

# **Cutting Global Warming Pollution: Case Studies of Municipal Governments, School Districts, and Communities**

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Towns and cities throughout Massachusetts have already embarked upon and completed a wide range of projects to reduce their greenhouse gas emissions. These projects include, but are not limited to: installation of energy efficient lights in street lights and in town buildings; purchase of electricity produced by renewable energy; renovation of buildings to incorporate energy efficient lights and appliances; purchases of hybrid vehicles; work with religious communities to encourage members to make their homes energy efficient; and educational events to inform the public about climate change.

Many of the projects that communities have completed have resulted in multiple benefits in addition to reducing their impact on climate change. For example, towns that have installed energy efficient lights have not only reduced their greenhouse gas emissions, they have also reduced their electricity bills. Green buildings also have multiple benefits. Research reflects that these buildings use less energy and also increase the productivity of the buildings' inhabitants. Choosing to use public transportation or to walk rather than to drive reduces pollution, noise, and traffic jams. Thus, cities and towns that make changes to reduce their greenhouse gas emissions, find that they are rewarded with environmental, economic and public health benefits.

Towns and cities are often concerned that the initial cost to purchase and install retrofits or to make structural changes to buildings to make them more energy efficient will be prohibitively expensive. However, in many situations, financial assistance is available which will subsidize these costs. Massachusetts has about \$120 million a year, funded through a surcharge on electricity bills and administered by the electrical utilities, which provides financial assistance to governments, businesses, non-profit organizations, and residents who want to make energy efficiency improvements to buildings and homes. A smaller fund is administered by the gas utilities, which funds improvements to gas-fired space and hot water heating systems.

A second source of funding is the Mass. Renewable Energy Trust Fund, administered by the Mass. Technology Collaborative. Funds from this Trust, also created through a surcharge on electricity bills, subsidize the costs of solar and wind power projects, green building construction, and other projects to support the development of renewable energy.

This document describes some of the projects that towns, cities, and community groups have completed in an effort to reduce their greenhouse gas emissions.

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## **I. Energy efficiency retrofits in municipal buildings and schools**

Electricity accounts for approximately 33% of the greenhouse gas emissions generated in the United States. As a result, reducing electricity demand can significantly reduce production of greenhouse gases. Cities can reduce their electricity consumption and their electricity bills by replacing light fixtures with energy efficient bulbs and fixtures and replacing appliances, such as air conditioners, refrigerators and computers, with energy efficient models.

Although cities are typically concerned about the capital outlays required to make these retrofits, rebates from utilities can help reduce the cost of the efficiency upgrades. In addition, since installing energy efficiency retrofits reduces the town's annual electricity expenditures, the payback period for these investments is typically short. Many of the towns which have made investment in energy efficiency retrofit have seen their investments pay back in only a few years.

### **a. Lighting in Lexington Public Schools<sup>1</sup>**

In July of 2003, NSTAR contractor DMJM-Harris presented recommendations to Lexington for making lighting improvements in eight of its public schools. Due to the widespread budget crisis in Massachusetts, the Town was reluctant to go ahead with the projects; it feared that making the energy efficiency upgrades would necessitate cutbacks to school programs. Sustainable Lexington and MCAN, however, convinced the School Department that due to large rebates from NSTAR and short payback periods (of the eight schools, six would have payback periods less than one year, one at just at over a year, and the last at 2.9 years), the investment made financial sense.

"The 80 percent rebate from NSTAR is what allowed us to go ahead," reports Susan Botton, Business Director for the schools. Botton is very pleased with the results. For the four schools that completed payback during late

summer, electricity bills were reduced approximately 23 percent in November and December 2003 from the prior year's electricity bill, saving the schools approximately \$40,000.

Botton notes that the large rebate made it possible for the schools to pay the small cash expense out of their operating funds instead of asking the town to borrow money. The Board may consider borrowing money in the future for projects which cost more and have a longer payback period than the upgrades made in 2003. However, the School Board is reluctant to incur debt, since doing so will involve the Town of Lexington in time consuming and complicated political processes.

### **b. Salem Municipal Parking Garage Lighting Retrofit<sup>2</sup>**

In the fall of 2003, Salem retrofitted the lighting in Salem's municipal parking garage at 1 Liberty Street. Replacement of the high-pressure sodium fixtures with fluorescent lights reduced electricity use by 56 percent which resulted in an annual savings of \$21,887 on the town's electricity bill.

The total cost of replacing 391 fixtures was \$96,438. Rebates from Mass Electric paid \$57,863, 60 percent of the total cost project, leaving the City with a net cost of \$38,575. Due to the significant reduction in electricity use, the project will pay back in less than two years.

### **c. Arlington Town Library Lighting Replacement<sup>3</sup>**

Under the guidance of Sustainable Arlington, Arlington replaced all the light fixtures in Robbins Library. Of the \$40,000 needed to replace 800 fixtures, NSTAR's efficiency funds covered \$32,000 (80 percent), leaving the Town with a bill of only \$8,000. With an estimated electricity savings of about \$9,000 per year, the payback period for this project was less than one year.

Mary Ellen Loud, the Library Director, was delighted with the results of the project: "During tight budget times, I'm very excited that we were able to save money, yet still provide

the same or better quality lighting for our customers."<sup>4</sup>

**d. Lighting in Newton City Hall <sup>5</sup>**

Although the lighting fixtures at Newton City Hall were only about ten years old and, as a result, fairly efficient, the city's decision to replace the fixtures and bulbs with the newest technology yielded significant energy and financial savings. The existing fixtures were mainly high efficiency ballasts with 34 watt lamps; each two-lamp/ballast combination consumed 63 watts. The town replaced these lamps with more efficient F25T12's lamps and replaced the older ballasts with electronics. As a result of these upgrades, power consumption was reduced to 48 watts per fixture and light levels increased 20%.

On average, each fixture retrofit saved 38 kilowatt hours (kWh) of electricity per year. The new fixtures reduced costs by more than \$4 each per year. They also reduced maintenance charges by \$0.25 per fixture per year during the first five years. NSTAR provided rebates which covered \$15 of the retrofit cost of \$35 per fixture. As a result, Newton paid only \$20 per fixture but realized a savings of \$21.25 over the first five years. Thus, Newton's decision to update its system resulted in a 20% return on investment.

**Lighting in Newton City Hall**

	<b>Before</b>	<b>After</b>
Ballasts	Efficiency Ballasts	Electronic Ballasts
Lamps	34 watts	F25T12 (25 watts)
Consumption/Fixture	63 watts	48 watts

**e. Other Newton Building Retrofit Projects**

Between January 2000 and May 2003, Newton completed 35 energy efficiency projects at a variety of municipal and school district buildings, including fire stations, community centers, schools, and the Health Department. The total cost for these changes was \$423,000. Utility rebates covered \$318,000 of this amount resulting in a net cost to the City of \$105,000. Projected energy savings are

533,348 kWh per year, yielding dollar savings of about \$50,000 annually to the city. The investment should pay back in two years. At 1.28 pounds of carbon dioxide emissions per kWh, the City estimates that it reduced its CO2 emissions by approximately 683,000 pounds (341 tons) per year.<sup>6</sup>

**f. Cambridge Municipal and School Buildings, May 1998 Projects <sup>7</sup>**

As of 1998, the City of Cambridge had completed efficiency improvements to a number of buildings, primarily in the public school system. The City received about \$1.52 million in rebates from the utilities, while spending \$2.47 million of its own funds. As a result, the City projects annual savings of 5.005 million kWh, which results in a saving of \$470,850. The City's payback period on the investment was 5.25 years. Although this payback period is longer than most municipalities would like, it is still relatively short and reflects a good financial investment.<sup>8</sup>

"As a result of significant savings at some schools with projects that have short pay back periods, we have been able to fund energy projects with longer payback periods in other schools," reported Schools Superintendent Bobbie D'Alessandro. HVAC projects typically have longer paybacks, and such changes included chiller/cooling tower and HVAC motor replacements at several schools. In addition, to help make the projects affordable, the school system's share of capital costs, about \$2.3 million, was financed over a 10-year period.<sup>9</sup>

A report from NSTAR shows that since the improvements made in 1998 and earlier, Cambridge has continued to utilize the efficiency funds. Between 1999 and early 2003, Cambridge received about \$270,000 in rebates, yielding an estimated annual savings of 666,941 kWh, on 23 separate projects.<sup>10</sup>

## II. Replacement of traffic and street lights with efficient bulbs

Communities can reduce their electricity consumption by replacing their street and traffic lights with more energy efficient technology. Most street lights in Massachusetts use mercury vapor bulbs. Cities can reduce the amount of electricity used to light streets approximately 50% by replacing the mercury vapor bulbs with high-pressure sodium bulbs or metal halide bulbs.

Cities can reduce electricity use from traffic signals approximately 85% by replacing standard bulbs with LEDs (light-emitting diodes). LEDs have color-coded signals that drivers can see but the signals do not illuminate the area around them.

### a. Replacement of Traffic Signal Bulbs With Light-Emitting Diodes (LEDs)

A number of cities and towns in Massachusetts, including Newton, Somerville, Arlington, and Brookline, have replaced standard traffic signal bulbs with LEDs.<sup>11</sup>

**Newton:** The City of Newton replaced the city's traffic signal bulbs with LEDs in \_\_\_\_\_, at a cost of \$124,160. SBC funds paid \$81,946, and the city paid \$42,214. Electricity use was reduced by 126,984 kWh per year, which, at a cost of 10 cents per kWh, saved the City \$12,698 on its annual electric bill. Newton also expects to save substantially on maintenance costs, since the LEDs last several times longer than the old bulbs. The payback period for installing the LEDs was slightly more than three years.

**Somerville:** As of early 2004, Somerville had replaced approximately 50% of its traffic light bulbs. The replacement cost for Somerville is \$289,000. NSTAR will pay approximately two-thirds of this cost leaving the City with a net cost of \$102,000. The expected annual electricity savings is \$62,700 (based on electric rates of 11 cents/kWh), which results in a payback period of less than two years.<sup>12</sup>

**Worcester:** In 1997, Worcester changed all 1,400 red lights in the city from incandescent

bulbs to LEDs which reduced electricity use by 84%. The city's electricity bill for street lights was reduced by 54% and, as a result, the investment was repaid in only one year. The city has also replaced the yellow and green lights with the more efficient LEDs as they burn out.<sup>13</sup>

### b. Replacement of Street Lights with More Efficient Bulbs<sup>14</sup>

**Arlington:** In early 2004, Arlington, which has about 3,540 street lights,<sup>15</sup> signed a contract to replace its mercury vapor lamps with high-pressure sodium bulbs. The Town estimates that electricity requirements will be cut in half from 2.2 million kWh to 1.1 million kWh per year, saving Arlington approximately \$96,000 a year. NSTAR will pay more than 80 percent of the total estimated cost of \$360,000 for the conversion, leaving Arlington with a net cost of only about \$47,000 for the job. Thus, the annual electricity savings is approximately twice the installation cost for the Town, yielding a payback period of only six months. Moreover, since the new bulbs last longer than the old ones, the Town expects to save additional money on reduced maintenance costs.

When Sustainable Arlington initially proposed replacing the bulbs with more efficient bulbs, the Town Manager was concerned that the town's residents would object to the aesthetic differences between the old and new bulbs. High-pressure sodium bulbs are more efficient and cheaper than the alternative choice, metal halide bulbs, but the sodium bulbs create light which is yellow rather than white. In another town where the Town Manager had worked prior to moving to Arlington, residents complained that the yellow light was unattractive.

As a result, prior to making a commitment to change the bulbs, the Town and Sustainable Arlington conducted a test to determine how residents would respond to the new bulbs. They installed sodium and metal halide bulbs on several blocks in the town and then collected feedback from the town's residents. They posted signs on telephone poles indicating which bulb was present, distributed fliers with survey questions to all residents on the

affected blocks, and published an article in the town's newspaper *The Arlington Advocate*. Sustainable Arlington and the Town asked town residents to return surveys to Town officials, providing feedback on the choice of bulbs. The Town received little negative feedback, and virtually no complaints about the yellow tinge of sodium bulbs. As a result, the Town decided to adopt the cheaper, more efficient option and install high-pressure sodium bulbs throughout the town.

**Somerville:** In the early 1990s, Somerville replaced its 4,100 street lights with high-pressure sodium. The new lamps use 145 kilowatts less than the old ones, and provide 30 percent more light per lamp. In addition, the city upgraded most of the lighting in its 19 parks.<sup>16</sup>

### III. Energy efficient design in new buildings and major renovations

Construction of new buildings or major renovations of existing buildings create ideal opportunities for communities to incorporate green design into town buildings. Green buildings provide multiple benefits to a community. Recent research reflects that green buildings result in environmental benefits and also create public health and economic benefits for the buildings' occupants; workers and students tend to work more productively in green buildings than in conventional buildings. Towns can apply for grants from the Mass. Renewable Energy Trust Fund to obtain assistance in financing these construction projects.

#### a. Green Building Design: Cambridge City Hall Annex<sup>17</sup>

At the end of 2003, major renovations were completed on Cambridge's City Hall Annex, 57 Inman Street which transformed the structure into, a LEED-certified green building. Energy-related features incorporated into the building include: a ground-source heat pump system; intelligent lighting (motion detectors, maximum use of natural light, calibration of indoor light levels needed according to avail-

able daylight); a high reflectivity roof to minimize heat absorption; "low-e" double glazed windows that minimize heat loss and gain; and bike facilities. The City estimates that the renovations will result in 44 percent reduction in carbon dioxide emissions. Cambridge received a \$337,500 grant from the Mass. Renewable Energy Trust Fund to install 24 KW of photovoltaic panels on the roof.

The renovated building relies on a heat pump, rather than a furnace or boiler, to control the building's temperature. The pump uses water pumped from underground, where it is a constant 55 degrees, to heat or cool the building's air to the appropriate temperature. Running the heat pump requires electricity, so the Annex's total electric use has increased. However, the building no longer uses any fuel oil, and only a minimal amount of natural gas. The City forecasts that CO2 emissions from the building will fall by 44%, to 161 tons; with 27 tons of reduction due to the production of 36,540 kWh of electricity by the solar panels.

#### Cambridge City Hall Annex

Item	Energy use	Greenhouse gas emissions
1998 actual energy use		
electricity	244,701 kilowatt-hours (kWh)	180 tons CO2
fuel oil	17,109 gallons	188 tons CO2
total CO2		368 tons CO2
Projected energy use		
electricity	310,000 kWh	237 tons CO2
Nat. gas	1,136 therms	7 tons CO2
total CO2		244 tons CO2
Photovoltaic system		
electricity produced	36,540 kWh	- 27 tons CO2
Projected reduction in CO2		161 tons CO2 (- 43.8%)

### **b. Somerville's Michael E. Capuano Early Childhood Center (School)**

The Capuano School is the first LEED registered (a national standard for green buildings) public school in New England. Due to the adoption of energy-efficiency measures, the school has reduced its use of natural gas by 24% and its use of electricity by 43%. The school generates 9% of its electricity from PV panels installed on the roof. As a result of incorporating green design into the building, the school has reduced its carbon dioxide emissions by 567,318 pounds. The City of Somerville expects to save \$60,000 annually on the heating and electricity bills for the school.<sup>18</sup>

### **c. Waltham's Green School Project**

Waltham is incorporating green design concepts into the construction of the South Street Elementary School. Green elements of the new school designed to reduce the school's electricity demands and reliance on conventional energy sources include the following features:

- referred orientation of the building
- "fins" on outside of building to redirect natural light
- skylights to provide natural light
- light sensors in all classrooms
- row of trees between parking lot and school to absorb heat
- heat reflective roof
- light shelves in classrooms to enhance use of natural light by redirecting light off ceiling
- fully operable windows to promote air quality
- low-e glass windows
- high efficiency boilers

Waltham is also considering installing a demonstration solar photovoltaic system on a side wall of the school; final decision on this project is contingent on the city's ability to obtain grant money.

South Street Elementary is the first of eight new "green" schools planned by the district. The City is considering installing geothermal

heat pumps in the next school construction project.

### **d. Newton South High School**

Backed by the Massachusetts Technology Collaborative's (MTC) Green Schools Initiative, Newton has taken great measures to make Newton South High School a "green school." According to Mass Energy Consumer Alliance, the school will use 32% less source energy than a conventional building.

## **IV. Solar hot water and solar photovoltaics**

Cities and towns can support renewable energy by installing solar energy systems on town buildings and by encouraging town residents to install systems on their homes. In addition to reducing greenhouse gas emissions, solar energy systems installed in schools and town buildings provide great opportunities to educate students and the public about the benefits of solar energy. Cities can finance these solar systems by applying for funding from the Mass. Renewable Energy Trust Fund.

### **a. Solar Energy Development: Newton<sup>19</sup>**

In 2003, the City of Newton, with the assistance of the Mass. Renewable Energy Trust fund (MRET), installed 2 kW (kilowatts) of solar photovoltaic (PV) panels on a community center. The Sunergy Program helped fund and install 7 PV installations on residences, for a total of 12 kW, with \$20,000 of the funds having been raised by Newton Green Decade Coalition. In the fall of 2003, the City installed 60 kW on Newton South High School, which is now certified as a green building. The city also plans to install 2 kW of PV on the roofs of six other municipal buildings.

### **b. Solar Power in Municipal Buildings: Westwood<sup>20</sup>**

Through the efforts of two members of the Westwood Environmental Coalition, four solar photovoltaic (PV) systems were installed in

Westwood in late 2003. The 16 kilowatts (kW) of generating capacity were installed on four buildings: the fire station (2.3 kW), the high school (4.7 kW), the First Parish Church (4.7 kW), and St. John's Episcopal Church (2.3 kW). The project was funded largely by a \$72,000 grant from the Mass. Technology Collaborative (Renewable Energy Trust Fund). Private donations covered the remaining cost.

renewable sources, for which TransCanada is charging an extra \$6,400 on the City's contract. (4 cents per kWh).<sup>21</sup>

## **V. Purchases of fuel-efficient vehicles**

State government reflects that transportation accounted for 33% of emissions in 1990, and for 66% of the increase in greenhouse gas emissions during the 1990s. Although municipal vehicles are only a small fraction of the vehicles driven throughout the state, towns and cities can make significant reductions to their carbon dioxide emissions by replacing their vehicles with more fuel efficient vehicles. Cities can join the federal program Cities for Climate Protection which is working with more than 100 municipalities throughout the United States.

### **a. Medford's Use of Electric Cars**

In October 2002, the City of Medford received five new "Think" electric cars donated by the Ford Motor Company. The City uses the cars, which can transport approximately 500 pounds, for short trips at the city's Hormel stadium, cemetery and high school athletic department.<sup>22</sup>

### **b. Boston, Brookline, Arlington and Newton Purchase Hybrid Cars**

Several cities and towns have purchased hybrid gas/electric vehicles in order to reduce the greenhouse gas emissions generated by city vehicles. Arlington purchased a Toyota Prius, rated at 48 miles per gallon, for the Health Department's use. Brookline has already purchased two hybrid cars and plans to purchase additional vehicles in the future.

Boston and Newton have also purchased hybrid cars.<sup>23</sup>

### **c. City Ordinances Require towns to purchase fuel-efficient vehicles**

In 2003, the City Council of Providence, Rhode Island adopted an ordinance requiring the City to purchase fuel efficient vehicles. The ordinance states, "When the City purchases motor vehicles for its municipal operations, each vehicle purchased must be the most fuel efficient model available that will fulfill the intended municipal function; provided that the vehicle also meets other normal procurement criteria including price, reliability, and life-cycle costs. Hybrid or alternatively fueled vehicles shall be prominently labeled."

Earlier, in 2002, Arlington and Amherst, Mass. adopted laws with language similar to the ordinance passed in Providence.<sup>24</sup>

The climate action plan adopted by Medford in October 2001 contains a provision requiring that all new vehicles purchased by the city be the most fuel-efficient vehicles in the class required for the job. The plan also requires the city to evaluate current vehicles in every department to determine if the size and fuel type of the vehicles are appropriate. Under the terms of the plan, Medford is required to purchase smaller vehicles for each department when feasible.<sup>25</sup>

## **VI. Controlling motor vehicle miles driven and providing alternatives**

Massachusetts residents are driving more miles than ever before and driving less efficient vehicles such as SUVs and pickups. In addition to contributing to global warming, our heavy reliance on cars results in traffic congestion and time wasted sitting in traffic. Communities can make efforts to increase use of public transportation, carpooling, bicycling and walking in order to decrease dependence on gas guzzling cars. The decision to walk or bike rather than drive provides public health and environmental benefits.

### **a. Cambridge Requires Companies to Support Cleaner Methods of Commuting**

The City of Cambridge requires new companies to encourage their employees to commute to work by taking public transportation, walking or biking. For example, the company Millennium Pharmaceuticals pays its employees \$175 each quarter for biking and walking and charges them up to \$45 every two week for parking in company spaces. As a result of their green policies, the EPA honored Millennium Pharmaceuticals by placing it on the agency's list of Best Workplaces for Commuters.<sup>26</sup>

### **b. Brookline Encourages Students To Walk to School**

Beginning in 2002 Brookline has sponsored "walk to school" days, encouraging parents to walk with their children to school instead of driving them -- and emphasizing the benefits of walking, in terms of physical health, reduced air pollution, and cutting carbon dioxide emissions.

## **VII. Energy efficiency improvements in houses of worship**

Since many religious belief systems include the principle that humans have an obligation to protect and conserve life and the health of our planet, religious communities are often interested in making changes to reduce their greenhouse gas emissions. In addition to making energy efficiency retrofits in a church, synagogue or other house of worship, religious leaders and members of religious groups can encourage each other to make changes in their homes and daily lives to reduce their energy use.

### **a. Energy upgrades by the Unitarian Society of Northampton<sup>27</sup>**

In 2004, the Unitarian Society of Northampton engaged in a Greening the Congregation exercise that resulted in energy efficiency upgrades in the church and in the residents of church members. After conducting an energy audit of the church, the congregation decided to make upgrades to the lighting, with a total cost of \$2,500. Massachusetts Electric paid 80% of the costs for the upgrades, saving the church approximately \$500 on its annual electricity bill. The payback period for the investment was one year.

In addition, twenty members of the church signed up to purchase green electricity in their homes. Thirty five members of the church agreed to take the Earth Stewardship Pledge which commits an individual to take three actions to reduce his energy use. The three actions are: (1) reduce the thermostat setting by 1 degree during the heating season and by 1 or 2 degrees during the cooling season; (2) reduce driving speed by 2 miles per hour when traveling 50 miles per hour or more; and (3) replace three lights bulbs with more efficient bulbs. A number of other people committed to making additional changes to increase the energy efficiencies of their residents and others put their names on a waiting list to purchase a hybrid car.

## **b. Efficiency retrofits in Needham, Westwood**

Virginia Ryan of the Westwood Environmental Coalition convinced two local churches to undertake efficiency retrofits during 2003. At the Unitarian Church in Needham, \$15,000 was spent on lighting upgrades. A lighting retrofit was also done at St. Margaret Mary's Catholic Church in Westwood. In both cases, much of the costs was covered by rebates from NSTAR.

## **VIII. Residential efficiency retrofits**

The typical home is full of appliances such as computers, washing machines, refrigerators, and air conditioners that use electricity. Home owners can reduce their use of electricity and their electric bills by replacing appliances with more energy efficient models and replacing regular light bulbs with energy efficient compact fluorescent lights. In addition, many residents of Massachusetts who are serviced by the utility Massachusetts Electric can choose to meet some or all of their electricity needs by opting for the green electricity option offered by the utility. Residents can also install solar energy or other renewable energy systems in their homes so that they can generate their own green electricity.

### **a. Medford Sees the Light' Campaign**

'Medford Sees the Light' campaign was an effort to introduce energy efficient lighting to the town of Medford. The Medford Climate Action Network sold compact fluorescent lights to the city's residents and urged every household to buy at least one of the energy efficient bulbs. The group calculated that if all 22,000 households in Medford replaced one regular 60 watt bulb with a more efficient bulb, the town would reduce its annual carbon dioxide emissions by 1.4 million pounds and its collective electricity bill by \$110,000.

### **b. Newton's Kyoto Project**

For the past several years the Green Decade Coalition/Newton has sponsored a "Kyoto Project," with a part-time staff person. The

project's emphasis has been on working with homeowners to plan and undertake complete energy efficiency plans for their houses, including "major measures" such as wall insulation and heating boiler replacement.

As of the fall of 2003, 75 home audits and home energy plans had been completed, according to project director Katherine Gekas, with major efficiency improvements made in most of them.

One example is the home of Bev Droz, the president of Green Decade Coalition/Newton, who reduced her electricity bills by 33% and increased the efficiency of her heating system by 15%. As a result, she is enjoying a savings of about \$450 a year on her electricity bills, and is expecting a reduction in her oil heating bills.

Droz implemented a series of measures, including: replace refrigerator, replace dehumidifier, replace halogen torchiere with a compact fluorescent one, replace light bulbs with CFLs, add insulating cover to attic hatch door, add insulation to bulkhead door, weatherize door to garage, and replace 1950's heating system with Energy Star-rated system. In each cases the Droz's upgraded to Energy Star-certified technologies, which means that the appliance is well above the federal energy standards for the product.

The Droz household's 2003 CO2 emissions dropped by 2.6 tons from 2002 levels, even though 2003 was 14% colder than the year before. Adjusting for the colder weather, the Droz's increased their "CO2 efficiency" by 25%!

Due to the Kyoto Project's work with insulation, the GDC/N became aware of problems with the quality of installations, and has been working with NSTAR both to resolve problems in particular residences and to improve overall quality assurance by their contractors.

## **IX. Education**

Although climate change is one of the most serious problems confronting our society, many people know little about the causes and potential consequences of climate change. Educating citizens about the different factors that contribute to global warming and how their actions are contributing to the problem is an essential first step to action. Communities have sponsored lecture series and educational events to inform the public how individuals can make small changes in their daily lives to reduce their impact on the atmosphere.

### **a. Energy Education in Warwick, Rhode Island<sup>28</sup>**

Half a dozen towns in Rhode Island, including Warwick, have reduced their energy demands and bills through their work with Energy Education, a consulting group that teaches school departments how to better manage their utility costs.

As part of the program, Energy Education requires each town to hire an energy manager who is trained by the consulting group in methods to reduce utility waste in the schools. After the training period, the energy manager works with town employees to make sure that they follow the steps to reduce energy demands and also keeps track of the reductions in energy consumption.

Prior to hiring Energy Education, Warwick had been spending \$2.3 million per year on heat and power in the school systems. After determining that the schools were leaving the heat on for too many hours in the day, the consultant advised the town to reduce the temperature in the school buildings at 3:00 in the afternoon, the end of the school day. Even when the heat was turned off at this time, the temperature in the building remained comfortable for several hours to accommodate teachers and students who were participating in after-school activities. The energy manager also advised the maintenance staff to turn down the temperature on the school boilers. Although the boilers needed to be at only 160 degrees to heat the buildings, most

of the boilers were 180 to 200 degrees which resulted in significant waste of energy.

The energy manager also educated workers in the building on ways to reduce their energy demands by making simple changes such as turning off lights and appliances when they were not in use. As a result of the program, Warwick has saved approximately \$500,000 on its annual energy bills.

### **b. Boston Hosts Educational Events**

In 2003, the Boston Climate Action Network hosted two educational events to inform the public about climate change. The first event was a talk at the New England Aquarium on the subject of renewable energy production on the Boston Harbor Islands. The second event, hosted at the George Robert White Environmental Education Center, was a talk on the topic of green buildings and homes.

### **c. Medford's Month of Weekly Lectures**

Medford hosted a month long speaker series on climate change which involved weekly lectures on different aspects of the topic. The series included presentations by a number of organizations including the Union of Concerned Scientists, Cape Wind and the New England Aquarium.

### **d. Solar Homes Tour in Newton**

For the past four years, Newton has hosted a Solar Homes Tour, which allows the public to visit residences that have solar hot water or solar photovoltaic panels installed.

## X. Endnotes

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<sup>1</sup> Susan Botta, Business Director, Lexington Public Schools, 3/2/04; Pat Gozempa, Salem Alliance for the Environment.

<sup>2</sup>

<sup>3</sup> "New lighting saves library money," Sarah Hill of Sustainable Arlington, *Arlington Advocate*, 11/14/02.

<sup>4</sup> Sarah Hill, 11/14/02.

<sup>5</sup> "Making Local Government Energy Efficient," David Tannozzini, City of Newton, 10/2002.

<sup>6</sup> Spreadsheet from David Tannozzini, Newton electrical engineer, titled "Newton EE projects to 0503.xls."

<sup>7</sup> Rosalie Anders and John Bolduc, City of Cambridge.

<sup>8</sup> Handout titled "City of Cambridge --- May 1999, Energy Conservation Projects," provided by Rosalie Anders of the City staff.

<sup>9</sup> Letter from Schools Superintendent Bobbie D'Alessandro to the Cambridge School Committee, 5/8/98. Also see *Boston Globe*, 5/24/98 and *Cambridge Chronicle*, 5/21/98.

<sup>10</sup> "Muni UsageJobs.xls Cambridge EE," prepared by NSTAR Energy Efficiency, 7/14/2003.

<sup>11</sup> Brookline - phone call with Werner Lohe 9/26/01.

<sup>12</sup> "Saving Electricity, Somerville Leads the Pack," Andrea Ranger, *Somerville Journal*, 1/19/2004.

<sup>13</sup> Local Action Urged On Climate Change, John J. Monahan, *Worcester Telegram*, 4/1/04.

<sup>14</sup> Chris Granda (Arlington), Andrea Ranger (Somerville).

<sup>15</sup> Memo dated 5/2/01 from Climate Wise Arlington.

<sup>16</sup> Ranger, 1/19/2004.

<sup>17</sup> John Bolduc, Cambridge Environmental Planner, via email, 11/5/02.

<sup>18</sup> Robert W. Varney: Bay State Towns Leading On Energy, Robert W. Varney, 11/6/2003. Action Plan Gives Plan To Save Somerville's Climate, Auditi Guha, *Somerville Journal*, 10/16/03.

<sup>19</sup> Katherine Gekas, Energy Committee Chair, Green Decade Coalition; David Tannozzini, City of Newton.

<sup>20</sup> Peter Kane and Virginia Ryan, Westwood Environmental Coalition, phone conversation with Virginia Ryan, 8/8/2003.

<sup>21</sup> Sean Cronin, Brookline Deputy Town Administrator, quoting the TransCanada contract, 8/12/03.

<sup>22</sup> City Receives Five Electric Cars, James Haynes, *Medford Transcript*, 10/30/2002.

<sup>23</sup> Green Fleets: Fuel-Efficient Vehicle Purchases by City Governments, Marc Breslow, January 2004. Warrant Article #22: Procurement of Fuel Efficient Town Vehicles, Submitted by Sustainable Arlington, a Sub-Committee of Vision 2020, Marc Breslow.

<sup>24</sup> Warrant Article #22: Procurement of Fuel Efficient Town Vehicles, Submitted by Sustainable Arlington, a Sub-Committee of Vision 2020.

<sup>25</sup> Green Fleets: Fuel-Efficient Vehicle Purchases by City Governments, Marc Breslow, January 2004.

<sup>26</sup> Robert W. Varney: Bay State Towns Leading on Energy, Robert Varney, 11/6/03

<sup>27</sup> Peggy MacLeod via email.

<sup>28</sup> Elizabeth Seal, "Schools told energy conservation could save \$3.7M in 7 years," *Cranston Herald*, September 23, 2004.