



2010

Town of Dedham, Massachusetts Energy Reduction Plan



Dedham Energy Reduction Plan 2010

Dedham Sustainability Advisory Committee

Dedham Environmental Department

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I. PURPOSE AND ACKNOWLEDGMENTS

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October 6, 2010

Ms. Virginia LeClair
Environmental Coordinator
Town of Dedham Conservation Office
Town Office Building
26 Bryant Street
Dedham, MA 02026

Dear Ms. LeClair:

Please be advised that at their meeting of September 30, 2010, the Board of Selectmen voted to adopt the Town of Dedham, Massachusetts, 2010 Local Climate Action Plan.

If you have any questions or need further assistance, please do not hesitate to call.

Very truly yours,

William G. Keegan, Jr.
Town Administrator

Cc: File



DEDHAM SCHOOL COMMITTEE

Tom Ryan, Chair
Kevin Coughlin, Vice Chair
Dave Roberts
Tracy Driscoll

Joe Heisler
Dimitria Sullivan
Mayanne Briggs

October 12, 2010

Ms. Virginia LeClair
Environmental Coordinator
Town of Dedham
26 Bryant Street
Dedham, MA 02026

Dear Ms. LeClair,

At the School Committee meeting of October 6, 2010, the Committee voted to endorse the Local Climate Action Plan for the Town of Dedham as presented. This endorsement comes with the understanding that any programs impacting or altering the curriculum and/or budget of the Dedham Public Schools would be subject to review by the School Committee and the Administration.

Sincerely,

A handwritten signature in blue ink, appearing to read "Tom Ryan".

Thomas Ryan
Chairman, Dedham School Committee



DEDHAM SCHOOL COMMITTEE

Tom Ryan, Chair
Kevin Coughlin, Vice Chair
Dave Roberts
Tracy Driscoll

Joe Heisler
Dimitria Sullivan
Mayanne Briggs

Ms. Virginia LeClair
Environmental Coordinator
Town of Dedham
26 Bryant Street
Dedham, MA 02026

Dear Ms. LeClair:

At the School Committee meeting of October 6, 2010, the Committee voted to adopt the Town of Dedham's Fuel Efficient Vehicle Policy as presented.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Tom Ryan'.

Thomas Ryan
Chair, Dedham School Committee

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I. EXECUTIVE SUMMARY

A. Narrative Summary of the Town

Dedham, MA is a classic New England town with a Town Meeting form of government that blends elements of urban sophistication, being just outside of Boston, while maintaining that small town flavor. While we are a small town of only 23,464, with approximately 8,900 housing units, we have diverse population of varied income levels, education, and occupations. There are 21 municipal buildings, including schools and 89 municipal vehicles within the Town fleet.

The Town of Dedham has been successful in aligning ourselves with the Commonwealth's sustainable development principles, which was reflective in our 2010 Commonwealth Capital score of 113, placing Dedham in the top 5 communities in the state. Through the work of the Selectmen appointed Sustainability Advisory Committee and the full time Environmental Coordinator the Town of Dedham has been very proactive in exploring many aspects of sustainability. In 2009 the Town was one of three communities to receive the Leading by Example Award from the State for outstanding efforts to establish and implement policies and programs resulting in significant and demonstrable environmental benefits in the realm of energy efficiency, renewable energy, water conservation, and waste reduction. This Energy Reduction Plan is part of the Town's Local Climate Action Plan, both of which represent a collective effort by all municipal departments, including the schools and reflects the Town's intentions to build a community for the future that is economically strong and environmentally sound.

The Town of Dedham is a member of ICLEI – Local Governments for Sustainability and has used their Clean Air Climate Protection (CACCP) software to conduct a baseline energy use inventory that established a starting point for our reduction goal identified in this plan. We entered into this software the Town's electricity and fuel usage for the baseline year of 2009 and the tool calculated and tracked our emissions of greenhouse gases (carbon dioxide, methane, nitrous oxide) and criteria air pollutants (NO_x, SO_x, carbon monoxide, volatile organic compounds, PM₁₀) associated with electricity and fuel use, as well as MMBtu of energy consumed.

The Town established a baseline year of 2009. This report reflects the comprehensive program that the Town has designed to reduce our baseline energy use of 150,091 MMBtu by 20% below 2009 levels (baseline year) by 2014. The Environmental Coordinator has also been trained on DOER's MassEnergy Insight software and intends to use that moving forward to track the Town's progress towards this goal.

This Energy Reduction Plan outlines the actions – policies, programs, and projects – the Town of Dedham will undertake to meet this reduction goal.

B. Summary of Municipal Energy Uses

1. Please see Appendix C for a breakdown of municipal buildings, including schools by type of heating fuel
2. Please refer to Appendix A for the Town's Green Fleets Fuel Efficiency Policy. Please see Appendix B for an inventory of the Town's vehicle fleet with replacement plan. The vehicles highlighted in blue represent vehicles that the fuel efficient vehicle policy applies to.

C. Summary of Energy Use Baseline and Plans for Reduction

Please see Appendix D: Siemens Performance Contracting Energy Savings

D. Goals and Strategies to Execute the Energy Reduction Plan

This Energy Reduction Plan is part of a larger Sustainable Dedham initiative in which the Town is using a multi-pronged approach to reduce both energy usage and therefore carbon emissions. In 2007, the Conservation Commission and Town Administrator created the position of Environmental Coordinator. The Environmental Coordinator oversees a vast array of environmental issues including climate change, recycling, stormwater, and wildlife management. This position works with the Conservation Commission as their Stormwater Officer reviewing and issuing stormwater management permits and serves as staff to the Sustainability Advisory Committee. The mission of the Environmental Department is to protect the Town's natural resources and create a sustainable Dedham by actively engaging residents and businesses in understanding environmental issues affecting the community.

The Dedham's Sustainability Advisory Committee was established in June 2008 to advise the Town's Board of Selectmen on strategies for advancing the Town's commitment to renewable energy, at the municipal, business, and residential levels. The purpose of the Committee is to educate Dedham and encourage energy conservation and sustainability by addressing the long term impacts of fossil fuels such as pollution, global warming and climate change. By engaging the community in making smart energy choices we are forging the path for a sustainable Dedham that will have a long-lasting, positive impact on future generations.

The Town is members of ICLEI – Local Governments for Sustainability and as a member has committed to completing the 5 Milestone Process toward climate protection. The Town has completed Milestones 1-3 by conducting an emissions inventory and forecast, set emissions reduction targets and developed a local climate and energy action plan. The final two milestones involve implementing the measures outlined in the plan and tracking and measuring the progress.

In addition, the Town has been asked to join a state wide campaign of the Massachusetts Climate Action Network (MCAN) called the Cool Mass Campaign to reduce carbon emissions. Dedham is one of 9 communities in MA to be chosen to participate in this groundbreaking endeavor. The goal of the Cool Dedham campaign is to empower at least 25% of Dedham households, over the next three years, to reduce their annual carbon footprints by at least 25%. The process is team focused, with friends, neighbors, and work colleagues joining Eco Teams or small groups of individuals that will help to educate and inspire each other to reduce their carbon footprint. The teams utilize The Low Carbon Diet – A 30 Day Program to lose 5000 Pounds as their guide. As a result of this campaign Dedham's overall carbon footprint will be reduced by approximately 178 million pounds of CO₂.

The Town has engaged in an ESCO with Siemens and is making significant energy improvements to its buildings and traffic signals. Dedham is committed to these energy improvements and will repay

the cost of these improvements through the on-going utility savings realized as part of the performance contract.

Each of these departments, committees, strategies, and goals will assist the Town in meeting the goal of this plan to reduce energy consumption by 20% in 5 years across all municipally owned and operated buildings, vehicles, street lights, and traffic lights.

II. ENERGY USE BASELINE INVENTORY

- a. Identification of Inventory Tool Used: ICLEI CACP Software
- b. Identification of the Baseline Year: 2009
- c. Municipal Energy Consumption for the Baseline Year:

The Town established a baseline year of 2009. According to the CACP software the Town of Dedham's Carbon Dioxide emissions for 2009 were 5,705 tons, Nitrous Oxide was measured at 31 lbs, and Methane was reported at 1,178 lbs. Our total energy use for 2009 was 150,091 MMBtu. See Appendix C, Table 2 -Summary of Municipal Energy Usage

- d. Identify Areas of Least Efficiency/Greatest Waste:

There are 21 municipal buildings, including schools and 89 municipal vehicles within the Town fleet. The data from our 2009 energy use baseline inventory revealed that the Main Fire Station and the High School were the largest energy consumers in Town. This is due in part to the size of the High School and the 24 hour operation of the Main Fire Station. The Town has engaged Siemens in a performance contract where they have conducted an investment grade audit of all of the buildings and are in the process of meeting each buildings need as determined by the audit. The end result will be improved efficiency of municipal and school buildings. (See included CD, Attachment A- Energy Management Services Agreement, Attachment B – Scope of Work and Attachment F – Performance Assurance Plan)

Fire station- 21,995 MMBtu
1,275 tons CO2
Dedham High School-15,320 MMBtu
645 tons CO2

- e. Areas that can be Most Easily Addressed:

The Town of Dedham has entered into an Energy Savings Performance Contract with Siemens, in which an Investment Grade Audit was conducted identifying Lighting and Lighting Controls as the area that could most easily be addressed through upgrades. Siemens has begun to upgrade the existing fixtures in all municipal and school buildings including lamps, and/or ballasts with more energy-efficient fixtures, lamps, and or ballasts. In addition, to lighting retrofits Siemens has also installed occupancy sensors to automatically shut the lights off in certain identified areas, such as offices.

III. SUMMARY OF ENERGY AUDITS

The Town of Dedham solicited an Energy Saving Performance Contract (ESPC) using MGL 25A 11i. We completed an RFQ and a selection process and chose Siemens for the ESCO partner. The Town of Dedham has an agreement with Siemens for an Investment Grade Audit (IGA) of 13 municipal and school buildings. This audit considered the facilities mechanical, electrical, and building envelope and analyzes the overall energy efficiency of the buildings (See included CD, Attachment B – Scope of Work).

The energy efficiency opportunities that were identified included lighting retrofits, lighting controls, energy management system (EMS) to control specific equipment at each building, sealing of gaps, cracks and holes in the building envelope at each of the buildings as needed, installation of vending machine controls to manage the power consumption of the machines using Vending Miser control systems on 10 cold drink machines and seven snack machines, pipe insulation on steam and condensate piping for the High school and Oakdale elementary schools, boiler replacements at the High School, Main Fire Station ECEC and the Main Police Station. In addition a new power management network utility system will be installed to measure, manage and minimize the energy consumed by the network's PC clients through one centralized interface. This system will address the energy usage of the computer workstations at the Town Hall, libraries, the High School and all elementary schools.

A crucial discovery by the audit found that based on CO2 measurements that were taken at the schools, the High School and 3 of the elementary schools appear to be lacking mechanical ventilation, therefore existing units will be demolished and replaced with new ventilators.

Existing high flow toilets will be replaced with new, low flow fixtures, sink faucets will be retrofitted with low flow restrictors and where applicable showerheads will be replaced with low-flow showerheads. Valve jackets will also be replaced with energy saving thermal blanket system on steam valves and cool control systems will be installed for the walk-in cooler/freezers located in the High School. Domestic hot water will be updated where necessary and the pool cover at the Recreation Facility will be installed to reduce evaporation and heat loss. Infrared Heaters will be installed at the Parks Department, Mechanics, and DPW garages and all Town owned traffic signals will be retrofitted from incandescent bulbs to LED. This accounts for 496 bulbs that will be replaced with LEDs in the Town.

The Town of Dedham was awarded \$500,000 through Congressman Stephen Lynch's office (funding was included in the Energy and Water Appropriations Act for FY 2010) to install photovoltaic panels on Town Hall and the Department of Public Works roofs as part of the Dedham Municipal Solar Project. This project will result in a savings of \$10,571 in the first year for the system installed on Town Hall, while offsetting 1,137 tons of carbon dioxide, the equivalent of planting 5,064 trees. The PV system for the Department of Public Works could save the Town \$20,177 in the first year, while offsetting 2,335 tons of carbon, the equivalent of planting 10,401 trees.

The Town was also awarded \$150,000 through Energy Efficiency Conservation Block Grant (EECBG) program to use towards the cost of an Energy Management System for the Greenlodge Elementary School and Early Childhood Education Center (ECEC) as part of the ESCO project.

For every dollar spent on the upgrades that are outlined in this audit the Town will be reducing its greenhouse gas emissions and operating costs, while increasing the community's knowledge of energy efficiency projects. This project will show leadership from the Town in tackling climate change and will engage and educate the community in making smart energy choices.

IV. ENERGY CONSERVATION

A. Overview of Short- and Long-Term Goals

The Environmental Department, along with the Sustainability Advisory Committee have made great strides in a short period of time. As mentioned earlier this plan is part of a larger Sustainable Dedham Initiative, which the Town has received numerous grants and awards for its efforts. Many of the energy savings initiatives will be addressed through the ESCO where both short and long-term goals will be addressed as this process plays out over the 20 year contract. Monitoring of these energy improvements will be a long-term goal of the Environmental Department.

The fuel efficiency policy will be very helpful as we begin to turn over our municipal fleet and purchase more fuel efficient vehicles. This will again be both a short and long term goal as it will be ongoing.

1. Municipal Buildings

Occupancy Sensors

Measure Status: Complete and Underway - Short term goal as incorporated in ESCO

Responsible Department: Environmental, Town Administrator, Library, Schools

Motion sensor lighting was installed in the restrooms at Town Hall, conference rooms and stairways in 2009 thanks to an NSTAR rebate program. The same year the top floor and basement of the main branch of the library had motion sensors installed. Occupancy Sensors are an immediately noticeable improvement over outdated technology which town citizens can observe and feel confident that Dedham is dedicated to saving energy. The money that is saved on energy bills can be used to fund other measures.

By the end of 2012, we plan to retrofit all municipal buildings with occupancy sensors as part of the ESCO project the Town is undertaking with Siemens.

Water Conserving Plumbing in Municipal Restrooms

Measure Status: Complete and Underway - Short term goal as incorporated in ESCO

Responsible Department: Environmental, Town Administrator, Library, Schools

In 2009, the Massachusetts Water Resources Authority appropriated \$100,000 for the installation of low flow toilets in a municipal building. As a result of this, the Environmental Coordinator and the School Building Facility Manager worked together to retrofit 25 toilets at the Greenlodge School. Dedham was originally given \$1,600 based on our population, but received another \$1,000 when other communities did not claim their funds. The goal of this project is to retrofit all twenty five toilets at Greenlodge and bring the water consumption rate per flush down to 1.6 gallons from 3.5 gallons.

As part of the ESCO all existing high flow toilets will be replaced with new, low flow fixtures, sink faucets will be retrofitted with low flow restrictors and where applicable showerheads will be replaced with low-flow showerheads.

Replace all Antiquated Appliances/Electronics with Energy Star Models

Measure Status: Short-term

Responsible Department: Information Technology (IT), Facilities Management, Environmental

The energy star program was created by the EPA in 1992 to provide consumers with an energy efficient alternative to products that normally use large quantities of electricity or natural gas. We plan to assess all appliances owned by the Town and determine how many energy star models are currently in use. This includes all, televisions, room air conditioners and refrigerators currently in use in all town buildings. We pledge that within the next three years, all outdated appliances will be replaced with energy star models. The total savings in energy costs should outweigh the cost of the new appliances/electronics within a very short period of time. All town computers are currently energy star models

Town Operated Compact Fluorescent Light Bulb Distribution Program

Measure Status: short term goal

Responsible Department: Environmental

The compact fluorescent bulb has reached iconic status as a symbol of the sustainable living movement. However, despite the positive publicity, many consumers still opt for incandescent bulbs because of the lower price. The price difference is deceiving because a fluorescent bulb will last ten times longer than an incandescent one simply because it uses six times less energy, and generates that much less heat. Therefore the energy savings makes the compact fluorescent not only the more sustainable option, but also the most economical in the long run. To convince Dedham citizens of this advantage, we would provide compact fluorescent bulbs at an affordable price through the Environmental Department. If consumers can buy the best product at a discounted price, then that product will, of course become the most widely used variety. This action will be heavily promoted annually, each April in celebration of Earth Day.

L.E.D. Exit Signs and Fire Alarm Signals

Measure Status: short term goal as incorporated in ESCO

Responsible Department: Facility Managers (schools and municipal)

Light emitting diode (L.E.D) technology has quickly become a favored, energy efficient alternative to incandescent lighting over the past decade. Although it may be difficult to assess exactly how much energy is consumed by these fixtures, we need to remember that lighting accounts for a significant portion of energy use in government buildings. The cost of these particular signals ranges from \$40-\$50 per signal (excluding labor costs).

This measure is included in the performance contract with Siemens.

Performance Contracting

Measure Status: Underway

Responsible Department: Environmental, Town Administrator, Finance, School, Building

Part of Dedham's appeal is that many of our town structures date back to the early twentieth century, however these older buildings are extremely energy inefficient and often times uncomfortable for the occupants, as well as expensive to maintain. To rectify this problem, the

Town of Dedham has partnered with Siemens Building Technologies to incorporate energy efficient improvements into all municipal buildings and school buildings.

We plan to improve the efficiency of our buildings by utilizing Performance Contracting, a twenty year process which enables municipal governments to fund utility improvements over time with actual energy savings. The scheduled improvements as listed earlier are also outlined in the attached CD since the file was too large to attach to this document electronically.

The cost of the entire project was calculated in March 2010 to be \$12,344,681. At first glance, this seems to be a staggering figure, but with about \$650,000 in grants, \$300,000 in utility incentives and annual energy savings of \$507,523, we could easily pay off the renovation costs within the next twenty five years.

2. Vehicular Energy Conservation

The leading cause of carbon dioxide emissions in America is transportation. Considering the fact that carbon dioxide alone accounts for ninety five percent of all greenhouse gas emissions, it is imperative that the Town of Dedham takes action improve its municipal fleet (including schools) by purchasing fuel efficient vehicles and alternative fuel vehicles. The Town views this initiative as both a short-term and long-term goal as we replace older vehicles with more fuel efficient models. Appendix A is the Town of Dedham's Green Fleets Fuel Efficiency Policy. Appendix B is the Town's vehicle fleet inventory and replacement plan.

Fuel Efficient Vehicles for Municipal Fleet

Measure Status: short and long-term goal

Responsible Department: Environmental, Police, Fire, DPW, Engineering, School Department, Parks and Recreation, Council on Aging, Youth Commission, Canine Control

The Town of Dedham's Board of Selectmen approved the Fuel Efficient Vehicle Policy for Municipal Fleet Vehicles on July 8, 2010. Recognizing that fuel costs are a direct impact to daily operating budgets the Selectmen took action to reduce not only spending by purchasing more fuel efficient vehicles, but the impact the Town's fleet will have on the environment. According to the EPA every gallon of gasoline a vehicle burns puts 20lbs carbon dioxide into the atmosphere. On average a vehicle emits 6 to 9 tons of carbon dioxide a year. By purchasing vehicles with better fuel economy, even a difference of 20 to 25 miles per gallon (mpg) can prevent 10 tons of carbon dioxide over the lifetime of the vehicle from entering the atmosphere. See Appendix A: Fuel Efficient Vehicle Policy

Alternative Modes of Transportation for Police

Measure Status: Underway and Long-term

Responsible Department: Environmental and Police

The Police Department Currently owns a Global Electronic Motorcars (GEM), which is most often used for meter duties. The Town owns nine mountain bikes. During 2011, the Town plans to work with the Police Department to procure additional alternative transportation vehicles. This item is marked as a long term goal since its dependent on grant funding and availability.

Global Electronic Motorcars (GEM) are battery and electric operated low speed cars, legal on roads with a speed limit of 35mph or less. These vehicles are designed for neighborhood travel

and require a charge every thirty miles. They are available in two, four or six passenger models and include an onboard charger

The Segway could prove to be a beneficial piece of equipment for patrolling Dedham Square. It is eleven times more fuel efficient than an average automobile and three times more efficient than a scooter. They do not emit exhaust fumes, so they can be used both indoors and outdoors

Costs: \$7,395 for two passengers GEM,
 \$850 for one police bicycle
 \$5000-\$6000 for i2 Segway

3. Installation of L.E.D. Traffic Signals

Measure Status: Short term goal as part of ESCO

Responsible Department: Public Works

Siemens will be retrofitting all Town owned traffic signals as part of the ESCO from incandescent bulbs to L.E.D. These account for 496 bulbs that will be replaced with LEDs in the Town (see table below). An L.E.D (Light-emitting diode) is a semiconductor of electricity which dispenses light by using solid state electronics. Tens or hundreds of L.E.D.s, measuring at about .25 inches each can be grouped together to shine brighter than an incandescent bulb. An incandescent traffic bulb lasts for about a year while an L.E.D. lasts for five to seven years on average and uses eighty to ninety percent less electricity than the traditional bulb. Although converting the conventional signals to modern L.E.D. lights can be a costly procedure, savings on maintenance costs add up quickly resulting in a payoff in about two years.

Retrofit Incandescent Traffic Signals to L.E.D

Size/Color	Qty
12" Red	126
12" Yellow	136
12" Green	98
12" Green Arrow	10
12" Yellow Arrow	6
8" Red	6
8" Yellow	74
8" Green	4
8" Yellow School Flasher	20
8" Yellow Hazard Flasher	4
8" Red Hazard Flasher	4
12" Yellow Hazard	8
Total	496

B. Summary of Long-Term Energy Reduction Goals – Beyond 5 years

LEED Certification of Municipal Buildings

Measure Status: Long term goal

Responsible Department: Building, Environmental, Town Administration

Leadership in Energy and Environmental Design is a revolutionary grading system for sustainable buildings created by the U.S. Green Buildings Council. As a third party program, LEED ratings are the most trusted indicators of a buildings' sustainability in the nation. LEED certification is achieved by all around improvement of energy efficiency, water conservation, emissions reductions, indoor conditions, impact on surrounding establishments, modern technological innovation and environmental awareness. Along with the physical benefits of creating a greener facility, obtaining LEED certification may also influence surrounding establishments to create a more eco-friendly community.

LEED certified buildings already existing in Dedham include L.L. Bean and Whole Foods. The Animal Rescue League of Boston at 238 Pine St. is currently taking steps to achieve LEED certification. The gray water used to bathe the animals will be recycled with a cistern. A porous driveway is also planned to allow for greater recharge of surface water to the groundwater table. A green roof will also be installed at this facility to help reduce the heat island effect.

In May 2010 Town Meeting passed the Stretch Energy Code, a requirement of the Green Communities Act. This new appendix to the MA State Building Code minimizes the life cycle energy costs for all new construction and is a step closer for the Town in achieving sustainable construction.

Install a Fuel Cell at Dedham Police Station

Measure Status: Long-term – possibly over 5 years

Responsible Department: Police Department

A fuel cell is an energy efficient alternative to grid electricity. The device runs in a very similar fashion to a battery. Oxygen and hydrogen activate electrodes on either end of the cell to create electricity. This eliminates the need for power lines, therefore limiting the chances of a blackout. The main difference between a fuel cell and a battery is that a fuel cell will not run out or require recharging if adequately supplied with hydrogen fuel. The hydrogen fuel is poured into the anode while oxygen flows through the cathode. Then, an anode catalyst such as cerium dioxide splits the hydrogen atom allowing the proton to flow through the electrolyte in the center. The electrons join up with the protons at the cathode and there, with the flowing oxygen, the only emission is water vapor. The police station would be a prime candidate to introduce this technology to the town for a number of reasons. First of all, they would be more adversely affected by a blackout due to the constant flow of information and reliance upon many different mediums to transmit that information, which is often of an urgent nature.

V. MEASUREMENT AND VERIFICATION

All municipal and school buildings as a result of the ESCO project will be monitored through an Energy Management System. The energy uses of each building will be available online for facility managers, as well as the public to view. The data from this system will be monitored by the Environmental Coordinator and will be logged into both ICLEI's CACP software and MassEnergy Insight software. This software will allow for comparison among buildings and future reporting as required by both the Green Communities Division and ICLEI.

As vehicles are turned over the fuel used will be monitored to prove the financial savings generated from switching to more fuel efficient vehicles, as well as the environmental benefits through reduced greenhouse gas emissions.

VI. ONSITE RENEWABLE ENERGY PROJECTS

The Town of Dedham received Congressional funding from the Federal Land and Waters Appropriation Act to install solar photovoltaics on the Town Hall and DPW roofs. Dedham Town Hall is approximately 17,430 square feet with a flat, rubber roof that is approximately 20 years of age. The current roof is in poor condition, the insulation is water saturated, therefore dramatically reducing the thermal value of the existing insulation. Installation of a new roof and new insulation will greatly improve the energy efficiency of the building. The new roof will consist of a highly reflective or white surface to reduce solar heat gain, therefore reducing energy consumption during summer months. Installing the roof in conjunction with the solar panels is advisable in order for solar panel supports to be efficiently incorporated into the new roof system. It is anticipated that the cost of this work will range between \$173,300 and \$218,300. The Town has appropriated \$250,000, which is included in this FY budget cycle. The new roof is essential to improving energy efficiency and the structural integrity for this project. A Feasibility Study indicated that a 49.9 kW system would be appropriate for Town Hall, covering 40% of the roof. The Department of Public Works building is approximately 13,800 square feet and has the newest roof in Town, installed in 2005. The new, flat, rubber roof has an immense amount of unobstructed roof space. The Feasibility Study estimated a 99.8kW system, covering 80% of the roof for the Department of Public Works would be appropriate.

The power that is generated from these arrays will be used at these buildings to offset the energy demand. It is estimated that the solar array for Town Hall will result in a savings of \$10,571 in the first year, while offsetting 1,137 tons of carbon dioxide, the equivalent of planting 5,064 trees. The PV system for the Department of Public Works could save the Town \$20,177 in the first year, while offsetting 2,335 tons of carbon, the equivalent of planting 10,401 trees. An educational kiosk will be placed at each building, providing an educational opportunity for students and the general public. This project will be completed by the summer of 2011.

The Dedham Middle School, which was built in 2006 as a Mass CHPS school is also LEED certifiable. The building was sited on an east-west axis to optimize daylighting opportunities and through daylighting and high-efficiency light fixtures reduces lighting costs by 9%. A 30kW flat mounted solar system is installed on the roof which will generate a portion of the school's power. In addition, a stormwater recycling system collects rainwater from the school roof, which is funneled to a 50,000 gallon cistern for use in sewage conveyance and site irrigation.

The Town is in the permitting process for construction of a new elementary school, which is striving to be LEED Platinum. This building is forecasted to be completed in 2012 and will also consist of a solar array. If grant funding becomes available the Town would like to outfit the old municipal landfill with photovoltaic panels.

VII. CONCLUSION

a. List of Resources

Town of Brookline, Local Action Plan on Climate Change, 2002
City of Cambridge Climate Protection Plan, 1999

Siemens Energy Management Services Agreement and Scope of Work, 2009
<http://www.cee1.org/gov/led/led-main.php3>
<http://www.cee1.org/gov/led/led-how.pdf>
<http://www.toolbase.org/Technology-Inventory/Electrical-Electronics/white-LED-lighting>
http://www.cityofknoxville.org/Press_Releases/Content/2007/1205.asp
<http://www.portlandonline.com/shared/cfm/image.cfm?id=111737>
<http://www.cityofreno.com/Index.aspx?page=1080>
<http://www.bing.com/images/search?q=Cities+for+climate+protection+campaign+ICLEI&form=QBIR&qs=n&sk=#focal=1b1786bc46db737511c8c323f98d9d52&furl=http%3A%2F%2Fwww.kalamunda.wa.gov.au%2FNR%2Frdonlyres%2FB4333DBF-4864-47A5-BD7D-3CBC99DF6090%2F120%2Fccplogo.jpg>
<http://www.freeenergy.ca/news/120/ARTICLE/1430/2008-04-17.html>
<http://www.sciencedaily.com/releases/2005/03/050321084549.htm>
<http://climateprogress.org/2009/05/14/lancet-global-health-impacts-climate-change/>
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b. Contacts

The Environmental Department and Sustainability Advisory Committee prepared this document. Inquiries may be addressed to:

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APPENDICES

Appendix A

Town of Dedham **Fuel Efficient Vehicle Policy**

Approval Date: July 8, 2010

Effective Date: July 8, 2010

DEFINITIONS

Combined city and highway MPG (EPA Combined fuel economy): Combined Fuel Economy means the fuel economy from driving a combination of 43% city and 57% highway miles and is calculated as follows:

$$=1/((0.43/City\ MPG)+(0.57/Highway\ MPG))i$$

Drive System: The manner in which mechanical power is directly transmitted from the drive shaft to the wheels. The following codes are used in the drive field:

AWD = All Wheel Drive: four-wheel drive automatically controlled by the vehicle powertrain system

4WD = 4-Wheel Drive: driver selectable four-wheel drive with 2-wheel drive option

2WD = 2-Wheel Drive

Heavy-duty truck: A vehicle with a manufacturer's gross vehicle weight rating (GVWR) of more than 8,500 pounds.

POLICY STATEMENT

In an effort to reduce the Town of Dedham's fuel consumption, energy costs, and carbon emissions the Board of Selectmen hereby adopts a policy to purchase only fuel efficient vehicles whenever such vehicles are commercially available and practicable.

OBJECTIVE

To establish a requirement for the Town of Dedham to purchase only fuel efficient vehicles for municipal and school use whenever such vehicles are commercially available and practicable.

APPLICABILITY AND EXEMPTIONS

This policy applies to all divisions and departments of the Town of Dedham with the following exemptions. Heavy duty vehicles such as fire-trucks, ambulances, Public Works and Parks and Recreation vehicles are exempt from this criterion. In addition, police cruisers and Fire Department command vehicles that are used to respond to emergencies are exempt from this criterion. However, the Police Department will commit to purchasing fuel efficient cruisers when they become available in the police package. Police department administrative vehicles must meet fuel efficiency requirements.

FUEL ECONOMY GUIDELINES

The Town of Dedham will maintain an annual vehicle inventory for non-exempt vehicles and a plan for replacing these vehicles with vehicles that meet the fuel efficiency ratings below. Based on the most recently published US Environmental Protection Agency data on fuel efficient vehicles, vehicles are to have a combined city and highway MPG no less than the following:

- 2 wheel drive car - 29 mpg
- 4 wheel drive car- 24 mpg
- 2 wheel drive small truck- 20 mpg
- 4 wheel drive small truck- 18 mpg
- 2 wheel drive standard large truck- 17 mpg
- 4 wheel drive standard large truck- 16 mpg

As more fuel efficient vehicles come onto the market we anticipate that the minimum combined miles per gallon requirements of the Green Communities Act may be revised upwards so the Town will check prior to ordering a new vehicle to ensure the most up to date numbers are being used.

INVENTORY

The Town of Dedham's vehicle inventory list shall be updated on an annual basis.

Note: Departments and Divisions may use EPA combined MPG estimates or actual combined MPG.

FUEL EFFICIENT VEHICLE REPLACEMENT PLAN

The Town of Dedham shall develop a plan to replace all non-exempt vehicles with fuel efficient vehicles as defined above. Said plan shall outline the process by which the Town of Dedham will replace vehicles, set goals for when the existing fleets will be replaced, and review said plan on an annual basis.

ENFORCEMENT

This policy is enforced by the Town Administrator and/or their designee(s).

ANTI-IDLING CAMPAIGN

The Town of Dedham's Sustainability Advisory Committee and Environmental Department launched an Anti-Idling Campaign in 2009. The cornerstones of the campaign are education and outreach. The Committee has posted signs around town at schools and businesses instructing drivers to turn off their engine when not in use, distributed pamphlets explaining the harmful effects of idling and visited the Schools and PTOs to educate students and parents about idling. This campaign will be reviewed and updated annually.

¹ The EPA changed their calculation of MPG in 2007 to better reflect actual driving conditions; this included a shift to more highway and less city driving.

Appendix B

TOWN OF DEDHAM VEHICLE SCHEDULE 7-1-10/11

As of 08/12/10

POLICE DEPARTMENT

Item #	Year	Make	Model	VIN	Cost	Plate #	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	1998	Speed Monitor	Trailer	MPH52398G1JLPC133	\$ 8,023	M56033		N
2	1989	International	Bus	1HVLNZRPOKH666518	\$ 28,000			N
3	2001	Smtm	Trailer	1P91410101G301018	\$ 34,000	MP64397		N
4	2003	Ford	Crown Vic	1FAFP71W93X112390	\$29,850			N
5	2010	Ford	Taurus	1FAHP2HXXAG128876	\$30,074	49194	2015-2020	Y
6	2003	Harley Dav	Motorcycle	1HD1FMW193Y727216	\$14,100	MMC187		N
7	2002	Gem	Electric	5A5AG27422F025434	\$7,000	MP640D	2015-2020	Y
8	2004	Ford	E350 Van	1FTSS34L74HA14963	\$30,030	MP631D	2010-2015	Y
9	2005	Ford	Crown Vic	2FAFP71W35X122853	\$30,000	MP634D	2010-2015	N
10	2004	Smtm Trailer	Mess Board	1P91410144G301270	\$13,385	M72501		N
11	2005	Ford	Crown Vic	2FAFP71W15X164776	\$32,000	MP99	2010-2015	N
12	2005	Ford	Crown Vic	2FAFP71W25X108720	\$28,000	958FE8	2010-2015	N
13	2006	Ford	Expedition	1FMPU16586LA00438	\$38,000	MP639D	2010-2015	Y
14	2007	Harley Dav.	Motorcycle	1HD1FMM137Y664946	\$18,000	MMC189		N
15	2006	Ford	Crown Vic	2FAFP71W96X138086	\$30,483	MP625D	2010-2015	N
16	2007	Ford	Crown Vic	2FAFP71W37X100273	\$29,657	3NH900	2010-2015	N
17	2006	Ford	Crown Vic	2FAFP71W46X148685	\$31,000	M37494	2010-2015	N
18	2009	Ford	Crown Vic	1FAHP71V99X143759	\$35,515	MP623D	2010-2015	N
19	1997	Acura	32TL	JH4UA365XVC009294	\$7,000		2010-2015	Y
20	2007	Ford	Crown Vic	2FAFP71W77X148519	\$34,000	MP637D	2010-2015	N
21	2009	Ford	Crown Vic	2FAHP71V79X143758	\$35,515	MP621D	2010-2015	N
22	2007	Ford	Crown Vic	2FAFP71W37X148520	\$34,000	MP632D	2010-2015	N
23	2008	Harley	Davidson	1HD1FMM128Y620843	\$17,984	MMC181		N
24	2008	Ford	Crown Vic	1FAFP71VX8X112252	\$34,000	1ZS660	2010-2015	Y
25	1997	Ford	Explorer	1FMDDU35P2VUC68234		3547RK	2010-2015	Y
26	2008	Ford	Crown Vic	2FAFP71V18X165762	\$34,000	MP624D	2010-2015	N
27	2008	Ford	Crown Vic	2FAFP71VX8X165761	\$35,515	MP622D	2010-2015	N
28	2008	Ford	Crown Vic	2FAFP71V09X179295	\$33,000	MP628D	2010-2015	N
29	2009	HD	Harley Dav	1HD1FMM129Y631133	\$13,200	MMC203		N
30	2009	HD	Harley Dav	1HD1FMM109Y622785	\$13,800	MMC195		N
31	2009	Ford	Explorer	1FMEEU73869UA04480	\$30,000	M63291	"Confidential"	Y
32	2009	Harley	Davidson	1HD1FMM149Y643865	\$20,000	MM128		N
33	2010	Ford	Crown Vic	2FABP7BV5AX102019		MP626D	2010-2015	Y

AUXILIARY POLICE

Item #	Year	Make	Model	VIN	Cost	Plate #	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2003	Ford	Crown Vic	2FAFP71W13X220373	\$19,500	MP5222	2010-2015	N
2	2008	Ford	Crown Vic	2FAFP71V68X111714	\$19,500	MP635D	2010-2015	N
3	2000	Ford	Crown Vic	2FAFP71W3YX183429	\$24,000	MP49	2010-2015	N

PARKS DEPARTMENT

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2001	Ford F250	Pickup	1FTNW21L71EB12419	\$20,000	M64866		N
2	1979	Ford	Front End Loader	C594261		M27760		N
3	1988	Ford	F250	2FTEF25H0JCA99833	\$ 14,000	M42866		N
4	1992	Ford	F350 Dump	2FDKS37M6NCB14551	\$ 20,000	M27857		N
5	1987	2 Ton	Trailer	10W0TTH236W010204	\$ 2,500			N
6	1987	4 Ton	Trailer	10W0TTG7FW0010374	\$ 4,000			N
7	1999	Ford F350	Pickup	1FTSF31L1XEE64719	\$25,000	M56476		N
8	1999	Ford F350	Dump	1FDWF36S8XED83505	\$35,000	M56477		N

ENDICOTT ESTATE

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2008	Ford	F250	1FTNF21578EE53590		M77843		N

SCHOOL DEPARTMENT

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2000	Chev	Astro Van	1GCDM19W5YB136269	\$ 20,000	M33589	2010-2015	Y
2	1998	Ford	Super Duty PU	2FTZF1727WCA25224	\$15,999	M54937		N
3	1996	Dodge	Ramvan	2B7HB21X8TK188077	\$21,000	M55612	2010-2015	Y
4	1986	Ford F350	Dump Truck	1FDJF37L7GKB46815	\$15,000	M67030		N
5	2004	Ford 150	Pick Up	1FTRW14W84KA07699	\$34,340	M70526	2010-2015	Y
6	2006	Ford F250	Pick Up	1FTSX21516EB19164	\$32,000	M37352		N

YOUTH COMMISSION

item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2010	Ford E150	Van	1FMNE1BW0ADA98600	\$ 30,000		2015-2020	Y

CANINE CONTROL

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	1998	Ford	E350 Ecovan	1FTSE34L9WHB76300	\$ 26,832	M52750	2010-2015	Y

COUNCIL ON AGING

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2004	Ford	E350 Van	1FTSS34L94HA21154	\$35,565	M55255	2010-2015	Y
2	2006	Ford	Freestar Van	2FMZA51606BA63431	\$36,333	M75815	2010-2015	Y

BOARD OF HEALTH

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	2006	Haulmark	Utility Trailer	16HCB12146P059109	\$ 4,228	M70768		N

DPW DEPARTMENT

Item #	Year	Make	Model	VIN	Cost	Plate	Replacement Timeframe	Fuel Efficient Vehicle Policy Apply?
1	1995	Ford	F350	2FTHF36H6SCA58903	\$28,000	M55493		N
2	1995	Ford	F350	2FDKF38F6SCA75391	\$33,000	M69826		N
3	1978	Ford	Flatbed	F37HCAG2246	\$20,000	M64512		N
4	1998	Ford	Ln8000	1FDYX82E2WVA39847	\$25,000	M56894		N
5	1990	Ford	L8000	1FDYK82A4LVA37136	\$12,000	M66339		N
6	1992	Ford	L8000	1FDYK82A9NVA35210	\$12,000	M49400		N
7	1993	Ford	L8000	1FDYK82A7PVA03360	\$20,000	M46041		N
8	1994	Ford	L8000	1FDYK82EXRVA25276	\$23,000	M79400		N
9	1992	John Deere	Front Loader	DW624EB537230	\$40,000	M48498		N
10	1987	Bombardier	Sidewalk Plow	1870992	\$30,000	M37100		N
11	1996	Ford	F350 Pickup	2FTHF36H5TCA56304	\$25,000	M56423		N
12	1977	Sullair	Compressor	35886	\$ 5,000	M24599		N
13	1993	Bush	Bandit Chipper	6780	\$ 5,000	M24217		N
14	1997	John Deere	955 Tractor	LV0955E203372	\$14,759	M56329		N
15	1997	Cross Country	58r Flat Bed	431FS0811V2000839	\$ 920	M56328		N
16	1998	Cam	Utility Trlr	4YUUF2024WJ000611	\$ 2,699	M56369		N
17	1999	Ford F150	Pickup	2FTRX08L8XCA05693	\$25,000	M56836	2010-2015	Y
18	1999	Ford F150	Pickup	2FTRX08L6XCA05692	\$25,000	M56847	2010-2015	Y
19	1999	Elg Pelican	Sweeper	S8731S	\$30,000	M61271		N

Appendix C – 2009 Energy Audit

Table 1. Municipal and School Buildings by Fuel Type

	Number
Buildings	
Oil Heat	9
Natural Gas Heat	15
Propane Heat	1
Biomass Heat	0
Other Heat Type	0
Vehicles	
Non-Exempt	16
Exempt	58
Street Lights	
Municipally-Owned	2,600
Utility Owned	
Traffic Lights	
Municipally-Owned	496
Utility Owned	

Table 2. Summary of Municipal Energy Usage

Baseline	2,009	kWh	Therms	Gal	\$kWh	\$Therm	\$Gal	Total	MMBtu
Town Hall		210,640	2,191	5,807	\$39,468	\$2,605	\$11,295	\$53,368	1713
Police Station		175,993	7,541		\$28,775	\$14,205		\$42,980	8360
Fire Station East		71,960	21,136		\$12,777	\$38,840		\$51,617	21995
Dedham FS Main	22,999	4,481		\$3,892	\$8,485		\$12,377	4689	
Library		64,480	7,435		\$13,294	\$13,962		\$27,256	7871
Rec Center Endicott		51,510		2,992	\$9,684		\$5,766	\$15,450	448
Estate Endicott	45,206	11,519		\$8,173	\$21,608		\$29,781	12007	
Library Brookdale	28,137	3,355		\$5,081	\$6,415		\$11,496	3548	
Cemetery DPW	10,922	1,203		\$2,243	\$2,416		\$4,659	1275	
Facility Park and Recs		143,640	16,777		\$25,688	\$31,876		\$57,564	2716
Garage Mechanics	5,587	3,009		\$979	\$5,717		\$6,696	320	
Garage	5,587	3,031		\$979	\$5,759		\$6,738	322	
HS		1,266,180	161,604	19,206	\$249,224	\$307,222	\$37,356	\$593,802	17069
Rec Pool		255,520	44,127		\$45,071	\$77,805		\$122,876	5285
Oakdale ES		131,137	29	22,453	\$23,783	\$236	\$37,356	\$61,375	2495
Riverdale ES		132,520	3	16,603	\$25,330	\$183	\$32,293	\$57,806	1964
Greenlodge ES	227,400	16,398	10,348	\$42,877	\$31,155	\$20,127	\$94,159	3358	
Dexter ES		195,240	1,237	10,776	\$37,094	\$2,460	\$20,959	\$60,513	1771
Early Childhood Center	90,600		13,018	\$17,956		\$25,320	\$43,276	1509	
Streetlights		1,220,272							41646
Vehicle Fleet		4,355,530						\$212,718	10540
		4,355,530	305,076	101,203	\$592,368	\$570,950	\$190,471	\$1,566,507	150901

Table 3. Summary of Municipal Energy Savings

Savings (annual)	kWh	Therms	Gal	mmBTU	\$kWh	\$Therm	\$Gal	Total
Town Hall	95,130	1,402		465	\$18,830	\$2,699		\$21,994
Police Station	25,250	2,909		377	\$4,127	\$5,480		\$9,984
Fire Station	9,695	5,792		612	\$1,721	\$10,644		\$12,977
East Dedham FS	4,992	1,468		164	\$845	\$2,780		\$3,789
Main Library	15,120	1,463		198	\$3,117	\$2,748		\$6,063
Rec Center	17,233		1,068	156	\$3,240		\$2,059	\$5,455
Endicott Estate	10,521	-13		36	\$1,902	-\$25		\$1,913
Endicott Library	8,085	371		65	\$1,460	\$709		\$2,234
Brookdale Cemetary DPW Facility	5,404	-11		18	\$1,110	-\$21		\$1,107
Park and Recs Garage	180,598	4,435		1,060	\$30,697	\$8,114		\$39,871
Mechanics Garage	1,274	327		37	\$209	\$637		\$883
HS	5,497	223		41	\$904	\$481		\$1,426
Rec Pool	260,707	39,765		4,866	\$51,315	\$75,596		\$131,777
Oakdale ES	11,790	18,492		1,890	\$2,079	\$32,606		\$36,575
Riverdale ES	44,953		2,633	393	\$8,535		\$5,122	\$14,050
Greenlodge ES	38,031		5,715	650	\$7,271		\$11,117	\$19,038
Dexter ES	44,600	7,457		886	\$9,035	\$14,379		\$24,300
Early Childhood Center	8,127			28	\$1,544			\$1,572
LED Traffic Lights	46,592		2,300	389	\$8,775		\$4,473	\$13,637
	187,828			641	\$37,566			\$38,207
	1,021,427	84,080	11,716	12,970	\$194,282	\$156,827	\$22,771	\$386,850

Appendix D – see attached document for full worksheet

Input Sheet Energy Savings Summary

FIM ID	Building/Facility	Description	Energy Savings		
			Electric \$	Electric kWh	% of
1.00	Town of Dedham	Lighting Retrofits	\$ 64,987.00	342,308	
2.00	Town of Dedham	Lighting Sensors	\$ 20,684.00	109,740	
3.00	Town of Dedham	Energy Management System	\$ 8,592.00	46,022	
4.00	Town of Dedham	Building Envelope	\$ 1,167.00	6,352	
5.00	Town of Dedham	Vending Machine Controls	\$ 5,067.00	26,296	
6.00	Town of Dedham	Pipe Insulation			
7.00	Town of Dedham	Steam System Improvements			

* Appendix E: Timeline of work to be completed for ESCO included in packet

Appendix F: Government Greenhouse Gas Emission Report included in packet

See Included CD: Town of Dedham Fully Executed Contract for additional information that was too large to include in this document.