WOODSTOCK, N.Y.
COLONY OF THE ARTS

The Road to Carbon Neutrality

How Woodstock achieved
net zero carbon dioxide emissions
Woodstock Library Forum
March 30, 2019

Ken Panza, Supervisor's Liaison
Ulster County Climate Smart Committee

Carbon Neutral Initiative

- 2007 Town Board Resolution
  - Achieve Carbon Neutrality by end 2017
- Task Force Recommendations
  1) Inventory CO2 Emissions
  2) Establish Plan to Reduce CO2
  3) Measure & Report Progress

NOW, THEREFORE, BE IT RESOLVED that the Woodstock Town Board commits to a Zero-Carbon Initiative, leading the Woodstock community by example and by implementing policies resulting in no net emission of carbon dioxide and other greenhouse gases by the end of 2017, and;

BE IT FURTHER RESOLVED, that as a public-private partnership, the Woodstock Zero-Carbon Initiative shall feature Town Government as a key stakeholder in a comprehensive community carbon-neutrality effort, which includes institutions, businesses, civic organization, and individual families and residents, and;

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NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

A Guide to Local Action

Climate Smart Communities Certification

Members of the Climate Smart Communities Program are a network of New York communities engaged in reducing greenhouse gas (GHG) emissions and improving climate resilience. Climate Smart Communities can take action in two main ways to minimize the risks of climate change and reduce its long-term costs:

Reducing GHG Emissions: Starting now to reduce GHG emissions and create permanent carbon sinks that remove GHG emissions from the atmosphere - these actions will help stabilize atmospheric levels of carbon dioxide at manageable levels and avoid severe climatic changes.

Adapting to a Changing Climate: Altering the built and natural environment in anticipation of predicted climatic changes, or in response to actual changes, will alleviate the risks associated with unavoidable changes in climate.

2017 NYSACC Environmental Achievement Award

- Awarded to Woodstock
  - Recognition for Achieving Carbon Neutrality
  - NYS Association of Conservation Commissions
  - Annual Conference on the Environment, Kingston, November 17 & 18, 2017

NYSACC
NEW YORK STATE ASSOCIATION OF CONSERVATION COMMISSIONS

The New York State Association of Conservation Commissions (NYSACC) is an independent, not-for-profit education organization established in 1971 by the New York State Department of Environmental Conservation to provide leadership in the development of vital environmental programs for cities, towns, and villages throughout the State of New York.

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Calculate Carbon Footprint

Municipalities are Required to Submit Energy Use and Expenditures

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	

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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

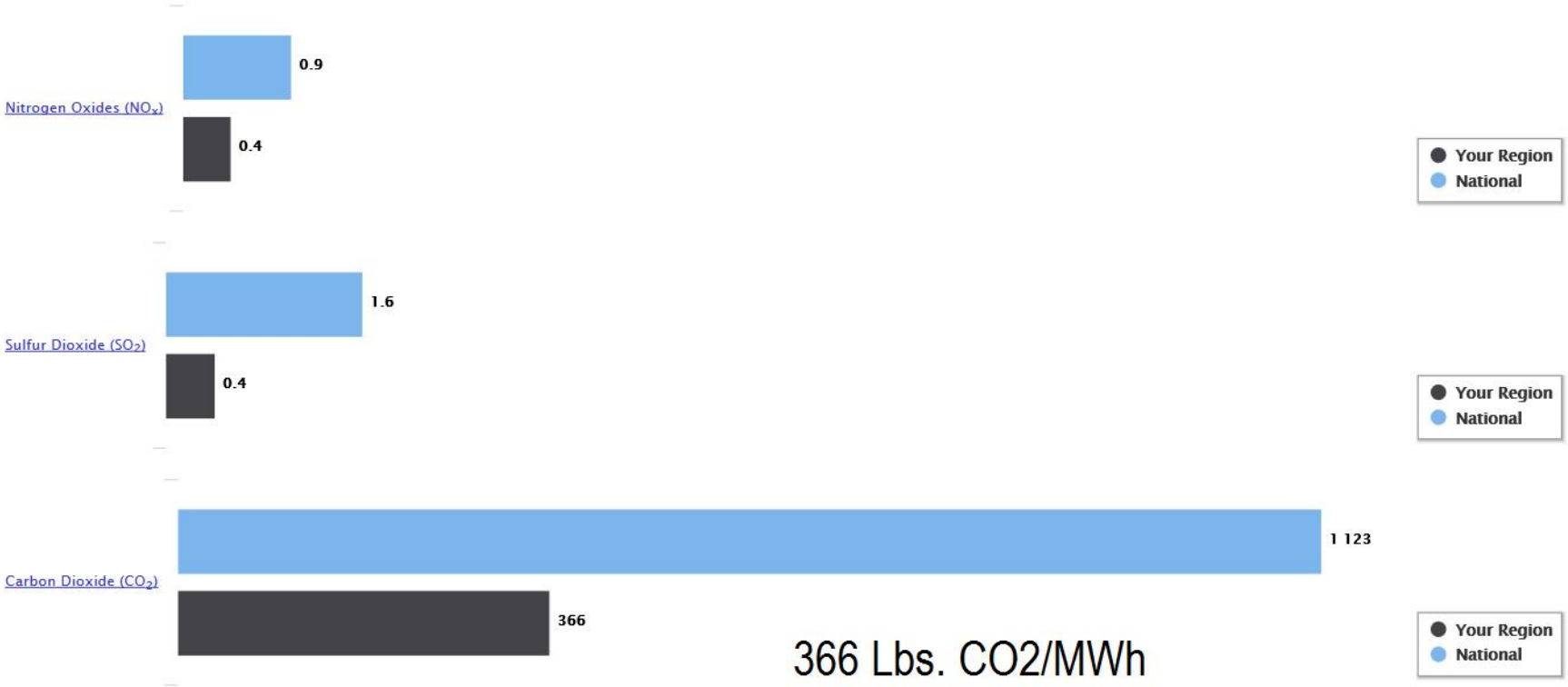
Carbon Dioxide (CO_2) Factors:	Pounds CO_2 Per Unit of Volume or Mass	Kilograms CO_2 Volume or Mass	Pounds CO_2 Million Btu	Kilograms CO_2 Million Btu
For homes and businesses				
Propane	12.70/gallon	5.76/gallon	139.05	63.07
Butane	14.80/gallon	6.71/gallon	143.20	64.95
Butane/Propane Mix	13.70/gallon	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

https://www.eia.gov/environment/emissions/co2_vol_mass.php

EPA Power Profiler

Emission Rate Comparison

This chart compares the average emissions rates (lbs/MWh) in your geographical region to the national average emissions rates (lbs/MWh) for nitgrogen oxide, sulfur dioxide, and carbon dioxide.



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https://www.epa.gov/energy/power-profiler

Calculating Carbon Emissions

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Coal			tons	
Propane	$6,243	4,915	gallons	

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

1 Metric Ton = 2204.6 lbs.

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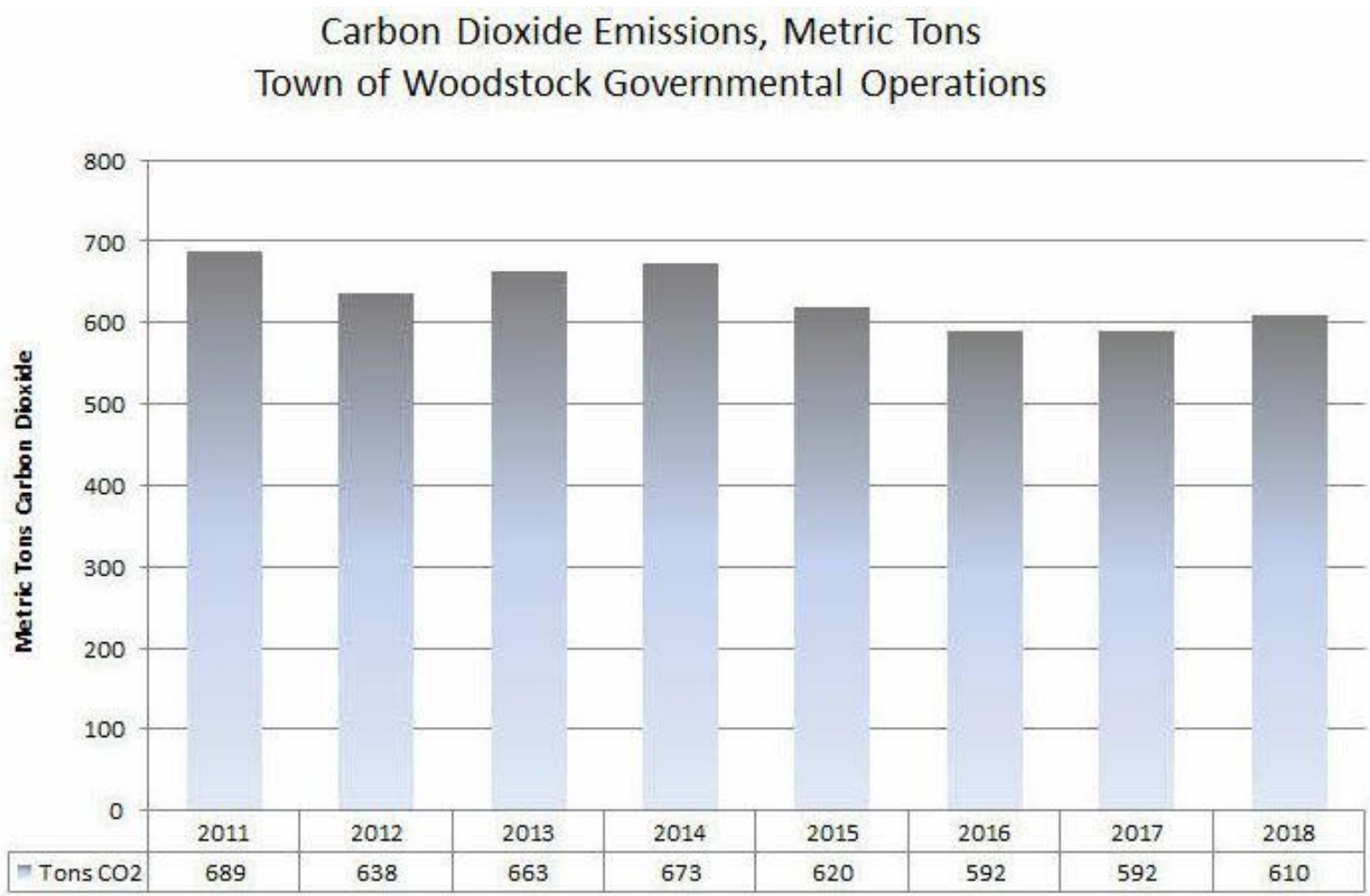

15% Drop in Emissions since 2011

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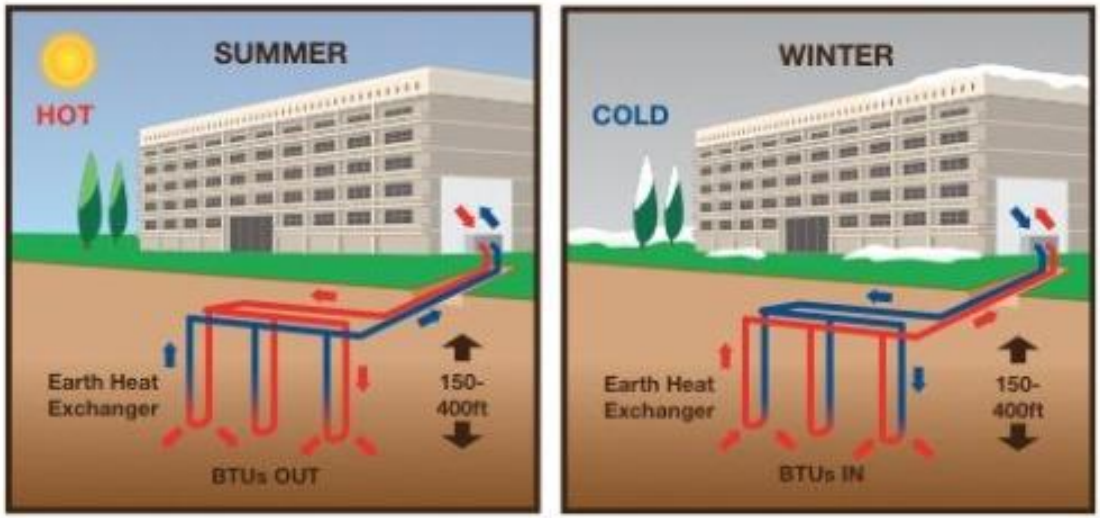
Climate Action Plan
Actions Reducing Emissions

- Ground-Based Geothermal
  - Highway Garage
  - Town Hall
- Air-Sourced Heat Pumps
  - Mescal Hornbeck Community Center
- Replace 8-Cyl Police Cars with 6-Cyl
- Tracking Energy Usage & Costs
  - Maintenance & Repair Actions
- Renewable Electricity
  - Wappingers Falls Hydroelectric

Ground-Based Geothermal

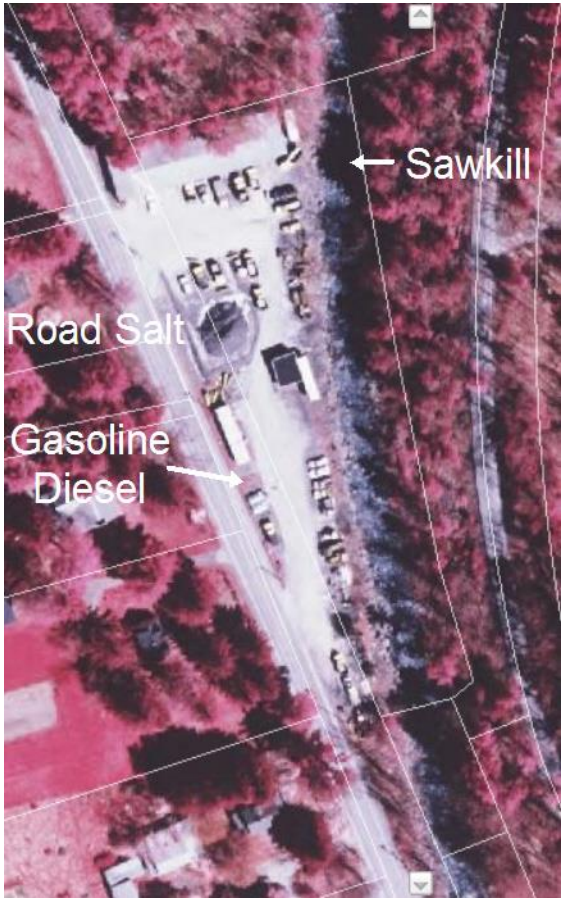


- Nearly Constant Temperature at Depth
- 400 ft. Deep Recirculating Wells
- Heat Pump Transfers Heat (Summer or Winter)
- No On-Site Fossil Fuels – Runs on Electricity

Woodstock Highway Garage

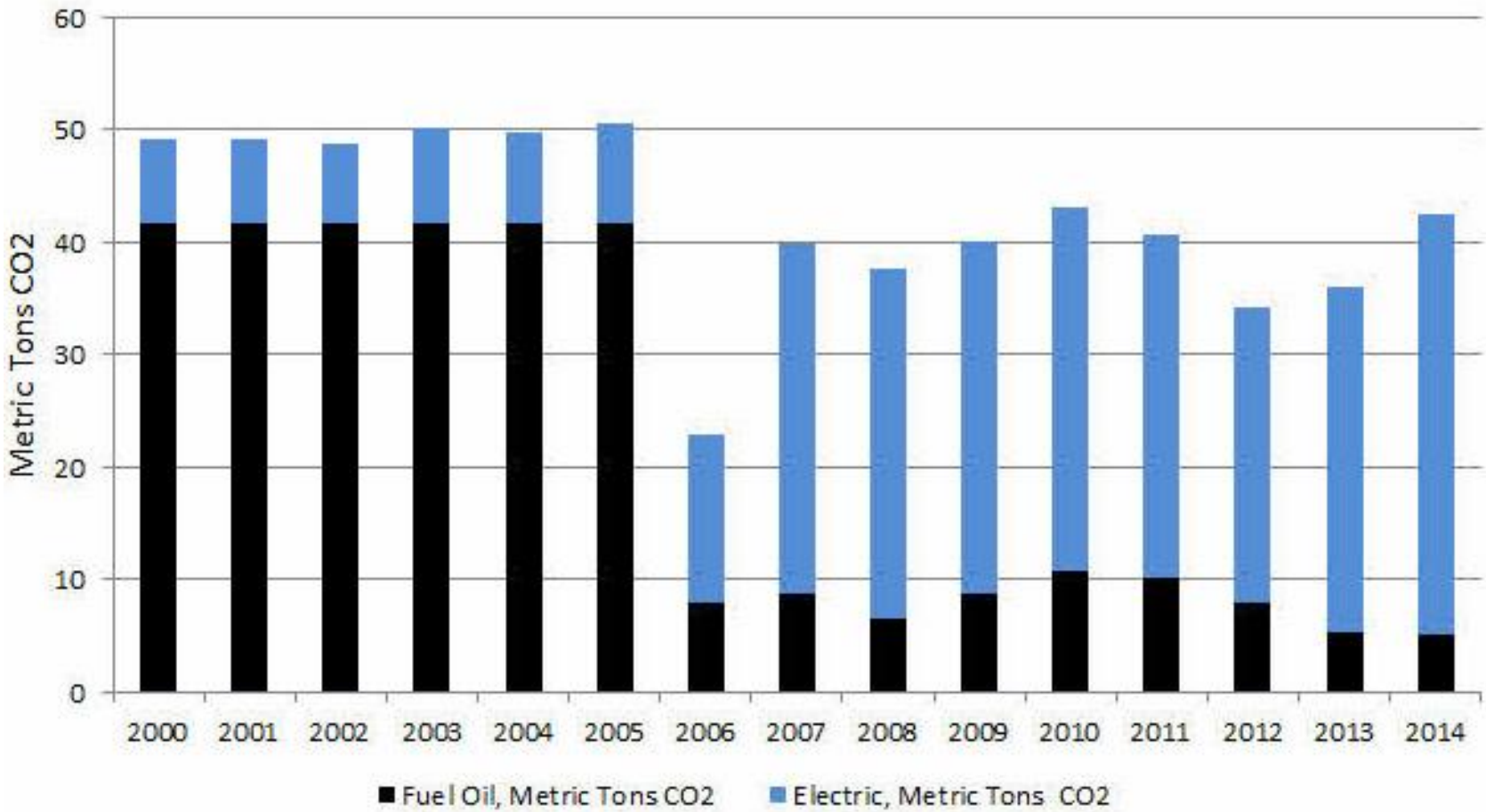
Adjacent to Sawkill Creek

- Remove Hazardous Material
  - Salt & Sand Moved
  - Gasoline & Diesel Fuel Tanks
- Improve Employee Facilities
- Remove All Fossil Fuels from Site
  - Eliminate Fuel Oil Heating
  - Ground-Based Geothermal
  - Increased Use of Electricity



Highway Department Carbon Footprint

Highway Garage, Landfill Sand & Salt Shed



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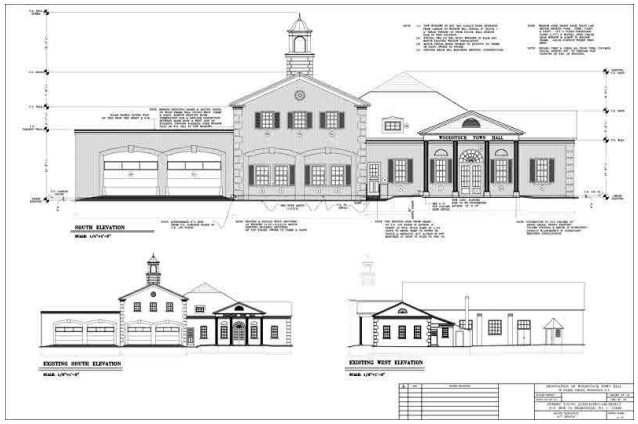
Woodstock Town Hall

Desperately Needed Renovation



- Reconfigure Space
  - Police, Dispatch, Courts
- Replace Four Heating Systems
  - Ground-Based Geothermal
  - All Electric

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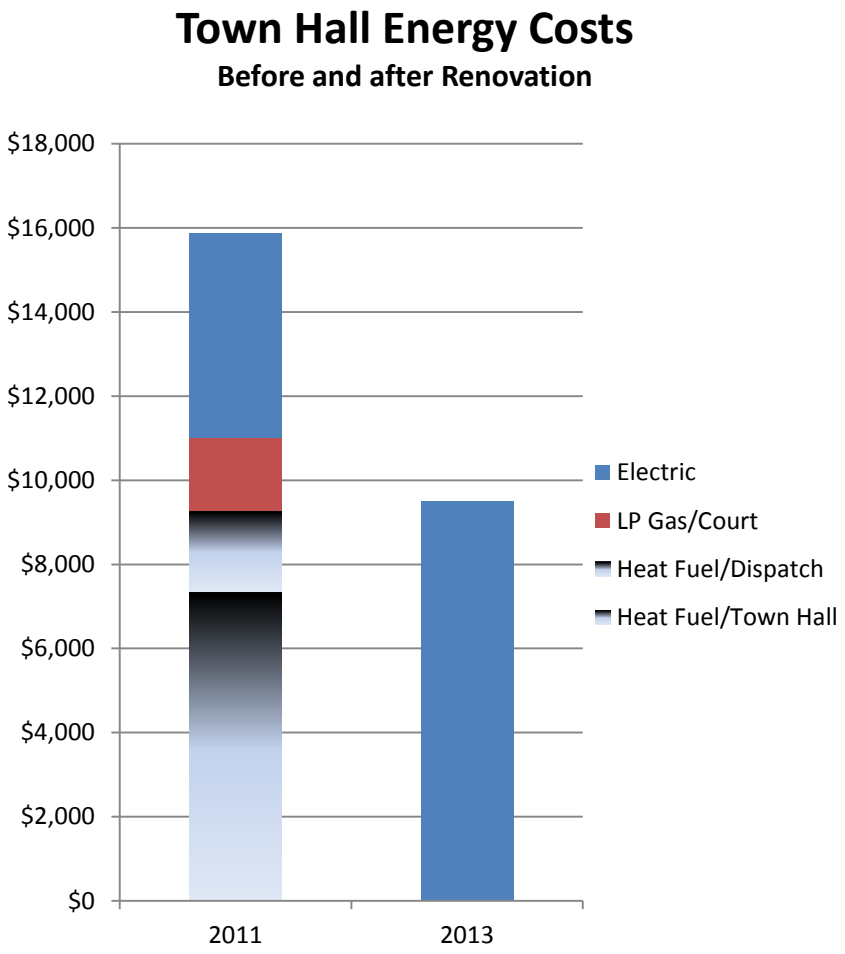
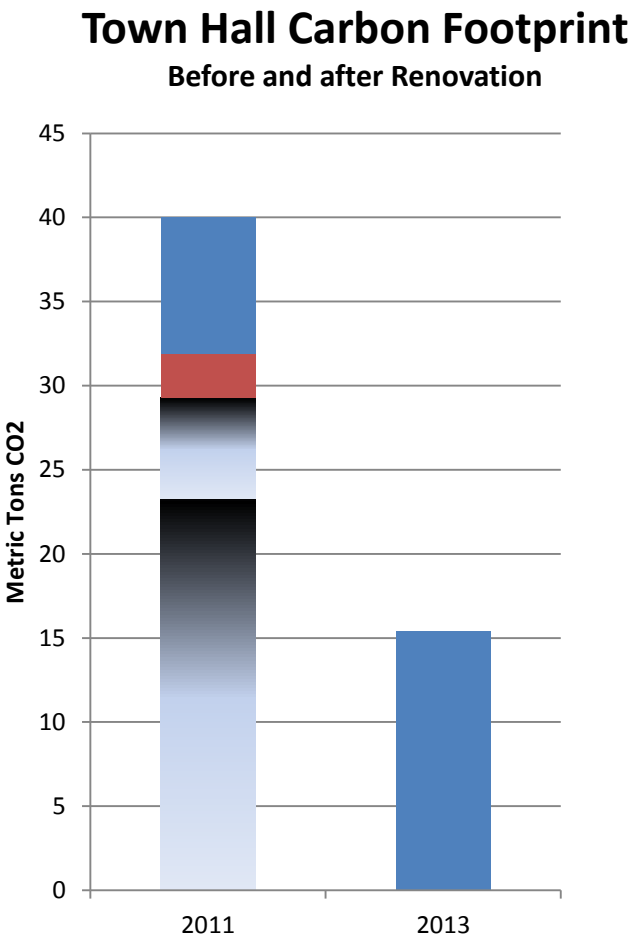
Woodstock Town Hall





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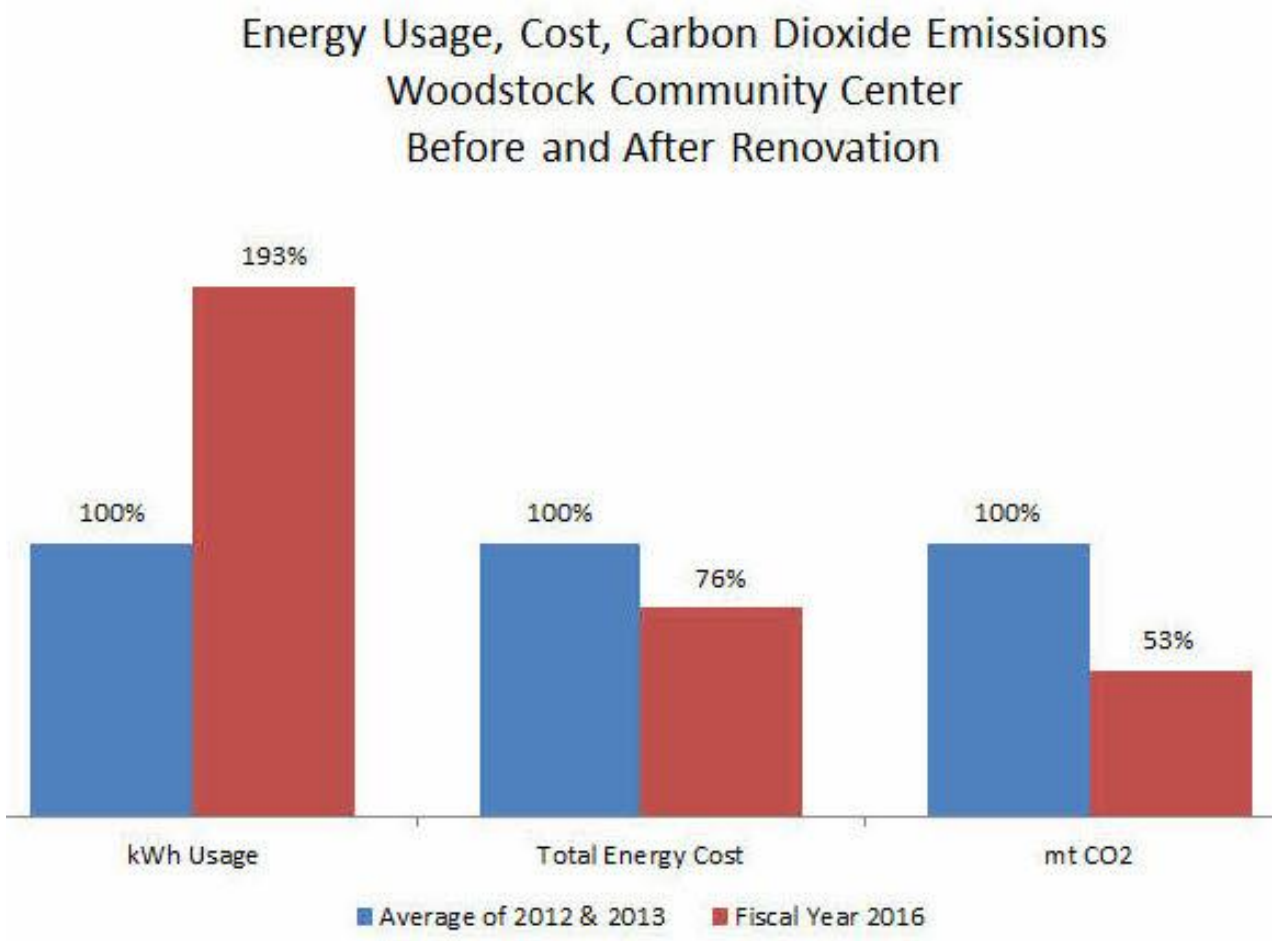
Woodstock Community Center

Air-Sourced Heat Pumps



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Woodstock Town Offices

Next Project

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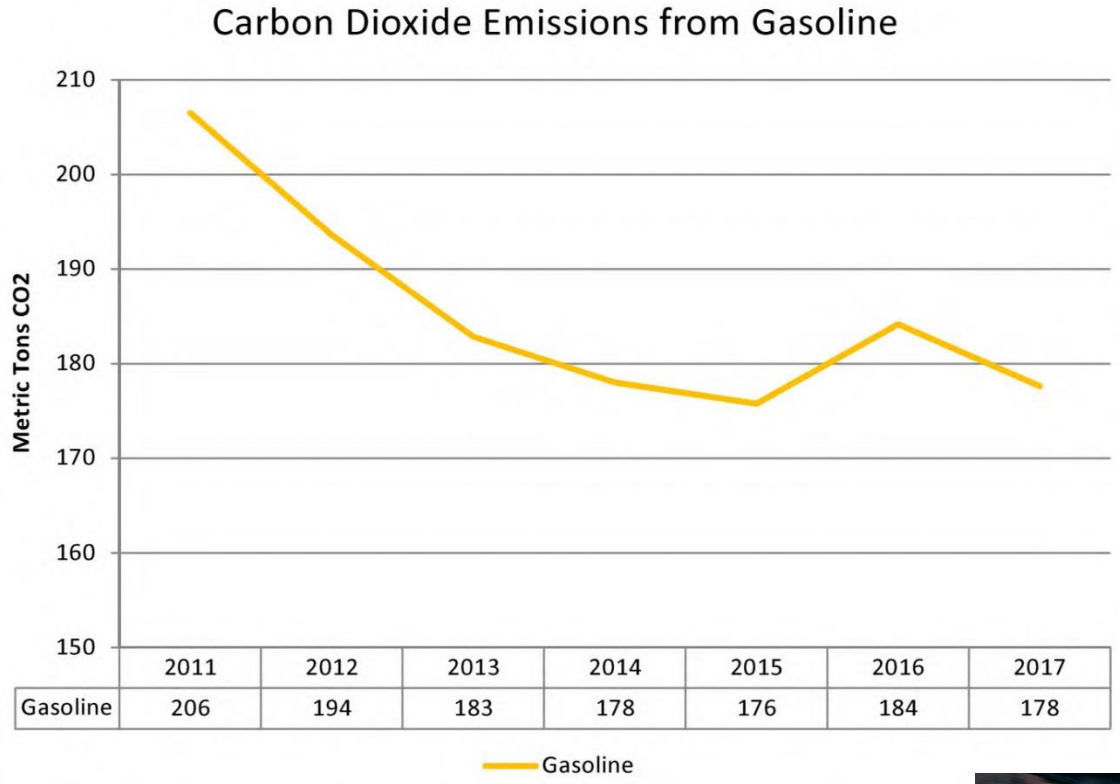
Police Vehicles

Replace 8-Cyl with 6-Cyl Vehicles



	2011	2012	2013	2014	2015	2016	2017
Gasoline	206	194	183	178	176	184	178

Considering Hybrid Police Vehicles

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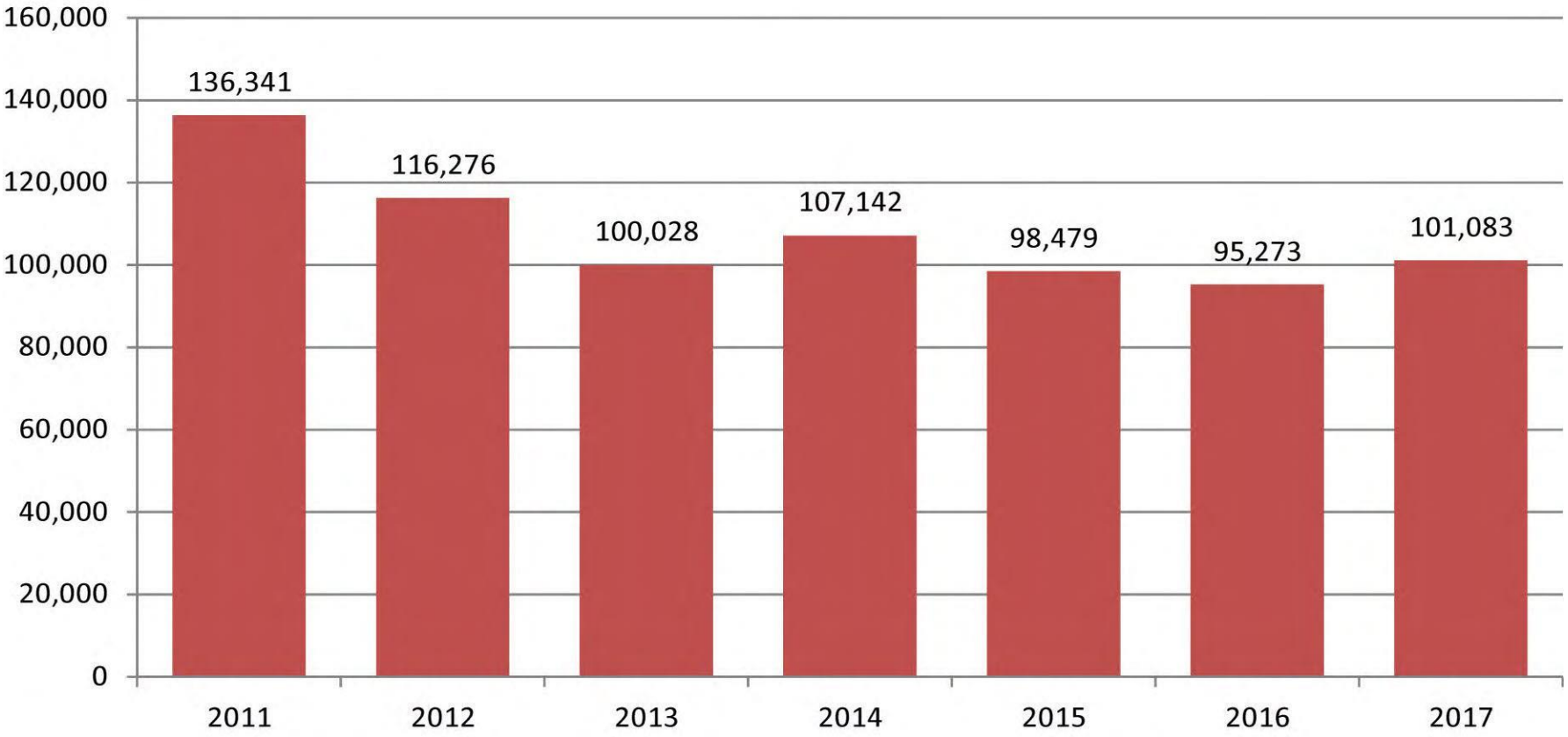
Water District Pump Houses
kWh



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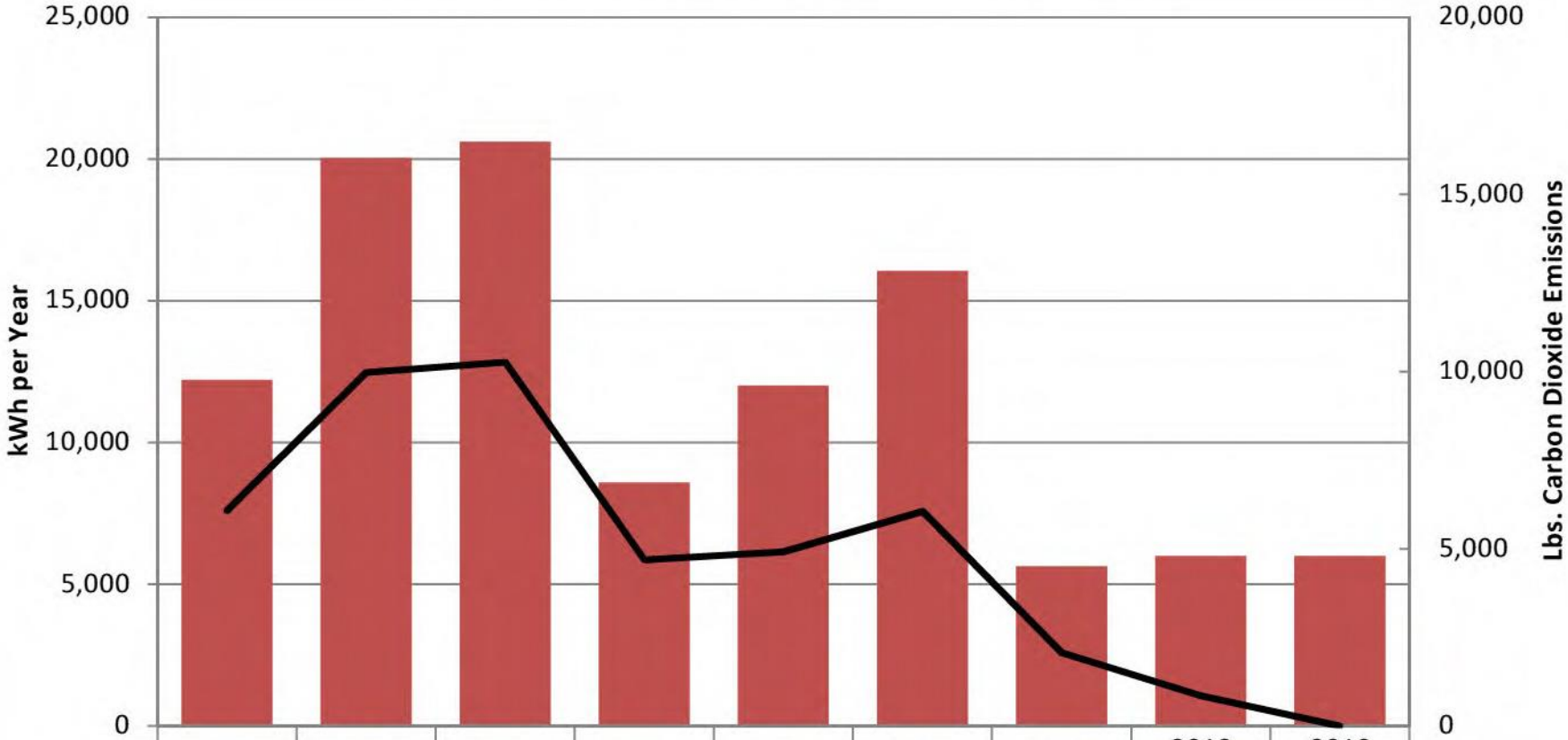
Woodstock Rock City Rd Restrooms
kWh and Carbon Dioxide Emissions



	2011	2012	2013	2014	2015	2016	2017	2018 Budget	2019 Forecast
kWh	12,211	20,031	20,613	8,585	12,009	16,060	5,635	6,000	6,000
Lbs. CO2	6,081	9,975	10,265	4,687	4,912	6,055	2,062	855	0

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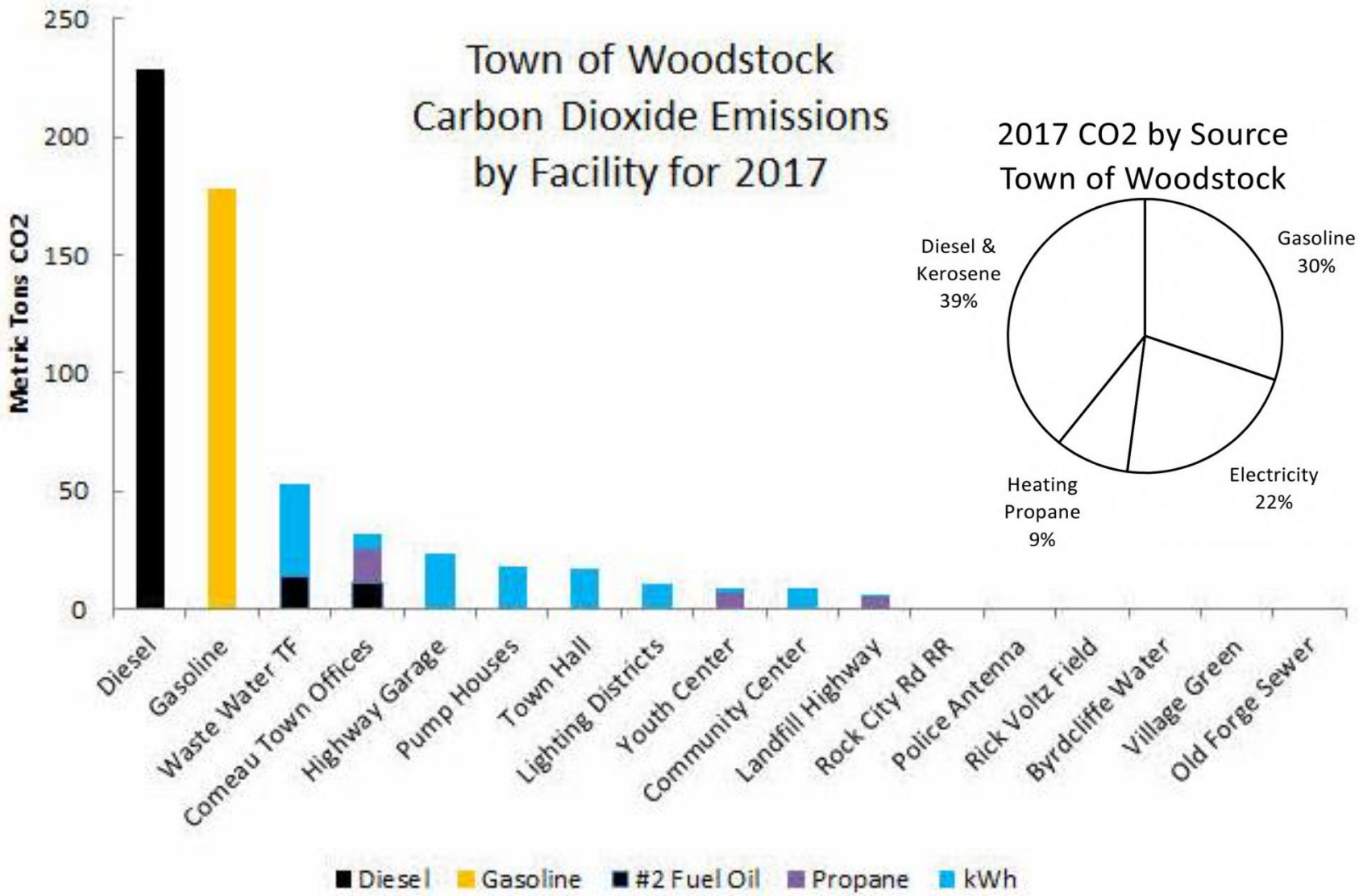

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Wappingers Falls Hydroelectric

Renewable Electric Power

- 90% Town Government Electricity
- 100 Metric Tons Reduction CO2 Emissions
- 30% Less CO_2 by 2020 (Compared with 2011)

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Path to Carbon Neutrality

Woodstock Governmental Operations

- Building Renovations
  - Remove Fossil Fuel Heating
- Renewable Electricity
- Energy Efficiency
  - Police Car Gas Consumption
  - Fix and Repair Infrastructure
  - LED Streetlights
- Town Forest as Carbon Sink

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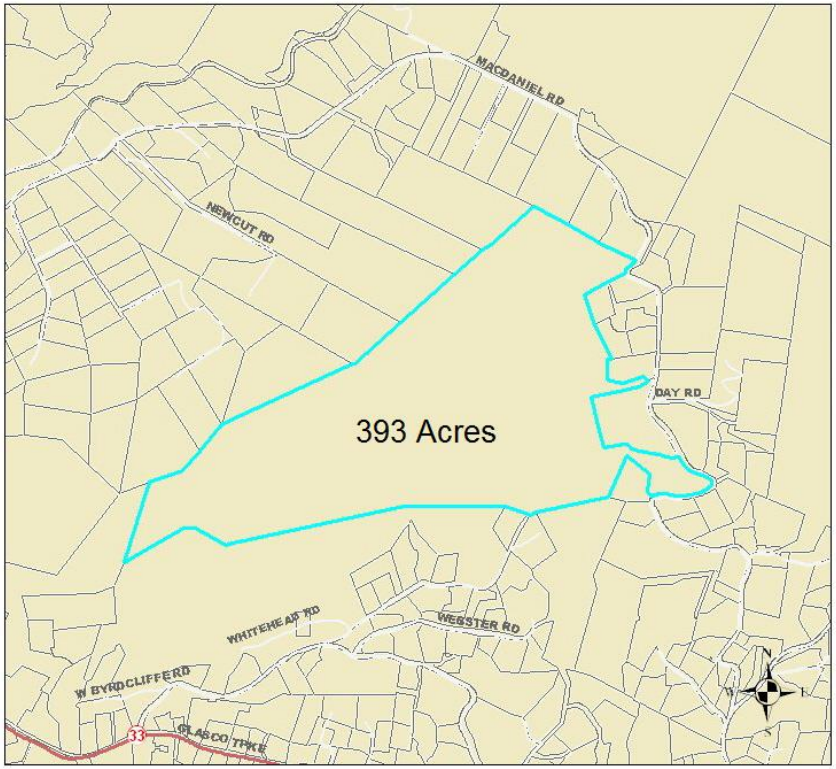
Woodstock's Carbon Sink

500 Acres, Town Owned Forest

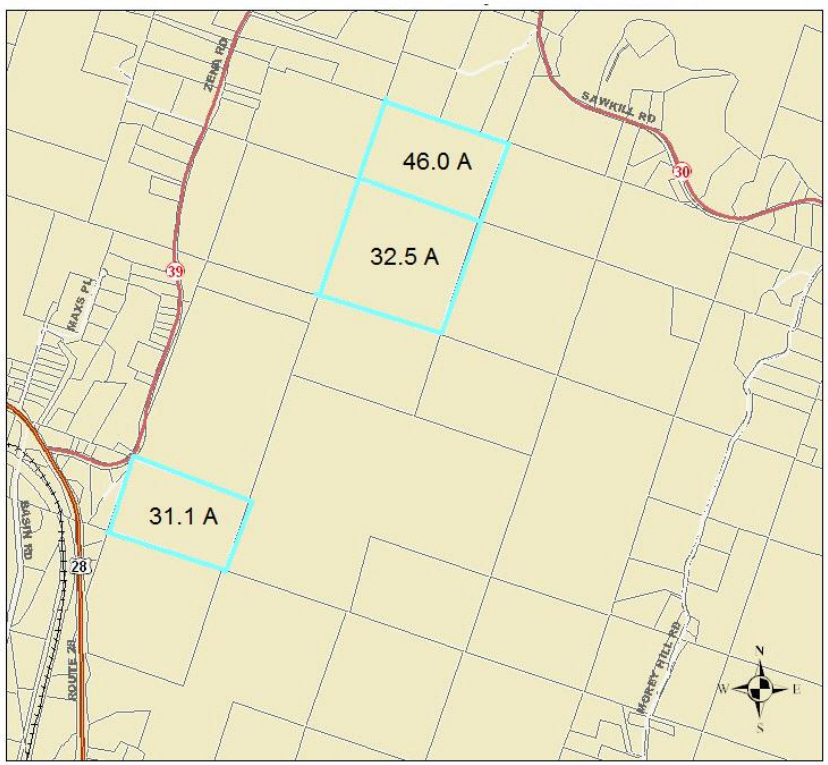
Mount Guardian



Disclaimer: This map was compiled using the most current GIS data available. It is deemed accurate, but is not guaranteed.

Mount Guardian - 393 Acres

Zena - Morey Hill Rds



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Zena, Morey Hill Rds. – 109.6 Acres

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Adirondack & Catskill Forest Preserve

3 million acres classified as Forest Preserve

- 2.6 million acres in the Adirondacks and
- 291,000 acres within the Catskills,

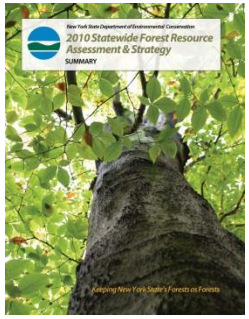
Remove atmospheric carbon dioxide

The approximate 3 million acres of the Adirondack and Catskill Forest Preserve are conservatively estimated to sequester 3 million tons of carbon per year.

1 Metric Ton of Carbon Sequestered/Acre/Year

500 acres X 3.666 Metric Tons CO_2/acre/year =
1,833 Metric Tons Atmospheric CO_2 Absorbed

New York State Department of Environmental Conservation
2010 Statewide Forest Resource Assessment & Strategy, Pages 16 & 17



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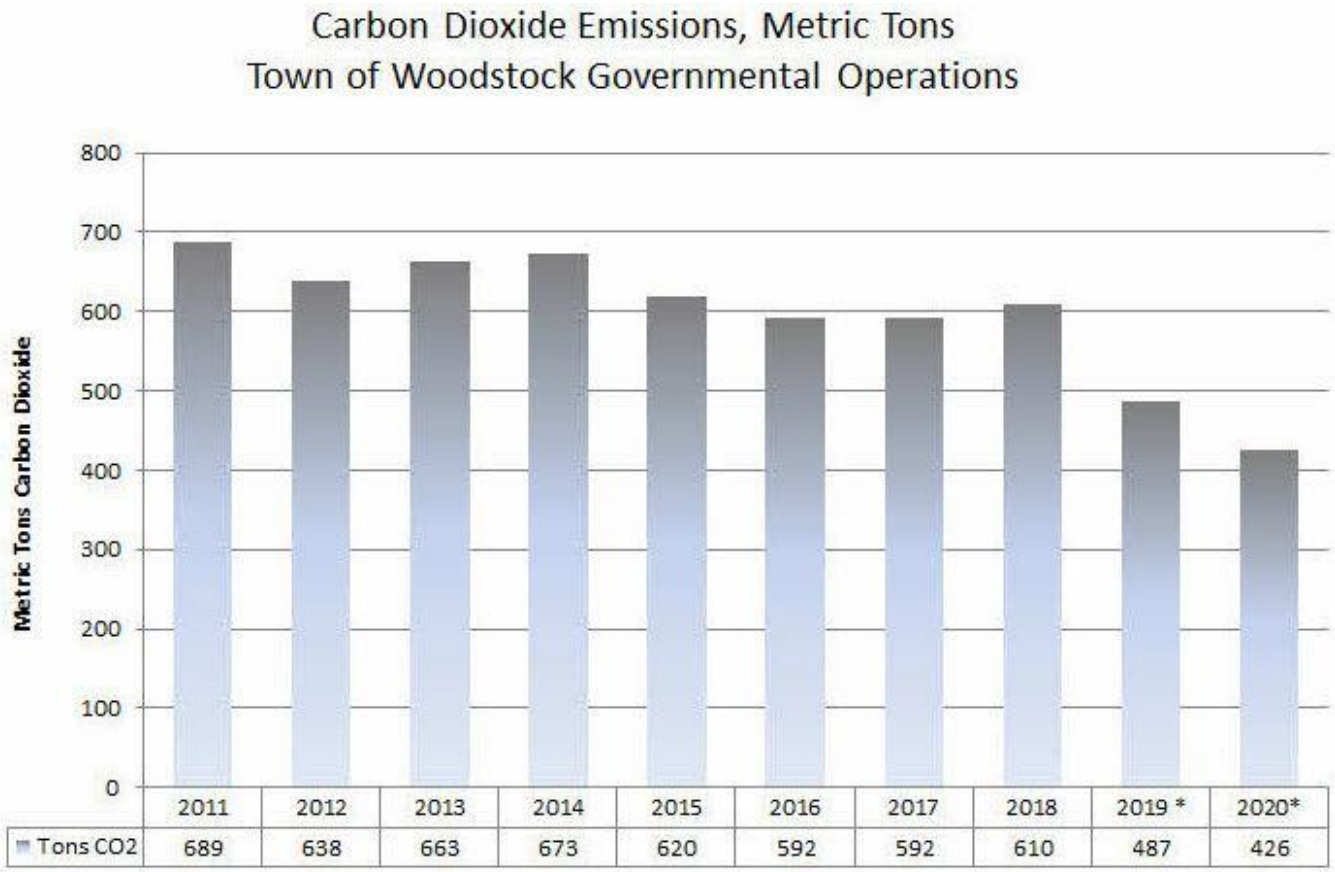
Next Steps

- Renewable Electricity – 100 Metric Tons CO2
- Hybrid Police Cars – 30 Metric Tons CO2
- Town Offices Renovation – 10 Metric Tons CO2
- LED Streetlights – 5 Metric Tons CO2
- Other Renovations – 5 Metric Tons CO2
- Micro Grid for Water Wells

No Identified Substitute for Diesel Fuel

Community Climate Actions

- 10% Challenge
  - Improve Residential Energy Efficiency
- Solarize Woodstock
  - NYSERDA Program to Promote Solar
- Electric Vehicles (EV)
  - EV Seminar and Demonstration
  - EV Charging Stations
- Community Solar Generation
  - Several Projects in Ulster County



<u>Woodstock Compared with 2011</u>

15% CO2 Reduction by 2017

30% CO2 Reduction by 2020*

40% CO2 Reduction by 2025*

NY State Goal: 40% CO2 Reduction by 2030

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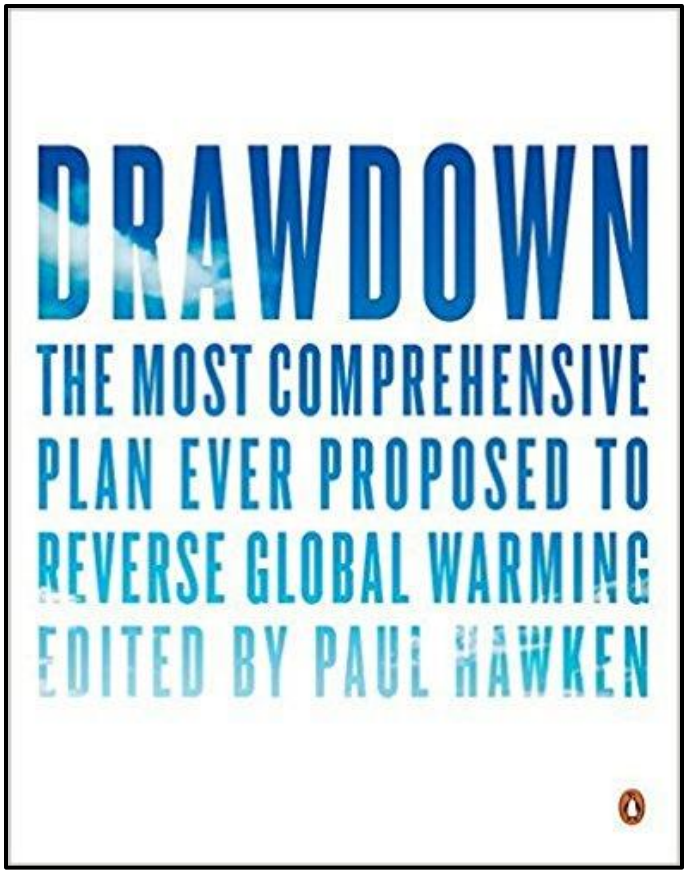
One Hundred Solutions to the Climate Crisis



"Drawdown is that point in time when the concentration of greenhouse gases in the atmosphere begins to decline on a year-to-year basis."

Project Drawdown, a global coalition of researchers, scientists, economists and others, has built a model to evaluate and rank the top active solutions to global warming, based on their actual impact on greenhouse gas emissions.

Woodstock Drawdown Solutions

Drawdown Solution	Rank	Description/Use
Temperate Forests	#12	500 acres of town owned forest to sequester carbon
Rooftop Solar	#10	Solar panels installed at the Highway Garage and Town Hall
In Stream Hydro	#27	Hydroelectric power from Natural Power Group
Retrofitting	#80	Town Hall and Community Center renovations
Heat Pumps	#42	Ground-sourced and air-sourced heat pumps
LED Lighting	#44	New construction, Lime Energy, and street lighting
Insulation	#31	Winterized Rock City Rd convenience restrooms
Cars (Hybrid)	#49	(Proposed for Police Department)

Woodstock's Climate Action Plan

3-Phase Climate Strategy

1. Replace Fossil Fuel Heating Systems
2. Energy Efficiency
3. Carbon Sink Absorbs CO2

2019-2020 Projects

Renovation of Town Offices

Hydroelectric Power

Hybrid Police Cars

LED Street Lights

30% Reduction in CO2

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Kenneth S. Panza, Liaison
Town of Woodstock
45 Comeau Dr.
Woodstock, NY 12498
kpanza@woodstockny.org

December 10, 2018

Woodstock Town Board
45 Comeau Dr.
Woodstock, NY 12498

Woodstock Climate Action Plan

In March 2007, the town board adopted a resolution committing that town governmental operations would be carbon neutral by year-end 2017. The town achieved carbon neutrality in 2015 and was formally recognized for its accomplishment at the 2017 annual meeting of the New York State Association of Conservation Commissions.

A three-pronged approach was used to achieve carbon neutrality. First, fossil fuel heating systems were replaced at the highway garage and town hall with ground-sourced heat pumps and at the community center with an air-sourced heat pump. The heat pumps reduced the building carbon footprints and energy costs.

> **NOW, THEREFORE, BE IT RESOLVED** that the Woodstock Town Board commits to a Zero-Carbon Initiative, leading the Woodstock community by example and by implementing policies resulting in no net emission of carbon dioxide and other greenhouse gases by the end of 2017, and;
>
> **BE IT FURTHER RESOLVED**, that as a public-private partnership, the Woodstock Zero-Carbon Initiative shall feature Town Government as a key stakeholder in a comprehensive community carbon-neutrality effort, which includes institutions, businesses, civic organization, and individual families and residents, and;
>
> Carbon Neutral Resolution, March 2007

Second, energy efficiencies were achieved with police vehicles, the Rock City Rd restrooms, and at the water wells. By replacing 8-cylinder police vehicles with 6-cylinder models, gasoline consumption was reduced. The recent availability of hybrid police vehicles presents an opportunity for additional reductions in gasoline usage. Winterizing the Rock City Rd convenience restrooms reduced electricity usage by about two-thirds, and maintenance and repair actions at the town's water wells reduced electricity consumption by about 30 percent.

Third, 500-acres of town owned forest were identified as a carbon sink available to sequester carbon dioxide emitted by town governmental operations. By year-end 2018, not only has the town reached carbon neutrality, the town has achieved Drawdown, defined as sequestering more carbon dioxide than the town emits.

Since 2011, carbon emissions from town governmental operations have dropped by 15%, and it's expected that by 2020, the town will have reduced its emissions by 30%. Because of carbon sequestration by the 500 acres of town owned forest, the town is removing more carbon from the atmosphere than it emits.

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