

CITY OF NEWTON

IN BOARD OF ALDERMEN

PUBLIC FACILITIES COMMITTEE REPORT

WEDNESDAY, FEBRUARY 17, 2010

Present: Ald. Schnipper, Lennon, Albright, Salvucci, Gentile, Crossley, Danberg, and Lappin
City staff present: Michael Cronin (Chief of Operations; School Department), Arthur Cabral (Interim Commissioner of Public Buildings), Joshua Morse (Facilities and Operations Supervisor; Public Buildings Department), Robert DeRubeis (Interim Parks and Recreation Commissioner), Robert Rooney (Chief Operating Officer), Reenie Murphy (School Committee), Jonathan Yeo (School Committee), and Clair Sokoloff (School Committee)

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#38-10 HIS HONOR THE MAYOR requesting authorization to appropriate and expend five hundred thousand dollars (\$500,000) in State Capital Bond Bill funds for the purpose of capital repairs to the Lower Falls Community Center. [01/26/10 @ 11:48 AM]

ACTION: **APPROVED 6-0 (Crossley and Lappin not voting)**

NOTE: The City has received a State Capital Bond Bill for \$500,000 for repairs to the Lower Falls Community Center. Commissioner of Parks and Recreation Bob DeRubeis recognized Representative Kay Khan's efforts in obtaining the funding. The City and neighborhood have had several meetings regarding the project. Everyone is in agreement regarding the priorities of the repairs. The Heating system improvements are the number one priority followed by window replacement, roof repair or replacement, and lighting improvements. The neighborhood and City are also in agreement regarding creating a greener building through the improvements. The roof replacement could potentially support wind turbines or solar panels. The Public Buildings Department provided the attached breakdown and the potential green elements of the project. The energy service company, NORESCO, has already audited the building and proposed additional energy efficiencies that would be undertaken as part of NORESCO's contract. Although the project cost estimate exceeds the bond bill funds, the City will do the projects as they are prioritized, and stop when they are out of funding. There is also the possibility that there will be fundraising efforts by the Community to provide additional funding. Ald. Salvucci moved approval, which carried unanimously.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#52-10 HIS HONOR THE MAYOR requesting authorization to appropriate and expend sixteen thousand eight hundred forty-five dollars (\$16,845) from Free Cash for the purpose of evaluating the condition and prepare replacement cost estimates for various sections of roofing systems at the following seven schools: Bowen, Brown, Cabot, Countryside, Franklin, Lincoln-Eliot, and Ward. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 5-0 (Gentile, Lappin & Lennon not voting)**

NOTE: Arthur Cabral presented the item to the Committee. He explained that the original request from the School Department was for \$475,000 for the design and replacement of the roofs for all seven schools. However, Commissioner Cabral thought it was best to inspect and evaluate the existing condition of the roofs in order to prepare estimates on the replacement costs. Therefore, the request is for \$16,845 from Free Cash.

It is possible that some of the roofs would only require a partial replacement. If the City does not use all of the requested funds, the unused funds would be used for the roof replacements. The City will use the on-call roofers to evaluate the roofs, as they can provide the necessary lifts and equipment needed for the evaluation.

Ald. Albright questioned whether the seven schools have been prioritized in regards to the order in which they would be replaced. Chief of Operations at the School Department Michael Cronin responded that each of the seven roofs leak. Mr. Cabral will work with the School Department to prioritize the roofs. Ald. Crossley asked for the age of each of the roofs. Mr. Cabral stated that he did not have the information with him but would provide it. Ald. Albright moved approval of the item, which carried unanimously.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#54-10 **HIS HONOR THE MAYOR** requesting authorization to appropriate and expend six hundred fifty thousand dollars (\$650,000) from bonded indebtedness for the design and replacement of the windows at the Burr Elementary School. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 5-0-2 (Gentile, Lennon abstaining; Lappin not voting)**

NOTE: Arthur Cabral explained that the item is a request to bond \$650,000 for new windows at the Burr Elementary School. The School Department began a window replacement program a number of years ago and the Burr Elementary School is the next in line for replacement windows. The existing windows are the original single-pane windows from 1968. The existing windows are opaque and many of them are broken and inoperable. School Committee member Jonathan Yeo stated that there is tremendous excitement at the school for the new windows. Parents, teachers, and students look forward to being able to see out the windows and the natural light that the new windows would be provide.

Ald. Crossley asked if it were possible to wrap the new windows into the energy service company (ESCO) contract. Josh Morse, Facilities and Operations Supervisor; Public Buildings Department, stated that it is a question of allowing the ESCO to use the savings generated by the window replacement. The City does not want the ESCO to do large capital projects, as the cost would be at a considerable mark up. In addition, the replacement would be significantly delayed if the ESCO were to do it.

The window replacement project is planned to begin in September and would be done after hours. It would be opportune if the project could begin in the summer; however, there is a long lead-time by the manufacturer for the windows. Committee members questioned why the capital projects for the schools were not docketed earlier in order to accomplish the projects in the summer. School Committee Member Reenie Murphy responded that the request for funding for these projects was sent to the previous administration. However, the projects were not docketed by the then Mayor.

The School Department is using approximately \$1.4 million of the \$1.75 million allotted to the School Department for capital projects this fiscal year. The projects include the roof evaluations at seven schools, Burr School windows, the Education Center generator, the Peirce School generator, the Williams School boiler, and the elevator lift at Countryside School. The School Department may also be docketing two more capital projects: a new boiler at Angier Elementary School and the replacement of auditorium seating at the F.A. Day Middle School. The Committee asked if Mr. Cronin was comfortable depleting the capital improvement funds for the proposed purposes. Mr. Cronin is comfortable with the use of the capital improvement funds for all of the proposed projects.

Ald. Danberg moved approval of the item, which carried by a vote of five in favor and two abstentions. Ald. Gentile and Lennon abstained, as they were not available for the full discussion of the item.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#55-10 HIS HONOR THE MAYOR requesting authorization to appropriate and expend two hundred two thousand one hundred twenty-five dollars (\$202,125) from bonded indebtedness to replace the generator at the Education Center at 100 Walnut Street. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 7-0 (Lappin not voting)**

NOTE: Public Buildings Commissioner Cabral stated that the emergency generator located at the Education Center is in poor condition and will not last much longer. The purpose of the generator is to provide emergency electrical power to the Education Center if the power fails. The generator should have been replaced last year; however, it was inadvertently not bid. The new generator will be a diesel powered generator as preferred by the Fire Department and is less likely to fail.

There are three programs, which involve students located at the Education Center. There is a fully integrated pre-school with 237 children, a program known as Spring Board for high school students with approximately 21 students, and the Central High School Program with approximately 17 students. The Education Center also houses a large amount of computer equipment and a power failure without a back-up generator could be a real problem from an information technology standpoint.

School Committee members provided the Committee with an overview of each program and the location of each within the Education Center. The Committee was concerned with the suitability of using an annex building for the Central High School Program. Ald. Crossley pointed out that the annex buildings were constructed approximately fifty years ago and are basically foundations with walls. There is no insulation in the annexes and the heat is poor. Josh Morse explained that improvements to the annex buildings would be included in the ESCO contract.

The Committee voted unanimously in favor of a motion to approve the item.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#56-10 **HIS HONOR THE MAYOR** requesting authorization to appropriate and expend fifty five thousand sixty-four dollars (\$55,064) from Free Cash to fund additional costs associated with the removal and replacement of the existing emergency generator at the Peirce Elementary School. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 5-0-1 (Gentile abstaining; Crossley & Lappin not voting)**

NOTE: Commissioner of Public Buildings Arthur Cabral explained that this is the third request for funds for the replacement of the emergency generator at the Peirce Elementary School. The Board approved a request for \$100,000 to replace the generator in January of 2006. When the project went out to bid in 2008, it came in \$43,000 higher than anticipated. Therefore, there was a second appropriation for the additional funds in July of 2009. Generator costs have risen significantly due to the natural disaster in Haiti and the Commissioner feels that the request for an addition \$55,064 is necessary to complete the project. The Commissioner will return any unused funds. The generator at the Peirce Elementary School is currently not working and the Public Buildings Department would like to replace the generator as soon as possible. The motion to approve the item was approved by a vote of five in favor and one abstention. Ald. Gentile had further financial questions that he will address during the Finance Committee meeting.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#57-10 **HIS HONOR THE MAYOR** requesting authorization to appropriate and expend two hundred thousand dollars (\$200,000) from bonded indebtedness for the design and replacement of one of the boilers at Williams Elementary School. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 6-0 (Crossley & Lappin not voting)**

NOTE: The two boilers at the Williams Elementary School are sixty years of age and at the end of their useful life. The Williams Elementary School boiler is next in line for replacement. In order to repair the boilers, the parts would have to be manufactured due to the age of the boilers. The new boiler will have dual fuel capacity and the other boiler will serve as a backup. The new boiler and new piping will increase fuel efficiency significantly. The City is nearly at the point where there are no buildings with boilers that are about to fail, however, some backup boilers are not working at all or are past their useful life.

Committee members asked Michael Cronin, Chief of Operations at the School Department, what the planning process is for the School Capital Improvement Plan (CIP). Mr. Cronin responded that the School Department looks at the CIP in the spring, discusses it in the summer, and finalizes it in the fall. The items are submitted to the Mayor in September of October to be docketed for discussion by the Board of Aldermen. Unfortunately, the previous Mayor did not docket the School CIP requests and the projects were delayed. Ald. Gentile asked if the modular classrooms were intended to be funded through the CIP money allocated to the School Department. School Committee Member Claire Sokoloff responded that the Mayor determined that the modular classrooms would be funded from a telecommunications settlement.

The Committee unanimously voted approval of Ald. Albright's motion to approve the request for funds to replace a boiler at the Williams Elementary School.

REFERRED TO PUBLIC FACILITIES AND FINANCE COMMITTEES

#58-10 HIS HONOR THE MAYOR requesting authorization to appropriate and expend one hundred fifty thousand dollars (\$150,000) from bonded indebtedness for the design and installation of an elevator lift at the Countryside Elementary School. [02/09/10 @ 7:20 PM]

ACTION: **APPROVED 6-0 (Crossley & Lappin not voting)**

NOTE: The item is a request for funds to install an elevator lift at the Countryside Elementary School similar to the vertical lift installed at Mason-Rice Elementary School. There are several students with disabilities, who attend Countryside School, and cannot access the second floor. The school changes classrooms from the second floor to the first to accommodate those students. The new lift will bring the school into compliance with the Americans with Disabilities Act. The Public Buildings Department will attempt to install the lift over the summer. The new elevator is 8' by 8' and would be located near the front of the school. The elevator would replace an existing closet and not affect classroom space. Ald. Danberg moved approval of the item, which carried unanimously.

#50-10 ALD. CROSSLEY & HESS-MAHAN requesting the adoption of a policy to reduce energy use baseline inventory for municipal buildings, vehicles, street and traffic lighting by 20%, in order to satisfy the requirements to qualify as a Green Community under Mass General Law Ch. 25A, §10(c). [02/09/10 @ 7:25 PM]

ACTION: **HELD 6-0 (Danberg & Salvucci not voting)**

NOTE: The Committee began an initial discussion of the proposed policy. The establishment of an energy use baseline inventory for all public buildings, streetlights and city buildings and a program to reduce the baseline by 20% over five years is one of the five State requirements that Newton must meet in order to obtain a Green Community Badge. If the City could meet all the requirements by May 14, 2010, it would be eligible for up to \$1 million in grant funds from the State. The State will allow the City to go back to FY'2007 to capture the streetlight replacement and NORESKO work as part of the reduction in energy. Ald. Crossley provided the attached sample energy reduction action plan and summary of the necessary requirements to achieve a Green Community Badge.

Ald. Crossley has spoken with many citizens regarding the Green Community Act and many are willing to volunteer time to work on achieving the five requirements. The Mayor's Office and the Planning Department support becoming a green community. The City's Energy Commission was particularly interested in the implementation of the five requirements. The next step to achieving the above requirement is a database for the inventory and an action plan. Jonathan Kantar of the High Performance Building Committee was present and stated that there are only a few communities that have passed the "Stretch Code" making Newton ahead of the game. It is a worthwhile effort and a great opportunity to obtain grant funds both this year and probably next year.

Ald. Gentile supports the concept of the Green Community Badge but thought that the implementation of the necessary zoning changes to meet some of the other requirements would be a tremendous challenge. Ald. Crossley is aware of the challenge but it does not hurt to try and the State Act establishes grant funding for the life of the act. Ald. Gentile asked that Aldermen

think about the amount of work that the new administration already has before adding to the workload.

Ald. Crossley stated that she would do further research on achieving the energy use baseline inventory for municipal buildings, vehicles, street and traffic lighting and the 20% reduction over five years of the baseline. Ald. Crossley will report back to the Committee when she has further information.

#385-07 ALD. SCHNIPPER AND GENTILE updating the Public Facilities Committee on the progress of the Newton North High School Project. [11/21/07 @ 10:23 AM]

ACTION: **HELD 6-0 (Danberg & Salvucci not voting)**

NOTE: The construction team is in the process of getting information regarding the demolition of the school from outside consultants. The construction team is investigating the correct way to present the demolition plan to the Department of Environmental Protection. There are four recommendations that the team is looking at. The team is also coming up with an action plan to address any hazardous material that might be an issue during demolition. The final cost of demolishing the school has not been determined.

The School Department has requested some changes to the new building, which the Executive Department is requiring further justification before the changes are approved. There are a couple of changes that are being addressed, which include the need for a sink and moisture blockers in the green house and a new wall in the copy center to accommodate machinery that is larger than was contemplated when the room was designed. There was nothing further to update the Committee on; therefore, the item was held.

Respectfully submitted,

Sydra Schnipper, Chairman

Project Name: Hamilton Community Center Rehab Project [Newton Lower Falls]

Historic Significance: Yes/No: _____ **Fed.Register Designation:** Yes/NO _____

Grantee: _____ City of Newton _____

Legal Address: _____ 1000 Commonwealth Avenue, Newton Centre, MA 02459 _____

Contract manager [oversees project]: Arthur F. Cabral, interim Public Buildings Commissioner, Public Buildings Department, 52 Elliot Street, Newton Highlands, MA 02461

Tel# 617-796-1600 _____ **Fax#** 617-796-1601 _____

E-mail Address: acabral@newtonma.gov _____

Vendor Code: _____

Project Scope: Interior X & Exterior X renovation/repairs/replacement

Project Cost Estimate: \$ 660,000 _____

Budget Detail: [Cost Estimates]

Heating System Replacement	\$ <u>235,000</u>	(including controls, etc.)
Window Replacement*	\$ <u>125,000</u>	(remaining windows)
Roof Replacement*	\$ <u>160,000</u>	
Interior Lighting Replacement	\$ <u>25,000</u>	(includes occupancy sensors)
Painting:	\$ <u>25,000</u>	
Gym Floor Refinishing & repair	\$ <u>30,000</u>	
Flooring Replacement	\$ <u>20,000</u>	
"Green Energy" Upgrades**	\$ <u>40,000</u>	
Other: TDB	\$ _____	
Total:	\$ <u>660,000</u>	

*Includes design

**TBD:

Funding:

State grant:	\$ <u>500,000</u>	
Other sources:	\$ <u>160,000</u>	Doc: City of Newton match
	\$ _____	Doc: _____
	\$ _____	Doc: _____

Vendors:

D&E: Yes X No _____

Contractors: Yes X No _____

Permits: _____ Yes _____ **Approvals** _____

Other Info: _____

Potential "Green" elements for the Lower Falls Community Center (LFCC)

There are many opportunities to "green" the

- 1) High Efficiency HVAC system
 - a) Upgrade the existing steam system
 - b) Convert the existing system to a high efficiency hot water system
 - c) Install co-generation (possibly bio-diesel) for heating, electricity and possibly cooling.
 - d) Replace the existing system with geo-thermal including possible cooling.
- 2) Solar electric and/or hot water systems
 - a) Consider roof-mounted and/or awning systems
 - b) Data acquisition system for renewable energy production and energy use.
- 3) Wind turbine
 - a) Roof mounted micro-turbines
 - b) Tower mounted turbine at edge of parking lot
- 4) Light emitting diode (LED) fixtures with occupancy sensors and day-lighting control
- 5) Building energy management system
 - a) Include indoor air quality monitoring
 - b) Provide building system to the
- 6) Weatherization of building envelope including glazing, insulation and air-sealing
- 7) Water conservation including rain water recovery
- 8) Provide a "green" library of books and other literature
 - a) Use the LFCC as a model and have tours and presentations
 - b) Demonstrate "smart grid" technology

Other "green" elements

Recycling program, Maintenance program, Use of environmentally friendly cleaning and maintenance chemicals. – Smaller things that can make the LFCC "greener."

Newton Lower Falls - Potential Energy Conservation Measures

#38-10

- * Lighting improvements
- * Lighting occupancy sensors
- * EnergyStar air conditioning units
- * Building envelope improvements
- * Weatherize steel beams on exterior walls
- * HVAC Controls Improvements
- * Low flow plumbing improvements with automatic controls
 - Low flow toilets
 - Ultra-low flow urinals (1/8 gal)
 - Low flow aerators for sinks
- * Renewable Energy
 - Residential wind turbine and/or Solar photovoltaic system
 - Energy display

MA Green Communities Badge for Newton...

Green Communities Act

Use the LR committee to investigate and organize meeting the requirements

FIVE requirements; alternatives exist within each one.

1. Enact by-right siting of renewable or alternative energy generating, and/or R&D, and/or manufacturing facilities in designated locations.

TASKS: MAP opportunities across the city:

1 – Rumford Avenue Dump 49 acre PV installation

2 – Business or light manufacturing district/s

Wells Avenue

Near Elliot St DPW?

Co-Docket with Planning Department, Mayor's office

BOA / ZAP Requires a public hearing?

2. Re #1, adopt an expedited permitting process (not to exceed one year)

Use DOER Guidelines (or Ch. 43D - X)

Co-Docket with Planning Dept

TASK – Draft proposed language

ZAP – Jen Molinsky; LAW – Marie Lawlor

- 3** Establish an energy use baseline inventory for all public buildings, streetlights and city vehicles (we have this), and put in place a program to reduce the baseline by 20% over five years...

TASK: Separate FY 2007 municipal energy use

Capture streetlight replacement and muni ESCO work...etc.

NEED: Letter from municipal official verifying adoption/ policy

- 4** Purchase only fuel-efficient city vehicles... (note exceptions)

TASK: Codify City Policy – write for mayor's office; BOA P&S and Finance

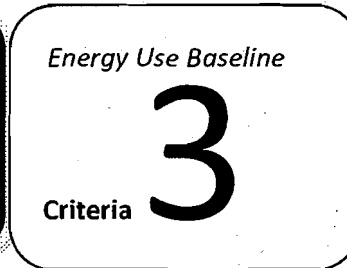
5. Adopt the MA Building Energy Stretch code. **DONE**

DEADLINE: MAY 14, 2010

Municipalities who meet this deadline are eligible for grants from a fund identified as having seven million dollars in it for FY 2010. No community has yet received the designation.

Time is of the essence to earn the badge so we can apply for the grant by May.

There are many citizens interested in this, including the Energy Commission, Green Decade coalition and High Performance Buildings coalition.



Sample Energy Reduction Action Plan Outline

INTRODUCTION

Criteria Three of the Green Communities Program requires that a municipality:

- (1) Establish an energy use baseline inventory for municipal buildings, vehicles, street and traffic lighting

The energy use baseline is applied in the aggregate across buildings, streetlights and vehicles on an MMBTU (million British Thermal Units) basis.

There are a number of acceptable tools for performing the inventory including:

- a. EnergyStar Portfolio Manager
 - b. ICLEI software
 - c. DOER's Energy Information Reporting System
 - d. Other tools proposed by the community and deemed acceptable by DOER
- (2) Put in place a comprehensive program designed to reduce this baseline by 20 percent within 5 years of initial participation in the program.

This guidance was prepared to assist cities and towns in developing a comprehensive program designed to reduce their baseline energy use by 20% within five years of initial participation in the Green Communities Program. This outline is intended for illustration purposes only, though communities are free to utilize the format provided.

ENERGY REDUCTION ACTION PLAN OUTLINE

A comprehensive reduction plan consists of a number of key components which enables a municipality, to establish energy reduction goals and develop a structure to meet those goals over a specific period of time. Green Communities recommends the following information / data be included in a energy reduction plan:

PURPOSE AND ACKNOWLEDGEMENTS

- Letter from municipal officials verifying adoption of the energy reduction plan

- List of contributors that participated in the baseline and reduction plan process
- Executive summary

I. INTRODUCTION

A. *Background*

- i. Summary of the town – populations, number of municipal buildings including schools, number of vehicles, fuel usage (eg. oil, propane, natural gas)
- ii. Goal of reducing fossil fuel energy use – include goals regarding any special school accreditations, Energy Star ratings, becoming a Green Community, EPA Community Energy Challenge, ICLEI community
- iii. Municipality's role
 - a. Energy use baseline inventory
 - b. Energy use forecast
 - c. 20% reduction
 - d. Statement of goals and strategies to be used in carrying out the action plan

II. RESULTS OF ENERGY USE BASELINE INVENTORY

A. *Inventory tool used*

B. *Existing municipal energy use*

- i. Municipal buildings
- ii. Vehicles
- iii. Street and traffic lighting

C. *Existing efficiency measures implemented in last 2 years*

D. *Areas of least efficiency/greatest waste*

E. *Areas that can be most easily addressed*

III. SUMMARY OF ENERGY AUDIT

NOTE: Although an energy audit is not a requirement, we strongly recommend an audit in order to provide better understanding of existing conditions and identification of opportunities for energy reduction

IV. SUMMARY OF FOSSIL FUEL REDUCTION MEASURES

A. *Overview of short-, and long-term goals*

B. *Getting to 20%*

- i. Prioritized list of strategies to reduce fossil fuel usage
- ii. Tools, resources and financial incentives
- iii. Program Management Plan for implementation, monitoring and oversight

V. FOSSIL FUEL ENERGY REDUCTION MEASURES

A. *Short-term energy reduction goals – getting to 20% reduction in 5 years*

- i. Municipal Buildings (including schools)
 - a. General goals and Prioritized List of Specific Projects
 - Retrofits and Renovations
 - New Construction and Additions
 - b. Projected Energy savings
 - c. Estimated Project Capital and Operating Costs
 - d. Schedule for implementation
- ii. Vehicles (including schools)
 - a. Areas of vehicle fleet affected
 - b. New vehicle/technology costs
 - c. Projected Annual energy savings
 - d. Timing of anticipated purchase
- iii. Street and traffic lighting
 - a. General goals and specific projects
 - b. Projected Energy savings
 - c. Project cost
 - d. Timeframe for implementation
- iv. Municipally-owned and -operated clean renewable or alternative energy installations
 - a. Project overview
 - b. Projected clean energy production
 - c. Project Capital Cost
 - d. Timeframe for implementation
- v. Total projected fossil fuel energy reduction

B. *Measurement and Verification Plan for Projected Reductions*

- i. Provide Common Technology Features as applicable, e.g. submetering, smart metering, energy management systems
- ii. Energy Information Reporting System
 - a. Centralized Compilation of data and creation of tracking reports
 - b. Comparison of actual vs projected reductions

C. *Long--term energy reduction goals – Beyond 5 years*

- i. Municipal Buildings (including schools)
- ii. Vehicles (including schools)
- iii. Street and traffic lighting
- iv. Municipally-owned and -operated clean renewable or alternative energy installations
- v. Total fossil fuel energy reduction

VI. CONCLUSION

List of Resources – Identify resources that are available (websites, documents, tools)

Contacts – Provide contact information for local, state, federal non-profit entities that support energy reduction planning

MISCELLANEOUS

- AFTER all energy reduction measures have been taken, credit may be given for the addition of renewable energy resources to reach the 20% reduction goal.
- A community can meet this requirement if it has completed an inventory as described above and has already implemented a program to reduce the baseline within the previous 24 months.
- For applications consisting of more than one community, all communities must complete the inventory. However, the comprehensive program to reduce the baseline by 20% can be applied across all communities.

BTU Conversion Chart

Fuel Energy Content of Common Fossil Fuels Per DOE/EIA

BTU Content of Common Energy Units – (1 million Btu equals 1 MMBTU)

- 1 barrel(42 gallons) of crude oil = 5,800,000 Btu
- 1 gallon of gasoline = 124,000 Btu (based on U.S. consumption, 2007)
- 1 gallon of diesel fuel = 139,000 Btu
- 1 gallon of heating oil = 139,000 Btu
- 1 barrel of residual fuel oil = 6,287,000 Btu
- 1 cubic foot of natural gas = 1,028 Btu (based on U.S. consumption, 2007)
- 1 gallon of propane = 91,000 Btu
- 1 short ton of coal = 20,169,000 Btu (based on U.S. consumption, 2007)
- 1 kilowatt hour of electricity = 3,412 Btu
- 1 therm = 100,000 Btu

FOR MORE INFORMATION

Website:

www.mass.gov/energy/greencommunities