NH Municipal Energy Assistance Program

Made possible through the NH Public Utilities Commission and the Greenhouse Gas Emissions Reductions Fund

Municipal Greenhouse Gas and Energy Use Baseline

Report for Exeter 2009

This report is a summary of greenhouse gas emissions and energy use for the town of Exeter, NH for the year 2009. The focus of this report is the municipal operations of the town, with special emphasis on town-owned buildings. It does not encompass residential, commercial, or industrial energy use. The following analysis of municipal energy use is based on data gathered from the municipality's utility bills for building electricity, building heating fuel, streetlight electricity, and municipal fleet vehicle fuel. Supporting data was also collected including building dimensions, hours of operation, number of streetlights, and vehicle types. The data was then analyzed using two software tools, Portfolio Manager Software provided online by the US Environmental Protection Agency (EPA) and the Small Town Carbon Calculator (STOCC) software developed by the University of New Hampshire and Clean Air-Cool Planet.[1] The STOCC software provides comparative information between the various sectors of municipal energy use (buildings, vehicles, and streetlights) while the Portfolio Manager software provides in-depth analysis of energy performance in individual buildings. The energy use per square foot is presented for each building, and Portfolio Manager allows for comparison of this metric to buildings of similar types across the US and in New Hampshire specifically.

This report was made possible by the Municipal Energy Assistance Program (MEAP), a collaborative project of Clean Air-Cool Planet, Jeffrey H. Taylor and Associates, the SDES Group, the Sustainable Energy Resource Group, Vital Communities, and Carbon Solutions New England and funded by the Regional Greenhouse Gas Initiative (RGGI). The community applied for support from the MEAP program and was selected to receive this baseline energy inventory. Community officials, employees, and volunteers then assisted the MEAP Energy Project Assistant, who collected and analyzed the data in this report.

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[1] For more information on EPA Portfolio Manager Software, see www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager. Information on Small Town Carbon Calculator (STOCC) software is at www.cleanair-coolplanet.org.

Municipal Overview

Town population: 14, 735 (2007 Census)[2].
Area of municipality: 19.8 sq.miles of land area and 0.3 sq. mi. of inland water area.
Population density: 734.0 persons/sq. mile.
Number of municipal buildings: 6;
Number of Water and Wastewater Buildings: 3
Total area of municipal building space: 76,369 sq. ft. (not including WWTP,WTP)
Average site energy intensity of all municipal buildings: 73.5 kBtu/sq. ft.
Number of street lights: 702.
Number of vehicles in fleet: 80.
Number of municipal employees: 150.
Municipal town budget in baseline year: $19, 286,258.
Total cost of municipal energy use in baseline year: $691,007.
Total municipal energy use in baseline year: 77571 MMBtu.
Total municipal CO2 emissions in baseline year: 10,942,804 lbs.

Community Profile

The town of Exeter New Hampshire is located in Rockingham County and is surrounded by the towns of Brentwood, Epping, Newfields, Stratham, Hampton, Hampton Falls, Kensington, East Kingston, and Kingston. The population of Exeter was 14,735 residents (2007 Census), which ranked Exeter 18th among New Hampshire's incorporated cities and towns.

Exeter has appointed Boards and Commissions for Planning, Zoning Conservation, Historic District, Recreation, Budget and Housing Authority. The town of Exeter has a Master Plan which was first adopted in 1969, fully updated in 1985, and revised in 1994. The Town Planner recommends periodic updates of individual chapters. The Planning Board currently is processing three chapters: Transportation, Housing, and Historic and Cultural Resources, and expects to have a final product for 2011 implementation. A Zoning Ordinance for small wind systems was adopted by town meeting in 2008.

The Capital Improvement Plan has been used to identify and schedule improvements to the town infrastructure for building energy efficiency improvements for boilers and HVAC systems, and recently inflow and infiltration of the Drinking Water and Wastewater Systems. The scheduled replacements are planned in 2010.

The town of Exeter voted in the Climate Change Resolution in 2007, which approved and established a Local Energy Committee. The Exeter Energy Committee (EEC) has been working with the Board of Selectmen on a number of projects, with the main focus to reduce energy costs in the budget and within municipal buildings. One of these projects was the 50/50 program (50% paid by town and 50% by Unitil), which identified energy improvements such as lighting for the Town Office and the Public Safety Complex and the window replacement program for the Library. The recommendations were implemented in 2009. The EEC developed the MEAP application and submitted this for the town in September 2009, and was selected to participate in December 2009. Also as part of MEAP, Exeter was one of six communities selected to participate in the energy and land use Policy Audit by Jeffrey H. Taylor Associates. The Exeter Town Master Plan and ordinances will be reviewed for their inconsistencies, from an energy perspective, in limiting development. The goal is to develop

[2] Population numbers are taken from the 2006 estimates from the census bureau at http://factfinder.census.gov/servlet/SAFFPopulation?_submenuId=population_0&_sse=on.

the recommendations to foster development patterns that use land in Exeter efficiently, while reducing the resident's reliance on fossil fuels.

The Town contracted with the Mercury Associates, Inc to conduct a vehicle fleet management study with a report completed in November 2009. This report identified a vehicle replacement program as well as energy saving strategies.

The Town of Exeter applied for the Energy Efficiency Conservation Block Grant by submitting three project applications on February 15th, two for Building Energy Efficiency Measures for retrofits, boiler and HVAC system replacements to the Public Safety Complex and to the Town Offices. The third project was considered in the "Other" category and was for a Power Grid Purchasing Agreement. This involved a contractor who would install the photovoltaic solar array at the Wastewater Treatment Plant, establish a contract price for town electricity, and then additional energy would be go back to the grid. This innovative project to decrease power draw from the grid was the one Exeter project that was accepted on March 10th and was funded for $50,000.

Municipal Sector Analysis

For each participating municipality, data was gathered on the operations of several sectors under the jurisdiction of the municipal government: the buildings, vehicle fleet, and street lights. Different types of energy use were considered depending on the sectors, such as electricity use, heating fuel use, and fuel for vehicles. Where records were available, the costs of purchasing these energy sources were factored in to the analysis. The STOCC software was used for the analysis of the aggregate data on all municipal sectors.

Table 1. Energy use, carbon emissions, and costs, by municipal sector

Summary Report

	Buildings		Vehicles		Streetlights		
	#	% of total	#	% of total	#	% of total	Grand Total
Annual Fuel Expense	$469,965	68%	$113,381	16%	$107,661	16%	**$691,007**
Annual CO2 Emissions (lbs)	9,609,404	88%	1,095,744	10%	237,656	2%	**10,942,804**
Annual Energy Use (MMBtu)	69,712.5	90%	6,963.6	9%	895.0	1%	**77,571.1**

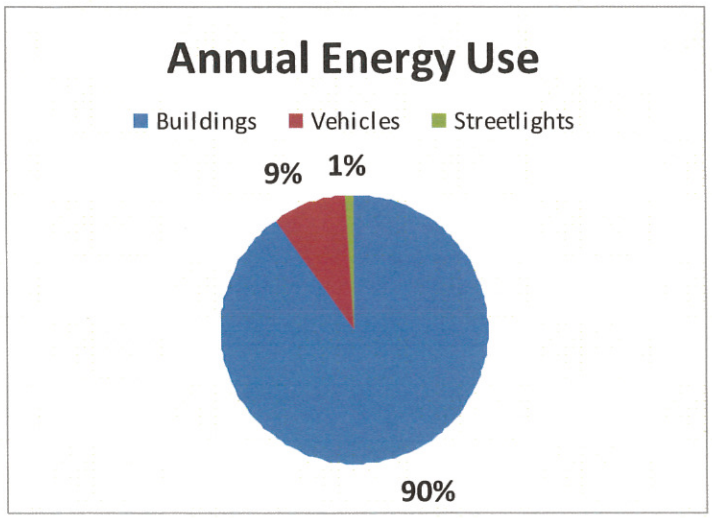
Generated by STOCC Software

The Town of Exeter has six municipal buildings and three Water and Wastewater Treatment facilities, which were included in this inventory: The Town Offices the Town Hall, the Public Safety Complex, the DPW Highway, the DPW Administration, and the DPW Water and Sewer Garage. The other buildings energy use included were the Waste Water Treatment Plant (WWTP) at Newfields Rd, the Waste Water Treatment Plant

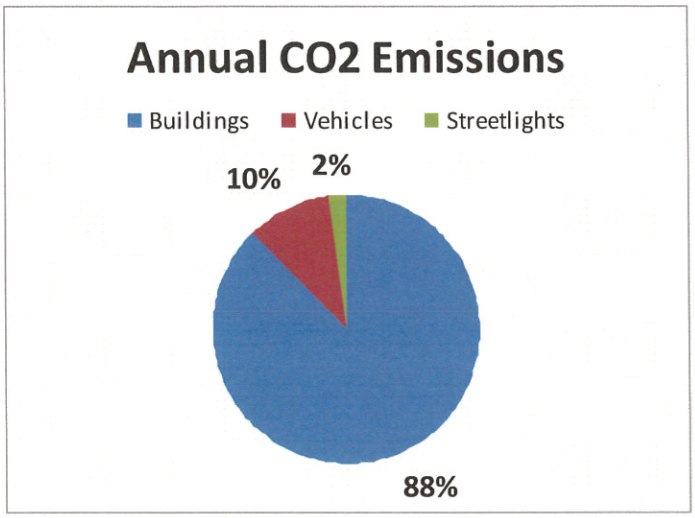
(WWTP) Main Pumping Station at 279 Water ST. and lastly the Drinking Water Treatment Plant (WTP) and Sedimentation building at 109 Portsmouth Ave.

Snapshot of Municipal Energy Use, Emissions, and Costs by Sector

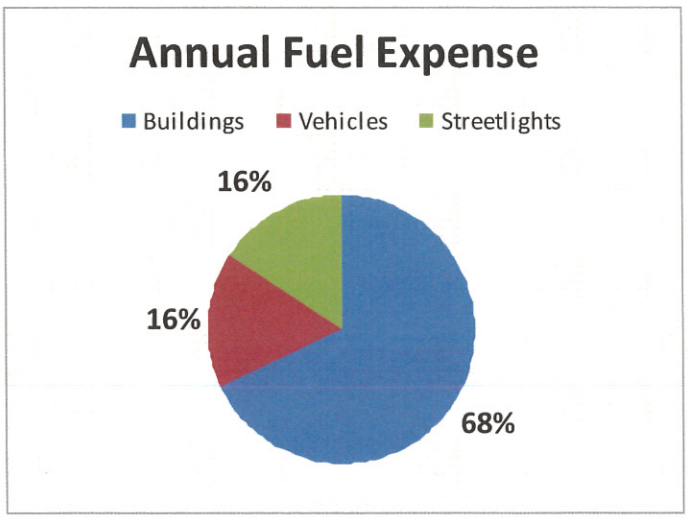
Graph 1a. Municipal Energy Use (MMBtu)



Graph 1b. Municipal Carbon Equivalent Emissions (tons)



Graph 1c. Energy Costs by Municipal Sector ($)



The Municipal Building sector is the largest energy user at 90 % of the annual energy use, and 68 % of the annual fuel expense at a total of $469,965 and 88% of the annual CO2 emissions.

The vehicle sector is the second largest sector at 9% of the annual energy use and 16% of the annual fuel expense at $113, 381and 10% of the annual Co2 emissions.

The streetlight sector is the smallest sector with 1% of the annual energy use and 16 % of the annual fuel expense at $107,661 and 2% of the Co2 emissions at237,656 lbs.

The annual energy fuel expense for Exeter during the 2009 baseline report was a total of $691,007.

Building Performance: Energy Use and Energy Intensity

Table 2. Energy Use and Intensity, by municipal building

Name of Building	Heating Fuel Type(s)	Area (Sq. Ft.)	Energy Use: Electricity (million Btu)	Energy Use: Heating Fuel (million Btu)	Total Building Energy Use (million Btu)	Site energy intensity (kBtu/sq ft)[3]	EPA Average Site kBtu/sq ft for building type	NH Average Site kBtu/sq ft for building type
Exeter Town Office	Natural gas	13,737	278	6120	6398	64	95	69
Exeter Town Hall	Natural gas	17, 256	220	9159	9379	64	95	68.9
Exeter Public Safety Complex	Natural gas	18,112	1005	11536	12541	117	78	65.5
Exeter DPW Highway	Natural gas	18,180	222	6934	7156	49	77	74
Exeter DPW Admin	Natural gas	3,084	107	990	1097	66	77	73.8
Exeter DPW W/S Garage	Natural gas	6,000	71	4258	4329	81	104	73.9
Exeter WWTP Newfields Rd	Natural gas	2,592	4184	6520	10,705	N/A	N/A	N/A
WWTP Main Pumping Station	Natural gas	1520	861	2178	3039	N/A	N/A	N/A
Drinking WTP & Sedimentation Building (Portsmouth Ave)	Natural gas	9996	2802	4232	7034	N/A	N/A	N/A
Average		12,728	317	6500	6,817			

Energy use data generated by STOCC software; energy intensity data generated by Portfolio Manager software. The average is based on six municipal buildings, starting from the top.

[3] Site energy intensity = amount of energy expended per square foot *on site* to heat, cool, and electrify the area. This measure relates to how much is being used on site and fluctuates directly with how much lighting is being used, how thermostats are kept, etc.

The Water and Wastewater Treatment Plants have been included in the energy analysis. However their energy intensity is not based on the kBtu/sq.ft, but upon the average flow of gallons per day, of either the water or wastewater that they are processing, thus the units are kBtu /gpd. Therefore, the not available as N/A is indicated in the chart above.

Facility	Current Site Energy per Flow (kBtu/gpd	EPA National Average Site EUI (kBtu/gpd)
Exeter Drinking Water Treatment Plant (Portsmouth Ave)	3.8026	2.0
Exeter Wastewater Treatment Plant (Newfields Rd)	2.0945	1.8
Exeter Wastewater Main Pumping Station (Water St)	0.6703	2.0

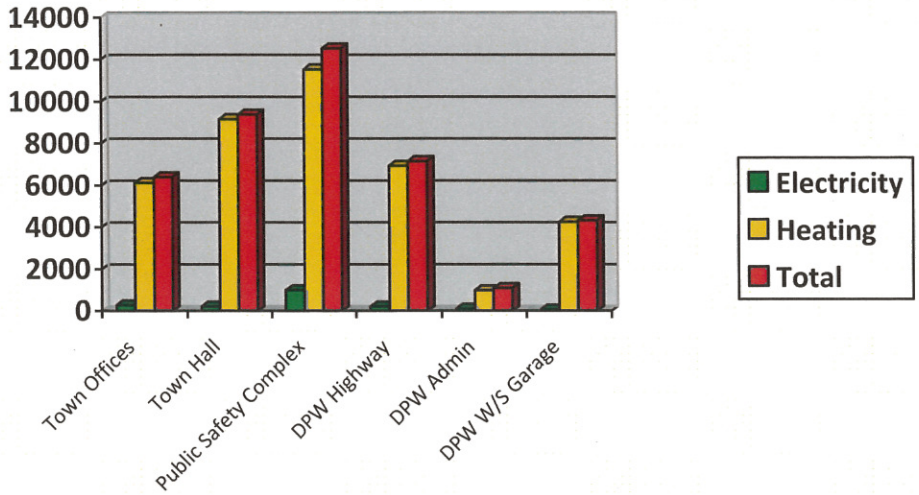
The EPA Portfolio Manager provide this analysis

The Exeter Drinking Water Treatment Plant site energy per flow is 3.8 kBtu/gpd, which is almost twice the EPA national average of 2.0 at kBtu/gpd. On the other hand, the Exeter Wastewater Treatment Plant current site energy per flow is slightly above at 2.09 kBtu/gpd, when comparing to the EPA national average of 1.8 kBtu/gpd.

The Wastewater Treatment Plant has been identified by an engineering firm as needing repair to its infrastructure. The term as stated as "inflow and infiltrations". If the town of Exeter makes the infrastructure more stable and efficient they will process only wastewater instead of the added infiltrated groundwater. This processing of the extra water requires more energy. Similarly, with the Drinking Water Treatment Plant there are leaking pipes, which lead to more demand from customers and thus more energy used in the water processing and distribution. The Capital Improvement Planning Process has identified and scheduled the repair activities for 2010.

Snapshot of Energy Use by Building

Graph 2a. Energy Use for Electricity, Energy Use for Heating, and Total Energy Use in Municipal Buildings

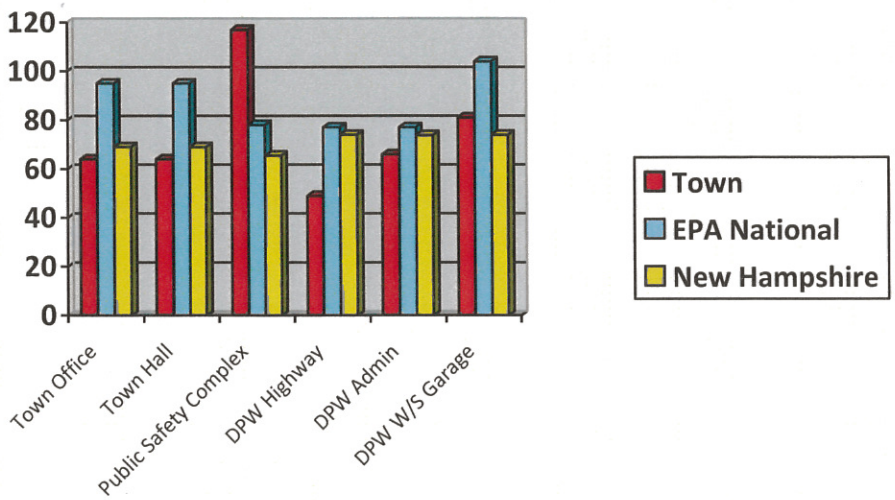


The Graph 2a shows the energy use for electricity, heating and total energy use. Energy use is greatest for the Public Safety Complex, followed by the Town Hall, DPW Highway, Town offices and DPW Water/Sewer Garage.

Energy intensity is the most powerful tool available for measuring the relative energy efficiency of particular buildings. Site energy intensity is calculated by taking the amount of energy used in the building (a total aggregate of heating fuel and electricity) and dividing it by the square feet of space. It can be reduced through behavioral and energy conservation measures. The best opportunities for saving energy on site would involve behavioral changes (such as keeping lights and computers turned off; turning down thermostats) and energy conserving technologies (such as motion sensor lighting).

Information about the source energy intensity of these buildings is available on your EPA Portfolio Manager account. Source energy is the energy used to produce the energy used in each building. Your municipality may consider reducing source energy intensity as a long-term goal. This can be accomplished through projects such as installing solar panels or a municipal combined heat and power plant.

Graph 2b. Site Energy Intensity and Average Site Energy Intensity for Type of Building (kBtu/sq.ft.)



The Public Safety Complex has the highest energy intensity at 117 kBtu/sq. foot and is also the highest energy user at 12, 541 MMBtu, of any municipal building. The PSC also exceeds both the New Hampshire average energy intensity of 65.5 kBtu/sq. foot as well as the EPA National level at 78 kBtu/sq. foot.

In contrast, the DPW Highway Garage has the lowest municipal building site energy intensity at 49 kbtu/sq. foot. This figure is lower than the average site intensity for NH highway garages (74 kBtu/sq.ft), and also lower than the EPA National average site for building type of 77 kBtu/sq.ft.

The Exeter Town Offices and the Exeter Town Hall each register site energy intensities of 64 kbtu/sq.ft, which is very close to the NH average site intensity for office buildings of 69 kBtu/sq. ft. The DPW Administration building and the DPW Garage also register energy intensities that are fairly close to NH averages for buildings of the same type (these are slightly lower than national averages for this type of building).

Building Performance: Cost and Emissions

Table 3. Energy Cost and Emissions, by municipal building

Name of Building	Area (Sq. Ft.)	Energy Cost ($)	Energy Cost per Square Foot	Energy Emissions (tons of CO2)	Energy Emissions per Square Foot
Town Office	13,737	21,159	1.54	790,307	57.5
Town Hall	17, 256	23,219	1.35	1,130,767	65.5
Public Safety Complex	18,112	57,396	3.2	1,617,441	89.3
DPW Highway	18,180	20,851	1.15	870,841	47.9
DPW Admin	3,084	6,619	2.14	144,393	46.8
DPW W/S Garage	6,000	10,328	1.7	517,353	86.2
Average	12,728	23,262	1.85	845.2	65.5

Emissions data generated by STOCC software

The Public Safety Complex is identified as the municipal building with the highest energy cost per square foot at $3.20, as well as the highest energy emissions per square foot at 89.3 lbs.

The DPW Administration is the second building with the highest energy cost per square foot at $2.14. However the energy emission per square foot is 46.8 lbs, which is lower than other municipal buildings.

The DPW W/S Garage is the third building with the highest energy cost per square foot at $1.70, with an energy emission per square foot of 86.2 lbs.

The Exeter Water and Wastewater Treatment facilities were not compared for their energy cost per sq foot, but the total energy costs for electricity and natural gas were provided:

Wastewater Treatment Plant - total annual cost = $157,836
Wastewater Treatment Plant Main Pumping Station - total annual cost =$42,958
Drinking Water Treatment Plant - total annual cost = $129,599

Analysis: Priorities and Custom Recommendations

1. The Public Safety Complex is the municipal building where there are the greatest energy saving opportunities. The SDES group will evaluate this building to determine whether this is the building that is the best candidate for the Decision Grade Audit.

2. Exeter has a comprehensive Capital Improvement Plan, which has identified and scheduled building energy efficiency improvements for the Public Safety Complex and the Town Offices. These include items such as boiler and HVAC systems. The town may consider having SDES group review your proposed plan and assist you during their advocacy work, to ensure that the technology choices are specific to your energy needs.

3. The DPW Water and Sewer Garage and the DPW Administration buildings should be evaluated for energy saving opportunities. The building operations and potential energy saving measures could be evaluated by SDES, during their advocacy work.

4. The Sedimentation Building at the Drinking Water Treatment Plant at 109 Portsmouth Ave, does not have a separate electrical meter. Currently there is one electrical meter at the main WTP building, which provides electricity to both buildings. It is recommended to install a separate electricity meter at the Sedimentation building to facilitate the tracking of the electricity use.

5. In the case of the Town Hall, there is a portion of the building that is leased. Install the meters for electricity and natural gas if feasible, to more easily track energy use.

6. The Vehicle Fleet Management Report was completed in November 2009 and is now scheduled to be reviewed by the Board of Selectmen in September 2010. This is to prepare the recommendations for the budget process. Exeter should consider implementing the recommendations for the vehicle replacement program.

7. Exeter has Streetlights are 16% of the annual energy expense and have 702 streetlights in total. Exeter has participated with Unitil in an LED traffic light replacement program. Exeter should consider evaluating their streetlights to determine if they are active locations and whether you have any energy saving opportunities. An LED replacement program for streetlights will save energy and require less maintenance. There may be LED rebate programs for streetlights in the near future.

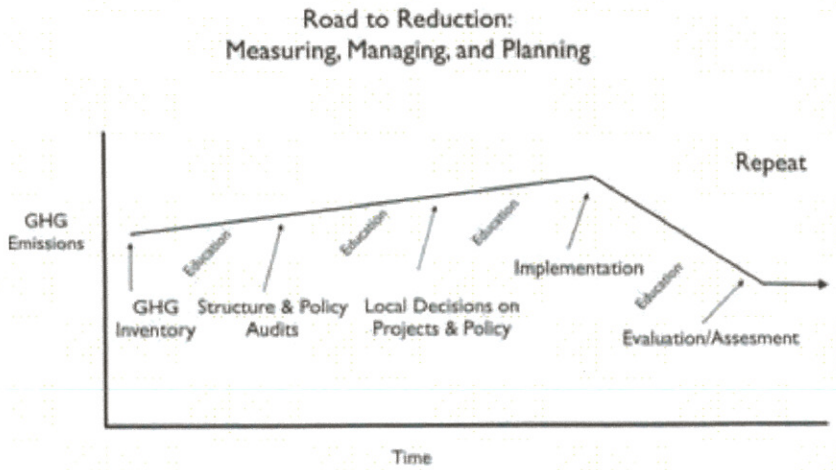
8. The EECBG funding for the Power Grid Purchase Agreement affords an opportunity to decrease power from the grid through a renewable Photovoltaic Solar Array, to be installed at the Exeter Waste Water Treatment Plant. This project will serve to be an Exeter Energy Committee activity to monitor and to provide as an educational tool for the Board of Selectmen for future energy saving strategies.

Analysis: General Recommendations for Municipal Energy Savings

1. Review existing Master Plan, Zoning Ordinances, and other town policies for inconsistencies with the goal to reduce energy usage.
2. Implement a behavioral change program in municipal buildings with municipal employees. Work with LEC Working Group for guidance to implement this initiative.
3. Implement buying strategy of Energy Star equipment and Products and environmentally sensitive office products, and implement awareness campaigns to encourage "thoughtful" consumption of equipment and products.
4. Evaluate ways to reduce fuel usage with vehicle fleet. This can be done by analyzing routes, usage, and a strict anti-idling policy.
5. Find alternative energy sources to reduce escalating fossil fuel prices and emissions. Investigate payback for possibly installing: a small CHP unit, biomass heating system or geothermal heat pump.
6. Encourage recycling and composting to the extent possible, in order to divert the amount of municipal solid waste (organic matter) going to landfill.

Next Steps

Once this draft inventory is finalized, the MEAP project team will work with your town to identify a low-performing building and to carry out an energy audit for that building. The selected building will receive a Decision Grade or Investment Grade energy audit. The audit will culminate in a set of recommendations for building retrofits and renovations that would allow the town to reduce its building's energy use.



Once the audit report is complete, the MEAP project team will provide on-going support to your town as your municipality begins the process of identifying priority renovations/retrofits, creating RFPs, hiring contractors and realizing potential reductions. All phases of this project will be accompanied by a program of public engagement and education.

Methods

Greenhouse gas inventory approach

Data collection for this inventory involved collaborative efforts between the Clean Air-Cool Planet staff, which organized the data collection process over all, and the local town representative volunteers. With personal connections to their home towns, volunteers were better able to ascertain where to access certain data and to spend time at local offices sorting through bills and records. To collect the data in each town, data sheets were developed based on the software/program that was used for data processing. We used 2009 as a baseline year to collect the fuel and energy consumption information. Data sheets were sent to the town representative, who then collected and/or accessed the data. Follow-ups were done on a regular basis to make sure that the inventory progressed, the data collection process was effective, and the data needed was more or less accurately collected.

Data processing and data analysis

To process the data collected, we used two types of fuel and energy assessment software. The first was the Small Town Carbon Calculator (STOCC) software used to quantify and estimate the amount of energy used and the greenhouse gases (GHG) generated from the energy usage. The STOCC software allowed us to make a municipal energy assessment by municipal sector. The second was the EPA Portfolio Manager Benchmarking Program, used to assess the energy consumption and GHG generated in specific buildings, based on square footage.

List of Acronyms

CA-CP	Clean Air-Cool Planet
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
kBtu	Kilo British Thermal Units
MMBtu	Million British Thermal Units
STOCC	Small Town Carbon Calculator