



2018 GHG Emissions Report

City of Sacramento

Provided by Utilimarc

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General Methodology

This report contains the results of two separate analyses based on your data pulled from the Utilimarc® database. These analyses include your fuel consumption by type as a percentage of fleet and your Greenhouse Gas Emissions analysis. This methodology gives industry comparison and provides access to the industry methods, practices and processes.

The purpose of this report is to provide initial baseline information that will provide an opportunity to be able to track and trend fuel consumption by type and total fleet GHG emissions on an annual basis.

The different types of fuel in the Utilimarc database are as follows:

- Unleaded Gasoline
- Diesel
- Propane
- CNG
- CNG Bi-fuel
- LNG
- LNG Bi-fuel
- E85
- Gas/Electric Hybrid
- Diesel/Electric Hybrid

In order to have a direct comparison of total fuel consumed, we use a Gasoline Gallon Equivalent (GGE) for LNG, CNG and Propane units. This ensures that your fuel consumption percentage is based on gallons and therefore a direct comparison can be made between all fuel types.

Summary Report

- Gasoline consumption increased 5.4% from 2016 to 2017.
- Diesel fuel consumption decreased 3.2% from 2016 to 2017.
- LNG fuel consumption decreased 2.9% from 2016 to 2017.
- CNG fuel consumption increased 30.9% from 2016 to 2017.
- Propane fuel consumption increased 44.2% from 2016 to 2017.
- E85 fuel consumption decreased 40.5% from 2017 to 2017.
- Your fleet's total fuel consumption increased 0.13% from 2016 to 2017.

Your greenhouse gas emissions increased 1.02% from 2016 to 2017.

Fuel Consumption

The table below compares each of your fuel types as a percentage of your total fuel consumption over the past three years and compares it to 2017 industry averages. This data is useful in understanding how your total fuel consumption compares to the industry. Of particular significance is your LNG consumption, which was 26.9% of your total fuel consumption in 2017. Your fleet has now begun to consume E85 fuel near the industry average.

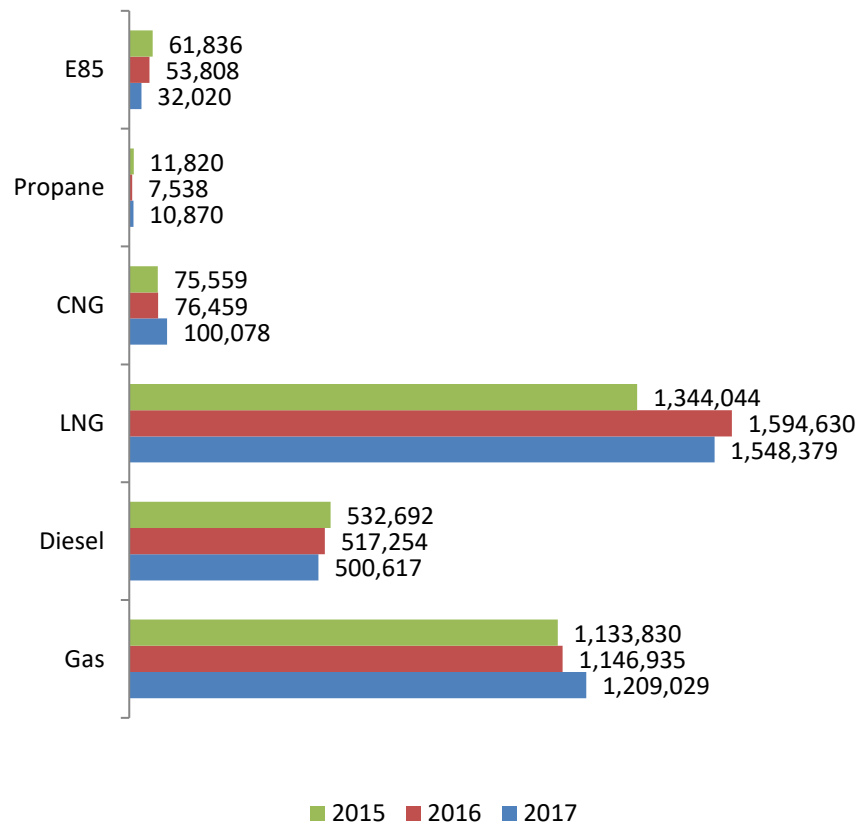
Fuel Type as % of Your Total Fuel Consumption compared to Industry Average

Trending Fuel Consumption Table

Fuel Type ¹	2015	2016	2017	2017 Industry Consumption
Gas	35.9%	33.8%	35.5%	30.8%
Diesel	16.9%	15.2%	14.7%	30.0%
LNG	42.5%	46.9%	45.5%	0.0%
CNG	2.4%	2.3%	2.9%	13.1%
Propane	0.4%	0.2%	0.3%	0.1%
E85	2.0%	1.6%	0.9%	25.9%

Fuel Gallon Consumption Trend: 2015 to 2017

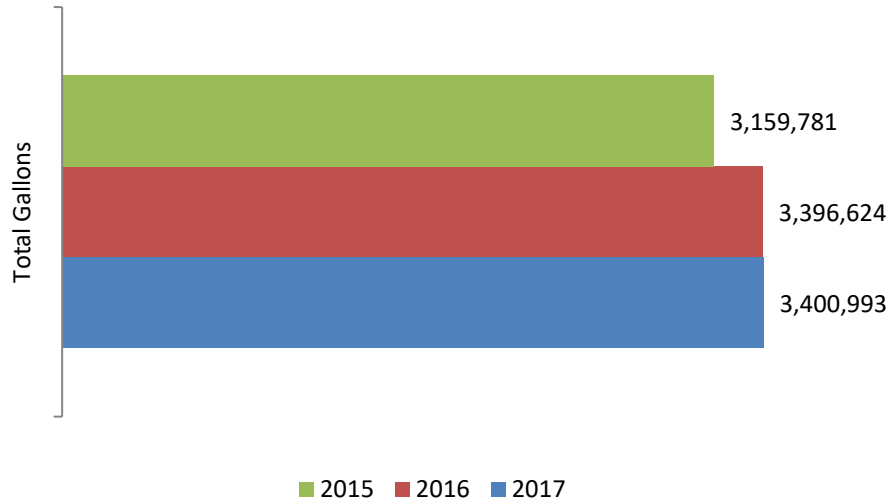
This graph displays the trend of each fuel type consumed over the past three years.



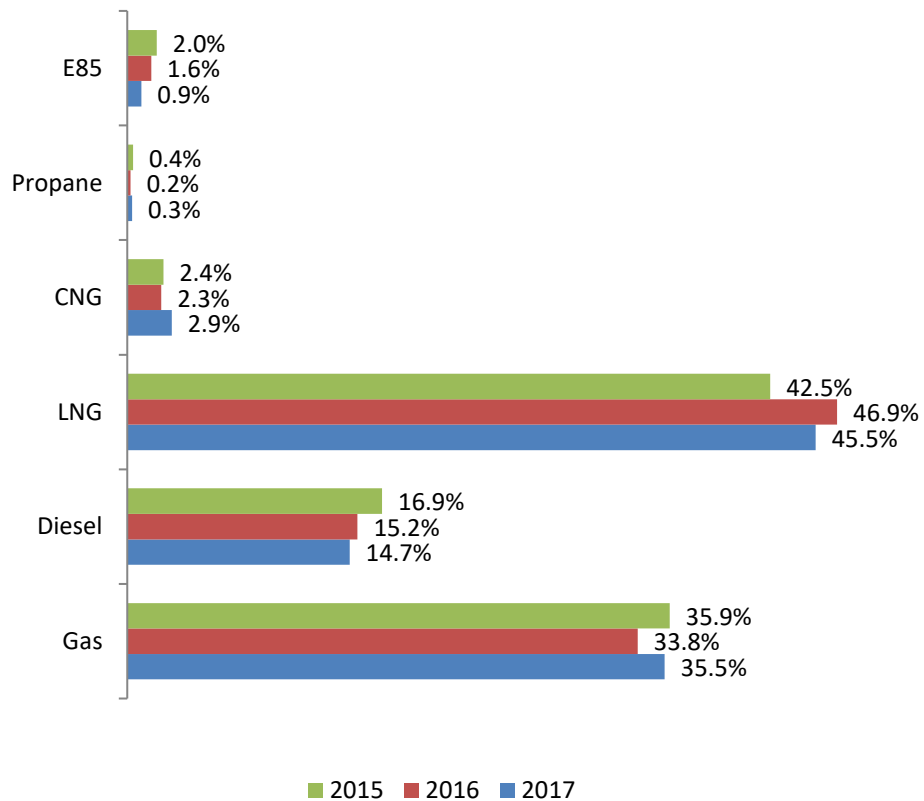
- **Gas:** Your fleet's gas consumption had a 5.4% increase from 2016 to 2017. Gas fuel is your second largest fuel type consumed on an annual basis.
- **Diesel:** Your fleet's diesel consumption decreased by 3.2% from 2016 to 2017. Diesel fuel remains your third largest fuel type consumed on an annual basis.
- **LNG:** Your fleet's LNG consumption decreased 2.9% from 2016 to 2017 and is your fleet's largest fuel type consumed on an annual basis.
- **E85:** Your fleet's E85 consumption has decreased 40.5% from 2016 to 2017.
- **Propane:** Your fleet's Propane consumption has increased 44.2% from 2016 to 2017 but is still your fleets smallest fuel type consumed on an annual basis.

Total Gallons Consumed Trend

Your fleet consumed a total of 3,159,781 gallons in 2015 compared to 3,400,993 gallons in 2017.



Fuel Type as Percentage of Total Fuel Consumed Trend



2015 Greenhouse Gas Emissions

Fleet Fuel Consumption:

Motor Gasoline			1,133,830	gallons
Diesel Fuel			532,692	gallons
Liquefied Petroleum Gas			11,820	gallons
Ethanol	Blend: E	85.00	61,836	gallons
Biodiesel	Blend: B	-	-	gallons
Liquefied Natural Gas			1,344,044	gallons
Compressed Natural Gas			75,559	gge
Electricity			-	KWH

Your total greenhouse gas emissions are **29,564.33 metric tons**

Results displayed in CO ₂ equivalent metric tons	CO ₂	N ₂ O	CH ₄	HFCs	Direct Emission Totals	Upstream CO ₂	Totals
Source Breakdown							
Aggregate: Mixed light-, medium- and heavy-duty vehicles	22,528.98	369.50	24.86	882.95	23,806.29	5,758.04	29,564.33
Fuel Breakdown							
Motor Gasoline (gallons)	10,196.50	167.24	11.25	399.62	10,774.61	2,493.09	13,267.69
Diesel Fuel (gallons)	5,454.23	89.46	6.02	213.76	5,763.47	1,315.22	7,078.68
Liquefied Petroleum Gas (gallons)	68.33	1.12	0.08	2.68	72.20	11.29	83.49
Ethanol (gallons)	300.59	4.93	0.33	11.78	317.63	(10.24)	307.39
Biodiesel (gallons)	-	-	-	-	-	-	-
Liquefied Natural Gas (gallons)	5,991.76	98.27	6.61	234.83	6,331.47	1,796.99	8,128.46
Compressed Natural Gas (scf)	517.56	8.49	0.57	20.28	546.91	151.70	698.61
Electricity (KWH)	-	-	-	-	-	-	-
Total	22,528.98	369.50	24.86	882.95	23,806.29	5,758.04	29,564.33
Percent	76.20%	1.25%	0.08%	2.99%	80.52%	19.48%	100.00%

2016 Greenhouse Gas Emissions

Fleet Fuel Consumption:

Motor Gasoline			1,146,935	gallons
Diesel Fuel			517,254	gallons
Liquefied Petroleum Gas			7,538	gallons
Ethanol	Blend: E	85.00	53,808	gallons
Biodiesel	Blend: B	-	-	gallons
Liquefied Natural Gas			1,594,630	gallons
Compressed Natural Gas			76,459	gge
Electricity			-	KWH

Your total greenhouse gas emissions are **30,950.95 metric tons**

Results displayed in CO ₂ equivalent metric tons	CO ₂	N ₂ O	CH ₄	HFCs	Direct Emission Totals	Upstream CO ₂	Totals
Source Breakdown							
Aggregate: Mixed light-, medium- and heavy-duty vehicles	23,536.56	386.03	25.97	922.44	24,871.00	6,079.96	30,950.95
Fuel Breakdown							
Motor Gasoline (gallons)	10,302.66	168.98	11.37	403.78	10,886.78	2,519.04	13,405.82
Diesel Fuel (gallons)	5,296.16	86.86	5.84	207.57	5,596.44	1,277.10	6,873.53
Liquefied Petroleum Gas (gallons)	43.57	0.71	0.05	1.71	46.04	7.20	53.24
Ethanol (gallons)	261.57	4.29	0.29	10.25	276.40	(8.91)	267.48
Biodiesel (gallons)	-	-	-	-	-	-	-
Liquefied Natural Gas (gallons)	7,108.87	116.59	7.84	278.61	7,511.92	2,132.02	9,643.95
Compressed Natural Gas (scf)	523.73	8.59	0.58	20.53	553.42	153.51	706.93
Electricity (KWH)	-	-	-	-	-	-	-
Total	23,536.56	386.03	25.97	922.44	24,871.00	6,079.96	30,950.95
Percent	76.04%	1.25%	0.08%	2.98%	80.36%	19.64%	100.00%

2017 Greenhouse Gas Emissions

Fleet Fuel Consumption:

Motor Gasoline			1,209,029	gallons
Diesel Fuel			500,617	gallons
Liquefied Petroleum Gas			10,870	gallons
Ethanol	Blend: E	85.00	32,020	gallons
Biodiesel	Blend: B	-	-	gallons
Liquefied Natural Gas			1,548,379	gallons
Compressed Natural Gas			100,078	gge
Electricity			-	KWH

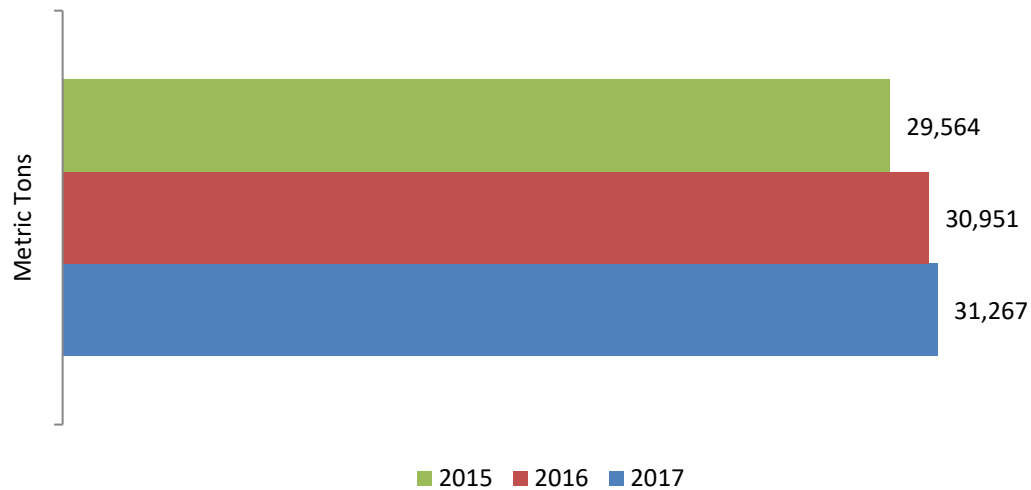
Your total greenhouse gas emissions are

31,266.54 metric tons

Results displayed in CO ₂ equivalent metric tons	CO ₂	N ₂ O	CH ₄	HFCs	Direct Emission Totals	Upstream CO ₂	Totals
Source Breakdown							
Aggregate: Mixed light-, medium- and heavy-duty vehicles	23,759.89	389.69	26.21	931.19	25,106.99	6,159.55	31,266.54
Fuel Breakdown							
Motor Gasoline (gallons)	10,827.38	177.58	11.95	424.34	11,441.25	2,647.34	14,088.59
Diesel Fuel (gallons)	5,125.82	84.07	5.66	200.89	5,416.43	1,236.02	6,652.45
Liquefied Petroleum Gas (gallons)	62.84	1.03	0.07	2.46	66.40	10.38	76.78
Ethanol (gallons)	155.65	2.55	0.17	6.10	164.48	(5.30)	159.17
Biodiesel (gallons)	-	-	-	-	-	-	-
Liquefied Natural Gas (gallons)	6,902.69	113.21	7.62	270.53	7,294.04	2,070.19	9,364.23
Compressed Natural Gas (scf)	685.51	11.24	0.76	26.87	724.38	200.93	925.31
Electricity (KWH)	-	-	-	-	-	-	-
Total	23,759.89	389.69	26.21	931.19	25,106.99	6,159.55	31,266.54
Percent	75.99%	1.25%	0.08%	2.98%	80.30%	19.70%	100.00%

Greenhouse Gas Emissions Trend

Your greenhouse gas emissions increased 316 metric tons from 2016 to 2017, a 1.02% increase.



Greenhouse Gas Emissions Calculation¹

Emissions Assumptions and Coefficients – provided by EDF²

Assumptions and Challenges

Tailpipe versus lifecycle emissions

Our calculator assists fleets in tracking their direct fleet environmental impact by quantifying tailpipe greenhouse gas emissions based on fuel-consumption data. Of course, activities involved in the production, refining and transporting fuels also result in greenhouse gas emissions. These upsteam emissions are part of a fleet's indirect environmental footprint and are not captured in our calculator.

Carbon Dioxide

Total emissions of carbon dioxide are calculated by multiplying volume of fuel consumed by the appropriate fuel-specific carbon dioxide coefficient. The CO₂ coefficients are drawn mainly from the U.S. EPA Climate Leaders guidance for mobile combustion sources. The CO₂ factors for electricity are from the U.S. Energy Information Agency. Emissions from ethanol and biodiesel are based on direct tailpipe emissions as reported from the Argonne National Laboratory GREET model.

¹ Calculated using Greenhouse Gas Emissions Calculator built by EDF and available on FleetAnswers.com

² http://edf.org/documents/9591_fleet-calculator-reference.pdf

Fuel Type	Units	kg CO ₂	Source
Motor Gasoline	gallons	8.81	EPA
Diesel Fuel	gallons	10.15	EPA
Residual Fuel Oil (#5, & 6)	gallons	11.8	EPA
Avgas	gallons	8.32	EPA
Jet Fuel	gallons	9.57	EPA
LPG	gallons	5.79	EPA
Ethanol	gallons	5.7	GREET
Biodiesel	gallons	9.6	GREET
Liquefied Natural Gas (LNG)	gallons	4.46	EPA
Compressed Natural Gas (CNG)	Scf	0.054	EPA
Electricity	KWH	0.6078	EIA

Methane (CH₄) and Nitrous oxide (N₂O)

Calculating emissions of CH₄ and N₂O is more complicated than calculating CO₂ emissions. Emissions of CH₄ and N₂O depend on drive cycle, miles traveled and pollution control technology. To more accurately calculate these emissions, the U.S. EPA provides coefficients for CH₄ and N₂O emissions. Fleets need unit-specific mileage data along with either pollution control technology (preferred method) or model year to utilize these coefficients.

Hydrofluorocarbons (HFCs)

HFCs are chemicals that are used as alternatives to ozone-depleting substances. HFC-134a (CF₃CH₂F) is utilized in most vehicle air conditioning systems. Each unit of HFC-134a emitted has the same global warming impact as 1,300 units of CO₂.

To fully account for emissions of HFC-134a, fleets need to track data on the capacity of each Vehicle's air conditioning system, its rate of leakage, any system recharges, and charge at time of disposal. Many fleets lack this data. Thus, our tool estimates these emissions using the same method as for N₂O and CH₄ emissions.

For HFCs, **the coefficients used in the three fleet profiles are:**

Profile	Vehicle Type	HFC-134a (as % of CO ₂)
One	Passenger Cars	4.29%
	Light Duty Trucks, Vans and SUVs	5.50%
	Medium and Heavy Duty Vehicles (8,500lb+)	0.55%
Two	Mixed Light Duty Vehicles	4.83%
Three	Mixed All Vehicle Types	3.71%