



**City of Northampton**  
**Municipal Energy**  
**Reduction Plan**  
**May 2010**



## Contents

PURPOSE AND ACKNOWLEDGEMENTS.....	1
EXECUTIVE SUMMARY .....	1
INTRODUCTION .....	3
Background.....	3
Facilities.....	3
Vehicles.....	3
Baseline Energy Use.....	3
Energy Use Forecast .....	4
STATEMENT OF GOALS AND STRATEGIES.....	4
RESULTS OF ENERGY USE BASELINE INVENTORY.....	6
Inventory Tool Used .....	6
Existing Municipal Energy Use.....	6
Existing efficiency measures implemented in last 2 years .....	8
LED Parking Lot Lights (fall 2009).....	8
Lighting Upgrade in Parking Garage (winter '09-'10).....	8
13 kW PV Array in James House Adult Learning Center (spring 2010) .....	8
Improved Lighting and HVAC at James House Adult Learning Center (winter '09-'10 and ongoing) .....	8
Senior Center - Silver LEED Designed, Geothermal Heat Pumps (Spring 2007).....	9
Landfill gas to energy – 800kW facility (March 2008) .....	9
Adjustments to Baseline Energy Use.....	9
Areas of least efficiency/greatest waste.....	10
Areas that can be Most Easily Addressed.....	12
Municipal Facilities via Performance Contract .....	12
Non-tax Income Streams: .....	12
SUMMARY OF ENERGY AUDIT .....	12
Summary of Proposed CES Investments at the City of Northampton.....	12
SUMMARY OF FOSSIL FUEL REDUCTION MEASURES .....	13
SPECIFIC FOSSIL FUEL ENERGY REDUCTION MEASURES .....	14
Energy Conservation Tasks to Achieve 20% Reduction in 5 Years.....	14
City Facilities .....	14
Vehicles.....	16
Street, Parking, and Traffic Lighting .....	17
Municipally-owned and -operated clean renewable or alternative energy installations.....	19
Total Projected Fossil Fuel Energy Reduction .....	21
MEASUREMENT AND VERIFICATION PLAN FOR PROJECTED REDUCTIONS.....	25
LONG-TERM ENERGY REDUCTION GOALS – BEYOND 5 YEARS.....	25
Municipal Sector.....	25
Residential and Commercial Sectors .....	26

## **PURPOSE AND ACKNOWLEDGEMENTS**

The measures spelled out in this energy reduction plan stem from Northampton city staff, commissions, and boards enacting actions called for in the Sustainable Northampton Comprehensive Plan. The Northampton 2010 Energy Reduction Plan consolidates and describes in one document Northampton's efforts to reduce consumption of fossil fuels and reduce greenhouse gas emissions as they stand in the spring of 2010. It describes the work of the Mayor's Office, Central Services, Department of Public Works, Planning Department, Parking Commissioner, Department of Community and Economic Development Office, School Department, Smith Vocational and Agricultural High School, the Northampton Energy and Sustainability Officer, and the Northampton Energy and Sustainability Commission. Multiple individuals from all of these organizations contributed to the development of this document and are instrumental in Northampton's continuing work toward a cleaner more energy efficient City.

## **EXECUTIVE SUMMARY**

This Plan describes specific measures that Northampton's City government will take to reduce municipal energy use by more than 20% in less than five years. Many of the actions specified here are already underway and build on past successes.

Northampton has a long history of prioritizing clean efficient energy use. The City has had an active energy commission and employed an energy officer on and off since the 1980s. Through the years, the City has conducted multiple energy audits and has established a habit of regularly upgrading to higher efficiency energy systems. In 2007, Northampton began to track energy use through the EPA's Portfolio Manager Program. This program revealed many of Northampton's buildings to be eligible for the Energy Star rating; however, Northampton is waiting until the City completes an energy services performance project before submitting to the EPA for this recognition. ConEdison Solutions, an energy services company that just completed an investment grade audit of Northampton's municipal buildings, reported that efficiency improvements had already been completed for many of Northampton's buildings.

The City's efficiency work hasn't stopped with its buildings. In 1992 the City conducted a study of street- and traffic-light use and, based on that study, implemented a street and traffic light energy reduction plan that reduced the City's operating costs for streetlights by 14%. More recently, in 2009, Northampton became the first city in Massachusetts to install high-efficiency LED lamps in a downtown parking lot. This follows Northampton's earlier installation of solar-powered parking pay and display machines for downtown parking areas.

The Northampton Parking Division has for years contracted for downtown trash to be collected by bicycle avoiding hundreds of gallons a year of diesel use. In 2007, The DPW began replacing four-wheel drive vehicles with more efficient two-wheel drive vehicles whenever possible. The DPW has also replaced two utility vehicles with gas-electric hybrids. In 2008, the City launched a landfill gas-to-energy plant that reduces greenhouse gas emissions by more than four times the level of emissions produced by all municipal energy use. The DPW now plans on generating electricity with an in-line hydro-electric plant in the water delivery system.

Recently the City has reduced car miles traveled by expanding to 12 miles of bike paths that connect to another 20 miles in other communities and installing 140 bike parking spaces and 12 bike lockers. The City has a goal to have a multi-use trail within ½ mile of 70% of city residents.

In 2000, Northampton joined the Cities for Climate Protection program run by ICLEI – Local Governments for Sustainability and established, in 2001, a Greenhouse Gas Inventory of

Northampton's municipal, business, industrial, and residential emissions. Northampton will conduct a second inventory in 2011 to track its progress in reducing greenhouse gas emissions. In 2008, Northampton completed a 28-month comprehensive community planning process that resulted in publication of the Sustainable Northampton Comprehensive Plan. Amongst other guiding principals, this Plan lays out a vision to significantly improve energy efficiency, reduce greenhouse gas emissions, and make the City more walkable, bikeable, and transit-oriented. In 2008, Mayor Higgins formally endorsed the Pioneer Valley Clean Energy Plan the first (and possibly only) regional clean energy plan in Massachusetts.

In Northampton, efforts to increase use of clean renewable energy and energy efficiency don't stop with the municipality. Northampton had by far the most number of residents and businesses of any city or town in Massachusetts participate in the Massachusetts Renewable Energy Trust's GreenUp Clean Energy Choice Program. This participation by its citizens resulted in \$254,000 in grant funds coming to Northampton for municipal clean energy projects. This and other grant funds have enabled Northampton to install 23 kW of photovoltaic panels on two City buildings and more is planned.

Northampton's City government is also committed to helping private residents and businesses increase efficiency and reduce greenhouse gas emissions. City staff are in communication with local lenders to make sure energy efficient mortgages are readily available in Northampton. The City's Community and Economic Development Director and Energy and Sustainability Officer are working with the Northampton Chamber of Commerce on a Green Business Initiative and the City has for years formally recognized local businesses for their green initiatives. Most recently, the City has partnered with regional planning agencies, not-for-profit groups, and local businesses to lobby Massachusetts legislators to enable cities and towns to implement Property Assessed Clean Energy (PACE) programs. While the City of Northampton is leading by example, its government is eager to launch initiatives such as a PACE program to expand energy efficiency and use of renewable energy throughout the community. Northampton sees this 20% Energy Reduction Plan as only the next step in a long-range plan.

## INTRODUCTION

### Background

Northampton is located along the banks of the scenic Connecticut River in Hampshire County, Massachusetts. In 2000, the population was 28,978 with 11,880 households and 5,880 families residing in the city according to the U.S. Census. Northampton is the county seat of Hampshire County and was dubbed "the Paradise of America" by the Swedish Nightingale, Jenny Lind. It is nicknamed The Paradise City.

### *Facilities*

The City of Northampton has, or pays energy costs for, approximately 29 significantly sized buildings, 14 water and sewage pump facilities, and a dozen smaller buildings and garages. This includes four elementary schools, one middle school, one high school, and one vocational-agricultural high school campus (six classroom / laboratory / administration buildings, three barns / greenhouses, and several sheds / storage facilities), five administration buildings, a Department of Public Works (DPW) complex (administration building, garage, sheds, transfer station), one water treatment plant, one sewage treatment plant, two fire stations, two libraries, one music hall, one senior center, one adult education center (James House), a parking garage, and several smaller facilities. Specifically, these buildings include:

- City Hall
- Memorial Hall
- Puchalski Municipal Bldg.
- Fire Department Headquarters
- Florence Fire Substation
- Police Station
- DPW Admin Building
- DPW Garage
- Transfer station
- DPW "Old salt shed"
- James House
- Senior Center
- Bridge St Elementary
- Feiker School
- Florence Learning Center
- Jackson St Elementary
- JFK Middle School
- Leeds Elementary
- Northampton High School
- Ryan Rd Elementary
- Smith Vocational & Agricultural High School (SVAHS) Campus
- Sewage Treatment Plant (four building campus)
- Water Dept. Admin Building
- Water Treatment Plant
- Landfill buildings
- Leachate Plant
- Rec. Dept. Admin Building
- Parking Garage
- 5 Recreation Comfort Stations
- 2 Cemetery Buildings
- 14 Water & Sewer Facilities

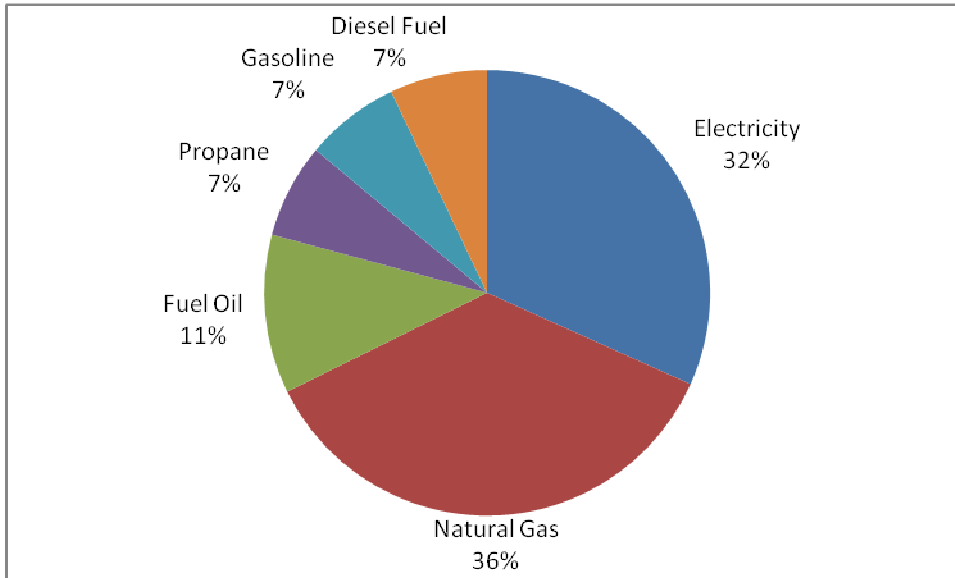
### *Vehicles*

The City has on-road licenses for 192 vehicles, most of which are heavy-duty public works vehicles, school buses, trailers, police cruisers, and fire trucks. Thirty-eight vehicles qualify as "non-exempt" under the DOER's Green Community Criteria 4.

### *Baseline Energy Use*

In fiscal year 2009 (FY09), Northampton consumed 10,695,126 kWh of electricity, 413,714 therms of natural gas, 95,426 gallons of #2 fuel oil, 86,704 gallons of propane, 63,531 gallons of gasoline, and 58,585 gallons of diesel fuel as summarized in Table 1. In addition to importing the above energy sources, Northampton consumes an average of 10,236 kWh a year produced on site by a 10 kW photovoltaic array at the JFK Middle School.

**City of Northampton Imported Energy Use for FY2009 (% MMBTU)**



**Table 1: City of Northampton Imported Energy Use (FY2009)**

Fuel Type	Qty. (conventional units)	Million BTU Equivalent (MMBTU)
<b>Electricity</b>	10,695,126 kWh	36,491.8
<b>Natural Gas</b>	413,714 therms	41,371.4
<b>Fuel Oil</b>	95,426 gal.	13,264.2
<b>Propane</b>	86,704 gal.	7,890.1
<b>Gasoline</b>	63,531 gal.	7,878.1
<b>Diesel Fuel</b>	58,585 gal.	8,143.1
<b>Total all energy</b>		<b>115,038.7</b>

*Energy Use Forecast*

Within the next five years, the City of Northampton expects to maintain its current fleet of 192 municipal vehicles. Construction for a new building for the Department of Public Works as well as a new headquarters for the Police Station is possible within the next five years. If completed, however, the old buildings will cease to be used, and the newly constructed buildings are expected to reduce energy use through more efficient building and operating practices. In addition, the City will sustain its commitment to the installation of LED parking-lot lights for any new parking-lot lighting for continued energy and maintenance savings.

**STATEMENT OF GOALS AND STRATEGIES**

In 2008, Northampton completed a 28-month comprehensive community planning process that resulted in publication of the *Sustainable Northampton Comprehensive Plan*, a vision for Northampton’s future and the principals, goals, and strategies required to support and implement that vision. Two of the *Plan’s* guiding principals read:

“Significantly improve energy efficiency in city buildings and programs, reduce greenhouse gas emissions, and encourage conservation and use of alternative and renewable energy sources throughout the community;”

“Make the city increasingly more walkable, bikeable, and transit oriented;”

In this document, under the section *Energy, Environment and Climate Protection*, the *Plan* sets goals to, “Reduce community’s and City’s energy demand and natural resource consumption” and “Reduce emissions of greenhouse gases [GHG]” with the following specific metrics:

- Trend in total energy demand from City facilities: 2 to 3% reduction per year
- Percent of municipal energy supplied by renewable sources: 25% energy demand supplied from renewable sources by 2017
- Match comparative performance standards from ICLEI, The Climate Registry, and others: Lead in local climate protection efforts
- Percent of FY2000 Equivalent CO<sub>2</sub> Emissions from all City functions: 8% below 2000 levels by 2010, 25% below by 2017, and 30% below by 2020

The *Plan* specifies thirty-six individual strategies and actions to meet these goals, many of which are already being implemented by City staff (including an Energy and Sustainability Officer), the Energy and Sustainability Commission, the Transportation Commission, Capital Improvement’s Commission, the Mayor, and City Council. Of specific note, several of these strategies and actions parallel Massachusetts Department of Energy Resources’ criteria to become a Green Community. These include:

- Investigate contracting with an Energy Service Company (ESCO) [for an Investment Grade Audit and a comprehensive energy performance contract]
- Prepare, as an addendum to *Sustainable Northampton*, a plan for climate protection for all sectors
- Keep energy audits and operations audits of all public buildings, vehicle fleets, and public lighting (street, parking, and traffic)
- Petition the Commonwealth of Massachusetts for state approval of Energy Star ratings as the minimum standards for local building code
- Present a report for public review that identifies where, as allowed by state law, the City land use ordinances could further address greenhouse gas emissions

Several years prior to development of the *Sustainable Northampton Plan*, in 2001, the Northampton City Council voted to join ICLEI’s Cities for Climate Protection Campaign and recognized the need to address the global warming problem swiftly, effectively, and on a local level. In 2001, the City completed its first Greenhouse Gas Emissions Inventory. The *Sustainable Northampton Plan* calls for the City to, “In 2011, update the City’s ICLEI inventory for climate protection with 2010 data to determine the City’s progress toward its GHG reduction targets and modify the City’s Climate Change Protection Action Plan as needed to ensure the City can meet its GHG reduction targets.”



Regionally, in 2008, Clare Higgins, Mayor of Northampton, signed a Memorandum of Agreement for Promoting and Implementing the *Pioneer Valley Clean Energy Plan* (2008) that calls for:

- a reduction in energy consumption to 2000 levels by the end of 2009 and reduction of that by 15% by 2020
- an 80% reduction in GHG emissions by 2050.
- a 28% reduction in energy use through efficiency improvements (in buildings) over 10 years.

In 2007, the City of Northampton joined the Environmental Protection Agency (EPA) New England's Community Energy Challenge and committed to specifically:

- Assess – benchmark – the energy performance of all municipal buildings, schools and/or drinking water/wastewater treatment facilities in our community
- Set a goal to reduce energy use in buildings by 10% or more
- Promote energy efficiency and renewable energy to companies and organizations in our community

## **RESULTS OF ENERGY USE BASELINE INVENTORY**

### **Inventory Tool Used**

Northampton uses Excel spreadsheets to track monthly energy use for all City facilities.

In the near future the City intends to use the DOER MassEnergyInsight on-line program concurrently with the Excel spreadsheets to track the City's energy use. Two City employees have attended trainings on this on-line data monitoring software and if the MassEnergyInsight program proves convenient and can provide the information that Northampton needs, the City anticipates transitioning to this on-line database to track monthly and annual energy use.

Beginning in 2007, the City also began to track energy use of some of its buildings concurrently with the EPA's on-line Portfolio Manager Program. Portfolio Manager, however, does not include categories for all of the City's facilities and does not provide any added convenience in use (e.g., it cannot receive City energy use data from utilities) and so did not supplant the City's use of Excel spreadsheets.

In 2000, through the efforts of an intern, Northampton analyzed its baseline energy use using ICLEI's Cities for Climate Protection Software. The City intends to repeat this in 2011 as a way to monitor its progress in reducing greenhouse gas emissions, however, the ICLEI software has not been used to track energy use annually.

### **Existing Municipal Energy Use**

Table 2 provides a full inventory of the City of Northampton's electricity, natural gas, fuel oil, and propane use in fiscal year 2009.

Table 3 provides a full inventory of the City of Northampton's consumption of unleaded and diesel fuels in fiscal year 2009. Note that this includes fuel consumed by all 192 of Northampton's vehicles including both "non-exempt" and "exempt" vehicles under the DOER's Green Community Criteria 4. The City is currently unable to distinguish fuel use per vehicle.

**Table 2: Municipal Buildings, and Parking, Street and Traffic Lighting - Fiscal Year 2009 Energy Use**

	Sq-Ft (ft <sup>2</sup> )	Electricity		Natural Gas		Fuel Oil		Propane		MMBTU	
		kWh	MMBTU	therms	MMBTU	Gal.	MMBTU	Gal.	MMBTU	Total	per ft <sup>2</sup>
City hall	16,675	94,800	323			3,774	525			848	.051
Memorial Hall	19,875	50,320	172			7,017	975			1,147	.058
Municipal Building	13,545	126,840	433	7,447	744.7					1,177	.087
Senior Center	20,934	218,280	745	1,264	126.4					871	.042
James House Adult Learning	8,500	29,120	99			4,313	600			699	.082
Academy of Music	10,178	72,360	247			8,942	1,243			1,490	.146
Main Fire HQ	21,246	281,440	960	14,970	1497	5,159	717			3,174	.149
Florence Fire Substation	7,832	51,833	177			5,161	717			894	.114
Police HQ	5,000	188,960	645							645	.129
DPW Administration Bldg.	3,868	56,092	191							191	.049
Water Department Administration	6,385	11,281	38	2,085	208.5					247	.039
DPW Garage	20,700	155,360	530	285	28.5	16,813	2,337			2,896	.140
Misc. DPW Campus Energy Use	n/a	33,337	114							114	
Waste water treatment plant	22,760	2,010,600	6,860			5,985	832	52,288	4758	12,450	.547
Waste water pumping facilities	n/a	59,623	203	646	64.6					268	
Water treatment plant	40,740	408,300	1,393					32,274	2937	4,330	.106
Water pumping facilities	n/a	209,895	716	499	49.9					766	
Landfill and cemeteries	n/a	113,556	387	2,077	207.7	4,897	681			1,276	
Bridge Street Elementary	60,489	215,280	735	28,808	2880.8					3,615	.060
Jackson Street Elementary	73,500	311,700	1,064	34,583	3458.3					4,522	.062
Leeds Elementary	72,085	249,240	850	43,157	4315.7					5,166	.072
Ryan Road Elementary	53,332	184,080	628	19,970	1997					2,625	.049
JFK Middle School	141,851	859,500	2,933	79,555	7955.5					10,888	.077
Northampton High School	203,617	1,159,000	3,955	68,333	6833.3					10,788	.053
Smith Vocational and Agricultural HS	173,720	1,232,000	4,204	104,824	10482.4	7,770	1,080	2,142	195	15,961	.092
Feiker Pre-School	11,256	21,377	73			3,856	536			609	.054
Florence Community Center	29,253	88,653	302			12,281	1,707			2,010	.069
Forbes Library	44,274	326,080	1,113			9,458	1,315			2,427	.055
Lilly Library	9,981	89,520	305	5,211	521.1					827	.083
Street lights (S1, S2, and S3 accounts)	n/a	1,173,597	4,004							4,004	
Misc. outdoor metered lighting	n/a	58,796	201							201	
Parking lot lights (metered)	n/a	336,489	1,148							1,148	
Signal Lights	n/a	72,186	246							246	
Misc other accounts	n/a	145,631	497							497	
<b>Total</b>		<b>10,695,126</b>	<b>36,492</b>	<b>413,714</b>	<b>41,371.4</b>	<b>95,426</b>	<b>13,264</b>	<b>86,704</b>	<b>7,890</b>	<b>99,017</b>	

**Table 3: All Municipal Vehicles - Fiscal Year 2009 Energy Use**

	<b>Unleaded (Gal)</b>	<b>Diesel (Gal)</b>
DPW-Streets	1,429	22,683
WWTP	2,384	1,416
Sewer	470	7,879
Water Dept.	5,441	7,929
DPW-Recreation Crew	1,960	3,175
Cemetery	1,325	1,737
DPW-Engineering	2,533	127
Police	29,825	30
SVAHS (and SVAHS Farm)	4,599	2,178
K-12 School	3,020	6,171
Council on Aging	379	-
Fire Department	4,776	16
Libraries	69	-
Central Services	2,291	-
Recreation Department	257	-
Parking	2,419	223
Bldg. Inspector	139	-
Board of Health	213	-
Landfill	5	5,024
<b>Total Gallons</b>	<b>63,531</b>	<b>58,585</b>
<b>Total MMBTU</b>	<b>7,878</b>	<b>8,143</b>

**Existing efficiency measures implemented in last 2 years***LED Parking Lot Lights (fall 2009)*

In the fall of 2009, Northampton upgraded sixteen high-pressure sodium (HPS) lighting fixtures in the Armory Street Parking Lot to LEDs.

*Lighting Upgrade in Parking Garage (winter '09-'10)*

During the winter of '09-'10 the City replaced 220 HPS interior parking garage fixtures with high-efficiency fluorescent fixtures.

*13 kW PV Array in James House Adult Learning Center (spring 2010)*

The City installed a 13 kW photovoltaic array on the James House Learning Adult Center that began producing power in March 2010.

*Improved Lighting and HVAC at James House Adult Learning Center (winter '09-'10 and ongoing)*

Note, in FY 2009 – Northampton's baseline year – the James House was underutilized due to a hold-up in renovation of the building. A 2008 scoping study of the James House building projected that, with no lighting or HVAC upgrades, when the full building is brought into use as an adult learning center, the building will consume 115,142 kWh. The FY09 oil consumption of 4,300 gallons is consistent with the building's historic need for heating oil.

With substantial funding from MassCEC, the City is in the process of upgrading the lighting and HVAC systems at the James House Adult Learning Center, which will result in a net energy reduction of 34,200 kWh and 4,300 gallons of oil annually once the full building is brought into use as an adult learning center.

*Senior Center - Silver LEED Designed, Geothermal Heat Pumps (Spring 2007)*

In April 2007, Northampton completed construction of a silver-LEED designed Senior Center that is heated and cooled with a ground-source heat pump system. By investing in ground coupled heat pumps to cool the space, condition the ventilation air, and heat water for supplementary radiation, the City reduced the calculated energy load of the building by 1,337 MMBTU per year over what the building would have used if heated and cooled with a more conventional gas-fired boiler and reciprocal chiller.

*Landfill gas to energy – 800kW facility (March 2008)*

In March 2008, Northampton began selling landfill gas to a private vender (Ameresco) to power a 0.8 MW landfill gas to energy facility. According to the US EPA, this facility provides an annual emissions reduction equivalent to reducing the City’s gasoline consumption by 3,828,533 gallons a year, or a total reduction of energy (MMBTU) that is four times the City’s current energy use.

*Adjustments to Baseline Energy Use*

In order to accurately account for the impact of some of the energy conservation measures being implemented by Northampton, adjustments to the baseline are needed.

- Adjustment due to Reduced Energy Use In Baseline Year at the James House**  
 As previously mentioned, the City expects that the James House would consume 115,142 kWh a year once the full building is brought into use as an adult learning center if no efficiency measures were taken. However, in our baseline year (FY09), because the building was underutilized due to renovations, it consumed only 29,120 kWh. Therefore, if the City is to consider the effects of efficiency measures taken at the James House, the baseline electrical use value must be adjusted by adding in 86,021 kWh to bring the annual consumption of electricity up to 115,142 kWh.
- Adjustment due to Geothermal vs. Conventional HVAC System at Senior Center**  
 Similarly, if Northampton is to consider the effects of installing a geothermal HVAC system at the James House, it must adjust the baseline energy use at the Senior Center to one that would have been experienced had the City installed a conventional HVAC system.

**Table 4: Adjusted Baseline Energy Use (MMBTU)**

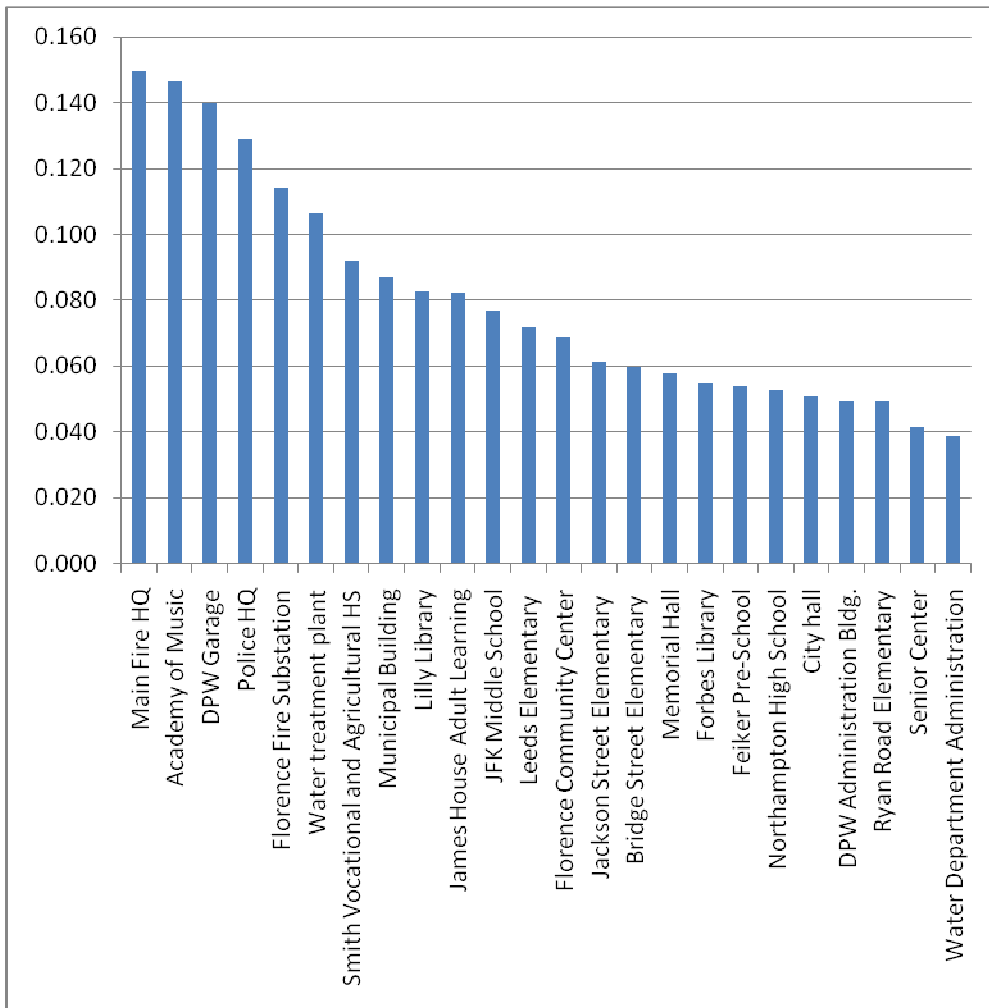
	Electricity	Natural Gas	Fuel Oil	Propane	Gasoline	Diesel	Total
<b>FY09</b>	<b>36,492</b>	<b>41,371.4</b>	<b>13,264</b>	<b>7,890</b>	<b>7,878</b>	<b>8,143</b>	<b>99,017</b>
Reduced Energy Use In FY09 at the James House	294						294
Geothermal vs. Conventional HVAC System at Senior Center							1,337
<b>Adjusted Baseline</b>							<b>116,669</b>

### Areas of least efficiency/greatest waste

Northampton’s largest energy users per square-foot are: the waste water treatment plant, fire department headquarters, Academy of Music, DPW Garage, police headquarters, Florence fire substation, water treatment plant, Smith Vocational and Agricultural High School, municipal building, Lilly Library, and James House Adult Learning Center. (See graph below of MMBTU per area of all buildings but the waste water treatment plant.) The JFK Middle School consumes the highest level of energy per sq.-ft. of all the K-12 school buildings, however, this is most likely due to it housing the community pool.

Historically, the City has directed most of its energy efficiency efforts at the K-12 public schools, therefore, it is not surprising to find that other municipal buildings use the greatest energy per square foot. However, the K-12 schools, due to their high level of total energy consumption, still provide some of the highest value in energy savings as has been revealed in an investment grade audit of Northampton’s municipal facilities.

### MMBTU per Square-Foot



In 2008, the City of Northampton solicited an Investment Grade Audit (IGA) through a competitive procurement process under Massachusetts General Laws, Chapter 25a, Section 11i. Subsequently, the City contracted with ConEdison *Solutions*® (“CES”) to

conduct the audit, which was completed by CES on February 16, 2010. After City review, CES finalized a package of energy conservation measures (ECMs) in 33 buildings to be included in a performance contract between the City and CES. The final IGA identified the annual cost savings shown in Table 5. When looked at in magnitude of annual savings, many of the K-12 school buildings will still provide some of the highest energy savings.

**Table 5: Cost Savings per Building Sorted by Annual Savings**

Building	Annual Cost Savings (FY09 energy prices)	% Cost Reduction
WWTP SPB	\$93,469	48.4%
Forbes Library	\$36,261	32.2%
Leeds Elementary	\$31,719	35.4%
JFK Middle School	\$28,626	12.8%
Water Treatment Plant	\$28,405	24.8%
Smith Voc Building B	\$27,975	27.1%
High School	\$27,785	10.5%
Jackson Elementary	\$24,943	22.9%
Smith Voc Building A	\$23,011	24.9%
DPW Garage	\$15,570	41.3%
Bridge Street Elementary	\$14,669	21.2%
Ryan Rd Elementary	\$13,267	25.1%
Memorial Hall	\$12,729	40.1%
Academy of Music	\$12,054	35.0%
Fire Dept. HQ	\$11,095	20.5%
Smith Voc Building D	\$10,049	20.5%
Leachate Bldg	\$9,460	57.2%
Florence Fire	\$9,269	40.3%
Smith Voc Building C	\$8,713	28.1%
Feiker Pre-School	\$7,150	41.2%
City Hall	\$6,791	19.7%
WWTP Control Bldg	\$6,036	10.7%
Municipal Building	\$4,479	13.7%
Senior Center	\$3,643	12.2%
Lilly Library	\$3,473	14.6%
WWTP Flood Bldg	\$2,715	29.8%
Smith Voc Multi-spec Barn	\$2,338	24.9%
Smith Voc Small Animal Barn	\$1,674	33.6%
WWTP Maintenance Bldg	\$1,562	23.4%
WWTP Digester Bldg	\$1,494	32.3%
Misc Bldgs	\$1,156	38.8%
Smith Voc Admin Bldg	\$489	8.9%
Recreation Dept. Admin	\$486	8.9%

## **Areas that can be Most Easily Addressed**

### *Municipal Facilities via Performance Contract*

Northampton's energy services performance contract with ConEdison Solutions will enable the City to fold a large number of conservation measures into one far-reaching package. Not only does this allow the City to design a comprehensive program of efficiency improvements, but it also greatly simplifies the procurement process that the City would otherwise have to engage in to complete these same set of conservation measures and it does not require up-front capital expenditures.

### *Non-tax Income Streams:*

Northampton's enterprise funds allow the City to implement least-cost efficiency improvements that benefit a specific enterprise fund without using tax dollars. This provides enterprise fund projects freedom from the need to compete for tight capital improvement funds. Fees from parking and water supply will support efficiency improvements at the City's parking lots and in its water delivery system respectively.

Measures underway include upgrading HPS lamps in the City's parking lots with high-efficiency florescent and LED fixtures and inserting a small conduit hydroelectric turbine (11.8 kW) at one of two pressure reduction valve stations in the City's water transmission system. Lighting upgrades at the Armory Street parking lot and parking garage are expected to reduce electric use by 94,870 kWh a year. The 11.8 kW hydroelectric turbine is expected to produce 73,200 kWh of electric power annually.

The City estimates that lighting upgrades at the City's six surface parking lots, along the bike path, and along City streets with metered pole top streetlights, the operations of which are paid for through enterprise funds, can reduce electricity consumption by an additional 115,000 kWh annually.

Securing grants provides another way the City can avoid using tax-dollars for efficiency improvements. Currently the City is completing HVAC and lighting upgrades to the James House Adult Learning Center through a grant by Massachusetts Technology Collaborative Renewable Energy Trust (Now Massachusetts Clean Energy Center).

## **SUMMARY OF ENERGY AUDIT**

CES's Investment Grade Audit (IGA) describes a wide array of Energy Conservation Measures ("ECM"s) at municipal buildings and schools throughout the city. The proposed package of ECMs to be included in a performance contract between the City and CES has a project cost of \$6,500,000. The long-term service agreement (15 years) with operation and maintenance measures needed to ensure efficiency savings is estimated to cost \$870,000.

### **Summary of Proposed CES Investments at the City of Northampton**

1. ECM Category 1: Upgrade Lighting and Lighting Controls: Selected lighting fixture replacements, comprehensive lamp/ballast retrofits, and lighting control upgrades in all building. New, high efficiency fixtures or lamp/ballast retrofits will reduce the connected kW of lighting systems. Improved occupancy and daylight controls will reduce lighting system run hours.
2. ECM Category 2: Major HVAC System Upgrades: Proposed upgrades include replacement of inefficient oil-fired boilers and inefficient oil-fired burners; installation of high efficiency cooling systems, infrared heating systems, and dehumidification systems;

and improvement of warm-up time with heating capacity upgrades.

3. ECM Category 3: Process System Upgrades: Proposed improvements include upgrade of process odor control system; replacement of process dehumidification system; installation of VFDs on plant water booster pump system, new pumps and VFDs to design pool water pumping system, and pool cover; and reduction of irrigation water use.
4. ECM Category 4: New Central Energy Management Control System and Upgrade/Repair Standalone Controls and Mechanical Deficiencies: Upgrades include new central energy management control system and repair of standalone controls; reduction of steam use; recommissioning pneumatic and existing computerized controls, and installation of self-contained temperature control valves.
5. ECM Category 5: Building Shell Upgrades: Improvements include installation of new double-pane windows and storm windows; upgrade of ceiling/roof insulation; and replacement/upgrade of weather-stripping.
6. ECM Category 6: Minor HVAC Projects: Upgrades include replacement of all steam traps with mechanical traps, improvement of control of DHW recirculation pumps and/or installation of instantaneous DHW heaters; and reduction of mechanical room infiltration and heating in seldom-used areas.
7. ECM Category 7: Install Improved Local (Non-EMCS) Controls: Improvements include installation of local programmable thermostats, bus engine block heater controls, and vending machine controls.
8. ECM Categories 8-11: Renewable Projects, Water Savings, and Misc.: Projects include installation of solar DHW heaters, Trombe wall outdoor air preheaters, water-saving fixtures, kitchen hood controls, and high-efficiency motors.

## **SUMMARY OF FOSSIL FUEL REDUCTION MEASURES**

Increasing energy efficiency is Northampton's top priority strategy to reduce fossil fuel consumption. The City is counting on a municipal-wide energy efficiency project of most existing City facilities to achieve the bulk of our 20% energy use reductions and will enact a long-term services agreement with an energy services company to implement a measurement and verification plan to maintain this efficiency. All new facilities will be built to a high-efficiency level; an example being the new LEED-Silver designed Senior Center completed in early 2007.

Where economically feasible, the City will install renewable energy systems to offset imported energy use. Such projects become even more attractive when they combine measures to increase efficiency along with adding a renewable energy system as was done with the James House energy upgrade project. As the State has changed its incentives for installation of renewable systems to encourage larger systems, Northampton will explore ways to use these incentives to build systems with capacities of more than 200 kW.

While Northampton has already begun to purchase higher efficiency vehicles, the City will enhance its efforts by upgrading its systems for tracking fuel use per vehicle and by meeting the specifications of the City's new fuel-efficient vehicle purchasing policy. And while,



increasing the efficiency of its fleet will remain the highest priority strategy, replacing fossil-based diesel fuels with biodiesel will also be used to reduce consumption of fossil fuels.

The City will continue to improve the efficiency levels of its streetlights and will expand on the leadership it has already shown in converting parking lot lights over to high-efficiency LED lamps.

## SPECIFIC FOSSIL FUEL ENERGY REDUCTION MEASURES

### Energy Conservation Tasks to Achieve 20% Reduction in 5 Years

#### City Facilities

Northampton will move forward with a performance contract in two phases. Phase one will include 33 facilities and, based on ConEdison *Solutions's* investment grade audit, will produce energy reductions as shown in Table 6.

**Table 6: Energy Use Reductions by Fuel Type per Energy Conservation Type for Northampton's 2010 Performance Contract**

	Electricity		Natural Gas		#2 Fuel Oil		Propane		Total
	kWh	MMBTU	Therms	MMBTU	Gal	MMBTU	Gal	MMBTU	MMBTU
ECM-1: Lighting and Controls Upgrades	355,914	1,214							1,214
ECM-2: Major HVAC System Upgrades	9,906	34	-29,248	-2925	44,023	6,119	1,815	165	3,393
ECM-3: Process Upgrades	313,455	1,070	2,000	200	1,206	168	28,312	2,576	4,014
ECM-4: EMCS Upgrades	809,976	2,764	45,801	4580	11,948	1,661	14,528	1,322	10,327
ECM-5: Building Shell Upgrades	483	2	9,725	973	7,457	1,037	1,272	116	2,126
ECM-6: Minor Equipment Replacement Upgrades			2,118	212	4,032	560	755	69	841
ECM-7: Local Controls and Plug Load Upgrades	25,802	88	477	48	1,134	158	1,283	117	410
ECM-8: Cogeneration and Renewables	9,030	31	2,318	232	193	27			289
ECM-9: Water Upgrades			2,412	241	21	3			244
ECM-10: Kitchen Upgrades	21,575	74	6,878	688					761
ECM-11: PHE Motors Upgrades	5,198	18							18
Total Utility Savings:	1,551,339	5,293	42,481	4248	70,014	9,732	47,965	4,365	23,638

Phase II will include a selection of facilities for which the City is deciding on their use and timeframe for renovation, expansion or disposal. These include building a replacement Police Headquarters, combining the Water Department and DPW administration buildings at the current location of the DPW administration building, expanding the DPW garage, and deciding on whether to keep or sell the Florence Community Center.

Replacement buildings are expected to reduce energy use due to ongoing City practice and policy to construct all new buildings to a LEED-Silver level design. Specifically, in March 2010, the Northampton Energy and Sustainability Commission issued the following recommended policy:

All new significant City buildings or major building renovations shall

1. Meet LEED™ certification standards; and
2. Achieve as many of the LEED categories of *Energy and Atmosphere* and *Sustainable Sites* pertaining to energy efficiency, renewable energy, and sustainable transportation strategies as feasible and practicable; and
3. If practical, be LEED-certified.

In April 2007, Northampton completed construction of a silver-LEED designed Senior Center that is heated and cooled with a ground-source heat pump system. By investing in ground coupled heat pumps to cool the space, condition the ventilation air, and heat water for supplementary radiation, the City reduced the calculated energy load of the building by 1,337 MMBTU per year over what the building would have used if heated and cooled with a more conventional gas-fired boiler and reciprocal chiller.

The City has completed phase one of an upgrade of all light fixtures at the James House Adult Learning Center to high-efficiency light fixtures and lamps and installation of occupation sensors in all rooms. Once completed and the full building is brought into use as an adult learning center this energy conservation measure is expected to reduce annual consumption of electricity by 30,000 kWh.

The City has begun to replace use of the oil-fired furnace and single oversized air-cooled chiller that are currently used to heat and cool the James House building with multiple air-source heat pumps under timed thermostatic control. Once complete and the full building is brought into use as an adult learning center this will reduce the oil use at the James House by an estimated 4,300 gallons a year, replacing this heat source with an electricity-driven high-efficiency heat pump system (HSPF of 9.0) that is expected to use 51,800 kWh per year, and reduce summer-time consumption of electricity for cooling by 30% (28,000 kWh).

The City will reduce energy use through management and behavior changes as well. The Northampton Energy and Sustainability Commission will produce a Sustainability Practices Guide for municipal employees that will reduce energy use, increase recycling, and promote sustainable transportation habits.

#### **ENERGY CONSERVATION TASK 1-A**

- **Task:** Guaranteed Energy Services Performance Project – Phase I
- **Timeline:** Phase I construction to begin in the summer of 2010 and run for 18 months.
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Mayor, Financial Director, City Council.
- **Projected Annual Energy Savings:** 23,638 MMBTU
- **Estimated Project Capital and Operating Costs:**
  - Project cost = \$6,500,000

- Long Term Service Agreement = \$870,000

#### **ENERGY CONSERVATION TASK 1-B**

- **Task:** Guaranteed Energy Services Performance Project – Phase II
- **Timeline:** Phase II IGA and construction contract to be developed in the fall of 2010.
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Mayor, Financial Director, City Council.
- **Projected Annual Energy Savings:** TBD
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 1-C**

- **Task:** Ground Source Heat Pump at Senior Center
- **Timeline:** Completed April 2007
- **Projected Annual Energy Savings:** 1,337 MMBT

#### **ENERGY CONSERVATION TASK 1-D**

- **Task:** HVAC and Lighting Efficiency at James House
- **Timeline:** Phase I was completed in spring of 2010. Phase II to be completed in fall 2010.
- **Responsible Party(ies):** Central Services, Community and Economic Development Director, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** 618 MMBTU
- **Estimated Project Capital and Operating Costs:**
  - Lighting Upgrades: \$17,600
  - HVAC improvements: \$57,000
  - Grant support: \$31,452

#### **ENERGY CONSERVATION TASK 1-E**

- **Task:** Sustainable Practices for City Government
- **Timeline:** Develop guiding document 2010 - 2011
- **Responsible Party(ies):** Energy and Sustainability Commission, Energy and Sustainability Officer, Department Heads, Mayor
- **Projected Annual Energy Savings:** TBD
- **Estimated Project Capital and Operating Costs:** TBD

#### *Vehicles*

While Northampton has recently adopted a fuel-efficient vehicle purchasing policy, the City has been purchasing high efficiency vehicles for several years. For instance, in 2007, the DPW switched from purchasing four wheel drive (4WD) to two wheel drive (2WD) vehicles used for reading water meters and Ford Escape Hybrid utility vehicles. Similarly, the parking division began purchasing Kia Rios (at 24 mpg) for light-duty parking lot chores. Adoption of

the fuel-efficient vehicle purchasing policy will result in the City purchasing even higher efficiency vehicles.

In addition, in 2007 Northampton's DPW began to use a biodiesel/diesel blend in all diesel vehicles. They found that a 20% biodiesel blend in warm months and 5% biodiesel blend in cold months worked well. Unfortunately, due to the national financial downturn's effects on City finances (i.e., budget cuts), the DPW went back to 100% diesel in 2008.

Currently, the City tracks vehicle fuel use by individuals, which effectively provides a history of fuel use by department. In addition, fuel use is not matched to miles driven for any vehicles. The City has begun to investigate ways to track fuel use per vehicle in a way that can be used to monitor individual vehicle's fuel efficiency fill up by fill up.

#### **ENERGY CONSERVATION TASK 2-A**

- **Task:** Upgrade to high efficiency vehicles
- **Timeline:** Ongoing
- **Responsible Party(ies):** City Department Heads, Mayor
- **Projected Annual Energy Savings:** TBD – Inadequate tracking of fuel use per vehicle prohibits an estimate of savings from being made at this time. Anticipate a 3% to 6% energy use reduction per vehicle upgrade.
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 2-B**

- **Task:** Upgrade Tracking of Fuel Use by Individual Vehicles
- **Timeline:** 2010 or 2011
- **Responsible Party(ies):** DPW, Energy and Sustainability Officer, Energy and Sustainability Commission, Mayor
- **Projected Annual Energy Savings:** N/A – will enable planning for measures that will reduce energy use.
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 2-C**

- **Task:** Use a blend of biodiesel in all DPW diesel vehicles
- **Timeline:** Anticipated to start in 2011 or 2012
- **Responsible Party(ies):** DPW, Mayor, Financial Director
- **Projected Annual Energy Savings:** 424 MMBTU<sup>1</sup>
- **Estimated Project Capital and Operating Costs:** \$6,000 annual price premium for biodiesel blend versus 100% diesel plus added cost of increased fuel filter changes.

#### *Street, Parking, and Traffic Lighting*

Northampton has already upgraded all of its red and green traffic lights to LED fixtures. A cost and energy use analysis conducted in 2007 by the Energy and Sustainability Officer

---

<sup>1</sup> Based on biodiesel providing a life-cycle reduction in fossil fuel use of 78% and 20% blend used for 7 months and 5% blend used for 5 months of the year

determined that the energy savings that could be realized by upgrading yellow traffic lights to LEDs were not worth it, the funds would be more effectively spent on other efficiency projects.

In the fall of 2009, Northampton replaced sixteen 400-watt high-pressure sodium (HPS) parking lot fixtures in the Armory Street parking lot with eight 128-watt LED fixtures and eight 96-watt LED fixtures. These are expected to reduce the City's energy use by 23,564 kWh a year.

During the winter of '09-'10 the City replaced all 220 70-watt HPS interior parking garage fixtures with high-efficiency fluorescent fixtures with photovoltaic controls. These are expected to reduce the City's energy use by 71,306 kWh a year.

The City's Parking Division maintains and operates cobra-head light fixtures at seven parking lots (Hampton Ave., South St., Union Station, Strong Ave., Masonic, James House, and Round House); pole-top fixtures similar to the Armory Street lot at Hampton Avenue, Gothic Street, Strong Avenue, Pearl Street, and along the bike path from Hampton Avenue to the railroad bridge; and six pole-top fixtures on top of the parking garage. The parking division will continue to phase in LED and other high efficiency light fixtures at all of these sites over the next one to five years. LED fixtures for the six pole-top fixtures on top of the parking garage are already on order. The City roughly estimates an annual savings of about 5 times the savings seen at the Armory Street lot once all upgrades are complete.

The City has and continues to seek grant funds to implement a LED streetlight pilot project to determine cost-effectiveness, energy reduction potential, and user acceptability of LED fixtures for street and sidewalk lighting.

Twenty years ago, Northampton completed a municipal streetlight survey to evaluate light levels throughout the city and recommend improvements to reduce energy use and improve traffic safety. Eight out of ten recommended phases from the study were completed that resulted in a net removal of 691 streetlights and an overall 14% reduction in lumens. Since then, new construction and individual requests by property owners to adjust light levels in their neighborhoods have occurred and the City has passed a dark-sky ordinance.

Over the next year or two, Northampton intends to conduct a new municipal streetlight survey taking into consideration new technologies (such as LED light fixtures), current recommended light levels for traffic safety, and specifications from the dark sky ordinance. At a minimum, the City anticipates achieving energy and cost savings that were identified in phases 9 and 10 of the 1992 survey.

### **ENERGY CONSERVATION TASK 3-A**

- **Task:** High Efficiency Florescent and LED Fixtures at Parking Facilities: Phase I
- **Timeline:** Completed in the fall/winter of 2009
- **Responsible Party(ies):** Parking Commissioner, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** 324 MMBTU
- **Estimated Project Capital and Operating Costs:**
  - Project Cost: \$60,000
  - Utility Rebates: \$22,514

- Simple payback LED fixtures: 1.5 years
- Simple payback florescent fixtures: 4 years

#### **ENERGY CONSERVATION TASK 3-B**

- **Task:** High Efficiency Florescent and LED Fixtures at Parking Facilities: Future Phases
- **Timeline:** 2011 - 2015
- **Responsible Party(ies):** Parking Commissioner, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** 400 MMBTU once all parking facilities are addressed
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 3-C**

- **Task:** LED Streetlight Pilot Project
- **Timeline:** ASAP 2011 - 2015
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** TBD
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 3-D**

- **Task:** Streetlight Survey
- **Timeline:** 2011/2012
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** N/A – will enable planning for measures that will reduce energy use.
- **Estimated Project Capital and Operating Costs:** TBD

#### **ENERGY CONSERVATION TASK 3-E**

- **Task:** Streetlight Efficiency Improvements
- **Timeline:** 2013 - 2015
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Mayor
- **Projected Annual Energy Savings:** TBD
- **Estimated Project Capital and Operating Costs:** TBD

#### *Municipally-owned and -operated clean renewable or alternative energy installations*

In March 2008, Northampton began selling landfill gas to a private vender (Ameresco) to power a 0.8 MW landfill gas to energy facility. According to the US EPA, this facility will provide a total equivalent annual emissions reduction of 4.051 tons of CO<sub>2</sub>, and 1,594 tons of methane (CH<sub>4</sub>), equivalent to reducing the City's gasoline consumption by 3,828,533 gallons a year. While the City is not considering this measure equivalent to reducing energy

use, it is notable that 3,828,533 gallons of gasoline has an energy content of 474,738 MMBTU, which is more than four times Northampton's adjusted baseline energy use.

<b>Total Equivalent Emissions Reduced</b> [Total = Direct + Avoided]		
<b>MMTCO<sub>2</sub>E/yr</b>	<b>tons CH<sub>4</sub>/yr</b>	<b>tons CO<sub>2</sub>/yr</b>
million metric tons of carbon dioxide equivalents per year	tons of methane per year	tons of carbon dioxide per year
0.0340	1,594	4,051

In March 2010, the City began producing power from a 13 kW photovoltaic array installed on the roof of the James House Learning Adult Center. This array is expected to offset 13,114 kWh of City electricity demand a year.

In October 2009, Northampton received authority from the US IRS to issue \$313,925 in New Clean Renewable Energy Bonds (New CREBs) under section 54C of the Internal Revenue Code, for two photovoltaic projects in the City; one a 100 kW system at the Smith Vocational and Agricultural High School (SVAHS) and a second 13 kW system on the Jackson Street elementary school (JSS). This would cover roughly 45% of the cost of these two projects. The anticipated energy savings due the estimated annual production of 139,960 kWh of electricity from these two projects would be enough to pay off the CREBs. The City is currently seeking funds to pay the remaining project costs. If funds can not be obtained, the City will evaluate soliciting a power purchase agreement (PPA) for one, both, or a modified version of these two projects.

Northampton's landfill is currently slated to close in 2012, however, before that time an expansion may be approved. While the City does not want to consider installing a photovoltaic array on the capped portions of the landfill while the current sections are in operation (i.e., before 2012), it may once the current section being filled is filled in. At that point, the City would consider soliciting a power purchase agreement (PPA) for a photovoltaic array of 200 kW or more to be installed on the capped portion of the landfill.

**ENERGY CONSERVATION TASK 4-A**

- **Task:** Landfill Gas to Energy
- **Timeline:** Completed
- **Responsible Party(ies):** DPW
- **CO<sub>2</sub>-equivalent Emissions Reduction from Equivalent Annual Energy Savings of:** 3,828,533 gallons of gasoline

**ENERGY CONSERVATION TASK 4-B**

- **Task:** 13 kW Photovoltaic Array on the James House
- **Timeline:** Completed March 2010
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Community and Economic Development Director
- **Projected Annual Energy Offset:** 45 MMBTU

- **Estimated Project Capital and Operating Costs:**
  - Project Costs: \$104,838
  - Grants: \$104,838

**ENERGY CONSERVATION TASK 4-C**

- **Task:** 113 kW Photovoltaic Arrays at SVAHS and JSS
- **Timeline:** 2010-2011
- **Responsible Party(ies):** Central Services, Energy and Sustainability Officer, Smith Vocational and Agricultural High School, Energy and Sustainability Commission, Financial Director, Mayor
- **Projected Annual Energy Savings:** 478 MMBTU
- **Estimated Project Capital and Operating Costs:** \$750,000

**ENERGY CONSERVATION TASK 4-D**

- **Task:** 200 kW or greater Photovoltaic Arrays at the Landfill
- **Timeline:** 2012 - 2015
- **Responsible Party(ies):** DPW, Energy and Sustainability Officer, Financial Director, Mayor
- **Projected Annual Energy Savings:** 833 MMBTU minimum
- **Estimated Project Capital and Operating Costs:** Commitment by City to purchase electricity produced by the array at a rate equivalent to or better than market rate of electricity.

*Total Projected Fossil Fuel Energy Reduction*

Table 7 provides a summation of energy conservation tasks 1 through 4.



**Table 7: Summation of Energy Conservation Tasks Reduction/Offset of Fossil Energy Use**

Factors in Calculating Adjusted Baseline		Energy Use by Energy Source						Total Current Energy Use (MMBTU)	
		Electricity (kWh)	Natural Gas (therms)	Fuel Oil (Gal.)	Propane (Gal.)	Gasoline (Gal.)	Diesel Fuel (Gal.)		
<b>BASELINE ENERGY USE</b>									
FY09 Municipal Energy Use		10,695,126	413,714	95,426	86,704	63,531	58,585	115,039	
Adjustment due to reduced energy use in baseline year at the James House		86,021						294	
Adjustment due to geothermal vs. conventional HVAC system at Senior Cen.								1,337	
<b>Adjusted Baseline</b>								<b>116,669</b>	
<b>Energy Conservation Tasks</b>		<b>Energy Reduction/Offset by Energy Source</b>						<b>Total Reduction (MMBTU)</b>	<b>% of Adjusted Baseline</b>
<b>Task #</b>	<b>Task Descriptor</b>	Electricity (kWh)	Natural Gas (therms)	Fuel Oil (Gal.)	Propane (Gal.)	Gasoline (Gal.)	Diesel Fuel (Gal.)		
<b>1. City Facilities</b>									
1-A	Guaranteed Energy Services Performance Project – Phase I	1,551,338	42,481	70,014	47,966			23,638	20.26%
1-B	Guaranteed Energy Services Performance Project - Phase II							TBD	
1-C	Ground Source Heat Pump at Senior Center							1,337	1.15%
1-D	HVAC and Lighting Efficiency at James House	34,200		4,300				714	0.61%
1-E	Sustainable Practices for City Government							TBD	

Energy Conservation Tasks		Energy Reduction/Offset by Energy Source						Total Reduction (MMBTU)	% of Adjusted Baseline
Task #	Task Descriptor	Electricity (kWh)	Natural Gas (therms)	Fuel Oil (Gal.)	Propane (Gal.)	Gasoline (Gal.)	Diesel Fuel (Gal.)		
<b>2. Vehicles</b>									
2-A	Upgrade to High Efficiency Vehicles							TBD	
2-B	Upgrade Tracking of Fuel Use by Individual Vehicles							N/A	
2-C	Use a blend of biodiesel in all DPW diesel vehicles						3,050	424	0.36%
<b>3. Street, Parking, and Traffic Lighting</b>									
3-A	High Efficiency Light Fixtures at Parking Facilities: Phase I	94,870						324	0.28%
3-B	High Efficiency Light Fixtures at Parking Facilities: Future Phases	117,820						402	0.34%
3-C	LED Streetlight Pilot Project							TBD	
3-D	Streetlight Survey							N/A	
3-E	Streetlight Efficiency Improvements							TBD	

Energy Conservation Tasks		Energy Reduction/Offset by Energy Source						Total Reduction (MMBTU)	% of Adjusted Baseline
Task #	Task Descriptor	Electricity (kWh)	Natural Gas (therms)	Fuel Oil (Gal.)	Propane (Gal.)	Gasoline (Gal.)	Diesel Fuel (Gal.)		
<b>4. Municipally-owned and -operated Clean Renewable or Alternative Energy Installations</b>									
4-A	Landfill Gas to Energy <sup>2</sup>							N/A	
4-B	13 kW Photovoltaic Array on the James House	13,114						45	0.04%
4-C	100 kW and 13 kW Photovoltaic Arrays at SVAHS and JSS	139,960						478	0.41%
4-D	200 kW or greater Photovoltaic Arrays at the Landfill	244,130						833	1%
<b>Total Determinable Energy Reductions</b>									
Reductions from Energy Conservation Tasks 1 - 3		1,798,228	42,481	74,314	47,966		3,050	<b>25,502</b>	<b>21.86%</b>
Reductions from Clean Renewable or Alternative Energy Installations		397,204						<b>1,355</b>	<b>1.16%</b>
<b>Total Determinable Energy Reductions</b>		<b>2,195,432</b>	<b>42,481</b>	<b>74,314</b>	<b>47,966</b>		<b>3,050</b>	<b>26,857</b>	<b>23.02%</b>

<sup>2</sup> While, according to the US EPA, the greenhouse gas reductions from this measure are equivalent to not consuming 3,828,533 gallons of gasoline annually the City is not considering this equivalent to reducing energy use. However, it is notable that 3,828,533 gallons of gasoline has an energy content of 474,738 MMBTU, which is more than four times Northampton's adjusted baseline energy use.

## **MEASUREMENT AND VERIFICATION PLAN FOR PROJECTED REDUCTIONS**

Each energy conservation measure (ECM) included in the performance contract will be associated with a specific measurement and verification (M&V) protocol agreed to by the City of Northampton and ConEdison *Solutions* (CES). If deviations in performance occur, CES's M&V plan will identify in a written report those deviations and identify clearly the party responsible for correcting such deviations. Those deviations under the control and management of CES will be corrected as soon as they are identified (typically during CES's operation and maintenance (O&M) oversight activities, but sometimes only after completion of CES's annual M&V activities) and, if such deviations cannot be corrected, savings will be recalculated using the agreed-upon building simulation models to recalculate interactive energy savings for the building. Those deviations under the control of City of Northampton will be identified as soon as practicable and the City will take corrective actions recommended by CES.

Because the City has included the new Senior Center in the performance contract, monitoring the performance of this building's geothermal system will be included in this process. In addition, the performance contract project will increase the City's energy management systems capabilities, which the City will use to monitor energy performance on a daily or weekly basis. For facilities not included in the energy services performance contract, the City will continue to monitor energy performance through its ongoing in-house energy tracking efforts. The City anticipates moving over to the MA DOER's MassEnergyInsight on-line tracking system as a way to upgrade the City's current level of energy tracking reporting.

Central Services will oversee all energy tracking responsibilities and will work closely with CES to implement the performance contract's O&M and M&V plans. Central Services will provide at a minimum an annual report on the performance of the energy services project for the Mayor of Northampton and the City Council.

Northampton will upgrade its capability to track gasoline and diesel fuel use and miles driven per vehicle so the City can track individual vehicle's fuel efficiency (miles per gallon).

Increased efficiency in outdoor lighting and energy produced by renewable energy projects will be verified by monitoring electric utility bills and on-line data monitoring systems respectively.

## **LONG-TERM ENERGY REDUCTION GOALS – BEYOND 5 YEARS**

The Sustainable Northampton Plan sets a short term goal of 30% greenhouse gas (GHG) emission reduction by 2030. The Pioneer Valley Clean Energy Plan, which has been endorsed by the City, sets a goal of 80% GHG reductions over 2000 levels by 2050.

### **Municipal Sector**

Northampton will continue to make comprehensive efficiency improvements in all City facilities as new technologies become available and/or energy prices make feasible. The City will evaluate at regular intervals whether technology and/or energy prices have changed enough to warrant the City undergoing another energy services performance project. In addition, the City will continue to seek funding and financing opportunities that will allow it to install renewable energy systems at City facilities.

The City will continue to encourage National Grid to provide a rate-tariff for high-efficiency LED streetlights and upgrade all of Northampton's streetlights to this new technology as soon as the technology and cost make this feasible. Results from any LED streetlight pilot project will be shared with National Grid to encourage them to bring this option to their customers.

### **Residential and Commercial Sectors**

In short, the City's long-term strategy to assist private property owners is to reduce barriers to increased efficiency in the residential and commercial sectors. The City can do this through policies and partnerships that provide funding, financing, and education and reduce uncertainties for private property owners to increase efficiency and use renewable energy. Some specific programs include:

- Property Assessed Clean Energy (PACE) financing
- Partnering with banks to provide:
  - energy efficiency loans
  - a deferred energy efficiency loan program for low income residents
- Work with regional partners to develop a regional carbon-offset program
- Establish seed money for a local revolving loan fund for energy efficiency and renewable energy projects
- Partner with the Chamber of Commerce to provide green business practices assistance to local businesses
- Work with SVAHS and other local educational organizations to prepare our workforce for jobs in energy efficiency and renewable energy