
1992	56,501	23,616	45,562	16,661	1,787	144,127	39.2%	16.4%	31.6%	11.6%	1.2%
1993	50,409	16,683	46,081	15,579	1,466	130,218	38.7%	12.8%	35.4%	12.0%	1.1%
1994	53,705	18,457	47,538	18,755	1,564	140,019	38.4%	13.2%	34.0%	13.4%	1.1%
1995	56,358	16,832	47,796	15,613	1,570	138,169	40.8%	12.2%	34.6%	11.3%	1.1%
1996	57,194	4,413	47,503	11,218	1,269	121,597	47.0%	3.6%	39.1%	9.2%	1.0%
1997	57,955	3,077	47,478	7,695	1,068	117,273	49.4%	2.6%	40.5%	6.6%	0.9%
1998	56,695	2,410	47,276	7,229	1,017	114,627	49.5%	2.1%	41.2%	6.3%	0.9%
1999	53,720	10,739	45,804	12,051	772	123,086	43.6%	8.7%	37.2%	9.8%	0.6%
2000	53,511	13,995	47,542	9,470	697	125,215	42.7%	11.2%	38.0%	7.6%	0.6%
2001	50,437	16,709	49,930	14,287	675	132,038	38.2%	12.7%	37.8%	10.8%	0.5%
2002	57,774	9,035	53,476	19,372	515	140,172	41.2%	6.4%	38.2%	13.8%	0.4%
2003	72,056	5,745	54,359	30,179	514	162,853	44.2%	3.5%	33.4%	18.5%	0.3%
2004	75,861	9,388	54,923	31,181	596	171,949	44.1%	5.5%	31.9%	18.1%	0.3%
2005	92,831	7,049	56,310	22,263	678	179,131	51.8%	3.9%	31.4%	12.4%	0.4%
2006	86,945	14,933	59,070	19,653	658	181,259	48.0%	8.2%	32.6%	10.8%	0.4%
2007	72,329	28,069	57,179	36,125	653	194,355	37.2%	14.4%	29.4%	18.6%	0.3%
2008	60,679	6,146	53,393	15,772	527	136,517	44.4%	4.5%	39.1%	11.6%	0.4%
2009	52,748	7,633	54,010	18,057	508	132,956	39.7%	5.7%	40.6%	13.6%	0.4%
2010	55,775	6,756	49,956	23,219	678	136,384	40.9%	5.0%	36.6%	17.0%	0.5%
2011	62,077	6,300	55,674	19,684	711	144,446	43.0%	4.4%	38.5%	13.6%	0.5%
2012	64,135	5,699	52,827	18,893	639	142,193	45.1%	4.0%	37.2%	13.3%	0.4%
2013	64,201	5,530	53,632	17,651	635	141,649	45.3%	3.9%	37.9%	12.5%	0.4%
2014	73,270	5,330	53,879	9,179	582	142,240	51.5%	3.7%	37.9%	6.5%	0.4%
2015	76,095	4,394	52,927	11,820	514	145,750	52.2%	3.0%	36.3%	8.1%	0.4%
2016	74,301	5,091	53,756	12,566	464	146,178	50.8%	3.5%	36.8%	8.6%	0.3%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.2, in 2016, the transportation sector consumed about 26,798 TBBLs of petroleum products, about 13,104 TBBLs of jet fuel, 10,626 TBBLs motor gasoline, 2,179 TBBLs of distillate fuel oil, 810 TBBLs of residual fuel oil, and 79 TBBLs of other petroleum products (mainly lubricants). From 1990 to 2016, total petroleum consumed in the transportation sector decreased 841 TBBLs; jet fuel consumption increased 458 TBBLs; motor gasoline consumption increased 2,149 TBBLs; residual fuel oil consumption decreased 1,847 TBBLs; distillate fuel oil consumption decreased 1,319 TBBLs; and other petroleum products (mainly aviation gasoline) consumption decreased 282 TBBLs.

Table 5.2 Petroleum Consumption by the Transportation Sector in Physical Unit

Year	Consumption in Billion Btu						% of Transportation Sector Petroleum Consumption				
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	4,321	968	3,290	247	2,661	11,487	37.6%	8.4%	28.6%	2.2%	23.2%
1965	7,618	1,195	3,947	844	690	14,294	53.3%	8.4%	27.6%	5.9%	4.8%
1970	14,273	1,744	5,508	722	226	22,473	63.5%	7.8%	24.5%	3.2%	1.0%
1975	14,849	1,013	6,615	831	212	23,520	63.1%	4.3%	28.1%	3.5%	0.9%
1980	14,116	1,441	7,129	3,331	300	26,317	53.6%	5.5%	27.1%	12.7%	1.1%
1985	13,260	1,526	7,443	3,184	228	25,641	51.7%	6.0%	29.0%	12.4%	0.9%
1990	12,646	2,657	8,477	3,498	361	27,639	45.8%	9.6%	30.7%	12.7%	1.3%
1991	11,123	2,594	8,771	4,201	345	27,034	41.1%	9.6%	32.4%	15.5%	1.3%
1992	9,993	3,756	8,674	2,860	348	25,631	39.0%	14.7%	33.8%	11.2%	1.4%
1993	8,891	2,654	8,808	2,674	278	23,305	38.2%	11.4%	37.8%	11.5%	1.2%
1994	9,472	2,936	9,088	3,223	298	25,017	37.9%	11.7%	36.3%	12.9%	1.2%
1995	9,940	2,677	9,160	2,683	299	24,759	40.1%	10.8%	37.0%	10.8%	1.2%
1996	10,087	702	9,104	1,928	237	22,058	45.7%	3.2%	41.3%	8.7%	1.1%
1997	10,221	489	9,104	1,322	198	21,334	47.9%	2.3%	42.7%	6.2%	0.9%
1998	9,999	383	9,065	1,242	187	20,876	47.9%	1.8%	43.4%	5.9%	0.9%
1999	9,474	1,708	8,786	2,071	138	22,177	42.7%	7.7%	39.6%	9.3%	0.6%
2000	9,438	2,226	9,118	1,627	123	22,532	41.9%	9.9%	40.5%	7.2%	0.5%
2001	8,895	2,658	9,576	2,455	120	23,704	37.5%	11.2%	40.4%	10.4%	0.5%
2002	10,189	1,437	10,262	3,329	89	25,306	40.3%	5.7%	40.6%	13.2%	0.4%
2003	12,708	914	10,448	5,186	91	29,347	43.3%	3.1%	35.6%	17.7%	0.3%
2004	13,379	1,493	10,560	5,359	106	30,897	43.3%	4.8%	34.2%	17.3%	0.3%
2005	16,372	1,121	10,833	3,827	125	32,278	50.7%	3.5%	33.6%	11.9%	0.4%
2006	15,334	2,375	11,379	3,387	122	32,597	47.0%	7.3%	34.9%	10.4%	0.4%
2007	12,756	4,465	11,092	6,246	119	34,678	36.8%	12.9%	32.0%	18.0%	0.3%
2008	10,702	978	10,416	2,729	92	24,917	43.0%	3.9%	41.8%	11.0%	0.4%
2009	9,303	1,214	10,588	3,124	91	24,320	38.3%	5.0%	43.5%	12.8%	0.4%
2010	9,837	1,075	9,838	4,019	120	24,889	39.5%	4.3%	39.5%	16.1%	0.5%
2011	10,948	1,002	10,985	3,409	126	26,470	41.4%	3.8%	41.5%	12.9%	0.5%
2012	11,311	906	10,434	3,274	114	26,039	43.4%	3.5%	40.1%	12.6%	0.4%
2013	11,323	880	10,595	3,060	111	25,969	43.6%	3.4%	40.8%	11.8%	0.4%
2014	12,922	848	10,648	1,591	103	26,112	49.5%	3.2%	40.8%	6.1%	0.4%
2015	13,421	699	10,460	2,049	88	26,717	50.2%	2.6%	39.2%	7.7%	0.3%
2016	13,104	810	10,626	2,179	79	26,798	48.9%	3.0%	39.7%	8.1%	0.3%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.3, in 2016, the electric power sector consumed 64,943 BBTUs of petroleum products. Petroleum consumed in the electric power sector only includes residual fuel oil and distillate fuel oil. Based on heat content, residual fuel oil accounted for 81.9% of total petroleum consumption in the electric power sector in 2016; distillate fuel oil accounted for 18.1%. From 1960 to 2016, total petroleum consumption of the electric power sector increased 47,632 BBTUs or 2.4% per year. During this period, the share of residual fuel oil decreased 16.8 percentage points.

Increased petroleum consumption in the electric power sector from 1960 to 2016 was due to the increase from 1960 to 1990. From 1990 to 2016, total petroleum consumption in the electricity sector decreased 32,658 BBTUs; consumption of residual fuel oil decreased 33,841 BBTUs; and consumption of distillate fuel oil increased 1,184 BBTUs.

Table 5.3 Petroleum Consumption by the Electricity Sector in Heat Content

Year	Consumption in Billion Btus						% of Electric	
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Residual Fuel Oil	Distillate Fuel Oil
1960	-	17,094	-	218	-	17,311	98.7%	1.3%
1965	-	26,984	-	355	-	27,339	98.7%	1.3%
1970	-	42,136	-	557	-	42,693	98.7%	1.3%
1975	-	55,830	-	2,498	-	58,328	95.7%	4.3%
1980	-	64,372	-	5,171	-	69,543	92.6%	7.4%
1985	-	64,724	-	4,378	-	69,102	93.7%	6.3%
1990	-	87,038	-	10,562	-	97,601	89.2%	10.8%
1991	-	70,373	-	9,958	-	80,332	87.6%	12.4%
1992	-	73,505	-	12,657	-	86,163	85.3%	14.7%
1993	-	63,509	-	12,640	-	76,149	83.4%	16.6%
1994	-	66,437	-	12,618	-	79,055	84.0%	16.0%
1995	-	67,329	-	12,870	-	80,199	84.0%	16.0%
1996	-	69,130	-	13,520	-	82,650	83.6%	16.4%
1997	-	68,356	-	13,398	-	81,754	83.6%	16.4%
1998	-	68,222	-	14,042	-	82,264	82.9%	17.1%
1999	-	68,518	-	14,867	-	83,385	82.2%	17.8%
2000	-	68,202	-	16,148	-	84,350	80.9%	19.1%
2001	-	66,725	-	17,312	-	84,037	79.4%	20.6%
2002	-	68,247	-	23,199	-	91,446	74.6%	25.4%
2003	-	67,907	-	13,367	-	81,275	83.6%	16.4%
2004	-	70,527	-	14,464	-	84,992	83.0%	17.0%
2005	-	71,070	-	15,035	-	86,104	82.5%	17.5%
2006	-	72,295	-	14,236	-	86,531	83.5%	16.5%
2007	-	71,832	-	13,377	-	85,210	84.3%	15.7%
2008	-	69,217	-	12,712	-	81,928	84.5%	15.5%
2009	-	67,297	-	13,008	-	80,305	83.8%	16.2%
2010	-	65,157	-	12,976	-	78,132	83.4%	16.6%
2011	-	64,471	-	13,071	-	77,542	83.1%	16.9%
2012	-	59,686	-	12,601	-	72,287	82.6%	17.4%
2013	-	57,940	-	11,992	-	69,932	82.9%	17.1%
2014	-	55,115	-	11,855	-	66,970	82.3%	17.7%
2015	-	54,987	-	12,310	-	67,297	81.7%	18.3%
2016	-	53,197	-	11,746	-	64,943	81.9%	18.1%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.4, in 2016, the electric power sector consumed about 10,498 TBBLs of petroleum products, about 8,461 TBBLs of residual fuel oil, and 2,037 TBBLs of distillate fuel oil. From 1990 to 2016, total petroleum consumed in the electric power sector decreased 5,159 TBBLs; residual fuel oil consumption decreased 5,383 TBBLs; and distillate fuel oil consumption increased 224 TBBLs.

Table 5.4 Petroleum Consumption by the Electricity Sector in Physical Unit

Year	Consumption in Thousand Barrels						% of Electric	
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Residual Fuel Oil	Distillate Fuel Oil
1960	-	2,719	-	37	-	2,756	98.7%	1.3%
1965	-	4,292	-	61	-	4,353	98.6%	1.4%
1970	-	6,702	-	96	-	6,798	98.6%	1.4%
1975	-	8,880	-	429	-	9,309	95.4%	4.6%
1980	-	10,239	-	888	-	11,127	92.0%	8.0%
1985	-	10,295	-	752	-	11,047	93.2%	6.8%
1990	-	13,844	-	1,813	-	15,657	88.4%	11.6%
1991	-	11,193	-	1,710	-	12,903	86.7%	13.3%
1992	-	11,692	-	2,173	-	13,865	84.3%	15.7%
1993	-	10,102	-	2,170	-	12,272	82.3%	17.7%
1994	-	10,567	-	2,168	-	12,735	83.0%	17.0%
1995	-	10,709	-	2,211	-	12,921	82.9%	17.1%
1996	-	10,996	-	2,323	-	13,319	82.6%	17.4%
1997	-	10,873	-	2,302	-	13,175	82.5%	17.5%
1998	-	10,851	-	2,413	-	13,264	81.8%	18.2%
1999	-	10,898	-	2,555	-	13,453	81.0%	19.0%
2000	-	10,848	-	2,775	-	13,623	79.6%	20.4%
2001	-	10,613	-	2,975	-	13,588	78.1%	21.9%
2002	-	10,855	-	3,987	-	14,842	73.1%	26.9%
2003	-	10,801	-	2,297	-	13,098	82.5%	17.5%
2004	-	11,218	-	2,486	-	13,704	81.9%	18.1%
2005	-	11,304	-	2,584	-	13,888	81.4%	18.6%
2006	-	11,499	-	2,453	-	13,952	82.4%	17.6%
2007	-	11,426	-	2,313	-	13,738	83.2%	16.8%
2008	-	11,009	-	2,199	-	13,209	83.3%	16.6%
2009	-	10,704	-	2,250	-	12,954	82.6%	17.4%
2010	-	10,364	-	2,246	-	12,610	82.2%	17.8%
2011	-	10,255	-	2,264	-	12,518	81.9%	18.1%
2012	-	9,494	-	2,183	-	11,677	81.3%	18.7%
2013	-	9,216	-	2,079	-	11,295	81.6%	18.4%
2014	-	8,767	-	2,055	-	10,822	81.0%	19.0%
2015	-	8,746	-	2,134	-	10,880	80.4%	19.6%
2016	-	8,461	-	2,037	-	10,498	80.6%	19.4%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.5, in 2016, the industrial sector consumed 22,320 BBTUs of petroleum products. Based on heat content, petroleum consumed in the industrial sector was mainly other petroleum products (77.9%) in 2016; followed by residual fuel oil (11.5%), motor gasoline (6.4%), and distillate fuel oil (4.2%). Other petroleum products consumed by the industrial sector mainly include still gas, asphalt and road oil, and petroleum coke. From 1960 to 2016, total petroleum consumption of the industrial sector increased 8,061 BBTUs or 0.8% per year. During this period, the share of other petroleum products increased 49.4 percentage points; the share of motor gasoline increased 3.3 percentage points; the share of distillate fuel oil decreased 18.4 percentage points; and the share of residual fuel oil decreased 34.3 percentage points.

Increased petroleum consumption in the industrial sector from 1960 to 2016 was due to the increase from 1960 to 1990. From 1990 to 2016, total petroleum consumption in the industrial sector decreased 9,584 BBTUs. Increased other petroleum and motor gasoline consumptions were more than offset by decreased consumptions of residual fuel oil and distillate fuel oil. From 1990 to 2016, other petroleum products consumption increased 1,354 BBTUs; motor gasoline consumption increased 720 BBTUs. On the other hand, residual fuel oil consumption decreased 8,377 BBTUs; and distillate fuel oil consumption decreased 3,281 BBTUs.

Table 5.5 Petroleum Consumption by the Industrial Sector in Heat Content

Year	Consumption in Billion Btus						% of Industrial Sector			
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	-	6,525	438	3,225	4,071	14,259	45.8%	3.1%	22.6%	28.6%
1965	-	10,763	401	3,697	6,489	21,350	50.4%	1.9%	17.3%	30.4%
1970	-	10,506	260	4,086	8,061	22,913	45.9%	1.1%	17.8%	35.2%
1975	-	8,463	278	3,512	9,001	21,254	39.8%	1.3%	16.5%	42.3%
1980	-	9,374	255	7,976	11,084	28,689	32.7%	0.9%	27.8%	38.6%
1985	-	8,449	546	2,665	6,862	18,522	45.6%	2.9%	14.4%	37.0%
1990	-	10,942	701	4,222	16,039	31,904	34.3%	2.2%	13.2%	50.3%
1991	-	11,274	788	4,014	14,448	30,524	36.9%	2.6%	13.2%	47.3%
1992	-	8,528	796	4,002	17,263	30,589	27.9%	2.6%	13.1%	56.4%
1993	-	6,640	1,262	3,895	18,215	30,012	22.1%	4.2%	13.0%	60.7%
1994	-	7,447	1,279	3,142	21,804	33,672	22.1%	3.8%	9.3%	64.8%
1995	-	6,441	1,277	3,191	20,389	31,298	20.6%	4.1%	10.2%	65.1%
1996	-	6,016	1,350	2,766	22,500	32,632	18.4%	4.1%	8.5%	69.0%
1997	-	5,310	1,264	3,624	18,030	28,228	18.8%	4.5%	12.8%	63.9%
1998	-	1,918	1,387	3,400	15,503	22,208	8.6%	6.2%	15.3%	69.8%
1999	-	2,090	810	2,487	15,083	20,470	10.2%	4.0%	12.1%	73.7%
2000	-	2,751	834	2,751	16,059	22,395	12.3%	3.7%	12.3%	71.7%
2001	-	50	636	2,751	17,551	20,988	0.2%	3.0%	13.1%	83.6%
2002	-	2,805	756	2,673	15,868	22,102	12.7%	3.4%	12.1%	71.8%
2003	-	2,287	714	2,557	16,608	22,166	10.3%	3.2%	11.5%	74.9%
2004	-	2,481	879	2,367	16,430	22,157	11.2%	4.0%	10.7%	74.2%
2005	-	4,912	691	2,977	17,423	26,003	18.9%	2.7%	11.4%	67.0%
2006	-	5,102	733	2,648	16,689	25,172	20.3%	2.9%	10.5%	66.3%
2007	-	2,690	1,256	2,606	16,267	22,819	11.8%	5.5%	11.4%	71.3%
2008	-	2,730	1,266	2,003	14,124	20,123	13.6%	6.3%	10.0%	70.2%
2009	-	2,930	1,191	2,334	18,624	25,079	11.7%	4.7%	9.3%	74.3%
2010	-	2,834	726	1,883	20,181	25,624	11.1%	2.8%	7.3%	78.8%
2011	-	2,852	747	1,973	20,123	25,695	11.1%	2.9%	7.7%	78.3%
2012	-	2,051	710	2,167	18,665	23,593	8.7%	3.0%	9.2%	79.1%
2013	-	1,780	699	1,875	20,000	24,354	7.3%	2.9%	7.7%	82.1%
2014	-	1,614	865	2,263	18,619	23,361	6.9%	3.7%	9.7%	79.7%
2015	-	1,876	1,438	1,853	18,587	23,754	7.9%	6.1%	7.8%	78.2%
2016	-	2,565	1,421	941	17,393	22,320	11.5%	6.4%	4.2%	77.9%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.6, in 2016, the industrial sector consumed about 3,694 TBBLs of petroleum products, about 2,842 TBBLs of other petroleum products, 408 TBBLs of residual fuel oil, 163 TBBLs of distillate fuel oil, and 281 TBBLs of motor gasoline. From 1990 to 2016, total petroleum consumed in the industrial sector decreased 1,537 TBBLs; residual fuel oil consumption decreased 1,332 TBBLs; distillate fuel oil consumption decreased 562 TBBLs; motor gasoline consumption increased 148 TBBLs; and other petroleum products increased 209 TBBLs.

Table 5.6 Petroleum Consumption by the Industrial Sector in Physical Unit

Year	Consumption in Thousand Barrels						% of Industrial Sector			
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	-	1,038	83	554	692	2,367	43.9%	3.5%	23.4%	29.2%
1965	-	1,712	76	635	1,074	3,497	49.0%	2.2%	18.2%	30.7%
1970	-	1,671	49	701	1,453	3,874	43.1%	1.3%	18.1%	37.5%
1975	-	1,346	53	603	1,646	3,648	36.9%	1.5%	16.5%	45.1%
1980	-	1,491	49	1,369	2,226	5,135	29.0%	1.0%	26.7%	43.3%
1985	-	1,344	104	458	1,091	2,997	44.8%	3.5%	15.3%	36.4%
1990	-	1,740	133	725	2,633	5,231	33.3%	2.5%	13.9%	50.3%
1991	-	1,793	150	689	2,357	4,989	35.9%	3.0%	13.8%	47.2%
1992	-	1,356	152	687	2,883	5,078	26.7%	3.0%	13.5%	56.8%
1993	-	1,056	241	669	3,284	5,250	20.1%	4.6%	12.7%	62.6%
1994	-	1,184	245	540	4,182	6,151	19.2%	4.0%	8.8%	68.0%
1995	-	1,024	245	548	3,826	5,643	18.1%	4.3%	9.7%	67.8%
1996	-	957	259	475	4,189	5,880	16.3%	4.4%	8.1%	71.2%
1997	-	845	242	623	2,962	4,672	18.1%	5.2%	13.3%	63.4%
1998	-	305	266	584	2,610	3,765	8.1%	7.1%	15.5%	69.3%
1999	-	332	155	427	2,466	3,380	9.8%	4.6%	12.6%	73.0%
2000	-	438	160	473	2,614	3,685	11.9%	4.3%	12.8%	70.9%
2001	-	8	122	473	2,910	3,513	0.2%	3.5%	13.5%	82.8%
2002	-	446	145	459	2,729	3,779	11.8%	3.8%	12.1%	72.2%
2003	-	364	137	439	2,793	3,733	9.8%	3.7%	11.8%	74.8%
2004	-	395	169	407	2,733	3,704	10.7%	4.6%	11.0%	73.8%
2005	-	781	133	512	2,872	4,298	18.2%	3.1%	11.9%	66.8%
2006	-	811	141	456	2,786	4,194	19.3%	3.4%	10.9%	66.4%
2007	-	428	244	451	2,721	3,844	11.1%	6.3%	11.7%	70.8%
2008	-	434	247	347	2,339	3,367	12.9%	7.3%	10.3%	69.5%
2009	-	466	234	404	3,027	4,131	11.3%	5.7%	9.8%	73.3%
2010	-	451	143	326	3,288	4,208	10.7%	3.4%	7.7%	78.1%
2011	-	454	147	342	3,282	4,225	10.7%	3.5%	8.1%	77.7%
2012	-	326	140	376	3,052	3,894	8.4%	3.6%	9.7%	78.4%
2013	-	283	138	325	3,241	3,987	7.1%	3.5%	8.2%	81.3%
2014	-	257	171	392	3,013	3,833	6.7%	4.5%	10.2%	78.6%
2015	-	298	284	321	3,016	3,919	7.6%	7.2%	8.2%	77.0%
2016	-	408	281	163	2,842	3,694	11.0%	7.6%	4.4%	76.9%

Source: Energy Information Administration, State Energy Data System

Petroleum product consumption in the commercial sector was more volatile. As shown in Table 5.7, in 2016, the commercial sector consumed 4,815 BBTUs of petroleum products. Based on heat content, petroleum consumed in the commercial sector was mainly other petroleum products (48.3%); followed by motor gasoline (32.9%), and distillate fuel oil (18.8%). Other petroleum products consumed by the industrial sector mainly include LPG/HGL. From 1960 to 2016, total petroleum consumption of the commercial sector increased 3,700 BBTUs or 2.6% per year. During this period, the share of other petroleum products increased 22.0 percentage points; the share of motor gasoline increased 6.9 percentage points; the share of distillate fuel oil decreased 6.0 of a percentage point; and the share of residual fuel oil decreased 22.9 percentage points. Since 2008, the commercial sector did not consume any residual fuel oil. Motor gasoline consumption in the commercial sector from 1993 to 2014 was very limited. Since 2015, motor gasoline consumption increased substantially in the commercial sector.

Increased petroleum consumption in the commercial sector from 1960 to 2016 was due to the increase from 1960 to 1990. From 1990 to 2016, total petroleum consumption in the commercial sector decreased 3,679 BBTUs. Increased other petroleum and motor gasoline consumptions were more than offset by decreased consumptions of residual fuel oil and distillate fuel oil. From 1990 to 2016, other petroleum product consumption increased 1,965 BBTUs; motor gasoline consumption increased 1,276 BBTUs. On the other hand, residual fuel oil consumption decreased 5,189 BBTUs; and distillate fuel oil consumption decreased 1,731 BBTUs.

Table 5.7 Petroleum Consumption by the Commercial Sector in Heat Content

Year	Consumption in Billion Btus						% of Commercial Sector			
	Jet Fuel	Resi- dual Fuel Oil	Motor Gasoline	Disti- llate Fuel Oil	Other Petro- leum	Petro- leum Total	Resi- dual Fuel Oil	Motor Gasoline	Disti- llate Fuel Oil	Other Petro- leum
1960	-	255	290	277	293	1,115	22.9%	26.0%	24.8%	26.3%
1965	-	195	309	416	540	1,460	13.4%	21.2%	28.5%	37.0%
1970	-	236	701	1,012	1,752	3,701	6.4%	18.9%	27.3%	47.3%
1975	-	95	517	491	1,154	2,257	4.2%	22.9%	21.8%	51.1%
1980	-	157	282	2,317	1,210	3,966	4.0%	7.1%	58.4%	30.5%
1985	-	131	249	768	291	1,439	9.1%	17.3%	53.4%	20.2%
1990	-	5,189	310	2,636	359	8,494	61.1%	3.6%	31.0%	4.2%
1991	-	116	256	3,552	370	4,294	2.7%	6.0%	82.7%	8.6%
1992	-	6,612	234	2,901	1,162	10,909	60.6%	2.1%	26.6%	10.7%
1993	-	214	57	2,414	250	2,935	7.3%	1.9%	82.2%	8.5%
1994	-	2,719	57	2,265	254	5,295	51.4%	1.1%	42.8%	4.8%
1995	-	392	58	1,998	243	2,691	14.6%	2.2%	74.2%	9.0%
1996	-	79	58	1,302	301	1,740	4.5%	3.3%	74.8%	17.3%
1997	-	69	58	2,282	558	2,967	2.3%	2.0%	76.9%	18.8%
1998	-	10,711	58	1,225	1,584	13,578	78.9%	0.4%	9.0%	11.7%
1999	-	36	58	1,512	898	2,504	1.4%	2.3%	60.4%	35.9%
2000	-	52	59	1,271	1,228	2,610	2.0%	2.3%	48.7%	47.0%
2001	-	34	60	793	1,245	2,132	1.6%	2.8%	37.2%	58.4%
2002	-	-	60	1,805	1,250	3,115	0.0%	1.9%	57.9%	40.1%
2003	-	-	61	1,644	925	2,630	0.0%	2.3%	62.5%	35.2%
2004	-	27	62	2,220	944	3,253	0.8%	1.9%	68.2%	29.0%
2005	-	18	63	2,237	963	3,281	0.5%	1.9%	68.2%	29.4%
2006	-	5	62	2,274	987	3,328	0.2%	1.9%	68.3%	29.7%
2007	-	3	62	1,629	856	2,550	0.1%	2.4%	63.9%	33.6%
2008	-	-	62	1,277	1,547	2,886	0.0%	2.1%	44.2%	53.6%
2009	-	-	62	1,574	2,074	3,710	0.0%	1.7%	42.4%	55.9%
2010	-	-	61	1,528	2,038	3,627	0.0%	1.7%	42.1%	56.2%
2011	-	-	61	1,729	2,421	4,211	0.0%	1.4%	41.1%	57.5%
2012	-	-	61	1,538	2,127	3,726	0.0%	1.6%	41.3%	57.1%
2013	-	-	63	1,473	2,299	3,835	0.0%	1.6%	38.4%	59.9%
2014	-	-	60	1,864	2,501	4,425	0.0%	1.4%	42.1%	56.5%
2015	-	-	1,564	1,299	2,316	5,179	0.0%	30.2%	25.1%	44.7%
2016	-	-	1,586	905	2,324	4,815	0.0%	32.9%	18.8%	48.3%

Source: Energy Information Administration, State Energy Data System

As shown in Table 5.8, in 2016, the commercial sector consumed about 1,076 TBBLs of petroleum products, about 605 TBBLs of other petroleum products (LPG/HGL), 157 TBBLs of distillate fuel oil, and 314 TBBLs of motor gasoline. From 1990 to 2016, total petroleum consumed in the commercial sector decreased 354 TBBLs; residual fuel oil consumption decreased 825 TBBLs; distillate fuel oil consumption decreased 296 TBBLs; motor gasoline consumption increased 255 TBBLs; and other petroleum products increased 512 TBBLs.

Table 5.8 Petroleum Consumption by the Commercial Sector in Physical Unit

Year	Consumption in Thousand Barrels						% of Commercial Sector			
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum
1960	-	41	55	48	65	209	19.6%	26.3%	23.0%	31.1%
1965	-	31	59	71	122	283	11.0%	20.8%	25.1%	43.1%
1970	-	38	133	174	415	760	5.0%	17.5%	22.9%	54.6%
1975	-	15	98	84	280	477	3.1%	20.5%	17.6%	58.7%
1980	-	25	54	398	315	792	3.2%	6.8%	50.3%	39.8%
1985	-	21	47	132	75	275	7.6%	17.1%	48.0%	27.3%
1990	-	825	59	453	93	1,430	57.7%	4.1%	31.7%	6.5%
1991	-	18	49	610	96	773	2.3%	6.3%	78.9%	12.4%
1992	-	1,052	45	498	302	1,897	55.5%	2.4%	26.3%	15.9%
1993	-	34	11	414	65	524	6.5%	2.1%	79.0%	12.4%
1994	-	433	11	389	66	899	48.2%	1.2%	43.3%	7.3%
1995	-	62	11	343	64	480	12.9%	2.3%	71.5%	13.3%
1996	-	13	11	224	78	326	4.0%	3.4%	68.7%	23.9%
1997	-	11	11	392	146	560	2.0%	2.0%	70.0%	26.1%
1998	-	1,704	11	211	412	2,338	72.9%	0.5%	9.0%	17.6%
1999	-	6	11	260	234	511	1.2%	2.2%	50.9%	45.8%
2000	-	8	11	218	321	558	1.4%	2.0%	39.1%	57.5%
2001	-	5	12	136	325	478	1.0%	2.5%	28.5%	68.0%
2002	-	-	12	310	326	648	0.0%	1.9%	47.8%	50.3%
2003	-	-	12	282	242	536	0.0%	2.2%	52.6%	45.1%
2004	-	4	12	382	246	644	0.6%	1.9%	59.3%	38.2%
2005	-	3	12	384	252	651	0.5%	1.8%	59.0%	38.7%
2006	-	1	12	392	257	662	0.2%	1.8%	59.2%	38.8%
2007	-	-	12	282	223	517	0.0%	2.3%	54.5%	43.1%
2008	-	-	12	221	403	636	0.0%	1.9%	34.7%	63.4%
2009	-	-	12	272	541	825	0.0%	1.5%	33.0%	65.6%
2010	-	-	12	265	531	808	0.0%	1.5%	32.8%	65.7%
2011	-	-	12	299	632	943	0.0%	1.3%	31.7%	67.0%
2012	-	-	12	266	555	833	0.0%	1.4%	31.9%	66.6%
2013	-	-	13	255	599	867	0.0%	1.5%	29.4%	69.1%
2014	-	-	12	323	652	987	0.0%	1.2%	32.7%	66.1%
2015	-	-	309	225	604	1,138	0.0%	27.2%	19.8%	53.1%
2016	-	-	314	157	605	1,076	0.0%	29.2%	14.6%	56.2%

Source: Energy Information Administration, State Energy Data System

Petroleum products consumed in the residential sector include mainly other petroleum products (LPG/HGL). In 2016, about 690 BBTUs (180 TBBLs) of LPG/HGL was consumed in the residential sector. Consumption of LPG/HGL was volatile over time.

Table 5.9 Petroleum Consumption by the Residential Sector in Heat Content

Year	Consumption in Billion Btus						% of Residential	
	Jet Fuel	Resi- dual Fuel Oil	Motor Gasoline	Disti- llate Fuel Oil	Other Petro- leum	Petro- leum Total	Disti- llate Fuel Oil	Other Petro- leum
1960	-	-	-	2	98	100	2.0%	98.0%
1965	-	-	-	3	193	196	1.5%	98.5%
1970	-	-	-	8	761	769	1.0%	99.0%
1975	-	-	-	4	545	549	0.7%	99.3%
1980	-	-	-	6	732	738	0.8%	99.2%
1985	-	-	-	2	171	173	1.2%	98.8%
1990	-	-	-	2	217	219	0.9%	99.1%
1991	-	-	-	2	223	225	0.9%	99.1%
1992	-	-	-	2	703	705	0.3%	99.7%
1993	-	-	-	11	149	160	6.9%	93.1%
1994	-	-	-	10	153	163	6.1%	93.9%
1995	-	-	-	10	147	157	6.4%	93.6%
1996	-	-	-	1	183	184	0.5%	99.5%
1997	-	-	-	3	337	340	0.9%	99.1%
1998	-	-	-	2	958	960	0.2%	99.8%
1999	-	-	-	2	543	545	0.4%	99.6%
2000	-	-	-	2	742	744	0.3%	99.7%
2001	-	-	-	2	753	755	0.3%	99.7%
2002	-	-	-	2	756	758	0.3%	99.7%
2003	-	-	-	2	560	562	0.4%	99.6%
2004	-	-	-	2	571	573	0.3%	99.7%
2005	-	-	-	1	583	584	0.2%	99.8%
2006	-	-	-	19	597	616	3.1%	96.9%
2007	-	-	-	19	479	498	3.8%	96.2%
2008	-	-	-	30	1,006	1,036	2.9%	97.1%
2009	-	-	-	16	919	935	1.7%	98.3%
2010	-	-	-	1	917	918	0.1%	99.9%
2011	-	-	-	1	853	854	0.1%	99.9%
2012	-	-	-	-	1,252	1,252	0.0%	100.0%
2013	-	-	-	-	838	838	0.0%	100.0%
2014	-	-	-	-	846	846	0.0%	100.0%
2015	-	-	-	2	504	506	0.4%	99.6%
2016	-	-	-	-	690	690	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

Table 5.10 Petroleum Consumption by the Residential Sector in Physical Unit

Year	Consumption in Billion Btus						% of Residential	
	Jet Fuel	Residual Fuel Oil	Motor Gasoline	Distillate Fuel Oil	Other Petroleum	Petroleum Total	Distillate Fuel Oil	Other Petroleum
1960	-	-	-	-	26	26	0.0%	100.0%
1965	-	-	-	1	50	51	2.0%	100.0%
1970	-	-	-	1	199	200	0.5%	100.0%
1975	-	-	-	1	142	143	0.7%	100.0%
1980	-	-	-	1	191	192	0.5%	100.0%
1985	-	-	-	-	45	45	0.0%	100.0%
1990	-	-	-	-	57	57	0.0%	100.0%
1991	-	-	-	-	58	58	0.0%	100.0%
1992	-	-	-	-	184	184	0.0%	100.0%
1993	-	-	-	2	39	41	5.1%	100.0%
1994	-	-	-	2	40	42	5.0%	100.0%
1995	-	-	-	2	38	40	5.3%	100.0%
1996	-	-	-	-	48	48	0.0%	100.0%
1997	-	-	-	-	88	88	0.0%	100.0%
1998	-	-	-	-	250	250	0.0%	100.0%
1999	-	-	-	-	142	142	0.0%	100.0%
2000	-	-	-	-	194	194	0.0%	100.0%
2001	-	-	-	-	197	197	0.0%	100.0%
2002	-	-	-	-	197	197	0.0%	100.0%
2003	-	-	-	-	146	146	0.0%	100.0%
2004	-	-	-	-	149	149	0.0%	100.0%
2005	-	-	-	-	152	152	0.0%	100.0%
2006	-	-	-	3	156	159	1.9%	100.0%
2007	-	-	-	3	125	128	2.4%	100.0%
2008	-	-	-	5	262	267	1.9%	100.0%
2009	-	-	-	3	239	242	1.3%	100.0%
2010	-	-	-	-	239	239	0.0%	100.0%
2011	-	-	-	-	222	222	0.0%	100.0%
2012	-	-	-	-	326	326	0.0%	100.0%
2013	-	-	-	-	218	218	0.0%	100.0%
2014	-	-	-	-	220	220	0.0%	100.0%
2015	-	-	-	-	132	132	0.0%	100.0%
2016	-	-	-	-	180	180	0.0%	100.0%

Source: Energy Information Administration, State Energy Data System

6 Hawaii Petroleum Expenditures

As shown in Table 6.1, petroleum accounted for 95.9% of Hawaii's primary energy expenditures and about 64.7% of total energy expenditures (including electricity addition) in 2016. Due to fluctuations of petroleum price, petroleum's share of total energy expenditures increased from 74.3% in 1970 to 86.6% in 1980; the share decreased to 58.6% in 1998, increased to 78.9% in 2007, and then decreased to 64.7% in 2016.

Table 6.1 Hawaii Total Energy, Primary Energy, and Petroleum Expenditures

Year	Total Energy Expenditures \$ Million	Primary Energy Expenditures \$ Million	Petroleum Expenditures \$ Million	Petroleum as % of	
				Total Energy %	Primary Energy %
1970	273.9	203.8	203.5	74.3	99.9
1975	651.5	518.6	518.1	79.5	99.9
1980	1,720.7	1,539.7	1,490.3	86.6	96.8
1981	2,060.7	1,785.0	1,730.3	84.0	96.9
1985	1,906.9	1,594.7	1,542.0	80.9	96.7
1986	1,461.9	1,139.2	1,100.7	75.3	96.6
1987	1,480.5	1,179.4	1,137.6	76.8	96.5
1988	1,592.9	1,267.9	1,227.4	77.1	96.8
1989	1,809.4	1,463.4	1,422.9	78.6	97.2
1990	2,117.9	1,807.6	1,764.9	83.3	97.6
1991	2,029.2	1,540.2	1,488.4	73.3	96.6
1992	1,984.3	1,472.8	1,416.7	71.4	96.2
1993	2,017.2	1,398.4	1,332.0	66.0	95.3
1994	2,122.1	1,441.7	1,375.7	64.8	95.4
1995	2,202.7	1,470.2	1,392.8	63.2	94.7
1996	2,305.8	1,532.5	1,453.4	63.0	94.8
1997	2,272.6	1,455.8	1,375.7	60.5	94.5
1998	2,092.5	1,296.7	1,226.6	58.6	94.6
1999	2,163.2	1,379.8	1,309.6	60.5	94.9
2000	2,705.1	1,863.0	1,783.7	65.9	95.7
2001	2,779.2	1,891.1	1,813.3	65.2	95.9
2002	2,688.2	1,882.7	1,798.8	66.9	95.5
2003	3,335.9	2,341.4	2,223.1	66.6	94.9
2004	4,024.6	2,886.3	2,782.3	69.1	96.4
2005	4,996.9	3,892.2	3,785.4	75.8	97.3
2006	5,729.1	4,535.9	4,418.7	77.1	97.4
2007	6,177.1	4,994.8	4,871.1	78.9	97.5
2008	6,828.5	5,297.3	5,138.9	75.3	97.0
2009	4,804.8	3,540.1	3,413.2	71.0	96.4
2010	5,863.7	4,530.7	4,385.3	74.8	96.8
2011	7,682.5	6,184.3	6,025.5	78.4	97.4
2012	7,845.7	6,246.7	6,079.6	77.5	97.3
2013	7,684.4	6,013.5	5,849.0	76.1	97.3
2014	7,434.0	5,648.0	5,471.4	73.6	96.9
2015	5,708.6	4,010.1	3,854.7	67.5	96.1
2016	5,037.8	3,403.0	3,261.8	64.7	95.9

Source: Energy Information Administration, State Energy Data System

From 1970 to 1981, petroleum expenditures as percent of nominal GDP increased from 4.4% to 12.3%; it decreased to 3.3% in 1998, increased to 8.6% in 2011, and then decreased to 3.8% in 2016.

Table 6.2 Petroleum Expenditures and Gross Domestic Product (GDP)

Year	Nominal GDP \$ Million	Petroleum Expenditures \$ Million	Petroleum Expenditures As Percent of GDP
1970	4,639.4	203.5	4.4
1975	7,878.2	518.1	6.6
1980	12,897.4	1,490.3	11.6
1981	14,111.9	1,730.3	12.3
1985	19,974.6	1,542.0	7.7
1986	21,627.7	1,100.7	5.1
1987	23,397.5	1,137.6	4.9
1988	25,832.4	1,227.4	4.8
1989	28,365.6	1,422.9	5.0
1990	31,360.5	1,764.9	5.6
1991	33,117.8	1,488.4	4.5
1992	34,825.9	1,416.7	4.1
1993	35,407.1	1,332.0	3.8
1994	36,046.2	1,375.7	3.8
1995	36,400.9	1,392.8	3.8
1996	36,749.9	1,453.4	4.0
1997	37,655.0	1,375.7	3.7
1998	37,585.0	1,226.6	3.3
1999	39,224.0	1,309.6	3.3
2000	41,472.0	1,783.7	4.3
2001	43,089.0	1,813.3	4.2
2002	45,581.0	1,798.8	3.9
2003	49,136.0	2,223.1	4.5
2004	53,755.0	2,782.3	5.2
2005	58,573.0	3,785.4	6.5
2006	62,054.0	4,418.7	7.1
2007	65,210.0	4,871.1	7.5
2008	66,692.0	5,138.9	7.7
2009	65,382.0	3,413.2	5.2
2010	68,225.0	4,385.3	6.4
2011	70,017.0	6,025.5	8.6
2012	72,532.0	6,079.6	8.4
2013	74,630.0	5,849.0	7.8
2014	77,035.0	5,471.4	7.1
2015	81,900.0	3,854.7	4.7
2016	84,904.0	3,261.8	3.8

Source: Energy Information Administration, State Energy Data System

Petroleum expenditures are affected by the petroleum price and consumption. Since petroleum consumption is less volatile than the petroleum price, the fluctuation of Hawaii's petroleum expenditures is mainly affected by the fluctuation of petroleum prices or the average expenditure of petroleum.

From 1970 to 2016, Hawaii's total petroleum expenditures increased \$3,058.3 million or 6.2% per year on average; the average petroleum expenditure increased \$12.61/MBTUs (\$71.24/BBL) or 5.8% per year; and petroleum consumption increased 0.4% per year.

Petroleum expenditures are very volatile over time mainly due to petroleum price fluctuations. As shown in Table 6.3, from 1970 to 1981, the average petroleum expenditure in dollars per million BTUs (\$/MBTUs) increased about 20.0% per year. As a result, petroleum expenditures in Hawaii increased \$1,526.8 million or 21.5% per year. During this period, the consumption of petroleum only increased 1.2% per year.

From 1981 to 1998, the average petroleum expenditure in \$/MBTUs decreased about 2.3% per year, as a result, petroleum expenditures in Hawaii decreased \$503.7 million or 2.0% per year. During this period, the consumption of petroleum only increased 0.3% per year.

From 1998 to 2008, the average petroleum expenditure in \$/MBTUs increased about 15.0% per year, as a result, petroleum expenditures in Hawaii increased \$3,912.3 million or 15.4% per year. During this period, the consumption of petroleum only increased 0.4% per year.

From 2008 to 2009, the average petroleum expenditure decreased about 33.7% per year, and petroleum expenditures in Hawaii decreased \$1,725.7 million or 33.6% per year.

From 2009 to 2012, the average petroleum expenditure increased about 21.2% per year, and petroleum expenditures in Hawaii increased \$2,678.8 million or 21.2% per year.

From 2012 to 2016, the average petroleum expenditure decreased by about 14.1% per year, and petroleum expenditures in Hawaii decreased by \$2,830.2 million or 14.4% per year.

Table 6.3 Hawaii Average Petroleum Expenditure

Year	Petroleum Expenditures \$ Million	Petroleum Consumption BBTUs	Petroleum Consumption TBBLs	Average Petroleum Expenditures	
				\$/MBTUs	\$/BBL
1970	203.5	195,419	34,105	1.04	5.97
1975	518.1	212,931	37,097	2.43	13.97
1980	1,490.3	249,648	43,563	5.97	34.21
1981	1,730.3	223,223	38,811	7.75	44.58
1985	1,542.0	232,124	40,005	6.64	38.55
1986	1,100.7	227,619	39,044	4.84	28.19
1987	1,137.6	228,895	39,390	4.97	28.88
1988	1,227.4	268,024	45,902	4.58	26.74
1989	1,422.9	280,098	48,021	5.08	29.63
1990	1,764.9	292,763	50,014	6.03	35.29
1991	1,488.4	266,575	45,757	5.58	32.53
1992	1,416.7	272,492	46,655	5.20	30.37
1993	1,332.0	239,475	41,392	5.56	32.18
1994	1,375.7	258,204	44,844	5.33	30.68
1995	1,392.8	252,515	43,843	5.52	31.77
1996	1,453.4	238,803	41,631	6.09	34.91
1997	1,375.7	230,561	39,829	5.97	34.54
1998	1,226.6	233,636	40,493	5.25	30.29
1999	1,309.6	229,990	39,663	5.69	33.02
2000	1,783.7	235,315	40,592	7.58	43.94
2001	1,813.3	239,948	41,480	7.56	43.72
2002	1,798.8	257,593	44,772	6.98	40.18
2003	2,223.1	269,486	46,860	8.25	47.44
2004	2,782.3	282,923	49,098	9.83	56.67
2005	3,785.4	295,104	51,267	12.83	73.84
2006	4,418.7	296,907	51,564	14.88	85.69
2007	4,871.1	305,431	52,905	15.95	92.07
2008	5,138.9	242,490	42,396	21.19	121.21
2009	3,413.2	242,984	42,472	14.05	80.36
2010	4,385.3	244,686	42,754	17.92	102.57
2011	6,025.5	252,748	44,378	23.84	135.78
2012	6,079.6	243,051	42,769	25.01	142.15
2013	5,849.0	240,607	42,336	24.31	138.16
2014	5,471.4	237,841	41,974	23.00	130.35
2015	3,854.7	242,486	42,786	15.90	90.09
2016	3,261.8	238,946	42,246	13.65	77.21
Annual Average Growth Rate (%)					
1970-1981	21.5%	1.2%	1.2%	20.0%	20.1%
1981-1998	-2.0%	0.3%	0.2%	-2.3%	-2.2%
1998-2008	15.4%	0.4%	0.5%	15.0%	14.9%
2008-2009	-33.6%	0.2%	0.2%	-33.7%	-33.7%
2009-2012	21.2%	0.0%	0.2%	21.2%	20.9%
2012-2016	-14.4%	-0.4%	-0.3%	-14.1%	-14.2%
1970-2016	6.2%	0.4%	0.5%	5.8%	5.7%

Source: Energy Information Administration, State Energy Data System

From 1970 to 2016, the average petroleum expenditure increased 5.8% per year, among the four major petroleum products, the average expenditure of distillate fuel oil increased the most at 6.8% per year; followed by residual fuel oil at 6.7%, jet fuel at 5.9%, and motor gasoline at 4.4% (Table 6.4).

Table 6.4 Hawaii Average Petroleum Expenditure by Product in Heat Content

Year	Total Petroleum \$/MBTU	Jet Fuel \$/MBTU	Residual Fuel \$/MBTU	Motor Gasoline \$/MBTU	Distillate Fuel \$/MBTU	HGL/LPG \$/MBTU	Asphalt Road Oil \$/MBTU	Lubricants \$/MBTU	Aviation Gasoline \$/MBTU
1970	1.0	0.7	0.4	3.3	1.0	1.5	0.6	5.1	2.2
1975	2.4	2.0	1.5	5.4	2.3	2.3	1.8	7.4	3.4
1980	6.0	6.2	3.7	10.8	6.6	4.2	3.6	14.4	9.1
1981	7.8	7.6	6.1	12.5	8.1	3.8	4.6	18.1	10.9
1985	6.6	6.2	4.8	11.1	7.9	11.2	4.4	18.1	9.9
1990	6.0	6.0	3.9	11.7	7.9	11.6	3.2	20.5	9.3
1995	5.5	4.4	2.9	11.5	7.3	7.1	3.2	21.7	8.4
2000	7.6	7.0	4.9	13.4	9.3	17.8	3.4	23.2	11.1
2001	7.6	5.9	4.8	14.5	9.0	18.7	3.7	24.5	11.1
2002	7.0	5.5	4.7	12.4	7.9	15.9	3.8	26.7	10.1
2003	8.2	6.6	4.7	15.2	10.5	17.6	4.2	28.9	13.0
2004	9.8	9.4	4.9	17.2	12.8	19.7	4.8	30.1	15.2
2005	12.8	12.9	8.1	20.7	15.7	23.1	5.0	35.2	18.8
2006	14.9	15.1	9.3	24.0	19.1	25.4	4.8	43.9	22.1
2007	15.9	16.2	10.7	24.5	20.2	26.5	5.3	47.0	23.8
2008	21.2	22.4	15.7	29.4	26.1	34.6	6.3	55.2	27.1
2009	14.0	12.7	9.1	22.9	16.8	27.2	16.1	56.2	20.1
2010	17.9	16.4	12.9	27.9	21.9	31.2	16.3	58.8	25.0
2011	23.8	22.7	18.5	34.4	29.1	32.3	18.4	69.6	31.8
2012	25.0	22.9	20.4	36.2	30.6	29.9	20.8	72.1	32.9
2013	24.3	22.6	19.5	34.8	30.2	27.4	21.7	69.5	32.4
2014	23.0	21.0	18.5	33.7	27.5	29.4	21.8	69.4	32.9
2015	15.9	12.3	9.7	27.6	22.2	18.3	18.0	67.3	24.4
2016	13.7	10.3	7.6	24.1	20.3	19.5	13.0	65.8	22.6
Annual Average Growth Rate (%)									
1970-1981	20.0%	23.7%	28.5%	12.8%	20.9%	8.5%	21.1%	12.2%	15.5%
1981-1998	-2.3%	-4.2%	-5.0%	-0.2%	-2.0%	8.3%	-1.4%	1.0%	-1.7%
1998-2008	15.0%	19.8%	19.9%	9.4%	16.2%	9.0%	5.7%	10.0%	12.8%
2008-2009	-33.7%	-43.5%	-41.9%	-22.1%	-35.5%	-21.5%	157.7%	1.7%	-25.8%
2009-2012	21.2%	21.9%	31.0%	16.5%	22.1%	3.2%	8.9%	8.7%	17.8%
2012-2016	-14.1%	-18.0%	-22.0%	-9.7%	-9.8%	-10.1%	-11.1%	-2.3%	-9.0%
1970-2016	5.8%	5.9%	6.7%	4.4%	6.8%	5.7%	7.1%	5.7%	5.2%

Source: Energy Information Administration, State Energy Data System

From 1970 to 2016, the average petroleum expenditure in Hawaii increased from \$6.0/BBL to \$77.2/BBL. The average petroleum expenditures reached a peak of \$142.1/BBL in 2012. In 2016, among the four major petroleum products consumed in Hawaii, the average expenditure of motor gasoline was highest at \$121.7/BBL; followed by distillate fuel oil at \$117.2/BBL, jet fuel at \$58.7/BBL, and residual fuel oil at \$47.7/BBL.

Table 6.5 Hawaii Average Petroleum Expenditure by Product in Physical Unit

Year	Total Petroleum \$/BBL	Jet Fuel \$/BBL	Residual Fuel \$/BBL	Motor Gasoline \$/BBL	Distillate Fuel \$/BBL	HGL/LPG \$/BBL	Asphalt Road Oil \$/BBL	Lubricants \$/BBL	Aviation Gasoline \$/BBL
1970	6.0	4.1	2.4	17.4	5.8	5.9	3.7	31.0	11.3
1975	14.0	11.5	9.6	28.6	13.1	8.7	11.6	45.2	17.2
1980	34.2	34.9	23.4	56.8	38.2	15.6	23.9	87.2	45.7
1981	44.6	42.3	38.4	65.5	47.3	14.0	30.5	110.0	54.6
1985	38.5	34.8	30.0	58.5	45.8	42.9	29.5	109.3	50.3
1990	35.3	33.6	24.6	61.5	45.8	44.4	21.0	125.0	47.1
1991	32.5	29.1	19.4	54.6	45.8	42.1	21.9	137.2	44.1
1992	30.4	27.7	17.4	57.5	42.0	40.9	18.6	136.4	43.2
1993	32.2	27.1	18.4	58.2	43.8	21.0	19.6	134.4	41.9
1994	30.7	24.4	16.4	59.2	43.1	24.4	20.6	130.9	40.0
1995	31.8	25.2	18.4	59.9	42.5	25.5	21.2	131.5	42.2
1996	34.9	29.7	21.2	63.4	45.0	28.4	22.4	131.5	46.7
1997	34.5	28.5	22.0	63.9	37.4	64.7	23.0	133.0	47.1
1998	30.3	20.8	16.0	62.5	33.8	55.3	23.9	129.3	41.1
1999	33.0	27.1	19.9	59.0	41.0	62.8	23.5	139.0	44.8
2000	43.9	39.6	30.7	70.0	54.1	68.0	22.8	140.8	55.6
2001	43.7	33.3	30.1	75.7	52.3	71.1	24.6	148.9	56.3
2002	40.2	30.9	29.5	64.6	45.9	59.4	25.2	161.8	50.0
2003	47.4	37.3	29.7	79.0	61.1	66.5	28.2	175.6	66.7
2004	56.7	53.4	30.9	89.6	74.6	74.9	31.7	183.1	76.9
2005	73.8	73.3	50.7	107.6	91.4	88.2	33.2	213.3	95.5
2006	85.7	85.6	58.5	124.4	110.6	96.8	33.3	265.4	112.2
2007	92.1	92.0	67.5	126.5	117.1	100.5	33.3	286.7	119.5
2008	121.2	127.0	98.4	150.5	150.9	132.8	50.0	336.4	135.7
2009	80.4	71.8	57.1	116.6	97.3	103.9	106.9	338.6	100.0
2010	102.6	92.9	80.9	141.8	126.7	119.5	107.9	357.3	127.0
2011	135.8	128.5	116.4	174.4	168.3	123.8	122.1	423.4	160.0
2012	142.1	130.1	128.5	183.2	176.9	114.7	138.1	439.6	164.5
2013	138.2	128.1	122.5	176.2	174.1	105.1	144.0	422.8	163.0
2014	130.4	119.3	116.5	170.4	158.7	112.7	144.6	422.3	164.3
2015	90.1	69.9	60.8	139.9	128.0	70.1	119.1	408.7	122.2
2016	77.2	58.7	47.7	121.7	117.2	75.0	86.2	400.0	116.7

Source: Energy Information Administration, State Energy Data System

Hawaii's petroleum expenditures by major product category are provided in Table 6.6. From 1970 to 2016, the share of distillate fuel oil increased 11.4 percentage points, the share of residual fuel oil increased 2.0 percentage points, the share of motor gasoline decreased 6.9 percentage points, the share of jet fuel decreased 5.1 percentage points, and the share of other petroleum products decreased 1.4 percentage point.

Table 6.6 Hawaii Petroleum Expenditures by Product

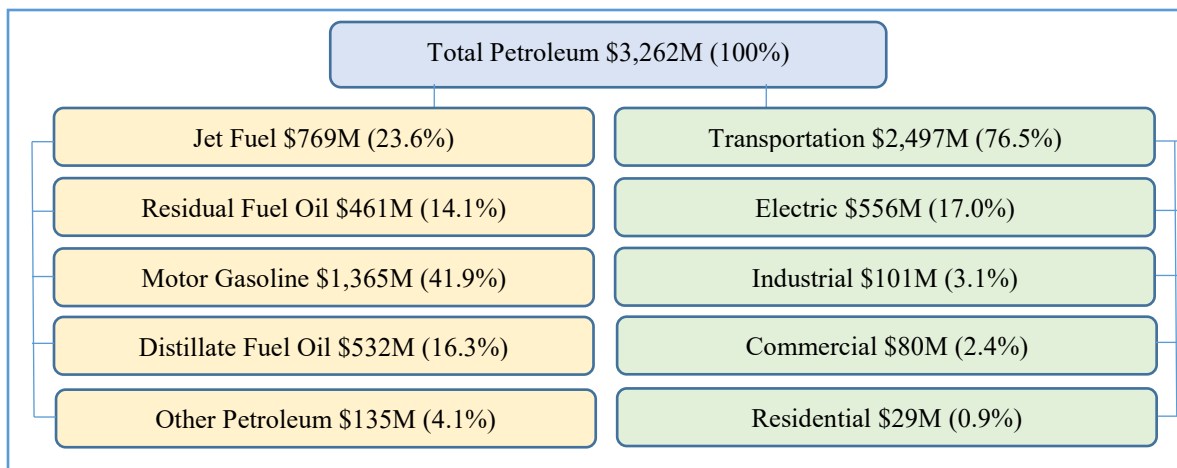
Year	Petroleum Expenditures: \$ Million						% of Petroleum Expenditures				
	Total Petro-leum	Jet Fuel	Resi-dual Fuel Oil	Motor Gaso-line	Disti-llate Fuel Oil	Other Petro-leum	Jet Fuel	Resi-dual Fuel Oil	Motor Gaso-line	Disti-llate Fuel Oil	Other Petro-leum
1970	203.5	58.4	24.7	99.2	9.9	11.3	28.7%	12.1%	48.7%	4.9%	5.6%
1975	518.1	170.3	108.5	193.5	25.6	20.2	32.9%	20.9%	37.3%	4.9%	3.9%
1980	1,490.3	492.4	308.6	410.7	228.7	49.9	33.0%	20.7%	27.6%	15.3%	3.3%
1981	1,730.3	424.4	505.3	470.9	285.0	44.7	24.5%	29.2%	27.2%	16.5%	2.6%
1985	1,542.0	462.1	395.4	444.4	207.1	33.0	30.0%	25.6%	28.8%	13.4%	2.1%
1990	1,764.9	425.3	468.5	533.4	297.0	40.7	24.1%	26.5%	30.2%	16.8%	2.3%
1995	1,392.8	250.5	266.8	563.9	246.0	65.6	18.0%	19.2%	40.5%	17.7%	4.7%
2000	1,783.7	373.4	415.5	650.0	275.5	69.3	20.9%	23.3%	36.4%	15.4%	3.9%
2001	1,813.3	295.9	400.1	735.3	316.0	66.0	16.3%	22.1%	40.6%	17.4%	3.6%
2002	1,798.8	315.0	375.6	673.4	371.0	63.8	17.5%	20.9%	37.4%	20.6%	3.5%
2003	2,223.1	474.0	359.0	837.6	501.4	51.1	21.3%	16.1%	37.7%	22.6%	2.3%
2004	2,782.3	714.2	404.7	962.2	644.5	56.7	25.7%	14.5%	34.6%	23.2%	2.0%
2005	3,785.4	1,199.9	669.5	1,181.7	667.7	66.6	31.7%	17.7%	31.2%	17.6%	1.8%
2006	4,418.7	1,313.2	858.4	1,434.2	739.8	73.1	29.7%	19.4%	32.5%	16.7%	1.7%
2007	4,871.1	1,173.3	1,102.0	1,435.5	1,088.1	72.2	24.1%	22.6%	29.5%	22.3%	1.5%
2008	5,138.9	1,359.2	1,222.2	1,607.0	830.0	120.5	26.4%	23.8%	31.3%	16.2%	2.3%
2009	3,413.2	667.7	707.5	1,263.6	588.8	185.6	19.6%	20.7%	37.0%	17.3%	5.4%
2010	4,385.3	913.9	961.4	1,416.9	868.4	224.7	20.8%	21.9%	32.3%	19.8%	5.1%
2011	6,025.5	1,407.1	1,363.3	1,943.7	1,062.4	249.0	23.4%	22.6%	32.3%	17.6%	4.1%
2012	6,079.6	1,471.3	1,378.6	1,939.7	1,078.7	211.3	24.2%	22.7%	31.9%	17.7%	3.5%
2013	5,849.0	1,450.9	1,271.5	1,893.3	995.9	237.4	24.8%	21.7%	32.4%	17.0%	4.1%
2014	5,471.4	1,541.9	1,150.0	1,846.1	692.0	241.4	28.2%	21.0%	33.7%	12.6%	4.4%
2015	3,854.7	938.5	592.7	1,546.4	605.5	171.6	24.3%	15.4%	40.1%	15.7%	4.5%
2016	3,261.8	768.9	461.3	1,365.4	531.5	134.7	23.6%	14.1%	41.9%	16.3%	4.1%
Annual Average Growth Rate (%)											
1970-1981	21.5%	19.8%	31.6%	15.2%	35.7%	13.3%	-1.4%	8.3%	-5.2%	11.7%	-6.7%
1981-1998	-2.0%	-4.1%	-5.0%	1.3%	-3.7%	2.9%	-2.2%	-3.0%	3.3%	-1.7%	5.0%
1998-2008	15.4%	20.7%	19.2%	10.7%	18.6%	5.2%	4.6%	3.2%	-4.1%	2.8%	-8.9%
2008-2009	-33.6%	-50.9%	-42.1%	-21.4%	-29.1%	54.0%	-26.0%	-12.8%	18.4%	6.8%	131.9%
2009-2012	21.2%	30.1%	24.9%	15.4%	22.4%	4.4%	7.4%	3.0%	-4.8%	0.9%	-13.9%
2012-2016	-14.4%	-15.0%	-23.9%	-8.4%	-16.2%	-10.6%	-0.7%	-11.1%	7.0%	-2.1%	4.4%
1970-2016	6.2%	5.8%	6.6%	5.9%	9.0%	5.5%	-0.4%	0.3%	-0.3%	2.7%	-0.6%

Source: Energy Information Administration, State Energy Data System

In 2016, the total petroleum expenditures in Hawaii was about \$3,262 million. Motor gasoline accounted for the most at 41.9%; followed by jet fuel at 23.6%, distillate fuel oil at 16.3%, residual fuel oil at 14.1%, and other petroleum products at 4.1% (Figure 6.1). Among the six types of petroleum products included in other petroleum consumed in 2016, still gas and petroleum coke were the two groups consumed by the industrial sector without charge, therefore, their expenditures were zero. Expenditures on other petroleum products mainly include expenditures on LPG/HGL (\$59.9 million or 1.8% of total petroleum expenditures), lubricants (\$38.4 million or 1.2%), and asphalt and road oil (\$35.6 million or 1.1%). Expenditures on aviation gasoline was only \$0.7 million in 2016.

Among the five sectors, petroleum expenditures of the transportation sector accounted for the most at 76.5%; followed by the electricity sector at 17.0%, industrial sector at 3.1%, commercial sector at 2.4%, and the residential sector at 0.9%.

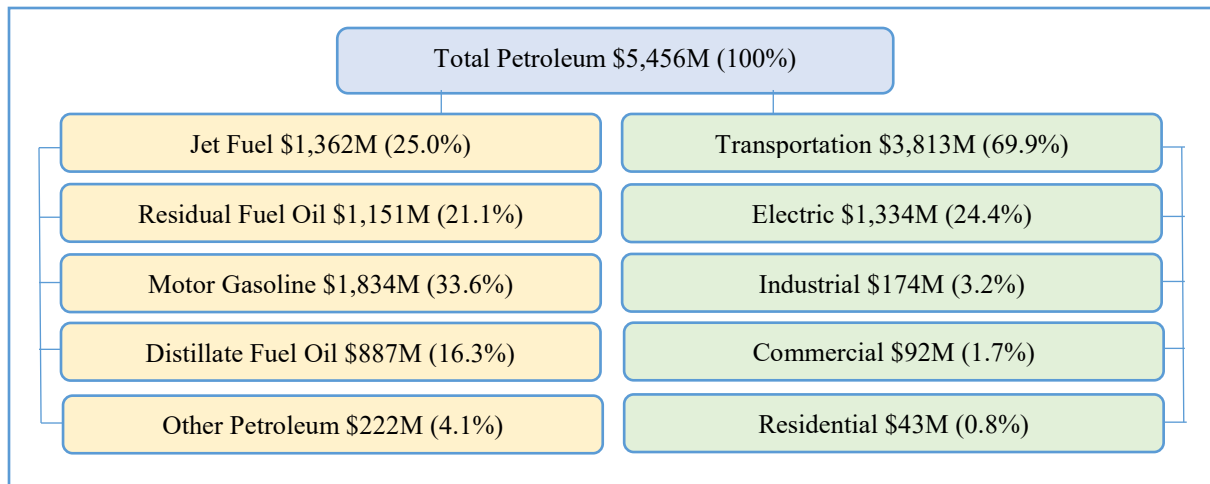
Figure 6.1 2016 Hawaii Petroleum Expenditures (\$M)



The average petroleum expenditures in the previous five years from 2011 to 2015 are provided in Figure 6.2. The average total petroleum expenditure in Hawaii was about \$5,456 million. Motor gasoline accounted for the most at 33.6%; followed by jet fuel at 25.0%, residual fuel oil at 21.1%, distillate fuel oil at 16.3%, and other petroleum products at 4.1%.

Among the five sectors, petroleum expenditures of the transportation sector accounted for the most at 69.9%; followed by the electricity sector at 24.4%, industrial sector at 3.2%, commercial sector at 1.7%, and the residential sector at 0.8%.

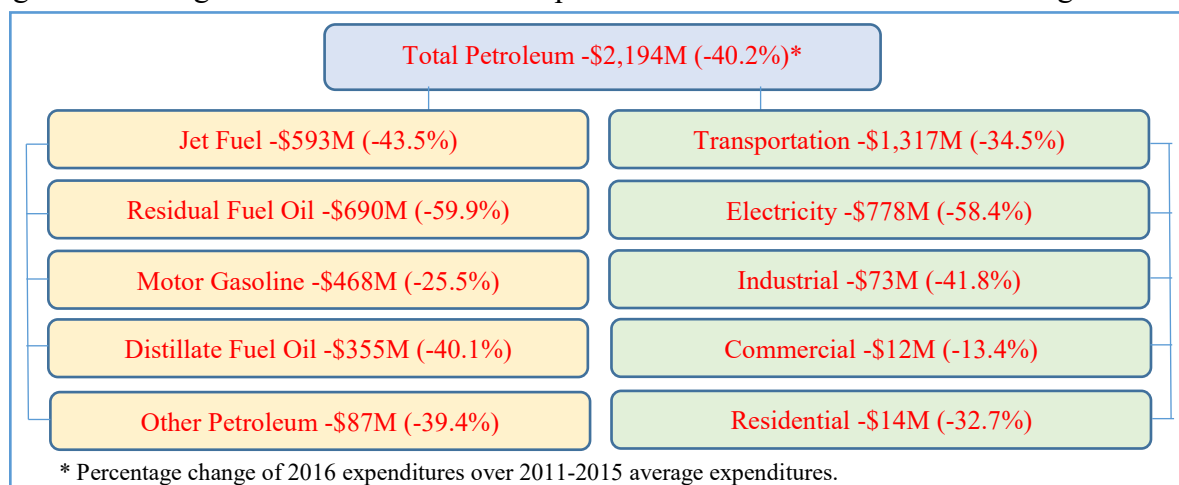
Figure 6.2 Average 2011-2015 Hawaii's Petroleum Expenditures (\$M)



The changes of petroleum expenditures in 2016 over the average of the previous five years are provided in Figure 6.3. In 2016, the total petroleum expenditures in Hawaii decreased \$2,194 million or 40.2% from the average expenditures of the previous five years. The expenditures of residual fuel oil decreased the most at \$690 million or 59.9%; followed by jet fuel at \$593 million or 43.5%, motor gasoline at \$468 million or 25.5%, distillate fuel oil at \$355 million or 40.1%, and other petroleum at \$87 million or 39.4%.

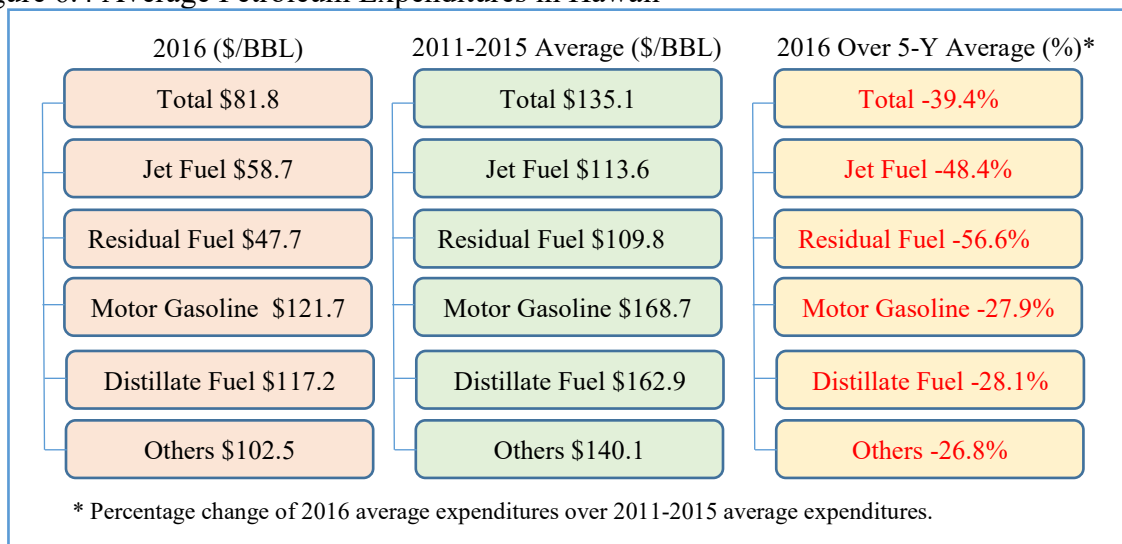
Among the five sectors, the transportation sector decreased the most at \$1,317 million or 34.5%; followed by the electric power sector at \$778 million or 58.4%, industrial sector at \$73 million or 41.8%, residential sector at \$14 million or 32.7%, and commercial sector at \$12 million or 13.4%.

Figure 6.3 Changes of Hawaii Petroleum Expenditures 2016 over 2011-2015 Average



The changes of average petroleum expenditures in 2016 over the average of the previous five years are provided in Figure 6.4. In 2016, the average total petroleum expenditure in Hawaii decreased 39.4% compared with the average of the previous five years from \$135.1/BBL to \$81.8/BBL. The average expenditure of residual fuel oil decreased the most at 56.6%; followed by jet fuel at 48.4%, distillate fuel oil at 28.1%, motor gasoline at 27.9%, and other petroleum at 26.8%.

Figure 6.4 Average Petroleum Expenditures in Hawaii



The average petroleum expenditure by product and sector in 2016 are provided in Table 6.7. For residual fuel oil, the average expenditures in the electric power sector was the highest; followed by the transportation sector, and the industrial sector. For distillate fuel oil, the average expenditures in the transportation sector was the highest; followed by the commercial sector, industrial sector, and the electric power sector.

Table 6.7 2016 Hawaii Average Petroleum Expenditures by Product and Sector

Product	Units: \$/BBL					Total
	Residential	Commercial	Industrial	Transportation	Electric	
Total Petroleum	162.2	73.9	77.6	93.2	52.9	81.8
Jet Fuel	NA	NA	NA	58.7	NA	58.7
Residual Fuel Oil	NA	NA	21.8	38.5	49.8	47.7
Motor Gasoline	NA	121.7	121.7	121.7	NA	121.7
Distillate Fuel Oil	NA	71.3	68.1	172.1	65.9	117.2
Other Petroleum	162.2	49.8	104.2	360.8	NA	102.5
LPG/HGL	162.2	49.8	44.4	50.0	NA	75.1
Asphalt and Road Oil	NA	NA	86.2	NA	NA	86.2
Lubricants	NA	NA	400.0	400.0	NA	400.0
Aviation Gasoline	NA	NA	NA	116.7	NA	116.7

Source: EIA