The City of Chelsea
Strategic Energy Plan

December 19, 2012

Prepared by the Metropolitan Area Planning Council (MAPC) and

Peregrine Energy Group

for

The City of Chelsea

MAPC
METROPOLITAN AREA PLANNING COUNCIL
Smart Growth & Regional Collaboration

LOCAL ENERGY
ACTION
PROGRAM

Acknowledgements

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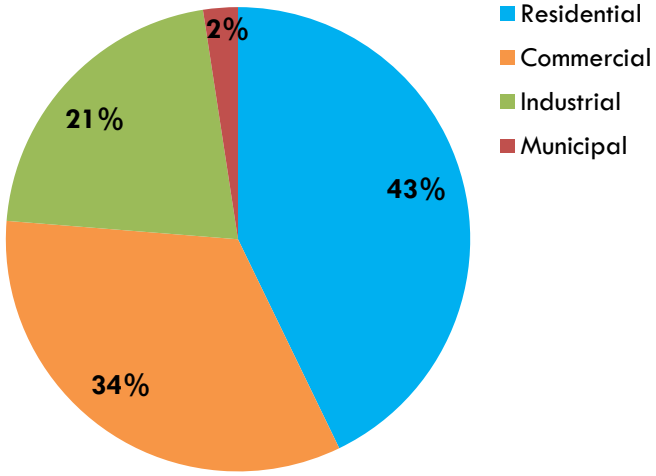
Introduction

Due to concerns over increasing energy costs, municipal fiscal responsibilities, and environmental consequences due to climate change, communities across the country are pursuing cost-effective and innovative ways to reduce energy consumption and to invest in cleaner energy sources.

FY 2012 Chelsea Energy Consumption by Sector



In 2009, the City of Chelsea was allocated $164,000 as part of the ARRA funded Energy Efficiency Conservation Block Grant (EECBG) Program for energy efficiency and alternative energy projects in the City. Over the past three years, this funding has supported a variety of projects, including the City's pursuit of an energy savings performance contract for efficiency upgrades in municipal buildings, exploration of rooftop solar opportunities, and implementation of LED streetlight retrofits. The City also used the funding to support the development of this Strategic Energy Plan. This plan provides a blueprint for City to achieve community-wide energy reductions by outlining a set of initiatives to complement and enhance EECBG-funded activities. Although the City has made great strides to pursue energy efficiency in the past, there remains significant potential for further energy reductions.

On the municipal side, the City can take advantage of existing utility programs and incentives and leverage energy cost savings through an energy savings performance contract that will improve building occupant comfort and drive infrastructure modernization, as well as reduce greenhouse gas emissions. Pursuing this work in municipal facilities will have the additional benefit of affirming the City's leadership role in the realm of energy efficiency and renewable energy development.

Since the residential, commercial, and industrial sectors account for 98% of the City's energy consumption, it is important that clean energy efforts in Chelsea continue outside of municipal facilities. The Strategic Energy Plan also contains recommendations and actions that the City could pursue to help Chelsea residents and businesses take advantage of utility programs and incentives and undertake their own energy efficiency and renewable energy efforts.

Chelsea Energy Profile

The City of Chelsea is an inner urban suburb of Boston with a population of 35,080 (Census 2010). It is located in the eastern part of the state, and borders Boston Harbor to the south, the Cities of Winthrop and Revere to the east, the City of Everett to the north, and the City of Somerville to the west. In the past several years, the City and community stakeholders have invested greater effort to make Chelsea a more energy efficient and sustainable community.

On the municipal side, the City has displayed tremendous success in reducing building energy consumptions through efficiency upgrades and improved operation management in the school buildings. Given that the residential, commercial, and industrial sectors account for 98% of the City's overall energy consumption, Chelsea also recognizes the significance in promoting energy efficiency and sustainability in the community. In order to strengthen community outreach efforts and increase energy efficiency in the residential and commercial sectors, the City participated in the Green Justice Coalition's Community Mobilization Initiative pilot and was a partner city in the EE2020 program. These examples highlight the outstanding efforts the City of Chelsea has undertaken to support clean energy in the community.

Municipal Energy Profile

Chelsea's municipal energy consumption accounts for approximately 2% of the overall city-wide energy consumption. To date, the City's energy efforts have centered on improving energy efficiency standards in municipal buildings and facilities. The following section builds upon the City of Chelsea Energy Reduction Plan and energy data obtained from Chelsea's MassEnergyInsight (MEI) account,[1] highlighting the implemented municipal energy work and assessing Chelsea's current progress towards meeting its energy reduction target.

Municipal Energy Reduction Progress

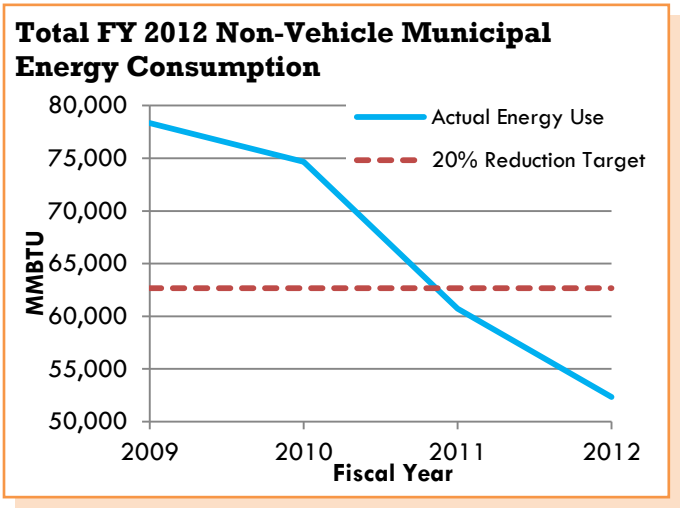
To guide the City's energy reduction efforts, Peregrine Energy Group and MAPC prepared an Energy Reduction Plan (ERP) detailing a multi-measure energy savings plan that help Chelsea achieve a 20% energy reduction target from the FY 2009 baseline level (83,899 MMBTUs).[2] The ERP anticipates the City will reduce its municipal energy consumption by 29.1% (25,466 MMBTUs) through proposed and completed energy efficiency projects in buildings and facilities between 2009 and 2014. Recommended energy conservation measures include:

[1] MassEnergyInsight is a free, web-based tool developed by Peregrine Energy Group and made available to cities and towns in Massachusetts through the Department of Energy Resources (DOER) as part of the Massachusetts Green Communities Program. Electric and natural gas usage for Chelsea's municipal accounts is pre-loaded by the utilities into the MEI program. Other fuel use data (such as heating oil and vehicle fuel) must be manually entered and kept up-to-date by Chelsea municipal staff.

[2] For more information on the Energy Reduction Plan, refer to Appendix A.

Facility	ERP Measures
Buildings	• Boiler replacement at the Fire Station; • HVAC upgrades at the Police Station.
Street Lighting	• Convert all City owned streetlights to LED.
Vehicles	• Enhance existing Fuel Management System; • Implement an automated Fleet Management System ; • Adopt a preventative maintenance schedule; • Use 100% synthetic oil; • Implement a no-idling policy for municipal employees.

As the graph on the right shows, Chelsea's non-vehicle municipal energy consumption has been slowly declining since 2009.[3,4] The City reduced its non-vehicle energy consumption over 20% in FY 2011 through energy conservation and energy efficiency improvement measures in the school buildings. As of FY 2012, the City has lowered its energy consumption by approximately 33% (26,018 MMBTUs) from the 2009 baseline level.



Municipal Building Energy Use Overview

The City of Chelsea has 14 municipally-owned buildings, including City Hall, City Yard, four fire stations, Police Station, Emergency OP/E911 building, Public Library, five school facilities, and Senior Center. Buildings are the largest category of users in municipal energy consumption, and accounts for 97% of the City's total municipal energy consumption. According to the "Municipal Building Inventory" on page 4, the Chelsea School Department accounts for the highest energy use among all municipal services, although the buildings are among the most efficient on an MMBTU/sf basis. Chelsea High School is the single highest energy user among all municipal buildings, followed by the Burke School Complex then the Clark Avenue Middle School. After the School Department, the Police Station, the City Hall, and Central Fire Station are the next highest energy users among all municipal buildings.

Chelsea High School (Source: Chelsea Public Schools)

[3] As of January 2013, Chelsea's MEI account is missing municipal fuel oil, gasoline, and diesel data for FY 2011 and FY 2012. Some of the overall energy reduction trends and energy data analysis described in this document may need to be adjusted to account for this data gap.

[4] The building energy consumption data in this document is adjusted to account for abnormal fuel consumption due to weather differences each year using simple-ratio based weather normalization.

Municipal Building Inventory

Building	Building Floor Area (Sq. Ft)	2009 Baseline Energy Use (MMBTU)	2009 Baseline EUI (kBTU/ Sq.Ft)	2012 Energy Use (MMBTU)	2012 EUI (kBTU/ Sq.Ft)
City Hall	49,728	3,278	66	3,443	69
City Yard	39,720	1,505	38	1,588	40
Emergency Ops/ E911	2,640	462	175	472	179
Central Fire Station	19,671	1,628	83	1,130	57
Engine #1 Fire Station	7,121	851	120	803	113
Engine #2 Fire Station	18,912	268	14	217	11
Engine #3 Fire Station	7,680	665	87	20	3
Police Station	22,080	3,486	158	3,452	156
Public Library	15,836	978	62	971	61
Burke School Complex	500,918	14,922	30	8,159	16
Chelsea High School	244,400	15,339	63	11,133	46
Clark Avenue Middle School	160,000	10,097	63	7,109	44
Shurtleff Early Learning Center	105,000	8,839	84	4,495	43
Williams School Complex	262,965	10,942	42	6,311	24
Senior Center	19,761	1,217	62	1,106	56

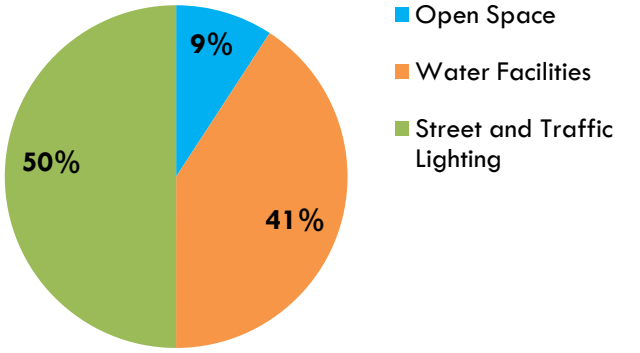
Municipal Building Energy Projects

As noted in the "Municipal Energy Reduction Progress" section, Chelsea has demonstrated great success in achieving building energy reductions, particularly in the schools. The City's current energy reduction strategies focus on implementing energy efficiency upgrades in other municipal facilities through an energy savings performance contract,[5] as well as facility operation management in the school buildings. For a detailed implementation plan of the City's building energy reduction projects, please refer to Appendix A: City of Chelsea Energy Reduction Plan.

Non-Building Energy Overview[6]

Non-building energy use makes up roughly 3% of Chelsea's overall municipal energy consumption in FY 2012. The largest category of non-building energy use in the City is street and traffic lighting, followed by water facilities then open space.

FY 2012 Non-Building Energy Use by Categories



Open Space & Water/Sewer

Chelsea's open space includes 238 Spruce Street, 256 Carter Street, Police Garage, and

[5] In 2011, MAPC facilitated a procurement process, with support from Peregrine Energy Group, for an Energy Services Company (ESCO) to provide energy efficiency services to 14 participating municipalities, including Chelsea.[5] As part of the procurement, the City of Chelsea was eligible to enter into an energy savings performance contract with AMERESCO, the winning vendor. For more information on MAPC's Regional Energy Services Company Procurement project, refer to http://www.mapc.org/regional-esco.

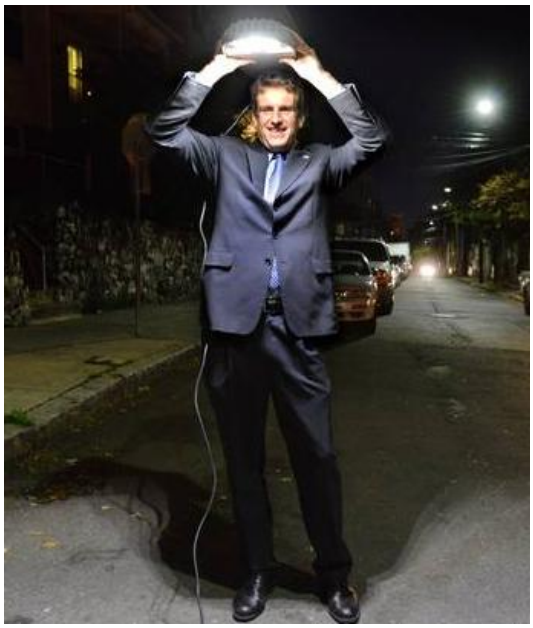
[6] Non-building energy use accounts for energy consumption in open space, water facilities, and street and traffic lighting and does not include vehicle energy consumption.

all park lighting. In FY 2012, open space accounts for 9% of the City's non-building energy consumption.

There are two pumping stations in the City: one located on 1 Broadway, the other on 432 Carter St. Both facilities only operate on electricity. In FY 2012, energy use in the facilities contributes to 41% of overall non-building energy consumption.

Street Lighting & Traffic Signals

In FY 2012, street lighting and traffic signals account for roughly 50% of Chelsea's non-building energy consumption. The City owns and operates its street, traffic and park lights, which creates an opportunity for immediately pursue energy reduction measures. The City used a portion of its EECBG funds to purchase and install LED streetlight retrofits, and is working in collaboration with MAPC and the City of Woburn and towns of Arlington and Natick to jointly procure retrofits for the rest of its street lighting system. Completion of the project is estimated to result in around 60% reduction in street lighting energy consumption.

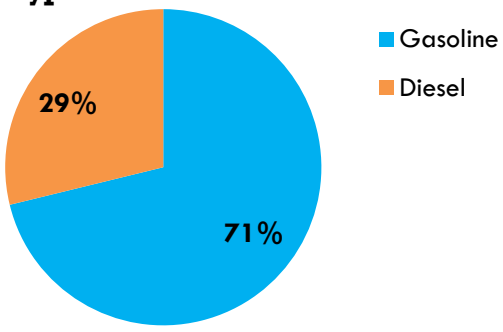


Chelsea City Manager Jay Ash with cobrahead-style LED (source: USA Today)

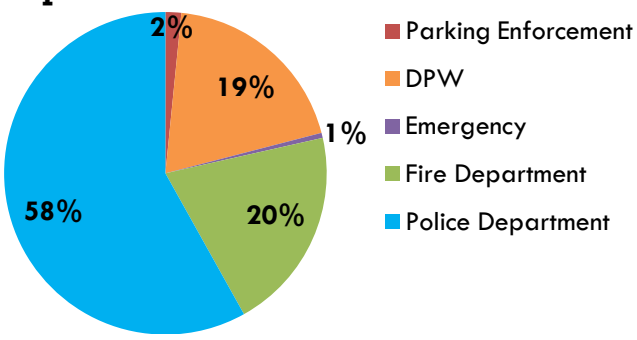
Vehicle Energy Overview[7]

Vehicle fuel consumption accounts for 13% of Chelsea's FY 2010 total municipal energy consumption. 74% of Chelsea's vehicle energy usage is attributable to gasoline fuel consumption, and the remaining 26% is attributable to diesel fuel consumption. Proportionally, gasoline usage and diesel usage accounted for approximately 71% and 29% respectively of municipal vehicle greenhouse gas emissions in FY 2010. Fuel use in the Police Department accounts for the highest vehicle energy consumption among all departments, followed by the Fire Department then the Department of Public Works.

FY 2010 Vehicle Greenhouse Gas Emissions by Fuel Types



FY 2010 Vehicle Energy Consumption by Departments

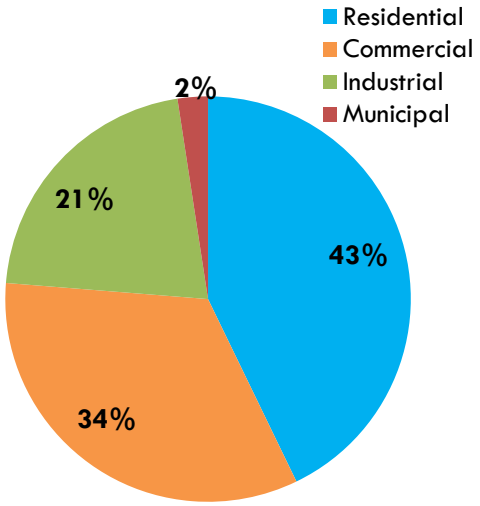


[7] As of January 2013, gasoline and diesel data for FY 2011 and FY 2012 has not yet been uploaded to Chelsea's MEI account.

Community Energy Profile

Approximately 98% of energy use in Chelsea is in the residential, commercial, and industrial sectors. Currently, there are no standard systems for municipalities to collect aggregate residential and commercial data from investor-owned utilities. Given the difficulty with accessing such data for developing this plan, the plan uses publicly available data such as census data, labor statistics, and building energy survey analyses to estimate aggregate energy use by sector. Since this profile was generated using static data sources, it cannot be used to benchmark and monitor subsequent changes in use. Actual aggregate data would have to be obtained from NSTAR and National Grid to benchmark the progress of community energy efforts.

Chelsea Energy Consumption by Sector



Residential Sector At-A-Glance

Chelsea Residential Profile		
Median Household Income	$43,590	
Total # Housing Units	12,550	
Units that Heat with Natural Gas	6,511	
Units that Heat with Fuel Oil	2,285	
Housing Type	**Owner-Occupied**	**Renter-Occupied**
Single-Family, Detached	6%	2%
Single-Family, Attached	4%	2%
Multi-Family, 2-4 Units	13%	36%
Multi-Family, 5+ Units	5%	31%
Total	28%	72%

Source: US Census 2010

Annual Residential Energy Consumption in Chelsea

Fuel Type	Energy Consumption	Greenhouse Gas Emission
Electricity	69 million kWh	57 million lbs CO_2
Natural Gas	4.4 million therms	52 million lbs CO_2
Fuel Oil	1.7 million gallons	38 million lbs CO_2

The calculation for greenhouse gas emissions is derived based on the energy consumption by fuel types and the following conversion factors:

Greenhoues Gas Emission Conversion Factors

Fuel Type	Factor (lbs CO_2 per Fuel Unit)	Fuel Unit
Electricity	0.828	kWh
Natural Gas	11.71	therms
Fuel Oil	22.38	gallons

Residential Sector

Chelsea's population by race and ethnicity shares similar characteristics with the state average, with a slightly larger black populations and a smaller Asian population. The City's population is slightly younger than the state average, with a higher percentage of children under 5 years (11.3%) and adult between the age of 30 and 34 (11.4%). Chelsea's median household income ($43,590) is lower than the state median ($62,895). 63% of Chelsea's households earn below the state's annual median income, with 10% earning between 60% and 80% of the state median household income.

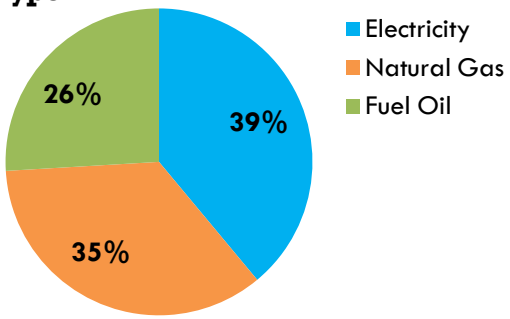
72% of Chelsea's occupied units are renter-occupied. The City has a large multi-family, 2-4 renter-occupied units housing stock (36% of total occupied housing stock). Over half of the homes in Chelsea heat with natural gas (52%), with an additional 18%

of homes heating with fuel oil. The remaining 30% have electric heat or use another heating fuel such as wood.

Residential Energy Consumption[8]

The residential sector makes up approximately 43% of energy consumption in Chelsea. By fuel type, electricity makes up the largest part of the residential sector's greenhouse gas emissions followed by natural gas, then fuel oil. Chelsea residents spend approximately $19 million each year on home energy expenditures.

Residential Greenhouse Gas Emissions by Fuel Type



Residential Energy Initiatives[9]

Launch of the Chelsea Community Mobilization Initiatives (Source: Green Justice Coalition)

In November 2010, led by Chelsea Collaborative, the City participated in a pilot with the Green Justice Coalition's Community Mobilization Initiative (CMI). The 10-month program aimed to increase residential participation in MassSave in hard to reach/hard to serve communities, targeting households with incomes between 60-120% of the state median income. Chelsea established a participation target in two categories: 50 retrofits in homes with 1-4 units and 4 retrofits of multi-family buildings with 5-20 units. The Chelsea Collaborative provided intensive customer support for residents with language and cultural barriers through the audit-to-retrofit process. In order to incentivize participation, the City of Chelsea provided a one-time-only gap funding of $500 to each customer to complete the retrofit work. By the program's completion in August 2011, the Collaborative had successfully completed energy efficiency upgrades in two multi-family buildings and 12 1-4 unit homes, and scheduled six additional retrofit jobs, two in multi-family buildings and four in 1-4 unit homes.

[8] Annual residential energy consumption and expenditures was approximated based on the average heating energy consumption for Massachusetts households provided by the 2009 Energy Information Administration Residential Energy Consumption Survey.

[9] This section is developed based on the information provided by the 2011 "Moving Towards Community Driven Energy Efficiency: An Evaluation of Green Justice Coalition's Community Mobilization Initiatives" report prepared by Green Justice Coalition and the 2011 "Evaluation of the Green Justice Coalition's Community Mobilization Initiative Chinatown and Chelsea Residential Energy Efficiency Pilots" report prepared by Arbor Consulting Partners.

Commercial and Industrial (C&I) Sectors

The commercial and industrial sectors in Chelsea consist of 744 business establishments that employ 13,544 people. The City has large office and food service sectors. The education and food sales sectors are also major employers in the community. Chelsea's industrial sector is relatively small, with specialty trade contractors being the major industry.

Commercial Energy Consumption

Energy use in the commercial and industrial sectors accounts for 34% and 21% of the City's overall community energy consumption. By fuel types, electricity accounts for the largest source of greenhouse gas emission in the commercial sector, followed by natural gas and fuel oil. In the industrial sector, the largest source of emission is natural gas, followed by electricity then fuel oil.[10] Chelsea's commercial establishments spend roughly $15 million annually on energy. Due to the limitations of the data sets used to approximate this baseline, industrial sector energy expenditures are not included here.

C&I Sectors At-A-Glance

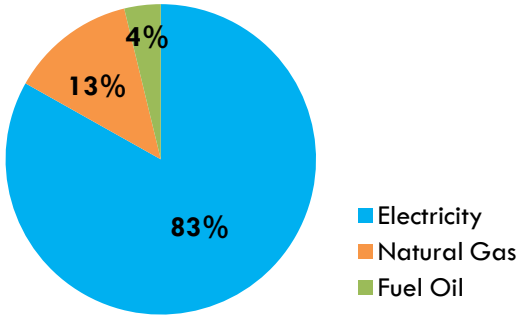
Chelsea Commercial Profile		
Median Weekly Wage	$834	
Total Employment	13,544	
Total Establishments	744	
Industry	*# Est.*	*# Emp.*
Education	10	1,217
Food Sales	48	1,171
Food Service	59	640
Outpatient Care	28	199
Lodging	23	906
Retail (non-mall)	17	95
Enclosed and Strip Malls	14	134
Office	149	2,282
Religious Worship	13	236
Service	50	259
Warehouse & Storage	63	1,050
Chelsea Industrial Profile		
Industry	*# Est.*	*# Emp.*
Construction of Buildings	10	29
Heavy and Civil Engineering Construction	3	33
Specialty Trade Contractors	26	235
Food	11	973
Chemicals	3	20
Fabricated Metal Products	6	75

Source: Bureau of Labor Standards Economic Survey, 2010

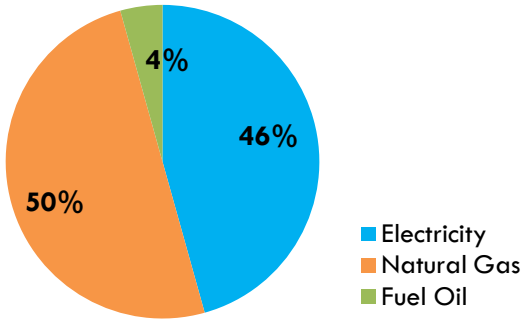
Annual Commercial Energy Consumption in Chelsea		
Fuel Type	**Energy Consumption**	**Greenhouse Gas Emission**
Electricity	153 million kWh	127 million lbs CO_2
Natural Gas	1.7 million therms	20 million lbs CO_2
Fuel Oil	258 thousand gallons	5.7 million lbs CO_2

Annual Commercial Energy Consumption in Chelsea		
Fuel Type	**Energy Consumption**	**Greenhouse Gas Emission**
Electricity	31 million kWh	127 million lbs CO_2
Natural Gas	2.4 million therms	20 million lbs CO_2
Fuel Oil	109 thousand gallons	5.7 million lbs CO_2

Commercial Greenhouse Gas Emissions by Fuel Type



Industrial Greenhouse Gas Emissions by Fuel Type



[10] The calculation for greenhouse gas emissions is derived based on the energy consumption by fuel types and standard conversion factors for each fuel type.

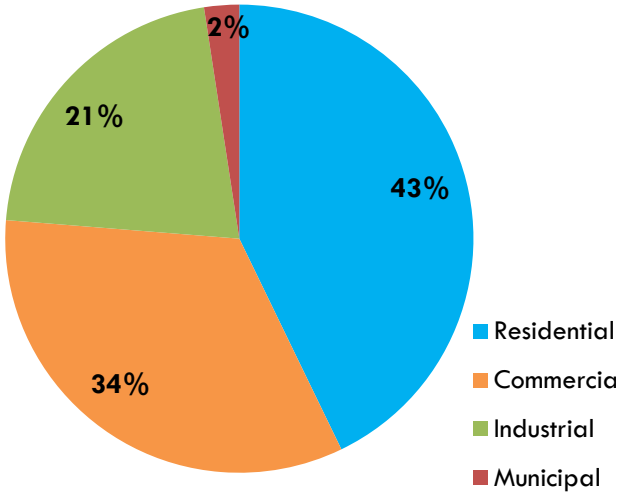
Commercial Energy Initiatives

In 2010, City of Chelsea was selected as a municipal partner with the EE 2020 program, with a focus on driving energy efficiency efforts through outreach to Chelsea's large commercial and industrial businesses. An evaluation of this program has not yet been completed. More information on EE2020 can be found on their website, at http://serrafix.com/ee2020/.

Chelsea Energy Strategies

This section was established based on the Chelsea Energy Profile and the Energy Reduction Plan generated by Peregrine Energy Group and MAPC. Since municipal energy consumption accounts for only 2% of Chelsea's total energy use, the City may want to consider strategies that encourage energy efficiency actions across sectors in order to achieve significant energy savings and greenhouse gas emissions reduction community-wide. The recommendations in this section highlight municipal energy reduction opportunities, as well as identify opportunities to support Chelsea's residents and businesses in similar efforts.

FY 2012 Chelsea Energy Consumption by Sector



Municipal Energy Strategies

As evidenced in the Municipal Energy Profile, the City has already made great strides towards improving energy efficiency in municipal buildings. To further advance Chelsea's clean energy efforts and to increase energy conservation and savings, the City should pursue the following strategies:

- Implement energy projects as outlined in the Energy Reduction Plan (ERP);
- Establish an energy task force comprised of municipal staff to support the implementation of municipal energy projects; and
- Consider creating a Shared Energy Coordinator position in partnership with neighboring communities to increase energy management and program/grant planning and coordinating capacity.

1. Implement Energy Reduction Plan Projects.

As of FY 2012, the City of Chelsea has already achieved more than 20% reductions in non-vehicle municipal energy use. In order to continue this outstanding trend, the City should closely monitor the progress made in implementing the ERP's proposed energy efficiency measures. The City should prioritize projects based on a project's energy savings and greenhouse gas reduction potential and its ability to help the City achieve both energy goals and other goals, such as those related to cost savings and capital improvements. The clearest path to achieving significant energy reductions is to perform energy efficiency upgrades in buildings with the lower

efficiency that are using significant amounts of energy. The "Areas of Least Efficiency/Greatest Waste" section in the Chelsea ERP highlights municipal buildings with the greatest energy reduction potential.

As noted in the Chelsea ERP, the City's ESCO project poses great opportunities to make a significant leap in the City's energy reduction progress. In addition to performance contracting, Chelsea should also conduct further research to identify additional financing mechanisms and funding opportunities, such as utility incentives and state grants, for pursuing clean energy projects beyond building efficiency upgrades. Potential projects may include community outreach campaigns, installation of renewable energy projects, and fuel-efficient vehicle purchases.

For more information on this strategy, refer to the Appendix: Energy Reduction Plan.

2. Establish Energy Task Force.

In order to ensure the Energy Reduction Plan is followed, it is recommended that the City under the leadership of the City Manager establish an energy task force staffed by municipal employees from various departments. Potential members of the energy committee may include:

- City Council;
- City Clerk;
- Health & Human Services Department;
- Planning & Development Department;
- Public Safety Department;
- Department of Public Works; and
- Chelsea School Department.

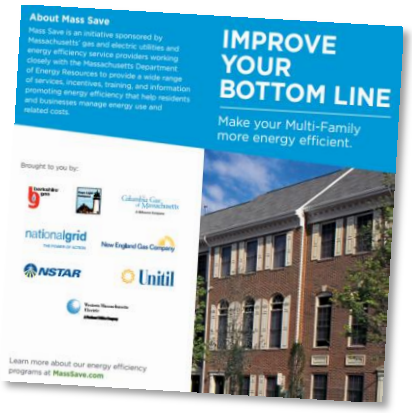
The committee should be charged with implementing the projects identified in the Energy Reduction Plan and would meet regularly or on an ad-hoc basis to discuss project milestones, as well as plan for next steps.

3. Consider Shared Energy Coordinator Position.

Given the significant opportunities for Chelsea to pursue additional grants and clean energy projects, as well as support residential and commercial clean energy efforts, the City should consider working with MAPC under the Circuit Rider Initiative to collaborate with other municipalities with energy-related staffing needs to hire a shared position and/or contract for energy coordinator/planner services. An energy coordinator or planner can manage existing energy projects and paperwork, as well as work closely with the proposed municipal staff energy committee to identify and to pursue new projects.

Residential Energy Strategies

With the residential sector accounting for approximately 43% of Chelsea's total energy consumption, strategies that promote energy efficiency activities by the City's residents are important to achieve significant greenhouse gas reductions and energy savings. Chelsea residents served by National Grid and/or NSTAR are eligible to participate in the state's MassSave program, so any effort to promote energy efficiency in the residential sector should focus on increasing participation in these existing opportunities. MassSave offers residents free energy assessments, as well as rebates and incentives for insulation, air sealing and the installation of energy efficiency measures, such as efficient lighting and ENERGY STAR appliances.



Source: MassSave

The City should educate and encourage residents to participate in the MassSave program, as well as organized community outreach efforts to support MassSave participation. Any effort to encourage residential participation in MassSave should be collaborative in nature, leveraging the resources and institutional knowledge of National Grid and NSTAR and energy service vendors, and the local and community expertise of municipal staff and community stakeholders.

Additionally, those promoting MassSave should consider developing targeted outreach strategies for (1) residents who are more likely to participate in MassSave, such as single- or multi-family, owner-occupied households; and (2) those who face more barriers to MassSave participation, such as renters and fuel oil users. In addition, the City should consider the lessons learned from the Community Mobilization Initiatives and the recommendations in the evaluation reports of the programs to strengthen outreach to hard to serve/hard to reach resident populations.

Beyond an outreach program, other actions that could potentially help the City reach support residential clean energy pursuits include adopting as-of-right siting for renewable energy development and integrating energy efficiency goals in Community Development Block Grant (CDBG) projects.

For guidance on specific residential outreach techniques and strategies, refer to MAPC's forthcoming Energy Toolkit at www.mapc.org.

C&I Energy Strategies

Chelsea's commercial and industrial sectors account for 45% of the community's energy consumption, and therefore are of equal importance in a strategy to reduce City's overall energy consumption. Similar to the recommendations made for targeting the residential sector, any effort to reduce energy in Chelsea's businesses will require coordination among the City, NSTAR, National Grid, and the Chelsea Chamber of Commerce.

Efforts to help local businesses reduce their energy consumption and pursue renewable energy should similarly be aligned with the business incentives and programs offered by National Grid and NSTAR. As local stakeholders consider how to engage local businesses, they should consider focusing on businesses that have specific energy consumption patterns, such as the food sales and services industries.

In addition to encouraging businesses to participate in the utility MassSave program, other actions that could potentially help the City reach commercial energy goals include adopting as-of-right siting for renewable energy developments and adopting expedited permitting process for energy manufacturing facilities.

For guidance on specific commercial outreach techniques and strategies, refer to MAPC's forthcoming Energy Toolkit at www.mapc.org.