TOWN OF WOODSTOCK
CLIMATE SMART TASK FORCE

Erin Moran, Coordinator
Kenneth Panza, Secretary

Application for 5 Points

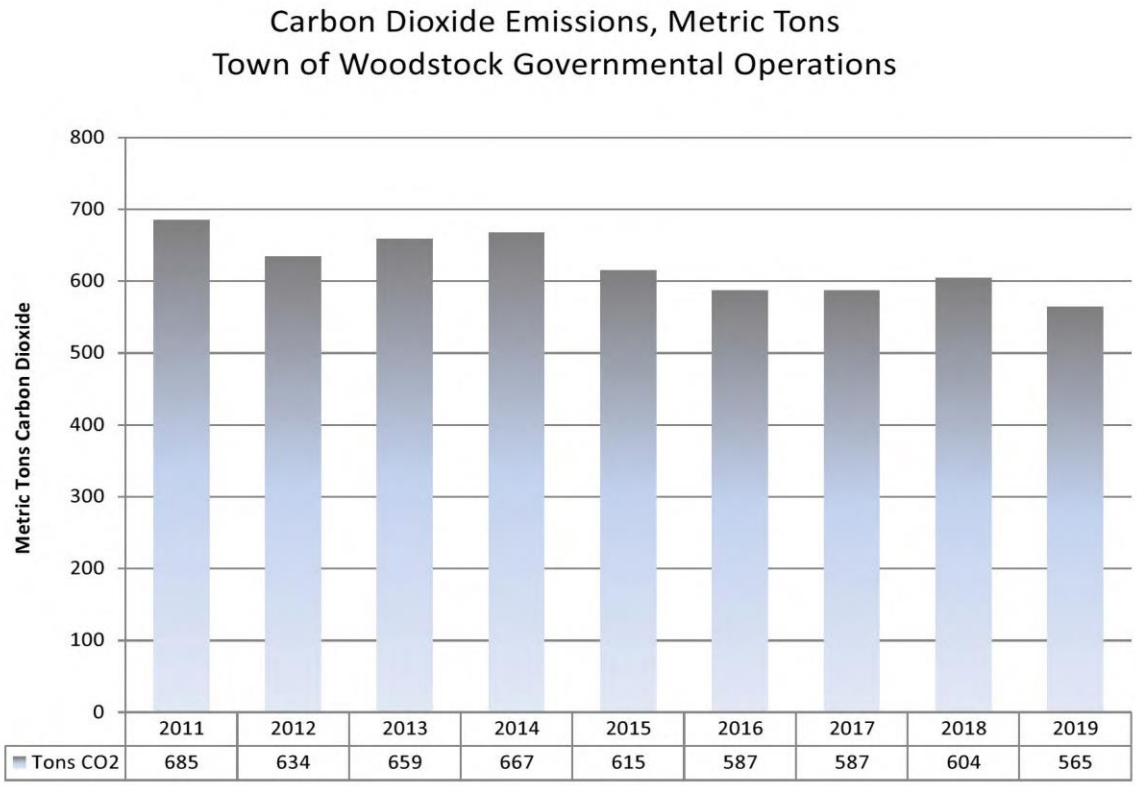
June 1, 2020

PE10 Action: GHG Tracking system

5 Points

The Woodstock GHG Tracking Report is updated for the final 2019 quantities of fossil fuels and electricity used in governmental operations. The report also reflects the March 2020 update to the eGRID emission factors. Beginning with 2011, the tracking report provides a consistent and accurate year-by-year assessment of Woodstock's government carbon footprint.

Woodstock GHG Tracking System, 2019 Final Results



Beginning in 2011, Woodstock's carbon dioxide emissions have dropped from 685 to 565 metric tons in 2019, a 18% reduction in CO_2 emissions from governmental operations

In 2007, the Woodstock town board committed that town governmental operations would be carbon neutral by year-end 2017. The town achieved carbon neutrality in 2015 and was recognized for its accomplishment at the 2017 annual meeting of the New York State Association of Conservation Commissions. The town began systematically tracking its carbon emissions in 2011.

1) The town uses a four part tracking system based on data required for its yearly financial report to the Office of the State Comptroller. The energy usage and cost reports documents usage for all Woodstock Scope 1 and Scope 2 GHG sources.
2) Carbon emissions for fossil fuel usage are calculated using the CO2 emission coefficients published by the U.S. Energy Information Administration (EIA).
3) Carbon emissions for the town's electrical usage are calculated using the EPA's Power Profiler and adjusted for the contribution of local hydroelectric generation.
4) An Excel spreadsheet is used to summarize and graph the town's carbon dioxide emissions, measured in metric tons.

Woodstock Energy Costs and Consumption

New York government entities are required to file a yearly financial report with the Office of the State Comptroller. Pursuant to Section 21, Subdivision 10A of Town Law, the Supervisor shall submit to the Town Board, the Town Clerk and the New York State Comptroller within sixty days after the close of the fiscal year a copy of the Annual Report, as required by law, and the Town Clerk shall publish within ten days in the official newspapers the fact that such annual report is available for inspection in the Town Clerk's office.

A table title, "Energy Costs and Consumption," is an exhibit that has been required since 2008. Below are the tables provided since 2011 showing Woodstock's governmental energy usage and cost submitted in the annual report to the Office of the New York State Comptroller. These exhibits, which are available on April 1 of the following year, form the basis for Woodstock's GHG tracking system.

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2019

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$39,991	20,390	gallons	
Diesel Fuel	$49,396	23,555	gallons	
Fuel Oil	$5,985	2,814	gallons	
Natural Gas			cubic feet	
Electricity	$121,884	808,484	kilowatt-hours	
Coal			tons	
Propane	$5,870	4,786	gallons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2018

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$44,011	20,800	gallons	
Diesel Fuel	$56,938	24,845	gallons	
Fuel Oil	$6,187	2,762	gallons	
Natural Gas			cubic feet	
Electricity	$123,529	823,883	kilowatt-hours	
Coal			tons	
Propane	$8,696	5,825	gallons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2017

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$35,654	19,988	gallons	
Diesel Fuel	$39,943	22,520	gallons	
Fuel Oil	$5,199	2,500	gallons	
Natural Gas			cubic feet	
Electricity	$111,186	764,419	kilowatt-hours	
Coal			tons	
Propane	$6,243	4,915	gallons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2016

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$32,539	20,724	gallons	
Diesel Fuel	$33,873	22,193	gallons	
Fuel Oil	$4,231	2,454	gallons	
Natural Gas			cubic feet	
Electricity	$110,398	732,875	kilowatt-hours	
Coal			tons	
Propane	$4,296	4,808	gallons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2015

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$36,118	19,780	gallons	
Diesel Fuel	$46,018	23,891	gallons	
Fuel Oil	$6,040	2,631	gallons	
Natural Gas			cubic feet	
Electricity	$121,430	747,877	kilowatt-hours	
Coal			tons	
Propane	$5,465	5,592	gallons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2014

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$56,043	20,031	gallons	
Diesel Fuel	$76,735	23,739	gallons	
Fuel Oil	$12,610	3,504	gallons	
Natural Gas	$10,557	5,733	cubic feet	gallons LP gas
Electricity	$131,042	724,325	kilowatt-hours	
Coal			tons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2013

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$61,075	20,576	gallons	
Diesel Fuel	$78,773	23,176	gallons	
Fuel Oil	$15,723	5,024	gallons	
Natural Gas			cubic feet	
Electricity	$113,179	729,123	kilowatt-hours	
Coal			tons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2012

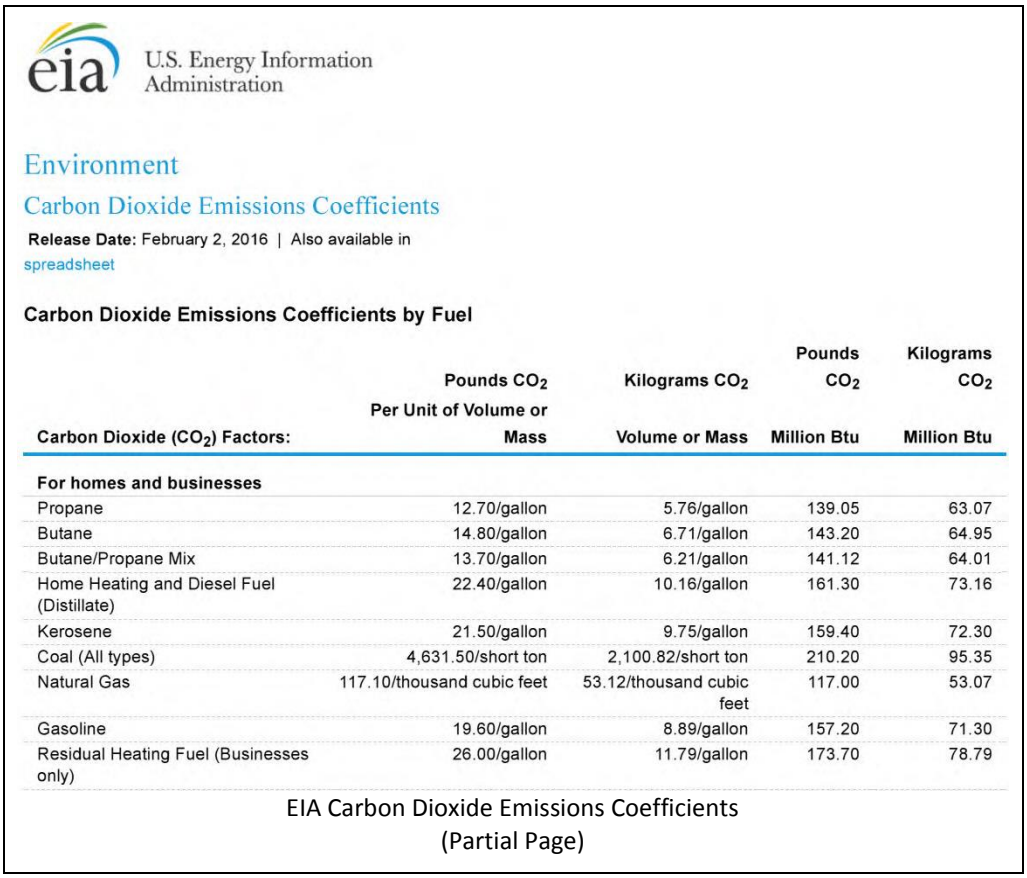
Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$67,263	21,786	gallons	
Diesel Fuel	$76,973	22,258	gallons	
Fuel Oil	$16,389	4,691	gallons	
Natural Gas			cubic feet	
Electricity	$108,017	639,570	kilowatts	
Coal			tons	

TOWN OF Woodstock
Energy Costs and Consumption
For the Fiscal Year Ending 2011

Energy Type	Total Expenditures	Total Volume	Units Of Measure	Alternative Units Of Measure
Gasoline	$70,666	23,150	gallons	
Diesel Fuel	$80,595	23,500	gallons	
Fuel Oil	$21,750	6,767	gallons	
Natural Gas			cubic feet	
Electricity	$100,499	617,410	kilowatts	
Coal			tons	

CO2 Emissions Coefficients for Fossil Fuels

The Energy Information Administration (EIA) publishes emission coefficients for fossil fuels. This document provides the lbs. of CO2 emissions by unit of measure for each fuel. [1] These coefficients are used to calculate the carbon dioxide emissions from the town government's use of fossil fuels.



U.S. Energy Information Administration

Environment

Carbon Dioxide Emissions Coefficients

Release Date: February 2, 2016 | Also available in spreadsheet

Carbon Dioxide Emissions Coefficients by Fuel

Carbon Dioxide (CO_2) Factors:	Pounds CO_2 Per Unit of Volume or Mass	Kilograms CO_2 Volume or Mass	Pounds CO_2 Million Btu	Kilograms CO_2 Million Btu
For homes and businesses				
Propane	12.70/gallon	5.76/gallon	139.05	63.07
Butane	14.80/gallon	6.71/gallon	143.20	64.95
Butane/Propane Mix	13.70/gallon	6.21/gallon	141.12	64.01
Home Heating and Diesel Fuel (Distillate)	22.40/gallon	10.16/gallon	161.30	73.16
Kerosene	21.50/gallon	9.75/gallon	159.40	72.30
Coal (All types)	4,631.50/short ton	2,100.82/short ton	210.20	95.35
Natural Gas	117.10/thousand cubic feet	53.12/thousand cubic feet	117.00	53.07
Gasoline	19.60/gallon	8.89/gallon	157.20	71.30
Residual Heating Fuel (Businesses only)	26.00/gallon	11.79/gallon	173.70	78.79

EIA Carbon Dioxide Emissions Coefficients
(Partial Page)

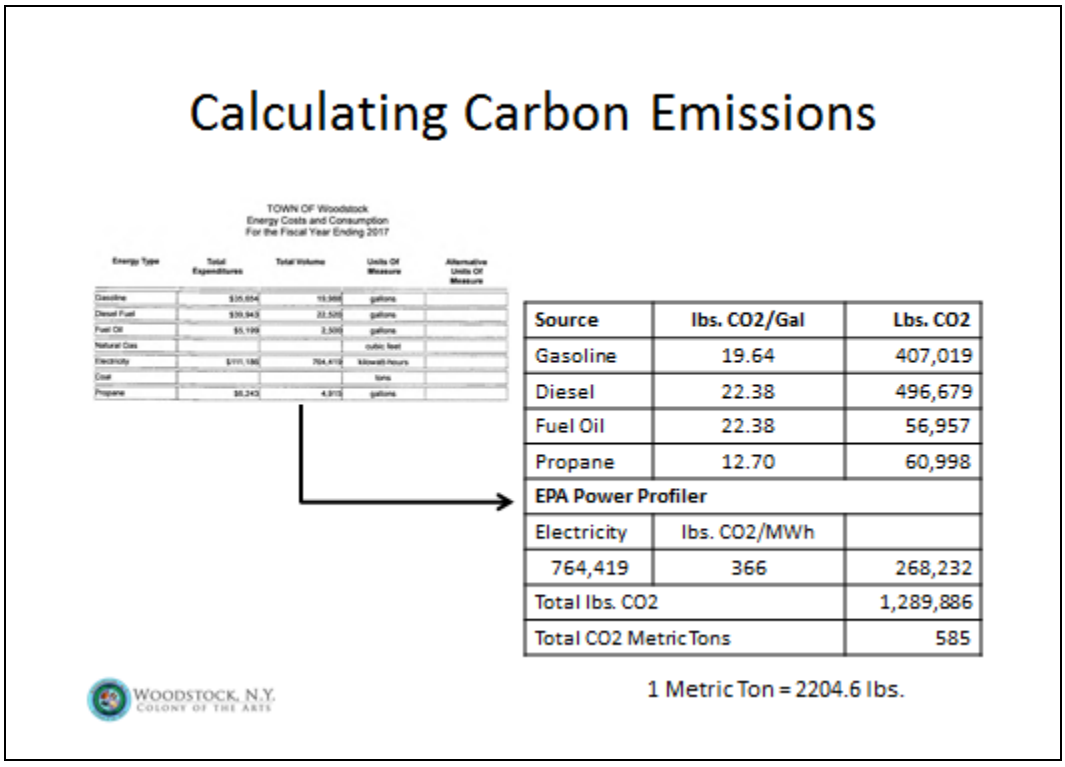
[1] Energy Information Agency, "Carbon Dioxide Emissions Coefficients by Fuel," February 2, 2016, https://www.eia.gov/environment/emissions/co2_vol_mass.php

Fossil Fuel Cost & Consumption

		Expenditures	Volume	Metric Tons CO2	Unit Price
2011	Gasoline (gals)	$70,666	23,150	205.8	$3.053
	Diesel Fuel (gals)	$80,595	23,500	238.8	$3.430
	Fuel Oil (gals)	$21,760	6,767	68.8	$3.216
	Propane (gals)	$9,341	4,064	23.4	$2.299
2012	Gasoline (gals)	$67,263	21,786	193.7	$3.087
	Diesel Fuel (gals)	$76,973	22,258	226.2	$3.458
	Fuel Oil (gals)	$16,389	4,691	47.7	$3.494
	Propane (gals)	$6,326	3,283	18.9	$1.927
2013	Gasoline (gals)	$61,075	20,576	182.9	$2.968
	Diesel Fuel (gals)	$78,773	23,176	235.5	$3.399
	Fuel Oil (gals)	$15,723	5,024	51.0	$3.130
	Propane (gals)	$6,934	4,704	27.1	$1.474
2014	Gasoline (gals)	$56,043	20,031	178.1	$2.798
	Diesel Fuel (gals)	$76,735	23,739	241.2	$3.232
	Fuel Oil (gals)	$12,610	3,504	35.6	$3.599
	Propane (gals)	$10,557	5,733	33.0	$1.841
2015	Gasoline (gals)	$36,118	19,780	175.9	$1.826
	Diesel Fuel (gals)	$46,018	23,891	242.7	$1.926
	Fuel Oil (gals)	$6,040	2,631	26.7	$2.296
	Propane (gals)	$5,465	5,592	32.2	$0.977
2016	Gasoline (gals)	$32,539	20,724	184.2	$1.570
	Diesel Fuel (gals)	$33,873	22,193	225.5	$1.526
	Fuel Oil (gals)	$4,231	2,454	24.9	$1.724
	Propane (gals)	$4,296	4,808	27.7	$0.894
2017	Gasoline (gals)	$35,654	19,988	177.7	$1.784
	Diesel Fuel (gals)	$39,943	22,520	228.8	$1.774
	Fuel Oil (gals)	$5,199	2,500	25.4	$2.080
	Propane (gals)	$6,243	4,915	28.3	$1.270
2018	Gasoline (gals)	$44,011	20,800	184.9	$2.116
	Diesel Fuel (gals)	$56,938	24,845	252.4	$2.292
	Fuel Oil (gals)	$6,187	2,762	28.1	$2.240
	Propane (gals)	$8,690	5,825	33.6	$1.492
2019	Gasoline (gals)	$39,991	20,390	181.3	$1.961
	Diesel Fuel (gals)	$49,396	23,555	239.3	$2.097
	Fuel Oil (gals)	$5,985	2,814	28.6	$2.127
	Propane (gals)	$5,870	4,786	27.6	$1.226

Calculating Woodstock Governmental Carbon Dioxide Emissions

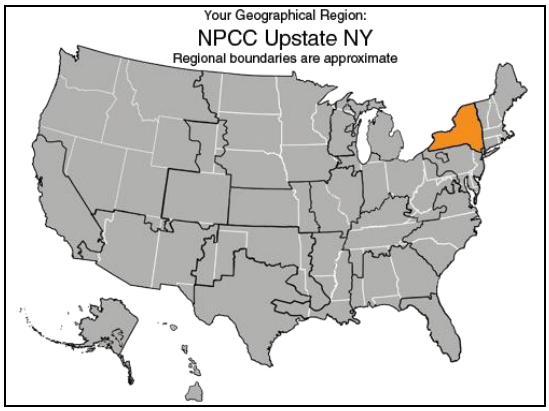
Using the above tables, it's then possible to calculate the total carbon emissions for Woodstock's governmental operations by multiplying the quantity of fuel/energy by its carbon coefficient.



Source	lbs. CO2/Gal	Lbs. CO2
Gasoline	19.64	407,019
Diesel	22.38	496,679
Fuel Oil	22.38	56,957
Propane	12.70	60,998
EPA Power Profiler		
Electricity	lbs. CO2/MWh	
764,419	366	268,232
Total lbs. CO2		1,289,886
Total CO2 Metric Tons		585

CO2 Emissions from Electric Generation

The EPA's Emissions & Generation Resource Integrated Database (eGRID) documents carbon dioxide, methane, nitrogen oxides, sulfur dioxide, and nitrous oxide emissions from electric generation by geographic region. [2] Upstate New York is one of the regions tracked in eGRID. By Googling 'EPA Power Profiler' and entering a ZIP code, the carbon dioxide emissions and fuel composition of power in any geographic region can be found.



[2] Environmental Protection Agency, "Emissions & Generation Resource Integrated Database (eGRID)", Available at https://www.epa.gov/energy/emissions-generation-resource-integrated-database-egrid

eGRID Database – Upstate New York

The eGRID database is periodically updated to account for changes in the generation profile and fuel sources. Carbon Dioxide emissions in upstate NY have been declining with the retirements of coal-fired power plants. Because of substantial hydroelectric and nuclear resources, EPA's Upstate NY sub-region has the lowest level of emissions in the country from electric generation.

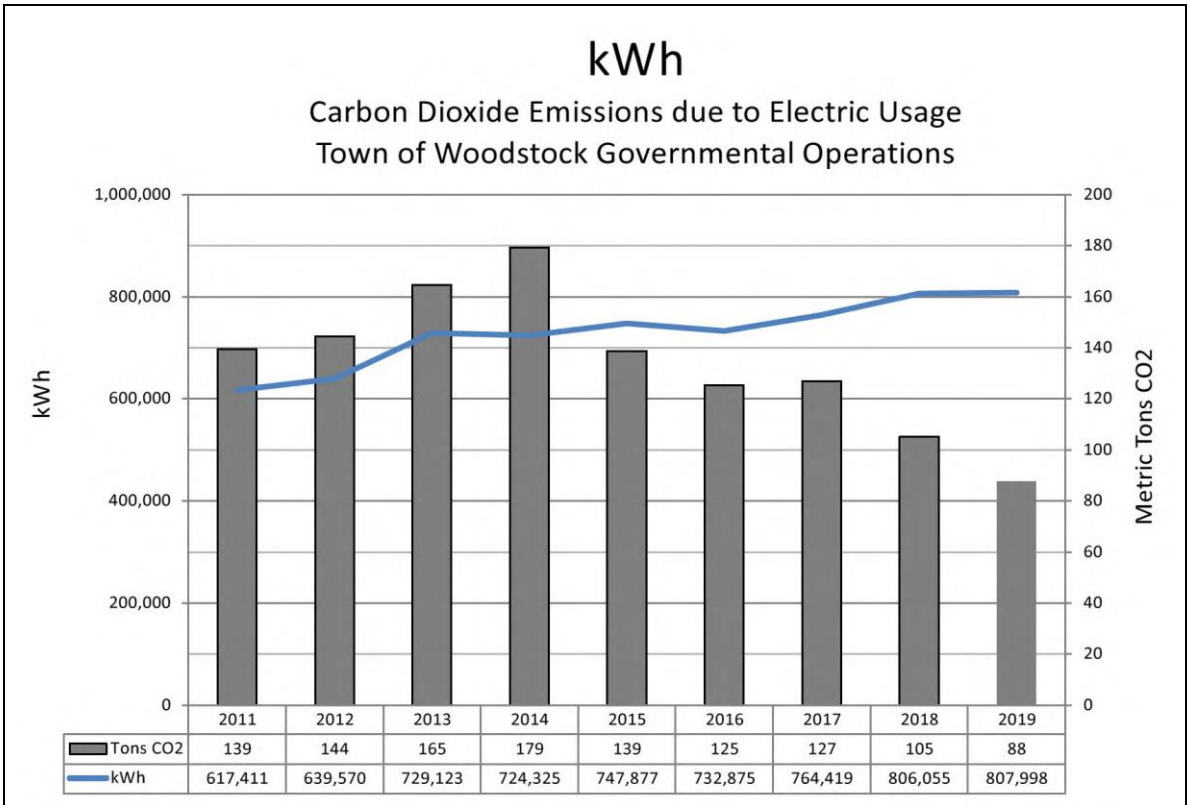
Fiscal Year	eGRID Version	eGRID Release	**Upstate NY CO_2 lbs./MWh[3]**
2019	eGRID2018	9-Mar-20	**253.1**
2018	eGRID2016	15-Feb-18	**294.1**
2017	eGRID2014 version 2	27-Feb-17	**366**
2016	eGRID2014	13-Jan-17	**377**
2015	eGRID2012	8-Oct-15	**409**
2014	eGRID2010	24-Feb-14	**546**
2013	eGRID2009	10-May-12	**498**
2012	eGRID2009	10-May-12	**498**
2011	eGRID2009	10-May-12	**498**

Woodstock Carbon Dioxide Emissions due to Electricity

Since 2011, the town's electrical usage for governmental operations has grown by 31%, and during this period, carbon dioxide emissions attributable to electrify have dropped by about 37%. Woodstock's increase in electricity usage has been driven by geothermal and air-sourced heat pumps used for heating and cooling the town's buildings. Usage is expected to reach 900,000 kWh by 2021 after the renovation of the town offices on Comeau.

Closing of upstate coal-fired generators and the town's contracts for hydroelectric power from the Natural Power Group, a local operator of hydroelectric generators, has reduced the town's carbon dioxide emissions attributed to electricity. It is expected carbon dioxide emissions due to electricity will be substantially eliminated in 2021.

[3] Environmental Protection Agency, "Power Profiler," Available at https://www.epa.gov/energy/power-profiler#/



Adjustments for Zero-Carbon Hydroelectric Power

In 2018, the Woodstock Town Board signed contracts with the Natural Power Group (NPG) for power sourced from the Wappingers Falls and Wallkill hydroelectric generating facilities under the terms of Community Distributed Generation (CDG). Under these contracts, Woodstock will receive over 90% of its electric power for governmental usage from zero-carbon sources. It's expected that carbon dioxide emissions from town governmental operations will drop to a level 30% below 2011 by 2021.

Woodstock has two Community Distributed Generation (CDG) contracts with the Natural Power Group. The contract for the Wallkill plant was signed in May 2018 for 37,000 kWh, and then upgraded in 2019 to 44,000 kWh. A second contract for the Wappingers Falls plant was signed in December 2018 for 681,000 kWh. Combined, these two contracts account for over 90% of Woodstock's electricity usage.

The table below summarizes the usage, source, and carbon dioxide emissions for Woodstock's electric supply.

kWh		2018	2019	2020 (est)
Woodstock Usage		823,883	808,484	810,000
Wallkill Hydro	(Note 1)	18,500	44,000	70,000
Wappinger Falls Hydro	(Note 2)			678,000
Total Hydroelectric		18,500	44,000	748,000
Central Hudson (Grid)	(Note 3)	805,383	764,484	62,000
Metric Tons CO2	(Note 4)	108	88	7

Note 1: Only six months of the contracted 37,000 kWh was delivered in 2018. Credit for the full 44,000 kWh contracted amount was received in 2019. To cover usage by the EV charging station at the Rock City Rd Restrooms in 2020, the town increased its Wallkill subscription to 70,000 kWh.
Note 2: Because of a rupture in the penstock at Wappingers Falls, no power was delivered in 2019.

Note 3: Amount of electricity sourced from the grid after deducting hydroelectric power.
Note 4: Hydroelectric power has zero carbon dioxide content. Power sourced from the grid in 2018 had a carbon dioxide content of 294.7 lbs./MWh, based on EPA's upstate New York region eGRID2016.In 2019, power sourced from the grid had a carbon dioxide content of 253.1 lbs./MWh,

Spreadsheet Summarizing Woodstock's Yearly GHG Emissions

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gasoline	23,150	21,786	20,576	20,031	19,780	20,724	19,988	20,800	20,390
Diesel Fuel	23,500	22,258	23,176	23,739	23,891	22,193	22,520	24,845	23,555
Kerosene	882	359							
Fuel Oil	6,767	4,691	5,024	3,504	2,631	2,454	2,500	2,762	2,814
Propane	4,064	3,283	4,308	5,733	5,592	4,808	4,915	5,825	4,786
Electricity (Total)	617,410	639,570	729,123	724,325	747,877	732,875	764,419	823,883	808,484
Hydroelectric								18,500	44,000
Conversion Factors	2011	2012	2013	2014	2015	2016	2017	2018	2019
Gasoline, lbs CO2/gal	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
Diesel Fuel, lbs CO2/gal	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40
Kerosene, lbs CO2/gal	21.54	21.54	21.54	21.54	21.54	21.54	21.54	21.54	21.54
Fuel Oil, lbs CO2/gal	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40	22.40
Propane, lbs CO2/gal	12.70	12.70	12.70	12.70	12.70	12.70	12.70	12.70	12.70
Electricity, lbs CO2/MWh	498.0	498.0	498.0	546.0	409.0	377.0	366.0	294.7	253.1
Hydroelectric								0	0
Metric Tons CO2	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Gasoline CO2	206	194	183	178	176	184	178	185	181
Diesel Fuel	239	226	235	241	243	225	229	252	239
Kerosene	9	4	0	0	0	0	0	0	0
Fuel Oil	69	48	51	36	27	25	25	28	29
Propane	23	19	25	33	32	28	28	34	28
Electricity (Grid)	139	144	165	179	139	125	127	108	88
Hydroelectric							0	0	0
Metric Tons	685	634	659	667	616	588	587	607	565
Percent Decline from 2011		7%	4%	3%	10%	14%	14%	11%	18%