Town of Skaneateles Climate Action Plan 2015

Appendix C: Action Strategy Summary Document

Acknowledgements

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

Climate Action Plan Advisory Committee
Hamilton Fish, Town Engineering Committee
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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 Skaneateles decided to participate in the Central New York Climate Change Innovation Program (C2IP) when they 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 Q1 and Q2 of 2015 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 Q2-4 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 Skaneateles 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 Skaneateles' 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 Skaneateles, 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 Skaneateles 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 Skaneateles 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 Skaneateles Greenhouse Gas Reduction Target

Through the analysis of the strategies outlined in this document the Town of Skaneateles has identified an emissions reduction target goal of 25% reductions for municipal operations and 10% reductions for the community, representing a total of 5,151 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

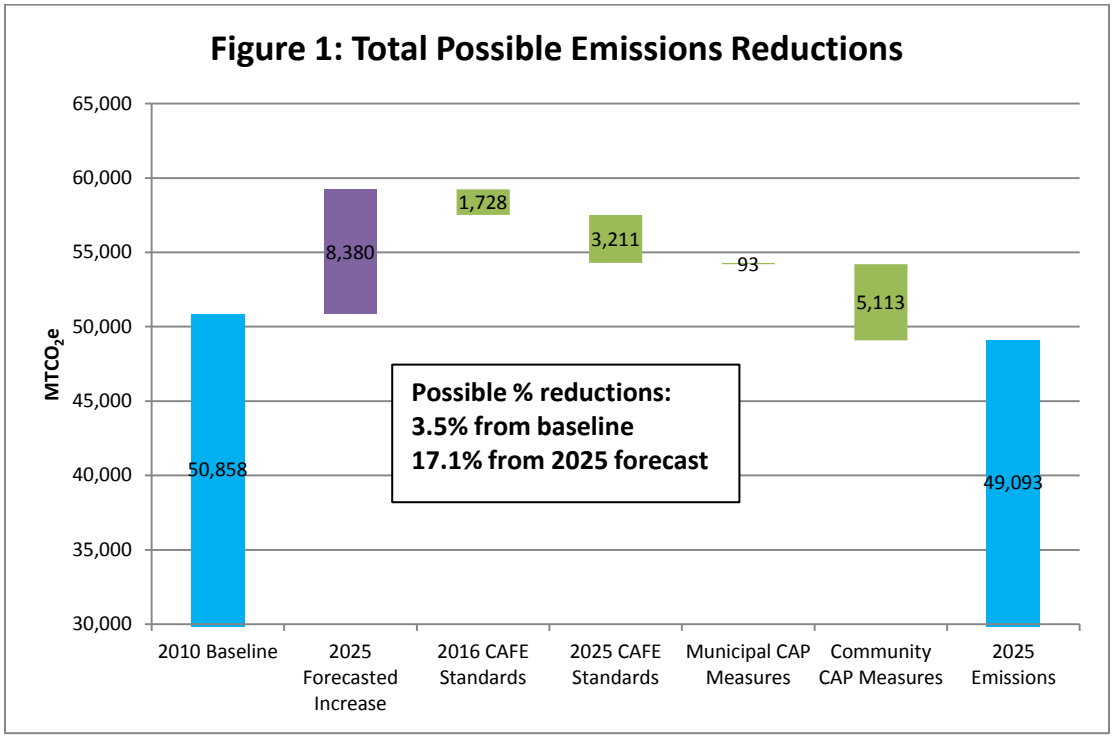


Figure 1 summarizes the results of the town's GHG inventory, a 2025 emissions forecast based on current trends, impacts from the strengthening of Federal CAFE standards, as well as the reductions associated with the Climate Action Strategies that were analyzed for the town separated into community-wide measures as well as municipal operations measures. It is projected that Skaneateles' total GHG emissions in 2025 could be reduced by 3.5%, or 17.1% from the 2025 forecast, if the town implements all of the recommended community-wide and municipal operations measures.

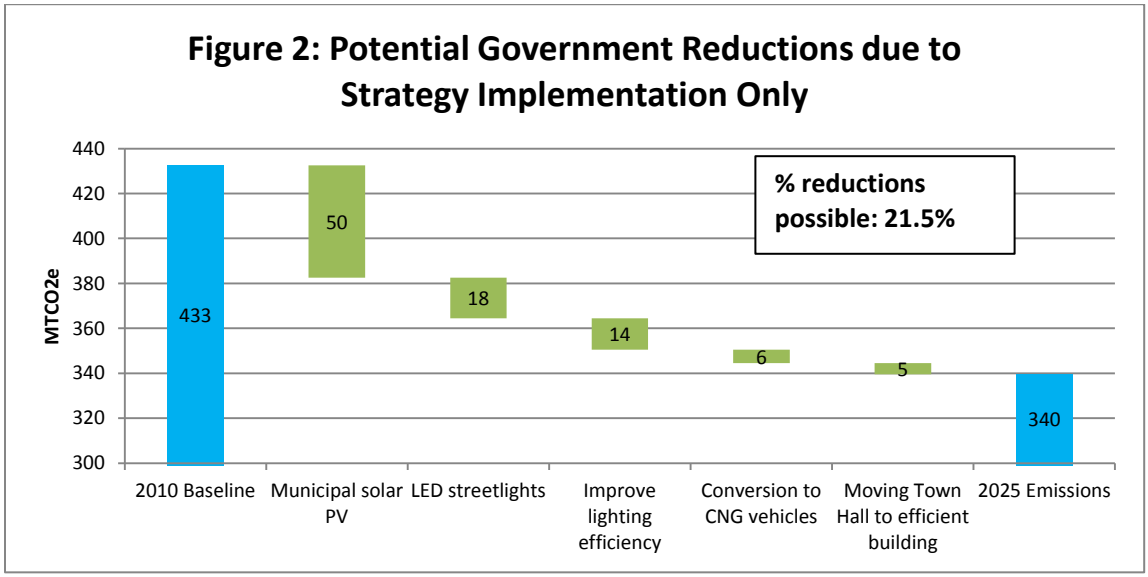


Figure 2 depicts the Town of Skaneateles' 2010 baseline municipal emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2025 should each of the suggested strategies be implemented. It is estimated that there will be a 21.5% reduction in community emissions if all suggested strategies are implemented.

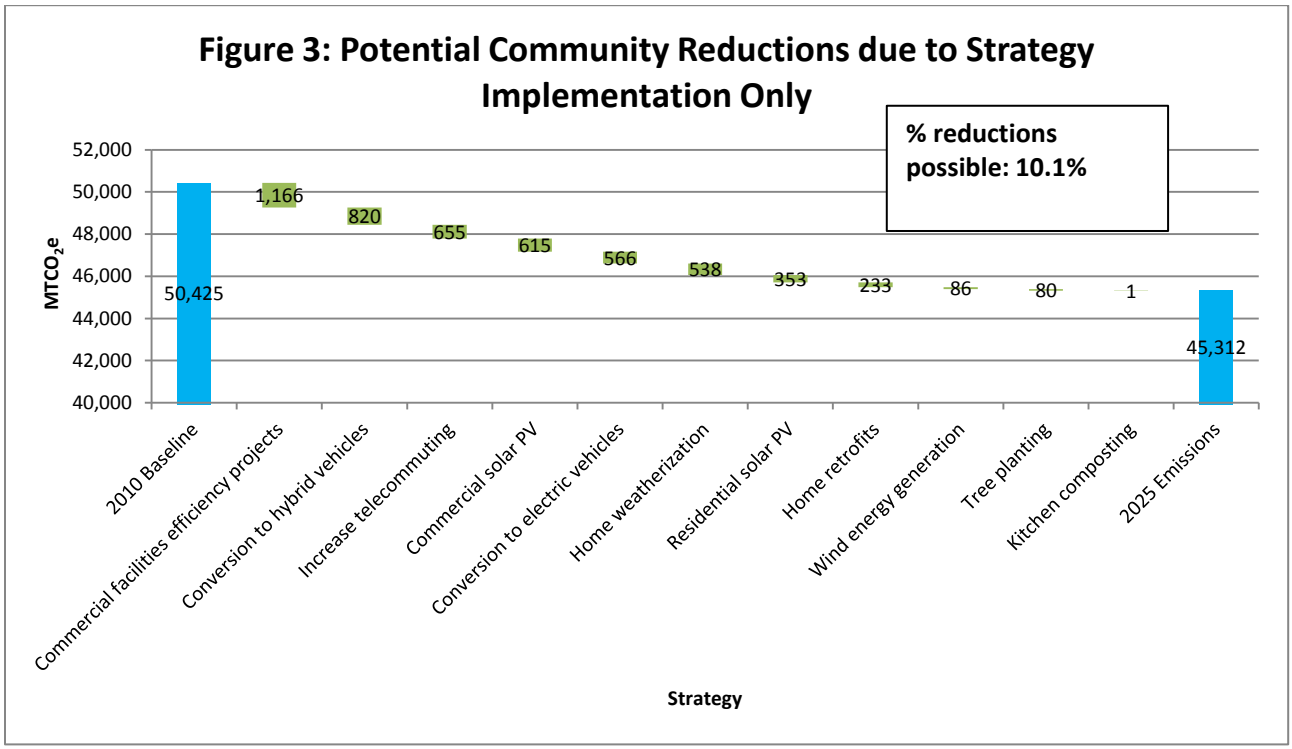


Figure 3 depicts the Town of Skaneateles' 2010 baseline community emissions as recorded by the GHG inventory report, potential reductions due to suggested strategies, and potential emissions in 2025 should each of the suggested strategies be implemented. It is estimated that

there will be a 10.1% reduction in community emissions if all suggested strategies are implemented.

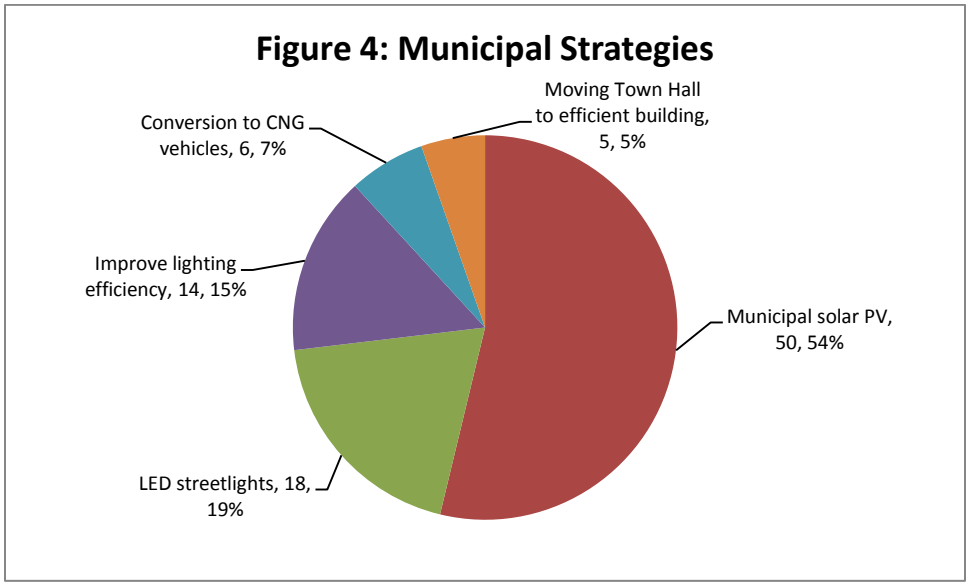


Figure 4 depicts each of the suggested municipal reduction strategies and their contribution to overall municipal emissions reductions.

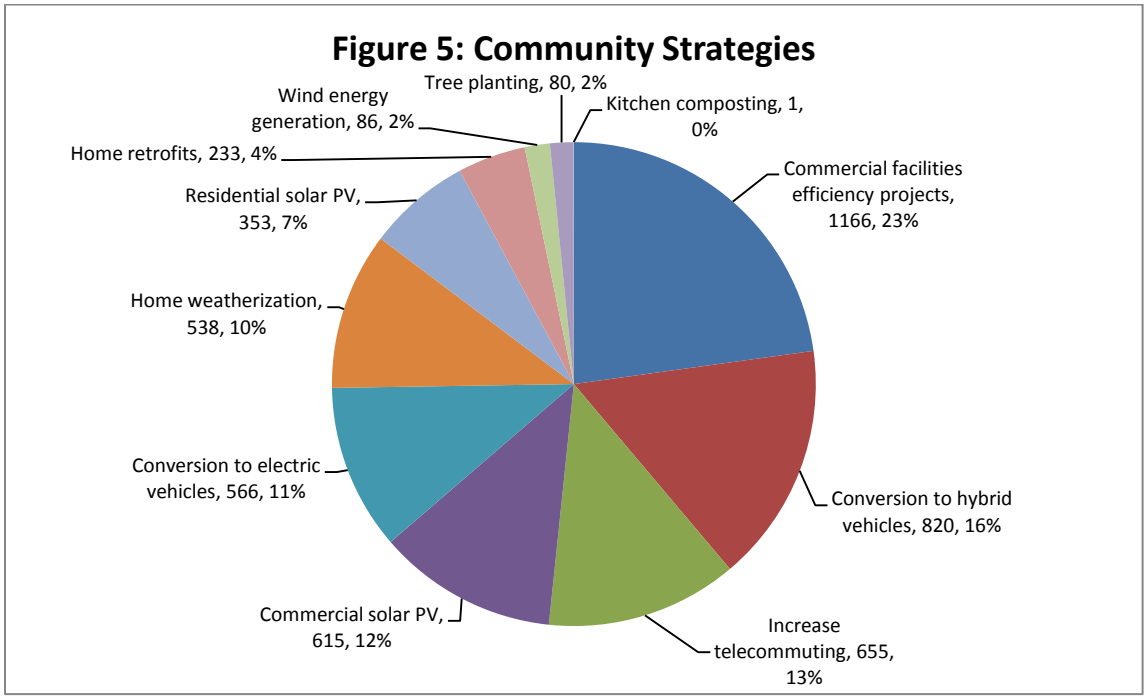


Figure 5 depicts each of the suggested community reduction strategies and their contribution to overall municipal emissions reductions.

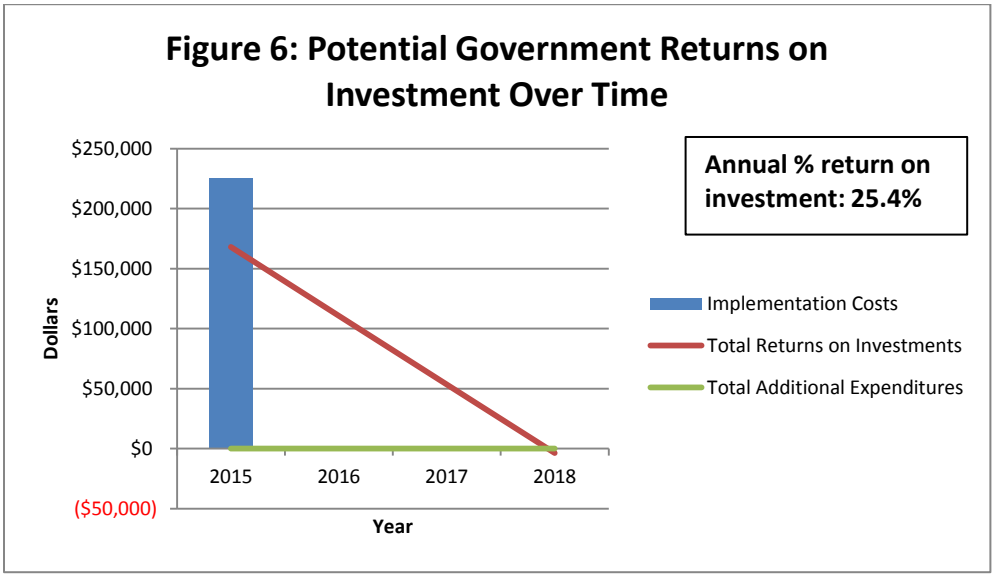


Figure 6 depicts the total implementation cost of all suggested municipal emissions reduction strategies and their annual returns on investment. It also shows additional expenditures that would be incurred due to strategy implementation. It is estimated that the annual return on investments for all of the suggested municipal emissions reduction strategies is approximately 25.4%. Moving the Town Hall to a more efficient building and LED streetlights are not included in this graph, as the costs and payback associated with implementing these strategies is uncertain at this time.

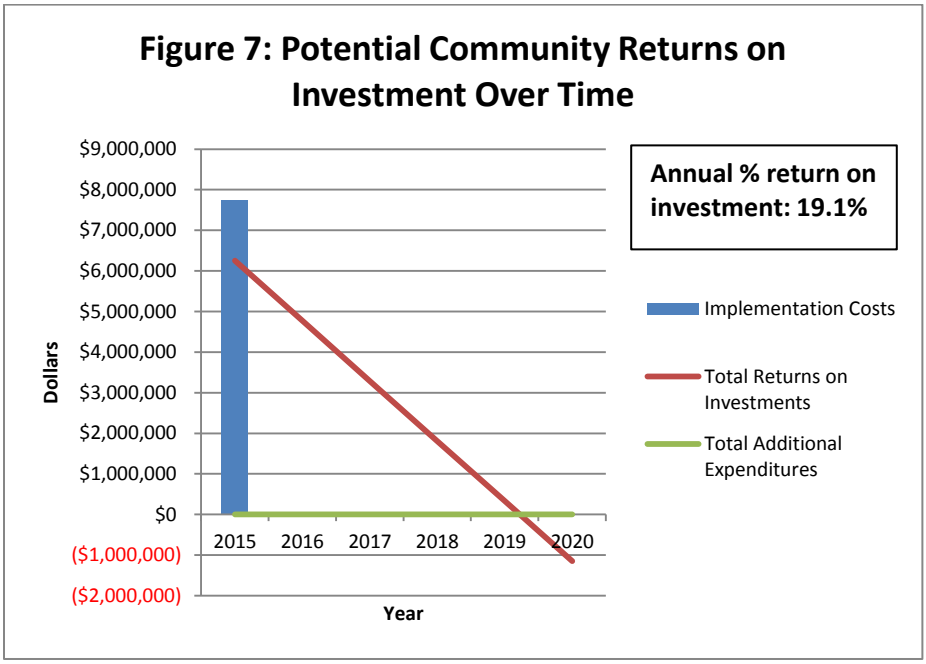


Figure 7 depicts the total implementation cost of all suggested community emissions reduction strategies and their annual returns on investment. It also shows additional expenditures that

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 19.1%. Commercial facilities efficiency projects is not included in this graph, as costs and payback associated with implementing this strategy is uncertain at this time.

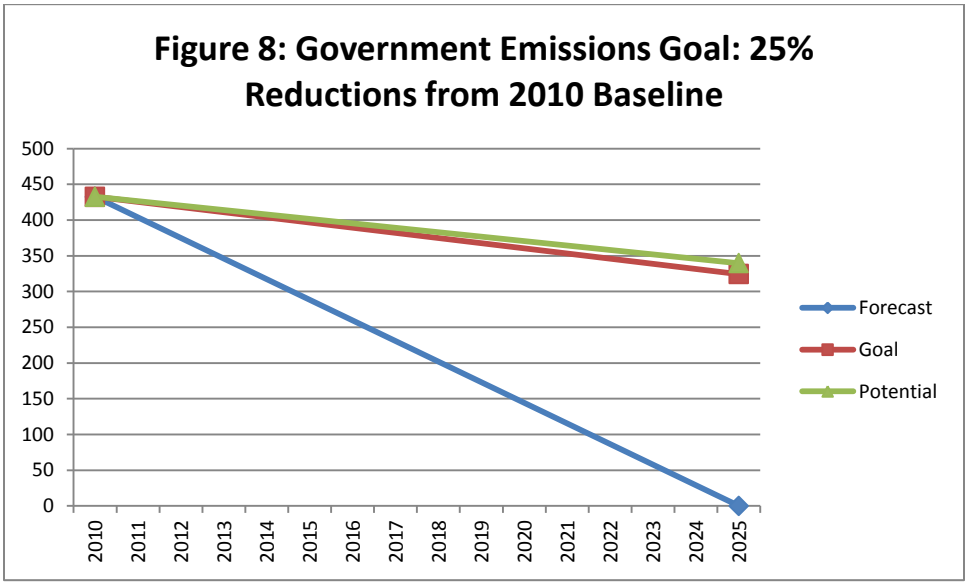


Figure 8 depicts forecasted emissions for the Town of Skaneateles in the year 2025 if no action is taken, emissions if a 25% government reduction goal is reached, and the emissions potential if all the suggested strategies are adopted.

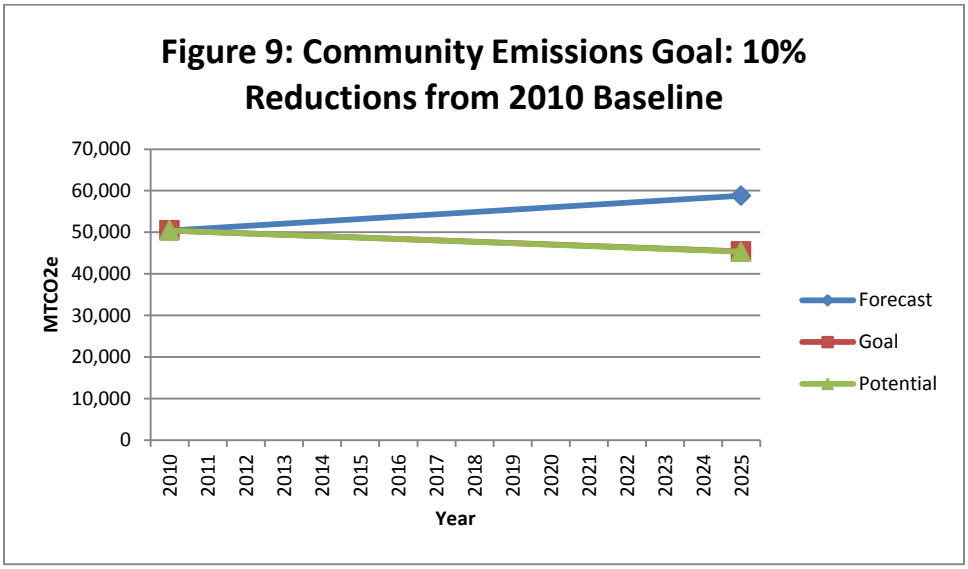


Figure 9 depicts forecasted emissions for the Town of Skaneateles in the year 2025 if no action is taken, emissions if a 10% community reduction goal is reached, and the emissions potential if all the suggested strategies are adopted.

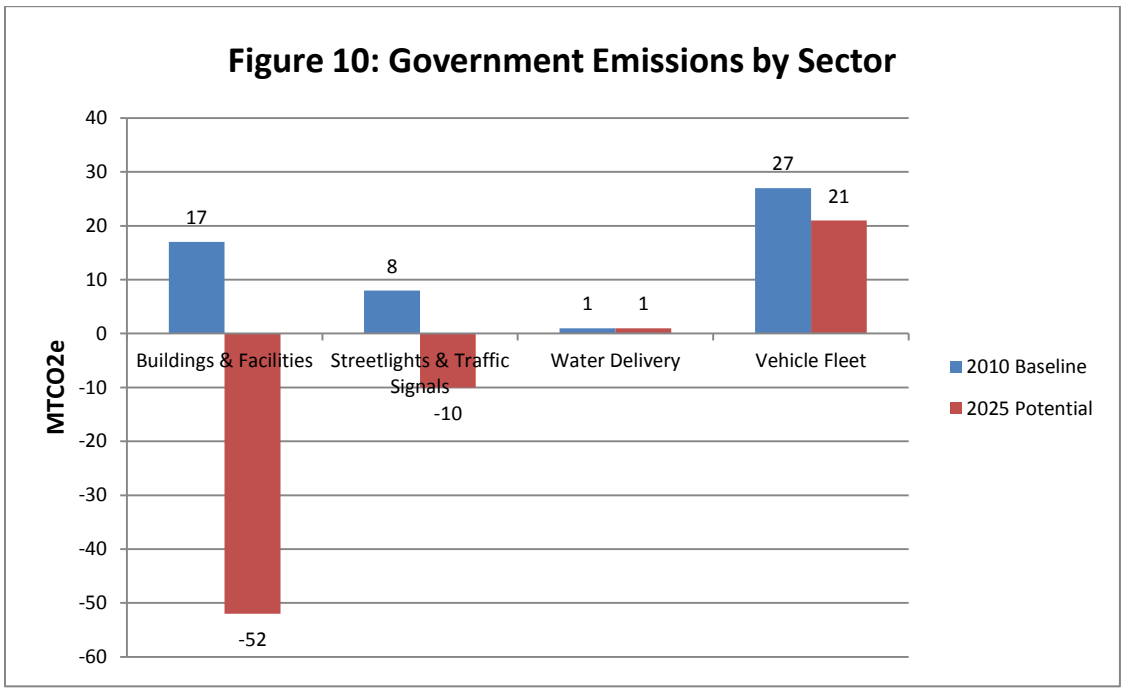


Figure 10 compares the municipal emissions per sector in the 2010 base year and 2025 emissions potentials if each of the suggested strategies is implemented.

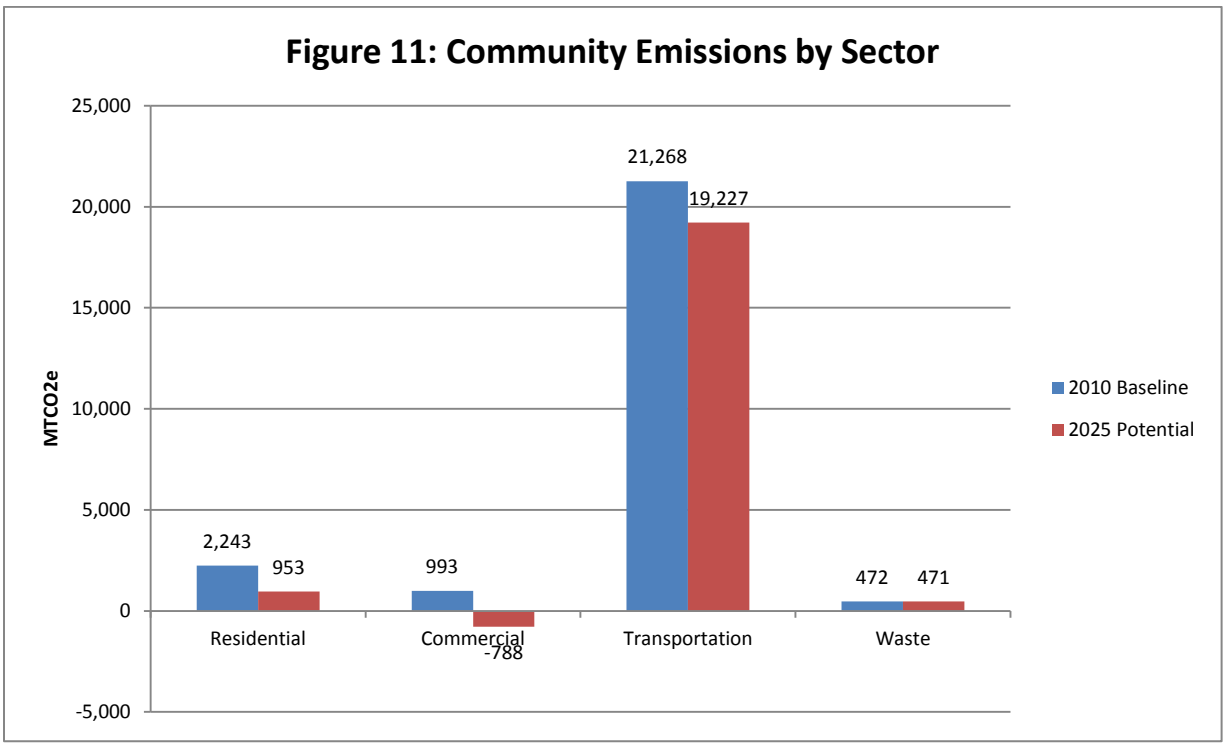


Figure 11 compares the community emissions per sector in the 2010 base year and 2025 emissions potentials if each of the suggested strategies is implemented.

Government Strategies

Transportation

1. Conversion to CNG vehicles

Strategy Description:
Because natural gas has lower carbon emissions per unit of energy than gasoline or diesel, CNG vehicles produce significantly less GHG emissions than gasoline or diesel-powered vehicles. Therefore, conversion to CNG vehicles would reduce GHG emissions, as well as fuel costs. The Town of Skaneateles currently operates 8 light-duty vehicles, including pick-up trucks, SUVs, and vans. If these vehicles were replaced with CNG, town emissions from transportation and costs would be reduced in the long term.

- **Methodology:**
  - Number of vehicles switching
    - Assume 2 vehicles: 2008 Ford F-150 pick-up and 2011 Ford F-250 pick-up
  - Price of gasoline
    - $3.19 per gallon[1]
  - Price of CNG
    - $0.49 per equivalent gasoline gallon – assuming similar prices to Village of Minoa[2]
  - Average fuel economy of vehicles switching to biodiesel (mpg)
    - 8.94 mpg[3]
  - Average annual miles
    - 10,631.5 miles per year[4]
  - Incremental cost of CNG vehicle
    - Assuming similar costs/grants as Village of Minoa[5]
    - Cost of conversion: $18,000 for 1 vehicle, paid in full by NYSERDA
    - Filling station cost $8,000, cost to village 50%, but village installed unit and got in-kind services rebate so actual cost = $2,000
    - Total cost paid by village = $2,000 for vehicle retrofits and filling station

2	Number of Vehicles switching to CNG

$3.19	Price of Gasoline ($ per gallon)
$0.49	Price of Natural Gas ($ per gallon gasoline equivalent)
8.9	Miles per Gallon of Vehicle Replaced
10,632	Average Annual Miles per Vehicle
$2,000	Incremental Cost of CNG Vehicle

2,378	Annual Gasoline Savings (gallons)
302,859	Increased Natural Gas Usage (Standard Cubic Feet)
$6,360.4	Annual Fuel Cost Savings
0.6	Simple Payback Period (years)

CO2e (metric tons)
6

Co-Benefits

-Reduces energy costs

-Reduces air pollutants

Village of Minoa CNG truck

Success Stories

-In the fall of 2012, the Village of Minoa converted one of its vehicles to CNG and installed a fill station with the help of NYSERDA funding. They have since saved in energy costs and reduced emissions.

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. The Town of Skaneateles has adopted 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 information required to participate in this program.

- **Methodology:**
  - kW of PV installed
    - Municipal operations use approximately 220,813 kWh/year. Assume government installs 200 kW of PV at transfer station, which would produce about 100% of the National Grid electricity needs of the town per year. Installing solar PV to cover costs of municipal electric accounts does not make financial sense because of low energy costs.
  - Price of electricity
    - $ 0.23 per kWh average[6]
    - $136.60 monthly base price for all accounts to be connected to NG[7]
  - Cost of PV installation
    - $1,100 per kW[8]

200	kW of PV Installed

$ 0.23	Price of Electricity ($ per kWh)
3.0	Sun hours per day
$1,100	Cost of PV installation ($ per kW)
$136.60	Monthly base price for all accounts to be connected to NG
219,000	Annual Energy Production (kWh)
$47,848	Annual Cost Savings
5	Simple Payback (years)

CO2e (metric tons)
50

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.[9]

2. Improve lighting efficiency

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. The town can also consider lighting retrofits, converting less efficient incandescent or fluorescent bulbs with more efficient fluorescent or LED bulbs.

- **Methodology:**
  - Square foot of facilities installing occupancy sensors
    - Assume transfer station (13,872 sq ft), transfer station repair building (1,200 sq ft), Austin Arena (36,200 sq ft), and Highway garage (7,000 sq ft) → 58,272 square feet[10]
  - Price of electricity ($ per kWh)
    - $0.05 per kWh[11]
  - Annual lighting energy use per square foot (kWh)
    - 6.85 (CAPPA estimate)
  - Percent savings with upgrades
    - Assume 15%
  - Cost of upgrades ($ per square foot)
    - Assume $0.50

58,272	Square Feet Installed with Occupancy Sensors

$0.05	Price of Electricity ($ per kWh)
6.85	Annual Lighting Energy Use per Square Foot (kWh)
15	Percent Savings With Upgrades
$0.50	Cost of Upgrades ($ per square foot)
59,874	Total Annual Electricity Savings (kWh)
$2,994	Annual Cost Savings
9.7	Simple Payback (years)

CO2e (metric tons)
14

Co-Benefits

- Security provided by motion sensor lighting

- Less maintenance on more efficient bulbs, such as LEDs

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.[12]

3. Moving Town Hall to more energy efficient facility

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 is looking into moving the Town Hall operations into a more energy efficient facility. This may or may not require retrofits to that facility, but is expected to reduce energy use and emissions either way.

- **Methodology:**
  - Square foot of facilities retrofitted
    - Assume Town Hall is moved → 6,266 square feet[13]
  - Price of electricity ($ per kWh)
    - $0.06 per kWh[14]
  - Price of natural gas ($ per therm)
    - $1.12 per therm[15]
  - Typical new construction annual energy use per square foot (kWh)
    - 7.82 kWh/sq. ft. [16]
  - Typical new construction annual energy use per square foot (gallons)
    - 0.22 therms/sq. ft. [17]
  - Percent electricity savings
    - Assume 25%
  - Percent propane savings
    - Assume 25%
  - Retrofit Cost ($ per square foot)
    - Uncertain

6,266	Square Foot of Facilities Retrofitted

$ 0.0600	Price of Electricity ($ per kWh)
$ 1.12	Price of Natural Gas ($ per therm)
7.8	Typical New Construction Annual Energy Use per Square Foot (kWh)
0.22	Typical New Construction Annual Energy Use per Square Foot (gallons)
25	Percent Electricity Savings
25	Percent Propane Savings
Uncertain	Retrofit Cost ($ per square foot)
12,250	Total Annual Electricity Savings (kWh)
345	Total Annual Propane Savings (gallons)
$1,121	Annual Cost Savings
Uncertain	Simple Payback (years)

CO2e (metric tons)
5

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.[18]

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."[19]

Streetlights and Traffic Signals

1. Streetlight conversion to LED

Strategy Description:
Streetlighting is often one of the largest items in a local government's energy budget. Many communities have older, inefficient bulbs in street lights. LEDs have been used to successfully reduce energy use for traffic signals, and some communities are now choosing to expand their use to save energy from streetlights. LEDs are highly efficient, and their light is directional, making it easy to focus them on roads, avoiding ambient light pollution and energy waste.

Currently, NYSEG allows municipalities that own their streetlights to convert to LEDs if the customer provides the necessary fixture specifications to NYSEG to allow NYSEG to calculate the wattage and billing kW. However, NYSEG does not currently offer utility-owned LEDs, but it is hoped that they will in the future. The implementation costs and payback period of this strategy will depend on buy-back costs and whether or not NYSEG does choose to offer a utility-owned LED option in the future.

- **Methodology:**
  - Number of streetlights replaced with LED
    - Assume all streetlights = 268[20]
  - Hours of light operation
    - Assume 11 hours/day
  - Price of electricity ($ per kWh)
    - $0.23 per kWh[21]
  - Percent HPS lamps
    - 100%
  - Wattage HPS lamps
    - Assume 144W[22]

268	Street Lights Replaced with LED Street Lights

11	Hours of Streetlight Operation
$ 0.2300	Price of Electricity ($ per kWh)
0	Percent Mercury Vapor Lamps
0	Percent Metal Halide Lamps
100	Percent High Pressure Sodium Lamps
0	Percent Low Pressure Sodium Lamps
0	Wattage of Mercury Vapor Lamps
0	Wattage of Metal Halide Lamps

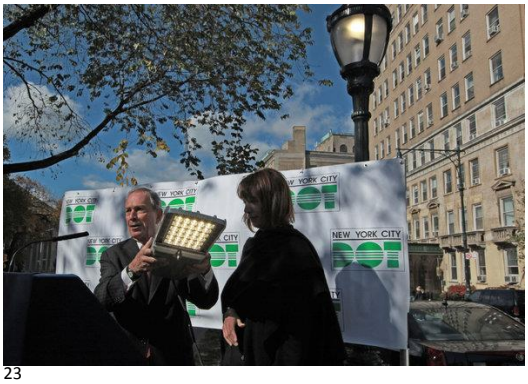
144	Wattage of High Pressure Sodium Lamps
0	Wattage of Low Pressure Sodium Lamps
77,473	Total Annual Energy Savings (kWh)
$17,819	Annual Cost Savings

CO2e (metric tons)
18

Co-Benefits

- Reduce light pollution

- Better quality of light (white vs. yellow light)



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Former Mayor Bloomberg and Janette Sadik-Khan, transportation commissioner, explain the NYS LED conversion project.

Success Stories

- The City of Binghamton, NY is in the process of converting 7,000 streetlights to LEDs. They expect to finish the project in early 2016.

-New York City is in the process of replacing 250,000 HPS streetlights with LEDs. The $76.5 million project is expected to save the city $14 million in maintenance and energy annually.

Community Strategies

Transportation

1. Conversion to Hybrid Vehicles

Strategy Description:
Hybrid/electric vehicles couple an electric drive with a gasoline engine and are widely available and are suited for a variety of applications. Hybrid vehicles are being used as taxi cabs in New York City and San Francisco. In 2006, Ford Motor Company pledged to make hybrid versions of half of their fleet, and automakers are increasingly making hybrid/electric versions of existing models.

Hybrids are less expensive to operate than regular vehicles, and while key issues related to battery life still remain, maintenance and fuel savings costs are expected to outweigh the price of battery replacement.

- **Methodology**
  - Number of vehicles switching
    - 3,602 community vehicles,[24] assume 15% make the switch = 540 vehicles
  - Price of gasoline
    - $2.53[25]
  - Price of electricity ($ per kWh)
    - $0.125 per kWh[26]
  - MPG of vehicles replaced
    - 23.8 mpg[27]
  - Average annual miles per vehicle
    - 7,949 miles[28]
  - Hybrid MPG
    - 46-55 MPG hybrid cars[29]
    - Assume 46 MPG
  - Incremental cost of hybrid vehicle
    - Toyota Prius Two base 2013 = MSRP $24,960[30]
    - Toyota Camry base 2013 = MSRP $23,030
    - $24,960 - $23,030 = $1,930

540	Number of Hybrids Used

$2.53	Price of Gasoline ($ per gallon)
46	Hybrid Miles per Gallon
23.8	Miles per Gallon of Vehicle Replaced
7,955	Average Annual Miles per Vehicle

$1,930	Incremental Cost of Hybrid
87,107	Annual Gasoline Savings (gallons)
$220,380	Annual Cost Savings
4.7	Simple Payback (years)

CO2e (metric tons)
820

Co-Benefits

- Reduces local air pollution

-Less expensive to operate than regular vehicles

-Reduces reliance on foreign oil

Success Stories

-Rockland County initiated the greening of its municipal fleet with Local Law 4 of 2006, which included a timeline for converting the entire fleet to hybrids or alternative fuel vehicles by 2010.[31]

-NYSERDA provides financial assistance and technical information to encourage fleets to purchase alternative fuel vehicles and install fueling facilities or charging stations. Certain hybrid-electric vehicles are eligible under many of the programs NYSERDA offers. [32]

-Houston's light duty passenger fleet has become over 50% hybrid, making it the 3rd largest municipal hybrid fleet in the US[33].

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
        - 2,548 people who live in Skaneateles have primary jobs,[34] assume all are offered incentives but only 5% utilize them (below)
    - Price of gasoline
        - $2.53[35]
    - Percent of employees telecommuting each workday
        - Assume 5%[36]
    - Average one-way commute length (mi)
        - Average one-way commute lengths
            - 691 commute less than 10 miles to work (avg. 5 miles)[37]
                - 691 x 5 = 3,455 miles
            - 778 commute 10-24 miles to work (avg. 17 miles)
                - 778 x 17 = 13,226 miles
            - 137 commute 25-50 miles to work (avg. 37.5 miles)
                - 137 x 37.5 = 5,137.5 miles
            - 942 commute more than 50 miles to work (50 miles)
                - 942 x 50 = 47,100 miles
            - 3,455 + 13,226 + 5137.5 + 47,100 = 68,958.5 miles total
            - 68,958.5 / 2,548 (total primary jobs) = 27.1 miles
    - Average fuel economy
        - 23.8 mpg[38]

2,548	Employees Offered Telecommuting Incentives

$2.53	Price of Gasoline ($ per gallon)

5	Percent of Employees Telecommuting each Workday
27.1	Average One-way Commute Length (mi)
23.8	Average Passenger Vehicle Fuel Economy
1,657,219	Annual Vehicle Mile Reduction
69,631	Annual Gasoline Savings (gallons)
$176,167	Annual Cost Savings

CO2e (metric tons)
655

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.[39]

3. Conversion to Electric Vehicles

Strategy Description:
Electric vehicle charging stations are an effective way to promote and incentivize electric vehicle usage. Because electric vehicles require electricity to operate instead of fossil fuels, emissions from transportation have the potential to decrease if electric vehicle charging stations are implemented. In 2013, NYS Governor Andrew Cuomo announced the Charge NY program which calls for investment in 3,000 public and workplace charging stations by 2018. NYS expects the number of EVs to increase to as many as 40,000 by 2018, and a million by 2025. The NYS Cleaner Greener Communities program has also made up to $1 million available for communities to adopt streamlined permitting and other ordinances for electric vehicle charging stations, funding is available in the amount of $2,500 per project for applicants representing a population of up to 30,000 residents.

- **Methodology**
  - Number of vehicles switching
    - 3,602 community vehicles,[40] assume 5% make the switch = 180 vehicles
  - Price of gasoline
    - $2.53[41]
  - Price of electricity ($ per kWh)
    - $0.125 per kWh[42]
  - MPG of vehicles replaced
    - 23.8 mpg[43]
  - Average annual miles per vehicle
    - 7,955 miles[44]
  - Incremental cost of electric vehicle
    - Nissan Leaf base 2013 = MSRP $35,690
    - Toyota Camry base 2013 = MSRP $23,030
    - $35,690 - $23,030 = $12,660
    - Plus a Federal tax credit up to $7,500 of Nissan Leafs purchased in or after 2010; $12,660 - $7,500 = $5,160

180	Number of Electric Vehicles

$2.53	Price of Gasoline ($ per gallon)
$ 0.1250	Price of Electricity ($ per kWh)
23.8	Miles per Gallon of Vehicle Replaced
7,955	Average Annual Miles per Vehicle
$5,160	Incremental Cost of Electric Vehicle
60,164	Annual Gasoline Savings (gallons)
516	Annual Electricity Use (kWh)
$152,150	Annual Cost Savings

6.1	Simple Payback (years)

CO2e (metric tons)
566

Co-Benefits	Success Stories
-Reduces local air pollution -Lower operating cost than gasoline vehicles  Installation of Blink electric car charging station in Syracuse, NY	-Governor Cuomo announced on April 11, 2013 that more than 360 electric vehicle and plug-in hybrid charging stations will be installed across the state in support of his Charge NY initiative, which is an initiative to create a statewide network of up to 3,000 public and workplace charging stations over the next five years and to put up to 40,000 plug-in vehicles on the road during that period.[45] -The Kanagawa Prefecture in Japan is the most successful electric vehicle region in the world, with 2,183 registered electric vehicles. In the US, citizens of cities like Los Angeles (2,000 registered electric vehicles), Portland (1,300 registered electric vehicles), New York City (238 registered electric vehicles), and Research Triangle, NC (134 registered electric vehicles) have begun to realize the benefits of electric vehicles as well[46]. -California offers several types of incentives to encourage drivers to make the switch to electric vehicles. The California Air Resource Board improved an initiative that allows EVs to access HOV lanes, which are usually reserved only for high-occupancy vehicles, via the use of a green decal sticker. The state also offers a $1,500 rebate through the Clean Vehicle Rebate Project towards the purchase or lease of an approved “clean” vehicle.[47]

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.

- **Methodology**
  - Number of homes weatherized
    - Assume 10% → Total occupied households = 1,796[48] * 10% = 180 homes
  - Price of electricity
    - $0.125 per kWh[49]
  - Price of natural gas
    - $1.30 per therm[50]
  - Price of fuel oil
    - $4.05[51]
  - Percentage of homes heated with gas
    - 787 homes using natural gas for heating of 1,796 total occupied homes[52] = 43.8%
  - Percentage of households using fuel oil
    - 404 homes using fuel oil for heating of 1,796 total occupied homes[53] = 22.5%

- Average electric energy (kWh) used for heating per household
  - 22,820,459 total kWh use[54] * 60% for heating[55] = 13,692,275 kWh total for heating / 109 households using electricity for heat[56] = 125,617 kWh per household
- Average natural gas energy (therms) used for heating per household
  - 1,187,054 total therms[57] * 60% for heating[58] = 712,232 therms total for heating / 787 households using natural gas for heat[59] = 905 therms per household
- Typical household fuel oil use (gallons)
  - 18,945 MMBtu[60] total for fuel oil = 151,700 gallons fuel oil / 404 homes using fuel oil for heat[61] = 376 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[62]
- Weatherization program cost ($ per home)
  - An average of $4,900 to weatherize a single unit in September 2011[63]

180	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)
44	Percentage of Homes Heated with Gas
22.5	Percentage of Households Using Fuel Oil
125,617	Average Electrical Energy (kWh) Used for Heating per Household
905	Average Natural Gas Energy (Therms) Used for Heating per Household
376	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)
1,523,985	Total Annual Electricity Savings (kWh)
22,832	Total Annual Natural Gas Savings (therms)
4,873	Total Annual Fuel Oil (gallons)
$1,333	Annual Cost Savings per Household
$239,915	Total Annual Cost Savings
4	Simple Payback (years)

CO2e (metric tons)
538

Co-Benefits		Success Stories
-Lower utility bills -Improving energy efficiency -Increase property values -Stimulate local economy through energy savings for low-income households		-Energy Star Home Performance Program: over 275,000 homes weatherized since 2002, lowering energy bills and improving comfort and indoor air quality.[64]

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.

- **Methodology:**
  - kW of PV installed
    - 1,621 owner-occupied homes in Town. *25% (typical amount of homes suitable for solar)= 405 homes. Assume 50% (203 homes)

install 7 kW[65] = 1,421 kW residential solar installed[66], and assuming that 7 kW system covers 100% of their electric needs

- Price of electricity
  - $0.125 per kWh[67]
  - $17.00/month base price for residents
- Sun hours per day
  - 3[68]
- Cost of PV installation
  - $745.2 per kW[69]

1,421	kW of PV Installed

$ 0.1250	Price of Electricity ($ per kWh)
3.0	Sun Hours per Day
$745.2	Cost of PV installation ($ per kW)
$17.00	Base price per month for electric meter connection with NG
1,55,995	Annual Energy Production (kWh)
$194,295	Annual Cost Savings
5	Simple Payback (years)

CO2e (metric tons)
353

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.[70]

3. Promote Loans/Incentives for Home Retrofits

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.

- **Methodology**
  - Number of homes retrofitted with loans
    - Assume 10% → Total occupied households = 1,796[71] * 10% = 180 homes
  - Price of electricity
    - $0.125 per kWh[72]
  - Price of natural gas
    - $1.30 per therm[73]
  - Price of fuel oil
    - $4.05 per gallon[74]
  - Average electric energy (kWh) used for heating per household
    - 22,820,459 total kWh use[75] * 60% for heating[76] = 13,692,275 kWh total for heating / 109 households using electricity for heat[77] = 125,617 kWh per household
  - Average natural gas energy (therms) used for heating per household
    - 1,187,054 total therms[78] * 60% for heating[79] = 712,232 therms total for heating / 787 households using natural gas for heat[80] = 905 therms per household
  - Typical household fuel oil use (gallons)
    - 18,945 MMBtu[81] total for fuel oil = 151,700 gallons fuel oil / 404 homes using fuel oil for heat[82] = 376 gallons per home
  - Percentage of homes heated with gas
    - 787 homes using natural gas for heating of 1,796 total occupied homes[83] = 43.8%
  - Percentage of households using fuel oil
    - 404 homes using fuel oil for heating of 1,796 total occupied homes[84] = 22.5%
  - Percent savings for energy used for heating (electric, natural gas, and fuel oil) through retrofits
    - Use CAPPA estimates 10% for each
  - Retrofit costs ($ per household)

- In New York the average cost of projects ranges from $5,600 to $8,500[85]
- 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[86]
- $7,050 * 10% = $705
- $7,050 - $705 = $6,345

180	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)
125,617	Typical Household Electricity Use (kWh)
905	Typical Household Natural Gas Use (therms)
376	Typical Household Fuel Oil Use (gallons)
44	Percentage of Households Using Natural Gas
23	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)
761,993	Total Annual Electricity Savings (kWh)
7,135	Total Annual Natural Gas Savings (therms)
1,523	Total Annual Fuel Oil Savings (gallons)
$615	Cost Savings per Household
$110,692	Annual Cost Savings
10.3	Simple Payback (years)

CO2e (metric tons)
233

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

NYSERDA
New York State Energy Research and Development Authority

Success Stories
-NYSERDA Residential Loan Fund Program- offers loans up to 4% less than typical loans, up to $20,000.[87]

4. 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.

- **Methodology:**
  - Capacity size (kW) for wind turbine
    - If your site has an average wind resource measuring 4 meters per second (9 mph) and follows a standard distribution (i.e. a "bell curve" of wind speeds), you can expect the Northwind 100 turbine to produce approximately 75,000 kilowatt hours of energy in a year[88]
    - Community: Assume 5 small wind turbines at 50 kW capacity, or 250 kW capacity total
  - Price of electricity
    - $0.125 per kWh[89]
  - Cost of turbine installation ($ per kW capacity)
    - Wind turbines under 100 kilowatts cost roughly $3,000 to $8,000 per kilowatt of capacity[90] → Average = $5,500 per kW
    - Plus 30% renewable energy tax credit = $5,500 x .3 = $1,650
    - However, NYSERDA has an incentive program for on-site wind power (PON 2439) valid through 12/31/15 that provides incentives up to $1,000,000 per site/customer up to 2 MW per site/customer. The incentive shall not exceed 50% of the total installed cost of the system
    - Plus NYSERDA incentives: According to CAPPA, a 50 kW system can produce 76,000 kWh. NYSERDA rebates provide $3.50 per kWh for the first 100,000 kWh produced. $3.50 x 76,000 = $266,000 for each 50 kW system; $266,000 / 50 = $532 per kW
    - $5,500 - $1,650 - $532 = $3,318 per kW

250	Capacity size (kW)

$ .125	Price of Electricity ($ per kWh)
$3,318.00	Cost of Turbine installation ($/ kWh capacity)
380,000	Potential Electricity Generation (kWh/yr)
$47,500	Annual Cost Savings

17.5	Simple Payback (years)

CO2e (metric tons)
86

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 Skaneateles

Success Stories

-In 2010 the US market for small wind turbines grew 26%, increasing small wind capacity by a total of 25 MW.[91]

Commercial Energy Use

1. Commercial Facilities Efficiency Projects

Strategy Description:
Educational programs targeted at businesses can provide information to business owners about energy saving measures they can take in their businesses, 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. These types of educational programs can reduce energy use significantly, therefore reducing GHG emissions.

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%.

Creating a policy of turning lights and other electronics off throughout buildings at the end of the work day reduces electricity wasted during non-business hours, therefore reducing GHG emissions from buildings and facilities. Lighting is typically the largest electricity user in commercial buildings. A power down at night policy can use a combination of education and technology like timers, power strips, and motion sensors.

Business owners can also choose to make retrofits to their facilities, such as replacing/upgrading HVAC equipment, improving insulation, or replacing lighting with energy efficient fixtures.

- **Methodology:**
  - Commercial energy savings assumed
    - 15%
  - Price of electricity
    - $0.125 per kWh[92]
  - Price of natural gas
    - $1.30 per therm[93]
  - Annual commercial electric energy use
    - 10,854,992 kWh[94]
  - Annual commercial natural gas energy use
    - 947,286 therms[95]

15%	Commercial energy savings assumed

$ 0.125	Price of Electricity ($ per kWh)
$ 1.30	Price of Natural Gas ($ per therm)
10,854,992	Annual Commercial Energy Usage (kWh)
947,286	Annual Commercial Energy Usage (therms)
1,628,249	Total Annual Energy Savings (kWh)

142,093	Total Annual Energy Savings (therms)
$388,252	Annual Cost Savings

CO2e (metric tons)
1,166

Co-Benefits

-Reductions in energy bills

-Increased comfort in buildings

Success Stories

-Energy Star's Portfolio Manager tool helps commercial buildings 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.[96]

-Flex Your Power (California)- Recognizes businesses showing leadership in energy efficiency and provides information on available incentives and best practices by industry.[97]

2. 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.

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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.

- **Methodology:**
  - kW of PV installed
    - Assume 2,475 kW[98]
  - Price of electricity
    - $0.125 per kWh[99]

        - $21.02 base fee per month for non-demand pricing, assume all businesses that install are non-demand pricing. Assume installations are for 10 businesses
    - Sun hours per day
        - 3[100]
    - Cost of PV installation
        - $745.2 per kW[101]

2,475	kW of PV Installed

$ 0.1250	Price of Electricity ($ per kWh)
3.0	Sun Hours per Day
$745.2	Cost of PV installation ($ per kW)
$21.02	Base fee per month for meter connection to NG
2,710,125	Annual Energy Production (kWh)
$336,243	Annual Cost Savings
5	Simple Payback (years)

CO2e (metric tons)
615

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.[102]

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.

- **Methodology**
  - Waste diverted from landfill (lbs/person/year)
    - Food waste = 18.6% total waste[103]
    - Total waste per person = 0.80 tons[104]
    - 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
    - 4,759[105]

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

4,759	Town Population
28	Life Cycle Emissions Avoided due to Composting (metric tons CO2e)
1	Annual Methane Emission Avoided from Food Waste (metric tons CO2e)
0	Change in kWh Generated from Energy Recovery

CO2e (metric tons)
1

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.[106]
-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)[107]

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.

- **Methodology**
  - Number of trees planted
    - Assume 20% households plant 1 tree = 1,796*20%= 359[108]
  - Price of electricity
    - $0.125 per kWh[109]
  - Annual energy savings of one mature tree (kWh)
    - An average tree conserves 435–483 kWh of electricity over 25 years post planting[110]
    - 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[111]
    - 1 pound = 0.00045359237 metric tons[112]
    - Annual CO_2 absorbed by one mature tree = .02177243376 metric tons
    - ~ .022 metric tons
  - Cost of planting a tree (depends on the tree planted)
    - $12 maple tree[113]
    - $12 paper birch
    - $9 cedar tree
    - $10.50 hickory
      - Avg. of $10.88 per tree

359	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)
$11	Cost of Planting Tree
6,591	Total Annual Energy Savings (kWh)
$824	Annual Cost Savings

5	Simple Payback (years)

CO2e (metric tons)
80

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.[114]

Reduction Summaries

Government

Measure	CO_2e (metric tons)	% towards goal
Municipal solar PV	50	43.13%
LED Streetlights	18	15.26%
Improve lighting efficiency	14	11.79%
Conversion to CNG vehicles	6	5.23%
Moving Town Hall to efficiency building	5	4.09%
Total	93	
Base Year Emissions (2010)	433	
Potential Emissions with Strategy Implementation (2025)	340	
% Reductions from Base Year based on Strategy Implementation Only	21.5%	

Community

Measure	CO_2e (metric tons)	% towards goal
Commercial facilities efficiency projects	1,166	8.49%
Conversion to hybrid vehicles	820	5.97%
Increase telecommuting	655	4.77%
Commercial solar PV	615	4.48%
Conversion to electric vehicles	566	4.12%
Home weatherization	538	3.92%
Residential solar PV	353	2.57%
Home retrofits	233	1.70%
Wind energy generation	86	0.63%
Tree planting	80	0.59%
Kitchen composting	1	0.01%
Total	5,113	
Base Year Emissions (2010)	50,425	
Potential Emissions with Strategy Implementation (2025)	45,312	
% Reductions from Base Year based on Strategy Implementation Only	10.1%	

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.[115] 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: 2016
  - There were 12 gasoline-powered vehicles used in 2010. Assume that half of the vehicles used in 2010 convert to more efficient vehicles by 2016.

6	Number of Smaller Vehicles Used

$3.19	Price of Gasoline ($ per gallon) [116]
34.1	Small Vehicle Miles per Gallon
10.84	Miles per Gallon of Vehicle Replaced[117]
4,659	Average Annual Miles per Vehicle[118]
1,759	Annual Gasoline Savings (gallons)
$5,611	Annual Cost Savings

CO2e (metric tons)
17

- Community: 2016
  - Americans keep cars an average of 11.4 years[119], so assume by 2016 half of the Town's passenger vehicles have been changed over since the 2010 inventory.

1,801	Number of Smaller Vehicles Used[120]

$2.53	Price of Gasoline ($ per gallon) [121]
34.1	Small Vehicle Miles per Gallon
23.8	Miles per Gallon of Vehicle Replaced[122]
7,955	Average Annual Miles per Vehicle[123]
181,828	Annual Gasoline Savings (gallons)
$460,024	Annual Cost Savings

CO2e (metric tons)
1,711

- Government: 2025
  - There were 12 gasoline-powered vehicles used in 2010. Assume that half of the vehicles used in 2010 convert to more efficient vehicles by 2016 and the other half converts by 2025.

6	Number of Smaller Vehicles Used

$3.19	Price of Gasoline ($ per gallon) [124]
5.5	Small Vehicle Miles per Gallon
10.84	Miles per Gallon of Vehicle Replaced[125]
4,659	Average Annual Miles per Vehicle[126]
2,066	Annual Gasoline Savings (gallons)
$6,590	Annual Cost Savings

CO2e (metric tons)
19

- Community: 2025

1,801	Number of Smaller Vehicles Used[127]

$2.53	Price of Gasoline ($ per gallon) [128]
54.5	Small Vehicle Miles per Gallon
23.8	Miles per Gallon of Vehicle Replaced[129]
7,955	Average Annual Miles per Vehicle[130]
339,093	Annual Gasoline Savings (gallons)
$857,905	Annual Cost Savings

CO2e (metric tons)
3,192

[1] 2013 information provided by Bridgett Winkelman, Town Budget Officer
[2] Information provided by Steve Giarrusso, WWTP supervisor, Village of Minoa
[3] Information provided by Bridgett Winkelman, Town Budget Officer
[4] Information provided by Bridgett Winkelman, Town Budget Officer
[5] Information provided by Dick Donovan, Mayor of Village of Minoa
[6] Information provided by Bridgett Winkelman, Town Budget Officer
[7] Information provided by Bridgett Winkelman, Town Budget Officer
[8] 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.
[9] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive
[10] Information provided by Bridgett Winkelman, Town Budget Officer
[11] Information provided by Bridgett Winkelman, Town Budget Officer
[12] Town of DeWitt. 2012. Local Government and Community Greenhouse Gas Emissions Inventory and Analysis:2008 Baseline
[13] Information provided by Bridgett Winkelman, Town Budget Officer
[14] Information provided by Bridgett Winkelman, Town Budget Officer
[15] Information provided by Bridgett Winkelman, Town Budget Officer
[16] Information provided by Bridgett Winkelman, Town Budget Officer
[17] Information provided by Bridgett Winkelman, Town Budget Officer
[18] http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager?c=evaluate_performance.bus_portfoliomanager
[19] http://www.dec.ny.gov/energy/64095.html
[20] Information provided by Bridgett Winkelman, Town Budget Officer
[21] Information provided by Bridgett Winkelman, Town Budget Officer
[22] The town has 268 streetlights ranging in wattage from 70W to 400W with an average wattage of 144W.
[23] http://www.nytimes.com/2013/10/25/nyregion/city-to-fit-all-streetlights-with-energy-saving-led-bulbs.html
[24] 2010 Census
[25] Gas price at Kwik Fill 797 W Genesee Street Rd on 4/23/15. http://www.syracusegasprices.com/GasPriceSearch.aspx
[26] National Grid Upstate NY Average
[27] 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

[28] 45,857,041 = total annual VMT – 15,497 government VMT = 45,841,544 community VMT. 85% of miles are through traffic (do not begin or end in town – Thruway traffic). 45,841,544 * 15% = 6,876,232 / 865 total vehicles = 7,949 average annual miles per vehicle
[29] http://www.consumerenergycenter.org/transportation/hybrids/
[30] Kelly Blue Book
[31] http://www.dec.ny.gov/energy/57108.html
[32] http://www.dec.ny.gov/energy/57108.html
[33] http://www.greenhoustontx.gov/ev/index.html
[34] http://onthemap.ces.census.gov/ → jobs by distance, minus village
[35] Gas price at Kwik Fill 797 W Genesee Street Rd on 4/23/15. http://www.syracusegasprices.com/GasPriceSearch.aspx
[36] CAPPA estimate
[37] http://onthemap.ces.census.gov/ → jobs by distance
[38] 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
[39] www.teleworkarizona.com/mainfiles/visitor/voverview.htm
[40] 2010 Census
[41] Gas price at Kwik Fill 797 W Genesee Street Rd on 4/23/15. http://www.syracusegasprices.com/GasPriceSearch.aspx
[42] National Grid Upstate NY Average
[43] 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
[44] 43,088,412 = total annual VMT – 107,282 government VMT = 42,981,130 community VMT. Assume 2/3 of miles are through traffic (do not begin or end in town). 42,981,130 * (2/3) = 28,654,087 / 3,602 total vehicles = 7,955 average annual miles per vehicle
[45] http://www.governor.ny.gov/press/04112013-hundreds-of-electric-vehicle-charging-stations
[46] http://cleantechnica.com/2012/11/11/the-most-successful-electric-car-cities-infographic/
[47] http://www.goelectricdrive.com/index.php/news-events/item/83-available-incentives-for-electric-vehicles
[48] US Census
[49] National Grid Upstate NY Average
[50] Chris Carrick, CNY RPDB
[51] http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Prices/Home-Heating-Oil/Average-Home-Heating-Oil-Prices#central
[52] US Census
[53] 2010 census
[54] 2010 National Grid energy data in GHG inventory
[55] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[56] 2010 census
[57] 2010 National Grid energy data in GHG inventory
[58] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[59] 2010 census
[60] 2010 energy data in GHG inventory, see "Town of Skaneateles data collection workbook" for more details
[61] 2010 census
[62] CAPPA estimates
[63] http://oversight.house.gov/wp-content/uploads/2012/04/Corrected-Weatherization-Report-Final-2.pdf p.8
[64] http://www.energystar.gov/index.cfm?fuseaction=hpwes_profiles.showsplash
[65] 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.
[66] 2010 census, Chris Carrick, CNY RPDB
[67] National Grid Upstate NY Average
[68] 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.
[69] Solarize CNY 2015 information, assuming average cost of $2.99 per Watt (average of Renovus, Halco, and APS 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
[70] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive

[71] US Census
[72] National Grid Upstate NY Average
[73] Chris Carrick, CNY RPDB
[74] http://www.nyserda.ny.gov/Cleantech-and-Innovation/Energy-Prices/Home-Heating-Oil/Average-Home-Heating-Oil-Prices#central
[75] 2010 National Grid energy data in GHG inventory
[76] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[77] 2010 census
[78] 2010 National Grid energy data in GHG inventory
[79] http://cmsapps.nyserda.ny.gov/homeheating/Tips.html
[80] 2010 census
[81] 2010 energy data in GHG inventory, see "Town of Skaneateles data collection workbook" for more details
[82] 2010 census
[83] US Census
[84] 2010 census
[85] http://www.energystar.gov/ia/home_improvement/HPwES_Utility_Intro_FactSheet.pdf
[86] http://www.nyserda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Residential/Programs/Existing-Home-Renovations/How-the-Process-Works/Incentives-and-Financing.aspx
[87] http://www.nyserda.ny.gov/BusinessAreas/Energy-Efficiency-and-Renewable-Programs/Residential/Programs/Existing-Home-Renovations/Residential-Loan-Fund-Program.aspx
[88] http://www.northernpower.com/wind-power-basics/faq.php#HowMuchEnergyWillA100kWTurbineProduce
[89] National Grid Upstate NY Average
[90] http://www.windustry.org/resources/how-much-do-wind-turbines-cost
[91] http://www.awea.org/learnabout/smallwind/upload/awea_smallwind_gms2011report_final.pdf p. 4
[92] National Grid Upstate NY Average
[93] Chris Carrick, CNY RPDB
[94] 2010 National Grid information provided by Jim Yienger
[95] 2010 National Grid information provided by Jim Yienger
[96] http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager?c=evaluate_performance.bus_portfoliomanager
[97] http://www.fypower.org/com/
[98] Commercial operations used 10,854,992 kW in 2010. 2,475 kW would cover almost 25% of commercial electric use; however, there are few commercial buildings in Skaneateles upon which solar can be mounted, so ground-mounted systems may be the best option.
[99] National Grid Upstate NY Average
[100] 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.
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[102] c2ip_programadministration_2012_Revised_no_cayuga_CC_5-24-13 excel sheet saved in CNY RPDB Y drive
[103] ICLEI Solid Waste Emission Activities, Appendix E, p. 32
[104] Onondaga County Resource Recovery Facility 2010 Annual/Quarterly report
[105] 2010 census
[106] https://ocrra.org/news/details/38
[107] http://www.sfenvironment.org/zero-waste/recycling-and-composting?ssi=3&ti=6
[108] 2010 census
[109] National Grid Upstate NY Average
[110] http://actrees.org/news/trees-in-the-news/research/mature-trees-significantly-reduce-energy-use-in-urban-areas/
[111] http://chemistry.about.com/od/environmentalchemistry/f/oxygen-produced-by-trees.htm
[112] Google Calculator (google search)
[113] http://www.arborday.org/shopping/trees/treedetail.cfm?ID=28
[114] http://www.arborday.org/globalwarming/summerShade.cfm

[115] 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
[116] Information provided by Bridgett Winkelman, Town Budget Officer
[117] Information provided by Bridgett Winkelman, Town Budget Officer
[118] Information provided by Bridgett Winkelman, Town Budget Officer
[119] http://www.huffingtonpost.com/reno-charlton/american-drivers-keeping-_b_3718301.html
[120] Total vehicles = 3,602 (2010 census minus village); assume half = 1,801
[121] Gas price at Kwik Fill 797 W Genesee Street Rd on 4/23/15. http://www.syracusegasprices.com/GasPriceSearch.aspx
[122] 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
[123] 43,088,412 = total annual VMT – 107,282 government VMT = 42,981,130 community VMT. Assume 2/3 of miles are through traffic (do not begin or end in town). 42,981,130 * (2/3) = 28,654,087 / 3,602 total vehicles = 7,955 average annual miles per vehicle
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[130] 43,088,412 = total annual VMT – 107,282 government VMT = 42,981,130 community VMT. Assume 2/3 of miles are through traffic (do not begin or end in town). 42,981,130 * (2/3) = 28,654,087 / 3,602 total vehicles = 7,955 average annual miles per vehicle