Town of Niles Climate Action Plan 2015

Appendix C: Action Strategy Summary Document

Acknowledgements

The Town of Niles and Cayuga County wish to thank the following community members, organizations, and staff for their contributions to developing this Climate Action Plan.

Sustainability Plan Advisory Committee
Charlie Greene, Town Supervisor
Kathleen Gorr, Board of Appeals
Don Klein, Board of Appeals
Janet Stinson, Town Resident
Jerry VeVone, Code Enforcement Officer

CNY Regional Planning and Development Board
Chris Carrick, Energy Program Manager
Amanda Mazzoni, Planner

Table of Contents

Acronyms Explained

Btu and MMBtu: British Thermal Units and Millions of British Thermal Units. A Btu is the amount of energy needed to cool or heat one pound of water by one degree Fahrenheit, and MMBtu represents 1 million Btu.

CAFE: Corporate Average Fuel Economy. CAFE standards have been set by the federal government for the years 2016 and 2025.

CAPPA: Climate and Air Pollution Planning Assistant. CAPPA is a tool provided by ICLEI – Local Governments for Sustainability to help local communities assess the effectiveness of certain emissions reduction strategies in their communities. CAPPA is the tool that was used for all of the calculations in this document.

DPW: Department of Public Works.

GHG: Greenhouse Gas

kW: Kilowatt. kW is a unit of power equal to 1,000 watts.

kWh: Kilowatt hour. A kilowatt-hour (symbolized kWh) is a unit of energy equivalent to one kilowatt (1 kW) of power expended for one hour (1 h) of time.

$MTCO_2e$: Metric Tons of Carbon Dioxide Equivalent. $MTCO_2e$ converts the warming potential of each greenhouse gas (i.e. carbon dioxide, nitrous oxide, methane, etc.) into one measurement.

NYSERDA: New York State Energy Research and Development Authority. NYSERDA is a public benefit corporation created in 1975. Its goal is to help New York meet its energy goals of reducing energy consumption, promoting the use of renewable energy sources, and protecting the environment. NYSERDA offers a variety of incentive programs to help New York residents achieve these goals.

PV: Photovoltaic. Solar PV systems convert sunlight directly into electricity.

VMT and DVMT: Vehicle Miles Traveled and Daily Vehicle Miles Traveled. Vehicle Miles Traveled (VMT) is the total number of miles driven by all vehicles within a given time period and geographic area. It is used by regional transportation and environmental agencies for planning purposes. VMT is influenced by factors such as population, age distribution, and the number of vehicles per household. However, the greatest factor by far is how land uses are arranged.

Introduction

Background

The Town of Niles was recruited to participate in the Central New York Climate Change Innovation Program (C2IP) in the fall of 2014. The Town adopted the Climate Smart Communities (CSC) pledge, pledging their commitment to energy and emissions reduction. The Town received technical assistance from the Central New York Regional Planning and Development Board (CNY RPDB) in the Q4 of 2014 to complete a greenhouse gas (GHG) inventory for the 2010 (baseline year) calendar year. The GHG inventory report was compiled to detail energy use and the sources of emissions in the Town. The inventory provided the Town with a better understanding of its contribution to carbon emissions, and also serves as a basis for the development of a targeted action plan for reducing GHG emissions over time.

The Town received additional assistance through the C2IP program in cooperation with the CNY RPDB throughout the winter of 2015 to begin to analyze potential strategies for reducing emissions. CNY RPDB staff worked to analyze potential strategies for reducing the Town's emissions for both municipal operations as well as at a community-wide scale. CNY RPDB staff utilized a software tool developed by ICLEI-Local Governments for Sustainability known as CAPPA (Climate and Air Pollution Planning Assistant) version 1.5 to calculate potential GHG reductions as well as cost savings for each strategy. CAPPA is an Excel-based decision-support tool designed to help U.S. local governments explore and identify potential opportunities to reduce greenhouse gas emissions and other air pollution emissions. CAPPA provides a starting point for two major tasks: determining an achievable emissions reduction target and selecting strategies to include in a local government–operations or community-scale emissions-reduction plan, commonly called a climate action plan. CAPPA users can compare the relative benefits of a wide variety of emissions reduction and clean air measures, and identify those most likely to be successful for their community based on its priorities and constraints.

The action strategies explored in this document provide the Town of Niles with an estimate of potential reductions as well as costs and other co-benefits. By implementing the strategies noted in this document, the community will not only be able to reduce GHG emissions, but will also be able to reduce energy costs, decrease reliance on non-renewable, foreign sources of energy, and conserve Niles' resources for the future.

Overview

Global concern with climate change is primarily focused on the amount of greenhouse gases in the atmosphere. Greenhouse gases, such as carbon dioxide, water vapor, and methane, among others, are an essential part of our atmosphere, and they serve a vital role in making our planet

warm enough for life. Greenhouse gases trap energy (in the form of long wave radiation) that is being emitted by the Earth, reflecting it back into the atmosphere to warm the planet. As the amount of carbon dioxide in the atmosphere has increased or decreased over time, the planet's temperature has changed in roughly the same proportion. Scientists have determined this relationship from studying ice cores taken from Antarctica from over 400,000 years ago. Right now there is more carbon dioxide in the atmosphere than at any time measured in the ice core.[i] Scientists expect that this will lead to a gradual warming of the planet in most areas.

Anthropogenic emissions of carbon dioxide and other greenhouse gases into the atmosphere are major contributors to global climate change. Therefore, it is imperative for municipalities around the world, including the Town of Niles, to take immediate action towards decreasing emissions.

The Purpose of this Document

The role of this document is to identify and analyze local actions that the Town of Niles can take to reduce greenhouse gas emissions caused by human activities occurring within the Town. The document does not debate the issue of global climate change. In recent years, the scientific community has reached a nearly unanimous consensus that climate change is occurring, that human activities are a primary cause, and that the potential consequences could be severe. Climate scientists around the world, represented by the Intergovernmental Panel on Climate Change (IPCC), have an unequivocal position: human activity is changing the earth's climate through the release of GHG emissions resulting from the combustion of fossil fuels. The longer communities delay taking action, the greater the risk humans face of irreversibly depleting nonrenewable resources and harming our environment. This strategy summary document is designed to act as a blueprint for the community's response to the challenges posed by climate change.

The Town of Niles cannot solve the global climate crisis alone, but together with partners in county, state, and federal government, the Town has committed to taking steps to reduce emissions and create new programs and services that will support the community and families in doing the same.

This document offers suggestions that can make homes more energy efficient and increase the amount of locally produced renewable energy. It explores strategies for reducing emissions from transportation. Finally, this document outlines measures that can make the Town's municipal operations a model for efficiency and resource-conservation.

[i] In January 1998, the collaborative ice-drilling project between Russia, the United States, and France at the Russian Vostok station in East Antarctica yielded the deepest ice core ever recovered, reaching a depth of 3,623 m (Petit et al. 1997, 1999). The extension of the Vostok CO_2 record shows the present-day levels of CO_2 are unprecedented during the past 420 kyr. Pre-industrial Holocene levels (~280 ppmv) are found during all interglacials, with the highest values (~300 ppmv) found approximately 323 kyr BP.

Town of Niles Greenhouse Gas Reduction Target

Through the analysis of the strategies outlined in this document the Town of Niles has identified an emissions reduction target goal of 7.5% reductions from municipal operations and 8.9% reductions from the community, representing a total of 556 metric tons of CO_2 reduced by 2025.

Strategy Summary

GHGs are gases in Earth's atmosphere that prevent heat from escaping into space. GHG emissions are typically associated with the burning of fossil fuels, such as coal and oil, and are classified into scopes.

- Scope 1 emissions are direct GHG emissions from sources that are owned or controlled by the entity. Scope 1 can include emissions from fossil fuels burned on site, emissions from entity-owned or entity-leased vehicles, and other direct sources.
- Scope 2 emissions are indirect GHG emissions resulting from the generation of electricity, heating and cooling, or steam generated off site but purchased by the entity, and the transmission and distribution (T&D) losses associated with some purchased utilities (e.g., chilled water, steam, and high temperature hot water).[1]
- Scope 3 emissions include indirect GHG emissions from sources not owned or directly controlled by the entity but related to the entity's activities. Scope 3 GHG emission sources that are typically quantified include T&D losses associated with purchased electricity, employee travel and commuting, contracted solid waste disposal, and contracted wastewater treatment. Additional sources may include GHG emissions from leased space, vendor supply chains, outsourced activities, and site remediation activities.[ii]

Utilizing CAPPA a variety of strategies were identified and analyzed to determine their potential for achieving emissions reductions either at the municipal operations level or the community scale. The analysis team also explored the potential impacts of one external large scale factor on the Town's emissions profile: New Federal CAFE Standards that will increase the average fuel economy of vehicles sold in the U.S. through 2025. The results of these analyses are summarized in the tables below. In most cases, if there were multiple potential strategies addressing a singular target area (e.g. vehicle fuel sources: electric, diesel, hybrid, natural gas), the strategy that was the most cost effective with the largest emissions reduction impact was chosen to be included in the final summary.

[ii] http://www.epa.gov/oaintrnt/ghg/ Greening EPA

Figures

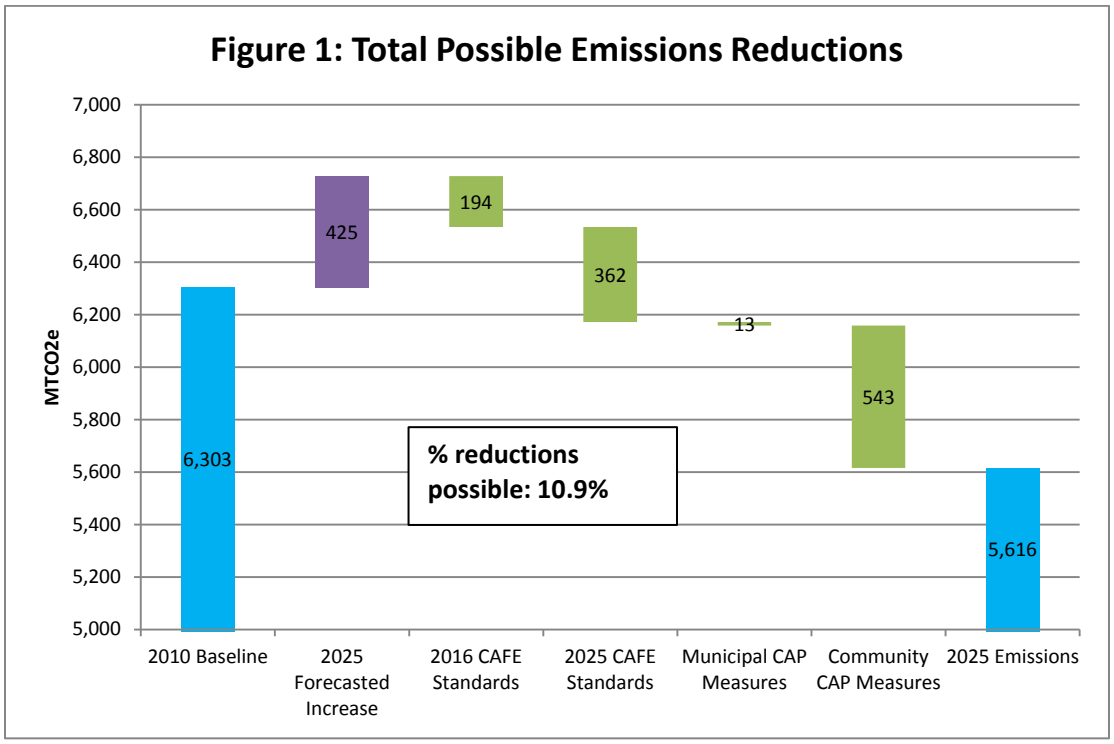

Figure 1 summarizes the results of the town's GHG inventory, a 2025 emissions forecast based on current trends, impacts from the strengthening of Federal CAFE standards, as well as the reductions associated with the Climate Action Strategies that were analyzed for the town separated into community-wide measures as well as municipal operations measures. It is projected that Niles' total GHG emissions in 2025 could be reduced by 10.9% if the town implements all of the recommended community-wide and municipal operations measures.

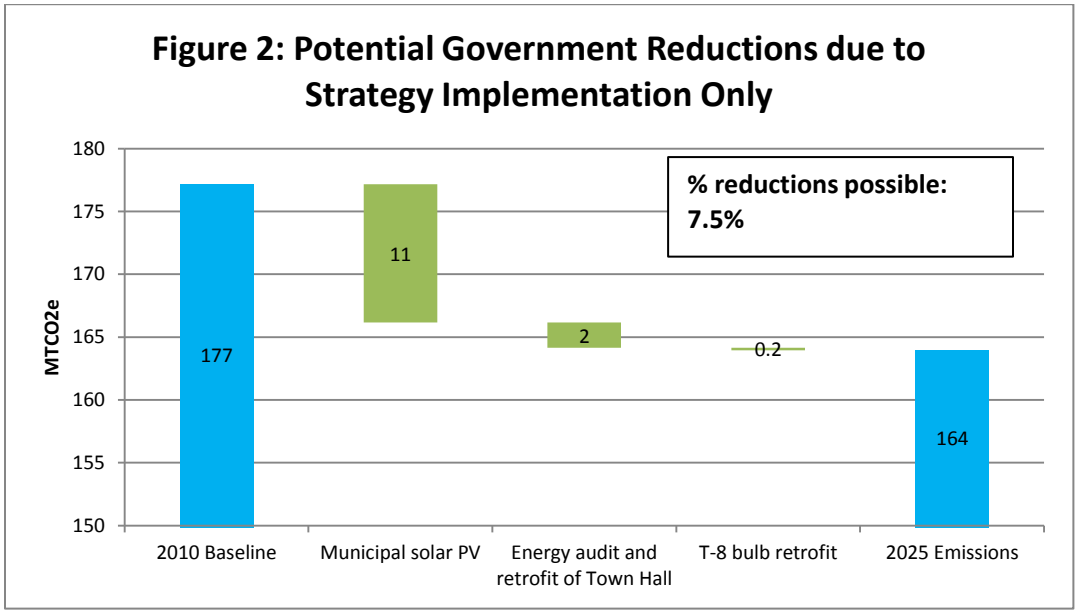

Figure 2 depicts the Town of Niles' 2010 baseline municipal emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2025 should each of the suggested strategies be implemented. It is estimated that there will be a 7.5% reduction in community emissions if all suggested strategies are implemented.

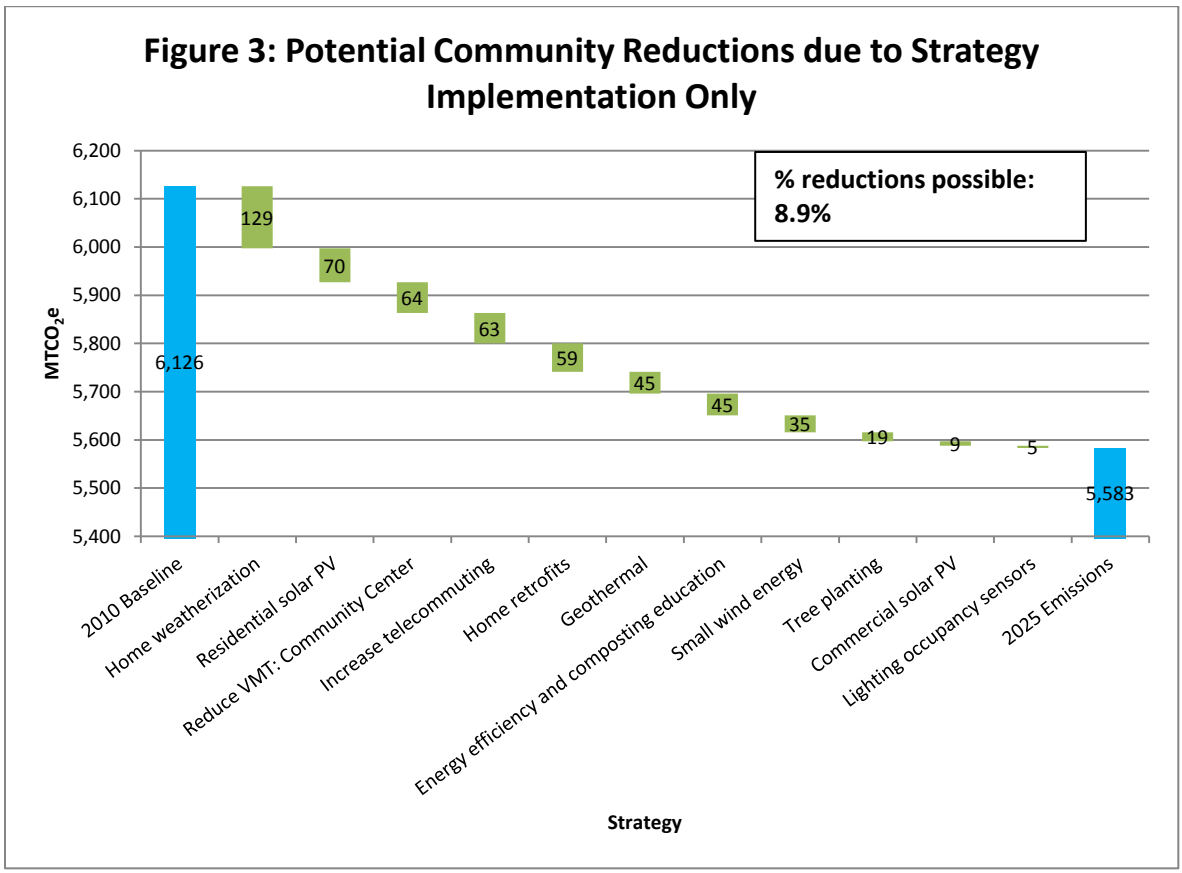

Figure 3 depicts the Town of Niles' 2010 baseline community emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2025 should each of the suggested strategies be implemented. It is estimated that there will be an 8.9% reduction in community emissions if all suggested strategies are implemented.

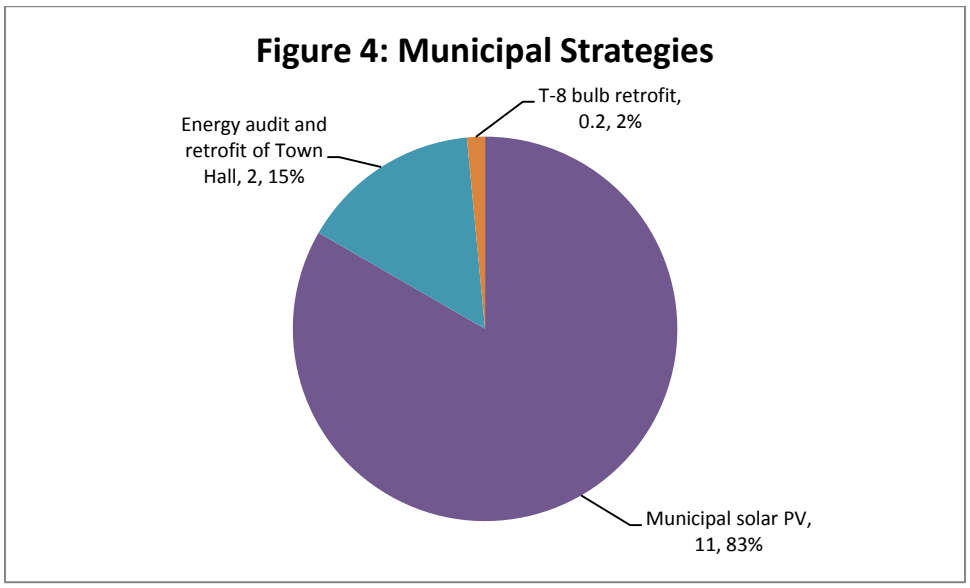

Figure 4 depicts each of the suggested municipal reduction strategies and their contribution to overall municipal emissions reductions.

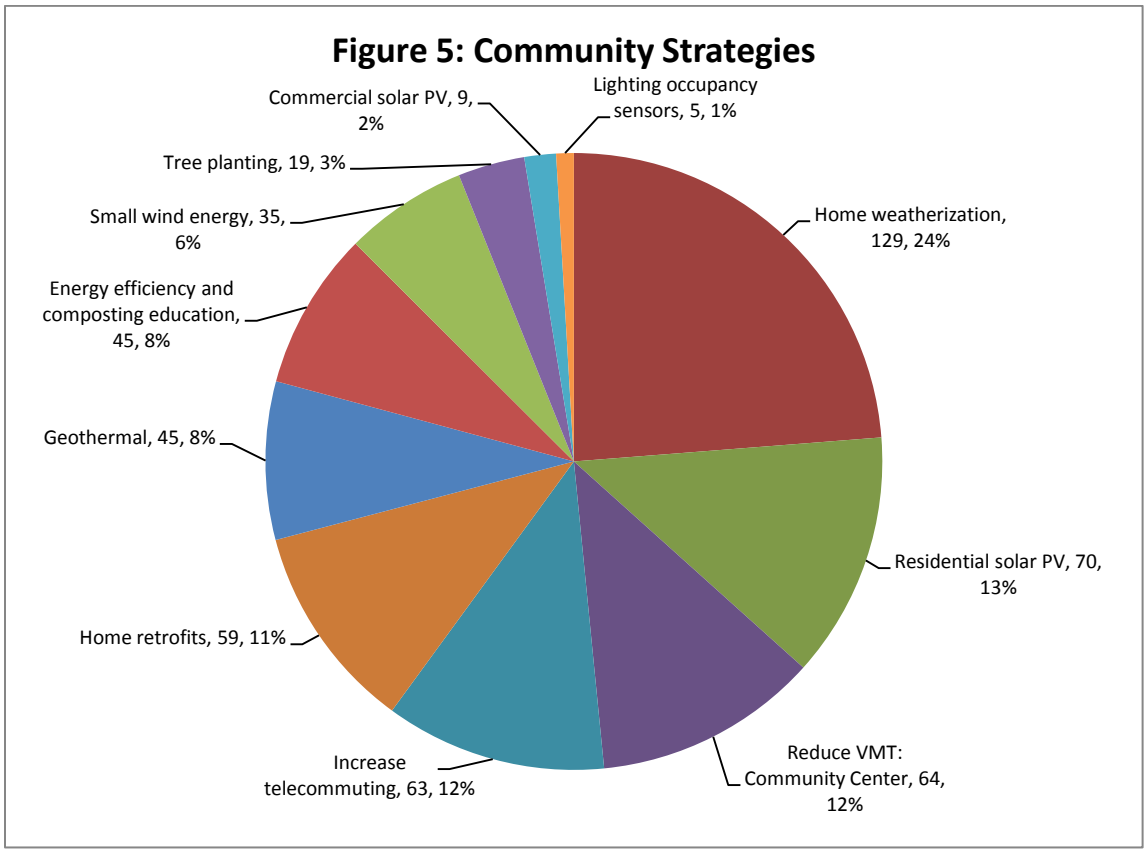

Figure 5 depicts each of the suggested community reduction strategies and their contribution to overall municipal emissions reductions.

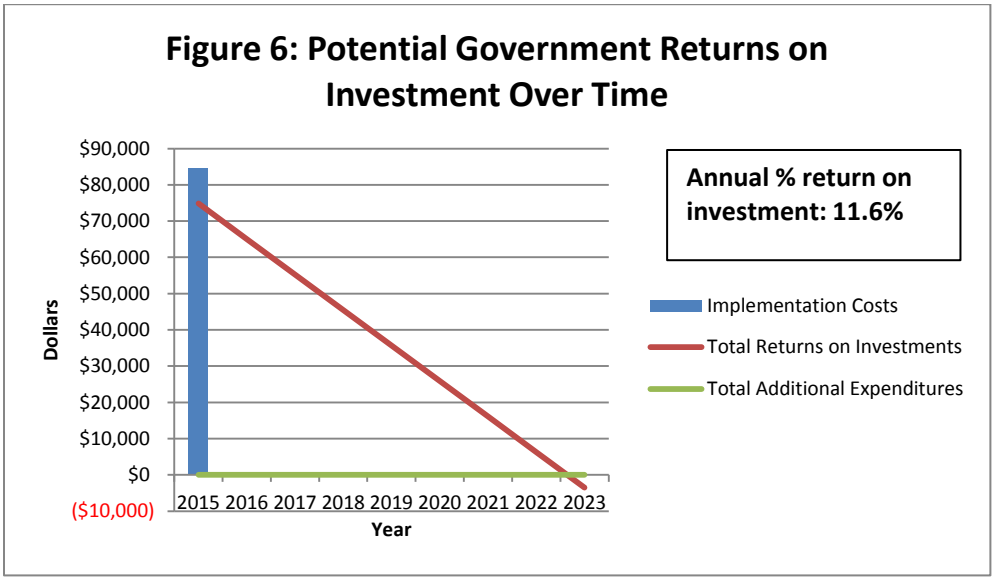

Figure 6 depicts the total implementation cost of all suggested municipal emissions reduction strategies and their annual returns on investment. It also shows additional expenditures that would be incurred due to strategy implementation. It is estimated that the annual return on investments for all of the suggested municipal emissions reduction strategies is approximately 11.6%.

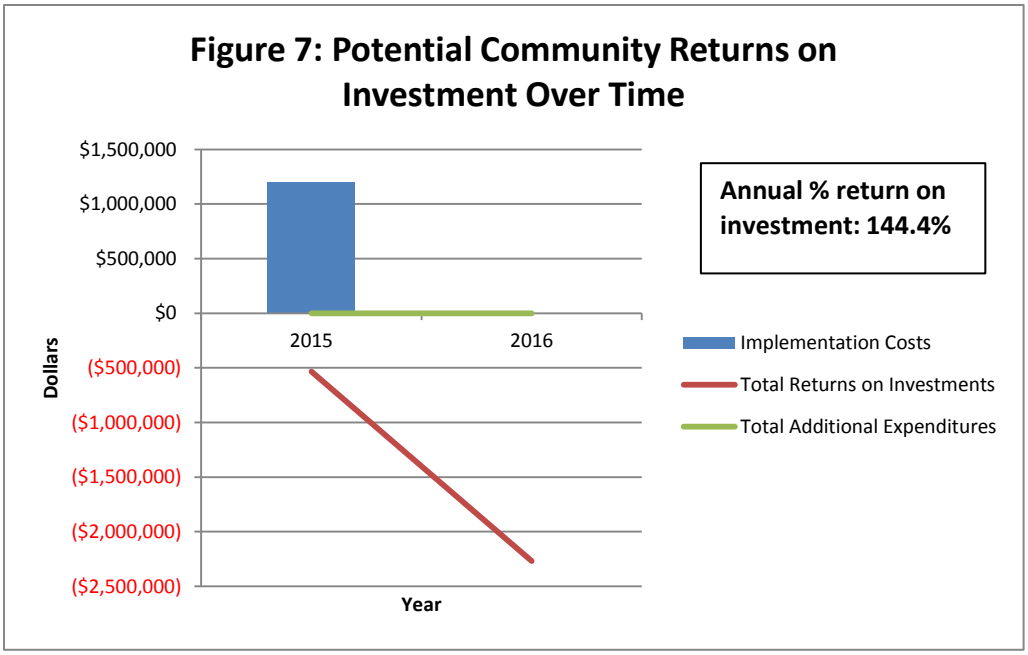

Figure 7 depicts the total implementation cost of all suggested community emissions reduction strategies and their annual returns on investment. It also shows additional expenditures that would be incurred due to strategy implementation. It is estimated that the annual return on investments for all of the suggested emissions reduction strategies is approximately 144.4%.

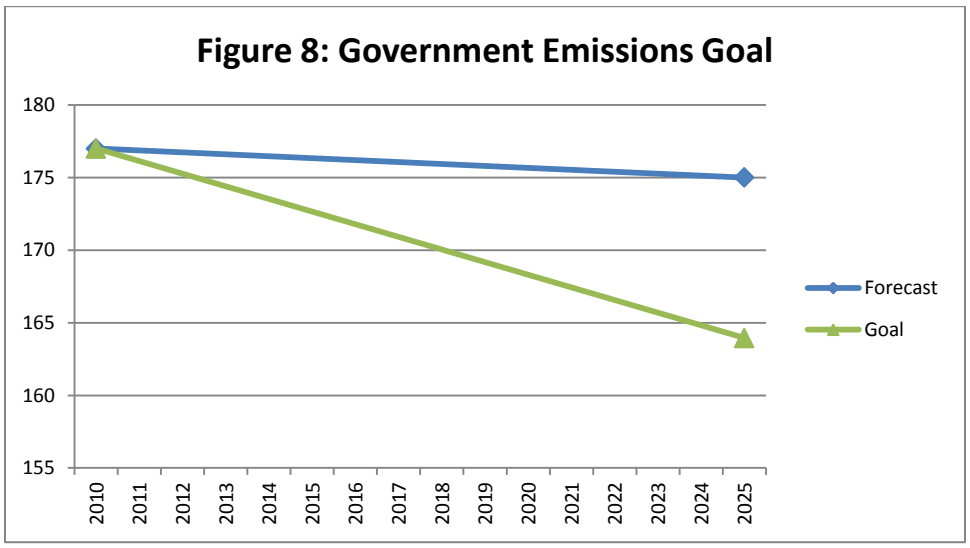

Figure 8 depicts forecasted emissions for the Town of Niles in the year 2025 if no action is taken and emissions if all the suggested strategies are adopted and the 7.5% government reduction goal is reached.

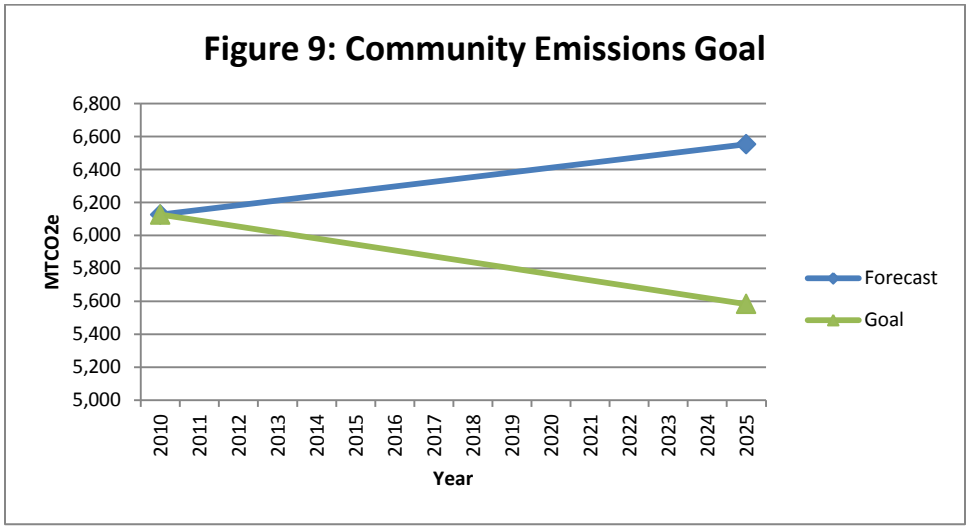

Figure 9 depicts forecasted emissions for the Town of Niles in the year 2025 if no action is taken and emissions if all the suggested strategies are adopted and the 8.9% community reduction goal is reached.

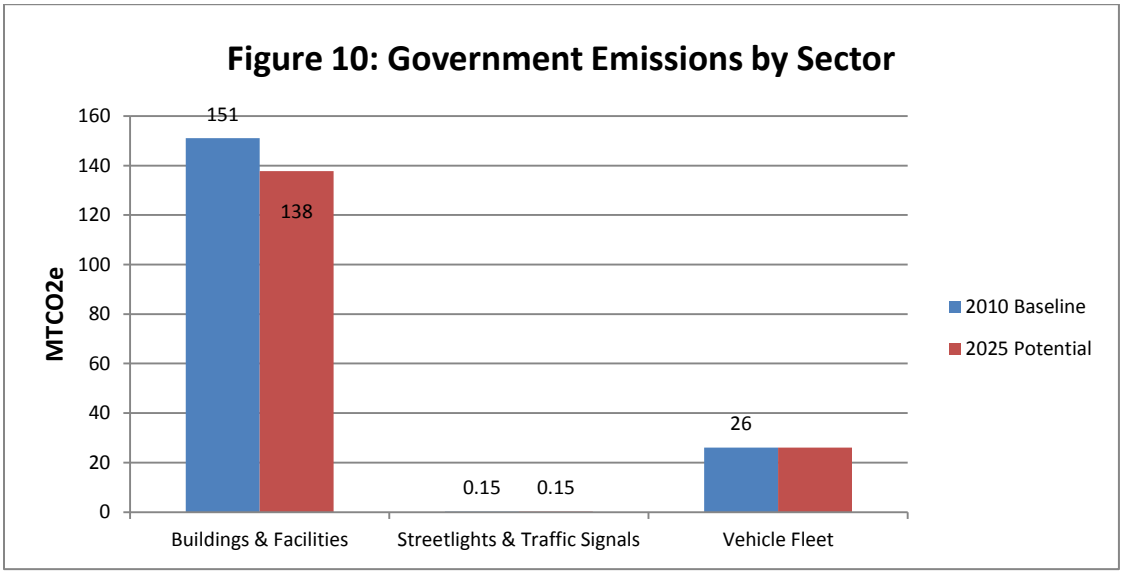

Figure 10 compares the municipal emissions per sector in the 2010 base year and 2025 emissions potentials if each of the suggested strategies is implemented.

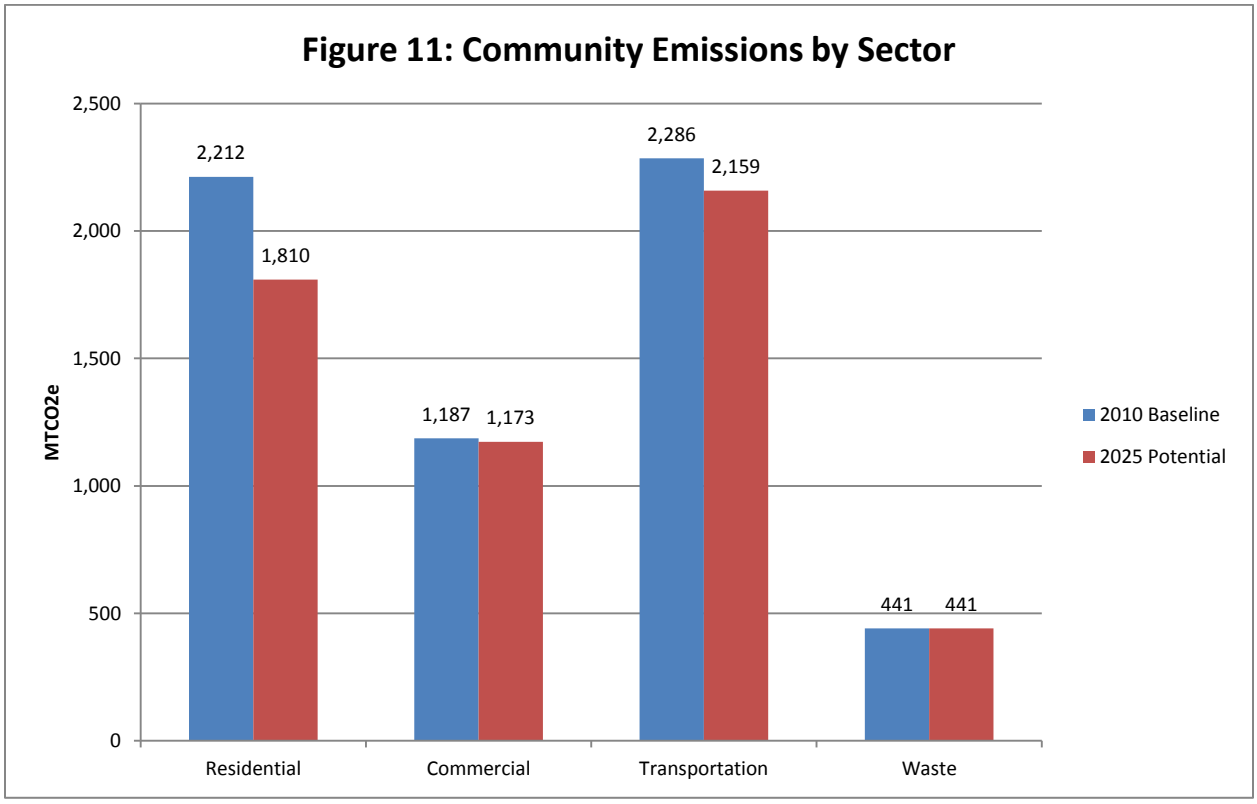

Figure 11 compares the community emissions per sector in the 2010 base year and 2025 emissions potentials if each of the suggested strategies is implemented.

Government Strategies

Buildings and Facilities

1. Municipal Solar PV

Strategy Description:
Solar photovoltaic (PV) energy production harnesses the sun's energy to produce electricity. GHG emissions reductions from this strategy are equal to the emissions that would have been produced if the electricity was supplied through fossil fuel based sources by the local utility because electricity generated from PV systems displaces electricity demand which would ordinarily be supplied by the local utility. Putting solar panels on city buildings is a good way to increase the visibility of solar energy in the community, while providing clean energy for building use. Contrary to popular belief solar power has been shown to be viable in a wide variety of climates that are not thought of as "sunny". Local governments can borrow money at low interest rates through bond issues, making solar more economical than it is for individuals or businesses. Some cities have combined solar energy with efficiency measures, with the shorter payback period of the efficiency measures helping to pay for the solar.

An increasingly popular way for a local government to overcome the financial hurdles of installing a photovoltaic system is through the "solar services model" also known as a Power Purchase Agreement (PPA). Through this type of arrangement the owner of a property can provide the space for a power producer to install the system. The property owner then agrees to buy the power produced from that system at a set rate that is competitive with grid electricity. Since the power producer retains ownership of the equipment, there are no installation and maintenance costs to the consumer of the electricity produced. This is particularly attractive to government entities that are unable to take advantage of tax based incentives for renewable energy.

NYSERDA, New York Power Authority (NYPA) and City University of New York (CUNY) developed a NYS Unified Solar Permit that helps to reduce costs for solar projects by streamlining municipal permitting processes and supports the growth of clean energy jobs across the state. The unified solar permit is part of Governor Cuomo's NY-Sun initiative to quadruple in 2013 the amount of solar capacity in New York that was added during 2011.

Adoption of a standardized residential/small business solar permit is a key element to help New York municipalities remove barriers to local economic development in the growing solar industry. The standardized permit cuts costs by creating a uniform permitting process in municipalities across the state. Installers in New York State have had to work with different permits and permitting processes in each of the State's 1,550 municipalities, which increased the complexity of permitting and have caused project delays and added costs. It is recommended that the Town of Niles adopt the unified solar permit to reduce soft costs associated with solar installations.

The CNY RPDB is also currently offering a bulk solar purchasing program for municipalities, known as Solarize CNY. This program will bundle solar installations from multiple local municipalities into a single Request For Proposals (RFP), allowing solar installers to offer lower installation prices than if each municipality were to pursue options individually. The CNY RPDB will choose the solar installer and complete the up-front leg-work for the municipalities to help save municipal time and money. The town has submitted potential sites to be considered as part of this program.

- **Methodology:**
  - kW of PV installed
    - Municipal operations used 48,387 kWh in 2013. Assume government installs 43 kW of PV[1]
  - Price of electricity
    - $ 0.19 per kWh average[2]
  - Sun hours per day
    - 3[3]
  - Cost of PV installation
    - $1,100 per kW[4]

43	kW of PV Installed

$0.19	Price of Electricity ($ per kWh)
3.0	Sun Hours per Day
$1,100	Cost of PV installation ($ per kW)
47,085	Annual Energy Production (kWh)
$8,946	Annual Cost Savings
5	Simple Payback (years)

CO2e (metric tons)
11

Co-Benefits

-Renewable energy

-Local energy

-Produces no air pollutants

Preble Town Hall with 9 kW solar PV panels installed on roof

Success Stories

-9 kW installed on Town Hall building in Preble, expected to save 9,720 kWh annually.[5]

2. Energy audit and retrofits of existing facilities

Strategy Description:
Buildings account for 40% of total energy use and about 35% of GHG emissions in the United States. Over the next few decades, most of this energy will be used by existing buildings. Many measures can be applied to existing buildings to improve their efficiency, including using efficient light bulbs and fixtures, replacing appliances with more efficient ones, increasing insulation, replacing windows, and upgrading HVAC systems. Local governments can set an example by making efficiency improvements to their own buildings. The jurisdiction can require improvements to private buildings when renovations are made or buildings are sold. Governments can also encourage efficiency improvements by offering low or zero interest loans to building owners for improvements. NYSERDA offers incentives for energy retrofits through its existing facilities program. Both prequalified incentives up to $30,000 for electric efficiency and up to $30,000 for natural gas efficiency measures; and performance-based incentives up to $2 million are available.

Many buildings are not equipped with the most recent energy efficient technologies, causing the Town to use more energy than is necessary. Retrofitting existing facilities through measures like replacing appliances with more efficient ones, increasing insulation, and upgrading HVAC systems can greatly improve energy efficiency and therefore reduce emissions from the Town's buildings and facilities. The town currently uses propane to heat the Town Hall facility, which, if converted to a more efficient heating source, could significantly reduce emissions.

The town should first consider undergoing a comprehensive energy audit of the Town Hall and possibly other facilities to learn where energy savings might be realized. The town should then consider the suggestions provided from the audit and undertake the strategies that will be most beneficial.

- **Methodology:**
  - Square foot of facilities retrofitted
    - Assume Town Hall building is retrofitted by 2025→ 7,387 square feet[6]
  - Price of electricity ($ per kWh)
    - $0.15 per kWh at these two buildings[7]
  - Price of propane ($ per gallon)
    - $1.71 per gallon[8]
  - Typical new construction annual energy use per square foot (kWh)
    - 3.69 kWh/sq. ft.[9]
  - Typical new construction annual energy use per square foot (gallons)
    - 0.25 gallons/sq. ft.[10]
  - Percent electricity savings
    - Assume 10%
  - Percent propane savings
    - Assume 10%
  - Retrofit Cost ($ per square foot)

- $5[iii]

7,387	Square Foot of Facilities Retrofitted

$0.15	Price of Electricity ($ per kWh)
$1.71	Price of Propane ($ per gallon)
3.69	Typical New Construction Annual Energy Use per Square Foot (kWh)
0.25	Typical New Construction Annual Energy Use per Square Foot (gallons)
10	Percent Electricity Savings
10	Percent Propane Savings
$5.00	Retrofit Cost ($ per square foot)
2,726	Total Annual Electricity Savings (kWh)
185	Total Annual Propane Savings (gallons)
$725	Annual Cost Savings
51.0	Simple Payback (years)

CO2e (metric tons)
2

Co-Benefits: -Reduce energy costs for heating and cooling -Makes geothermal, solar and wind energy more feasible	 Energy Star's Portfolio Manager tool helps local governments track and assess energy and water consumption in existing buildings, identify the best opportunities for improvement, track immediate and cost effective reductions over time and document savings results.[11]	Success Stories: - **Village of Montebello, NY** - An Energy Audit of municipal buildings was completed along with lighting, insulation and Energy Star upgrades, saving one third on the village's energy bill. Montebello has also installed solar panels on the village hall. The mayor estimates that the village netted about $3,000 in "returned electricity."[12]

[iii] Chris Carrick, CNY RPDB. It is important to note that retrofit costs and energy savings vary widely depending on the age and type of building being retrofitted and the measures being implemented.

3. Replacing T-12 light bulbs with T-8

Strategy Description:
Lighting is typically the largest electricity draw in commercial buildings. The Niles Town Hall underwent a lighting retrofit about four years ago that converted 96[13] T-12 bulbs with T-8 bulbs.

- **Methodology:**
  - Number of bulbs replaced
    - Town Hall facility upgraded- 96 T-12 bulbs to T-8 bulbs
  - Price of electricity ($ per kWh)
    - $0.15 per kWh[14]
  - Wattage of T-12 bulb
    - 50W[15]
  - Wattage of T-8 bulb
    - 30W[16]
  - Annual energy savings of one T-8 bulb
    - Assuming bulbs are on 2 hours per day, 5 days per week, 40 weeks per year
    - 20W x 2 hr x 5 days x 40 weeks = 8,000 Wh/yr = 8 kWh/yr[iv]
  - Cost of T-8 bulb
    - $3-$5[v17]

96	Number of bulbs replaced

$ 0.1500	Price of Electricity ($ per kWh)
50	Wattage of T-12 bulbs
30	Wattage of T-8 bulbs
8	Annual energy savings of one T-8 bulb
$4.00	Cost of one T-8 bulb
768	Total Annual Electricity Savings (kWh)
$115	Annual Cost Savings
3	Simple Payback (years)

CO2e (metric tons)
0.2

[iv] The CAP committee did not know how much energy the town has saved since this renovation, so estimates were used.
[v] The CAP committee did not know how much the town spent on this renovation, so estimates were used.

Co-Benefits

- Reduces municipal operational costs, savings can be redistributed

Example of T-12 and T-8 bulbs.

Success Stories

- The Town of Niles replaced 96 T-12 bulbs with more efficient T-8 bulbs about four years ago and has been realizing energy and cost savings since.

4. Geothermal Heat Pump

Strategy Description:
Geothermal heat pump technology utilizes the physical phenomenon of fairly constant annual temperatures several feet below the surface of the earth. During the winter, a heat exchanger fluid is pumped into the ground where the heat is transferred to the fluid and then delivered to the building as heat. During the summer, the heat exchanger fluid takes away the heat in the building and discharges it into the ground, thus cooling the building. Electricity is used to run the pumps for the geothermal system, meaning there will still be greenhouse gas emissions associated with heating and cooling unless the electricity is supplied by non-carbon sources; however, the energy use and emissions will be much less than with a traditional heating/cooling system. Because energy used for heating and cooling represents the majority of energy use in a building, installing a geothermal system can significantly reduce overall energy use and emissions.

While the Highway Garage building was only built a few years ago, it currently uses propane for heating. The building was built with radiant heat plumbing with the idea that it might eventually be converted to a geothermal heating system. The town should consider a conversion to geothermal at the end of the useful life of the current boiler.

Community Strategies

Transportation

1. Reducing VMT through Development of Community Center

Strategy Description:
Community members and groups currently travel to Auburn and other nearby towns and villages for group meetings and recreation opportunities. The town should consider implementing recreational activities (i.e. playground, baseball diamond) and encouraging meetings to occur at the Town Hall facility to cut down on residents' vehicle miles traveled. Developing the Town Hall into a community center would reduce VMT and local air pollutants while bringing residents together and creating a sense of community. The town is already working to make the basement a more usable meeting space.

- **Methodology**
  - Annual miles eliminated
    - Assume a 5% reduction in VMT
    - 3,662 miles per vehicle[18] *5% = 183 miles per vehicle * 887 total vehicles = 162,321 miles
  - Price of gasoline
    - $2.25[19]
  - MPG of vehicle
    - 23.8 mpg[20]

62,321	Annual miles eliminated

$2.25	Price of Gasoline ($ per gallon)
23.8	Miles per Gallon of Vehicles Eliminated
6,820	Annual Gasoline Savings (gallons)
$15,345	Annual Cost Savings on Energy

CO2e (metric tons)
64

Co-Benefits		Success Stories
- Reduces local air pollution -Reduces reliance on foreign oil		- Salt Lake City, Utah has implemented a Clear the Air program aimed at reducing VMT in their city. They have already reduced driving by 572,766 miles, saving 26,032 gallons of gas, and 7,234 pounds of emissions.[21]

2. Increase Telecommuting

Strategy Description:
Computers, modems, the Internet, telephones and fax machines—everything is now in place to allow many employees to work at home. Some can do it part time, some full time. Use advanced telephones and, if possible, video cameras to meet with individuals rather than travel to meet with the people face to face. A variation on this theme is to furnish or rent office space at a strategic location near employees who formerly commuted long distances. Other ways to reduce the need to commute: change the work week—to ten hours a day for four days, or nine hours a day for five days, for example. All these options reduce commuting miles for employees and shift traffic to more efficient off-peak hours.

While telecommuting reduces driving to work, it may free up vehicles for other uses like running errands, so the net driving reduction may be less than the reduction in commuting. Telecommuting encouragement programs are most effective if combined with other programs to reduce driving, like parking fees or parking cash-out programs and congestion pricing.

- **Methodology:**
  - Number of employees offered telecommuting incentives
    - 359 people with primary jobs in Town of Niles,[22] assume all are offered incentives but only 5% utilize them (below)
  - Price of gasoline
    - $2.25[23]
  - Percent of employees telecommuting each workday
    - Assume 5%[24]
  - Average one-way commute length (mi)
    - Average one-way commute lengths
      - 77 commute less than 10 miles to work (avg. 5 miles)[25]
        - 77 x 5 = 385 miles
      - 211 commute 10-24 miles to work (avg. 17 miles)
        - 211 x 17 = 3587 miles
      - 69 commute 25-50 miles to work (avg. 37.5 miles)
        - 69 x 37.5 = 2587.5 miles

- 2 commute more than 50 miles to work (50 miles)
  - 2 x 50 = 100 miles
- 385 + 3587 + 2587.5 + 100 = 6659.5 miles total
- 6659.5 / 359 (total primary jobs) = 18.6 miles

- Average fuel economy
  - 23.8 mpg[26]

359	Employees Offered Telecommuting Incentives

$2.25	Price of Gasoline ($ per gallon)
5	Percent of Employees Telecommuting each Workday
18.6	Average One-way Commute Length (mi)
23.8	Average Passenger Vehicle Fuel Economy
160,258	Annual Vehicle Mile Reduction
6,734	Annual Gasoline Savings (gallons)
$1,515,040	Annual Cost Savings

CO2e (metric tons)
63

Co-Benefits

- Reduces traffic

- Reduces local noise and air pollution

- Reduces reliance on foreign fuels

Success Stories

- The State of Arizona has successfully encouraged more than 4,000 state employees to telework, reducing driving by 5.25 million miles a year.[27]

4. Improve/Expand Pedestrian Infrastructure

Strategy Description:
Walking brings health and environmental benefits, reduces traffic congestion, and brings customers to business along the walking route. Planning that prioritize pedestrian needs will yield a quite different design from planning that prioritizes automobiles. While sidewalks and other typical pedestrian infrastructure may not be the most effective in the Town of Niles, creating walking paths connecting destinations could help to achieve this goal of converting vehicle trips to walking. The town could consider tapping into existing snowmobile trails and/or abandoned roadways for trail locations.

- **Methodology**
  - Weekly trips switching from car to walking
    - Annual VMT= 4,928,102.771 miles[28] *(2/3) [vi]/365 = 9,001 DVMT
    - (9,001*28% of trips are less than 1 mile[29])*5% changing to walking*7 days = 882
  - Price of gasoline
    - $2.25[30]
  - Average length of avoided trip (miles) due to expanded bike infrastructure
    - Use CAPPA estimation/source – 1 mile
  - Average fuel economy
    - 23.8 mpg[31]

882	Weekly Trips Switching from Car to Walking

$2.25	Price of Gasoline ($ per gallon)
1	Average Length of Avoided Trip (mi)
23.8	Average Passenger Vehicle Fuel Economy
45,864	Annual Vehicle Mile Reduction
2,328	Annual Gasoline Savings (gallons)
$5,238	Annual Cost Savings

CO2e (metric tons)
22

[vi] Assuming 1/3 of VMT is through traffic that does not begin or end in Niles

Co-Benefits
-Alternate transportation such as walking promotes exercise and a healthier population
-Reduced fuel costs
-Reduced local pollution
-Reduced reliance on foreign oil

Creekwalk in Syracuse, NY

Success Stories
-The Creekwalk in Syracuse, NY allows walking or biking through the city, including to and from Destiny USA.[32]

Residential Energy Use

1. Home Weatherization

Strategy Description:
While low-income earners generally have smaller houses and fewer appliances than higher-income earners, their homes are often older and poorly insulated. Low-income weatherization programs seal cracks around windows and doors, add insulation, and sometimes replace inefficient appliances, reducing energy-use-related GHG emissions and lowering utility bills. There are federal and state programs to provide weatherization assistance (sometimes administered by local governments), but funding is limited and often insufficient for the number of homes requiring retrofitting. There is an opportunity for additional local programs to implement cost-effective energy saving measures that reduce emissions while benefiting low-income individuals and families.

The NYS Weatherization Assistance Program (WAP) assists income-eligible families and individuals by reducing their heating/cooling costs and improving the safety of their homes through energy efficiency measures. Energy efficiency measures performed through the program include air sealing (weatherstripping, caulking), wall and ceiling insulation, heating system improvements or replacement, efficiency improvements in lighting, hot water tank and pipe insulation, and refrigerator replacements with highly efficient Energy Star rated units. Both single-family and multi-family buildings are assisted. Household energy use reductions and resultant energy cost savings are significant, with an average savings in excess of 20%. Individual households apply by contacting the provider that serves their area. Households with incomes at or below 60% of state median income are eligible for assistance. Program services are available to both homeowners and renters, with priority given to senior citizens, families with children and persons with disabilities.

This strategy is a priority for the Town of Niles. The town could consider assisting in a weatherization program by providing loans or grants to low-income residents. The New York State Weatherization Assistance Program is also available to households with incomes at or below 60% of the state median income. This program provides an energy audit and weatherization services based on the results of the audit to reduce heating and cooling energy use.

- **Methodology**
  - Number of homes weatherized
    - Assume 10% → Total occupied households = 432[33] * 10% = 43 homes
  - Price of electricity
    - $0.125 per kWh[34]
  - Price of natural gas
    - $1.30 per therm[35]
  - Price of fuel oil

        - $4.05[36]
    - Percentage of homes heated with gas
        - 4 homes using natural gas for heating of 432 total occupied homes[37] = 0.9%
    - Percentage of households using fuel oil
        - 174 homes using fuel oil for heating of 432 total occupied homes[38] = 40.3%
    - Average electric energy (kWh) used for heating per household
        - 6,581,592 total kWh use[39] * 60% for heating[40] = 3,948,955 kWh total for heating / 45 households using electricity for heat[41] = 87,755 kWh per household
    - Average natural gas energy (therms) used for heating per household
        - 11,352 total therms[42] * 60% for heating[43] = 6,811 therms total for heating / 4 households using natural gas for heat[44] = 1,703 therms per household
    - Typical household fuel oil use (gallons)
        - 8,159 MMBtu[45] total for fuel oil = 65,332 gallons fuel oil / 174 homes using fuel oil for heat[46] = 375 gallons per home
    - Percent savings for energy used for heating (electric, natural gas, and fuel oil) through weatherization program
        - 20% electricity, 32% natural gas, 32% fuel oil[47]
    - Weatherization program cost ($ per home)
        - An average of $4,900 to weatherize a single unit in September 2011[48]

43	Homes Weatherized

$0.1250	Price of Electricity ($ per kWh)
$1.30	Price of Natural Gas ($ per therm)
$4.05	Price of Fuel Oil ($ per gallon)
0.9	Percentage of Homes Heated with Gas
40.3	Percentage of Households Using Fuel Oil
87,755	Average Electrical Energy (kWh) Used for Heating per Household
1,703	Average Natural Gas Energy (Therms) Used for Heating per Household
375	Typical Household Fuel Oil Use (gallons)
20	Percent Savings of Energy Used for Heating (kWh)
32	Percent Savings of Energy Used for Heating (therms)
32	Percent Savings of Energy Used for Heating (Fuel Oil)
$4,900	Program Cost ($ per home)
443,759	Total Annual Electricity Savings (kWh)
211	Total Annual Natural Gas Savings (therms)
2,079	Total Annual Fuel Oil (gallons)
$1,492	Annual Cost Savings per Household
$64,166	Total Annual Cost Savings
3	Simple Payback (years)

CO2e (metric tons)
129

Co-Benefits
-Lower utility bills
-Improving energy efficiency
-Increase property values
-Stimulate local economy through energy savings for low-income households

Success Stories
-Energy Star Home Performance Program: over 275,000 homes weatherized since 2002, lowering energy bills and improving comfort and indoor air quality.[49]

2. Install Residential Solar PV Panels

Strategy Description:
Solar photovoltaic (PV) energy production harnesses the sun's energy to produce electricity. GHG emissions reductions from this strategy are equal to the emissions that would have been produced if the electricity was supplied through fossil fuel based sources by the local utility because electricity generated from PV systems displaces electricity demand which would ordinarily be supplied by the local utility. Contrary to popular belief solar power has been shown to be viable in a wide variety of climates that are not thought of as "sunny". Investments in solar energy should be combined with efficiency measures, with the shorter payback period of the efficiency measures helping to pay for the solar investment.

Many residents or businesses would like to use solar power, but the large up-front cost is an obstacle. Local governments can help overcome this barrier by paying a portion of system costs, offering low-interest loans, or organizing group buying programs to negotiate lower prices such as the Solarize Madison program in Madison County and Solarize Syracuse in Syracuse, Onondaga, Manlius, and DeWitt. These programs are an effective way of combining public and private funds for renewable energy. The New York State Energy Research and Development Authority (NYSERDA) provides incentives for the installation of Solar PV based on system size. Additionally there are state and federal tax credits for residential and commercial Solar PV installations. Educational and technical assistance programs can also promote solar power. Local governments can offer information clearinghouses and connect consumers with solar installers.

An increasingly popular way for businesses to overcome the financial hurdles of installing a photovoltaic system is through the "solar services model" also known as a Power Purchase Agreement (PPA). Through this type of arrangement the owner of a property can provide the space for a power producer to install the system. The property owner then agrees to buy the power produced from that system at a set rate that is competitive with grid electricity. Since the power producer retains ownership of the equipment, there are no installation and maintenance costs to the consumer of the electricity produced.

Similar to PPAs, residential and commercial property owners can take advantage of leasing agreements which will lower costs of implementing PV systems. Regional solar developers are currently offering lease products from companies like Sungevity and SunPower. These agreements allow property owners to install solar with no upfront cost. A monthly fee must be paid by the property owner to the owner of the PV system; however, solar leases today can often offer electricity to the property owner for the same price or an even lower price than customers are currently paying for electricity from the grid.

The Central New York Regional Planning and Development Board and the five CNY counties (Cayuga, Cortland, Madison, Onondaga, and Oswego) are offering a solar bulk-purchasing program, known as Solarize CNY, to all residents and business owners in CNY. This program will offer educational workshops, technical assistance, and reduced installation costs to participants.

- **Methodology:**
  - kW of PV installed
    - 399 owner-occupied homes in Town. *25% (typical amount of homes suitable for solar)= 100 homes. Assume 40% (40 homes) install 7 kW[50] = 280 kW residential solar installed[51]
  - Price of electricity
    - $0.125 per kWh[52]
  - Sun hours per day
    - 3[53]
  - Cost of PV installation
    - $768 per kW[54]
    - (If not involved in Solarize CNY – average cost of installations in Cayuga County is $984 per kW[55])

280	kW of PV Installed

$ 0.1250	Price of Electricity ($ per kWh)
3.0	Sun Hours per Day
$768	Cost of PV installation ($ per kW)
306,600	Annual Energy Production (kWh)
$38,325	Annual Cost Savings
6	Simple Payback (years)

CO2e (metric tons)
70

Co-Benefits
-Renewable energy
-Local energy
-Produces no air pollutants

Preble Town Hall with 9 kW solar PV panels installed on roof

Success Stories
-9 kW installed on Town Hall building in Preble, expected to save 9,720 kWh annually.[56]

3. Promote Loans/Incentives for Energy Efficiency Improvements

Strategy Description:
Many businesses and homes are not equipped with the most recent energy efficient technologies, causing the community to use more energy than is necessary. Retrofitting existing facilities through measures like replacing appliances with more efficient ones, increasing insulation, and upgrading HVAC systems can greatly improve energy efficiency and therefore reduce emissions. Local governments can encourage these efficiency improvements by offering low or zero interest loans to building owners for improvements. The Energy Improvement Corporation (EIC) was created in NYS to offer PACE (Property Assessed Clean Energy) financing to commercial customers in 2012. EIC is seeking municipalities with lean authority from throughout the state to adopt the PACE model and allow for commercial property owners to finance energy efficiency retrofits through their tax bill.

This strategy is a priority for the Town of Niles. The town could consider assisting in a program by providing loans or grants to low-income residents to upgrade HVAC equipment. The federal Home Energy Assistance Program (HEAP) also provides assistance for replacing furnaces, boilers, and other direct heating components necessary to keep a home's primary heating source functional.

- **Methodology**
  - Number of homes retrofitted with loans
    - Assume 10% → Total occupied households = 432[57] * 10% = 43 homes
  - Price of electricity
    - $0.125 per kWh[58]
  - Price of natural gas
    - $1.30 per therm[59]
  - Price of fuel oil
    - $4.05 per gallon[60]
  - Average electric energy (kWh) used for heating per household
    - 6,581,592 total kWh use[61] * 60% for heating[62] = 3,948,955 kWh total for heating / 45 households using electricity for heat[63] = 87,755 kWh per household
  - Average natural gas energy (therms) used for heating per household
    - 11,352 total therms[64] * 60% for heating[65] = 6,811 therms total for heating / 4 households using natural gas for heat[66] = 1,703 therms per household
  - Typical household fuel oil use (gallons)
    - 8,159 MMBtu[67] total for fuel oil = 65,332 gallons fuel oil / 174 homes using fuel oil for heat[68] = 375 gallons per home
  - Percentage of homes heated with gas
    - 4 homes using natural gas for heating of 432 occupied homes[69] = 0.9%
  - Percentage of households using fuel oil
    - 174 homes using fuel oil for heating of 432 total occupied homes[70] = 40.3%

- Percent savings for energy used for heating (electric, natural gas, and fuel oil) through retrofits
  - Use CAPPA estimates 10% for each
- Retrofit costs ($ per household)
  - In New York the average cost of projects ranges from $5,600 to $8,500[71]
  - Use average of $7,050 for CAPPA
  - NYSERDA offers a 10% cash back incentive when you complete energy efficiency upgrades through the Home Performance with ENERGY STAR program[72]
  - $7,050 * 10% = $705
  - $7,050 - $705 = $6,345

43	Homes Retrofitted with Loans

$ 0.1250	Price of Electricity ($ per kWh)
$ 1.30	Price of Natural Gas ($ per therm)
$ 4.05	Price of Fuel Oil ($ per gallon)
87,755	Typical Household Electricity Use (kWh)
1,703	Typical Household Natural Gas Use (therms)
375	Typical Household Fuel Oil Use (gallons)
1	Percentage of Households Using Natural Gas
40	Percentage of Households Using Fuel Oil
10	Percent Electricity Savings Compared to Existing Code
10	Percent Natural Gas Savings Compared to Existing Code
10	Percent Fuel Oil Savings Compared to Existing Code
$6,345	Retrofit Cost ($ per household)
221,880	Total Annual Electricity Savings (kWh)
66	Total Annual Natural Gas Savings (therms)
650	Total Annual Fuel Oil Savings (gallons)
$708	Cost Savings per Household
$30,452	Annual Cost Savings
9.0	Simple Payback (years)

CO2e (metric tons)
59

Co-Benefits
-Energy and water cost savings
-Reduced criteria air pollutants by reducing energy use

Success Stories
-NYSERDA Residential Loan Fund Program- offers loans up to 4% less than typical loans, up to $20,000.[73]

4. Geothermal Heat Pump

Strategy Description:
Geothermal heat pump technology utilizes the physical phenomenon of fairly constant annual temperatures several feet below the surface of the earth. During the winter, a heat exchanger fluid is pumped into the ground where the heat is transferred to the fluid and then delivered to the building as heat. During the summer, the heat exchanger fluid takes away the heat in the building and discharges it into the ground, thus cooling the building. Electricity is used to run the pumps for the geothermal system, meaning there will still be greenhouse gas emissions associated with heating and cooling unless the electricity is supplied by non-carbon sources; however, the energy use and emissions will be much less than with a traditional heating/cooling system. Because energy used for heating and cooling represents the majority of energy use in a building, installing a geothermal system can significantly reduce overall energy use and emissions.

- **Methodology:**
  - Number of homes using
    - Assume half of new homes built install geothermal. Average 2 homes per year since 2012,[74] over 10 years of Plan = 20 homes, assume 10 install geothermal
  - Price of electricity ($ per kWh)
    - $0.125 per kWh[75]
  - Price of fuel oil ($ per gallon)
    - $4.05 per gallon[76]
  - Typical household fuel oil use (gallons)
    - 8,159 MMBtu[77] total for fuel oil = 65,332 gallons fuel oil / 174 homes using fuel oil for heat[78] = 375 gallons per home
  - Annual energy used for cooling (gallons of fuel oil)
    - 6,581,592 total kWh use[79] * 11% used for cooling[80] = 723,975 kWh / 432 households = 1,676 kWh
  - Square footage of average house = 2,437 sq. ft.[81]
  - Cost of geothermal heat pump system ($ per sq. ft.) = $10 / sq. ft. [82]

10	Number of Homes using

$0.1250	Price of Electricity ($ per kWh)
$4.05	Price of Oil ($ per gal)
375	Annual Oil Use Per House (gal)
80	Efficiency of Oil Boiler (%)
12,195	Annual Heat Demanded For Building (kWh conversion)
4	COP of Geothermal Heat Pump[83]
3,049	Annual Electricity Demanded For Heat With Geothermal (kWh)
1676	Annual Cooling Electricity Use Per House (kWh)

10	EER Of Air Conditioning[84]
2.93	COP of Air Conditioning
4,912	Annual Heat Removed From Building (kWh conversion)
35	EER Of Geothermal Heat Pump
478.86	Annual Electricity Demanded for Cooling After Geothermal (kWh)
$10.00	Cost per Square Foot of Geothermal
2437	Square Footage of Average House
-18,517	Total Annual Electricity Savings (kWh)
3,750	Total Annual Oil Savings (gal)
$12,873	Annual Cost Savings
18.9	Simple Payback (years)

CO2e (metric tons)
45

- ***Notes**
  - Although total energy use is reduced significantly, electric energy usage would increase due to the drop off in fuel oil. However, solar and/or wind energy can be used to offset 100% of electricity used to run geothermal heat pumps, thus converting 100% of electricity used for heating to local renewable sources.
    - For a typical sized 10kW heat pump you would require at best 2.5kW of energy to run the heat pump. Depending on the heat distribution method or if domestic hot water is being produced it could be even higher (4kW+). To obtain this type of power you would require at least 25m2 of south facing roof covered in PV, (without the other household electricity consumption). If wind is being considered then, for example, a 5.5m diameter wind turbine at a height of 12m produces on average 11kWh per day. Enough to run the heat pump only for just under 3 hours.[85]
  - Geothermal systems may be eligible for low-interest financing through the Home Performance with Energy Star program[86]
  - New York State Energy Conservation Improvements Property Tax Exemption: includes solar PV, wind, and geothermal heat pumps- residents will receive exemptions for 100% of the value added to the residence by the improvements.[87]

Co-Benefits
-Reduce reliance on fossil fuels
-Decrease local air pollution
-Decrease energy costs

Geothermalgenius.org Banner

Success Stories
-The new net-zero Skaneateles Village Hall uses solar PV to capture energy from the sun, as well as geothermal heating and cooling, a geothermal water heater, Energy Star appliances, occupancy sensors, and Solatube light wells.[88]

5. Promote energy efficiency and composting through educational campaign

Strategy Description:
Educational programs targeted at residents can provide information to residents about energy saving measures they can take in their homes, such as replacing appliances with energy efficient ones, sealing leaks and increasing insulation, or turning the thermostat down in cold weather and up in hot weather. Specifically, the CNY Energy Challenge Team Program teaches participants these and other techniques to reduce household energy usage. The program has seen a 29% reduction in energy usage for participants, thus reducing GHG emissions and energy costs significantly. The NYSERDA Home Performance with ENERGY STAR program provides incentives for 1-4 unit residential properties to improve building energy efficiency. Additionally, the Green Jobs Green NY (GJGNY) program provides free* comprehensive energy assessments to all 1-4 family households in NYS.

The town should consider working with the CNY RPDB to implement an energy efficiency and composting educational program for residents who can use the lessons learned in their homes, businesses, and farms to save energy and reduce emissions.

- **Methodology:**
  - Number of households targeted
    - Assume 10% → Total occupied households = 432[89] * 10% = 32 households
  - Price of electricity
    - $0.125 per kWh[90]
  - Price of natural gas
    - $1.30 per therm[91]
  - Typical household electricity use (kWh per year)
    - 6,581,592 kWh total / 432 homes = 15,235 kWh per home
  - Typical household natural gas use (therms)
    - 11,352 total / 432 homes= 26 therms per home per year
  - Percent Electricity Savings
    - Percent energy savings total = 29%[92]
  - Percent natural gas Savings
    - Percent energy savings total = 29%[93]
  - Cost of education program ($ per household)
    - Assume nothing

43	Number of households targeted

$0.125	Price of Electricity ($ per kWh)
$1.30	Price of natural gas ($ per therm)
15,235	Typical household electricity use (kWh per year)
26	Typical household natural gas use (therms per year)
29	Percent electricity savings
29	Percent natural gas savings

$0.00	Cost of Education Program ($ per home)[vii]
189,980	Total Annual Energy Savings (kWh)
324	Total Annual Energy Savings (therms)
$562	Annual Cost Savings per household
$24,169	Total Annual Cost Savings
0.0	Simple Payback (years)

CO2e (metric tons)
45

Co-Benefits
-Save on electricity bills

Success Stories
-29% savings in pilot study of CNY Energy Challenge Team Program.

[vii] Note: The CNY Energy Challenge Team Program is free for the homeowner to participate. Costs to the homeowner depend upon the measures they choose to take because of what they learned through the program.

6. Small Wind Generation

Strategy Description:
Wind power harnesses energy from wind through rotating turbines which power generators. In many places, wind power is the most cost-effective form of renewable energy. Wind turbines come in a variety of sizes and there are a range of options for promoting wind energy. Small wind turbines have a rated output of less than 100 kW, and produce enough energy to power a home, small business, school, or government building. Large wind turbines produce from 100 kW up to several MW. The energy they produce is sold to the local utility, generative income for the owners, or distributed to coop members.

Whether wind energy is a good investment will depend on how much wind a location gets. In general, average annual wind speeds above 10 miles per hour are good for small wind turbines. The Town of Niles is interested in possibly creating a town renewable energy cooperative or municipal power authority that can then use the renewable power to benefit the Hamlet of New Hope by providing cheaper, renewable energy.

- **Methodology:**
  - Capacity size (kW) for wind turbine
    - Assume a 100 kW turbine
  - Price of electricity
    - $0.125 per kWh[94]
  - Cost of turbine installation ($ per kW capacity)
    - Wind turbines under 100 kilowatts cost roughly $3,000 to $8,000 per kilowatt of capacity[95] → Average = $5,500 per kW = $550,000 total
    - Plus 30% renewable energy tax credit = $550,000 x .3 = $165,000
    - Plus NYSERDA rebates: According to CAPPA, a 100 kW system can produce 152,000 kWh. NYSERDA rebates provide $150,000 plus $0.30 for every kWh over 125,000 kWh. $0.3 x 27,000 = $8,100 + $150,000 = $158,100
    - $550,000 - $165,000 - $158,100 = $226,900 / 100 kW = $2,269 per kW installed

100	Capacity size (kW)

$ 0.125	Price of Electricity ($ per kWh)
$2,269	Cost of Turbine installation ($/ kW capacity)
152,000	Potential Electricity Generation (kWh/yr)
$19,000	Annual Cost Savings
11.9	Simple Payback (years)

CO2e (metric tons)
35

Co-Benefits

-Renewable energy

-Local energy

-Produces no air pollutants

-Reduces reliance on foreign fossil fuels

Small wind turbine similar to what could be used in Niles

Success Stories

-In 2010 the US market for small wind turbines grew 26%, increasing small wind capacity by a total of 25 MW.[96]

7. Micro-hydraulic power

Strategy Description:
In a hydropower system, moving water turns a turbine which spins a generator and produces electricity. In order for the hydropower system to be successful, a system needs flowing water with the right amount of head, or vertical distance the water falls, and flow, or the quantity of water falling.

Industry professionals would have to measure the head and flow of water bodies in Niles, such as Dutch Hollow Brook or Bear Swamp Creek, before determining whether this type of system would work in the town. If applicable, the town could then possibly create a renewable energy cooperative or municipal power authority and use the renewable power to benefit town residents by providing cheaper, renewable energy.

Commercial Energy Use

1. Install Commercial Solar PV Panels

Strategy Description:
Solar photovoltaic (PV) energy production harnesses the sun's energy to produce electricity. GHG emissions reductions from this strategy are equal to the emissions that would have been produced if the electricity was supplied through fossil fuel based sources by the local utility because electricity generated from PV systems displaces electricity demand which would ordinarily be supplied by the local utility. Contrary to popular belief solar power has been shown to be viable in a wide variety of climates that are not thought of as "sunny". Investments in solar energy should be combined with efficiency measures, with the shorter payback period of the efficiency measures helping to pay for the solar investment.

Many residents or businesses would like to use solar power, but the large up-front cost is an obstacle. Local governments can help overcome this barrier by paying a portion of system costs, offering low-interest loans, or organizing group buying programs to negotiate lower prices such as the Solarize Madison program in Madison County and Solarize Syracuse in Syracuse, Onondaga, Manlius, and DeWitt. These programs are an effective way of combining public and private funds for renewable energy. The New York State Energy Research and Development Authority (NYSERDA) provides incentives for the installation of Solar PV based on system size. Additionally there are state and federal tax credits for residential and commercial Solar PV installations. Educational and technical assistance programs can also promote solar power. Local governments can offer information clearinghouses and connect consumers with solar installers.

An increasingly popular way for businesses to overcome the financial hurdles of installing a photovoltaic system is through the "solar services model" also known as a Power Purchase Agreement (PPA). Through this type of arrangement the owner of a property can provide the space for a power producer to install the system. The property owner then agrees to buy the power produced from that system at a set rate that is competitive with grid electricity. Since the power producer retains ownership of the equipment, there are no installation and maintenance costs to the consumer of the electricity produced.

Similar to PPAs, residential and commercial property owners can take advantage of leasing agreements which will lower costs of implementing PV systems. Regional solar developers are currently offering lease products from companies like Sungevity and SunPower. These agreements allow property owners to install solar with no upfront cost. A monthly fee must be paid by the property owner to the owner of the PV system; however, solar leases today can often offer electricity to the property owner for the same price or an even lower price than customers are currently paying for electricity from the grid.

The Central New York Regional Planning and Development Board and the five CNY counties (Cayuga, Cortland, Madison, Onondaga, and Oswego) are offering a solar bulk-purchasing

program, known as Solarize CNY, to all residents and business owners in CNY. This program will offer educational workshops, technical assistance, and reduced installation costs to participants.

- **Methodology:**
  - kW of PV installed
    - Assume 5 systems at 7 kW each = 35 kW, most likely on very small businesses or small farms in town[97]
  - Price of electricity
    - $0.125 per kWh[98]
  - Sun hours per day
    - 3[99]
  - Cost of PV installation
    - $768 per kW[100]

35	kW of PV Installed

$ 0.1250	Price of Electricity ($ per kWh)
3.0	Sun Hours per Day
$1,500	Cost of PV installation ($ per kW)
38,325	Annual Energy Production (kWh)
$4,791	Annual Cost Savings
6	Simple Payback (years)

CO2e (metric tons)
9

Co-Benefits
-Renewable energy
-Local energy
-Produces no air pollutants

Preble Town Hall with 9 kW solar PV panels installed on roof

Success Stories
-9 kW installed on Town Hall building in Preble, expected to save 9,720 kWh annually.[101]

2. Install Lighting Occupancy Sensors

Strategy Description:
Lighting is typically the largest electricity draw in commercial buildings. Energy is wasted by lights that are left on when no one is using them. Installation of lighting occupancy sensors prevents waste by using sensors to detect motion in the lighted space and turning lights off if no one is present. Sensors can reduce energy use for lighting by an average of 35%.

Sensors are usually either ultrasonic or infrared. If no motion is detected after a set delay period, the sensor turns off or dims lights. Occupancy sensors are a low-cost way to save energy on lighting, with a typical payback time of less than two years. This strategy is usually included when completing an energy-efficiency retrofit to an existing facility; however, occupancy sensors can also be implemented at a separate time or in buildings that do not undergo complete energy-efficiency retrofits, and this strategy is therefore included as a separate measure.

- **Methodology:**
  - Square feet installed with occupancy sensors
    - Assume 10,000 square feet (at elementary school?)
  - Price of electricity ($ per kWh)
    - $0.125 per kWh[102]
  - Annual lighting energy use per square foot (kWh)
    - 6.85 (CAPPA estimate)
  - Percent savings with occupancy sensors
    - 35% (CAPPA estimate)
  - Cost of sensors ($ per square foot)
    - $0.06 (CAPPA estimate)

10,000	Square Feet Installed with Occupancy Sensors

$0.125	Price of Electricity ($ per kWh)
6.85	Annual Lighting Energy Use per Square Foot (kWh)
35	Percent Savings With Occupancy Sensors
$0.06	Cost of Sensors ($ per square foot)
23,975	Total Annual Electricity Savings (kWh)
$2,997	Annual Cost Savings
0.2	Simple Payback (years)

CO2e (metric tons)
5

Co-Benefits

- Security provided by motion sensor lighting

- Work automatically once installed

A typical lighting occupancy sensor

Success Stories

- DeWitt Town Hall installed light sensors in bathrooms, supply rooms, and other rooms where lights might normally be left on.[103]

Waste

1. Encourage Organics (Kitchen) Composting

Strategy Description:
When organic matter like wood, paper, food, and yard wastes is placed in landfills, it decomposes anaerobically, producing methane. Methane is a greenhouse gas 21 times as powerful as carbon dioxide. Collecting and composting organic waste prevents the emissions it would have produced in the landfill.

Composting produces fertilizer that can be used for farms or gardens, returning nutrients to the soil that were removed with food production. Composting reduces the volume of material sent to landfills, reducing disposal costs.

**This strategy is included above in the educational strategy but explained in detail here.

- **Methodology**
  - Waste diverted from landfill (lbs/person/year)
    - Food waste = 18.6% total waste[104]
    - Total waste per person = 0.8 tons[105]
    - 1 ton = 2,000 lbs.
    - Therefore, total waste per person = 0.8*2,000 = 1,600 lbs. annually
    - 1,600 lbs.*18.6%= 298 lbs. food waste per person
    - Assume 25% is composted. 298 lbs.*25% = 75 lbs. per person
  - Town population
    - 1,194[106]

75	Waste Diverted from Landfill (lbs/person/yr)

1,194	Town Population
7	Life Cycle Emissions Avoided due to Composting (metric tons CO2e)
0	Annual Methane Emission Avoided from Food Waste (metric tons CO2e)
0	Change in kWh Generated from Energy Recovery

CO2e (metric tons)
0.3

Co-Benefits
-Composting creates fertilizer that can be used for farming or gardens instead of fertilizers derived from fossil fuels
-Reduced cost in fertilizers
-Reduced amount of waste treated in landfills

Amboy Compost Site Aerated Static Pile System

Success Stories
-Amboy Compost Site (Camillus, NY) has effectively composted yard and food waste for several years.[107]
-San Francisco's Mandatory Recycling and Composting Ordinance requires residents to separate their recyclables, compostables, and landfill trash. They hope to produce zero waste by 2020. (CAPPA source)[108]

Natural Resources

1. Tree Planting for Carbon Storage and Energy Savings

Strategy Description:
Planting trees in strategic ways to shade buildings can reduce energy used to cool buildings. Trees that are properly planted with energy savings in mind can reduce the amount of energy (electricity, natural gas, or other fuel) used to cool and heat buildings. This not only reduces associated emissions, but also saves money. The shade from a single well-placed mature tree reduces annual air conditioning use from two to eight percent (in the range of 40-300 kWh), and peak cooling demand from two to ten percent (as much as 0.15-0.5 kW) therefore reducing GHG emissions.

The Cayuga County Soil and Water Conservation District has an annual tree sale during April and May. Visit http://www.cayugaswcd.org/annual-tree-shrub--groundcover-sale.html for more information.

- **Methodology**
  - Number of trees planted
    - Assume 20% households plant 1 tree = 432*20%= 86[109]
  - Price of electricity
    - $0.125 per kWh[110]
  - Annual energy savings of one mature tree (kWh)
    - An average tree conserves 435–483 kWh of electricity over 25 years post planting[111]
    - Avg. of 435 and 483 = 459 kWh over 25 years
    - 459 / 25 = 18.36 kWh per tree per year
  - Annual CO_2 absorbed by one mature tree (metric tons)
    - A single mature tree can absorb carbon dioxide at a rate of 48 lbs./year[112]
    - 1 pound = 0.00045359237 metric tons[113]
    - Annual CO_2 absorbed by one mature tree = .02177243376 metric tons
    - ~ .022 metric tons
  - Cost of planting a tree (depends on the tree planted)
    - $50 per tree[114]

86	Trees Planted to Shade Buildings

$ 0.1250	Price of Electricity ($ per kWh)
18	Annual Energy Savings of one Mature Tree (kWh)
.022	Annual CO2 Absorbed by one Mature Tree (metric tons)
$50	Cost of Planting Tree
1,579	Total Annual Energy Savings (kWh)
$197	Annual Cost Savings

22	Simple Payback (years)

CO2e (metric tons)
19

Co-Benefits
-Save on energy bills
-Can reduce storm water runoff
-Can create more attractive environment, increasing property values

A well shaded home, according to the Arbor Day Foundation website.

Success Stories
-The Arbor Day Foundation provides information on its website explaining how to plant trees to conserve energy most effectively.[115]

Reduction Summaries

Government

Measure	CO_2e (metric tons)	% towards goal
Municipal solar PV	11	80.51%
Energy audit and retrofit of Town Hall	2	12.19%
Convert municipal lighting from T-12 to T-8	0.2	1.31%
Geothermal at DPW garage	Uncertain	Uncertain
Total	13	
Base Year Emissions (2010)	177	
Potential Emissions with Strategy Implementation (2025)	164	
% Reductions from Base Year based on Strategy Implementation Only	7.5%	

Community

Measure	CO_2e (metric tons)	% towards goal
Home weatherization	129	23.70%
Residential solar PV	70	12.77%
Reduce VMT: Community Center	64	11.77%
Increase telecommuting	63	11.62%
Home retrofits	59	10.87%
Energy efficiency and composting education	45	8.25%
Geothermal	45	8.24%
Small wind energy	35	6.45%
Tree planting	19	3.54%
Commercial solar PV	9	1.60%
Lighting occupancy sensors	5	1.00%
Total	543	
Base Year Emissions (2010)	6,126	
Potential Emissions with Strategy Implementation (2025)	5,583	
% Reductions from Base Year based on Strategy Implementation Only	8.9%	

CAFE Standards Emissions Reduction Calculations

Description: New Federal CAFE Standards
The U.S. Congress first enacted Corporate Average Fuel Economy (CAFE) standards in 1975 to reduce energy consumption by increasing the fuel economy of cars and light trucks. In 2011 the United States Environmental Protection Agency (US EPA) and The National Highway Traffic Safety Administration (NHTSA) established new fuel efficiency standards for passenger vehicles to average 34.1 miles per gallon by 2016. NHTSA issued finalized standards for model years 2017 – 2025 in 2012 that will increase fuel economy to the equivalent of 54.5 mpg for cars and light-duty trucks. It is anticipation that U.S. oil consumption with decrease by 12 billion barrels by 2025, saving more than $1.7 trillion dollars.[116] These changes at the national level will impact vehicle-based emissions within the Town, as such the analysis team has attempted to identify the potential impacts of improved fuel economy. The NHTSA has also mandated improvements in medium and heavy-duty vehicle fuel efficiencies; however, we do not have enough information at this time to calculate the emissions reductions that will occur due to these standards.

- **Methodology:**
  - CAPPA tab "Use Smaller Fleet Vehicles"

- Government: 2025
  - There are no gasoline-powered vehicles used that could be affected by this regulation.

- Community: 2016
  - Americans keep cars an average of 11.4 years[117], so assume by 2016 half of the Town's passenger vehicles have been changed over since the 2010 inventory.

443	Number of Smaller Vehicles Used[118]

$2.25	Price of Gasoline ($ per gallon) [119]
34.1	Small Vehicle Miles per Gallon
23.8	Miles per Gallon of Vehicle Replaced[120]
3,662	Average Annual Miles per Vehicle[121]
20,589	Annual Gasoline Savings (gallons)
$46,324	Annual Cost Savings

CO2e (metric tons)
194

- Community: 2025

444	Number of Smaller Vehicles Used[122]

$2.25	Price of Gasoline ($ per gallon) [123]
54.5	Small Vehicle Miles per Gallon
23.8	Miles per Gallon of Vehicle Replaced[124]
3,662	Average Annual Miles per Vehicle[125]
38,483	Annual Gasoline Savings (gallons)
$86,586	Annual Cost Savings

CO2e (metric tons)
362

[1] The Town uses 48,387 kWh of electricity annually at their buildings and streetlights. 43 kW of PV installed could cover almost 100% of the Town's electric needs. However, the Town does not have many municipal buildings upon which to install solar, so the majority of this capacity would have to be installed as ground-mounted systems on public land, or on land rented by the municipality.
[2] Municipal information provided by Tina Weed, Town Clerk
[3] http://nyserda.cleanpowerestimator.com/nyserda.htm.There is a 1218 multiplicative factor between kW installed and annual kWh output (calculated from the results of the NYSERDA Clean Power estimator, which when divided by 365 days per year, is the equivalent of 3.34 capturable sun hours per day. Assuming 10% losses in the equipment, this drops the deliverable sun hours per day to 3.0.
[4] Chris Carrick, CNY RPDB. This is the price at which it would make sense for local governments to install solar. Otherwise, payback periods may be too long and municipal operations may want to focus their attention on projects with shorter payback periods.
[5] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive
[6] Municipal information provided by Tina Weed, Town Clerk
[7] Municipal information provided by Tina Weed, Town Clerk
[8] Municipal information provided by Tina Weed, Town Clerk
[9] Municipal information provided by Tina Weed, Town Clerk
[10] Municipal information provided by Tina Weed, Town Clerk
[11] http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager?c=evaluate_performance.bus_portfoliomanager

[12] http://www.dec.ny.gov/energy/64095.html
[13] According to Charlie Greene, Town Supervisor
[14] Municipal information provided by Tina Weed, Town Clerk
[15] http://members.questline.com/article.aspx?userID=1459337&NL=7592&articleid=10964
[16] http://members.questline.com/article.aspx?userID=1459337&NL=7592&articleid=10964
[17] http://www.hoveyelectric.com/hovey-electric-power-blog/bid/84918/T12-vs-T8-vs-T5-T-12-As-Outdated-As-Your-Granparents-Bingo-Game
[18] 4,928,102.771 = total annual VMT – 56,411 government VMT = 4,871,692 community VMT. Assume 1/3 miles are through traffic (do not begin or end in town). 4,871,692 * (2/3) = 3,247,795 / 887 total vehicles = 3,662 average annual miles per vehicle
[19] Gas price at Kwik Fill 797 W Genesee Street Rd 1/22/15 http://www.newyorkstategasprices.com/GasPriceSearch.aspx
[20] Default fuel efficiency by vehicle type, 2009 passenger car, ICLEI's U.S. Community Protocol Compliance Appendix D, Transportation and Other Mobile Emission Activities and Sources page 73
[21] Data as of 7/17/2013 http://cleartheairchallenge.org/results.php
[22] http://onthemap.ces.census.gov/ → jobs by distance
[23] Gas price at Kwik Fill 797 W Genesee Street Rd 1/22/15 http://www.newyorkstategasprices.com/GasPriceSearch.aspx
[24] CAPPA estimate
[25] http://onthemap.ces.census.gov/ → jobs by distance
[26] Default fuel efficiency by vehicle type, 2009 passenger car, ICLEI's U.S. Community Protocol Compliance Appendix D, Transportation and Other Mobile Emission Activities and Sources page 73
[27] www.teleworkarizona.com/mainfiles/visitor/voverview.htm
[28] 4,928,102.771 = total annual VMT
[29] http://blog.bikeleague.org/blog/2010/01/national-household-travel-survey-short-trips-analysis/
[30] Gas price at Kwik Fill 797 W Genesee Street Rd 1/22/15 http://www.newyorkstategasprices.com/GasPriceSearch.aspx
[31] Default fuel efficiency by vehicle type, 2009 passenger car, ICLEI's U.S. Community Protocol Compliance Appendix D, Transportation and Other Mobile Emission Activities and Sources page 73
[32] http://www.destinyusa.com/index.php?page=green
[33] 2010 census
[34] National Grid Upstate NY Average
[35] Chris Carrick, CNY RPDB
[36] http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Prices/Home-Heating-Oil/Average-Home-Heating-Oil-Prices#central
[37] 2010 census
[38] 2010 census
[39] 2010 National Grid energy data in GHG inventory
[40] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[41] 2010 census
[42] 2010 National Grid energy data in GHG inventory
[43] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[44] 2010 census
[45] 2010 energy data in GHG inventory, see "Town of Niles data collection workbook" for more details
[46] 2010 census
[47] CAPPA estimates
[48] http://oversight.house.gov/wp-content/uploads/2012/04/Corrected-Weatherization-Report-Final-2.pdf p.8
[49] http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showsplash
[50] 7kW is the average system size installed in CNY, according to Open NY (https://data.ny.gov/) and as seen in the Solarize Syracuse program.
[51] 2010 census, Chris Carrick, CNY RPDB
[52] National Grid Upstate NY Average
[53] http://nyserda.cleanpowerestimator.com/nyserda.htm.There is a 1218 multiplicative factor between kW installed and annual kWh output (calculated from the results of the NYSERDA Clean Power estimator, which when divided by 365 days per year, is the equivalent of 3.34 capturable sun hours per day. Assuming 10% losses in the equipment, this drops the deliverable sun hours per day to 3.0.
[54] Solarize CNY 2015 information, assuming average cost of $3.04 per Watt (average of Renovus and Halco prices), a NYSERDA rebate of $0.60 per Watt for the first 50 kW installed, a 30% federal tax credit and a 25% state tax credit. http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Renewables/Solar-Technologies/PV-Funding-Balance.aspx

[55] Average cost of $3.52 per Watt (according to data.ny.gov), a NYSERDA rebate of $0.60 per Watt for the first 50 kW installed, a 30% federal tax credit and a 25% state tax credit. http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Renewables/Solar-Technologies/PV-Funding-Balance.aspx
[56] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive
[57] 2010 census
[58] National Grid Upstate NY Average
[59] Chris Carrick, CNY RPDB
[60] http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Prices/Home-Heating-Oil/Average-Home-Heating-Oil-Prices#central
[61] 2010 National Grid energy data in GHG inventory
[62] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[63] 2010 census
[64] 2010 National Grid energy data in GHG inventory
[65] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[66] 2010 census
[67] 2010 energy data in GHG inventory, see "Town of Niles data collection workbook" for more details
[68] 2010 census
[69] 2010 census
[70] 2010 census
[71] http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf
[72] http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Residential/Programs/Existing-Home-Renovations/How-the-Process-Works/Incentives-and-Financing.aspx
[73] http://www.nyserda.ny.gov/BusinessAreas/Energy-Efficiency-and-Renewable-Programs/Residential/Programs/Existing-Home-Renovations/Residential-Loan-Fund-Program.aspx
[74] Information provided by Jerry VeVone, Town Codes Enforcement Officer
[75] National Grid Upstate NY Average
[76] http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Prices/Home-Heating-Oil/Average-Home-Heating-Oil-Prices#central
[77] 2010 energy data in GHG inventory, see "Town of Niles data collection workbook" for more details
[78] 2010 census
[79] 2010 National Grid energy data in GHG inventory
[80] http://www.slideshare.net/SamuelGordon/energy-challenge-teamoutreachpresentation
[81] Energy Information Administration. 2009. Residential Energy Consumption Survey (RECS): Average heated square footage for detached oil fueled houses in New York
[82] Chris Carrick, CNY RPDB
[83] Environmental Protection Agency. 2013. ENERGY STAR Most Efficient 2013 — Geothermal Heat Pumps. http://www.energystar.gov/index.cfm?c=most_efficient.me_geothermal_heat_pumps COP of 4 is a typical number.
[84] Power Knot, LLC. 2009-2013. COPs, EERs, and SEERs: How Efficient is Your Air Conditioning System? http://www.powerknot.com/how-efficient-is-your-air-conditioning-system.html
[85] http://www.yougen.co.uk/blog-entry/1675/Three+things+to+consider+before+running+a+heat+pumps+with+solar+or+wind+power/
[86] http://www.nyserda.ny.gov/BusinessAreas/Energy-Efficiency-and-Renewable-Programs/Renewables/Geothermal-Heat-Pumps.aspx
[87] http://www.dsireusa.org/incentives/incentive.cfm?Incentive_Code=NY27F&re=1&ee=1
[88] http://sustainableskaneateles.wordpress.com/events-programs/alternative-energy-tour-saturday-october-5-noon-4-pm/skaneateles-village-hall/
[89] 2010 census
[90] National Grid Upstate NY Average
[91] Chris Carrick, CNY RPDB
[92] According to the Energy Challenge Team program info
[93] According to the Energy Challenge Team program info
[94] National Grid Upstate NY Average
[95] http://www.windustry.org/resources/how-much-do-wind-turbines-cost
[96] http://www.awea.org/learnabout/smallwind/upload/awea_smallwind_gms2011report_final.pdf p. 4
[97] Information provided by CAP committee
[98] Assume same as community average price

[99] http://nyserda.cleanpowerestimator.com/nyserda.htm.There is a 1218 multiplicative factor between kW installed and annual kWh output (calculated from the results of the NYSERDA Clean Power estimator, which when divided by 365 days per year, is the equivalent of 3.34 capturable sun hours per day. Assuming 10% losses in the equipment, this drops the deliverable sun hours per day to 3.0.
[100] Solarize CNY 2015 information, assuming average cost of $3.04 per Watt (average of Renovus and Halco prices), a NYSERDA rebate of $0.60 per Watt for the first 50 kW installed, a 30% federal tax credit and a 25% state tax credit. http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Renewables/Solar-Technologies/PV-Funding-Balance.aspx
[101] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive
[102] Assume same as community average price
[103] Town of DeWitt. 2012. Local Government and Community Greenhouse Gas Emissions Inventory and Analysis:2008 Baseline
[104] ICLEI Solid Waste Emission Activities, Appendix E, p. 32
[105] Auburn Landfill 2010 Annual/Quarterly report
[106] 2010 census
[107] https://ocrra.org/news/details/38
[108] http://www.sfenvironment.org/zero-waste/recycling-and-composting?ssi=3&ti=6
[109] 2010 census
[110] National Grid Upstate NY Average
[111] http://actrees.org/news/trees-in-the-news/research/mature-trees-significantly-reduce-energy-use-in-urban-areas/
[112] http://chemistry.about.com/od/environmentalchemistry/f/oxygen-produced-by-trees.htm
[113] Google Calculator (google search)
[114] Information provided by Charlie Greene, Town Supervisor
[115] http://www.arborday.org/globalwarming/summerShade.cfm
[116] Press Release: National Highway Transportation Safety Administration. Obama Administration Finalizes Historic 54.5 mpg Fuel Efficiency Standards. August 28, 2012 http://www.nhtsa.gov/About+NHTSA/Press+Releases/2012/Obama+Administration+Finalizes+Historic+54.5+mpg+Fuel+Efficiency+Standards
[117] http://www.huffingtonpost.com/reno-charlton/american-drivers-keeping-_b_3718301.html
[118] Total vehicles = 887 (2010 census); assume half = 443
[119] Gas price at Kwik Fill 797 W Genesee Street Rd 1/22/15 http://www.newyorkstategasprices.com/GasPriceSearch.aspx
[120] Default fuel efficiency by vehicle type, 2009 passenger car, ICLEI's U.S. Community Protocol Compliance Appendix D, Transportation and Other Mobile Emission Activities and Sources page 73
[121] 4,928,102.771 = total annual VMT – 56,411 government VMT = 4,871,692 community VMT. Assume 1/3 miles are through traffic (do not begin or end in town). 4,871,692 * (2/3) = 3,247,795 / 887 total vehicles = 3,662 average annual miles per vehicle
[122] Total vehicles = 887 (2010 census); assume half = 444
[123] Gas price at Kwik Fill 797 W Genesee Street Rd 1/22/15 http://www.newyorkstategasprices.com/GasPriceSearch.aspx
[124] Default fuel efficiency by vehicle type, 2009 passenger car, ICLEI's U.S. Community Protocol Compliance Appendix D, Transportation and Other Mobile Emission Activities and Sources page 73
[125] 4,928,102.771 = total annual VMT – 56,411 government VMT = 4,871,692 community VMT. Assume 1/3 miles are through traffic (do not begin or end in town). 4,871,692 * (2/3) = 3,247,795 / 887 total vehicles = 3,662 average annual miles per vehicle