

2013

2013 GHG Emissions Report for
City of Sacramento

Utilimarc

7/25/2013

-Table of Contents-

General Methodology – 3

Fuel Consumption Comparison and Trend – 3-5

Greenhouse Gas Emissions Trend and Analysis – 6-9

Emission Assumptions and Coefficients – 10 & 11

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 reduction of 10% from 2011 to 2013
- LNG fuel consumption increased 87% from 2011 to 2013
- Diesel fuel consumption decreased by 34% from 2011 to 2013
- E85 fuel consumption increased by 116% from 2011 to 2013
- Your fleet consumed 703,419 less gallons of gasoline and diesel fuel in 2013 compared to 2009
- In 2013, your fleet had an decrease of 33.5% in total gasoline and diesel fuel consumption compared to 2009
- Your greenhouse gas emissions decreased by 3,040 metric tons from 2009 to 2013. This represented an 11% decrease from 2009 to 2013.

Fuel Consumption

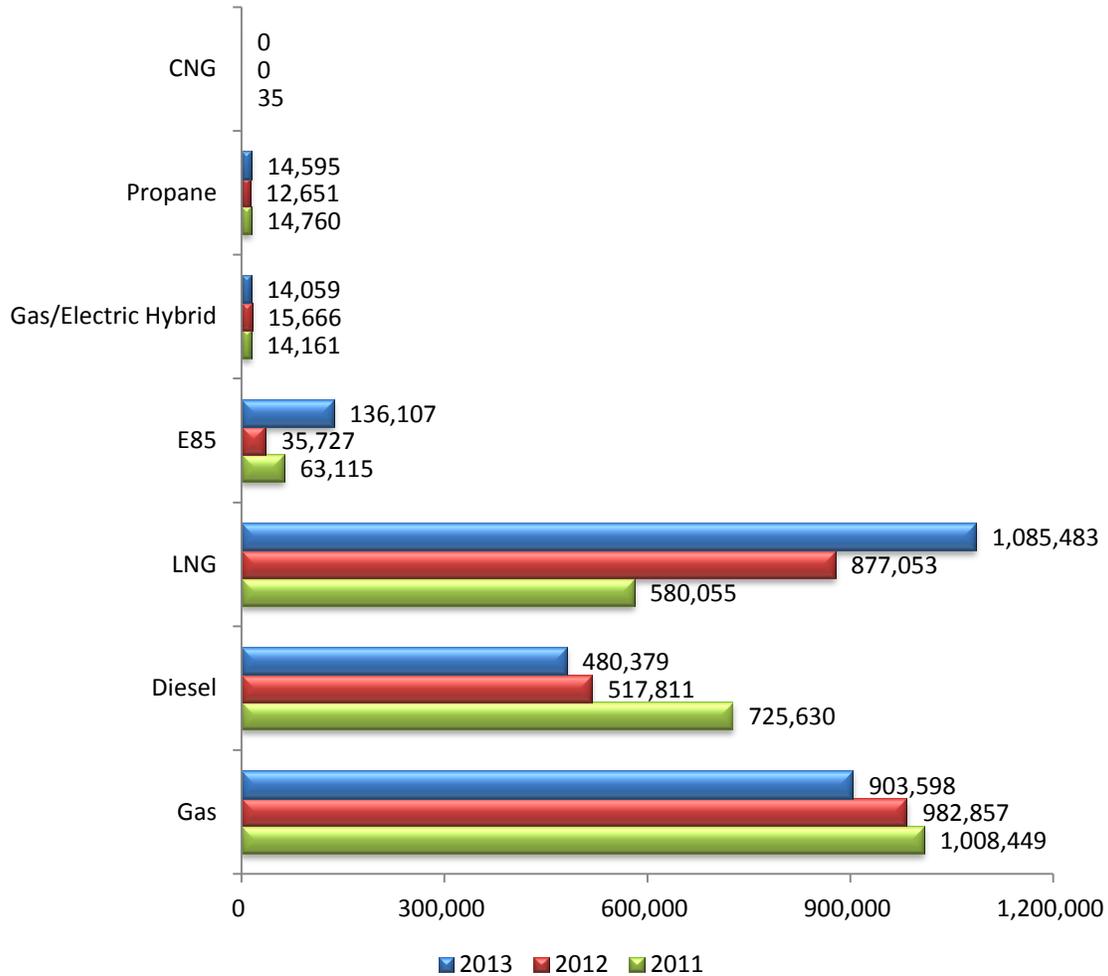
The table below compares each of your fuel types as a percentage of your total fuel consumption over the past 3 years and compares it to 2012 industry averages. This data is useful in understanding how your total fuel consumption compares to industry averages. Of particular significance is your LNG consumption, which was 41% of your total fuel consumption in 2013 compared to the 2012 industry average of 1.1%. Your fleet is also consuming a lower percentage of E85 fuel and diesel fuel than the industry average consumption.

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

Fuel Type¹	2011	2012	2013	Industry Average 2011 Consumption	Industry Average 2012 Consumption
Gas	42%	40%	34%	42%	43%
Diesel	30%	21%	18%	44%	46%
LNG	24%	36%	41%	0.8%	1.1%
E85	2.6%	1.5%	5.2%	10.3%	8.1%
Gas/Electric Hybrid	0.6%	0.6%	0.5%	1.0%	0.8%
Propane	0.6%	0.5%	0.6%	0.1%	0.1%

¹ All fuel types are in gasoline gallon equivalents.

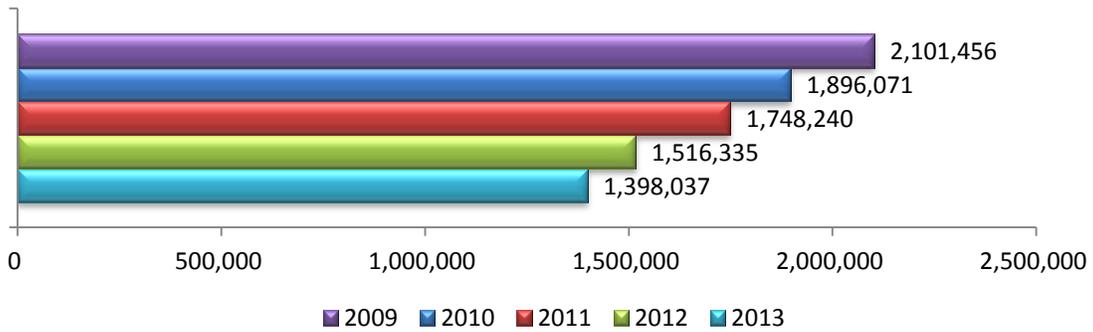
Fuel Gallon Consumption Trend: 2011 to 2013



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

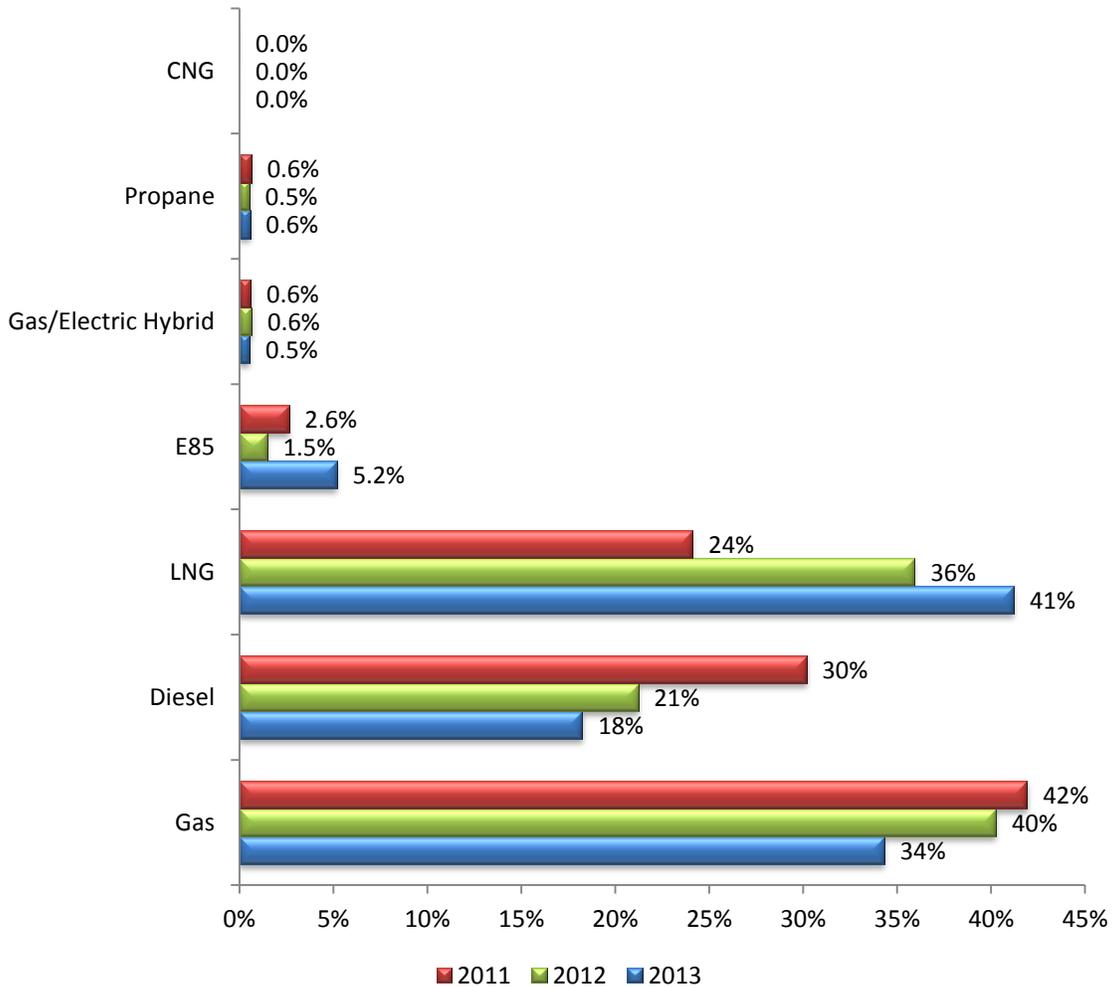
- Gas:** Your fleet's gas consumption had a 10% reduction from 2011 to 2013, since your fleet consumed less gas in 2013 than it did in 2011. Gas still remains a significant part of overall fuel consumed in your fleet.
- Diesel:** Your fleet's diesel consumption decreased by 34% from 2011 to 2013. Diesel fuel remains your third largest fuel type consumed on an annual basis.
- LNG:** Your fleet's LNG consumption increased 87% from 2011 to 2013 and is now your fleet's largest fuel type consumed on an annual basis.
- E85:** Your fleet's E85 consumption increased 116% from 2011 to 2013.

Total Gasoline and Diesel Fuel Gallons Consumed Trend



Your fleet consumed a total of 1,398,037 gasoline and diesel fuel gallons in 2013 compared to 2,101,456 gallons in 2009. Your fleet consumed 703,419 less gallons of fuel in 2013 than 2009 which represents a 33.5% decrease over that period.

Fuel Type as Percentage of Total Fuel Consumed Trend



2009 Greenhouse Gas Emissions

Step 1: Choose your calculation approach

- I have fuel data for each of my vehicle types
- I have aggregate fuel data for a mixed fleet of vehicles
- I have aggregate fuel data for a light-duty fleet

I would like to enter my data in Gallons Liters

Step 2: Enter vehicle fuel consumption data

Aggregate: Mixed light-, medium- and heavy-duty vehicles

Motor Gasoline gallons

Diesel Fuel gallons

Liquefied Petroleum Gas gallons

Ethanol Blend: E gallons (Add another blend)

Biodiesel Blend: B gallons (Add another blend)

Liquefied natural gas gallons

Compressed natural gas scf gge

Electricity KWH

Step 3: Non-Highway Equipment Emissions

- I want to enter fuel usage for additional equipment (optional)

Your total greenhouse gas emissions are

27,656.91 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	21,255.76	348.59	23.38	833.23	22,460.96	5,195.96	27,656.91
Fuel Breakdown							
Motor Gasoline (gallons)	11,007.16	180.52	12.11	431.48	11,631.26	2,691.32	14,322.59
Diesel Fuel (gallons)	8,916.52	146.23	9.81	349.53	9,422.09	2,150.10	11,572.19
Liquefied Petroleum Gas (gallons)	63.17	1.04	0.07	2.48	66.76	10.45	77.20
Ethanol (gallons)	109.19	1.79	0.12	4.28	115.38	-3.72	111.66
Biodiesel (gallons)	--	--	--	--	--	--	--
Liquefied natural gas (gallons)	1,159.48	19.02	1.28	45.45	1,225.22	347.74	1,572.96
Compressed natural gas (scf)	0.23	--	--	0.01	0.24	0.07	0.31
Electricity (KWH)	--	--	--	--	--	--	--
Total	21,255.76	348.59	23.38	833.23	22,460.96	5,195.96	27,656.91
Percent	76.86%	1.26%	0.08%	3.01%	81.21%	18.79%	100.00%

2010 Greenhouse Gas Emissions

Step 1: Choose your calculation approach

- I have fuel data for each of my vehicle types
- I have aggregate fuel data for a mixed fleet of vehicles
- I have aggregate fuel data for a light-duty fleet

I would like to enter my data in Gallons Liters

Step 2: Enter vehicle fuel consumption data

Aggregate: Mixed light-, medium- and heavy-duty vehicles

Motor Gasoline gallons

Diesel Fuel gallons

Liquefied Petroleum Gas gallons

Ethanol Blend: E gallons (Add another blend)

Biodiesel Blend: B gallons (Add another blend)

Liquefied natural gas gallons

Compressed natural gas scf gge

Electricity KWH

Step 3: Non-Highway Equipment Emissions

- I want to enter fuel usage for additional equipment (optional)

Your total greenhouse gas emissions are

25,951.13 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	19,962.79	327.39	21.96	782.54	21,094.68	4,856.45	25,951.13
Fuel Breakdown							
Motor Gasoline (gallons)	9,906.11	162.46	10.90	388.32	10,467.79	2,422.11	12,889.90
Diesel Fuel (gallons)	8,129.09	133.32	8.94	318.66	8,590.01	1,960.22	10,550.23
Liquefied Petroleum Gas (gallons)	95.96	1.57	0.11	3.76	101.41	15.87	117.27
Ethanol (gallons)	272.67	4.47	0.30	10.69	288.13	-9.30	278.83
Biodiesel (gallons)	--	--	--	--	--	--	--
Liquefied natural gas (gallons)	1,558.96	25.57	1.71	61.11	1,647.35	467.55	2,114.90
Compressed natural gas (scf)	--	--	--	--	--	--	--
Electricity (KWH)	--	--	--	--	--	--	--
Total	19,962.79	327.39	21.96	782.54	21,094.68	4,856.45	25,951.13
Percent	76.92%	1.26%	0.08%	3.02%	81.29%	18.71%	100.00%

2011 Greenhouse Gas Emission

Step 1: Choose your calculation approach

- I have fuel data for each of my vehicle types
 I have aggregate fuel data for a mixed fleet of vehicles
 I have aggregate fuel data for a light-duty fleet

I would like to enter my data in Gallons Liters

Step 2: Enter vehicle fuel consumption data

Aggregate: Mixed light-, medium- and heavy-duty vehicles

Motor Gasoline gallons
Diesel Fuel gallons
Liquefied Petroleum Gas gallons
Ethanol Blend: E gallons (Add another blend)
Biodiesel Blend: B gallons (Add another blend)
Liquefied natural gas gallons
Compressed natural gas scf gge
Electricity KWH

Step 3: Non-Highway Equipment Emissions

I want to enter fuel usage for additional equipment (optional)

Your total greenhouse gas emissions are

25,547.73 metric tons

<i>Results displayed in CO₂ equivalent metric tons</i>	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	19,613.89	321.67	21.58	768.86	20,726.00	4,821.72	25,547.73
Fuel Breakdown							
Motor Gasoline (gallons)	9,206.13	150.98	10.13	360.88	9,728.12	2,250.96	11,979.08
Diesel Fuel (gallons)	7,429.73	121.85	8.17	291.25	7,850.99	1,791.58	9,642.57
Liquefied Petroleum Gas (gallons)	85.34	1.40	0.09	3.35	90.18	14.11	104.29
Ethanol (gallons)	306.81	5.03	0.34	12.03	324.21	-10.46	313.75
Biodiesel (gallons)	--	--	--	--	--	--	--
Liquefied natural gas (gallons)	2,585.89	42.41	2.84	101.37	2,732.50	775.53	3,508.04
Compressed natural gas (scf)	--	--	--	--	--	--	--
Electricity (KWH)	--	--	--	--	--	--	--
Total	19,613.89	321.67	21.58	768.86	20,726.00	4,821.72	25,547.73
Percent	76.77%	1.26%	0.08%	3.01%	81.13%	18.87%	100.00%

2012 Greenhouse Gas Emission

Step 1: Choose your calculation approach

- I have fuel data for each of my vehicle types
 I have aggregate fuel data for a mixed fleet of vehicles
 I have aggregate fuel data for a light-duty fleet

I would like to enter my data in Gallons Liters

Step 2: Enter vehicle fuel consumption data

Aggregate: Mixed light-, medium- and heavy-duty vehicles

Motor Gasoline gallons
Diesel Fuel gallons
Liquefied Petroleum Gas gallons
Ethanol Blend: E gallons (Add another blend)
Biodiesel Blend: B gallons (Add another blend)
Liquefied natural gas gallons
Compressed natural gas scf gge
Electricity KWH

Step 3: Non-Highway Equipment Emissions

- I want to enter fuel usage for additional equipment (optional)

Your total greenhouse gas emissions are

24,104.00 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	18,413.23	301.98	20.25	721.80	19,457.26	4,646.74	24,104.00
Fuel Breakdown							
Motor Gasoline (gallons)	8,954.64	146.86	9.85	351.02	9,462.36	2,189.47	11,651.83
Diesel Fuel (gallons)	5,301.87	86.95	5.83	207.83	5,602.48	1,278.48	6,880.96
Liquefied Petroleum Gas (gallons)	73.15	1.20	0.08	2.87	77.30	12.09	89.39
Ethanol (gallons)	173.67	2.85	0.19	6.81	183.52	-5.92	177.60
Biodiesel (gallons)	--	--	--	--	--	--	--
Liquefied natural gas (gallons)	3,909.90	64.12	4.30	153.27	4,131.59	1,172.62	5,304.21
Compressed natural gas (scf)	--	--	--	--	--	--	--
Electricity (KWH)	--	--	--	--	--	--	--
Total	18,413.23	301.98	20.25	721.80	19,457.26	4,646.74	24,104.00
Percent	76.39%	1.25%	0.08%	2.99%	80.72%	19.28%	100.00%

2013 Greenhouse Gas Emission

Step 1: Choose your calculation approach

- I have fuel data for each of my vehicle types
- I have aggregate fuel data for a mixed fleet of vehicles
- I have aggregate fuel data for a light-duty fleet

I would like to enter my data in Gallons Liters

Step 2: Enter vehicle fuel consumption data

Aggregate: Mixed light-, medium- and heavy-duty vehicles

Motor Gasoline gallons

Diesel Fuel gallons

Liquefied Petroleum Gas gallons

Ethanol Blend: E gallons (Add another blend)

Biodiesel Blend: B gallons (Add another blend)

Liquefied natural gas gallons

Compressed natural gas scf gge

Electricity KWH

Step 3: Non-Highway Equipment Emissions

- I want to enter fuel usage for additional equipment (optional)

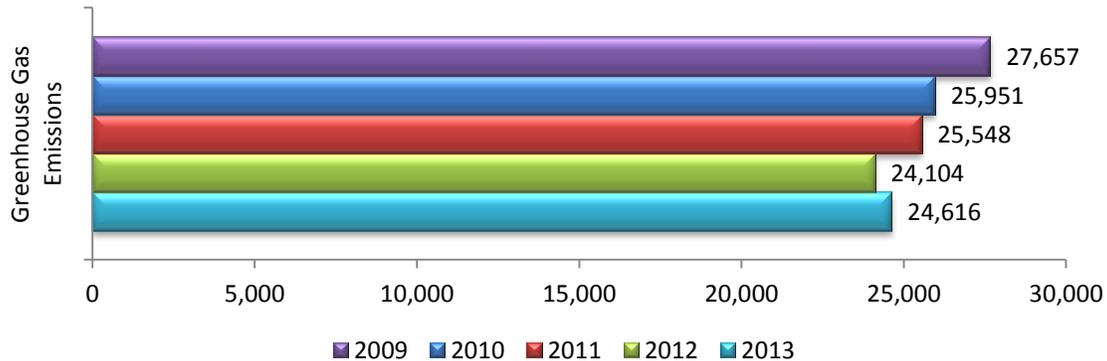
Show Results in Kilograms Metric Tons

Your total greenhouse gas emissions are

24,616.01 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	18,871.33	309.49	20.76	739.76	19,941.33	4,674.68	24,616.01
Fuel Breakdown							
Motor Gasoline (gallons)	8,367.62	137.23	9.20	328.01	8,842.06	2,045.94	10,888.00
Diesel Fuel (gallons)	4,918.60	80.67	5.41	192.81	5,197.49	1,186.06	6,383.54
Liquefied Petroleum Gas (gallons)	84.39	1.38	0.09	3.31	89.17	13.95	103.13
Ethanol (gallons)	661.64	10.85	0.73	25.94	699.15	-22.56	676.59
Biodiesel (gallons)	--	--	--	--	--	--	--
Liquefied natural gas (gallons)	4,839.08	79.36	5.32	189.69	5,113.46	1,451.29	6,564.75
Compressed natural gas (scf)	--	--	--	--	--	--	--
Electricity (KWH)	--	--	--	--	--	--	--
Total	18,871.33	309.49	20.76	739.76	19,941.33	4,674.68	24,616.01
Percent	76.66%	1.26%	0.08%	3.01%	81.01%	18.99%	100.00%

Greenhouse Gas Emissions Trend



Annual Greenhouse Gas Emissions (in metric tons)

Your greenhouse gas emissions decreased by 3,041 metric tons from 2009 to 2013. This represented a 11% decrease from 2009 to 2013.

Greenhouse Gas Emissions Calculation²

Emissions Assumptions and Coefficients – provided by EDF³

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 upstream 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.

² Calculated using Greenhouse Gas Emissions Calculator built by EDF and available on FleetAnswers.com

³ 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%