The City of Medford
Local Energy Action Plan

Part III – Appendix

February 25th, 2013

Prepared by the Metropolitan Area Planning Council (MAPC)

for

The City of Medford

MAPC
METROPOLITAN AREA PLANNING COUNCIL
Smart Growth & Regional Collaboration

LOCAL ENERGY ACTION PROGRAM

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Appendix A: Methodologies for Creating a Local Energy Baseline

SUMMARY

This document is meant to serve as a guide for developing a rough baseline of building energy consumption and expenditures in a community's residential and commercial sectors. In the absence of utility data, this methodology can serve as an approximation of aggregate-level energy use based on census data, labor statistics, and building energy survey analyses. It is meant to serve as a baseline for the purposes of local energy planning efforts, and provide insight as to the types and scale of energy use within a community. However, since the inputs are based on static data sources, the baselines derived using this methodology cannot be used to benchmark and monitor subsequent changes in use, i.e., the success of an energy efficiency outreach program.

The methodology in this document describes how to derive local energy baselines for communities in Massachusetts. However, this data is publically available on the national level and could be replicated for a community anywhere in the United States (with some modifications to regionally-specific assumptions). In the interest of simplicity, these baselines include only electricity, natural gas and fuel oil consumption. Communities that rely heavily on other fuels (i.e., wood, propane, district heating) should consider expanding the methodology to account for those fuel types.

For reference, the following conversion factors are used to compare physical fuel units with Btu (British thermal units):

Energy Unit Conversion Factors		
Fuel Type	**Units**	**Factor**
Electricity	MMBTU/ kWh	0.003412
Natural Gas	MMBTU/ therm	0.1
Fuel Oil	MMBTU/ gallon	0.139

Residential Sector

REFERENCED DATA SETS

- American Community Survey (ACS), 2006-2010 5-Year Community Estimates
  - Occupied Housing Units, Units in Structure
  - Heating Fuel
- Energy Information Administration (EIA) Residential Energy Consumption Survey (RECS) , 2005

STEP-BY-STEP INSTRUCTIONS

Step 1. Find the number of housing units, by type. Use ACS 2010 estimates by municipality for Housing Units in Structure to determine the total number of housing units for the following types:

a. Single-Family, Detached

b. Single-Family, Attached

c. Multi-Family, 2-4 Units (Sum of 2-Family and 3-4 Units categories)

d. Multi-Family, 5+ Units (Sum of 5-19 Units, 20-49 Units, and 50+ Units categories)

e. Other

Step 2. Determine the percentage of homes within a community that heat with different fuel types. Use ACS 2010 estimates by municipality for Heating Fuel to determine the total number of units that heat with the following major fuel types:

a. Utility Gas (natural gas)

b. Fuel Oil

c. Electricity

Example:

MUNICIPALITY	TOTAL UNITS	SF_DETACHED	SF_ATTACHED	2-4 UNITS	5+ UNITS	% GAS HEAT	% FUEL OIL HEAT
Chelsea	13,009	1,345	594	6,748	4,322	48%	18%

Step 3. Determine average use and expenditures by fuel type for each housing unit type. Start with EIA RECS 2005 Consumption and Expenditures data in Tables 8-10 to determine average consumption and expenditures by housing type. These numbers are national averages. In order to scale these national averages to a region- or state-specific level, the national averages must first be weighted by the percentages of housing unit types at the regional or state level.

Example: Calculate the average annual electricity consumption of a single-family, detached home in New England. The following quantities are known based on EIA and ACS data:

	A	B	C	D	E
1		US Average Electricity Consumption (kWh)	% Units in US	% Units in New England	New England Average Electricity Consumption
2	All Households	11,480	100%	100%	7,432
3	Single Family, Detached	13,159	63%	58%	?
4	Single Family, Attached	9,240	6%	4%	?
5	2-4 Units	7,460	8%	16%	?
6	5+ Units	7,001	17%	18%	?
7	Other	11,787	6%	4%	?

There are some variations between the percentage breakdown of housing unit types in New England versus the US; most noticeably, New England has twice as high a concentration of two- to four-unit apartments as the US as a whole. In order to account for this when comparing an average New England home (i.e., averaged across all housing units) with an average US home, the first step is to obtain a weighted US Average Electricity Consumption (cell B2) based on the percentage breakdown of housing unit types in New England. The following formula is used:

=SUMPRODUCT(B3:B7, C3:C7)/SUM(C3:C7)

In other words, this represents what the average US household electricity consumption would be if the percentage breakdown of housing unit types in the US were the same as it is in New England. The results are as follows:

	Electricity Consumption (kWh)
Average NE Household	7,432
Average US Household	11,480
Average US Household, NE-Adjusted	10,914
% Difference between NE and US, NE-Adjusted	47%

The average New England household uses approximately 47% less electricity than a US household, with variations in housing stock held constant. To obtain average electricity use by housing unit type in New England, simply reduce the amounts in cells B3:B7 by 47%.

	A	B	C	D	E
1		US Average Electricity Consumption (kWh)	% Units in US	% Units in New England	New England Average Electricity Consumption
2	All Households	11,480	100%	100%	7,432
3	Single Family, Detached	13,159	63%	58%	6,993
4	Single Family, Attached	9,240	6%	4%	4,910
5	2-4 Units	7,460	8%	16%	3,964
6	5+ Units	7,001	17%	18%	3,721
7	Other	11,787	6%	4%	6,264

Note: The average electricity, natural gas, and fuel oil consumption for MA households is not reflected in EIA data. Instead, use the total residential consumption for the state divided by the number of households using that fuel, as follows:

	Electricity	Natural Gas	Fuel Oil
Total Households Using Fuel (millions)	2.5	1.8	0.8
MA Residential Consumption (trillion BTU)	66.4	137	85.3
Average Use per Household (MMBTU)	27	81	100

Due to insufficient data, energy expenditure data for MA towns is based on New England averages.

Step 4. Determine total energy consumption and expenditures. Multiply the number of housing units by each type times the average consumption for that housing type, and add together. Heating fuels (natural gas and oil) are also multiplied by the percentage of units in a community using that fuel.

Commercial Sector

Referenced Data Sets

- The Energy Information Administration's Commercial Building Energy Survey (CBECS), 2003
- The MA Executive Office of Wages and Labor Division (EOWLD)'s ES-202 – Employment and Wages Survey

Step-by-Step Instructions

Step 1. Find the total number of employees and establishments, by industry and Primary Building Activity (PBA). EOWLD ES-202 survey data lists the number of employees and establishments by industry, sorted by the industry standard North American Industry Classification System (NAICS) codes. Set up the ES-202 raw data with the following columns:

	A	B	C	D	E
1	**Municipality**	**NAICS Code**	**NAICS Title**	**Employment**	**Establishments**
2	Chelsea	311	Food Manufacturing	973	11

Use the following SUMIFS function to determine employees and establishments by PBA for each community:

=SUMIFS(sumrange, criteriarange1, criteria1, criteriarange2, criteria2)

Variable	Means
sumrange	Column D (for employment) or Column E (for establishments)
criteriarange1	Column B
criteria1	3-Digit NAICS code
criteriarange2	Column A
criteria2	Municipality

It may be helpful to set up a reference sheet with NAICS codes to link to for the purposes of setting up this formula.

EIA CBECS analysis data based on Primary Building Activity (PBA) rather than NAICS codes The following crosswalk (generated by EIA) correlates the Primary Building Activity (PBA) codes used in CBECS with standard three-digit NAICS codes between 400 and 1000.

	PBA	NAICS Code (3-digit)
A	Education	611
B	Food Sales	445
C	Food Service	722
D	Inpatient Health Care	622
E	Outpatient Health Care	621
F	Lodging	623, 721
G	Retail (non-mall)	441, 442, 443, 444, 451, 452, 453, 532
H	Retail (mall)	446, 448
I	Office	454, 486, 511, 516, 517, 518, 519, 521, 522, 523, 524, 525, 531, 533, 541, 551, 561, 624, 921, 923, 924, 925, 926, 928
J	Public Assembly	481, 482, 485, 487, 512, 515, 711, 712, 713
K	Public Order/ Safety	922
L	Religious Worship	813
M	Service	447, 483, 484, 488, 491, 492, 811, 812
N	Warehouse/ Storage	423, 424, 493
O	Other	562, 927

To get the total number of employees and establishments by PBA, sum the quantities for each of the above NAICS codes for each PBA.

Step 2. Determine average energy use and consumption by employee for each PBA.

CBECS Tables 14, 24 and 34 provide average energy use and expenditures by building, square footage, and employee for each PBA. Although square footage would be the most reliable factor for scaling up community-level data, information on square footage by PBA on a community level of not easily obtained. Therefore, average use and expenditures by employee is used for the purposes of this methodology. These are all US averages.

- **Exception: Enclosed and Strip Malls.** The 2003 CBECS survey employed a different data collection method for mall buildings, and therefore energy data is not available by employee. Total energy use in the Mall category is calculated by multiplying the total number of establishments by the average energy use per building.

A note on fuel oil: The data available in the 2003 CBECS on fuel oil consumption per employee and building is incomplete for some PBAs. Two options were explored for the purposes of this methodology:

- Option 1[1]: Compare average fuel oil use to average natural gas use in the same building types, using Office buildings as a baseline. For example, if a PBA that uses natural gas uses 50% more natural gas than an Office building, assume that if the same PBA used fuel oil, it would use 50% more fuel oil than an Office building.

[1] Option 1 generates a more conservative estimate of fuel oil use and is the preferred method for this methodology.

- Option 2: Find the average consumption of fuel oil for an average New England building (across all PBAs), and divide it by the average number of employees in an industry. Use this as the scaling factor.

Step 3. Determine total energy use and expenditures.

- Multiply the total number of employees in each PBA by the average energy consumption/expenditures (by fuel type) for that PBA;
- For electricity, assume a factor of 100%;
- For natural gas and fuel oil, assume a factor equal to the percentage of residences that heat with each fuel type respectively. For example, if 30% of the housing units in a community heat with fuel oil, the following equation would be used:

(Total # Employees) x (Average Fuel Oil Consumption by Employee) x 30%

Industrial Sector

Referenced Data Sets

- The Energy Information Administration's Manufacturing Energy Consumption Survey (MECS), 2006
- The MA Executive Office of Wages and Labor Division (EOWLD)'s ES-202 – Employment and Wages Survey

Step-By-Step Instructions

Step 1. Find the total number of employees and establishments by industry type. EOWLD ES-202 survey data lists the number of employees and establishments by industry, sorted by the industry standard North American Industry Classification System (NAICS) codes. Use a "SUMIF" function by municipality to determine employees and establishments by three-digit NAICS codes. This sector encompasses NAICS codes between 311 and 339. Industrial energy uses between 100 and 200 (such as power generation and utility operations) are not incorporated in this methodology.

NAICS_3	Industry	NAICS_3	Industry
311	Food	326	Plastics and Rubber Products
312	Beverage and Tobacco Products	327	Nonmetallic Mineral Products
313	Textile Mills	331	Primary Metals
314	Textile Product Mills	332	Fabricated Metal Products
315	Apparel	333	Machinery
316	Leather and Allied Products	334	Computer and Electronic Products
321	Wood Products	335	Electrical Equip., Appliances, and Components
322	Paper	336	Transportation Equipment
323	Printing and Related Support	337	Furniture and Related Products
324	Petroleum and Coal Products	339	Miscellaneous
325	Chemicals		

Step 2. Determine average energy consumption by employee for each industry.

"MECS Table 6.1 – MMBTU/Employee in the Northeast" provides a reference table for total MMBTU use per employee for each industry. For each community, multiply the number of employees in an industry times the average MMBTU use for that industry.

Step 3. Approximate percentage breakdown of fuel types for total energy use.

"MECS Table 1.1 – Consumption of Energy for All Purposes" provides a total quantity of energy consumption by industry in trillion Btu.

- "MECS Table 5.4 – End Uses of Fuel Consumption" provides a total quantity of energy consumption by fuel type and industry in trillion Btu.
- Divide the total quantity of energy consumption by fuel type by the total quantity of energy consumption overall to obtain a percentage that can be used to approximate how much of each fuel type is used by each industry in each community.
- Sum the total MMBTU overall and by fuel use for all industry types for each community to obtain total energy use information.

Note: This methodology for the industrial sector currently accounts for energy consumption only; expenditures are not included.

Example:

	A	B
1	**Industry**	**311 - Food**
2	MMBTU/Establishment (US Avg)	83,947
3	MMBTU/employee (Northeast)	435
4	Total Energy Consumption (trillion)	1186
5	Total Electricity Consumption (trillion BTU)	266
6	% Electricity of Total	22%
7	Total NG Consumption (trillion BTU)	635
8	% NG of Total	54%
9	Total Fuel Oil Consumption (trillion BTU)	42
10	% Fuel Oil of Total	4%

Chelsea, MA	# Employees	Total MMBTU	Electricity MMBTU
311 - Food	973	(973 x B3) = 422,768	(422,768 x B6) = 93,008

Appendix B: Residential Energy Use and Expenditures by Housing Types

Annual residential energy consumption and expenditures was approximated based on the following assumptions for households heating with either natural gas or oil. The data was Massachusetts household average provided by the 2009 Energy Information Administration Residential Energy Consumption Survey.

Average Annual Use & Expenditures by Housing Type - Natural Gas vs. Oil Heat

Housing Type	Average Floor Area (sq.ft)	Electricity (kWh)	Natural Gas (thousand CF)	Gas-Heated Home, Total ($)	Fuel Oil (gallons)	Oil Heated Home, Total ($)
Single-Family, Detached	2,977	8,825	88	$2,270	814	$2,922
Single-Family, Attached	2,038	6,197	82	$1,885	686	$2,331
Multi-Family, 2-4 Units	1,191	5,003	81	$1,816	726	$2,339
Multi-Family, 5+ Units	849	4,695	50	$1,232	762	$2,317
Other	1,030	7,905	64	$1,752	503	$2,066

Source: Energy Information Administration Residential Energy Consumption Survey, 2009

Appendix C: Methodology for Weather Normalization

SUMMARY

This document is intended to provide guidance to communities for approximating weather normalization of their building energy consumption baseline. Energy consumption in thermal controlled buildings is dependent on outside air temperature. In order to compare building energy consumption from year to year and have an accurate analysis of an energy reduction progress, communities must adjust building energy consumption for data taking into account of weather conditions. In the absence of professional energy data analysis tools, this document serves as a guide for performing approximate weather normalization on building energy consumption based on regional historic weather data.

The methodology in this document describes how to adjust building energy consumption for weather conditions based on historical temperature data in the Massachusetts coastal division. However, this data is publically available on the national level and could be replicated for a community anywhere in the United States (with some modifications to historical weather data specific to geographic locations). In the interest of simplicity, this methodology only addresses three heating fuels: natural gas, fuel oil, and propane. Communities that rely heavily on other fuels (i.e., wood, electricity) or communities that consume significant amount by cooling buildings should consider expanding the methodology to account for the specific energy use patterns.

For reference, the following conversion factors are used to compare physical fuel units with Btu (British thermal units):

Energy Unit Conversion Factors		
Fuel Type	**Units**	**Factor**
Electricity	MMBTU/ kWh	0.003412
Natural Gas	MMBTU/ therm	0.1
Fuel Oil	MMBTU/ gallon	0.139

REFERENCED DATA SET

National Climate Data Center (NCDC) Historical Climatologically Series (HCS) 5-1, 2007-2012

- Massachusetts Coastal Division (for communities outside the MAPC region, please refer to a different division according to your location.)
- Available online at: http://www1.ncdc.noaa.gov/pub/orders/CDODiv2610105927925.txt

TERMS TO KNOW

Term	Definition
Outside Air Temperature	"Outside air temperature" is the temperature measured outside a building.
Weather Normalization	"Weather normalization" is the process of adjusting building energy consumption for weather conditions based on historical outside air temperature data. Also known as "weather correction."
Base Temperature	The "base temperature" is the outside air temperature threshold below which a building needs to be heated. In the U.S., the typical base temperature used for most buildings is 65°F (18°C).
Heating Degree Days (HDD)	"Heating degree days" measure how much (in degrees) and for how long (in days) the outside air temperature is below the base temperature within a given period.
Average Year Degree Days (ADD)	"Average year degree days" is the average annual degree day value measured within a given period (in years).

STEP-BY-STEP INSTRUCTIONS

Step 1. Select a measurement period. A measurement period is the timeframe in which historical temperature data is collected. The start date of a measurement period should be the baseline year for a building. The end date of a measurement period should be AT LEAST five years after the baseline year or the energy reduction target year of the building. *(For demonstration purpose, the measurement period selected for this document is FY 2008 to FY 2012.)*

Step 2. Determine the monthly heating degree days for the measurement period. Use the dataset NCDC HCS 5-1 to determine the monthly heating degree days in the Massachusetts Coastal Division for each month during the measurement period and organized the data in a spreadsheet. Please note that NCDC HCS data is only available in .TXT format. Communities need to manually enter the data into a spreadsheet. A complete "Heating Degree Days Chart" for the Massachusetts Coastal Division from FY 2008 to FY 2012 is available at the end of this document.

Example:

SHEET 1 – HDD				
	A	B	C	D
1	**FISCAL YEAR**	**YEAR**	**MONTH**	**HDD**
2	2008	2007	July	5
3	2008	2007	August	7

Step 3. Determine the aggregated heating degree days for each fiscal year. Use "SUM" function to find the total heating degree days for each fiscal year.

Example: Calculate the total heating degree days for FY 2008.

SHEET 1 – HDD				
	A	B	C	D
1	FISCAL YEAR	YEAR	MONTH	HDD
2	2008	2007	July	5
3	2008	2007	August	7
4	2008	2007	September	56
5	2008	2007	October	262
6	2008	2007	November	693
7	2008	2007	December	1023
8	2008	2008	January	1026
9	2008	2008	February	927
10	2008	2008	March	846
11	2008	2008	April	531
12	2008	2008	May	291
13	2008	2008	June	17
14	**2008**		**Total HDD**	**5,684**

To find the "Total HDD" (cell D14), the following formula is used:

=SUM (D2:D13)

Step 4. Determine the average year degree day value for the given measurement period. The average year degree day is usually the five year, ten year, or twenty year average of the total heating degree days. For cross-regional comparisons purposes, a standard degree day value may also be used. A five year average for the Massachusetts coastal division is the value used in this example. To find the average value for a period of years, divide the sum of the total heating degree days in each fiscal year by the number of fiscal years in the measurement period.

Example: Calculate the average year degree day value for FY 2008 to FY 2012.

SHEET 1 – HDD				
	A	B	C	D
1	FISCAL YEAR	YEAR	MONTH	HDD
14	**2008**		**Total HDD**	**5,684**
27	**2009**		**Total HDD**	**6,109**
40	**2010**		**Total HDD**	**5,544**
53	**2011**		**Total HDD**	**5,947**
66	**2012**		**Total HDD**	**4,786**
67			**Average Year Degree Day**	**5,614**

To find the "Average Year Degree Day" (cell D67), the following formula is used:

=AVERAGE (D14,D27,D40,D53,D66)

Step 5. Determine each building's baseline energy consumptions by fuel type. Create a building inventory on a separate sheet in your weather normalization Excel workbook. List energy consumption for each building by fuel types in the selected baseline year.

SHEET 2 – BUILDING INVENTORY					
	A	B	C	D	E
1	BUILDING	2009 ELECTRICITY (kWh)	2009 GAS (therms)	2009 OIL (gallons)	2009 PROPANE (gallons)
2	Town Hall	90,800	4,980	-	-
3	Senior Center	30,700	-	4,200	-
4	Fire Station	35,000	44,20	-	240
5	High School	1,650,300	65,000	-	300

Step 6. Determine the energy consumption per degree day by building and heating fuel type. (Please note that weather normalization should be applied to heating fuel consumption only. The consumption of fuels which the usage is not affected by weather conditions, such as electricity, gasoline, and diesel should not be adjusted.) Calculate the energy consumption per degree day by building and heating fuel type (gas, oil, propane) by dividing the total baseline energy consumption by the total number of heating degree days in the baseline year.

Example: Calculate the gas consumption (therms) per degree day for the Town Hall for FY 2009.

SHEET 2 – BUILDING INVENTORY							
	A	C	D	E	F	G	H
1	BUILDING	2009 GAS (therms)	2009 OIL (gallons)	2009 PROPANE (gallons)	2009 GAS (therms) per DEGREE DAY	2009 OIL (gallons) per DEGREE DAY	2009 PROPANE (gallons) per DEGREE DAY
2	Town Hall	4,980	-	-	0.82	?	?
3	Senior Center	-	4,200	-	?	?	?
4	Fire Station	44,20	-	240	?	?	?
5	High School	65,000	-	300	?	?	?

In this example, the therms per degree day for the Town Hall in FY 2009 (SHEET 2 cell F2) is the quotient of the Town Hall's 2009 gas consumption (SHEET 2 cell C2) divided by the total heating degree days in 2009 (SHEET 1 cell D27). The following formula is used:

=C2/'SHEET 1 – HDD'!$D$27

At the end of this step, the sheet should look like this:

SHEET 2 – BUILDING INVENTORY							
	A	C	D	E	F	G	H
1	BUILDING	2009 GAS (therms)	2009 OIL (gallons)	2009 PROPANE (gallons)	2009 GAS (therms) per DEGREE DAY	2009 OIL (gallons) per DEGREE DAY	2009 PROPANE (gallons) per DEGREE DAY
2	Town Hall	4,980	-	-	0.82	-	-
3	Senior Center	-	4,200	-	-	0.67	-
4	Fire Station	44,20	-	240	0.72	-	0.039
5	High School	65,000	-	300	10.6	-	0.049

Step 7. Perform simple-ratio based weather normalization to determine the adjusted energy consumption by building and heating fuel type. To find the normalized equivalents of each consumption value, multiply each energy consumption per degree day value (SHEET 2, columns F through H) by the average year degree day value (SHEET 1, cell D67).

Example: Calculate the weather normalized gas consumption (therms) for the Town Hall for FY 2009.

SHEET 2 – BUILDING INVENTORY							
	A	F	G	H	I	J	K
1	BUILDING	2009 GAS (therms) per DEGREE DAY	2009 OIL (gallons) per DEGREE DAY	2009 PROPANE (gallons) per DEGREE DAY	WEATHER NORMALIZED GAS (therms)	WEATHER NORMALIZED OIL (gallons)	WEATHER NORMALIZED PROPANE (gallons)
2	Town Hall	0.82			4,603	?	?
3	Senior Center		0.67		?	?	?
4	Fire Station	0.72		0.039	?	?	?
5	High School	10.6		0.049	?	?	?

In this example, the weather normalized gas consumption for the Town Hall in FY 2009 (SHEET 2 cell I2) is the product of the Town Hall's 2009 gas consumption per degree day (SHEET 2 cell F2) multiplied by the average year degree day value (SHEET 1 cell D67). The following formula is used:

=F2*'SHEET 1 – HDD'!$D$67

At the end of this step, the sheet should look like this:

SHEET 2 – BUILDING INVENTORY							
	A	F	G	H	I	J	K
1	BUILDING	2009 GAS (therms) per DEGREE DAY	2009 OIL (gallons) per DEGREE DAY	2009 PROPANE (gallons) per DEGREE DAY	WEATHER NORMALIZED GAS (therms)	WEATHER NORMALIZED OIL (gallons)	WEATHER NORMALIZED PROPANE (gallons)
2	Town Hall	0.82	-	-	4,603	-	-
3	Senior Center	-	0.67	-	-	3,761	-
4	Fire Station	0.72	-	0.039	4,042	-	219
5	High School	10.6	-	0.049	59,508	-	275

Step 8. Determine the total weather normalized energy consumption for each building. Find the sum of the (non-adjusted) electricity consumption and the weather normalized heating fuel energy consumption for each building in MMBTU's.

Example: Calculate the total weather normalized energy consumption for Town Hall for FY 2009.

SHEET 2 – BUILDING INVENTORY						
	A	B	I	J	K	L
1	BUILDING	ELECTRICITY (kWh)	WEATHER NORMALIZED GAS (therms)	WEATHER NORMALIZED OIL (gallons)	WEATHER NORMALIZED PROPANE (gallons)	WEATHER NORMALIZED TOTAL (MMBTU)
2	Town Hall	90,800	4,603	-	-	770
3	Senior Center	30,700	-	3,761	-	?
4	Fire Station	35,000	4,042	-	219	?
5	High School	1,650,300	59,508	-	275	?

In order to add up fuel consumptions measured in different physical fuel units, please remember to convert all energy consumption value in physical fuel units to MMBTU's. To find the total weather normalized consumption for the Town Hall (cell L2), the following formula is used:

=B2*0.003412 + I2*0.1 + J2*0.139 + K2*0.091

At the end of this step, the sheet should look like this:

SHEET 2 – BUILDING INVENTORY						
	A	B	I	J	K	L
1	BUILDING	2009 ELECTRICITY (kWh)	WEATHER NORMALIZED GAS (therms)	WEATHER NORMALIZED OIL (gallons)	WEATHER NORMALIZED PROPANE (gallons)	WEATHER NORMALIZED TOTAL (MMBTU)
2	Town Hall	90,800	4,603	-	-	770
3	Senior Center	30,700	-	3,761	-	628
4	Fire Station	35,000	4,042	-	219	544
5	High School	1,650,300	59,508	-	275	11,606

RESULTS

The following is a comparison of the energy use baseline in each building before and after weather normalization. The weather normalization process adjusted the building energy consumptions for additional energy used for heating due to weather that was colder than average in the FY 2009 baseline (relative to the overall 5-year, FY 2008 to FY 2012 weather data measurement period).The weather normalized energy consumption value is therefore lower than the non-adjusted values.

Before weather normalization:

BUILDING	2009 ELECTRICITY (kWh)	2009 GAS (therms)	2009 OIL (gallons)	2009 PROPANE (gallons)	TOTAL (MMBTU)
Town Hall	90,800	4,980	-	-	808
Senior Center	30,700	-	4,200	-	689
Fire Station	35,000	44,20	-	240	583
High School	1,650,300	65,000	-	300	12,158

After weather normalization:

BUILDING	2009 ELECTRICITY (kWh)	WEATHER NORMALIZED GAS (therms)	WEATHER NORMALIZED OIL (gallons)	WEATHER NORMALIZED PROPANE (gallons)	WEATHER NORMALIZED TOTAL (MMBTU)
Town Hall	90,800	4,603	-	-	770
Senior Center	30,700	-	3,761	-	628
Fire Station	35,000	4,042	-	219	544
High School	1,650,300	59,508	-	275	11,606

Resources

Massachusetts Coastal Division Heating Degree Day Table (FY 2008 to FY 2012)

FY Year	Year	Month	HDD
2008	2007	July	5
2008	2007	August	7
2008	2007	September	56
2008	2007	October	262
2008	2007	November	693
2008	2007	December	1023
2008	2008	January	1026
2008	2008	February	927
2008	2008	March	846
2008	2008	April	531
2008	2008	May	291
2008	2008	June	17
2008		**Total HDD:**	**5,684**
2009	2008	July	0
2009	2008	August	11
2009	2008	September	62
2009	2008	October	440
2009	2008	November	693
2009	2008	December	942
2009	2009	January	1246
2009	2009	February	944
2009	2009	March	893
2009	2009	April	504
2009	2009	May	261
2009	2009	June	113
2009		**Total HDD:**	**6,109**
2010	2009	July	11
2010	2009	August	0
2010	2009	September	114
2010	2009	October	440
2010	2009	November	516
2010	2009	December	1032
2010	2010	January	1138
2010	2010	February	941
2010	2010	March	707
2010	2010	April	447
2010	2010	May	181
2010	2010	June	17
2010		**Total HDD:**	**5,544**

FY Year	Year	Month	HDD
2011	2010	July	0
2011	2010	August	0
2011	2010	September	41
2011	2010	October	344
2011	2010	November	654
2011	2010	December	1051
2011	2011	January	1184
2011	2011	February	994
2011	2011	March	846
2011	2011	April	531
2011	2011	May	255
2011	2011	June	47
2011		**Total HDD:**	**5947**
2012	2011	July	0
2012	2011	August	0
2012	2011	September	49
2012	2011	October	297
2012	2011	November	510
2012	2011	December	806
2012	2012	January	958
2012	2012	February	812
2012	2012	March	648
2012	2012	April	438
2012	2012	May	208
2012	2012	June	60
2012		**Total HDD:**	**4,786**
		5-Year Average Year Degree Day:	**5,614**

Appendix D: Summary of Medford Energy Action Plan Recommendations

	Number of Actions being Implemented					
	2012	2013	2014	2015	2016	2017
Residential	4	17	15	10	6	5
Commercial	4	9	7	6	6	5
Municipal	7	15	18	14	16	11
Total	**15**	**41**	**40**	**30**	**28**	**21**

*** Bolded actions indicate priority actions.**

Actions to Serve Medford Residents

Actions Starting in 2012

2012 (1 Year)

- Set residential energy reduction goal.

2012-2013 (2Years)

- Create an ongoing system for tracking aggregated residential energy consumption and participation in MassSave.

2012-2017 (On-going)

- **Design and implement a school and youth group outreach campaign to educate students on clean energy science, measures, and policies.**
- Track number of residential solar installations.

Actions Starting in 2013

- **Identify best practices for outreach to promote Go Green Medford projects, programs, and information.**
- Promote clean energy success stories and opportunities to targeted audiences

2013-2014 (2 Years)

- Use aggregated residential energy consumption data to set a baseline of residential energy consumption that can be used to benchmark energy reductions.
- Identify best practices for residential energy campaign to help residents access cost-effective energy efficiency programs and incentives.
- Hold events with local organizations to help non-English speakers access clean energy opportunities.

- Investigate the benefits of and opportunities for community choice aggregation.
- **Design and conduct energy efficiency outreach campaign for rental housing to increase landlord/ tenant participation in MassSave's audit and promote energy efficiency retrofits at rental units.**
- **Design and implement outreach program to promote oil efficiency and oil-to-gas conversion opportunities.**

2013-2015 (3 Years)

- **Design and conduct local outreach campaign to increase participation in MassSave's audit and retrofit opportunities.**
- **Design and implement outreach program based on Solarize Mass model to inform residents of solar opportunities and encourage the use of financial incentive options for solar installation.**

2013-2016 (4Years)

- Conduct outreach to educate the community on the environmental and financial benefits of electric vehicles.

2013-2017 (On-going)

- **Increase public awareness of biking, walking, and public transportation opportunities.**
- Collect and distribute information on the benefits of and incentives, rebates, and other financial opportunities for energy efficiency upgrades, oil-to-gas conversion, and solar development.
- **Use "Go Green Medford" branding to frame energy and sustainability efforts; develop consistency and a common way for residents to recognize and become familiar with energy and sustainability efforts.**

ACTIONS STARTING IN 2014

2014-2015 (2 Years)

- **Pursue affordable housing-focused energy efficiency programs**

ACTIONS STARTING IN 2015

Improve bike and walking paths.

Actions to Serve Medford Businesses

Actions Starting in 2012

- Set commercial energy reduction goal.

2012-2013 (2Years)

- Create an ongoing system for tracking aggregated commercial energy consumption and participation in MassSave.

2012-2017 (On-going)

- Use aggregated commercial energy consumption data to benchmark energy reductions.
- **Establish and hold an annual Green Business Program to engage local businesses in clean energy opportunities, celebrate energy improvements that have been implemented, educate and encourage others to pursue energy audits, and implement energy conservation and efficiency measures.**

Actions Starting in 2013

- **Identify best practices for outreach to promote Go Green Medford projects, programs, and information.**

2013-2014 (2 Years)

- Design and conduct outreach programs that target sector-specific energy use by helping businesses access project-specific retrofit opportunities and building-specific upgrades incentives.

2013-2015 (3 Years)

- **Design and implement outreach program to inform businesses of solar opportunities and encourage the use of financial incentive options for solar installation.**

2013-2017 (On-going)

- **Use "Go Green Medford" branding to frame energy and sustainability efforts; develop consistency and a common way for businesses to recognize and become familiar with energy and sustainability efforts.**
- Collect and distribute information on the benefit, incentives, rebates, and other financial opportunities for energy efficiency retrofits, oil-to-gas conversion, and solar development.
- Identify corporate partners and encourage local businesses to participate in Better Buildings Challenge.

Actions Starting in 2016

- Create tax incentive program to attract clean energy business investment.

Actions to Serve the Municipality

Actions Starting in 2012

- Present Energy Action Plan to municipal officials and the public.

2012-2013 (2 Years)

- Establish a standardized process for (1) maintaining and updating the City's MassEnergyInsight account and (2) utilizing the data to benchmark energy reductions.

2012-2014 (3 Years)

- Monitor the Town's progress in reducing energy consumption to meet the Green Communities goal of 20% reductions by 2014 and Better Buildings Challenge goal of 20% building energy reductions by 2020.

2012-2017 (6 Years)

- Identify and implement policies and standards that promote building energy efficiency.
- Purchase energy efficient vehicles in compliance with the Green Communities 4th Criteria.

2012-2017 (On-going)

- Annually review energy supplier contracts.
- **Create and maintain a plan for completing municipal retrofit work, which will include a list of priority projects, how projects will be funded, and how they will be completed.**

Actions Starting in 2013

- **Identify best practices for outreach to promote Go Green Medford projects, programs, and information.**
- Retrofit utility-owned streetlights with LEDs or more efficient fixtures; purchase streetlights if necessary.

2013-2014 (2 Years)

- Assess building energy audit needs and have outside vendor perform building or project specific energy audits.
- Identify and secure utility incentives and rebates for municipal retrofit work.

2013-2016 (4 Years)

- Research solar development opportunities, perform cost-and-benefit analysis, and adopt cost effective financing models for solar installation.

2013-2017 (On-going)

- **Annually review Energy Action Plan, document achievements, plan for next steps, including adjusting the action plan timeframe for existing actions and projects and adding new actions and projects given new circumstances and interests.**
- Hold annual municipal department meeting that celebrates energy accomplishments, gets staff input, and provides reminders on energy policies and opportunities.
- **Establish an ongoing internship program to provide assistance to E&E Office and to help with the implementation of the Energy Action Plan.**
- **Use "Go Green Medford" branding to frame energy and sustainability efforts; develop consistency and a common way for municipal staff and stakeholders to recognize and become familiar with energy and sustainability efforts.**

ACTIONS STARTING IN 2014

- Design and implement a policy for using life cycle cost analyses when making purchasing decisions.
- Identify and implement parking policies that support Electric Vehicles/Alternate Fuel Vehicles/High-Efficiency Vehicles adoption.

2014-2015 (2 Years)

- Conduct feasibility study for anaerobic digestion.
- **Integrate clean energy into the City's broader planning and development efforts, like Master Planning.**

2014-2016 (3 Years)

- Identify and implement zoning policies that support renewable energy development.

2014-2017 (On-going)

- Create and maintain an Enterprise Fund to be used to finance energy projects and/or staff-time.

ACTIONS STARTING IN 2015

- **Install EV infrastructures to prepare for mass EV adoption.**

2015-2016 (2 Years)

- Conduct study to identify siting options for additional wind turbine projects.
- Explore opportunities to install solar thermal at municipal buildings.
- Implement building standards that integrate both building efficiency and healthy housing components, such as weatherization and ventilation.

2015-2017 (3 Years)

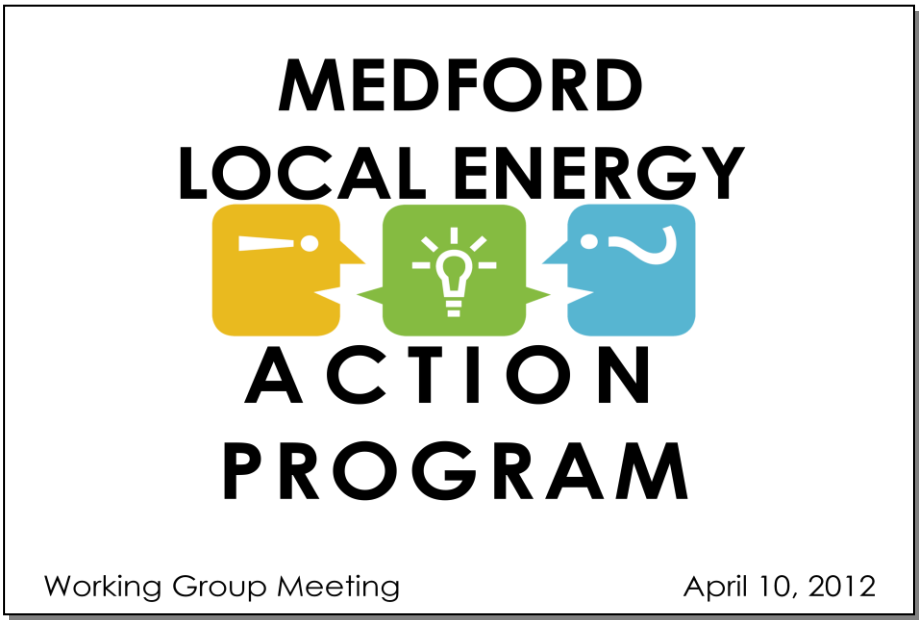
- Explore opportunities to collect and use wood chippings.

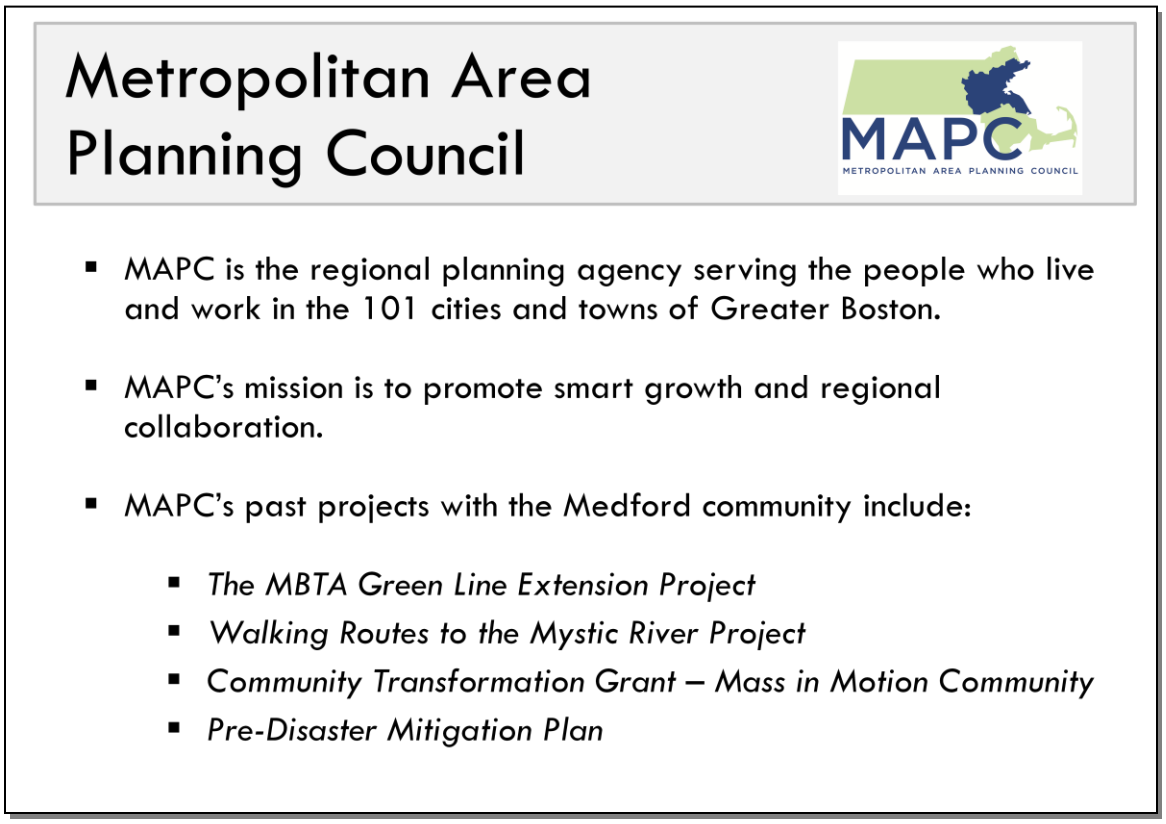
ACTIONS STARTING IN 2016

2016-2017 (2 Years)

- Use zoning to increase clean energy industries.

Appendix E: Medford LEAP Working Group Meeting (April 10) Handouts[2]





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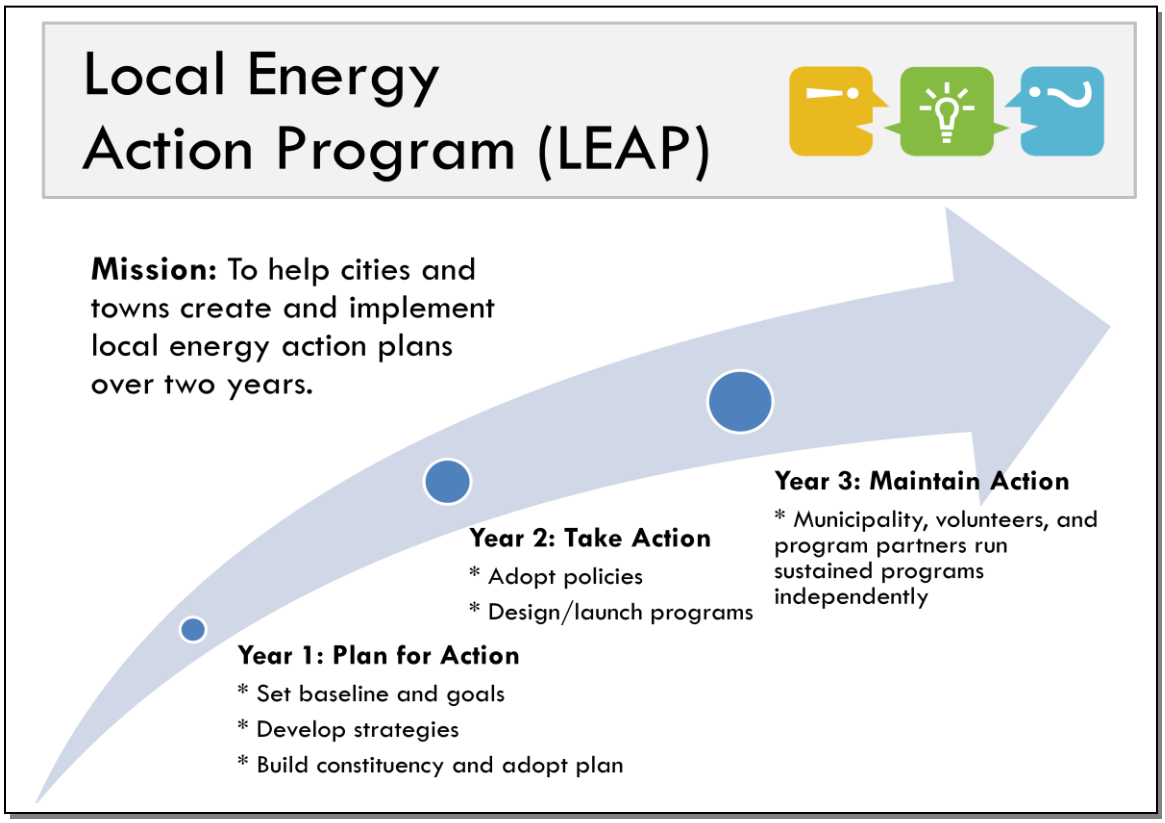
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Year 1: Plan for Action
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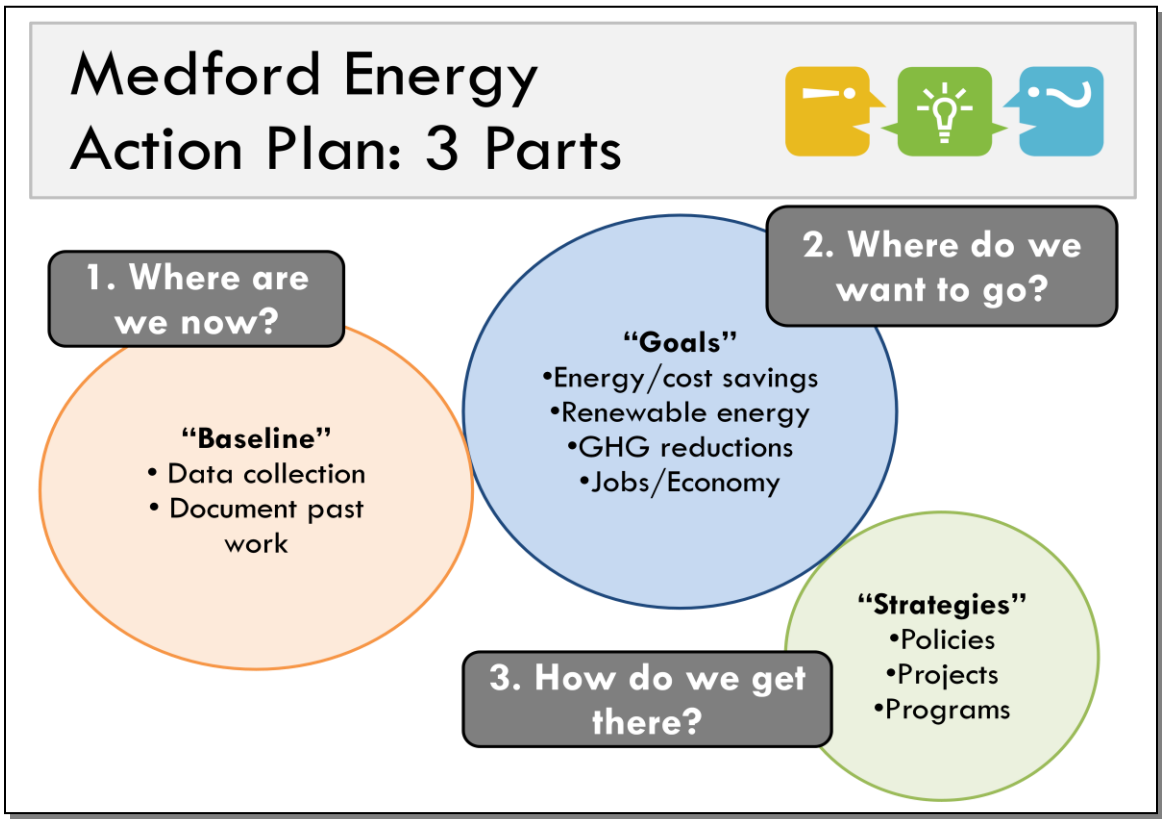
* Develop strategies
* Build constituency and adopt plan
Year 2: Take Action
* Adopt policies
* Design/launch programs
Year 3: Maintain Action
* Municipality, volunteers, and program partners run sustained programs independently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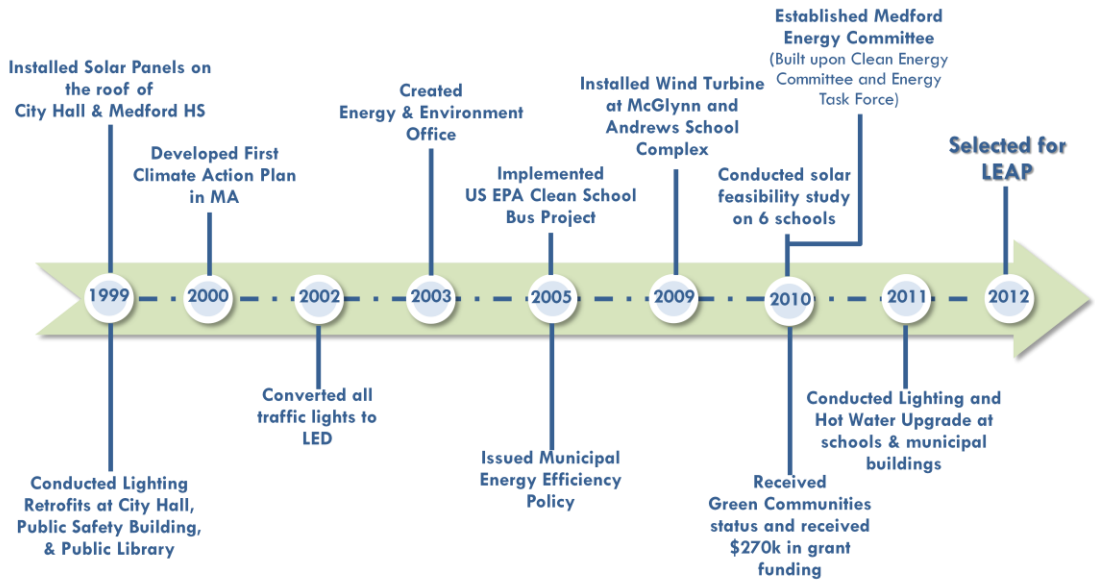
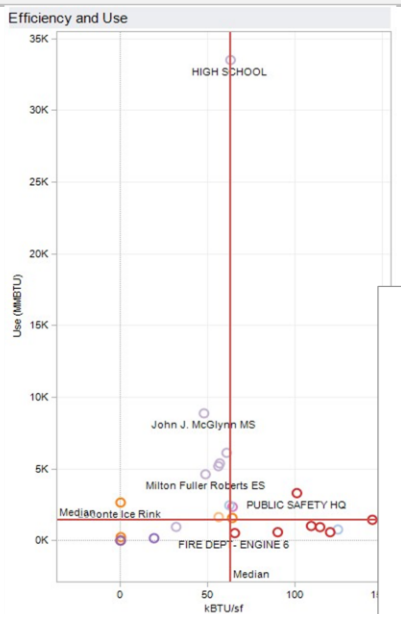
"Baseline"
• Data collection
• Document past work
2. Where do we want to go?
"Goals"
•Energy/cost savings
•Renewable energy
•GHG reductions
•Jobs/Economy
3. How do we get there?
"Strategies"
•Policies
•Projects
•Programs

Where are we now?



Where are we now?

Municipal Energy Profile

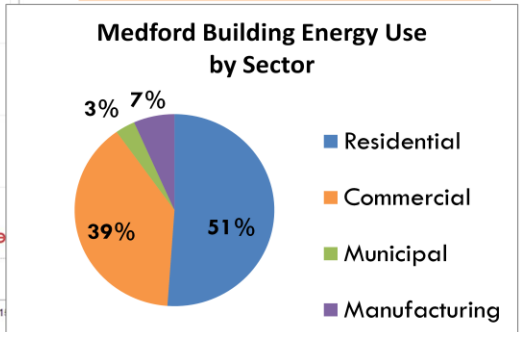


Annual Energy Consumption:

Electricity: **12.3 million kWh**
Natural gas: **492,000 therms**
Heating oil: **31,000 gallons**

Annual Building Energy Expenditures:

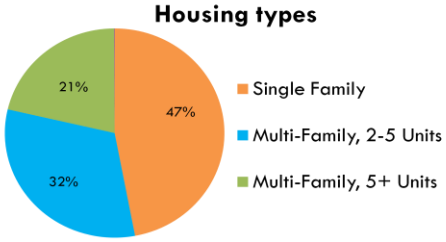
$1.26 million
(excludes vehicle fuel)



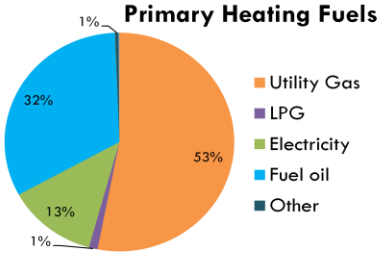
Where are we now?

Residential Energy Profile

Housing types



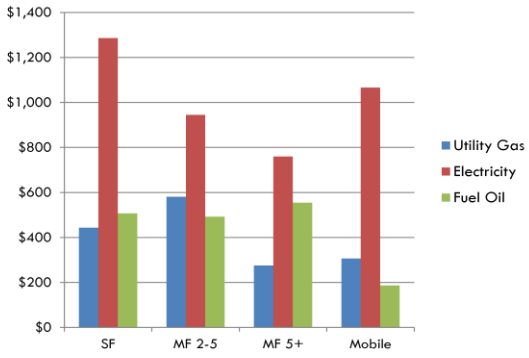
Primary Heating Fuels



Annual Energy Consumption:
Electricity: **178 million kWh**
Natural gas: **6.6 million therms**
Heating oil: **1.8 million gallons**

Annual Energy Expenditures: $46 million

Annual Residential Energy Expenditure Per Household



Where are we now?

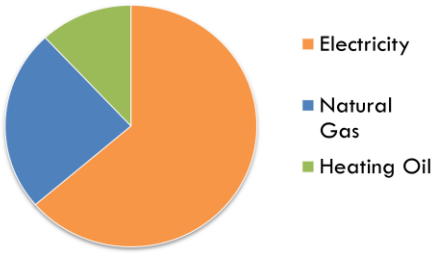
Commercial Sector Energy Profile**

Type	# Establishments	# Employees
Education	20	3,511
Office	326	2,455
Outpatient Care	81	1,154
Food Services	83	1,057
Retail (Non-Mall)	71	950
Services	130	881
Lodging	11	823
Warehouse	36	794
Food Sales	37	785
Retail (Mall)	39	364
Public Assembly	17	261
Religious	18	58
Total	**869**	**13,093**

Annual Energy Consumption:
Electricity: **217 million kWh**
Natural gas: **2.6 million therms**
Heating oil: **1 million gallons**

Annual Energy Expenditures:
$28 million

Commercial Energy Use by Fuel Type



**Does not include manufacturing/industrial sectors, in which Medford has an additional 4,097 jobs and 435 establishments

Where are we now?

Past Energy Action	Municipal Sector	Residential Sector	Commercial, Industrial, Institutional Sectors
Committed Staff/Volunteer Time	◐	◐ ?	?
Tracking of Energy Consumption	●	○ ?	?
Energy Goals & Commitments	◐	◐	?
Renewable Energy Projects	◐	◐ ?	◐ ?
Energy Efficiency Projects	◐	◐ ?	◐ ?
Outreach and Educational Programs	◐	◐	?
Local Cleantech Industry	-	-	◐ ?

Keys: ● Yes ◐ Some/In Progress ○ None ? Need more information

Where do we want to be?

Appendix F: Medford LEAP Working Group Meeting (April 10) Minutes

MEDFORD LEAP WORKING GROUP
MEETING MINUTES

Location: Medford City Hall, Council Chamber
Date: Tuesday, April 10 2012
Time: 3:30 - 5:30 pm
Meeting Leader: Erin Brandt, Metropolitan Area Planning Council
Facilitator: Helen Aki, Metropolitan Area Planning Council
Note Taker: Po-Yu Yuen, Metropolitan Area Planning Council
Attendees: 18 residents/stakeholders

Meeting Agenda

1. Welcome and Introductions
2. Purpose and Desired Outcomes
3. Introduction to Metropolitan Area Planning Council (MAPC) and LEAP
4. Past Community Achievements
5. Baseline: "Where are we now?"
6. Brainstorm
    a. What are the best things about living/ working in Medford?
    b. What are the greatest challenges?
    c. What past community efforts worked well and why?
    d. What past community efforts didn't work well and why?
    e. What should be the primary objective of LEAP?

Meeting Purposes and Desired Outcomes

- To launch the LEAP program with stakeholders in the Medford community
- To present an overview of the program
- To begin discussions on opportunities in pursuing clean energy work in Medford
- To learn about past experience with energy work in Medford
- To begin discussions on developing next steps
- This meeting was for general brainstorming purposes
- In-depth discussions on pros and cons of any particular ideas were not encouraged
- This meeting aimed to develop clean energy ideas that would tie to the community's priorities

Introduction to MAPC and LEAP

Erin gave an overview of MAPC and LEAP. See presentation at http://www.mapc.org/leap.

Past Community Achievements

MAPC explained that it had an understanding of Medford's municipal clean energy achievements and efforts, but needed more information on residential and commercial efforts. Meeting participants were

asked to discuss past energy efforts initiated by residents, local businesses, and community organizations in Medford. The following information was given:

- Grace Church upgraded its boiler and conducted lighting retrofits to LED
- Tufts converted from an oil to a gas boiler, as well as did HVAC efficiency improvements
- 750 National Grid households participated in the MassSave home energy assessment program in 2011
- Green Medford initiated Walk/Ride Days

Brainstorming

Brainstorming activities were facilitated to help MAPC and the City of Medford develop a strong understanding of the community's assets, challenges, priorities and goals in clean energy work. Five questions were asked.

1. "What are the best things about living/working in Medford?"
   Participant's answers mainly focused on diversity, accessibility, infrastructure and public facilities. Medford's unique urban/open space balance was also highly valued.
   - Diversity
     - Socioeconomic diversity
     - Great racial diversity
     - Mix of ages
     - Many local artists
     - Fascinating people/residents
     - Residents that have lived in the community for a long time
   - Accessibility
     - Accessibility to Tufts
     - Availability of public transportation
     - Proximity to Boston, Cambridge, Route 128, and other major communities (2)
     - Ability to easily access activities and resources of other communities
   - Infrastructures and facilities
     - Wind Turbine
     - Outdoor spaces – green parks (2)
     - Space for biking
     - Wright's Pond
     - Medford Square and West Medford – mix uses (restaurants/ shops) at community centers
     - Hospitals
   - Distinctive characteristics
     - Good urban and open space balance
     - Progressive- first city to have Climate Action Plan
     - One-stream recycling

2. "What are the challenges about living/working in Medford?"
   Meeting participants discussed the challenges of living and working in Medford. These challenges mainly revolved around diversity, communication, transportation, and built infrastructure. Energy-related struggles were also mentioned during this discussion.
   - Diversity
     - Difficulty doing outreach and communicating broadly to diverse resident populations (different cultures and levels of education)

        - Transient housing stock (tenants/ landlords/students) is challenging for reaching to the right decision makers
        - Groups of people/cultures are geographically separated in different parts of the community
        - Competition exists among neighborhoods and cultural groups
        - Large student population creates a transient and seasonal population
    - Communication
        - Difficulty doing outreach to residents
        - Communication is often one-way, meaning residents get information, but those doing outreach don't get feedback from the residents
        - Communication gap between people with the knowledge and information and those who don't is wide
        - Lack of transparency and understanding of how to get things done in the city, which results in the need to re-invent processes
    - Transportation
        - Traffic pattern does not accommodate bike users
        - Route 16 totally inadequate for biking
        - Little parking enforcements and little parking spaces
        - Lack of respect from drivers; many of them view the city as a highway
        - Green Line Extension may upset urban ecology/ equilibrium (traffic/ retails)
    - Infrastructure
        - Old housing stock – and many people, such as elderly, in such homes don't have resources to fix their housing problems, like asbestos or inefficient oil heaters
    - Energy-related challenge
        - Hard to distribute broad information about energy to residents and businesses
        - A lot of old buildings make energy efficiency improvements difficult
    - Other concerns
        - Some crime around Tufts area, although for the most part, it's safe
        - Limited funding resources
        - Municipal budget has been tight – little resources available for making changes
3. <u>What past community efforts worked well and why?</u>
   Meeting participants discussed past community efforts or events that worked well in the community. Successful efforts or events included those that are well established in the community and attract many attendants. Events or efforts that draw attendees through contests or awards were also highlighted. Some discussed success with efforts focused specifically on energy issues. Some highlighted the benefit of combining energy events with established events that already have great attendance.
    - Medford Health Matters
        - Public recognition and giving out awards brought people to the event
        - Event created a strong community feel
    - Green Ups/Clean Ups
        - Brings people together from a group like a church to do something that is easy
    - Let's Move
        - Brings together a variety of communities
        - Kids are involved
    - Jingle Bell Festival

    - Very well-attended for activities, like the lighting of the tree
    - Multiple events over a long period
    - Family-oriented
    - Free
    - Next Step Living had a table at the festival; Green Medford and Energy Committee shared a table
- Tufts Community Day
    - Well attended
    - Free food
    - Residents enjoy it
- Community garden at the Columbus school
    - Incredibly successful
    - Columbus has strong parent presence; parents run after school program
- Farmers Market
    - Market is doing well.
    - Market get publicity through people liking it on Facebook
- Energy related events
    - CFL Swap (Tufts)
    - Reusing refrigerators for art work (an event in other communities)
    - National Grid Poster Contests – people have to come to events to find out if kids won poster contests
- Other successful events
    - Art Festival (Medford Mystic)
    - Events at the Senior Center

4. <u>What past community efforts didn't work well and why?</u>

   Meeting participants discussed past community efforts or events that did not work well. Reasons for unsuccessful events or efforts included scheduling and organizing difficulties, challenges with outreach, and specific event contexts.

   - Scheduling and organizing difficulties
       - Overlapping events
       - There is often an overwhelming number of events in Spring and Summer
       - There is a lack of alternative space to hold events if there is bad weather
       - Events can get really crowded – almost too much to be enjoyable
   - Outreach
       - Difficulty for some to find out about events
       - It is challenging to engage parents with older kids
       - Information doesn't get shared
   - Context
       - Events that are well attended and most liked in the community are just about having fun; educational components are often not valued or of interest to attendees; there is a challenge to get people to pay attention to activities that are not pure entertainment

- A common sense of purposes is missing at events; there needs to be a strategy to help people feel like there is a mission/purpose to an event or effort that everyone can rally around

5. What do you think should be part of LEAP's objectives and goals?
   Meeting participants brainstormed potential objectives and goals for LEAP. The group then picked their top six priorities. The number of votes each idea received is noted in parentheses.
   - Communication (11)
   - Education (10)
   - Prioritizing residential programs: focus on MassSave (9)
   - Sustainability (8)
   - Greater community involvement (6)
   - Fiscal sustainability (6)
   - Target residential energy (4)
   - Community awareness (4)
   - Emissions reduction (4)
   - Cost reduction (3)
   - Use of subsidized programs (3)
   - Tackle non-building energy uses (3)
   - Energy efficiency and conservation (2)
   - Change through codes and standards (2)
   - Resilience/ adapt action (1)
   - Other buildings consumption reduction(e.g. business sector) (1)
   - Unified community front

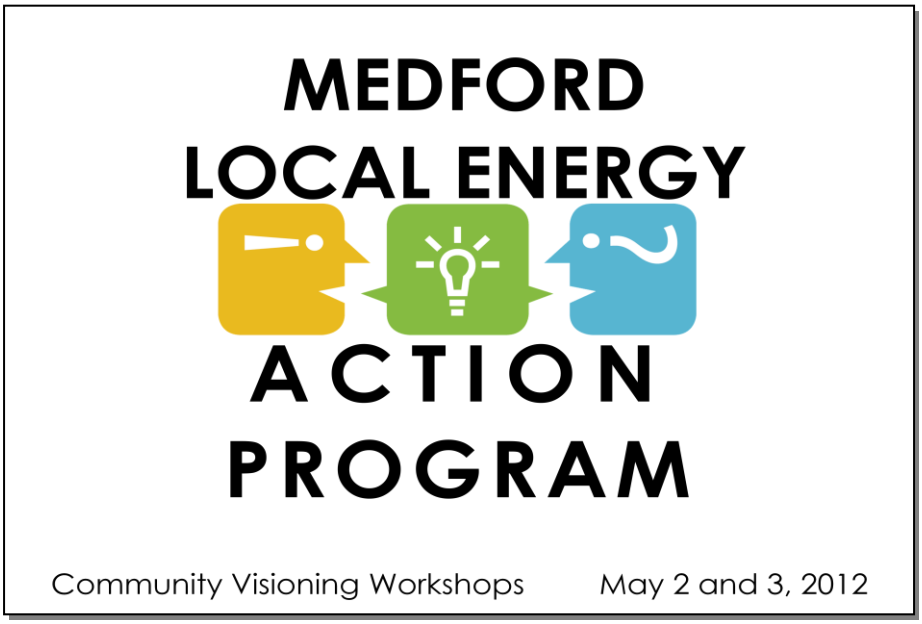
Next Steps

- MAPC will continue to compile research for energy action plan
- MAPC will hold two public meeting or visioning workshop
  - (May 2, 7-9pm & May 3, 10am -12pm)
- The Working Group will be invited to discuss the draft action plan
- The draft plan will be open for public comment before it is formally adopted
- MAPC will work with the City and Medford stakeholders to begin implementing action plan strategies

Meeting Evaluation

The meeting ended with a $+/\Delta$ exercise where everyone noted one thing that worked well during the meeting and one thing they would like to see changed for future meetings.

Appendix G: Medford LEAP Community Visioning Workshop (May 2-3) Presentation[3]



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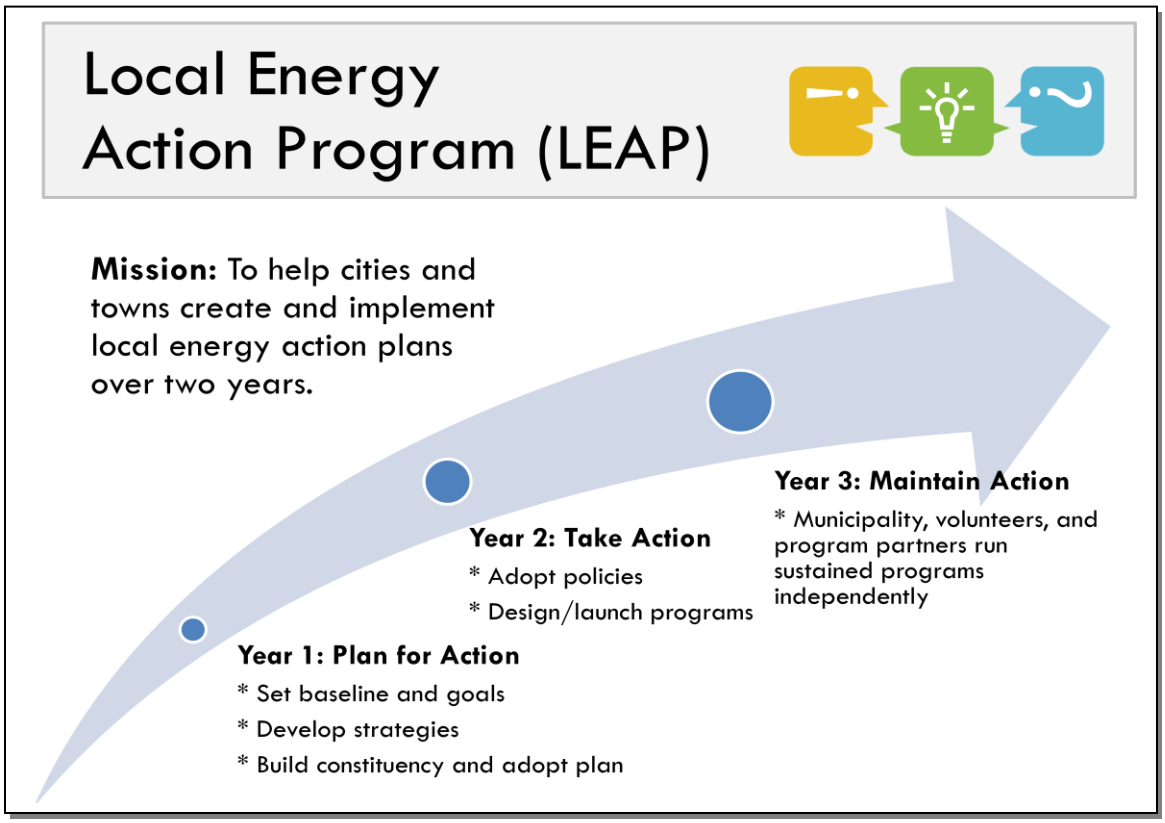
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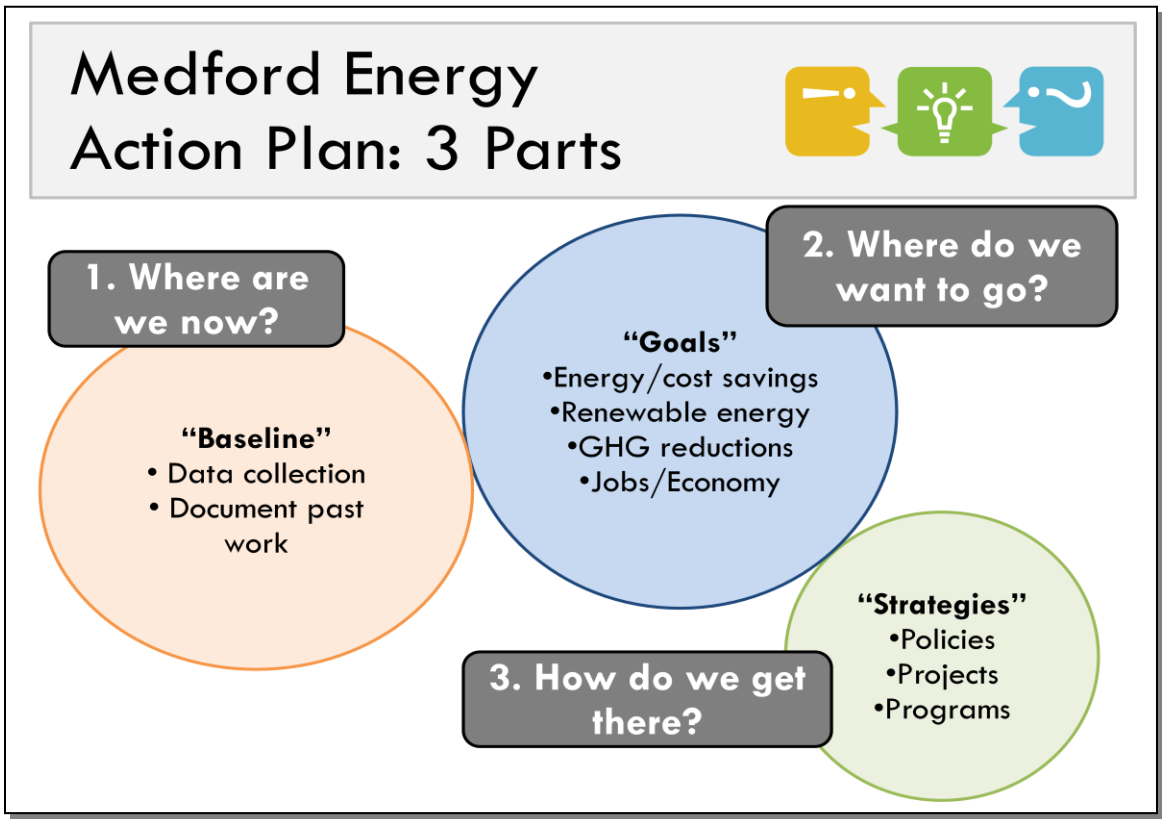
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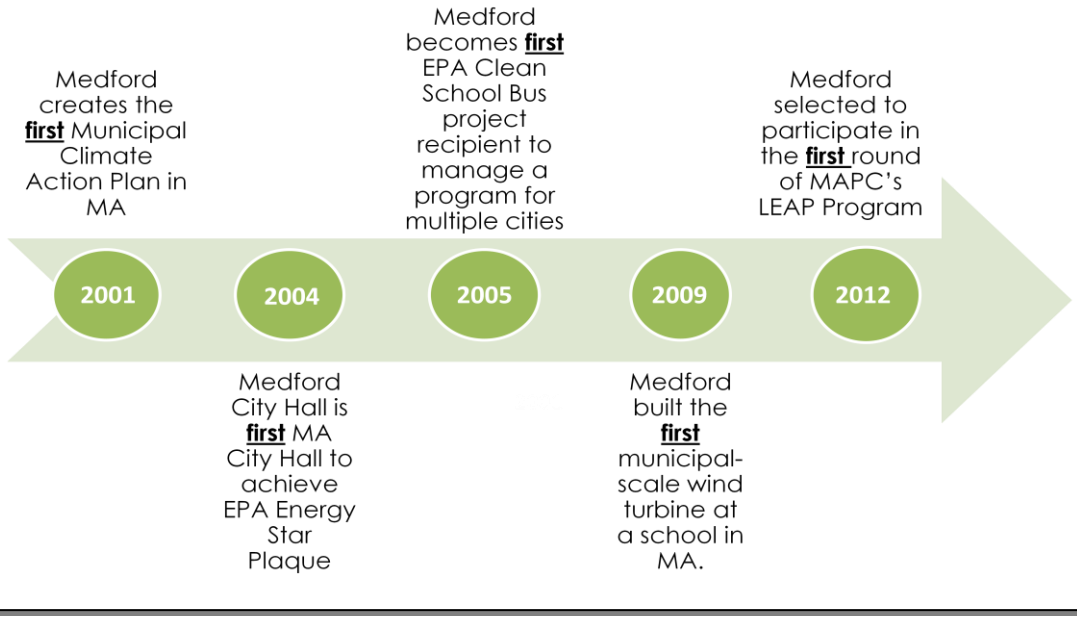
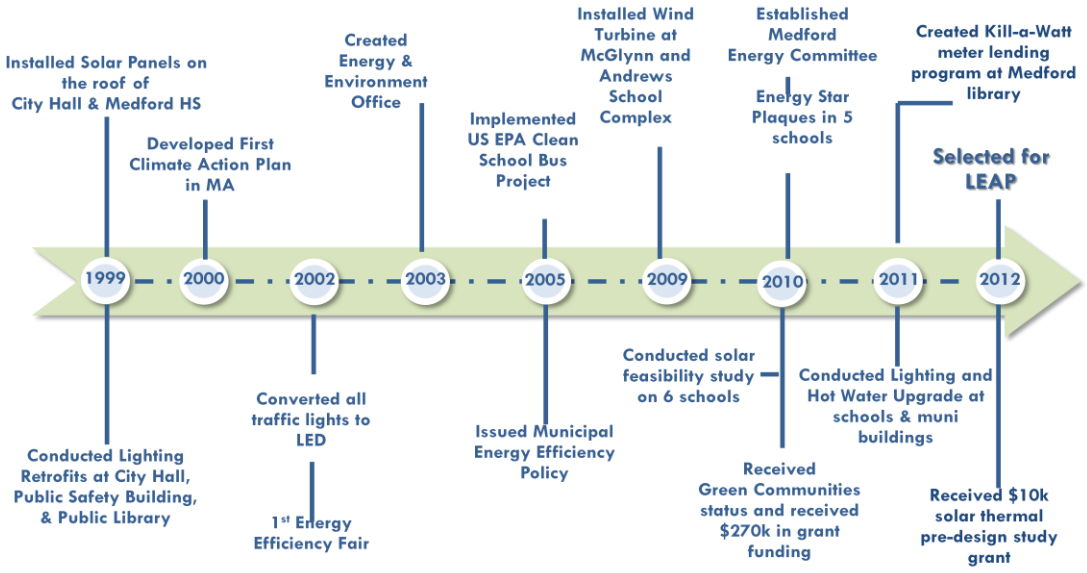
• Document past work
2. Where do we want to go?
"Goals"
•Energy/cost savings
•Renewable energy
•GHG reductions
•Jobs/Economy
3. How do we get there?
"Strategies"
•Policies
•Projects
•Programs

Where are we now?

Medford Leads the State…

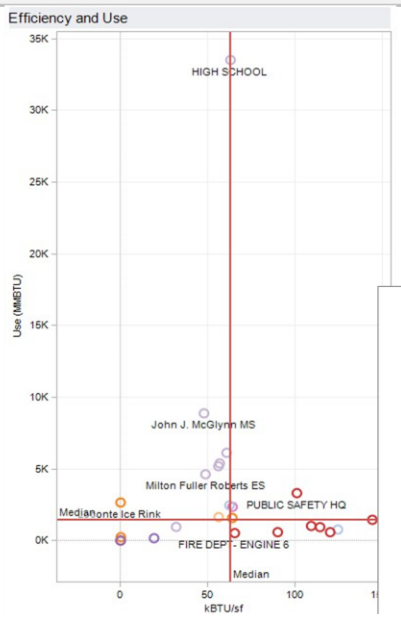


Go Green Medford
Initiatives & Achievements



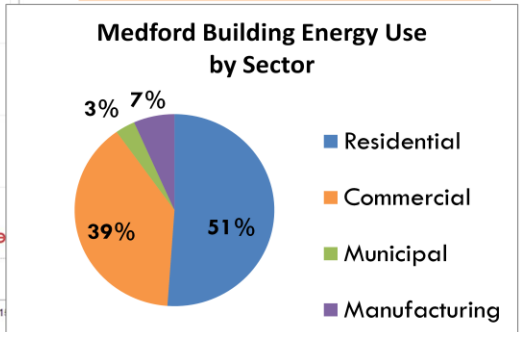
Where are we now?

Municipal Energy Profile



Annual Energy Consumption:
Electricity: **12.3 million kWh**
Natural gas: **492,000 therms**
Heating oil: **31,000 gallons**

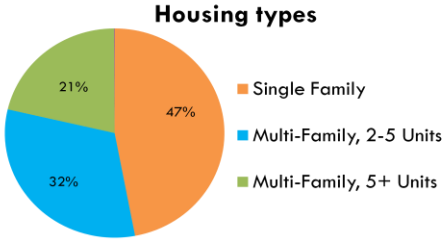
Annual Building Energy Expenditures:
$1.26 million
(excludes vehicle fuel)



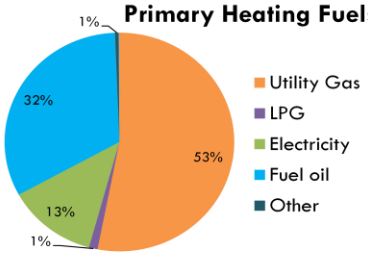
Where are we now?

Residential Energy Profile

Housing types



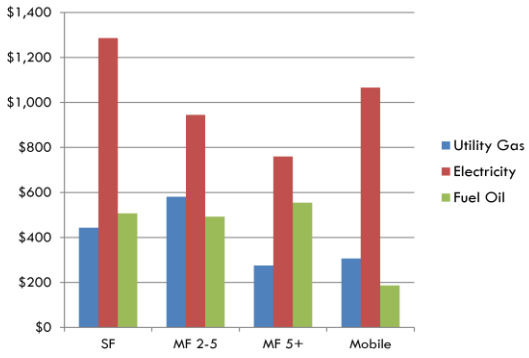
Primary Heating Fuels



Annual Energy Consumption:
Electricity: **178 million kWh**
Natural gas: **6.6 million therms**
Heating oil: **1.8 million gallons**

Annual Energy Expenditures: $46 million

Annual Residential Energy Expenditure Per Household



Where are we now?

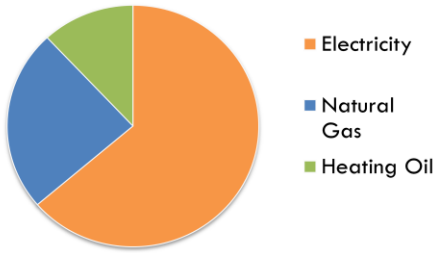
Commercial Sector Energy Profile**

Type	# Establishments	# Employees
Education	20	3,511
Office	326	2,455
Outpatient Care	81	1,154
Food Services	83	1,057
Retail (Non-Mall)	71	950
Services	130	881
Lodging	11	823
Warehouse	36	794
Food Sales	37	785
Retail (Mall)	39	364
Public Assembly	17	261
Religious	18	58
Total	**869**	**13,093**

Annual Energy Consumption:
Electricity: **217 million kWh**
Natural gas: **2.6 million therms**
Heating oil: **1 million gallons**

Annual Energy Expenditures:
$28 million

Commercial Energy Use by Fuel Type



**Does not include manufacturing/industrial sectors, in which Medford has an additional 4,097 jobs and 435 establishments

Where do we want to go?

Input from LEAP Working Group…

- **Reduce City of Medford energy use** 20% by 2014
- **Reduce residential and commercial energy use**
- Improve **outreach and education** to Medford community
- …

How do we want to get there?

Input from LEAP Working Group…

- Increase local **renewable energy generation**
- Increase **participation in existing programs and opportunities** (such as MassSave)
- Reduce **energy expenditures**
- …

Brainstorming Session

What residential, commercial, and municipal energy programs and policies do you want to see in Medford?

Appendix H: Medford LEAP Community Visioning Workshop (May 2) Minutes

MEDFORD LOCAL ENERGY ACTION PROGRAM COMMUNITY VISIONING WORKSHOP MINUTES

Location: Medford City Hall Chamber Council
Date: Wednesday, May 2, 2012
Time: 7:00 – 9:00 pm
Meeting Leader: Erin Brandt, Metropolitan Area Planning Council
Facilitator: Helen Aki, Metropolitan Area Planning Council and Alicia Hunt, the City of Medford
Note Taker: Po-Yu Yuen, Metropolitan Area Planning Council
Attendees: 7 Medford residents/stakeholders

Meeting Agenda

1. Welcome and Introductions
2. Purpose and Desired Outcomes
3. Demographic keypad polling
4. Introduction to Metropolitan Area Planning Council (MAPC) and LEAP
5. "Go Green Medford" – Past Community Achievements
6. Baseline: "Where are we now?"
7. Goals: "Where do we want to go?"
8. Brainstorm: Clean Energy Opportunities
9. Next steps

Meeting Purposes and Desired Outcomes

Purposes

- To launch the LEAP program with residents and stakeholders in the Medford community
- To present an overview of the program
- To begin discussions on opportunities in pursuing clean energy work in Medford
- To begin discussions on developing next steps

Desired Outcomes

- This meeting was for general brainstorming purposes
- This meeting aimed to develop clean energy ideas that would tie to the community's priorities

Demographic Keypad Polling

A keypad polling exercise was facilitated to help MAPC and the City of Medford understand the general demographics of the workshop participants and their knowledge on the workshop topics. The following questions were asked. For detailed results, please see the keypad polling results presentation.

- Do you live in Medford?
- Do you work in Medford?
- What is your age?

- How did you learn about today's workshop?
- How familiar are you with MAPC and/or LEAP?
- How familiar are you with clean energy topics, such as renewable energy and energy efficiency?
- Which of these (clean energy assistance programs) are familiar to you?

Introduction to MAPC and LEAP

Erin gave an overview of MAPC and LEAP. See presentation.

"Go Green Medford" - Past Community Achievements

Alicia gave a report on the City's past energy achievements and the status of the community's "Go Green Medford" campaign. See presentation.

Baseline: "Where are we now?"

Helen gave a summary of Medford's quantitative energy baseline in the municipal, residential, and commercial sectors. See presentation.

Goals: "Where do we want to go?"

Helen gave a summary of Medford's existing clean energy goals based on the City's previous clean energy plans and input from the community's LEAP Working Group. These goals include:

- Reduce City of Medford energy use 20% by 2014
- Reduce residential and commercial energy use
- Improve outreach and education to Medford community
- Increase local renewable energy generation
- Increase participation in existing programs and opportunities (such as MassSave)
- Reduce energy expenditures

Brainstorming

Brainstorming activities were facilitated to help MAPC and the City of Medford develop a strong understanding of the community's interest, concerns, priorities, and challenges in clean energy opportunities. Workshop participants were asked: *"What residential, commercial, and municipal energy programs and policies do you want to see in Medford?"* The following ideas were given:

Energy Efficiency

- Encourage oil-to-gas conversion
    - Identify and map homes with opportunities to convert to gas
    - Educate residents about the benefits and resources for oil-to gas conversion
    - Help residents access financial assistance and technical resources
- Support the use of electric vehicles and alternative-fuel vehicles
    - Plan for charging stations and compressed natural gas stations
    - Inform the City about local interest and demand

    - Educate residents about the environmental benefits and financial benefits of electrical vehicles
- Convert utility-owned streetlights to LED
    - Discuss the opportunities of buying off streetlights from utilities
- Utilize municipal vehicles more energy-efficiently and strategically
- Strengthen anti-idling policy enforcement

Renewable Energy

- Develop more solar and wind projects in the residential and municipal sectors
- Put in solar panels on municipal buildings
- Discuss the potentials of a second wind turbine
- Initiate the discussion on the feasibility of composting and anaerobic digestion

Education

- Provide interactive education about energy efficiency and renewable energy
- Apply for educational grants for clean energy education
- Designate "clean energy" as an education theme in schools
- Use parents as a key resource to push for energy-focused curriculum
- Build Medford as a model to teach residents smart strategies of energy reduction
- Educate residents and businesses about clean energy programs
    - Facilitate information gathering and sharing among the City, residents, business owners, and other local stakeholders
- Capitalize Community Reads Program to introduce clean-energy-related themes

Outreach and Programs Participation

- Close the information gap between consumers and clean energy opportunities
    - Generate and distribute a list of City-approved vendors and service providers
    - Have residents share their successful experience through social media, like Youtube
    - Present Medford's energy audits and efficiency improvement data (e.g., cost savings) to demonstrate local success
- Center outreach based on clusters
    - Neighborhoods
    - Squares
    - Farmers market
- Use local civic groups as a point for information distribution
- Use existing events to pull residents and businesses into clean energy discussions
- Bring in parents to school events to share clean energy success and opportunities
- Use comfort as a selling point for energy efficiency improvement programs
- Initiate tenant-landlord conversation on participating in energy audits and energy efficiency improvement programs
- Develop a clear, concise, and easy-to-use guide to help residents and businesses access to clean energy strategies and resources
- Create a checklist to tie into a do-it-yourself guide for both residents and businesses
- Learn from Energy Smack-Down's great model

Other Ideas

- Improve walk-ability and bike-ability
- Improve traffic management
    - Identify gridlock concerns
    - Discuss the potentials for re-routing and/ or eliminating selected bus lines
    - Discuss the opportunities for "Urban Loop"
- Plan for landscaping and tree-planting

The workshop participants were also asked: *"What actions are you most excited to participate/ hear about?"* Each participant was given six stickers to vote for their priorities among all actions generated in the brainstorming session. This activity was aimed to help MAPC and the City of Medford learn about local community's interest as an effort to create an energy action plan that best tie to the community's needs and priorities.

Next Steps

- MAPC will continue to compile research for energy action plan
- The Medford LEAP Working Group will be invited to discuss the draft action plan
- The draft plan will be open for public comment before it is formally adopted
- MAPC will with the City and Medford stakeholders to begin implementing action plan strategies

Appendix I: Medford LEAP Community Visioning Workshop (May 3) Minutes

MEDFORD LOCAL ENERGY ACTION PROGRAM COMMUNITY VISIONING WORKSHOP MINUTES

Location: Medford City Hall Chamber Council
Date: Wednesday, May 3, 2012
Time: 10:00 am – 12:00 pm
Meeting Leader: Erin Brandt, Metropolitan Area Planning Council
Facilitator: Helen Aki, Metropolitan Area Planning Council and Alicia Hunt, the City of Medford
Note Taker: Po-Yu Yuen, Metropolitan Area Planning Council
Attendees: 11 Medford residents/stakeholders

Meeting Agenda

1. Welcome and Introductions
2. Purpose and Desired Outcomes
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Meeting Purposes and Desired Outcomes

Purposes

- To launch the LEAP program with residents and stakeholders in the Medford community
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- Do you live in Medford?
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- How did you learn about today's workshop?
- How familiar are you with MAPC and/or LEAP?
- How familiar are you with clean energy topics, such as renewable energy and energy efficiency?
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- Reduce City of Medford energy use 20% by 2014
- Reduce residential and commercial energy use
- Improve outreach and education to Medford community
- Increase local renewable energy generation
- Increase participation in existing programs and opportunities (such as MassSave)
- Reduce energy expenditures

Brainstorming

Brainstorming activities were facilitated to help MAPC and the City of Medford develop a strong understanding of the community's interest, concerns, priorities, and challenges in clean energy opportunities. Workshop participants were asked: *"What residential, commercial, and municipal energy programs and policies do you want to see in Medford?"* The following ideas were given:

Renewable Energy

- Promote solar panel installation in the residential sector
- Educate residents and businesses on solar leasing options
- Conduct solar feasibility study in the residential sector to identify ideal roofs
    - Promote the use of National Renewable Energy Lab – In My Backyard
- Help connect residents interested in solar installation with home owners with ideal roofs
- Generate and distribute a list of city-recommended solar vendors and providers
- Discuss the potentials for solar installation on warehouses/flat roofs
- Research on the credibility and benefits of thermal imaging services
- Explore waste-to-energy opportunities (e.g., compost, anaerobic digestion)

Education

- Integrate practical clean energy training in high school and vocational school
    - Allow students to work on maintenance and efficiency improvement work
    - Educate about the communication and application aspects of clean energy work
    - Develop a sense of Medford pride through local energy programs
- Partner with wind turbine companies for education programs
- Educate residents clean energy opportunities and resources
    - Solar
    - Energy efficiency improvement programs
    - MassSave

Outreach and Programs Participation

- Connect the community to energy data and opportunities
- Target neighborhoods on participation in clean energy programs
    - Distribute neighborhood-specific flyers
    - Work with residents with successful experience to hold open house events
- Generate a contact list of local residents that have successfully demonstrated energy savings and cost savings through participating in clean energy programs
- Compile business programs available to deliver to business owners
- Develop a better understanding on "owner vs. tenant" issues in the business sector
    - Are business owners renting their buildings?
    - Are business owners paying for electricity?
- Use community organizations and stakeholders as a point for information distribution
    - Religious organizations
        - Effective solutions to trust issue
        - Grace Church; Unitarian Universalist Church
    - Chamber of Commerce
        - Use chamber as a point for deliver information about business energy programs
        - Use businesses as local champions
        - Use first year Green Business Award winners as local models
    - Parent Teacher Association from neighborhood schools
    - Mom/ dad groups
    - Medford Senior Center
    - Local cafes and pastry stores
- Consider non-English speaking population

Other Ideas

- Donate wood chips from chopped down trees to power plant

The workshop participants were also asked: *"What actions are you most excited to participate/ hear about?"* Each participant was given six stickers to vote for their priorities among all actions generated in the brainstorming session. This activity was aimed to help MAPC and the City of Medford learn about local community's interest as an effort to create an energy action plan that best tie to the community's needs and priorities.

Further Comments

Workshop participants were given the opportunity to express further ideas and opinions on the City's clean energy work via comment cards. The following ideas came either from the comment cards collected at the workshops or from residents who could not attend the workshops, but gave input before the meeting to MAPC staff.

- LEAP should send an email survey out to residents and businesses to get a better understanding of people's needs and interests. See Medford's Open Space Plan survey; it had a high number of responses
- City should help residents vet solar companies, so that residents know who to trust; city could also help aggregate solar demand to ease process and reduce costs
- City should look at greening Medford's Christmas display with LED lights
- City should support community garden plots in dense areas

Next Steps

- MAPC will continue to compile research for energy action plan
- The Medford LEAP Working Group will be invited to discuss the draft action plan
- The draft plan will be open for public comment before it is formally adopted
- MAPC will with the City and Medford stakeholders to begin implementing action plan strategies