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Executive Summary: The Cities for Climate Protection Campaign

As one of 147 municipalities in the United States and over 550 cities and counties around the world that are participating in the Cities for Climate Protection Campaign, Williamstown has taken a leadership role in the effort to stop global climate change. In 2001, the Williamstown Board of Selectmen passed a resolution to join the Campaign (see page 9), committing local government, businesses, institutions, and residents of Williamstown to take steps to reduce the emissions of greenhouse gases that are causing global climate change.

Sponsored by the International Council for Local Environmental Initiatives (ICLEI), the Cities for Climate Protection Campaign follows a Five Milestone Process: completing a greenhouse gas emissions inventory and report, setting an emissions reduction target, completing a local climate action plan to reduce greenhouse gas emissions, implementing the local climate action plan, and monitoring the impact of emissions reduction measures.

The greenhouse gas emissions inventory and forecast was completed in 2002, and reported that in 2000, Williamstown released 116,117 tons of eCO₂ into the atmosphere, mostly from electricity use, gasoline, and natural gas for heating. The committee recommends that the town set a goal of reducing overall emissions by 10% below 2000 levels by 2010. In order to reach this target, 11,612 tons of eCO₂ will have to be eliminated over the next 6 years.

The following plan, written by the Williamstown Cities for Climate Protection Committee, represents completion of the third milestone. It identifies existing actions and proposes new actions that can be undertaken by residents, businesses, local government, and institutions to help Williamstown reach its greenhouse gas emissions reduction goal.

Each action is carefully described and includes implementation costs, financial savings and investment payback periods, potential partners in implementation, and strategies for monitoring and assessment. The actions are designed to increase energy efficiency and reduce traffic and solid waste volumes, while raising the public's awareness of solutions to global warming. Taken together, these measures will help the town to reach its goal for reducing its greenhouse gas emissions.

The table on the following page provides an overview of the actions proposed for each sector and will assist Williamstown in tracking its progress.

Table 1: Summary of Actions

ACTION	Residential	Municipal	Commercial	Institutional
Purchase Energy Efficient Products: Lighting	X	X	X	X
Purchase Energy Efficient Products: Appliances and Office Equipment	X	X	X	
Purchase Energy Efficient Products: Heating and Cooling	X	X	X	
Purchase Green Power	X		X	X
Purchase Fuel-Efficient Vehicles	X	X	X	X
Support Regional Bike Path	X	X		X
Build "Green"		X		X
Install Renewable Energy Systems	X	X		X
Increase Recycling, Reduce Waste			X	X
Increase Composting	X			X

Sector and source contributions to Williamstown’s total can be seen below. This information, and the detailed information offered by the inventory, will help the community to focus its efforts where the most improvement can be made.

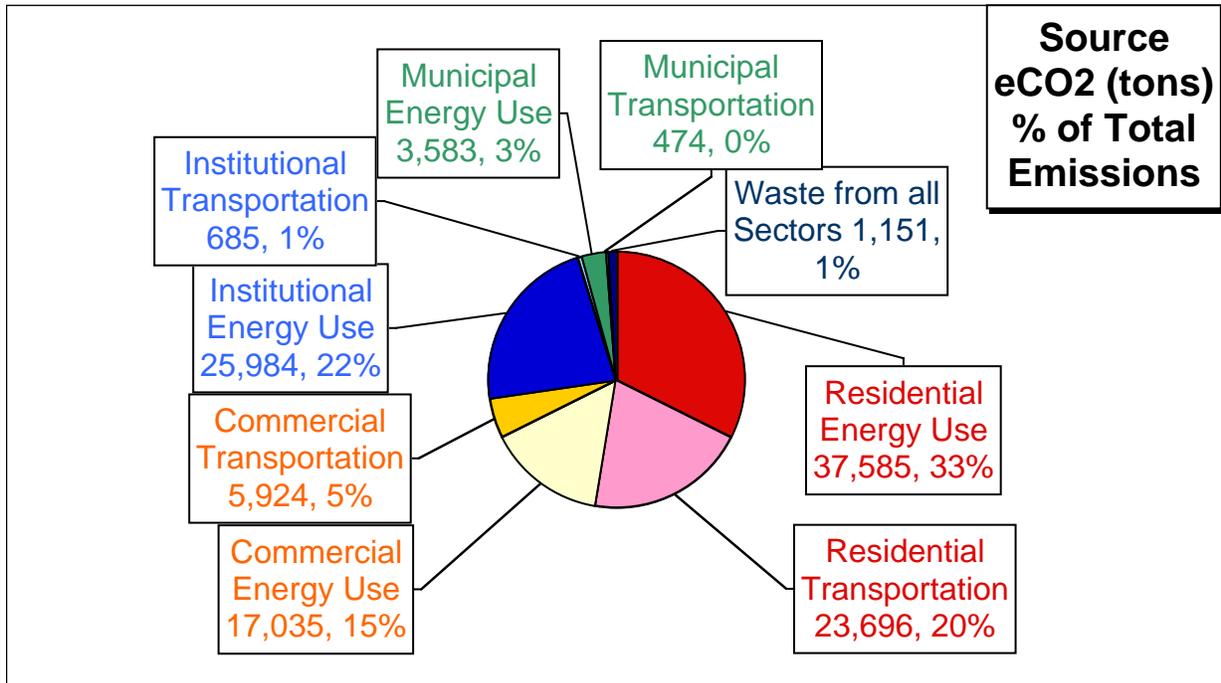


Figure 1 Williamstown Greenhouse Gas Emissions by Sector and Source (116,117 tons total)

The 'Enhanced' Greenhouse Effect, Global Warming, and Climate Change

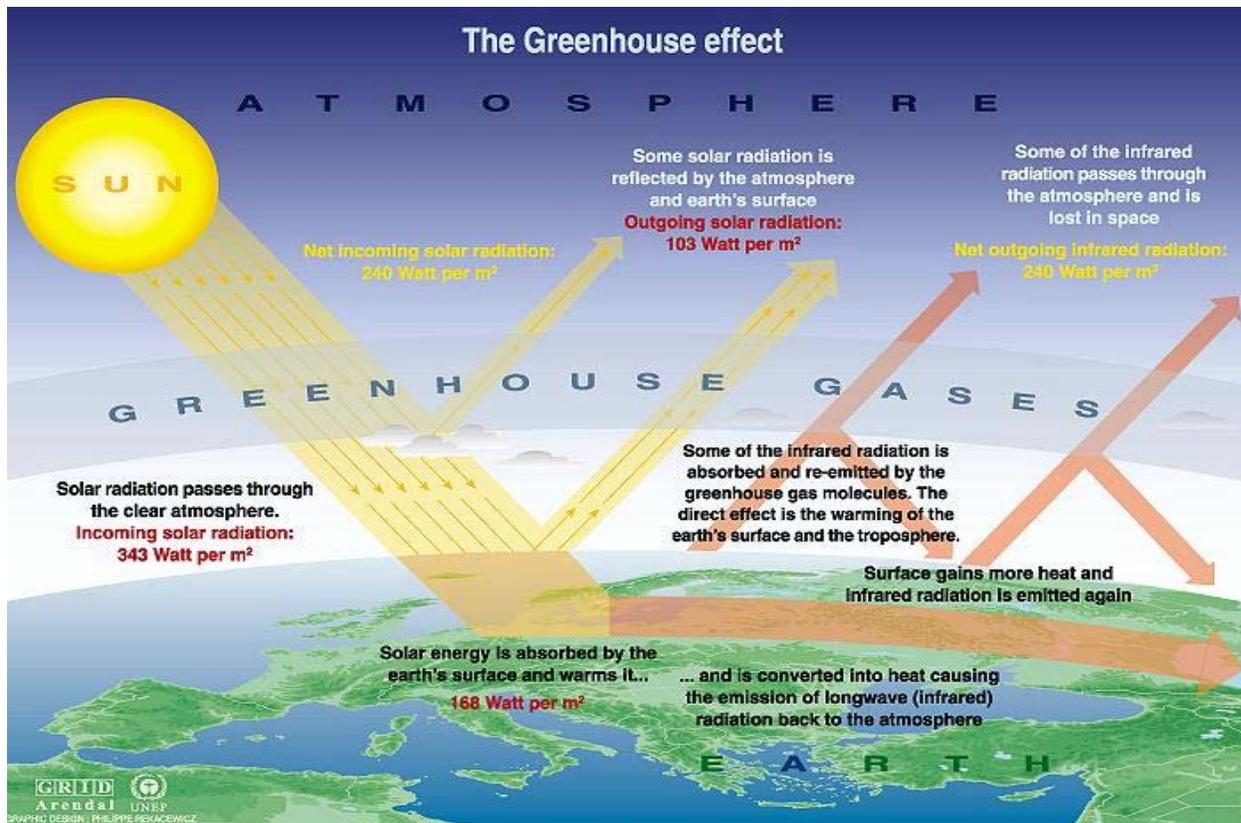
Evidence gathered by the world's leading atmospheric scientists over the past decade has proven that the planet has become approximately 1° F warmer since the late 19th century due primarily to a steady rise in the concentration of greenhouse gases in the atmosphere. The warmest years ever recorded have all occurred in the past ten years. 2001 was the second warmest year and 1998 the warmest. Because the release of greenhouse gases worldwide is rapidly increasing, scientists expect the planet's mean surface temperature to continue to rise unless emissions are dramatically reduced in the near future. The most recent estimates of the Intergovernmental Panel on Climate Change¹ (IPCC) project global mean temperature to rise between 2°F and 12°F by 2100. This temperature increase may not seem significant, but seeing as a 9°F warming was all that was necessary to melt away the last ice age, these apparently small temperature shifts can trigger significant climatic changes.

Also, scientists expect the temperature increase over the United States to be slightly greater than the global mean temperature increase due to the fact that landmasses are more sensitive to temperature changes than bodies of water. In Massachusetts, fall and summer temperatures are expected to be 1.3 times the global-mean warming over the next century, while winter and spring temperatures are expected to be 1.5 times the global-mean warming.

Greenhouse gases, which include water vapor (H₂O), ozone (O₃), carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O), are able to absorb and re-emit infrared radiation. The greenhouse effect (Figure 1) occurs when solar radiation is absorbed by the earth's surface, converted into heat, and subsequently emitted into the atmosphere as infrared radiation. Some of this infrared radiation escapes into outer space; however, some is absorbed and re-emitted back towards the earth's surface by greenhouse gases. These returning waves of infrared radiation warm the troposphere and the earth's surface once again (UNEP).

Without the greenhouse effect the planet's mean temperature would be 60°F cooler and life on Earth as we know it would not be possible. In other words, the greenhouse effect is a naturally occurring phenomenon. Global warming, however, is the result of the 'enhanced' greenhouse effect. Human activities, such as deforestation and the combustion of fossil fuels, have tipped the delicate balance of greenhouse gases in the atmosphere, thereby intensifying the natural greenhouse effect. The concentration of CO₂ in the atmosphere has climbed from 280 parts per million in pre-industrial times to approximately 370 parts per million (Figure 2). The concentration of CH₄ has climbed from 700 parts per billion to over 1,700 parts per billion. And the concentration of N₂O has climbed from 270 parts per billion to over 310 parts per billion.

¹ The Intergovernmental Panel on Climate Change was established by the United Nations Environment Program and the World Meteorological Organization in 1988 to research climate change.



Sources: Okanagan university college in Canada, Department of geography, University of Oxford, school of geography; United States Environmental Protection Agency (EPA), Washington; Climate change
Figure 2 The Greenhouse Effect (IPCC, 1996)

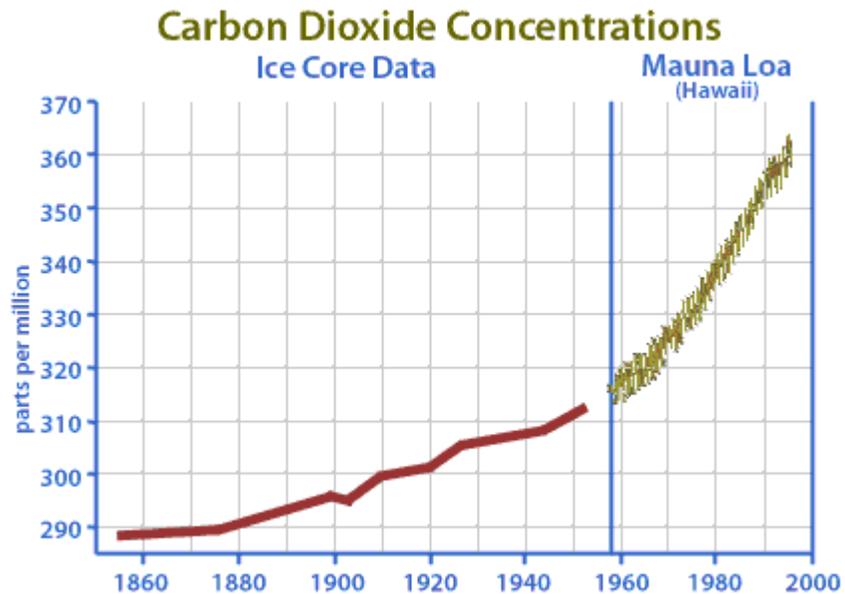


Figure 3 Atmospheric Concentrations of Carbon Dioxide from 1855 to 1996 (White House Initiative on Global Climate Change, 2002)

The Impacts of Climate Change

Although atmospheric scientists have not completely determined the full effects of rising temperatures on the global climate system, current trends and advanced computer models have allowed them to predict how some climate patterns will likely change over the 21st century. A recent publication by the Intergovernmental Panel on Climate Change (IPCC), entitled *Climate Change 2001: Impacts, Adaptation, and Vulnerability*, considers the following projected impacts very likely (i.e., 90-99% chance of occurring): higher maximum temperatures, increased risk of damage to a number of crops, decreased risk of damage to a number of crops, more intense precipitation events, increased flooding in some areas, and increased risk of drought in others. The IPCC also considers it very likely that warmer temperatures at the northern latitudes will push the range of some agricultural pests and disease-carrying vectors northward.

Globally, higher temperatures cause ocean water to expand and glaciers to melt causing sea levels to rise. Glaciers around the world have already begun to melt at startling rates. The mountains of Venezuela, for example, contained six glaciers in 1972. Today only two remain. Sea levels worldwide have risen by an average of 4 to 10 inches since 1900., and scientists expect between a 6 and 47-inch rise in sea level by 2100. The coastal regions of the U.S. that are most vulnerable to higher sea levels are the mid-Atlantic and south Atlantic coasts and the Gulf Coast. Rising sea levels pose a number of serious threats to coastal regions including erosion of beaches, permanent inundation of wetlands and lowlands, increased flooding and storm damage, and salinization of fresh water reserves. The ecological and economic damage is expected to be enormous. More extreme weather events will likely result in billions of dollars worth of damage to coastal property and shipping infrastructure. Warmer ocean temperatures and the flooding of coastal wetlands, which provide habitat for numerous plant and animal species, could ruin coastal and marine ecosystems and cause valuable commercial fisheries to collapse. In 1997 and 1998 local ocean temperatures off the Pacific coast of the United States rose by 6°F, causing populations of Pacific salmon to fall drastically.

Around the world, rising temperatures and changing patterns of precipitation will also impact agriculture, yet the exact nature of these impacts remains unclear. The production of some crops in some regions may increase due to a longer growing season and more frequent precipitation, while the production of other crops in other regions could fall significantly due to more frequent droughts.

We can also expect to see the effects of climate change on a local level. Though global warming is indeed a global issue, we must take action locally if we are to prevent any of the forecasted effects of climate change. In Williamstown, the Berkshires, and New England, global warming is predicted to negatively impact our famous fall foliage, as changing temperature and precipitation patterns affect growing seasons. The New England ski season, reliant on abundant snow and cold temperatures, could also be adversely impacted. The old, beloved sugar maples in Williamstown's own Hopkins Memorial Forest, along with the entire maple sugar industry, will suffer as warmer nights prevent the sap from running; forest records already show a decline in the trees' production.

With so many projected impacts on both a global and local scale, global warming has become an issue that we can no longer afford to ignore.

Williamstown's Story

Williamstown has been a leader in environmental protection since before it was a well-known or politically charged issue. The 1972 Town Report features an article by environmentalist Michael Shay, who describes the town's recycling and composting successes, its implementation of a thorough road salt analysis and experiment, and its concentrated, on-going environmental awareness program. He writes, "1972 can easily be looked upon as the landmark year in the development of Williamstown's environmental effort, when not only did the town become a national symbol for environmental accomplishment, but when the residents demonstrated their concern and pride for the environment in concrete and far-reaching ways."

Williamstown's decision to join the Cities for Climate Protection Campaign in 2001 signaled another such benchmark year for a town with a long history of dedication to environmental protection and awareness. With the action plan presented here, the town has the opportunity to continue this tradition of commitment by following through with the measures proposed here.

Aside from averting climate change and its related problems, Williamstown can reap significant benefits for the entire community by reducing its greenhouse gas emissions. Measures designed to improve energy efficiency will save residents and the municipal government money on electric and heating bills, allowing the Town of Williamstown to divert taxpayers' money toward more worthwhile things, such as schoolbooks and public parks. Reduced demand for electricity from coal-fired power plants will also reduce emissions of criteria air pollutants, such as nitrous oxides, sulfur oxides, and volatile organic compounds, which are regulated under the Clean Air Act due to the hazards they pose to human health.

The actions contained in this plan are also consistent with the measures for environmental sustainability proposed in the Williamstown Master Plan (2002). The Master Plan calls for enhancing the environmental quality of Williamstown and the region by:

- Investigating opportunities for the production or purchasing of renewable energy (solar, water, photovoltaic, wind) through Massachusetts Technology Collaborative;
- Planning for the adoption and regulation of renewable energy production and consumption at municipal, commercial, and domestic levels; and
- Encouraging sustainability by moving toward zero waste, enhancement of water and air quality, with zero or reduced impact as a goal of the community and region.

Resolution to Participate in the Cities for Climate Protection Campaign

WHEREAS, a scientific consensus has developed that carbon dioxide (CO₂) and other greenhouse gases (ghg) released into the atmosphere have a profound effect on the Earth's climate; and

WHEREAS, scientific evidence including the Third Assessment Report from the International Panel on Climate Change (IPCC) and the U.C. Global Change Research Program's (USGCRP) First National Assessment indicate that global warming has begun, with the 1990s being the hottest decade in recorded history; and

WHEREAS, more than 160 countries pledged under the United Nations Framework Convention on Climate Change to reduce their greenhouse gas emissions; and

WHEREAS, in 2001 at the request of the Administration, the National Academy of Sciences (NAS) reviewed and confirmed the concerns of the environment and public health community and declared global warming a real problem impacting key vulnerable populations. The NAS report also confirmed that global warming is caused, at least in part, by the actions of humankind.

WHEREAS, energy consumption, specifically the burning of fossil fuels, accounts for more than 80% of U.S. greenhouse gas emissions; and

WHEREAS, local governments greatly influence the community's energy usage by exercising key powers over land use, transportation, construction, waste management, and energy supply and management; and

WHEREAS, local government actions taken to reduce greenhouse gas emissions and increase energy efficiency provide multiple local benefits by decreasing air pollution, creating jobs, reducing energy expenditures, and saving money for the City government, its businesses and its citizens; and

WHEREAS, the Cities for Climate Protection Campaign, sponsored by the International Council for Local Environmental Initiatives (ICLEI), has invited the Town of Williamstown, MA to become a partner in the Campaign;

NOW THEREFORE, BE IT RESOLVED that the Town of Williamstown, MA pledges to join with jurisdictions from all over the world in the Cities for Climate Protection Campaign and, as a participant in the Cities for Climate Protection Campaign, the Town of Williamstown, MA pledges to:

1. Establish an inventory and forecast for key sources of greenhouse gas emissions in the community.
2. Set an emissions reduction goal.
3. Develop and adopt a local greenhouse gas emissions action plan to achieve those reductions.
4. Implement the local greenhouse action plan.
5. Monitor and report on greenhouse gas emissions and implementation of actions and measures.

By unanimous vote of the Williamstown Board of Selectmen, December 10, 2001.

Reducing Individual and Household Greenhouse Gas Emissions

Many daily household activities are directly related to the emissions of greenhouse gases and, by extension, to the threat of global climate change. Energy use is the source of the vast majority of greenhouse gases that are created by individuals and households, and by decreasing your use of energy — for electricity and heating — you can save money and improve comfort while reducing global warming. In addition savings can be achieved by reducing waste, increasing recycling, and by investing in more efficient transportation.

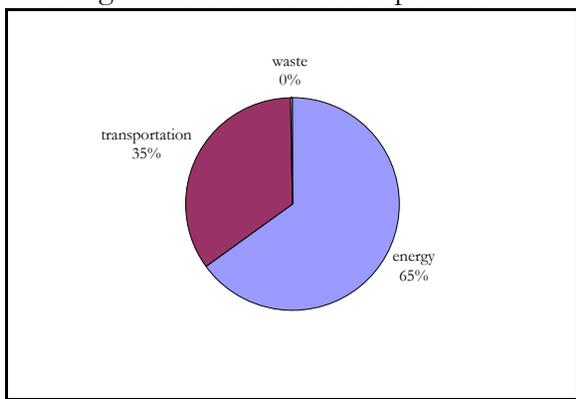


Figure 4 Sources of Residential eCO₂ Emissions

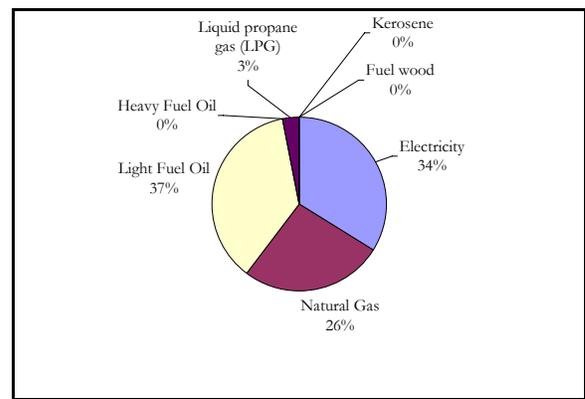


Figure 5 Residential Energy Use

This section provides numerous actions that residents can take to significantly reduce household emissions. Where possible, the estimated eCO₂ reduction has been calculated, along with potential financial savings for a sample household.

To do your part in reducing your household's greenhouse gas emissions, there is a personal CO₂ calculator provided by International Council on Local Environmental Initiatives at www.iclei.org/iclei/co2calc.htm that can help you create a household action plan. The chart below can help you make decisions about the best and easiest ways to save energy at home.

The following pages examine Williamstown residential progress so far, and plot further emissions reduction strategies. Where possible, the estimated eCO₂ reduction has been calculated, along with potential financial savings for the a sample household.

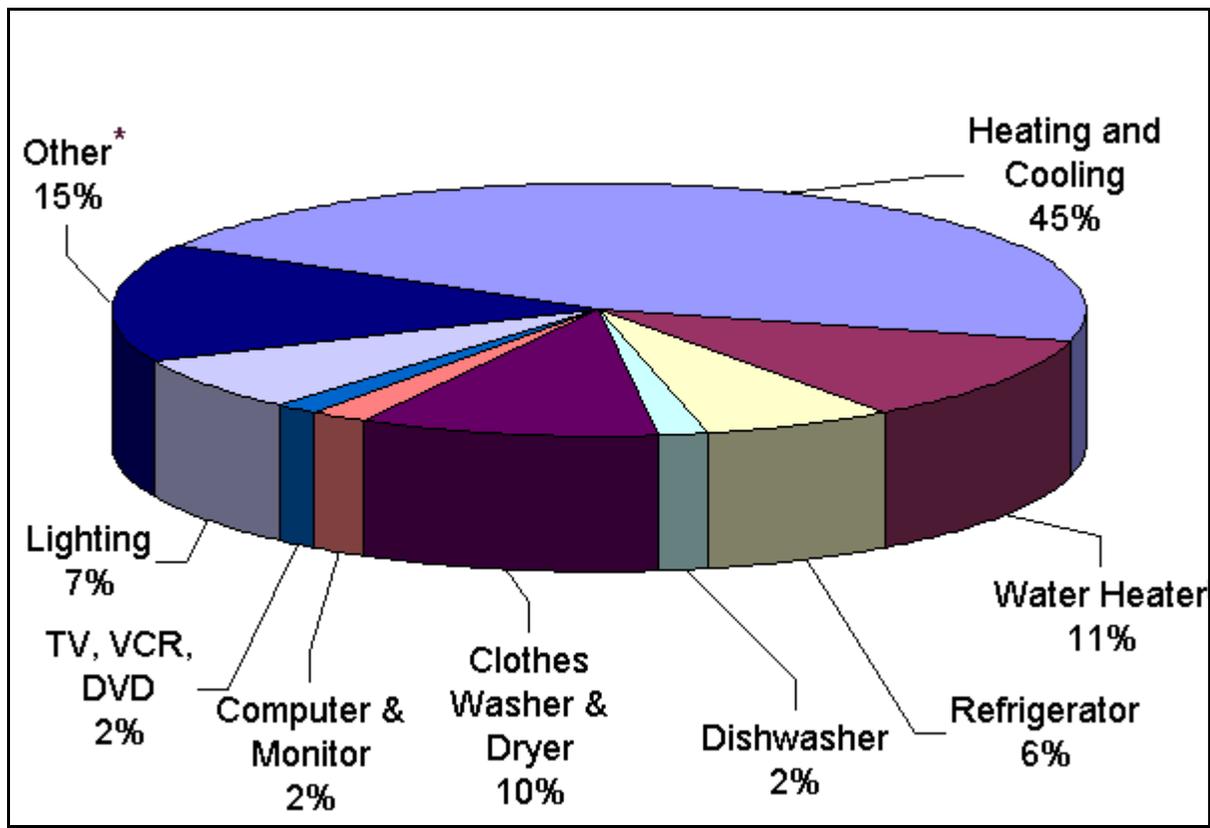


Figure 6 Average Household Energy Use

* "Other" represents an array of household products, including stoves, ovens, microwaves, and small appliances. Individually, these products account for no more than about 2% of a household's energy bills. Chart:

www.energystar.gov



“Pay As You Throw” Solid Waste Disposal Program

Responsible Party	Individual household
eCO ₂ Reduction (Town)	Negligible
Financial Savings (annual)	Unknown

The Pay-As-You-Throw Solid Waste Disposal Program was first implemented in 1991, and currently, an estimated 23% of Williamstown’s residents participate. The program reduces waste and encourages recycling by making residents aware of the cost of waste disposal. Garbage bags and a sticker for access to the transfer station must be purchased, while paper and containers can be recycled at the transfer station for no additional cost. This promotes better recycling habits, reduces the greenhouse gases produced by waste disposal, and reduces the environmental strain of high levels of consumption. Greater participation would help underline Williamstown’s commitment to climate protection.

Currently, garbage bags can be purchased at four locations throughout town: the Treasurer's office in Town Hall, The Spirit Shop on Cole Ave, Wild Oats on Main Street and Stop and Shop in North Adams. Stickers for the transfer station are available at Town Hall; an annual pass is \$65.00 for the first vehicle in a household and \$2.00 for each additional vehicle in the same household, or a 30-day temporary pass is \$6.00. On average, 1575 annual stickers and 360 temporary stickers are sold.

Resources

- Northern Berkshire Solid Waste Management District: (413) 743- 8208; email nbswmd@verizon.net ; 20 East Street, Adams, MA 01220
- Springfield Materials Recycling Facility: www.springfieldmrf.org
- Eric Weiss, Chair of Springfield Materials Recycling Facility Advisory Board: (413) 268-3845
- Recycling Information: 888-888-0784 ext. 2293 or 1-800-CLEAN-UP

Implementation Strategy

Raise awareness of program through newspaper and local cable (Willinet) advertisements.
Sell garbage bags for program in more highly visible locations.
Increase residents’ knowledge of what can be recycled with easy-to-read signs

Potential Partners

Municipality
Schools
Willinet

Monitoring/ Assessment (how to measure success)

- Number of households participating
- Amount of material recycled
- Number of bags sold

Methodology used to calculate savings

Although residential solid waste only accounts for 0.09% of Williamstown's eCO₂ emissions and 0.2% of the residential sector's emissions, producing less waste is one of many behavioral changes that will contribute to an overall town reduction.



Purchase Energy Efficient Products (Lighting)

Responsible Party	Individual Household
eCO ₂ Reduction (for Town)	630 tons (0.6% of 2000 baseline)
Financial Savings per household	Switch to CFLs: eliminate 5% of energy costs* Other savings vary by action, see table below

By purchasing energy efficient lighting products, households will save money and energy while helping Williamstown reach its greenhouse gas emissions target. Compact fluorescent bulbs (CFLs) now provide a viable alternative to regular incandescent bulbs; in comparison to the fluorescent bulbs of 10 years ago, CFLs offer softer lighting capabilities and instantaneous, flicker free lighting. They use 30% of the energy and last 10 times longer than a regular incandescent bulb, while providing an equal amount of light. More efficient fixtures can also be installed to decrease electricity use.

Lighting accounts for 7% of the energy use of a typical household. By switching to all compact fluorescent lighting, you can reduce your household energy costs by 5%. Furthermore, despite the higher initial cost of CFLs, one CFL has the lifespan of 10 incandescents and will save you \$25 in electricity costs over its lifetime. To achieve the proposed reduction for the residential sector, the actions below will have to be taken (calculations are also given).

Resources

- CFL models by size and features: www.energystar.gov/products/cflbulbs.html .
- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp .
- Other options at the Lighting Resource Center: www.lrc.rpi.edu .
- Rebates and exchange programs through Massachusetts Electric: www.nationalgridus.com/masselectric

Implementation Strategy

Targeted campaign to encourage residents to purchase and use compact fluorescents. Make sure CFLs are available for purchase from local hardware, grocery, and lighting supply stores; ask lighting retailers about their participation in the Energy Star program.

Potential Partners

MECO
Local retailers
Schools
CET

Monitoring/Assessment

Methodology used to calculate savings

Incandescent Light Bulb	Compact Fluorescent Light Bulb
1 60W incandescent bulb = \$0.50 (10 bulbs = \$5, to equal life of 1 CFL)	1 CFL = \$7
Electricity cost (10,000 hrs, 10 60W incandescents) = \$36	Electricity cost (10,000 hrs, 1 CFL) = \$9

*Assumes:

- **Financial savings:** $[0.07 \text{ (7\% of household energy costs)}] * [0.7 \text{ (70\% reduction from efficiency improvement)}] = 4.9\%$ average savings on energy bill
Savings per bulb: $(\$36 \text{ electricity} + \$5/\text{ten bulbs incandescent}) - (\$9 \text{ electricity} + \$7/\text{one CFL}) = \$25$ savings over lifetime

Before action: $60W * (4 \text{ hrs/day}) * (30 \text{ days/mo}) * (12 \text{ mos/yr}) * (1 \text{ kWh}/1000W \text{ hrs}) = 86.4 \text{ kWh/yr per bulb}$

After actions (descriptions in table, next page):

- $(86.4 \text{ kWh/yr/bulb}) * 2,753 \text{ bulbs (1 bulb/household)} * [0.7 \text{ (70\% reduction from efficiency improvement)}] = 166,501.4 \text{ kWh/yr saved, eCO}_2 \text{ reduction} = 62 \text{ tons/yr, (62 tons/yr) * 5 yrs} = 310 \text{ tons by 2010}$
- $2753 \text{ households} * [0.04 \text{ (4\% of homes)}] * (185 \text{ lbs/replacement}) * (1 \text{ ton}/2000 \text{ lbs}) = (10.2 \text{ tons/yr}) * 5 \text{ yrs} = 50 \text{ tons by 2010}$
- $2753 \text{ households} * [0.5 \text{ (50\% of homes)}] * (130 \text{ lbs/home}) * (1 \text{ ton}/2000 \text{ lbs}) = (89.5 \text{ tons/over next 5 yrs}) = 89 \text{ tons by 2010}$
 $2753 \text{ households} * [0.25 \text{ (25\% of homes)}] * (525 \text{ lbs/replacement}) * (1 \text{ ton}/2000 \text{ lbs}) = (180.7 \text{ tons/over next 5 yrs}) = 181 \text{ tons by 2010}$
- 6% of total eCO₂ from residential electricity use (310+50+89+181 tons/7928 tons)
- 0.64% of total Williamstown eCO₂ from College electricity use (630 tons/116,117 tons)

SPECIFIC ACTION	HOUSEHOLD SAVINGS	TOWN SAVINGS
Replace incandescent light bulbs with Energy Star screw-in compact fluorescent light bulbs (CFLs).	Replacing three existing incandescent bulbs will result in annual energy savings of \$20 and reduce household emissions of CO ₂ by 280 pounds per year*.	Replace 2,753 incandescent bulbs per year for next 5 years (equal to 1 bulb per household per year). CO ₂ emissions will be reduced by 119 tons per year, for a 595 ton total reduction.
	*Assumes replacing three 60W incandescent bulbs with three 18-watt CFLs (total of 21w, +3 for ballast) with a four-hour burn time. Average marginal emissions rate = 1.481 lbs/kWh.	
Install high efficiency lighting fixtures.	Replacing kitchen incandescent fixtures and bulbs with a high efficiency fixture will result in annual energy savings of \$13 and reduce household emissions of CO ₂ by 185 pounds per year*.	Replace one incandescent bathroom and kitchen fixture with high efficiency fixtures in 20% of Williamstown's households by 2010 (4%/yr over next 5 yrs). CO ₂ emissions will be reduced by 10 tons per year, for a 50 ton total reduction.
	*Assumes replacing two 60W incandescent bulbs with a 32W circline in the kitchen and replacing two 60W incandescent bulbs with two 17W T-8s in the bathroom.	
Install timer controls, motion sensors, or dimmer switches.	Reducing the use of four 60W bulbs by one hour each day will result in annual energy savings of \$10 and reduce household emissions of CO ₂ by 130 pounds per year.	Reduce use of one bulb by one hour each day in 50% of Williamstown's households over next 5 years. CO ₂ emissions will be reduced by 89 tons by 2010.
Purchase CFL torchiere lamp	Replacing a 300W halogen torchiere with a CFL model will result in annual energy savings of \$35 and reduce household emissions of CO ₂ by 525 pounds per year*.	Replace halogen torchiere lamps with CFL models in 25% of Williamstown's households over next 5 years. CO ₂ emissions will be reduced by 181 tons by 2010.
	*Assumes replacement with 58W CFL torchiere lamp and ballast, 4 hour burn time.	



Purchase Energy Efficient Products (Appliances)

Responsible Party	Individual household
eCO ₂ Reduction (Town)	1204 tons (1.04% of 2000 baseline)
Financial Savings per household	Varies by action, see table below

By purchasing energy efficient (Energy Star) appliances, households will save money and energy. Appliances with the Energy Star label are the same as or better than standard products, but they use less energy. Energy Star appliances meet strict energy efficiency criteria set by the US Environmental Protection Agency or the US Department of Energy. Since they use less energy, these products save money on the electricity bill and help protect the environment by causing fewer harmful emissions from power plants, while providing standard features and high quality performance.

For example, Energy Star refrigerators are at least 15% more efficient than the minimum federal efficiency standard. Qualified TVs consume 3 watts or less when switched off, compared to a standard TV, which consumes almost 6 watts on average. Office equipment that qualifies automatically enters a low-power "sleep" mode after a period of inactivity. Qualified furnaces offer a rating of 90% AFUE or greater, which is about 15% more efficient than the minimum federal efficiency standard.

Home appliances, including water heaters, washers and dryers, refrigerators, and dishwashers, account for 23% of an average household's energy use, and significant financial savings can result from increased energy efficiency. Other household products, including stoves, ovens, microwaves, and small appliances account for 15% of a household's energy bills.

Resources

- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp
- Appliances by size and features: www.energystar.gov/index.cfm?fuseaction=find_a_product.
- Borrow an appliance meter the public library

Implementation Strategy

Targeted campaign to encourage residents to purchase Energy Star appliances.

Potential Partners

MECO
Local retailers
Berkshire Gas
CET
Local library

Monitoring/Assessment

Participation in rebate programs
Survey local retailers

Methodology used to calculate savings

eCO₂ reductions after actions (action descriptions in table):

- Water heater: 2753 households*[0.05 (5% of homes)] * (2800 lbs/replacement)*(1 ton/2000 lbs)
= **(193 tons/over next 5 yrs) = 193 tons by 2010**
- Shower heads: 2753 households*[0.10 (10% of homes)]*(1800 lbs/replacement)*(1 ton/2000 lbs)
= **(248 tons/over next 5 years) = 248 tons by 2010**
- Refrigerators: estimate 1500 households with pre-1993 models:
1500 * [0.2 (20% of homes take action)] * (1000 lbs/replacement)*(1 ton/2000 lbs)
= **150 tons by 2010**
- Refrigerators: estimate 1253 households with post-1993 models meeting minimum efficiency:
1253 * [0.05 (5% of homes take action)] * (285 lbs/replacement)*(1 ton/2000 lbs)
= **9 tons by 2010**
- Unplug secondary refrigerators: (50/yr)*(1 ton/fridge)* (5 yrs) = **250 tons by 2010**
- Washers and dryers: 2753 households * [0.25 (25% of homes)] * (570 lbs ave./replacement, depending on energy source)*(1 ton/2000 lbs) = **196 tons by 2010**
- Line dry laundry: 2753 households * [0.25 (25% of homes)] * (5 lbs/load)*(25 loads/yr)* (1 ton/2000 lbs) = **43 tons by 2010**
- Dishwashers: 2753 households * [0.25 (25% of homes)] * (335 lbs ave./replacement, depending what is replaced)*(1 ton/2000 lbs) = **115 tons by 2010**

- 8% of total eCO₂ from residential electricity use
(193+248+150+9+250+196+43+115 tons/7,928 tons) = 0.146
- 1.04% of total Williamstown eCO₂ from College electricity use (1204 tons/116,117 tons)

SPECIFIC ACTION	HOUSEHOLD SAVINGS	TOWN SAVINGS
Purchase a high versus standard efficiency water heater. Select gas water heaters instead of electric.	For a typical family of four, save \$565 in annual energy costs and reduce household CO ₂ emissions by up to 2,800 lbs per year*.	Get 5% of households to replace their old water heaters by 2010. CO ₂ emissions will be reduced by 193 tons by 2010.
	*Assumes selecting natural gas water heater over electric; 19.5 mmbtu annual consumption for hot water. Electric rate of emission = 0.885 lbs CO ₂ /kWh, cost = \$0.10/kWh. Natural gas = 117 lbs CO ₂ /mmbtu, cost = \$0.62/ccf.	
Use less hot water. Install non-aerating low-flow shower heads.	Save up to \$120 in annual energy costs and reduce household CO ₂ emissions by up to 1,800 lbs per year*.	Switch to low-flow shower heads in 10% of households by 2010. CO ₂ emissions will be reduced by 248 tons per year.
	*Assumes natural gas heated water	
Purchase Energy Star refrigerators.	Compared to models made before 1993, new Energy Star models can save \$60 or more in annual energy costs and reduce household CO ₂ emissions by 1,000 lbs per year*. Compared to a model meeting federal minimum efficiency standards, an Energy Star model can save \$19 and reduce emissions by 285 lbs**.	Replace 20% of old models; CO ₂ emissions will be reduced by 150 tons per year. Replace 5% of standard models; CO ₂ emissions will be reduced by 9 tons by 2010.
	*Assumes 1,200 kWh for pre-1993 model, 575 for Energy Star model. **Based on Ammana BH20S5, 575 annual kWh, 768 NAECA consumption.	
Unplug extra refrigerator/freezer.	Save \$100 or more in annual energy costs and reduce household CO ₂ emissions by 1 ton or more per year* (save more by unplugging older models).	Unplug 50 non-primary refrigerators per year. CO ₂ emissions will be reduced by 50 tons per year, 250 tons by 2010.
	*Assumes year-round operation on 2 nd refrigerator; 1,200 kWh consumption.	
Purchase Energy Star clothes washers and dryers.	In houses using electric dryers and water heaters, save \$58 annually, reduce household CO ₂ emissions by 860 lbs per year. In houses using natural gas dryers and water heaters, save \$20 annually, reduce household CO ₂ emissions by 280 lbs per year. Save on water bills with increased efficiency.	Replace existing clothes washers and dryers with Energy Star models in 25% of households. CO ₂ emissions will be reduced by ~196 tons (depending on what is replaced).
Line dry laundry.	Save \$0.35 and cut 5 lbs of CO ₂ emissions per load of laundry.	Line dry 25 loads of laundry (only feasible in summer months) per year in 25% of Williamstown's households. CO ₂ emissions will be reduced by 43 tons per year.
Purchase Energy Star dishwashers.	By replacing an existing dishwasher with an Energy Star model, save \$28 or more in annual energy costs and reduce household CO ₂ emissions by 410 lbs per year*. Compared to a model meeting federal minimum efficiency standards, an Energy Star model can save \$20 and reduce emissions by 260 lbs per year**. Save on water bills with increased efficiency.	Replace existing dishwashers with Energy Star models in 25% of households. CO ₂ emissions will be reduced by 115 tons per year.
	*Assumes existing consumption = 800 kWh/yr, new = 700 kWh/yr. **Energy Star dishwasher is 33% better than latest standards.	



Purchase Energy Efficient Products (Home Electronics)

Responsible Party	Individual household
eCO ₂ Reduction (Town)	37.8 tons (0.33% of 2000 baseline)
Financial Savings per household	Varies by action, see table below

By purchasing Energy Star electronic equipment and using energy efficient features, households will save money and energy. Products with the Energy Star label are the same as or better than standard ones, but they use less energy. They meet strict energy efficiency criteria set by the US Environmental Protection Agency or the US Department of Energy. Since they use less energy, these products save money on the electricity bill and help protect the environment by causing fewer harmful emissions from power plants, while providing standard features and high quality performance.

Home electronics account for 4% of an average household's energy bills. Over its lifetime, Energy Star qualified equipment in a single home office (e.g., computer, monitor, printer, and fax) can save enough electricity to light an entire home for more than two years.

Resources

- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp
- Home electronics by size and features: www.epa.gov/appdstar/home_electronics/index.html

Implementation Strategy

Targeted campaign to encourage residents to purchase Energy Star appliances.

Potential Partners

Local retailers
MECO

Monitoring/Assessment

Survey local retailers

Methodology used to calculate savings

SPECIFIC ACTION	HOUSEHOLD SAVINGS	TOWN SAVINGS
Purchase Energy Star TVs, VCRs, and other home electronics.	By replacing a conventional TV with an energy efficient model will result in annual energy savings up to \$8 and reduce household CO2 emissions by as much as 110 lbs per year*.	Replace existing TVs with energy efficient models in 25% of Williamstown's households by 2010. CO2 emissions will be reduced by 37.8 tons per year.
	*Assumes TV off for 18 hrs/day; conventional TV uses 13W when off, Energy Star TV uses only 1.5W when off.	

- TVs: $2753 \text{ households} * [0.25 \text{ (25\% of homes)}] * (110 \text{ lbs/replacement}) * (1 \text{ ton}/2000 \text{ lbs})$
= **37.8 tons by 2010**

- 0.48% of total eCO₂ from residential electricity use: $(37.8/7,928 \text{ tons}) = .0048$
- 0.33% of total Williamstown eCO₂ from College electricity use $(37.8 \text{ tons}/116,117 \text{ tons})$



Install Energy Efficient Products (Heating and Cooling)

Responsible Party	Individual household
eCO ₂ Reduction (Town)	Highly variable, will depend on how green building is encouraged- with information on installations, reductions can be calculated with table below
Financial Savings per household	Varies with action, see table below

By insulating your home and installing energy efficient heating and cooling systems, you can save money on your household energy bill, increase comfort, and reduce the greenhouse gas emissions that are produced as we struggle to keep our homes warm in the New England winter and cool in the summer.

The specific measures described here all have the potential to create significant savings, especially as space heating often produces the most greenhouse gases because it requires a lot of energy. However, actual savings will vary over the type of building in which they are implemented. Additionally, if multiple actions are taken, savings will be created but this value cannot be calculated here because the effect may not be completely additive.

Resources

- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp
- Information on furnaces, insulation, thermostats, windows, air conditioners: www.energystar.gov
- Berkshire Gas and Massachusetts Electric will give you up to \$1000 or more to help make your home more energy efficient: call 1-800-944-3212 for information on home performance with Energy Star
- Berkshire Gas offers a number of Energy Efficiency services, call the Center for Ecological Technology (CET) at 445-4556 (local) or 1-800-238-1221 (toll-free)

Implementation Strategy

Targeted campaign to encourage residents to participate in home energy audit and install recommended measures.

Potential Partners

MECO
Heating contractors
Berkshire Gas
CET

Monitoring/Assessment

Participation in home energy audits and rebate/incentive programs

Methodology used to calculate savings

SPECIFIC ACTION	
Install Energy Star heating equipment during new construction.	An Energy Star gas furnace will result in annual energy savings of \$85 and reduce household CO ₂ emissions by 1,400 lbs per year*.
	*Assumes natural gas, annual CO ₂ emissions of 9465 lbs and energy costs of \$566. Energy Star equipment can save up to 15% in energy bills.
Properly insulate and define building shell, minimize air leakage (esp. at top and bottom of heated envelope).	Savings and costs are site specific. Properly insulating the ceiling in a natural gas-heated home typically will result in annual energy savings of \$50 to \$100 and reduce household CO ₂ emissions by up to 1,900 lbs per year*.
	*Assumes natural gas, annual CO ₂ emissions of 9465 lbs and energy costs of \$566. Energy Star equipment can save up to 15% in energy bills.
Select low carbon content heating fuel such as natural gas.	Installing a natural gas furnace instead of an oil-fired furnace during new construction will reduce household CO ₂ emissions by up to 4,600 lbs per year*.
	*Assumes 80.9 mmbtu consumption for annual space heating. Oil emissions = 173.9 lbs CO ₂ /mmbtu, natural gas emissions = 117 lbs CO ₂ /mmbtu.
Install programmable thermostat to set back temperatures at night.	A programmable thermostat will save up to \$60 in annual energy costs and reduce household CO ₂ emissions by up to 1,170 lbs per year*.
	*Assumes annual conservation of 10 mmbtu and cost of \$0.62/ccf.
Install Energy Star windows.	Installing Energy Star windows can result in annual energy savings of up to \$80 and reduce household CO ₂ emissions by as much as 1,400 lbs per year*.
	*Savings are site-specific.
Install Energy Star window air conditioning units if necessary.	An Energy Star AC unit can result in annual energy savings of up to \$50 and reduce household CO ₂ emissions by 330 lbs per year.
	*Assumes annual consumption for New England home = 738 kWh, Energy Star unit saves 30%. 1.481 lbs CO ₂ /kWh.



Purchase Green Power

Responsible Party	Individual households
eCO ₂ Reduction	791 tons (0.68% of 2000 baseline) Green electricity also reduces acid-rain-causing sulfur dioxide emissions, toxic mercury emissions, smog-causing nitrogen oxide emissions, and particulate matter emissions that cause haze and damage lungs.
Financial Savings per household	Cost is 1.9¢ more per kWh

By purchasing green power, households support existing and new renewable energy sources such as wind and solar power, low-impact hydroelectric generation, and biomass. This sends a message to suppliers that citizens want locally harvested, less polluting energy sources.

Through the Green Start New England program offered by the Massachusetts Electric Company, individual households can support new renewable energy sources, keep energy related dollars in local communities, and help create local jobs. It costs just \$0.019 more per kilowatt hour (kWh) — just a few pennies a day — which adds up to a premium of approximately \$6 to \$12 per month on a household’s monthly electric bill.

Each kilowatt hour of regular electricity you use emits 1.5 pounds of eCO₂ to the atmosphere. By switching to green electricity, you can prevent the emission of 1.5 pounds of eCO₂ with each kilowatt hour you use.

Resources

- www.GreenerWattsNewEngland.com: match 100% of your electric usage with 100% Green Energy certified renewable resources from New England
- CET can provide more information on GreenerWatts New England: 1-800-238-1221
- Massachusetts Electric GreenUp Program:
http://www.nationalgridus.com/masselectric/home/energychoice/3_renewable.asp

Implementation Strategy

Include as part of energy efficiency and renewable energy campaign.

Potential Partners

MECO
CET

Monitoring/Assessment

Monitor participation through MECO and CET.

Methodology used to calculate savings

- In 2000, the 2753 households in Williamstown used 21,361,929 kWh of electricity, for an average of 7760 kWh per home per year.
- Action: 10% of households switch to green electricity through their supplier
- $2753 * [0.1(10\% \text{ of homes})] * (7760 \text{ kWh/household}) = \mathbf{791 \text{ ton eCO}_2 \text{ reduction}}$
- 9.9% (791/7,928) reduction of the emissions produced by residential electricity use in 2000
- 0.68% (791/116117) reduction of Williamstown's total greenhouse gas emissions in 2000

Coal and gas power plants emit:

67% of nation's sulfur dioxide, which causes acid rain

36% of nations' carbon dioxide, which causes climate change

33% of mercury, which causes toxic contamination

28% of nitrogen oxides, which create smog

Particulate matter, which causes haze and damages lungs

The electricity supply in Massachusetts comes from: 28% coal burning power plants, 27% gas burning power plants, 20% oil burning power plants, 14% nuclear power plants, 6% large hydro, and 4% biomass.

Purchase Fuel Efficient Vehicles

Responsible Party	Individual
eCO ₂ Reduction (Town)	1,472 tons (1.3% of 2000 baseline)*
Financial Savings (annual)	Go twice as far on a tank of gas in a hybrid and save half of your yearly gasoline or diesel costs

By purchasing a vehicle that gets over thirty miles per gallon, individuals will save money, reduce our dependence on fossil fuels, and reduce air pollution. It is important to demonstrate that fuel-efficient vehicles are just as easy to maintain as regular gasoline or diesel cars and to explain that the money you save in gasoline quickly makes up any difference on the sticker price.

If you drive 12,000 miles per year in a hybrid, you can prevent the emission of approximately 3.3 TONS of eCO₂ to the atmosphere compared to the emissions that are produced by a regular car. Furthermore, a hybrid pays for itself over time in gas savings, since it gets twice as many miles to the gallon. For example, a standard Ford Camry standard has a manufacturer's suggested retail price of \$18,560, while the Prius hybrid is listed at \$20,810, but the Prius averages 55 miles per gallon, while the Camry only goes 27. Besides being much more environmentally friendly than standard gasoline cars, hybrid vehicles make good financial sense. In 2004, the federal government is also offering a \$1500 tax deduction that makes it even easier to invest in climate protection.

Resources

- Federal Tax Deduction: www.irs.gov/newsroom/article/0,,id=104549,00.html
- Frequently Asked Questions about Hybrid Electric Vehicles: www.ott.doe.gov/hev/faqs_text.html

Implementation Strategy

Showcase energy efficient vehicles at community events.

Potential Partners

Local car dealers
Northeast Sustainable Energy Association (NESEA)

Monitoring/Assessment

Monitor purchases of hybrid vehicles through town and dealers

Methodology used to calculate savings

- 6,574 registered town vehicles (not including 750 student and 48 local government vehicles)
- Estimate that each household has 1.9 cars on average: $2753 \text{ households} \times 1.9 \text{ cars/hh} =$
5231 residential vehicles (80% of VMT)
1343 commercial vehicles (20% of VMT) (6,574 total - 5,231 residential)
- In 2000, the 5231 residential vehicles consumed 2,041,442 gallons of gasoline and 164,435 gallons of diesel, emitting 23,696 tons of eCO₂.
- In 2000, the 1343 commercial vehicles consumed 510,361 gallons of gasoline and 41,109 gallons of diesel, emitting 5,924 tons of eCO₂.
- Inventory estimates of breakdown of town vehicles:
 - 85.5% are gas-burning cars, 18 mpg
 - 8% are gas-burning light trucks, 14 mpg
 - 3% are diesel cars, 20 mpg
 - 3% are diesel light trucks, 15.6 mpg
 - 0.5% are diesel buses, 4 mpg
- Estimate that the 5,231 residential vehicles are composed of 4491 gas cars (85.8%), 420 gas light trucks (8%), 160 diesel cars (3%), and 160 diesel autos (3%).
- Estimate that the 1,343 commercial vehicles are composed of 26 diesel buses, 200 gas light trucks and 200 diesel light trucks (15% each, because the proportion is probably higher in the commercial sector), 805 gas cars (60%) and 8% diesel cars.

*If 10% of the residential gasoline-burning cars were replaced by hybrid cars getting 40 mpg, Williamstown could reduce eCO₂ emissions by approximately 2900 tons, or 12% of the total eCO₂ produced by residential transportation, 9.3% of the total eCO₂ by all transportation, and 2% of the town's total emissions.

$2,041,442 \text{ gallons used in 2000} \times 0.1(10\%) = 204,144.2 \text{ gallons of gasoline affected by action}$

After action: total gallons gasoline used = $2,041,442 - 204,144.2 + (204,144.2/2) = 1,939,370 \text{ gal.}$

- $1,939,370 \text{ gal} \times 0.0116 \text{ tons eCO}_2/\text{gal} = 22,496.69 \text{ tons eCO}_2 \text{ emitted after action}$
 $23,969 \text{ tons in 2000} - 22,497 \text{ tons after action} = \mathbf{1472 \text{ ton reduction by 2010}}$

Support Regional Bike Path

Responsible Party	Individual
eCO ₂ Savings (Town)	Unknown

By supporting the expansion of the regional bike path to Williamstown, residents will encourage the use of alternate transportation that will reduce dependence on fossil fuels and reduce pollution. The construction of a regional bike path will provide benefits to residents in the form of recreation, community building and regional cooperation and interaction.

Much research has already been done on the subject, and the resources cited below provide detailed studies of possible projects. Environmental Planning (ENVI 302) students created a feasibility study for a recreational path between Williamstown, MA and North Pownal VT. They write, “considerations while performing the study were to pave the way for a further extension of the trail, that it connect specific places and that it serve a definite purpose.” Another study examined the Williamstown Draft Master Plan's recommendation "to accept town ownership of Route 43 and work to create a pedestrian and bicycle trail along it” and encouraged timely implementation of this objective, as the community does not currently fully benefit from the natural resource of the Green River.

Resources

- “A Vision for an Interstate Recreational Path: Williamstown, MA to Pownal, VT”. www.williams.edu/CES/studentpapers/recpath.pdf
- “Green River Recreational Trail” www.williams.edu/CES/studentpapers/bike.pdf
- Berkshire Bike Path Council: www.berkshirebikepath.org

Implementation Strategy

Work with Berkshire Bike Path Council in design, education and implementation phases.

Potential Partners

Berkshire Bike Path Council
Local boards and committees
Schools
Williams College

Monitoring/Assessment

Construction and use of bike path



Install Renewable Energy Systems

Responsible Party	Individual households
eCO ₂ Reduction	Unknown

By installing renewable energy systems, households will save money on their energy bill and use less energy. For example, a solar water heating system can save 40 to 60% of the electricity used by an average family for water heating .

Resources

- CET
- NESEA

Implementation Strategy

Co-sponsor workshop on renewable energy for the home.

Potential Partners

CET

Renewable energy companies and installers

Monitoring / Assessment

Attendance at workshops

Number of building permits issued for renewable energy systems

Survey renewable energy installers Methodology used to calculate savings

CO₂

Financial



Borrow Phantom Load Detector from Library

Responsible Party	Individual household
eCO ₂ Reduction (Town)	Unknown
Financial Savings (annual)	By finding out which appliances use the most electricity even when off, changes can be made and savings achieved

Many household appliances have a “phantom load”, which means they use energy even when not in operating mode. For example, a conventional television uses 6 watts when turned off. By using a phantom load detector, residents can determine the amount of energy their appliances use and make more educated decisions about unplugging them or replacing them with Energy Star equipment.

Resources

CET
NESEA

Implementation Strategy

Place phantom load detector in library for lending, inform public through library newsletter.

Potential Partners

Library
CET

Monitoring/Assessment

Monitor use of detector



Participate in Composting Program

Responsible Party	Individual household
eCO ₂ Reduction (Town)	Negligible
Financial Savings (annual)	Unknown

Organic material makes up about 30% of our waste. By composting food and yard waste, residents save money, reduce the strain on landfills, and create a natural soil fertilizer for gardening.

Resources

- Information about composting: www.cetonline.org/Publications/new-compost.pdf

Implementation Strategy

Arrange for composting workshop with CET and coordinate efforts with municipality and Northern Berkshire Solid Waste Management District to make composting bins available to residents at a reduced cost. Promote composting of yard waste at Transfer Station.

Potential Partners

CET
Local government
Northern Berkshire Solid Waste Management District
Williamstown Transfer Station

Monitoring/Assessment

Number of people attending workshops
Number of bins sold
Follow-up survey (pre- and post- workshop?)

Methodology used to calculate savings

CO₂

Financial

Reducing Municipal Greenhouse Gas Emissions

By joining the Cities for Climate Protection Campaign, Williamstown made a commitment to reducing its greenhouse gas emissions as part of an effort to stem global warming. Now, the Town has an opportunity to take a leadership role in acting on this commitment and become a model of sustainable development for the wider community.

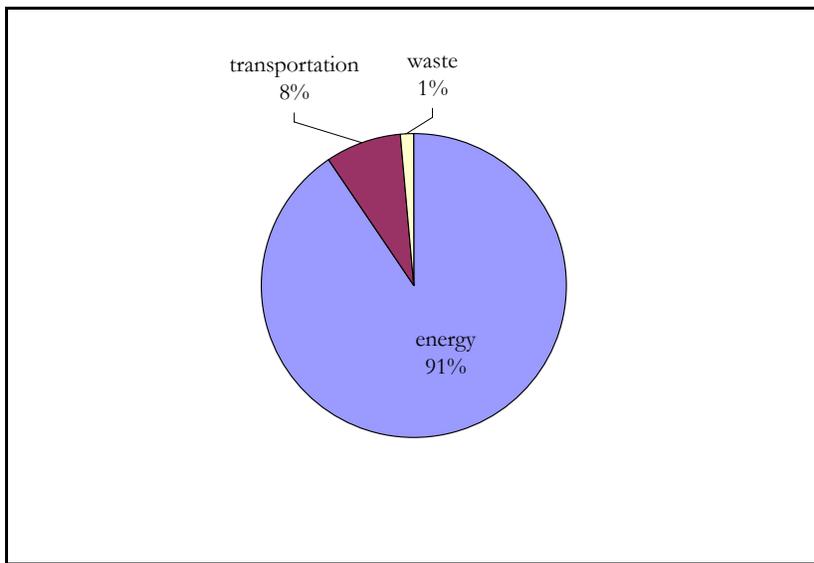


Figure 7 Sources of Local Government eCO₂ Emissions

Though local government activities and buildings were the source of only 4.3% of all of Williamstown's emissions in 2000, municipal action sets a good example for everyone. Energy use, for electricity, heating, and transportation, is far and away the largest contributor to municipal greenhouse gas emissions. Electricity use alone accounted for approximately half of the greenhouse gases emitted by local government in 2000. Data from the 2000 Williamstown Greenhouse Gas Emissions Inventory, as summarized in the chart above, can help focus efforts where the most progress and reductions can be made. In addition to reducing their own emissions, the local government plays an important role in encouraging reduction in the residential and commercial sectors through policies, regulations, and permits.

The following pages examine the Town's progress so far, and plot further emissions reduction strategies. Where possible, the estimated eCO₂ reduction has been calculated, along with potential financial savings for the Town. Local ordinance ideas:

<http://www.massclimateaction.org/MCANdocspdf/LocalOrdinanceIdeas.pdf>



Photovoltaic System on Williamstown Elementary School

Responsible Party	Elementary School
eCO ₂ Reduction	22 tons (0.02% 2000 baseline)
Financial Savings (annual)	\$3000

A 24 kilowatt photovoltaic system was installed at the Williamstown Elementary School in October 2003. It is estimated to generate 30,000 kWh per year, which will result in the elimination of approximately 45,000 pounds of eCO₂ emissions. It is also estimated to save the school approximately \$3000 per year in electricity costs (“North County turns its attention to solar power”, North Adams Transcript. See article, next page).

The new Williamstown Elementary School opened in 2002, and since then has received funding from the Massachusetts Renewable Energy Trust “Green Schools” program, which allowed the school to explore and implement many green building features. The array of photovoltaic panels on the school roof produce approximately 9% of the school’s electricity needs, resulting in a significant financial savings. Furthermore, the school was constructed with large south-facing roofs to allow for future expansion of the photovoltaic system. Since the panels are modular, a commitment should be made to continue investment in solar power in order to fulfill the energy generating potential of the site.

Other Green Features of WES

Additionally, the new school has a smaller square footage than the old school, being 88,000 square feet as compared to 104,000 square feet. The old school had practically no designed insulation envelope, and the new school exceeds insulation code requirements. An energy intensive ventilation system and an extensive air conditioning system increase the energy demands of the school, but it was found that emissions from the new WES appear to have decreased by ~47 tons of eCO₂ compared to the average of the old WES during the previous two years (“Towards a Williamstown Reduction Target” report, 2003). This is a 0.03% reduction of total Williamstown emissions in 2000.

The new school uses more electricity and more natural gas but less heating oil than the old school, and overall creates less eCO₂ emissions.

Methodology used to calculate savings

- WES electricity use in 2000: 323,560 kWh
- Electricity generated by PV panels: 30,000 kWh = 9.27% of electricity needs
- WES spent \$33,326 on electricity in 2000; a 9% savings = approx. \$3000.



Energy Efficient Computers

Responsible Party	Town
eCO ₂ Reduction (Town)	Unknown
Financial Savings (annual)	Unknown, but energy savings can be considerable

In 2004, the majority of the computers at the Town Hall were replaced with Energy Star equipment. Energy Star qualified monitors, in sleep mode, use 90% less electricity than monitors without power management features by entering two successive low-power modes of less than or equal to 15 watts and eight watts after a period of inactivity. New chip technologies have made power management features more reliable, dependable, and user-friendly than even just a few years ago. Spending a large portion of time in low-power mode not only saves energy, but helps monitor equipment run cooler and last longer.

The Town may also realize additional savings on air conditioning and maintenance from the purchase of these computers.



Wood-burning at Department of Public Works Facility

Responsible Party	DPW
eCO ₂ Reduction	Unknown
Financial Savings (annual)	Unknown, but reduces waste disposal costs

Since the new Department of Public Works facility was constructed in 1998, sources of heat for the building have been largely wood from downed trees and used motor oil. While the facility does have a #2 fuel oil system, it is used only about 10% of the time. The majority of the time the building is heated by the wood (70%) and used motor oil (20%). This practice saves the town money and reduces dependence on fossil fuels.

The Department of Public Works has wood heat, and the wood furnace typically operates from December through March. In 2000, the DPW burned 79 cords of wood, emitting 12 tons of eCO₂.



Increase Recycling and Reduce Waste Through Promotion of Pay-As-You-Throw Solid Waste Disposal Program

Responsible Party	Individual departments
eCO ₂ Reduction (Town)	Negligible
Financial Savings	Unknown

Municipal buildings currently recycle paper but not containers. The existing program could be expanded to include plastic and glass containers.

Resources

- Northern Berkshire Solid Waste Management District: (413) 743- 8208; email nbswmd@verizon.net ; 20 East Street, Adams, MA 01220

Implementation Strategy

Expand municipal recycling to include plastic, glass, and metal.

Potential Partners

CCP Committee

Monitoring/Assessment

Monitor yearly recycling rates and waste rates and cost savings for Town.



Purchase Energy Efficient Products (Lighting)

Responsible Party	Parks and Cemetery Dept.
eCO ₂ Reduction	Unknown
Financial Savings (annual)	Many lights are already fluorescent and produce savings

By purchasing energy efficient lighting products, the local government will save money and energy while helping Williamstown reach its greenhouse gas emissions target. Compact fluorescent bulbs (CFLs) now provide a viable alternative to regular incandescent bulbs; in comparison to the fluorescent bulbs of 10 years ago, CFLs offer softer lighting capabilities and instantaneous, flicker free lighting. They use 75% less energy and last 10 times longer than a regular incandescent bulb, while providing an equal amount of light. More efficient fixtures can also be installed to decrease electricity use.

Resources

- CFL models by size and features: www.energystar.gov/products/cflbulbs.html .
- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp .
- Other options at the Lighting Resource Center: www.lrc.rpi.edu .
- Rebates and exchange programs through Massachusetts Electric: www.nationalgridus.com/masselectric

Implementation Strategy

Perform lighting assessment and install energy efficient lighting and controls (such as occupancy sensors) where possible.

Potential Partners

Town Manager
Appropriate departments
MECO

Monitoring/Assessment

Green report card

Methodology used to calculate savings

- **Financial savings per bulb:** (\$36 electricity + \$5/ten bulbs incandescent) – (\$9 electricity + \$7/one CFL) = \$25 savings over lifetime

Before action: $60W \times (4 \text{ hrs/day}) \times (30 \text{ days/mo}) \times (12 \text{ mos/yr}) \times (1 \text{ kWh}/1000W \text{ hrs}) = 86.4 \text{ kWh/yr per bulb}$

After actions (descriptions in table):

- $(86.4 \text{ kWh/yr/bulb}) \times (\text{█} \text{ bulbs/yr}) \times (5 \text{ yrs}) \times [0.7 \text{ (70\% reduction from efficiency improvement)}] = 166,501.4 \text{ kWh/yr saved, eCO}_2 \text{ reduction} = \text{█} \text{ tons by 2010}$
- $2753 \text{ households} \times [0.04 \text{ (4\% of homes)}] \times (185 \text{ lbs/replacement}) \times (1 \text{ ton}/2000 \text{ lbs}) = \mathbf{(10.2 \text{ tons/yr}) \times 5 \text{ yrs} = 50 \text{ tons by 2010}}$
- $2753 \text{ households} \times [0.5 \text{ (50\% of homes)}] \times (130 \text{ lbs/home}) \times (1 \text{ ton}/2000 \text{ lbs}) = \mathbf{(89.5 \text{ tons/over next 5 yrs}) = 89 \text{ tons by 2010}}$
- $2753 \text{ households} \times [0.25 \text{ (25\% of homes)}] \times (525 \text{ lbs/replacement}) \times (1 \text{ ton}/2000 \text{ lbs}) = \mathbf{(180.7 \text{ tons/over next 5 yrs}) = 181 \text{ tons by 2010}}$
- 6% of total eCO₂ from residential electricity use (310+50+89+181 tons/7,928 tons)
- 0.64% of total Williamstown eCO₂ from College electricity use (630 tons/116,117 tons)

SPECIFIC ACTION	SAVINGS PER ACTION	TOWN SAVINGS
Replace incandescent light bulbs with Energy Star screw-in compact fluorescent light bulbs (CFLs).	Replacing three existing incandescent bulbs will result in annual energy savings of \$20 and reduce household emissions of CO ₂ by 280 pounds per year*.	Replace █ incandescent bulbs per year for next 5 years. CO ₂ emissions will be reduced by █ tons per year.
	*Assumes replacing three 60W incandescent bulbs with three 18-watt CFLs (total of 21w, +3 for ballast) with a four-hour burn time. Average marginal emissions rate = 1.481 lbs/kWh.	
Install timer controls, motion sensors, or dimmer switches.	Reducing the use of four 60W bulbs by one hour each day will result in annual energy savings of \$10 and reduce emissions of CO ₂ by 130 pounds per year.	Reduce use of one bulb by one hour each day in █ of Williamstown's households. CO ₂ emissions will be reduced by █ tons per year.



Purchase Energy-Efficient Products (Office Equipment and Appliances)

Responsible Party	Individual departments
eCO ₂ Reduction	Unknown
Financial Savings	See table for benefits

By purchasing Energy Star office equipment and appliances, Williamstown's will save money and energy while maintaining high performance. Savings are realized through the use of a "sleep" mode that uses significantly less electricity during periods of inactivity. Office equipment with the Energy Star label includes computers, LED monitors, printers, copiers, and faxes. Actual savings will vary depending on how much energy an old model wastes compared to Energy Star models, but this step is crucial to demonstrating the commitment of the municipal sector to reducing Williamstown's greenhouse gas emissions.

As seen below, there are many resources that can help the local government learn about and purchase EPPs (Environmentally Preferable Products), which are products or services that have a lesser or reduced effect on human health and the environment than competing products or services.

Resources

- Sample energy policy from ICLEI (see next page)
- Energy Star purchasing and procurement for local governments: www.energystar.gov/purchasing, Steve Jurovics, (919) 403-5104, sjurovics@cadmusgroup.com
- EPPNET Listserve: www.nerc.org/eppnet.html
- Toolbox of Environmentally Preferable Products: www.epa.gov/opptintr/epp/
- Massachusetts EPP Website: www.mass.gov/osd/enviro.htm
- King County, WA EPP Website: www.metrokc.gov/procure/green/index.htm
- Mass 9th EPP Vendor Fair/Conference: October 26, 2004, Worcester, MA

Implementation Strategy

Implement purchasing policy for Energy Star equipment and environmentally preferable office products; use state contract when applicable.

Potential Partners

Town manager
Energy Star personnel
Appropriate town departments

Monitoring/Assessment

-Green report card

Methodology used to calculate savings

SPECIFIC ACTION	BENEFITS
Insulate water heaters and hot water distribution pipes	Water heater insulation jackets reduce energy consumption from electric water heating.
Reduce hot water temperatures	Turning down tank temperatures to 120° will minimize tank stand-by losses.
Wastewater recirculation or reprocessing	Grey water may be used for various non-potable purposes or, in some applications, provide cost-effective pre-heating of make-up water ofr water heaters. Heat in drain water where many showers are taken (e.g., a health club) can be largely recovered through use of the GFX retrofit at modest cost.
Require Energy Star labeled appliances such as refrigerators and A/Cs	Energy Star refrigerators, for example, use less than half of the energy used by a typical 12 year old model and it may be cost effective to retire old appliances early.
Purchase Energy Star labeled office equipment	This will ensure optimal efficiency of new purchases, reducing energy costs and emissions.
Turn off un-needed copiers and printers during non-business hours or put equipment in “sleep” mode	During periods of prolonged inactivity, much energy can be saved by using the “sleep” mode on this equipment.
Control “instant-on” electronic equipment with a power strip and its toggle switch	“Instant-on” really means that the equipment is only in a “slepe” mode even when off, and results in phantom energy use that adds up to significant energy waste and extra greenhouse gas emissions.
Site heat-producing appliances away from refrigeration equipment	Save energy used to operate refrigeration equipment
Install an “outdoor air economizer” for walk-in coolers	When outdoor air is lower than pre-set temperature, use of cool outdoor air is allowed instead of using compressor (and additional energy)
Use insulated doors instead of “anti-sweat” (electronic resistance heat) heaters on display cooler doors	Minimizes condensation around door frames while cutting operating costs and greenhouse gas emissions.

Sample Resolution to Purchase Energy Efficient Products, Appliances and Equipment

Resolution to Modify Williamstown's Purchasing Policies to Purchase Energy Efficient Products, Appliances and Equipment

WHEREAS, state and local governments spend over \$25 billion annually purchasing energy-using products and over \$10 billion annually on energy bills to power those products; and

WHEREAS, the fossil fuels burned to produce the electricity used by these products are responsible for a significant percentage of US greenhouse gas emissions and the emissions that cause air pollution; and

WHEREAS, energy using products are responsible for [REDACTED] of the greenhouse gas emissions from Williamstown's municipal operations, reducing the energy use from these products by implementing energy efficiency procurement policies can be a key action in Williamstown's local climate protection action plan;

WHEREAS, new designs and technologies have produced products, such as light fixtures, copiers, computers and other office equipment, windows, appliances, exit signs, motors and building heating and cooling equipment that meet the Department of Energy and Environmental Protection Agency Energy Star labeling criteria because they cut energy use without compromising quality or performance; and

WHEREAS, purchasing and utilizing currently available energy-efficient products can reduce energy use by 25 to 75 percent, lowering energy bills and saving money for the Town and its citizens; and

WHEREAS, minimal modifications to existing purchasing policies and bid specs can ensure that Williamstown buys durable, low maintenance, energy efficient equipment and products while at the same time lowering Williamstown's utility bills, energy use and greenhouse gas emissions;

THEREFORE, BE IT RESOLVED, that to save energy, money, and reduce greenhouse gas emissions, the Williamstown Board of Selectmen directs staff of the local government to revise purchasing and procurement specifications to assure that, when cost effective and consistent with operational needs, all products purchased that impact energy use will be energy efficient, defined as meeting either Energy Star specifications or criteria that puts products in the upper 25% of energy efficiency, as well as meeting quality, performance and durability requirements.

BE IT FINALLY RESOLVED, that the Town of Williamstown requests assistance from the International Council for Local Environmental Initiatives (ICLEI) as it implements this policy.



Purchase Energy Efficient Products (Heating and Cooling)

Responsible Party	Department of Public Works
eCO ₂ Reduction (Town)	Highly variable, with information on installations, reductions can be calculated with table below
Financial Savings (annual)	Varies with action

Bring all Town HVAC systems up to a minimum operating efficiency level and implement maintenance systems. This will involve training and education of Town employees.

Resources

- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp
- Information on furnaces, insulation, thermostats, windows, air conditioners: www.energystar.gov
- Berkshire Gas offers a number of Energy Efficiency services, call the Center for Ecological Technology (CET) at 445-4556 (local) or 1-800-238-1221 (toll-free)

Implementation Strategy

Perform energy assessment to identify system inefficiencies and opportunities to increase efficiency. Install Energy Star equipment at time of replacement.

Potential Partners

Town Manager
Appropriate departments
MECO

Monitoring/Assessment

Green report card

Methodology used to calculate savings

SPECIFIC ACTION	BENEFITS
Upgrade or install insulation; reduce or eliminate excessive air infiltration; clearly and properly define the heated envelope	Greater comfort, increased building material longevity, and decreased roof ice-damming accompany reduced energy consumption and business greenhouse gas emissions.
Install energy efficient windows, window films, or other window treatments	High efficiency windows are cost-effective while increasing comfort levels and reducing energy consumption and business greenhouse gas emissions.
Perform manufacturer recommended maintenance and performance testing on existing heating and cooling systems	Optimize operating efficiencies and comfort levels, minimize emission rates and operating costs.
Switch to lower carbon content fuels for primary space heating	All of the energy sources required for space heating and cooling systems should be considered in cost-efficiency analyses, as other fuels and technologies can result in lower overall energy costs and emissions even though heat pumps use energy very efficiently.
Improve ventilation system efficiency, install heat recovery ventilators (HRV)	Ensure optimal ventilation with minimal emissions and energy costs instead of uncomfortable over- and under- ventilating a business space.
Install automatic setback thermostats or other energy system management controls	With fixed occupancy hours, automatic setback thermostats are ideal for optimizing energy costs and CO ₂ emissions.

Purchase Fuel Efficient Vehicles

Responsible Party	Department of Public Works
eCO ₂ Reduction	Between 2 and 7.5 tons per vehicle
Financial Savings	Denver, CO has saved over \$150,000 in greening their 3,500 car fleet.

The Town of Williamstown should encourage the use of hybrid and electric vehicles in the Town vehicle fleet wherever feasible. When upgrading the fleet, it is important to take into account the main use of the vehicle and purchase the smallest and most fuel-efficient vehicle in the class required for the job.

Further information can also be found in the Residential Actions chapter.

Resources

- The Towns of Arlington has passed an ordinance requiring that all new vehicles purchased for municipal use are the most fuel-efficient vehicles allowable for the job:
www.massclimateaction.org/arlington.htm
- State contract
- Local car dealers

Implementation Strategy

Research opportunities to purchase fuel efficient vehicles at time of replacement.
Incorporate efficiency standards into purchasing policy.

Potential Partners

Town Manager
Appropriate departments
State purchasing personnel

Monitoring/Assessment

Green report card

Methodology used to calculate savings

- 48 local government vehicles
- In 2000, the 48 local government vehicles consumed 24,430 gallons of gasoline and 19,957 gallons of diesel, emitting 473 tons of eCO₂.
- An SUV getting 15 mpg emits 10 tons CO₂ per year on average; a compact car getting 27.5 mpg emits 5.5 tons CO₂ per year on average; a fuel-efficient car getting 40 mpg emits 3.5 tons CO₂ per year on average.

*Calculate savings using formula:

- 24,430 gallons used in 2000 * ___ (___%) = ___x___ gallons of gasoline affected by action
- **After action:** total gallons gasoline used=24,430 - ___x___ + (24,430/2) = ___y___ gal.
- ___y___ gal * .0109 tons eCO₂/gal = ___z___ tons eCO₂ emitted after action
- 479 tons in 2000 - ___z___ tons after action = ___?___ **ton reduction by 2010**

 **Support Regional Bike Path**

Responsible Party	Board of Selectmen
eCO ₂ Reduction	Unknown

By supporting the expansion of the regional bike path to Williamstown, residents will encourage the use of alternate transportation that will reduce dependence on fossil fuels and reduce pollution. The construction of a regional bike path will provide benefits to residents in the form of recreation, community building and regional cooperation and interaction.

Much research has already been done on the subject, and the resources cited below provide detailed studies of possible projects. Environmental Planning (ENVI 302) students created a feasibility study for a recreational path between Williamstown, MA and North Pownal, VT. They write, “considerations while performing the study were to pave the way for a further extension of the trail, that it connect specific places and that it serve a definite purpose” and concluded, after extensive research and interviews with residents of both towns, that “if a trail was built along our route, it would be embraced by both the Williamstown and Pownal communities.”

Resources

- “A Vision for an Interstate Recreational Path: Williamstown, MA to Pownal, VT”, by Ken Brown ’05, Mark Orłowski ’04, Amanda Stout ’04:
www.williams.edu/CES/studentpapers/recpath.pdf
- Berkshire Bike Path Council: www.berkshirebikepath.org

Implementation Strategy

Work with town and Berkshire Bike Path Council to sponsor community education and surveying.

Potential Partners

Town Manager
Appropriate departments
Berkshire Bike Path Council

Monitoring/Assessment

Construction and use of bike path



Promote Energy Star Standards for New Construction and Major Renovations

Responsible Party	Department of Inspection Services
eCO ₂ Reduction	Will vary for different projects
Financial Savings (annual)	Energy efficiency savings can be large

Energy efficient buildings save money, reduce maintenance costs, and improve comfort. The town can promote Energy Star standards in all new town construction through the LEED Rating System. The US Green Building Council's LEED (Leadership in Energy and Environmental Design) Rating System outlines a system of practical incentives with point values so that a building's sustainability can be scored. Local contractors should be encouraged to learn about the system and to suggest it to their clients. Design and construction professionals with a proficiency in sustainable design should be chosen when possible, and the town should develop a mechanism for identifying these professionals for institutions.

The Williamstown Elementary School has benefited greatly from its green features. Where the old elementary school had practically no designed insulation envelope, the new school exceeds insulation code requirements. An energy intensive ventilation system and an extensive air conditioning system increase the energy demands of the school, but it was found that emissions from the new WES appear to have decreased by ~47 tons of eCO₂ compared to the average of the old WES during the previous two years ("Towards a Williamstown Reduction Target" report, 2003). The new school uses more electricity and more natural gas but less heating oil than the old school, and overall creates less eCO₂ emissions.

Resources

- More information on the LEED Green Building Rating System: http://www.usgbc.org/leed/leed_main.asp
- Features and benefits of Energy Star systems: www.energystar.gov .

Implementation Strategy

Energy Star and LEED standards can also be promoted through the town Department of Inspection Services.

Showcase local success stories (for example, Williams College, Williamstown Elementary School, and the Habitat for Humanity house on Hall Street.

Advocate for incentives at a local level for green building.

Make information about funding incentives available to residents and contractors.

Potential Partners

Inspection Services

CET

Williamstown Elementary School

Monitoring/Assessment

Green report card



Construct New Town Buildings to Energy Star and LEED Standards

Responsible Party	Town Manager, Selectmen
eCO ₂ Reduction	Will vary for different projects
Financial Savings (annual)	Energy efficiency savings can be large

Energy efficient buildings save money, reduce maintenance costs, and improve comfort. The town can commit to building to Energy Star standards in all new municipal buildings construction through the LEED Rating System. The US Green Building Council's LEED (Leadership in Energy and Environmental Design) Rating System outlines a system of practical incentives with point values so that a building's sustainability can be scored. Local contractors should be encouraged to learn about the system and to suggest it to their clients. Design and construction professionals with a proficiency in sustainable design should be chosen when possible, and the town should develop a mechanism for identifying these professionals for institutions.

See the previous action for more information on the benefits of energy efficient and green building.

Resources

- The Town of Arlington passed a law establishing the goal of LEED silver certification (an accepted standard for "green buildings") for new and substantial renovations of town-owned buildings: http://www.massclimateaction.org/Arlington_LEEDlaw.htm
- http://www.usgbc.org/leed/leed_main.asp for information on the LEED Green Building Rating System
- Features and benefits of Energy Star systems: www.energystar.gov.

Implementation Strategy

Incorporate Energy Star standards into design and bid specifications.

Potential Partners

Inspection Services
CET

Monitoring/Assessment

Green report card



Install Renewable Energy Systems

Responsible Party	Department of Public Works
eCO ₂ Reduction	Unknown
Financial Savings	Unknown, Williamstown Elementary School has enjoyed significant savings from their PV panels

By installing renewable energy systems (photovoltaic panels, solar hot water systems), the town can demonstrate leadership in the use of clean, renewable energy sources. The Williamstown Elementary School has benefited greatly from the 24 kilowatt photovoltaic system that was installed there in October 2003. The system saves the school approximately \$3000 per year in electricity costs (“North County turns its attention to solar power”, North Adams Transcript) and has eliminated the emission of approximately 45,000 pounds of eCO₂

Resources

- CET
- NESEA

Implementation Strategy

Explore funding opportunities for renewable energy systems.

Potential Partners

MTC
CET

Monitoring/Assessment

Green report card

Reducing Commercial Greenhouse Gas Emissions

Williamstown's commercial sector contributed approximately 20% of the town's total greenhouse gas emissions in 2000. By improving energy efficiency in this sector, the town can work towards its overall goal for emissions reduction, and businesses will receive collateral benefits. Climate protection can increase profits in the commercial sector by creating reduced annual operating and maintenance costs, improved productivity from enhanced comfort and improved lighting, reduced risk, increased customer and client comfort, and marketing and tax benefits.

As the level of public interest in sustainable energy use increases, a concerted effort should be made to increase citizens' awareness of commercial energy efficiency and climate protection efforts. In this way, businesses will also reap the benefits of good publicity along with the concrete financial benefits that reducing energy use will afford.

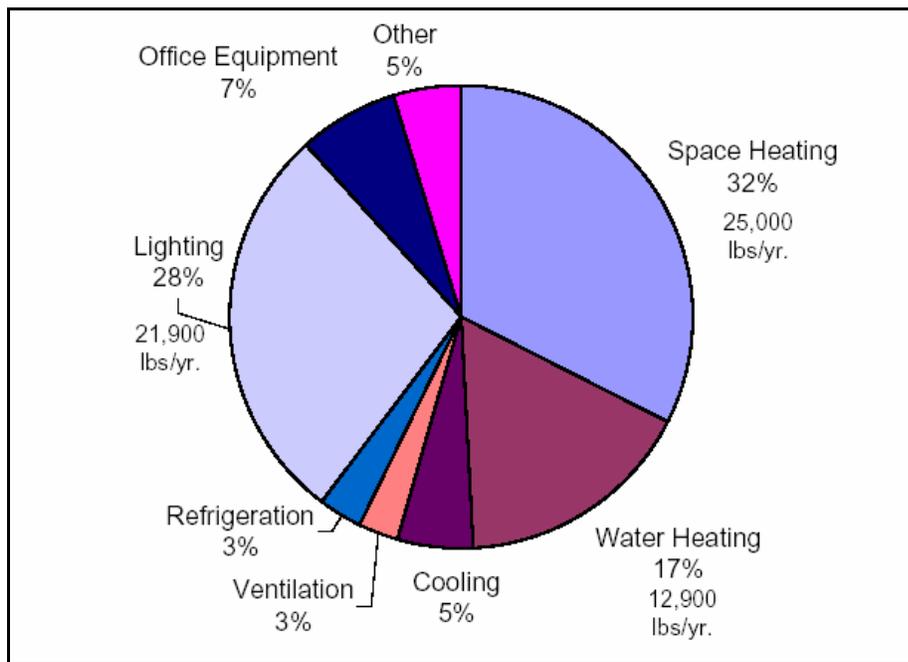


Figure 8 Average Business Energy Use

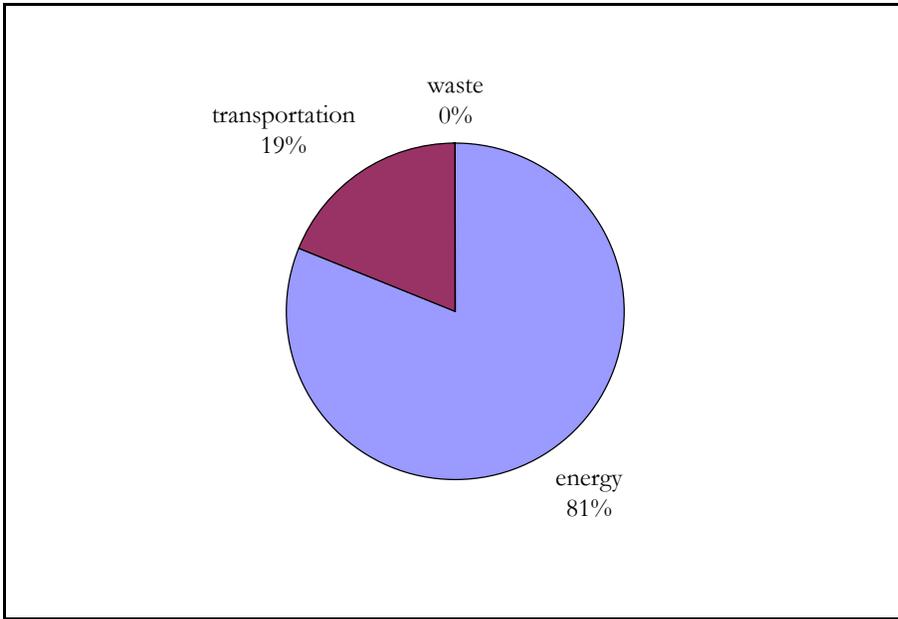


Figure 9 Sources of Commercial eCO₂ Emissions

Major commercial uses of energy include space heating, lighting, cooling and refrigeration, though it varies depending on the primary business activity. An energy audit — often provided free by utilities — of your business' energy use can help focus efforts where the most progress and emissions reductions can be made. The following pages examine commercial progress so far, and plot further emissions reduction strategies. Where possible, the estimated eCO₂ reduction has been calculated, along with potential financial savings for an average business.



Purchase Energy Efficient Products (Lighting)

Responsible Party	Individual business
eCO ₂ Reduction	Unknown
Financial Savings per Business	Unknown, see table for specifics

By purchasing energy efficient lighting products, businesses will save money and energy while maintaining lighting quality. Savings for businesses include not only lower energy bills and maintenance costs, but also reduced installation costs through utility funded incentives. As an easy first step towards responsible energy use and climate protection, high efficiency fluorescent lighting, energy efficient exit signs, and lighting controls like motion sensors will help to demonstrate the financial benefits of reduced energy usage and encourage more thoughtful patterns of consumption.

Resources

- The Lighting Resource Center: www.lrc.rpi.edu
- Qualified Energy Star products and technical specifications: www.energystar.gov/products/cflbulbs.html
- Lighting contractors and manufacturers

Implementation Strategy

Promote high efficiency lighting strategies through the use of “lighting design guide” and by showcasing local success stories.

Potential Partners

MECO
Chamber of Commerce

Monitoring/Assessment

Green report card
Williamstown “Green Business” stickers to indicate participation in the program

Methodology used to calculate savings

It is not currently known what proportion of commercial lighting is incandescent and what is already fluorescent. However, commercial lighting accounts for about 15% of Williamstown's total emissions so even if only a small proportion of the lighting is incandescent, switching to fluorescent would have a large impact. For example, even if only 1/3 of commercial lighting were incandescent, switching that third to fluorescent would reduce Williamstown's total emissions by 1.7%. This commercial estimate plus the residential fluorescent reductions would reduce 3.6% of Williamstown's total emissions.

SPECIFIC ACTION	BUSINESS SAVINGS
Daylighting	Minimize use of electrical lighting while improving lighting quantity and quality.
Replace incandescent lamps with compact fluorescent lamps or other options	Save \$4 and 60 lbs. of CO ₂ emissions per year for every 60W incandescent bulb (on for 8 hours a day) that is replaced with a 15W CFL.
Upgrade fluorescent lighting fixtures; optimize design with tandem wiring and specular reflectors.	Use lighting with electronic ballasts and T-8 lamps, instead of older, magnetically ballasted fluorescent fixtures with T-12 lamps, and improve lighting quality, save energy, and reduce emissions by 20% per fixture.
Outdoor and security lighting	Replace high wattage incandescent or mercury vapor outdoor lighting with high efficiency lighting such as CFLs, high pressure sodium (HPS) or metal halide (MH) lamps. Energy consumption can be reduced by 80-90% with comparable emissions reductions.
Lighting controls	Occupancy sensors and photocell controls can provide energy savings from 25-50%.



Purchase Energy Efficient Products (Office Equipment and Appliances)

Responsible Party	Individual business
eCO ₂ Reduction	Unknown
Financial Savings per Business	Unknown, see benefits in table

By purchasing Energy Star office equipment and appliances, businesses will save money and energy while maintaining high performance. Savings are realized through the use of a “sleep” mode that uses significantly less electricity during periods of inactivity. Office equipment with the Energy Star label includes computers, LED monitors, printers, copiers, and faxes. Actual savings will vary depending on how much energy an old model wastes compared to Energy Star models, but this step is crucial to demonstrating the commitment of the commercial sector to reducing Williamstown’s greenhouse gas emissions.

Home electronics account for 4% of an average household’s energy bills. Over its lifetime, Energy Star qualified equipment in a single home office (e.g., computer, monitor, printer, and fax) can save enough electricity to light an entire home for more than two years.

Resources

- Qualified Energy Star products and technical specifications:
www.energystar.gov/products/appliances

Implementation Strategy

Showcase local success stories at Chamber of Commerce meeting, Rotary Club, etc.
Arrange tours of model green businesses.

Potential Partners

Local retailers
Chamber of Commerce
MECO

Monitoring/Assessment

Green report card
Williamstown “Green Business” stickers to indicate participation in the program

Methodology used to calculate savings

SPECIFIC ACTION	BUSINESS BENEFITS
Insulate water heaters and hot water distribution pipes	Water heater insulation jackets reduce energy consumption from electric water heating.
Reduce hot water temperatures	Turning down tank temperatures to 120° will minimize tank stand-by losses.
Wastewater recirculation or reprocessing	Grey water may be used for various non-potable purposes or, in some applications, provide cost-effective pre-heating of make-up water ofr water heaters. Heat in drain water where many showers are taken (e.g., a health club) can be largely recovered through use of the GFX retrofit at modest cost.
Require Energy Star labeled appliances such as refrigerators and A/Cs	Energy Star refrigerators, for example, use less than half of the energy used by a typical 12 year old model and it may be cost effective to retire old appliances early.
Purchase Energy Star labeled office equipment	This will ensure optimal efficiency of new purchases, reducing energy costs and emissions.
Turn off un-needed copiers and printers during non-business hours or put equipment in "sleep" mode	During periods of prolonged inactivity, much energy can be saved by using the "sleep" mode on this equipment.
Control "instant-on" electronic equipment with a power strip and its toggle switch	"Instant-on" really means that the equipment is only in a "slepe" mode even when off, and results in phantom energy use that adds up to significant energy waste and extra greenhouse gas emissions.
Site heat-producing appliances away from refrigeration equipment	Save energy used to operate refrigeration equipment
Install an "outdoor air economizer" for walk-in coolers	When outdoor air is lower than pre-set temperature, use of cool outdoor air is allowed instead of using compressor (and additional energy)
Use insulated doors instead of "anti-sweat" (electronic resistance heat) heaters on display cooler doors	Minimizes condensation around door frames while cutting operating costs and greenhouse gas emissions.



Purchase Energy Efficient Products (Heating and Cooling)

Responsible Party	Individual business
eCO ₂ Reduction	Unknown
Financial Savings per Business	Unknown, see benefits in table

By installing and utilizing energy efficient heating and cooling systems, businesses will save money and energy and increase comfort. Heating and cooling equipment with Energy Star labels include air conditioners, boilers, heat pumps, furnaces, ceiling fans, ventilating fans, and programmable thermostats.

Resources

- Qualified Energy Star products and technical specifications:
http://www.energystar.gov/index.cfm?c=heat_cool.pr_hvac
- Call Energy Star: 1-888-STAR-YES

Implementation Strategy

Organize forum for Chamber of Commerce, Rotary Club etc. to highlight successes, advertise, and educate (“dog and pony show”).

Potential Partners

Local retailers
Chamber of Commerce
Local contractors

Monitoring/Assessment

Green report card
Williamstown “Green Business” stickers to indicate participation in the program

Methodology used to calculate savings

SPECIFIC ACTION	BUSINESS BENEFITS
Upgrade or install insulation; reduce or eliminate excessive air infiltration; clearly and properly define the heated envelope	Greater comfort, increased building material longevity, and decreased roof ice-damming accompany reduced energy consumption and business greenhouse gas emissions.
Install energy efficient windows, window films, or other window treatments	High efficiency windows are cost-effective while increasing comfort levels and reducing energy consumption and business greenhouse gas emissions.
Perform manufacturer recommended maintenance and performance testing on existing heating and cooling systems	Optimize operating efficiencies and comfort levels, minimize emission rates and operating costs.
Switch to lower carbon content fuels for primary space heating	All of the energy sources required for space heating and cooling systems should be considered in cost-efficiency analyses, as other fuels and technologies can result in lower overall energy costs and emissions even though heat pumps use energy very efficiently.
Improve ventilation system efficiency, install heat recovery ventilators (HRV)	Ensure optimal ventilation with minimal emissions and energy costs instead of uncomfortable over- and under- ventilating a business space.
Install automatic setback thermostats or other energy system management controls	With fixed occupancy hours, automatic setback thermostats are ideal for optimizing energy costs and CO ₂ emissions.



Purchase Green Power

Responsible Party	Individual business
eCO ₂ Reduction (Tonn)	1435 tons (1.2% of 2000 baseline)
Financial Savings per business	Cost is 1.9¢ more per kilowatt hour

By purchasing green power, businesses support existing and new renewable energy sources such as wind and solar power, low-impact hydroelectric generation, and biomass. This sends a message to suppliers that businesses want locally harvested, less polluting energy sources.

Through the GreenWatts New England program offered by the Massachusetts Electric Company, businesses can support new renewable energy sources, keep energy related dollars in local communities, and help create local jobs. It costs just \$0.019 more per kilowatt hour (kWh) — just a few pennies a day — which, on average, adds up to a premium of approximately \$6 to \$12 per month on a monthly electric bill.

Resources

- Renewable Energy through Massachusetts Electric Company (MECo):
http://www.nationalgridus.com/masselectric/business/energychoice/3_renewable.asp

Implementation Strategy

“It’s Getting Easier to Be Green” campaign.

Potential Partners

MECO

CET

Chamber of Commerce

Monitoring/Assessment

Green report card

Williamstown “Green Business” stickers to indicate participation in the program

Monitor through MECO and CET

Methodology used to calculate savings

- You save 1 pound of CO₂ for every kilowatt hour of green electricity that you use.
- In 2000, the commercial sector used 28,701,214 kWh of electricity, emitting 10,652 tons of eCO₂. If 10% of this electricity came from green sources, the emission of 1065 tons of eCO₂ would be prevented. This would be 10.8% of the emissions produced by residential electricity use in 2000 and 1.2% of Williamstown's total greenhouse gas emissions in 2000.
- After action: $28701214 \times 0.1 \times (1/2000) = \mathbf{1435 \text{ ton reduction by 2010}}$



Purchase Fuel Efficient Vehicles

Responsible Party	Individual business
eCO ₂ Reduction (Tonn)	Between 2 and 7.5 tons per vehicle that is replaced
Financial Savings per Business	Go twice as far on a tank of gas in a hybrid and save half of your yearly gasoline or diesel costs.

By purchasing a vehicle that gets over thirty miles per gallon, businesses will save money, reduce our dependence on fossil fuels, and reduce air pollution. It is important to demonstrate that fuel-efficient vehicles are just as easy to maintain as regular gasoline or diesel cars and to explain that the money you save in gasoline quickly makes up any difference on the sticker price. When upgrading commercial fleets, it is important to take into account the main use of the vehicle and purchase the smallest and most fuel efficient vehicle in the class required for the job.

If you drive 12,000 miles per year in a hybrid, you can prevent the emission of approximately 3.3 TONS of eCO₂ to the atmosphere compared to the emissions that are produced by a regular car. Furthermore, a hybrid pays for itself over time in gas savings, since it gets twice as many miles to the gallon. For example, a standard Ford Camry standard has a manufacturer’s suggested retail price of \$18,560, while the Prius hybrid is listed at \$20,810, but the Prius averages 55 miles per gallon, while the Camry only goes 27. Besides being much more environmentally friendly than standard gasoline cars, hybrid vehicles make good financial sense. In 2004, the federal government is also offering a \$1500 tax deduction that makes it even easier to invest in climate protection.

Resources

- Frequently Asked Questions about Hybrid Electric Vehicles:
www.ott.doe.gov/hev/faqs_text.html
- Local car dealers

Implementation Strategy

Develop model guidelines for efficiency standards into purchasing policy.

Potential Partners

Local car dealers
Massachusetts Climate Action Network (MCAN)
Chamber of Commerce

Monitoring/Assessment

Green report card
Williamstown “Green Business” stickers to indicate participation in the program

Methodology used to calculate savings

- An SUV getting 15 mpg emits 10 tons CO₂ per year on average; a compact car getting 27.5 mpg emits 5.5 tons CO₂ per year on average; a fuel-efficient car getting 40 mpg emits 3.5 tons CO₂ per year on average.

Commercial transportation breakdown:

- 6,574 registered town vehicles (not including 750 student and 48 local government vehicles)
- Estimate that there are 1343 commercial vehicles (20% of VMT) (6,574 total - 5,231 residential)
- In 2000, the 1343 commercial vehicles consumed 510,361 gallons of gasoline and 41,109 gallons of diesel, emitting 5,924 tons of eCO₂.
- Inventory estimates of breakdown of town vehicles:
 - 85.5% are gas-burning cars, 18 mpg
 - 8% are gas-burning light trucks, 14 mpg
 - 3% are diesel cars, 20 mpg
 - 3% are diesel light trucks, 15.6 mpg
 - 0.5% are diesel buses, 4 mpg
- Estimate that the 1,343 commercial vehicles are composed of 26 diesel buses, 200 gas light trucks and 200 diesel light trucks (15% each, because the proportion is probably higher in the commercial sector), 805 gas cars (60%) and 8% diesel cars.

Calculate savings using formula:

- 510,361 gallons used in 2000 * (%) = x gallons of gasoline affected by action
- **After action:** total gallons gasoline used = 510,361 - x + (510,361/2) = y gal.
- y gal * .0109 tons eCO₂/gal = z tons eCO₂ emitted after action
- 6,004 tons in 2000 - z tons after action = ? **ton reduction by 2010**



Institute Recycling Program

Responsible Party	Individual business
eCO ₂ Reduction (Town)	Negligible
Financial Savings per Business	Unknown

By recycling and or reusing materials, businesses can save money by reducing waste. Opportunities include recycling through your waste hauler, participating in the CET Paper Recycling Co-op, and taking part in the Massachusetts Materials Exchange. Businesses can start at the very beginning by arranging an internal recycling/reuse system to make it easy for their employees and customers to recycle. A comprehensive effort could include putting up signs to make people aware of the benefits of recycling along with a commitment to reduce waste of materials and energy whenever possible.

Resources

- Northern Berkshire Solid Waste Management District: (413) 743- 8208; email nbswmd@verizon.net ; 20 East Street, Adams, MA 01220
- Center for Ecological Technology (CET)

Implementation Strategy

Targeted initiative through Chamber of Commerce.

Potential Partners

Northern Berkshire Solid Waste Management District
CET
Chamber of Commerce
Waste haulers

Monitoring/Assessment

Green report card
Number of businesses participating in CET paper recycling cooperative
Survey waste haulers

Reducing Institutional Greenhouse Gas Emissions

As the town's largest employer, Williams College can play a significant leadership role in helping the community reach its climate protection goal. Along with other town institutions and businesses, this sector has unique emissions reductions opportunities because of its high current levels of energy use, plans for significant future facility expansions with the potential for many energy efficiency measures, high levels of public visibility, non-profit orientation, commitment to the community, and opportunities to educate students. Most importantly, climate protection measures in this sector often qualify as least-cost options because of their economic and operational benefits.

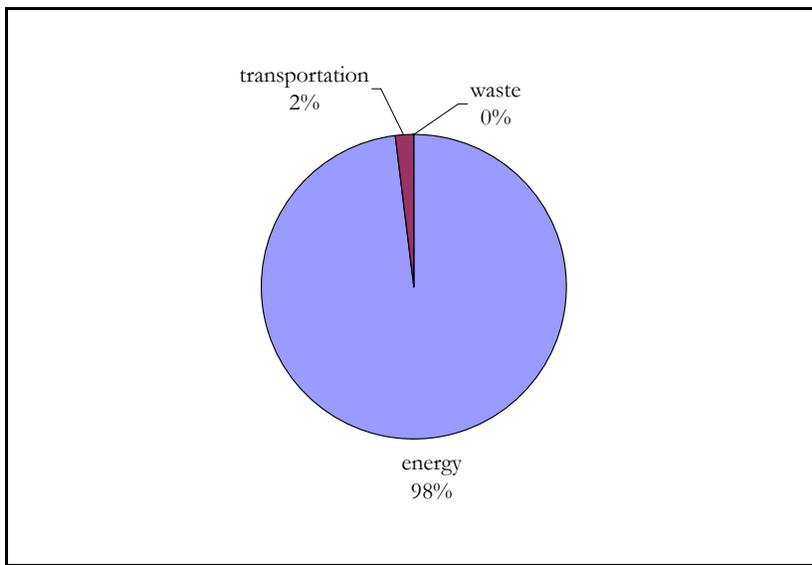


Figure 10 Sources of Williams College eCO₂ Emissions (24.9% of total)

Energy use, as in other sectors, is the key area to focus on, primarily in the form of electricity and heating fuel oil. Transportation is also an important area for the institutional sector to examine. Clean, fuel-efficient technologies are a viable and attractive option that will serve a larger educational, demonstrative function.

The College was responsible for 24.9% of Williamstown's greenhouse gas emissions in 2000. The following pages examine College progress so far, and plot further emissions reduction strategies; a number of the measures discussed here could be applied by other town institutions and businesses as part of the wider community effort. Where possible, the estimated eCO₂ reduction has been calculated, along with potential financial savings for the College.



Williams College Co-Generation Plant

Responsible Party	Williams College (Institution)
eCO ₂ Reduction	2414.38 tons (2.08% of 2000 baseline)
Financial Savings (annual)	\$189,856.06

Although the co-generation plant had not been installed at the time the inventory was compiled in 2000, the electricity co-generation plant is currently in operation. Thus the reductions from this measure count toward Williamstown's overall reductions. It is estimated that the co-generation plant will produce 6.5 million kWh per year ("Towards a Williamstown Reduction Target", 2003), accounting for approximately 25% of the College's overall electricity use. This electricity takes the place of electricity that would otherwise be purchased off the grid, and can be subtracted from the College's total electricity use. The savings are a significant reduction of 4637 tons of eCO₂, or 3.2% of Williamstown's 2000 emissions.

Methodology used to calculate savings

eCO₂

- 2000 electricity use by College, excluding off-campus rental properties = 25,711,171 kWh/year
- Co-generation plant will produce = 6,500,000 kWh/year = 25.3% of 2000 use
- 2000 eCO₂ from College electricity use = 9543 tons
- **After action:** = $.253 * 9543 = 2414.38$ ton eCO₂ reduction

Financial

- 2000 College spending on electricity = \$750,419.21
- Spending on electricity after action: $\$750,419.21 * (1-.253) = \$560,563.15$
- **Savings = \$189,856.06**



Williams College High-Efficiency Washers and Dryers

Responsible Party	Williams College (Institution)
eCO ₂ Reduction	1.1 tons (negligible percent of 2000 baseline)
Financial Savings	\$83

By replacing many of its top-loading washing machines with more water and energy-efficient front-loading units, the College was able to take a small step toward the larger emissions reduction target. The 79 washers replaced will save 2825.79 kWh per year, according to the washing machine supplier (Maytag) and Robin Malloy of Williams College Buildings and Grounds (“Towards a Williamstown Reduction Target”, 2003). This action by the College can serve as a good example for a commercial and residential energy efficiency campaign.

Methodology used to calculated savings

eCO₂

- 2000 electricity use by College, excluding off-campus rental properties = 25,711,171 kWh/year
- High-efficiency washers and dryers will save 2825.79 kWh/year = .011% of 2000 use
- 2000 eCO₂ from College electricity use = 9,543 tons
- eCO₂ reduction = $.000116 * 9543 = 1.1$ tons

Financial

- 2000 College spending on electricity = \$750,419.21
- Spending on electricity after action: $\$750,419.21 * (1 - .00011) = \$750,336.66$
- **Savings = \$82.55**

Hybrid Vehicles in College Fleet

Responsible Party	Williams College (Buildings and Grounds)
eCO ₂ Reduction (Town)	5 tons (negligible percent of 2000 baseline)
Financial Savings for Williams College	*\$896.58

Since 2000, the College has acquired 2 hybrid vehicles, a Honda Civic hybrid and a Toyota Prius hybrid, replacing two Ford Taurus station wagons. For the 38,133 miles traveled by these two vehicles, miles per gallon has increased from 20 to 25 mpg to 35 to 40 mpg. The College also enjoyed some savings on the purchase cost, according to Tim Reisler, Buildings and Grounds Assistant Director for Administrative Services. Though this action has not created a significant reduction in eCO₂ emissions on its own, it has been a good way for the College to demonstrate its commitment to climate protection. Also, since a large number of students and faculty drive these two cars for field trips, club transportation, or other miscellaneous trips, many people come in contact with the technology that makes hybrid cars just as easy to use as regular gasoline cars while reducing overall emissions. In this way, the myth that fuel-efficient cars need to be plugged in (or are otherwise difficult to use and maintain) is erased and the participation of citizens in our climate protection efforts is demonstrably practical.

The College and other town institutions should continue and increase efforts to have “green” fleets and to educate the commercial and residential sectors about the potential of these new technologies.

Methodology used to calculate savings

2000 College car usage	2 Ford Taurus gasoline-powered station wagons	Hybrid vehicles
363,262 VMT	38,133 VMT	38,133 VMT
cost of fuel = \$31,355	\$2,286.14 (\$1.40/gal. 2000)	\$1,961.10 (\$1.80/gal. 2004)
amount of fuel (gasoline) = 21,639 gal.	1587.6	1089.5

*If the College had continued to purchase 1587.6 gallons of gasoline for the two Ford Taurus station wagons, it would have spent \$2857.68 (1587.6 gal * \$1.80/gal) instead of the \$1,961.10 (1089.5 gal * \$1.80/gal) that it now costs to fuel the two hybrid vehicles. This savings of \$896.58 is the savings given above. Savings will change as the cost of fuel changes; the initial cost of the vehicles and payback time should also be taken into account.



Purchase and Distribute Energy Efficient Products (Lighting)

Responsible Party	Williams College (Buildings and Grounds), Greensense
eCO ₂ Reduction	109 tons (.0009% of 2000 baseline)
Financial Savings	Annual savings on electricity = \$10,368 (initial investment = \$14,000)*

By implementing a program whereby Williams College students can exchange their incandescent light bulbs for energy efficient compact fluorescent bulbs, the College has the opportunity to save itself money and reduce greenhouse gas emissions from electricity use while providing an equal amount of light.

Incandescent light bulbs are highly wasteful, using only 8% of the electricity they use to create visible light and losing the rest as heat. According to www.energystar.gov, compact fluorescent light bulbs use 66% less energy and last ten times longer than incandescents, so they are much more energy efficient. Moreover, if every household in the United States replaced one incandescent light bulb with a compact fluorescent light bulb the greenhouse gas emissions reductions would be equivalent to removing 1,000,000 cars from the roads.

The College could allow students to exchange their incandescent light bulbs for CFLs, either for free or at a reduced cost (\$2-3). The potential savings are calculated below.

Resources

- CFL models by size and features: www.energystar.gov/products/cflbulbs.html .
- Local Energy Star retailers: www.energystar.gov/stores/storelocator.asp .
- Other options at the Lighting Resource Center: www.lrc.rpi.edu .
- Rebates and exchange programs through Massachusetts Electric: www.nationalgridus.com/masselectric

Implementation Strategy

Initiate discussion with Williams College Buildings and Grounds and students in Greensense. Stress participation as part of larger town effort and highlight potential savings.

Potential Partners

CET
Greensense
Massachusetts Electric Company (MECo)

Monitoring/Assessment

Number of students who exchange bulbs
Green report card

Methodology used to calculate savings

Incandescent Light Bulb	Compact Fluorescent Light Bulb
1 60W incandescent bulb = \$0.50 (10 bulbs = \$5, to equal life of 1 CFL)	1 CFL = \$7
Electricity cost (10,000 hrs, 10 60W incandescents) = \$36	Electricity cost (10,000 hrs, 1 CFL) = \$9
Electricity cost of 1 incandescent for 1 school year = \$6.912 = (\$36/10,000 hrs)*(8 hrs/day)*(30 days/mo)*(8 mos/yr)	Electricity cost of 1 CFL for 1 school year = \$1.728 =(\$9/10,000 hrs)*(8hrs/day)*(30days/mo)*(8mos/yr)

*Assumes:

- (annual electricity cost per incandescent – annual electricity cost per CFL) * 2000 bulbs =
(\$6.912 - \$1.728)*2000 = **\$10,368**
- Initial cost = (cost CFL)*2000 bulbs = \$7*2000 = \$14,000
- **Before action:** 60W*(8 hrs/day)*(30 days/mo)*(8 mos/yr)*(1 kWh/1000W hrs) =
115.2 kWh/yr/bulb
- **After action:** (115.2 kWh/yr/bulb)*2000 bulbs (1 bulb/student)*[0.7 (70% reduction from
efficiency improvement)] = 161,280 kWh/yr saved, eCO₂ reduction = 116 tons
- 1.2% of total eCO₂ from College electricity use (116 tons/9,543 tons)
- 0.099% of total Williamstown eCO₂ from College electricity use (116 tons/116,117 tons)

If the College purchases the CFLs and gives them to students for free, it will still save \$20 per incandescent bulb that is replaced because of the superior energy efficiency of CFLs. This savings will only be realized if students reuse the bulbs each year or return them at the end of the school year.

=> Spend \$7 (bulb) + \$9 (electricity) = \$16 instead of \$36 (electricity)

However, if the College does not recollect most of the bulbs it gives out, there may be a financial loss per bulb. Each CFL would be \$8.728 (electricity + bulb cost), instead of the \$6.912 that is spent on electricity for each incandescent bulb. Therefore, another option might be to sell the CFLs at a reduced rate, perhaps \$2-3, so that the College would still save money on the action even if students do not return their CFLs at the end of the school year. (This also assumes that students would need new CFLs each year, which would not be the case if students bring them back each year — the program may be most important for incoming freshmen).



Invest in Green Power: Photovoltaic Panels on Schow Science Library

Responsible Party	Williams College (Institution), Greensense, Center for Environmental Studies
eCO ₂ Reduction (Town)	Unknown (calculate once potential kWh generation is know)
Financial Savings	Unknown, WES has seen \$3000 annual savings from their PV system

There are many potential benefits for the proposed installation of photovoltaic panels on Schow Science Library. In a visible location, they would be a reminder of the viability of solar power and a monument to the importance of committing to clean energy. They could be integrated into environmental science course curricula and become an educational tool. as well as a working source of renewable energy.

Resources

- Massachusetts Technology Collaborative: www.mtpc.org
- US Department of Energy: www.energy.gov
- Center for Ecological Technology: www.cetonline.org

Implementation Strategy

Currently in progress

Potential Partners

Greensense
CET
Campus Environmental Advisory Committee
Center for Environmental Studies

Monitoring/Assessment

Monitor output of PV system
Green report card



Invest in Green Power: Develop Wind Generation Facility on Berlin Pass

Responsible Party	Williams College, with town support
eCO ₂ Reduction	11,928.75 tons (10.3% 2000 baseline)
Financial Savings	Payback period = 4-8 yrs, after which electricity is free

The College has investigated the possibility that the old college ski area on Berlin Pass might support a wind farm. Based on a wind study conducted in 1980, it is estimated that the site may produce upwards of 32 million kWh per year, the equivalent of 125% of the College's electricity use in 2000. Were power (specifically the green certificates accompanying renewable energy) generated by this project to be consumed in Williamstown, this would count as a significant reduction in Williamstown's emissions, 22930 tons of eCO₂, approximately a 16% reduction below 2000 levels.

For the purpose of reductions it is important that the green certificates formed along with the clean power be used by entities within Williamstown. The College could produce the power and then sell it to itself, or negotiate with the town for energy users in the town to purchase it. In any case, it is likely there will be an opportunity for Williamstown to directly purchase green certificates from the site to reduce its emissions, since the site would produce more power than the College would use. Consumption of this green power by the College would also be counted for emissions reductions. There is much support for this project from the environmental community at the College, and Williams is officially forming an academic program around the project which is working both to investigate the site's wind potential, and its usefulness as a valuable educational tool. However, there are still understandable reservations on the part of the administration, mostly stemming from concerns about public reception to the proposed project. Explicit support from the town would certainly be a favorable factor in the moving forward of this project. The potential productivity of the site also presents an opportunity for collaboration between the town and the College on the development.

A report done in the fall of 2002 by students at the college in an environmental planning course provides a detailed investigation of many of the issues surrounding the proposed development. The abstract states: "This report shows that this wind project is indeed feasible, and desired by the communities it would affect. There is strong support for this project in Berlin, New York; Petersburg, New York; and Williamstown, Massachusetts; and other surrounding communities. In addition, the legal, ecological, and siting issues are not impediments to this project, allowing Williams College to proceed without being liable for dangerous situations, or conflicts with surrounding communities. This project also presents the college with an ideal opportunity to be an environmental leader, and make a positive impact in surrounding communities." Though more obstacles to the construction of a Berlin wind farm have since arisen (see following articles on wind power and projects in the region), it would be a valuable clean energy source and a huge step towards Williamstown's goal.

Resources

- Full text of report cited above: <http://www.williams.edu/CES/studentpapers/Wind.htm>
- Contacts for this project are Nick Hiza (nhiza@williams.edu) and Professor David Dethier (ddethier@williams.edu).
- Berlin Wind Project: www.berlinwind.org

Implementation Strategy

Work with College to sponsor education efforts about visual and auditory impacts of wind farm

Potential Partners

UMass Renewable Energy Lab

Utility companies

Massachusetts Technology Collaborative

Berkshire Renewable Energy Collaborative

Monitoring/Assessment

Continue to monitor and survey town support for wind farm

Do not allow issue to be sidelined

Green report card

Methodology used to calculate savings

- 2000 eCO₂ from College electricity use = 9,543 tons
- Site will generate 32 million kWh, 125% of College's electricity use in 2000
- Reduction eCO₂ from wind project = $1.25 * 9543 = 11,928.75$ tons
- According to the "Report on the Feasibility of a Wind Power Project on the Berlin Pass" cited on previous page, "the total investment for site infrastructure and seven turbines is about ten million dollars. Equipment and installation will cost \$1,200,000 per 1.5 megawatt General Electric wind turbine. Infrastructure and siting, including road construction, interconnect to the existing electricity grid, and substation construction will cost \$1,600,000 total. The payoff period, which is the period of time required to earn back the original capital investment not accounting for inflation or other market changes, is relatively fast. A conservative estimate is around eight years and an optimistic estimate is four years. Business investors generally consider a project with a payoff period shorter than ten years a solid investment."



Purchase Green Power

Responsible Party	Individual institution
eCO ₂ Reduction (Town)	Unknown, but could be considerable. Green electricity also reduces acid-rain-causing sulfur dioxide emissions, toxic mercury emissions, smog-causing nitrogen oxide emissions, and particulate matter emissions that cause haze and damage lungs.
Financial Savings	GreenerWatts residential program costs 1.9¢ more per kWh, may cost less for institutions (bulk discounts available) or be different for institutional suppliers.

By purchasing green power, institutions support existing and new renewable energy sources such as wind and solar power, low-impact hydroelectric generation, and biomass. This sends a message to suppliers that consumers want locally harvested, less polluting energy sources. Public relations can also be improved by showcasing institutional environmental protection efforts, and it is possible for institutions to commit to purchasing green power for at least some portion of their energy needs.

Resources

- Massachusetts Electric Company (MECo):
http://www.nationalgridus.com/masselectric/business/energychoice/3_renewable.asp

Implementation Strategy

Identify a contact person for interested institutions; explore opportunities for purchasing green power and describe how purchase of green energy can relate to the mission of the individual institution and is beneficial to their clientele.

Potential Partners

CET
Energy suppliers

Monitoring/Assessment

Green report card

Methodology used to calculate savings

Each kilowatt hour of regular electricity used emits 1.5 pounds of eCO₂ to the atmosphere, and by switching to green electricity, these emissions are prevented.

Williams College used 25,711,171 kWh of electricity in 2000, emitting 9,543 tons of eCO₂.

Purchase Fuel-Efficient Vehicles

Responsible Party	Individual Institution
eCO ₂ Reduction (Town)	Depends on vehicles
Financial Savings (annual)	Unknown

Town institutions should encourage the use of hybrid and electric vehicles in their vehicle fleets wherever feasible. When upgrading a fleet, it is important to take into account the main use of the vehicle and purchase the smallest and most fuel-efficient vehicle in the class required for the job. By purchasing a vehicle that gets over thirty miles per gallon, institutions will save money, reduce our dependence on fossil fuels, and reduce air pollution. Institutions will play a crucial role in demonstrating that fuel-efficient vehicles are just as easy to maintain as regular gasoline or diesel cars and are much more environmentally friendly.

Resources

- Frequently Asked Questions about Hybrid Electric Vehicles:
www.ott.doe.gov/hev/faqs_text.html
- Local car dealers

Implementation Strategy

Develop model guidelines for efficiency standards into purchasing policy.

Potential Partners

Local car dealers
Massachusetts Climate Action Network (MCAN)
Chamber of Commerce

Monitoring/Assessment

Green report card

Methodology used to calculate savings

eCO₂

- 129 College vehicles
- In 2000, the 129 College vehicles consumed 57,874 gallons of gasoline and 5,816 gallons of diesel, emitting 685 tons of eCO₂.

*Calculate savings using formula:

- 57,874 gallons used in 2000 * (%) = x gallons of gasoline affected by action
- **After action:** total gallons gasoline used=57,874 – x + (57,874/2) = y gal.
- y gal * .0109 tons eCO₂/gal = z tons eCO₂ emitted after action
- 685 tons in 2000 – z tons after action = ? **ton reduction by 2010**

Financial

- In 2000, the College spent \$81,475 on gallons of gasoline on \$6,980 on gallons of diesel fuel. By purchasing vehicles with better fuel efficiency, the same number of vehicles miles could be achieved for less money.

Support Regional Bike Path

Responsible Party	Individual institutions
eCO ₂ Reduction	Unknown
Financial Savings (annual)	Unknown

By supporting “Bike to Work” and “Bike to School” events, local institutions can draw attention to the large potential benefits of a regional bike path. Institutions, especially Williams College, are in a unique position to promote environmentally friendly modes of transportation because of their high levels of visibility and extensive educational resources. Support for a regional bike path will highlight the community’s commitment to climate protection, moreover, the construction of a bike path will provide many benefits to institutional employees and clientele in the form of recreation, community building, and regional cooperation and interaction.

Resources

- “A Vision for an Interstate Recreational Path: Williamstown, MA to Pownal, VT”:
<http://www.williams.edu/CES/studentpapers/recpath.pdf>
- “Green River Recreational Trail”: <http://www.williams.edu/CES/studentpapers/bike.pdf>
- Berkshire Bike Path Council: www.berkshirebikepath.org

Implementation Strategy

Support “Bike to Work” and “Bike to School” events

Potential Partners

Berkshire Bike Council

Monitoring/Assessment

Participation in events

Methodology used to calculate savings

It is hard to estimate the savings that will result from increasing people's transportation opportunities to include more biking and walking, but this measure should surely be part of the effort to increase Williamstown's climate-friendliness.



Construct New College Buildings to Energy Star and LEED Standards

Responsible Party	Williams College and other institutions
eCO ₂ Reduction	Unknown, could be large
Financial Savings	Unknown, could be large

Use the US Green Building Council's LEED (Leadership in Energy and Environmental Design) Rating System, which outlines a system of for designing sustainable buildings, to promote green construction. Encourage local contractors to learn about the system and to suggest it to their clients. Work with design and construction professionals with a proficiency in sustainable design when possible and implement a system for identifying these professionals.

Resources

- www.energystar.gov for features and benefits of Energy Star homes and businesses
- http://www.usgbc.org/leed/leed_main.asp for information on the LEED Green Building Rating System

Implementation Strategy

Promote Energy Star and LEED standards through appropriate town departments and boards. Showcase local success stories (i.e., Williams College, Williamstown Elementary School, and the Habitat for Humanity house on Hall Street. Advocate for incentives at a local level for green building.

Potential Partners

Inspection Services
CET
Williams College
Williamstown Elementary School
Habitat House
Selectmen

Monitoring/Assessment

Green report card
Contact Energy Star representatives, US Green Building Council for participation

Methodology used to calculate savings

Savings will vary greatly depending on the precise measures implemented and the type of building.



Install Renewable Energy Systems

Responsible Party	Individual Institution
eCO ₂ Reduction	Unknown
Financial Savings (annual)	Unknown

Individual institutions may be in a good position to invest in renewable energy systems such as the photovoltaic panels at Williams College, or other systems that produce renewable energy. Institutions can demonstrate leadership in the use of clean renewable energy resources.

See Municipal Sector, Existing Actions for benefits and savings enjoyed by the Williamstown Elementary School from its photovoltaic system.

Resources

- CET
- NESEA

Methodology used to calculate savings

Implementation Strategy

Showcase success stories at local institutions and provide information about financial incentives

Potential Partners

CET
Massachusetts Technology Collaborative
Renewable energy companies and installers
Williams College
Williamstown Elementary School

Monitoring/Assessment

Green report card



Institute Recycling Program

Responsible Party	Individual institution
eCO ₂ Reduction	Unknown
Financial Savings (annual)	Unknown

By recycling and or reusing materials, institutions can save money by reducing waste. Opportunities include recycling through your waste hauler, participating in the CET Paper Recycling Co-op, and taking part in the Massachusetts Materials Exchange. Institutions can start at the very beginning by arranging an internal recycling/reuse system to make it easy for their employees, residents and visitors to recycle. A comprehensive effort could include putting up signs to make people aware of the benefits of recycling along with a commitment to reduce waste of materials and energy whenever possible.

Resources

- CET
- Northern Berkshire Solid Waste Management District

Implementation Strategy

Identify and work with contact person at each institution to assess current status and explore opportunities for expanding what is presently being done and adding an educational component.

Potential Partners

Northern Berkshire Solid Waste District
Waste haulers
CET

Monitoring/Assessment

Assess what is presently being done to establish a baseline for progress.
Monitor steps taken and results achieved.Green report card



Expand Present Composting Program

Responsible Party	Williams College and other institutions
eCO ₂ Reduction	Unknown
Financial Savings (annual)	\$5000 for WES

In 2003, students at the Williamstown Elementary School began separating their food waste after lunch time in the cafeteria. Williams College picks up food waste at the school to transport to Holiday Farm in Dalton for composting. The estimated savings in waste disposal costs during the first years was \$5000.

Resources

- Williams College
- Williamstown Elementary School

Implementation Strategy

Assess opportunities at each institution. Work together to establish collection route and investigate location and operation of regional composting facility.

Potential Partners

Northern Berkshire Solid Waste District
CET
Williams College, CES
Appropriate state agencies
Williamstown Board of Health
Holiday Farm (Dalton)

Monitoring/Assessment

Assess what is presently being done to establish a baseline for progress.
Monitor steps taken and results achieved.

Glossary

Aerosols

Extremely small particles of liquid or dust in the atmosphere.

Ampere

Standard measure of strength for an electrical current (volts multiplied by amps equals watts).

British Thermal Unit (Btu)

Amount of heat needed to raise the temperature of one pound of water 1 degree Fahrenheit (\approx 252 calories).

Compact Fluorescent

Energy efficient lamp that can replace a standard incandescent bulb; consists of gas-filled tube and magnetic or electronic ballast.

Double-pane or Glazed Window

Window with two layers of glass separated by air space; increases resistance to heat loss (R-value).

EER

Energy Efficiency Ratio; gives number of Btus removed per hour per watt of power used.

Energy Audit

Survey to show how much energy a building or household uses.

EnergyStar

Rates appliances for efficiency based on EER and SEER.

Grid

System for transmission and distribution of electricity.

Incandescent

Standard light bulb; light produced by electrically heated filament.

Kilowatt

Standard unit of electrical power, equals one thousand watts.

Kilowatt-hour

Measure of electricity equal to the use of 1000 watts for one hour.

LEED

Leadership in Energy and Environmental Design Rating system of the US Green Building Council Rating System that scores a building's sustainability.

Megawatt

One thousand kilowatts, or 1 million watts; standard measure of electric power plant generating capacity.

Phantom load

Energy consumption employed by items not in use but drawing power.

Photovoltaic device

Solid-state electrical device made of semi-conductors that converts light directly into energy.

SEER

Seasonal Energy Efficiency Ratio; gives number of Btus removed per hour per watt of power used (air conditioner efficiency rating).

Volt

Unit of electrical force; supplied in constant amount.

Watt

Unit of electrical power; low wattage means a lower electrical bill.

Future Actions

*Municipal Sector
Proposed Actions*



Increase Police Bike-Patrols



Sponsor “Go Green” Days



Plant More Trees Around Town Buildings

Responsible Party	
eCO ₂ Reduction	
Financial Savings	

Resources

Implementation Strategy

Potential Partners

Monitoring/Assessment

Methodology used to calculate savings



Convert Fleet Vehicles to Biodiesel

Responsible Party	Town
eCO ₂ Reduction	
Financial Savings (annual)	

In 2000, Town diesel vehicles in the Highway, Water, Sewer, Cemetery and Parks, and Fire Departments and at the landfill used 19,957 gallons of diesel fuel for a total of \$24,710 and 213 tons of eCO₂ emissions. Biodiesel could be used in these vehicles instead. Biodiesel is a clean, renewable fuel substitute produced from agricultural resources such as soybeans or rapeseed. Vegetable oil from these plants, either used or virgin, is processed with lye and methanol to form biodiesel. It can be burned in any standard, unmodified diesel engine, most commonly as a 20% blend. Current biodiesel fleets have reported operational consistency over extended periods of use—engine performance, payload power and range are completely unaltered. There is no cost to convert engines to run on biodiesel fuel, and although a 20% blend of biodiesel costs an average of \$0.20/gallon more than petroleum diesel, biodiesel is both a renewable energy source and a fuel that reduces particulate emissions, making it easier to meet emissions standards. Furthermore, much research is currently underway that seeks to reduce the cost of biodiesel.

Resources

Implementation Strategy

Potential Partners

Monitoring/Assessment

Methodology used to calculate savings

 **“No Idling” Campaign**

Responsible Party	Town
eCO ₂ Reduction	
Financial Savings (annual)	

The Town could institute a “no-idling” public education campaign and require a clause in its with construction firms prohibiting idling (COLLEGE too??- bulk of town construction). Idling a car or truck for more than 10 seconds uses more fuel than restarting the engine, and idling for 10 minutes per day wastes an average of 26 gallons of gasoline per year. Contrary to popular belief, idling is an ineffective way to warm up a car and can actually damage an engine. The best way to warm up an engine is to drive the car.

Idling wastes fuel and money, emits harmful carbon dioxide and other pollutants, and has a negative effect on human health. Children are particularly vulnerable to the air pollution caused by vehicle emissions because they breathe faster than adults and inhale more air per pound of body weight. In addition, there is a direct correlation between air pollution and asthma in children, which has significantly increased in recent years.

Resources

Implementation Strategy

Potential Partners

Monitoring/Assessment

Methodology used to calculate savings



Solar Hot Water Heating

Responsible Party	
eCO ₂ Reduction	634 tons (0.44% 2000 baseline)
Financial Savings (annual)	

It takes 4.18 joules to heat one liter of water 1 degree Celsius. The typical water heater for a family of four has an 80 gallon tank and that typical family will use all 80 gallons (302.83 liters) in a day. This means that water heating consumes a tremendous amount of energy, 14% of a household's total energy budget and 4.4% of Williamstown's total emissions. Solar hot water heaters have the potential to eliminate water heating from the emissions count. However, the initial costs are very high: \$3267 for a SUN HōM domestic hot water active solar water heater for the New England region. Yet after installation, the usually large bill for water heating would be eliminated from all households. Plans to switch to solar water heaters include public education and town financed loans. The town could loan money to residents for purchase of solar water heaters and both the town and the residents would make and save money in the long run. This initially expensive project has very high returns in financial savings and eCO₂ reductions. Yet, it might be best saved for when the town is financially ready for such a large project. Perhaps the town could invest money saved on smaller energy efficiency projects in the solar water heater project. If we estimate that 10% of Williamstown residents switched to solar hot water heating, 634 tons of eCO₂ would be saved, 0.44% of the total emissions in 2000.

Solar hot water is one of the best investments you can make for your house and for the environment.

Resources

Implementation Strategy

Potential Partners

Monitoring/Assessment

Methodology used to calculate savings



Institute Energy-Efficient Procurement Policies and Bulk Purchasing

Responsible Party	Individual institution
eCO ₂ Reduction	
Financial Savings (annual)	

[Include examples of saving money and energy]

Resources

Implementation Strategy

Sponsor workshop on procurement and explore opportunities for bulk purchasing and collaboration.

Potential Partners

Monitoring/Assessment

[Notes from ICLEI workshop (Worcester)]

Methodology used to calculate savings



Conversion of Fleet Vehicles to Biodiesel

Responsible Party	Individual institution
eCO ₂ Reduction	
Financial Savings	

In 2000, diesel vehicles in the College’s Buildings and Grounds Service Fleet used 5709 gallons of diesel fuel, and miscellaneous lawn mowers and other equipment used 107 gallons of diesel fuel, for a total of 5816 gallons and \$6980. Biodiesel could be used in these vehicles instead. Biodiesel is a clean, renewable fuel substitute produced from agricultural resources such as soybeans or rapeseed. Vegetable oil from these plants, either used or birgin, is processed with lye and methanol to form biodiesel. It can be burned in any standard, unmodified diesel engine, most commonly as a 20% blend. Current biodiesel fleets have reported operational consistency over extended periods of use—engine performance, payload power and range are completely unaltered. There is no cost to covert engines to run on biodiesel fuel, and although a 20% blend of biodiesel costs an average of \$0.20/gallon more than petroleum diesel, biodiesel is both a renewable energy source and a fuel that reduces particulate emissions, making it easier to meet emissions standards. Furthermore, much research is currently underway that seeks to reduce the cost of biodiesel.

Resources

Implementation Strategy

Potential Partners

Monitoring/Assessment

Methodology used to calculate savings