

*energy tips*  
FOR LOWELL

# Lowell



*Updated July, 2012*

• a

# *energy tips* FOR

## Lowell

*There is currently a flood of information and publicity about saving energy in all of the media, most of it very significant and innovative.*

*To the average consumer however, it can all be very confusing and overwhelming.*

*In this publication, we are attempting to simplify, coordinate, and summarize this material into a format that pertains to the circumstances and situations in Lowell.*

*To that end, we have broken down a lot of the information to the specific user groups; an owner of a small home has much different possibilities and constraints than a facilities manager of a large hospital.*

*There is also the issue of timing as many of the grants and rebates end on set dates, while other grants are constantly changing their focus and/or criteria.*

*As the existing supply of energy resources and fuel decreases and it's demand increases, we must change our way of supplying and using natural resources. This handbook will provide tools and techniques for citizens and companies in the community to improve their energy uses in everyday life.*



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# GLOSSARY

## ENERGY

**AFUE** Annual Fuel Utilization Efficiency

**Alternating Current (AC)**

Type of electrical transmission and distribution that alternates in direction; the US standard is 120 reversals (60 cycles/second).

**Building Envelope**

An exterior assembly that encloses the interior space of a building.

**BTU (British Thermal Unit)**

The amount of heat that would raise 1 lb. of water by 10 degrees Fahrenheit.

**COP** - Coefficient of Performance.

**Direct Current (DC)**

Type of electricity transmission and distribution by which electricity flows in one direction through the conductor.

**Economizer**

A heat exchanger for recovering heat from flue gases for heating water or air.

**EER** Energy Efficiency Ratio.

**Fossil Fuel**

Any naturally occurring organic fuel such as oil, gas, coal, etc.

**HVAC**

Heating, venting, and air conditioning.

**kWh**

Amount of kilowatts used in an hour.

**R value**

Unit of the heat resistance features of a material.

**Thermal Mass**

A mass that absorbs and stores heat during sunny periods when heat is not desirable in the living space and then releases the heat during overcast periods or during the night when heat is desirable.

**Ton**

12 thousand BTUs.

## AGENCIES

**BASEA** The Boston Area Solar Energy Association is an educational organization that promotes sustainable energy technologies.

**CEERE**

Center for Energy Efficiency & Renewable Energy.

**DOE**

US Department of Energy.

**DOER**

Massachusetts Division of Energy Resources.

**Energy efficient mortgage**

A type of home mortgage that takes into account that a buyer of a unit that saves on energy bills has more income to put towards the mortgage.

**EPA** The Environmental Protection Agency has interest in alternative energy because of its beneficial impact on pollution.

**FHA**

Federal Housing Administration.

**HUD**

US Department of Housing and Urban Development.

**NGrid**

National Grid, a utilities company based in England, supplies electricity and natural gas to Lowell.

**LEED**

Leadership in Energy & Environmental Design is a green building rating system. It is a nationally accepted benchmark for the design, construction, and operation of high performance green buildings.

**MaCEC** The Massachusetts Clean Energy Center is responsible for supporting renewable energy projects throughout the Commonwealth.

**MAEEP**

Massachusetts Energy Efficiency Partnership.

**MTC**

The Massachusetts Technology Collaborative is a public-private partnership to advance the Massachusetts technology sector.

## CONSERVATION & EFFICIENCY

### **Blown-In Insulation**

An insulation product composed of loose fibers or pellets that are blown into the building cavities.

### **CFL-Compact Florescent Lamp**

A small florescent lamp that may be used in place of lesser efficient incandescent lamps.

### **Closed Loop**

A type of heating system in which the transfer fluid circulates from the heating component to a heat exchanger that's immersed in a heat storage media, passing its heat to the storage media without physically contacting it.

### **Cogeneration (CHP) combined heat & power**

A power generating system that recovers and utilizes the waste heat from making electricity.

### **District heating system**

A heating system in which steam or hot water is piped from a central boiler plant or electric power/heating plant to a cluster of buildings.

### **Heat Pump**

A heat pump is a reverse-cycle air conditioner.

### **HERS**

the Home Energy Rating System represents the energy use of a building compared to other buildings; a lower score corresponds to less energy. A score of 100 equals the American Standard Building while a score of 0 indicates no net purchased energy.

### **HRV**

Heat Recovery Ventilator. A heat exchanger that preheats fresh air entering the building with the heat from the discharged used air. Can precool air in the same manner in the summer time.

### **LED**

A light emitting diode is a semiconductor device that produces a low but highly efficient and durable luminescence.

### **Low-e**

Low emissivity glass; a thin coating of metal oxide on multiple pane glass prohibits heat loss but permits a specific amount of solar gain.

### **Microturbine**

An efficient, clean, and compact engine composed of a moving shaft with a turbine wheel on one end, a generator on the other, and an air compressor in the middle.

### **Solartube**

Tubular skylight where sunlight is redirected down a highly reflective shaft and diffused throughout the interior space.

### **Standing column wells**

Similar to a water well, but a 500' deep well must have a minimum of 350' of water, preferably 450'.

### **T5HO**

A florescent light with 40% smaller diameter than a T8 florescent and able to produce double the lumens.

### **ZEH**

Zero Energy House. A home that produces at least as much heat and power as it consumes.

## ALTERNATIVE TECHNOLOGIES

### **Biomass**

Plant derived organic matter that can be used as a fuel and is readily grown and/or replaced.

### **Fuel Cell**

An electrochemical energy conversion device converting hydrogen and oxygen into electricity and heat. Provides a direct current voltage that can be used to power electrical devices.

### **Hydroelectric power**

Uses the kinetic energy of moving water to generate electricity.

### **Methane (CH<sub>4</sub>)**

A hydrocarbon produced through anaerobic (without oxygen) decomposition of wastes in landfills or sewerage plants.

### **Solar HW**

Solar hot water panels that absorb heat in a medium which is circulated to a hot water storage tank to heat the home's hot water.

### **Solar Thermal**

Solar panels that carry absorbed heat from the sun to hot water storage tanks that provide space heating for the home.

### **Solar PVs (Photovoltaics)**

Solar panels that create electricity from the sun's rays and store it in either a bank of batteries or send surplus into the grid.

### **Geothermal**

A method of heating and cooling a building by taking advantage of the natural stable warmth and coolness stored in the earth.

### **Wind power**

The conversion of rotating turbine blades into electricity by means of a generator.

# energy tips FOR LOWELL

## Efficiency

### INSULATION

Insulation will provide the building owner with the quickest payback.

The building envelope should have enough heat resistance, "R", to prevent transfer of heat or cold between interior and exterior. In New England the attic should be at least R-45; wood frame walls, R-20; and basements, R-18.

The most prevalent insulation types are: Fiberglass batts with an R value of 3 per inch; mineral wool & cellulose with an R of 3 1/2"; extruded polystyrene with an R of 4 1/2"; and polyurethane foam & polyisocyanurate with 6R 1/2"

All air leaks should be sealed. All ducts, pipes, and hot water heaters should be wrapped.

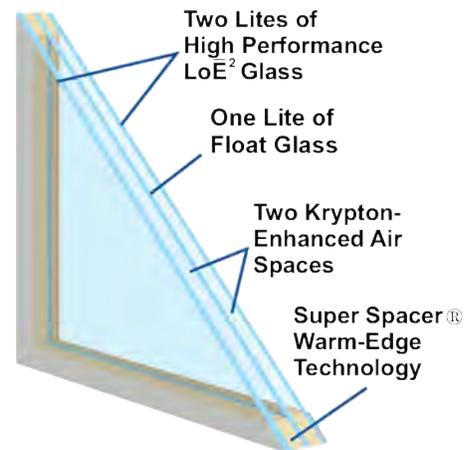
Areas of house requiring insulation  
[energystar.gov](http://energystar.gov)



Highly insulated homes must maintain sufficient ventilation and to prevent costly heat loss or gain, should have a heat recovery ventilator installed.  
[www.hvacquick.com](http://www.hvacquick.com)

### ENVELOPE

Windows often comprise the largest percentage of heat loss & gain in the building envelope and should be upgraded to a minimum double pane sash. Best replacement option is a triple pane with low-e emissive glass which can have as low as a .15 U factor. Windows can also adapt to climate variations with storms, blinds, and drapes.

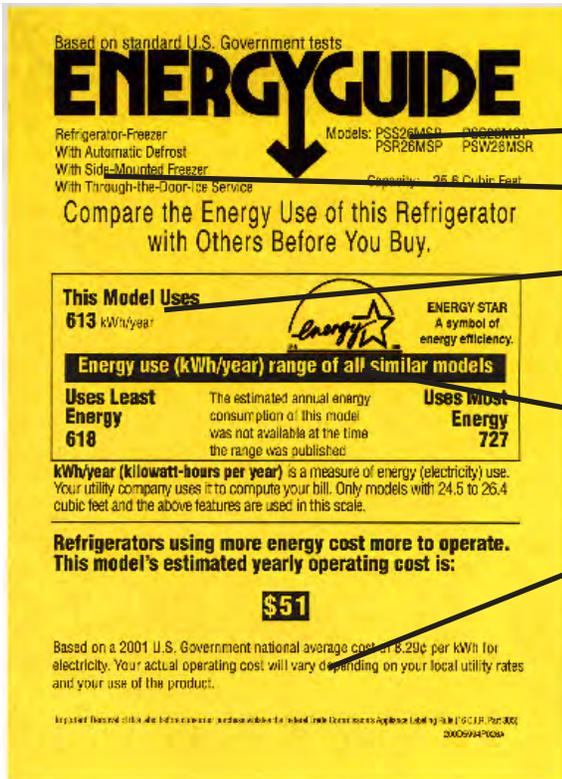


### ORIENTATION and FORM

Glazing on the south side of the building can increase passive solar gain in the winter; overhangs can shield this unwanted gain in the summer.

Internal thermal mass can alleviate temperature swings, i.e. a centrally located masonry chimney and/or fireplace will perform as a heat sink.

Evergreens to the north can shield winter winds while deciduous trees to the south block the summer sun while letting it in during the winter.



**Use this Energy Guide to select heating and cooling products that will save you energy costs**

- **Manufacturer and model numbers.**
- **Information about features, capacity, and size helps you to compare brands**
- **The energy efficiency rating for the product. The lower the number, the more energy-efficient the product, and the less it costs to run.**
- **The range of ratings from “less efficient” to “more efficient” for similar models. Use this scale to see how a particular model measures up to the competition.**
- **Important information on energy use and operating cost is published in fact sheets and product directories. Installers and contractors are required by law to provide these to you.**

The ENERGYSTAR® program is operated jointly by the US Department of Energy and the EPA. The amount by which an appliance must exceed the minimum standards is different for each product rated and depends on available technology. More information on energy star is available at [www.energystar.gov](http://www.energystar.gov).



### CONTROLS

Thermostats should be regularly used and should be programmable.



Have timers on equipment and sleep software on computers. Light and occupancy sensors can provide additional methods to limit use of energy.

## EQUIPMENT

### EFFICIENT APPLIANCES

Make sure that your furnace, boiler, air conditioners, dehumidifiers, heat pumps, refrigerators, and fans are energy efficient. All equipment and/or appliances should be ENERGYSTAR®. Lighting should be florescent or LEDs.



Compact Florescents

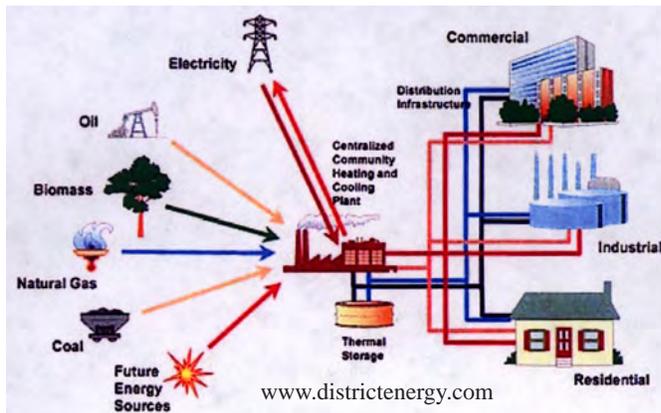


Energy Efficient Boiler



Energy Star Refrigerator

# Alternative Energy

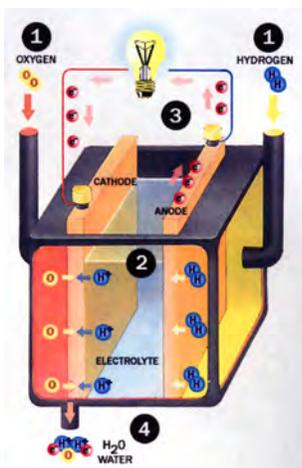


## DISTRICT HEATING

District energy systems produce hot water, steam, or chilled water at a central plant and then distribute the energy to a group of buildings through underground pipes which are connected to the system. The water is returned to the central plant to be reheated and re-chilled and then recirculated through the closed-loop piping system. A cogeneration plant can also provide electricity to the complex.

District energy systems increase energy efficiency, reduce air pollution, enhance fuel flexibility, facilitate the use of renewable energy, and help manage the demand for electricity.

## FUEL EFFICIENCY



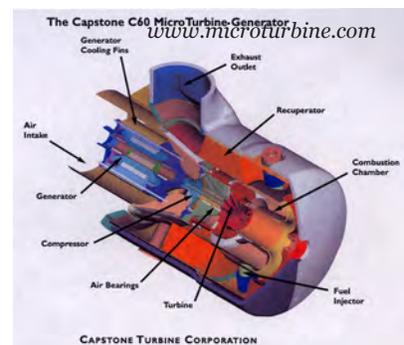
*fossilenergy.gov*

## FUEL CELL

The fuel cell is a device that converts the chemical energy of a fuel directly into usable electricity and heat without combustion. Fuel cells are similar to batteries in that both produce a DC current by means of an electromechanical process. Any hydrogen-rich material can theoretically serve as a source of hydrogen for fuel cells including natural gas, methanol, or ethanol.

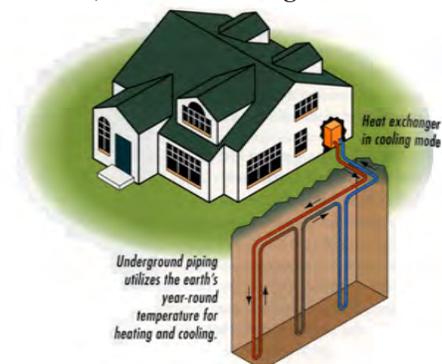
## MICROTURBINE

Microturbines usually consist of single stage radial compressor and turbine and a recuperator. Can be used for on site automatic heat & power generation fueled by natural gas or biogas. Can be hooked to the utility grid.

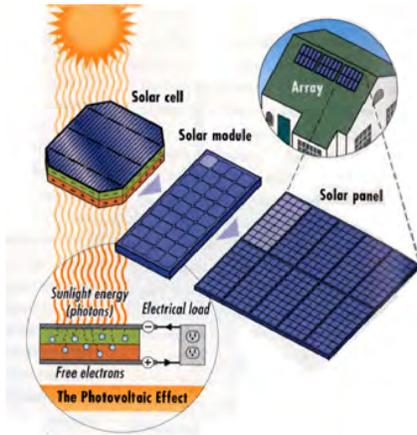


## GEOHERMAL HEAT PUMP

Geothermal heat pumps draw on the relatively stable temperatures of the ground surrounding your home as a source of heat in the winter and cooling in the summer. Some “hydronic” models can also supply hot water. Because they are actually moving heat rather than creating heat, the system is very clean. Usually the “standing column” well system is best for Lowell; other systems include open & closed horizontal, open & closed vertical, and direct refrigerant.

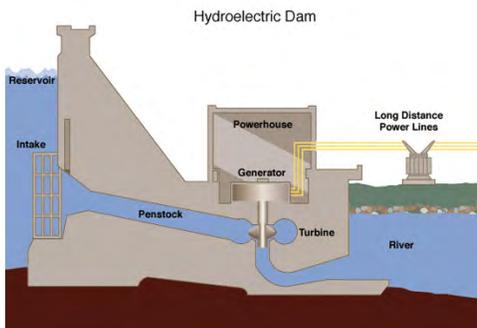


# ALTERNATIVE FUELS



## PHOTOVOLTAICS (PVs)

When the photons in sunlight strike the photovoltaic panels, electrons are released from the atoms in the silicon semiconductors to create electricity. This DC current must be converted to AC by an inverter. About 40 cells are enclosed in protective casings called modules; about 10 of these are mounted on one PV panel. Crystalline-silicon cells are cut from ingots of crystalline silicon. On thin film PVs, the PV material is deposited on glass or thin metal. Net metering allows the meter to run backwards when any excess power produced is returned to the grid.



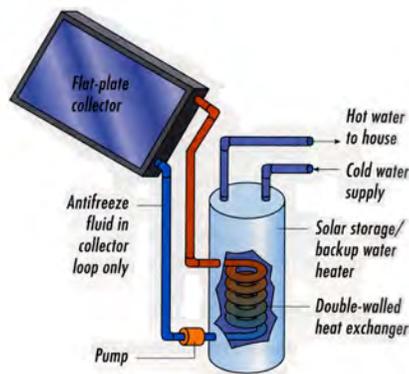
## HYDROPOWER

Hydropower uses water pressure to move a turbine, which drives a generator to produce electricity. Head is the vertical distance the water falls; flow is the volume of water. The power generated is the product of the head, flow, and efficiency of the equipment. An inverter may be used to produce AC electricity. Boott Hydro generates 24 MW of electricity with a 37 ft. head and 3300 cfs flow in a plant on the Merrimack River in Lowell.

## SOLAR THERMAL

(Hot water supply)

Roof mounted, south facing flat plate collectors are warmed by the sun. The heat is circulated either by water or antifreeze solution to the water storage tanks. A closed loop glycol or a closed loop drain back system is necessary in New England to prevent freezing. Plates should be tilted to 60 degrees, and face due south for level yearly gain.



## BIOFUELS

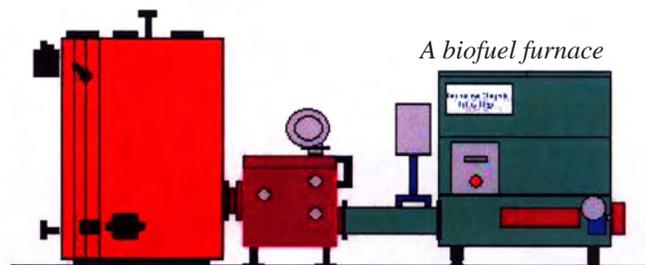
Any fuel produced from biomass or its metabolic by-products.

Like oil, it is a product of solar energy, but has the advantage of being biodegradable and renewable.

The US grows corn and soybeans for fuel use. Other materials include straw, timber, manure, rice husks, sewage, and biodegradable waste.

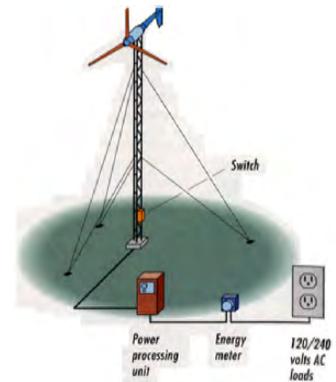
Biofuel can be used for both centralized and decentralized production of electricity and heat.

Used motor oil and cooking oil can also be recycled as an energy source.



## WINDMILLS

A wind system consists of a wind turbine, a tower, and wiring, together with controllers and inverters. Generally the higher the tower, the more energy produced. Can be hooked to batteries or into the grid. Although the wind speed in Lowell is not ideal, wind has proven to offer a comparatively quick payback.



# energy tips FOR LOWELL

## Home Owners

Home owners have the most personal control over reducing their escalating fuel and power costs. They stand to gain the most by lowering their future energy costs while increasing the value of their property.

After evaluating the various materials and methods available to them, the home owner can proceed in order of time of payback, but one should always remember that a slow rate of return can be offset by a payback to the community and your children.



Go to [energy.gov](http://energy.gov) to find out how to save in each of your rooms

**Conservation and efficiency** measures provide the quickest payback to the homeowner and these measures should be taken immediately.

- The attic, exterior walls, and basement should be insulated to the maximum possible and any air leaks sealed. All pipes, ducts, and water heaters should be wrapped and the fireplace damper closed.
- All drafty single pane windows should be replaced with double or triple pane low-e windows.
- All HVAC equipment i.e. furnaces, boilers, air conditioning, heat pumps, fans should be ENERGY STAR® together with all appliances including, refrigerator, dishwasher, clothes washer and dryer.
- All lighting should be fitted with energy efficient florescent bulbs.
- Your thermostat should be programmable and the lights should have sensors/timers on them.

### How do I start? Who can help me out?

#### UTILITIES

National Grid - [www.nationalgrid.com](http://www.nationalgrid.com)

GOVERNMENT- Mass. Division of Energy Resources - [www.mass.gov/doer](http://www.mass.gov/doer)

ENERGY STAR® - [www.energystar.gov](http://www.energystar.gov)

Home Energy Saver- [hes.lbl.gov/HES](http://hes.lbl.gov/HES)

#### AGENCIES

American Council for Energy Efficient Economy - [www.aceee.org](http://www.aceee.org)

Northeast Sustainable Energy Association- [www.nesea.org](http://www.nesea.org)

Partnership for Advancing Housing Technology - [www.pathnet.org](http://www.pathnet.org)

Alliance to Save Energy - [ase.org](http://ase.org)

#### PUBLICATIONS

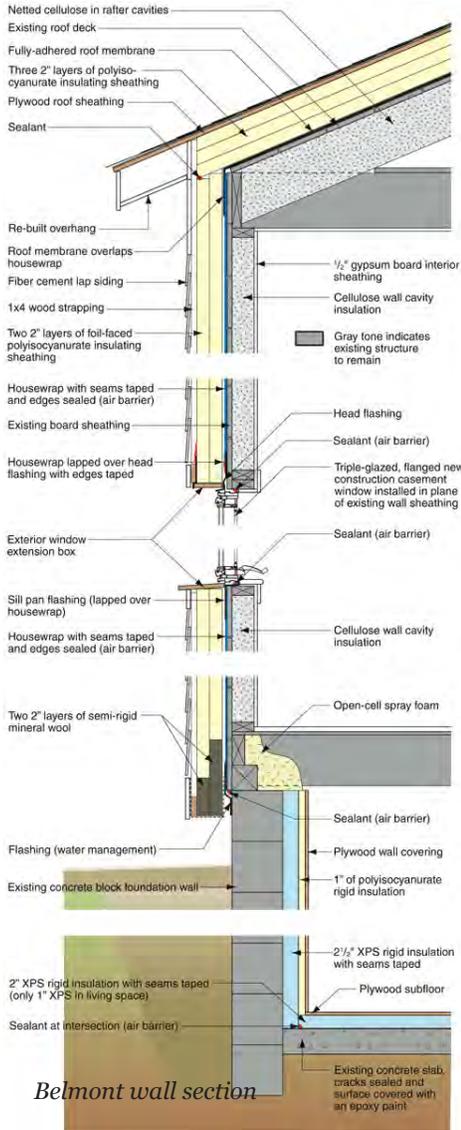
[www.homeenergy.com](http://www.homeenergy.com)

[www.finehomebuilding.com](http://www.finehomebuilding.com)

Homeowners should start out with an energy audit to assess their situation. Two techniques that a professional auditor will utilize are the blower door test to measure

the extent of leaks in the building and infrared cameras to reveal areas of air infiltration and missing insulation.





*Belmont wall section*

*Belmont 2 family deep energy retrofit to 10kwh per year with exterior insulation (R40 walls, R60 roof), hi efficient gas boiler, heat recover ventilator, triple pane windows, 4kw PV array. Byggmeister, Contractor with Building Science, Designer. National Grid Deep Energy Reduction Pilot*



*Foam in attic interior*



*Insulation in basement*



*Applying spray foam in exterior walls.*

## SUPER INSULATION

Superinsulating a home can enable deep energy cuts and a smaller heating system. Typically walls reach R-40 and roofs, R-60. Insulation continuity and air sealing become critical. A heat recovery ventilator becomes necessary to provide fresh air.



*The Somerville retrofit was unique in that it retained the existing siding & windows under the new insulation & windows.*



## HVAC & WATER

A central boiler's efficiency is rated by its AFUE (the ratio of the heat output to the energy consumed). Older, low-efficiency heating systems tended to have a natural draft that created a flow of combustion gases, a continuous pilot light, and a heavy heat exchanger which resulted in a 70% AFUE. Today's high efficiency heating systems can condense flue gases in a second heat exchanger for extra efficiency and have sealed combustions which can result in a 93% AFUE.

Options for hot water heating include:

- A stand alone tank. Gas should be sealed combustion with an EF of .67 and electric should be .93EF.
- An indirect model which is heated by your boiler
- A tankless, indirect model which heats the water as needed.
- An integrated system (provides space heat) or a
- Heat pump hot water heater.

Before installing any air conditioning, home owners should implement all of the shading and venting options that are available to them. If they determine that air conditioning is required, they might want to look into the new mini-split options that are available.

### Some innovative housing

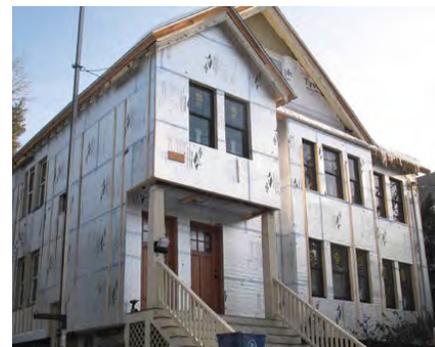
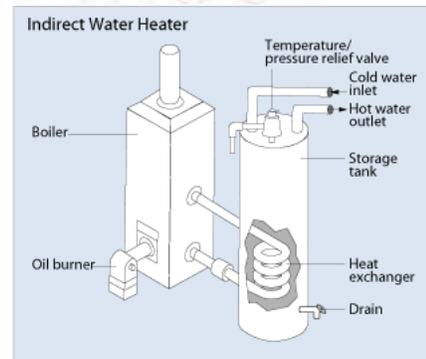
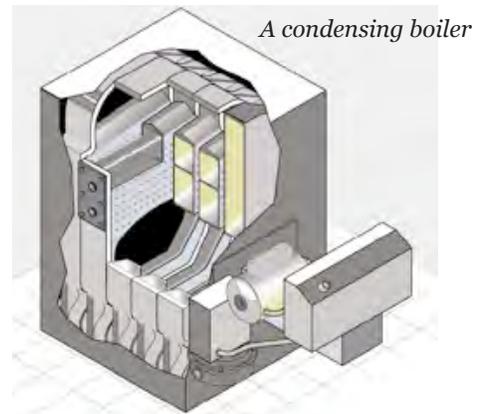
Bindley home on Squam Lake, Holderness N.H.  
1970s ranch; Urethane foam panels on exterior, (walls 52R, roof 73R), Closed loop ground heat pump. Design/build Ben Southworth. Energy Neutral.

Concord Square Village, 1915 Sears Roebuck home;  
Exterior rigid insulation on walls & roof; foam insulation, basement; condensing boiler space & water heat; PVs. 83% reduction.  
Building Science with Synergy Companies

Belmont, 2 family on 118 Gilbert Rd. Exterior insulation, R40 walls & R60 roof; hi efficiency combustion gas furnaces; triple pane windows, 4kwh PV array. HERS from 197 to 23. Byggmeister, contractor; Synergy, construction. National Grid Deep Energy pilot.

Somerville duplex. Exterior foam insulation over existing siding & new double windows in front of exist. windows. Gas condensing boiler, indirect hot water tank, 5.25 kw DC PVs. HERS 119 to 37 Byggmeister, remodeler. Baczek, Architect.

Quincy House - 2nd floor addition. Wrapped in 4" of exterior insulation, energy efficient boiler, heat exchange; PVs on roof, uses 11kwh/year. Timeless Architecture; National Grid Deep Energy pilot



Arlington 2 family Deep Energy Cut with exterior insulation by DOER & NStar Building Science; Synergy Construction



Medford 2 family has 5" exterior out-board Insulation, Heat Recover Ventilator National Grid's Deep Energy Cuts Energy Efficiency Assocs.

# ALTERNATIVES

After your home envelope is sealed, you could consider the ultimate efficient heating system, a geothermal heat pump. When appliances have been upgraded, look into solar thermal and/or PVs.

*PV array on a Lowell home  
Lowell's Getting to Zero Program*



## PHOTOVOLTAIC

550 Sq Ft Panel to generate  
12kW/year for family  
for 5K system (MTC max.)

Installation	\$35,000
CEC rebate	\$4,252
Feds	\$10,500
State	\$1,000
NetCost	\$19,248

*Solar Thermal System in Lowell, MA  
bobgagnon.com*



## SOLAR THERMAL

60 Sq Ft Panel for 4 person household;  
100 gallon tank with connecting  
plumbing & controls.  
Need a glycol or draindown system to  
prevent freezing. 60 degree tilt.

System cost	\$6000
CEC	\$1500
Feds credit 30%	\$1800
State credit 15%	\$900
Net cost	\$1800

*Geothermal Heat Pump for NYC  
Townhouse ecrttech.com*



## GEO THERMAL HEAT PUMP

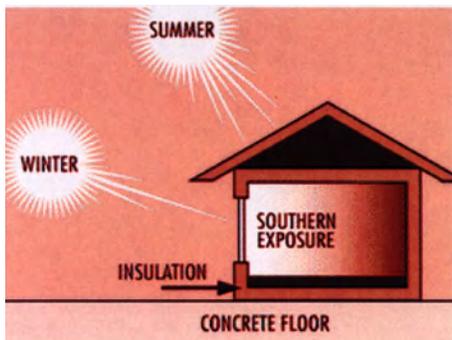
Usually, standing column well  
system best for Lowell.  
Average house requires 4 Tons.  
(depends on size & tightness)  
100' of hole = 1Ton.

Cost	\$4000/Ton
(depends on well depth & use of existing distribution system)	
Credits: Fed	\$4800 (30%)
Net Cost	\$11,200

## COSTS & PAYBACKS

Average Lowell Fuel Bill - **\$2400**  
Average Lowell Power Bill - **\$1500**

Maximum Potential Savings  
Conservation 50%  
Alternative & Conservation 100%



Homes can take advantage of passive thermal conditioning by keeping larger expanses of glass to the south and shading this same glass in the summer with overhangs and/or deciduous trees.

## Grants, Refunds, Credits

FEDERAL (Tax Credit) for Renewable Installation  
Solar Thermal & Solar PVs; Geothermal- 30%

STATE (Credit) Lesser of 15% or \$1000 for  
Renewable Installation.

COMMONWEALTH SOLAR  
to .85/watt to \$4250 for Solar PVs  
25%, Solar thermal. [masscec.com](http://masscec.com)

NGRID 75% to \$2000 Weatherization (1-4 DUs),  
AC, Heat pumps, Lighting, Equipment.  
(1-800-632-8300) <http://masssave.org>  
to \$1500,Boiler; \$800, Furnace; \$800,Tankless  
hot water; \$500, Condensing hot water; \$400,  
Indirect hot water; \$500, Heat recover vent;  
(1-800-232-0672) [www.gasnetworks.com](http://www.gasnetworks.com)  
Major renovations- 75% TO \$2K for envelope.  
1-800-628-8413

FEDERAL HOUSING ADMINISTRATION  
Energy Efficient Mortgage

# energy tips

## FOR LOWELL

# Multi-Family

Multifamily buildings come in a wide variety of types from low rise townhouses to hi rise apartments, from public housing to luxury condos, from new construction to old and sometimes historic structures.

*Advantages they all have in common when addressing energy issues are centralized heating and utility systems, a larger thermal mass, and a smaller part of the building envelope exposed to the weather.*

Many technologies and methods are available to the building landlord or the condo association to get a handle on escalating energy and fuel costs.

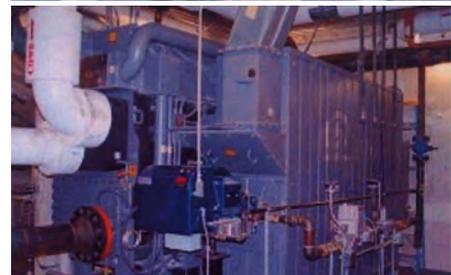
The first step with the quickest payback is conservation: insulation, sealing air leaks, installing energy rated windows. Many older apartments and public housing complexes have antiquated and inefficient heating and hot water systems. Controls, sensors, programmable thermostats, and other electronic control devices can be crucial, particularly if motivation is lacking because energy bills not absorbed by the individual occupant.

Condo associations can organize bulk buying packages to encourage individual owners to upgrade their windows, unit convectors, etc.

Usually unit owners are picking up the electric tab so they should be motivated to engage in ENERGY STAR® programs. Microturbines with their cogeneration capabilities can create large savings. Photovoltaics are the most prevalent of the alternative energy resources utilized in multifamily housing. When used in conjunction with insulation and a geothermal heat pump, zero energy status can be reached.



*Pine Street Cohousing in Amherst, MA. has a geothermal heat pump for heating & cooling. [www.ColdhamArchitects.com](http://www.ColdhamArchitects.com)*



*PVs on the roof and a gas fired cogeneration boiler in the Maverick Landing East Boston project. ICON, Architects Photos by Lucy Chen Group*



*Saint Polycarp village apartments on a former church site in Somerville provides 24 affordable and 3 retail units with PVs, a vegetated roof, foam insulation, and triple pane windows. Davis Square Architects*

## RESOURCES & INFORMATION

DOE - Department of Energy  
Building Technologies Program  
[eren.doe.gov](http://eren.doe.gov)

HUD - Dept. of Housing & Urban Development  
Energy Efficient Rehab Advisor  
[hud.gov/offices/cpd/library/energy/index.cfm](http://hud.gov/offices/cpd/library/energy/index.cfm)

HUD - [rehabadvisor.pathnet.org](http://rehabadvisor.pathnet.org)

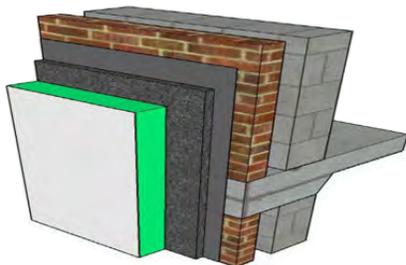
Consortium for Energy Efficiency -  
Multi Family Housing [cee1.org](http://cee1.org)

Association for Energy Affordability Inc.  
[aeany.org](http://aeany.org)

Mass. Dept. of Housing & Community  
Development - [www.mass.gov/dhcd](http://www.mass.gov/dhcd)



*Castle Square low income housing in Boston got down to 25% of previous energy use with exterior insulation, double pane windows, efficient boilers and PVs. Elton&Hampton, Architects; Peterson Engineering; Building Science*



## Some innovative multifamily housing

Maverick Landing, East Boston  
Crystalline PVs, gas fired geothermal, absorption air conditioning.

Johnson Square Village, Brockton - 26 town houses. Crystalline PVs provide 60% of each unit's power. Energy Star rated.

Castle Square Housing Block in Boston got down to 25% with efficient heating, exterior insulation, new windows, and PVs.

360 State St, Newhaven Conn.  
400 kwt fuel cell powers 500 DUs , common space, & retail.  
First platinum LEED under ND program.

Drake Landing, Okotoks, Alberta  
52 home subdivision with garage mounted solar thermal panels connected to a central energy center that contains short term storage in the summer (for nights & cloudy days) in water tanks, and seasonal storage with a borehole in-ground heat sink system. This solar system meets 90% of the homes' heating needs.  
[sterlinghomesgroup.com/drake/](http://sterlinghomesgroup.com/drake/)

## Grants, Rebates, Tax Credits

NATIONAL GRID - 5 or more units including condos.  
Multifamily Program provides Hi efficiency heating & cooling, Hot water upgrades, Lighting, Thermostats & sensors  
to 75% of insulation for electric heated buildings:  
1-800-594-7277  
Low Income Multi: 1-617-348-6425  
to \$750/kilowatt of Cogeneration.

COMMONWEALTH SOLAR provides .45/W DC to \$2250 for solar PVs

FEDERAL \$1.80/sq ft in +4 story multifamily for 50% savings over ASHREA 90.1 model code

HUD has an extensive weatherization rebate program for low income units.

# energy tips

FOR LOWELL

## Renters & Condo Owners

Condo owners and especially renters can make few decisions regarding capital improvements to conserve energy. However, they can make a sizable dent in their electric and/or fuel bills. Moreover, they can influence their landlords and/or condo associations to make wise energy related investments.

Controlling electrical use is their first line of defense. Any appliances that they own should be ENERGYSTAR®. Light bulbs should be florescent & task lighting should be utilized. Clean the coils in your fridge and any air/vent filters frequently. Install power saving software on your computer.

### Rebates, Interest Discount

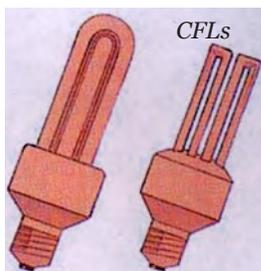
NATIONAL GRID - Rebates on Energy Efficient Appliances, Florescent Bulbs [www.nationalgridus.com](http://www.nationalgridus.com)

FHA - Energy Efficient Mortgage for condo buyers [www.hud.gov](http://www.hud.gov)

MTC - Opportunities to purchase clean energy for your town. [www.cleanenergychoice.org](http://www.cleanenergychoice.org)

### EFFICIENT APPLIANCES

Highly efficient washer/dryer by Thor Appliance. Ventless model available



Computer power save



### RESOURCES & INFORMATION

American Council for Energy Efficient Economy [www.aceee.org](http://www.aceee.org)

DOE Consumer Guide to Energy Efficiency & Renewable Energy [www.eere.gov](http://www.eere.gov)

[www.masssave.com](http://www.masssave.com)

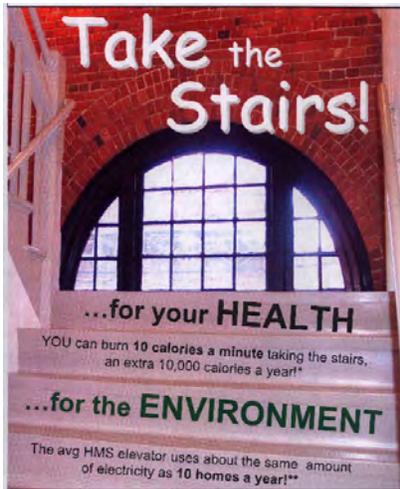
[www.energystar.gov](http://www.energystar.gov)

EPA Home Energy Advisor [www.advisor.lbl.gov/hit/Controller](http://www.advisor.lbl.gov/hit/Controller)

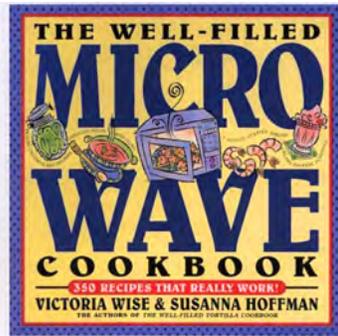


Keep those coils and vents CLEAN





Harvard Green Campus  
Harvard Longwood Campus



Turn down the thermostat @ nite and when you leave or have a programable one installed.



## LIFESTYLE

Lifestyles can be adjusted to conserve: showers instead of baths; microwaves instead of ovens. Solar clothes dryers are amazing. If on an upper floor, use the stairs when going down.



Kohler Master Shower® Eco showerhead



thunderboltsocks.com



## THERMAL COMFORT

To save on fuel bills, the thermostat should be utilized frequently; adjust the temperature when you retire or leave the unit. In the winter electric rugs and socks can make more sense than heating a huge space; while in the summer a fan and an ice collar can do the job of an energy hogging air conditioner. Address the high conductance of windows with insulated drapes and/or shades. Let the sun shine in on winter days and block it in the summer.

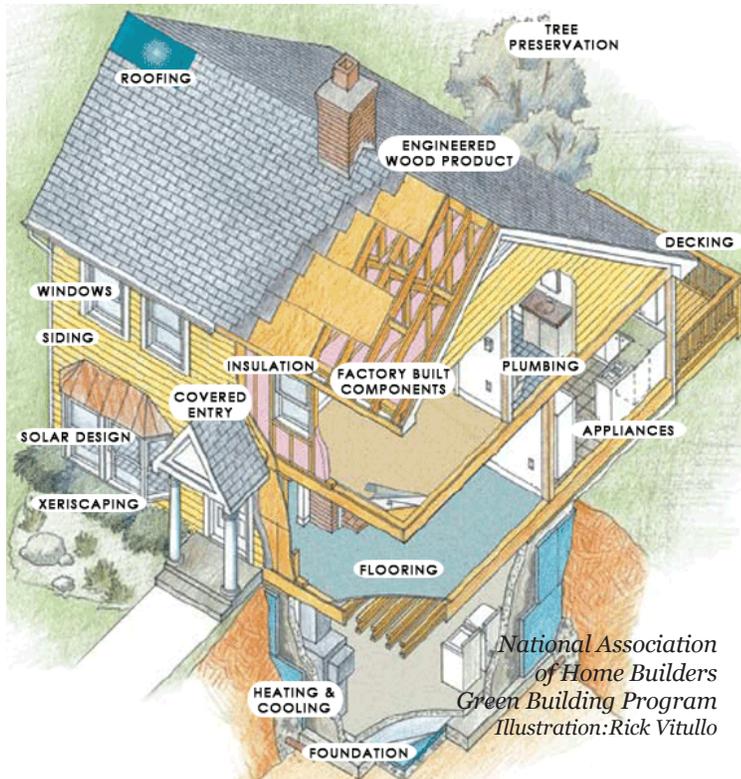
# energy tips FOR LOWELL

## Contractors

Builders and contractors play a critical role in changing our lifestyle of fuel dependency.

Builders have the best opportunity when doing new construction to incorporate many of the newer techniques and materials which are often not an option in retrofits. These might include building orientation, roof angle and orientation, interior chimney location, 2x6 framing, exterior or interior rigid insulation, exterior basement insulation, air & vapor barriers.

Contractors can help the building owner handle the many challenges in a rehab, including choosing the appropriate HVAC system and increasing the R factor of the building envelope.



Lowell has adopted the **Massachusetts Stretch Code** which requires:

for RESIDENTIAL

- HERS of 60 or less for all new single & multi homes
- HERS of 70 or less for major renovations. (85 or less when retaining existing heating systems)
- for renovations under 600 sq ft or less than 30% of conditioned space; Energy Star codes for zone 5A

for COMMERCIAL

- Buildings over 100K sq ft - 20% below ASHRAE 90.1 2007 code
- Medium buildings (4 or more stories less than 100K sq ft) can use large building requirement or Energy Code 780 CMR based on chap 5, IECC 2009 energy code.

### ENERGY STAR REBATES

ENERGY STAR for new homes Improvement over 2011 Massachusetts Reference Home and compliance with sections 3 & 5 of the Energy Star Thermal enclosure system rater checklist. Call 1-800-628-8413

	SINGLE	2-99 Units	100- 199 DUs	200 DUs & over
+ 15%	\$750	\$650	\$500	\$350
+ 30%	\$1250	\$1150	\$850	\$550
+45%	\$8000	\$4000	\$3000	\$2000

[massenergystarhomes@icfi.com](mailto:massenergystarhomes@icfi.com)

## How can you begin to apply these new technologies to your current projects?

Here is a list of contacts & resources to get you started.

### TRAINING

Northeast Sustainable Energy Association  
413-774-6051 [www.nesea.com](http://www.nesea.com)

National Association of Home Builders  
[www.nahb.org](http://www.nahb.org)

Yestermorrow Design Build School  
[www.yestermorrow.com](http://www.yestermorrow.com)

### SOFTWARE & VIDEOS

Sustainable Buildings Industry Council  
[www.sbicouncil.org](http://www.sbicouncil.org)

### CERTIFICATION

North American Board of Certified Energy Practitioners [www.nacep.org](http://www.nacep.org)

Building Performance Institute Inc.  
[www.bpi.org](http://www.bpi.org)

Renewable Electric Certificate Program  
[www.green-e.org](http://www.green-e.org)

### MAGAZINES

Fine Home Building  
Home Energy Magazine

### WEB SITES

Partnership for Advancing Housing Technology [www.pathnet.org](http://www.pathnet.org)

DOE Energy Efficiency & Renewable Energy Network [www.eere.energy.gov](http://www.eere.energy.gov)

Environmental Building News  
[www.buildinggreen.com](http://www.buildinggreen.com)  
[advancedbuildings.org](http://advancedbuildings.org)

*Affordable ZEH in Edmond, Oklahoma  
Built by Ideal Home Builders; 1650 sq ft. & priced under \$200K  
Solar Hot Water, PVs, Geothermal Heat Pump; Tankless Hot Water, Cellulose Insulation, Vinyl Framed Low-e Windows  
[www.idealinnovation.com](http://www.idealinnovation.com)*



***With a combination of efficiency, insulation, PVs, and geothermal heating & cooling, it is now possible to build affordable homes with a zero net energy consumption.***

## Rebates & Credits

*The IRS will credit \$2000 for each unit that cuts energy by 50% over the '04 international code  
NATIONAL GRID Energy Star \$8K/Unit in 3 tiers.*



*Wisdom Way Village Affordable housing, 10 duplexes, in Greenfield MA, with \$300 energy bills/year.  
Steve Winter, Architect; Rural Development, Builder*



*Bread & Roses Housing for low income residents in Lawrence, National Grid's Mass Zero Energy Challenge program.*



*One Massachusetts builder, Transformations, has built many energy neutral homes in the affordable price range.*

## Retail

An effective way for businesses to increase their profits and to improve their public image is to aggressively make use of recent methods and technologies that use less fuel and power in the operation of their businesses. Different types of problems confront a small news stand versus a big box, but there is a wide array of solutions and resources out there to lower the sometimes daunting expense of business energy requirements.

### Some Options for Retail Stores

#### EFFICIENCY

**MICRO TURBINE** - By generating your own power, you are creating a more economical and reliable source of power for your operation. The waste heat can also be utilized.

**GEOHERMAL HEAT PUMP** - Businesses with parking lots have plenty of room to install a loop or well. Very appropriate for businesses as they often have a higher air conditioning load.

**RECOVERING** heat from freezers for hot water and/or space heating. **COVERS** should be provided on freezer displays



**LIGHTING** is a huge issue for business, particularly retail. Many larger stores are using T5HO and LED lighting where appropriate. The use of carefully planned and insulated skylights can slash energy bills.



*The Hannaford Supermarket in Augusta, Maine became the first LEED certified supermarket with geothermal wells, PVs, a green roof, insulated skylights, & solar tubes for natural light, sliding insulated glass on freezers, low flow fixtures, etc. It was constructed in an abandoned high school.*

#### ALTERNATIVE ENERGY

Restaurants can save **COOKING OIL** and service stations, **MOTOR OIL** as an alternative fuel source. Supermarkets generate high volumes of green waste which can be converted to biofuel in addition to providing compost.



#### PHOTOVOLTAICS

Businesses in big boxes have huge flat roofs which provide sufficient space for installing a large photovoltaic array. A trellis over the parking area and/or pedestrian canopies/arcades are also effective mounting areas.

#### WINDMILLS

A large parking lot for a business can sometimes accommodate a windmill. Businesses in a high rise can install special windmills on their facade or roof.



*The innovated skylighting system in Hannaford's achieved an R rating similar to the walls.*

## RESOURCES & INFORMATION

MAEEP - Massachusetts Energy Efficiency Partnership [www.maeep.org](http://www.maeep.org)  
Gives technical assistance on commercial energy issues including utility demand side, chiller optimization, pump systems, process heating, steam systems.

EPA - Green Chill Advanced Refrigeration [epa.gov](http://epa.gov)

DEPARTMENT of ENERGY [eren.doe.gov/buildings/info/retail/index.html](http://eren.doe.gov/buildings/info/retail/index.html)

International Mass Retailers Assoc - IMRA

National Assoc of Convenience Stores- NACS

*Freezers together with lighting represent a big portion of a supermarket's energy*



*Many big box retailers are implementing energy savings programs including Home Depot, Target, and Staples. Two of the more innovative retail projects have been built by Walmart in McKinney, TX and Aurora, CO. Some of the features in these experimental big boxes include:*

- a Cogeneration Gas Micro Turbine combined with an Absorption Chiller
- Fabric Air Ducts, Radiant Floor Heating.
- Heat Recovery from the freezers for hot water & space heating
- A biofuel boiler that runs on recycled cooking & motor oil
- Several photovoltaic arrays including crystalline and thin film
- Wind mills in the parking lots.
- Clearstory lighting, T5HO Florescents, LEDs, & Solartube lighting

[www.walmartfacts.com](http://www.walmartfacts.com)

## Some energy efficient retail stores:

Giant Eagle, Columbus, Ohio - skylights with sensors, space heating from recovered freezer heat, windmills, and biofuels from trimmings and waste. LEED gold.

Stop & Shops - lighting, refrigeration & frig doors.

Shaw Stores. LED lights in freezers. PVs in Burlington. Newton store provides 90% energy from fuel cell

Office Depot - Skylights with tracking device & prismatic lens; lights dims when sun shines.

## Grants, Rebates, Credits

FEDERAL \$1.80/sq ft for a building 50% more energy efficient than ASHREA Standard 90.1-2001 code  
[www.efficientbuildings.org](http://www.efficientbuildings.org)

NATIONAL GRID 50% to \$100K

Gas Retrofit - HVAC, Hot water, Heat recover, Steam systems, Kitchen equipment.  
1-800-787-1706 [gasnetworks.com](http://gasnetworks.com)

Electric Retrofit - Lighting, Controls, AC, Vending equip, Heat recover [masssave.org](http://masssave.org)

Custom Retrofit - 50% to \$100K for upgrades:

Direct Install - to 70% for lighting & controls  
1-800-332-3333

New Construction - to 70%, electric;  
50% to \$100K, natural gas. 800-787-1706

50% to \$750/kilowatt of Cogeneration.  
781-907-2196, [mark.stafford@ngrid.com](mailto:mark.stafford@ngrid.com)

COMMONWEALTH SOLAR \$45/W DC to \$2250 for solar PVs; 25%, Solar hot water.

STATE Corporate tax deduction (deducted from net income)



*PVs in the Garden Center*



*Recycled Oil*

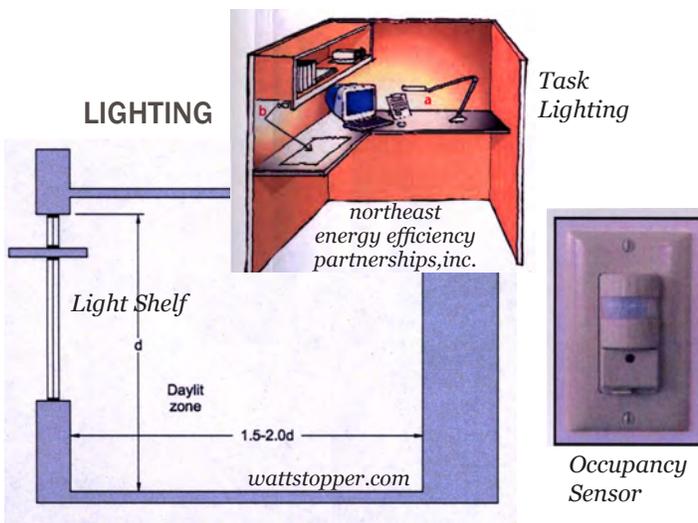
# energy tips

## FOR LOWELL

# Office Buildings

Office buildings come in many forms but they have similar interior functions and are all usually on a Monday through Friday, 9 to 5 schedule.

Consequently, natural daylighting and/or efficient florescents can play a significant part in leveling energy loads.



[advancedbuildings.org](http://advancedbuildings.org)

## EQUIPMENT

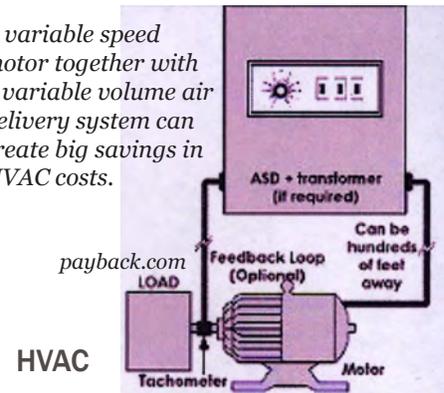
Efficient Equipment



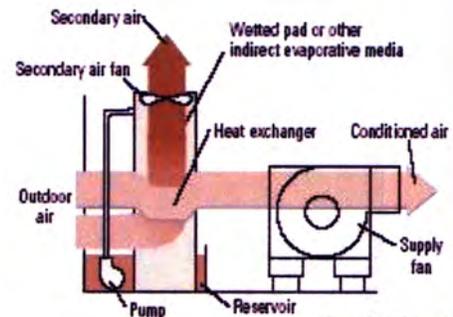
Together with an efficient HVAC system, significant savings can be achieved. Office equipment is the third biggest energy consumer and should be upgraded accordingly.

Not only is the bottom line improved, but a more comfortable working environment can increase worker morale and project a better image to the public. In Europe, double skinned glass exteriors are common place and are beginning to make their appearance in this country. With appropriate ventilators, flexible screening, and sensors this one feature can decrease energy usage by half.

A variable speed motor together with a variable volume air delivery system can create big savings in HVAC costs.



HVAC



## RESOURCES & INFO

[GreenBiz.com](http://GreenBiz.com)

Department of Energy Building Technologies [www.eere.energy.gov](http://www.eere.energy.gov)

[www.energystar.gov](http://www.energystar.gov)

[www.energypriorities.com](http://www.energypriorities.com)

Association of Energy Engineers [aeecenter.org](http://aeecenter.org)

American Soc.of Heating, Refrigeration & Air Cond. Engineers [ashrae.org](http://ashrae.org)

IESNA- Illumination Engineering Society of North America



*Genzyme Center, Cambridge.  
Lyme Properties*

*Mitre Center, Bedford, Ma -  
Architect, Stubbins Associates*



*17 Gordon Avenue, South Providence  
South Providence Development Corp,  
DePasquale Building & Realty Co,  
Providence Preservation Soc. Revolving Fund*



## Significant Office Projects

- Mitre, Bedford - PVs on entry canopy & roof, Operable efficient windows
- Genzyme, Cambridge - Atrium acting as hugh duct, Natural light, Solar tracking mirrors, Operable windows, Double exterior glass skin
- Manulife, Boston - Double skin wall, Variable speed drives and digital control for HVAC, Air to air heat recovery.
- Four Times Square, NYC - Double glazing, Fuel cells, PVs, Absorption chillers, Light sensors
- 17 Gordon Avenue, S.Providence - Rehab of industrial building to business incubator- Green roof, PVs, Atrium
- UCS offices, Cambridge - PVs, Low-e windows & reflective interiors, Two stage heat pumps



*Nobis Engineering's LEED certified offices in Lowell*

## Grants & Rebates

- COMMONWEALTH SOLAR \$ .45/W DC  
to \$2250 for Solar PVs; to 25% for solar thermal.
- NATIONAL GRID - 50% to \$100K  
Gas Retrofit - HVAC, Hot water  
Electric Retrofit - Lighting, AC, Equipment  
1-800-787-1706 [efficiency@nationalgrid.com](mailto:efficiency@nationalgrid.com)
- Custom Measures - 50% to \$100K for HVAC,  
building envelope, management systems  
1-800-787-1706
- Direct Install - to 70% for lighting & controls.  
1-800-332-3333
- New Construction Incentives -to 70% for electrical  
upgrades & to 50% for gas upgrades to \$100K.
- Cogeneration - \$750/kilowatt . 781-907-2196
- FEDERAL tax \$1.80/sq ft for 50% reduction  
beyond ASHRAE standard

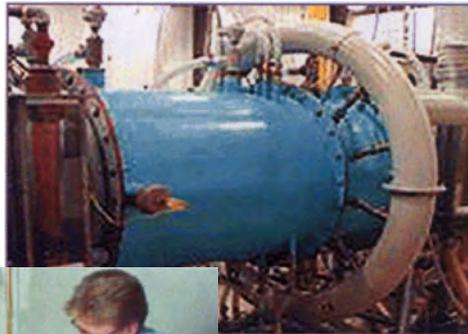
# energy tips

FOR LOWELL

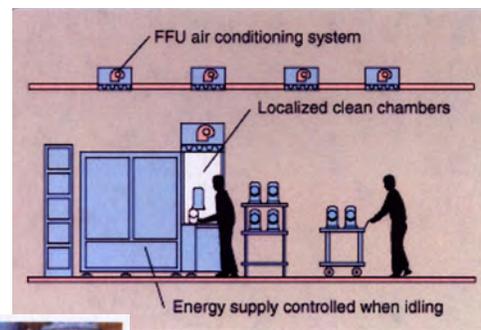
## Industrial Utilities

One third of the energy in this country is consumed by industrial users including manufacturers, warehousing, transportation, storage, and maintenance facilities, and water and sewage plants etc. Most of their energy comes from oil and gas, followed by electricity and coal. Rising energy costs are putting many of them under pressure to perform an in depth audit and to upgrade the efficiency of their mechanical and processing equipment in order to survive.

*Super Boiler Project DOE*



*Motors, pumps, and fans DOE*



*NEC Clean Room Energy Efficiency. necel.com*

*Compressed Air, DOE*

*Among the technologies that have more or less importance according to the nature of the operations are:*

ENERGY EFFICIENT MOTORS

SENSORS & CONTROLS

COMPRESSED AIR SYSTEMS - variable speed drives, sealed air leaks

COMBINED HEAT & POWER SYSTEMS (CHP)

CONTINUOUS FIBER CERAMIC COMPOSITS (CFCC) - performance in hot environments without getting brittle

COMBUSTION - advanced burners in boilers & furnaces

STEAM SYSTEMS - insulating and condensate return lines, stopping steam traps, condensate return to boiler

### RESOURCES & INFORMATION

Department of Energy  
Industrial Technology Program  
[www.eere.gov/industry](http://www.eere.gov/industry)

Mass Energy Efficiency Partnership  
[www.maeeep.org](http://www.maeeep.org)

Center for Efficiency & Renewable Energy  
[www.ceere.org](http://www.ceere.org)

Massachusetts Municipal [mmwec.org](http://mmwec.org)

Whole Building Design Guide  
[www.wbdg.org](http://www.wbdg.org)

National Assoc. of Manufacturers  
[www.nam.org](http://www.nam.org)

## Industrial and Utility Projects

Deer Island Sewage Treatment Plant in Boston - Hydroturbine in outfall tunnel; 16Kkw cogen from biomass.

Brockton, Pittsfield, Westford brightfields - Large PV arrays on old brownfields.

Malden Mills, Lawrence - Cogeneration System

Riverdale Mills, Blackstone River, MA. ("Aquamesh") - Gas powered cogen.

NEC Electronics, CA - Ultra efficient clean rooms

Veolia Energy, Cambridge - 277K kw natural gas cogen for district heating.

Pioneer Valley Resource Recovery - 9,400 kw cogen from waste; electric to grid, steam to wastewater treatment.



*An Urban Bright Field*



*An energy efficient data Center in Holyoke, MA; a joint project of MIT, BU, UMass, NEastern, Cisco, & EMC.*



*Clark Distribution Center Warehouse is powered by 2304 solar panels, Milford, MA.*

*Malden Mills is powered by cogeneration*



## Grants & Rebates

**NATIONAL GRID** 50% to \$100K 800-787-1706

Gas Retrofit - HVAC, Hot water, Steam system up grades, Process & manufacturing equipment.

Electric Retrofit - Lighting, Heat Pumps, AC, Motor VFDs, Air compressors. [masssave.com](http://masssave.com)

Custom Retrofit- with engineer's study

Direct Install- 70% lighting, controls 800-332-3333

To \$750/installed kilowatt, Cogeneration.

**FEDERAL**

\$1.80/sq ft for 50% over ASHRAE standard  
[www.efficientbuildings.org](http://www.efficientbuildings.org)

**COMMONWEALTH SOLAR**

\$.45/W DC to \$2250 for solar PVs;  
25%, Solar hot water.

**STATE** Corporate tax deduction

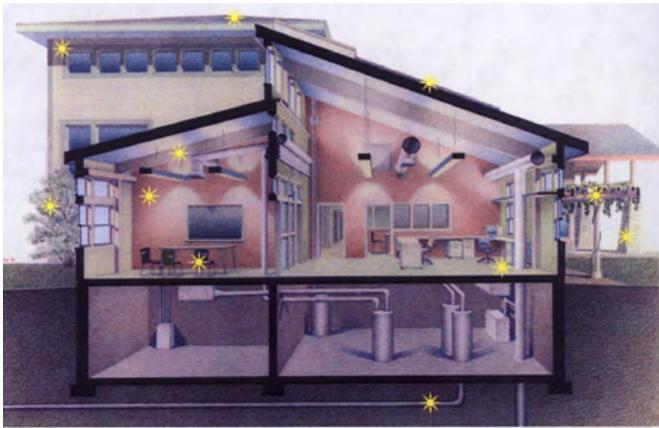
# energy tips FOR LOWELL

## Institutional

*Institutions and non-profits have the best track record for incorporating green technologies into their facilities. They usually have more concern for maintenance and image issues than just the initial upfront costs.*

*They often have the advantage of being able to consider the total spectrum of technologies when planning for their energy needs. In addition to the numerous conservation and efficiency measures, institutions can often tap into the complete range of energy measures including:*

<i>Cogeneration</i>	<i>Micro Turbines</i>	<i>Fuel Cells</i>
<i>Biofuels</i>	<i>Green Roofs</i>	<i>Geothermal</i>
<i>Photovoltaics</i>	<i>Wind</i>	<i>Hydro</i>



*GRW Environmental Conservation Center - Architects, Primary Group with Steven Winter & Associates [massaudubon.org](http://massaudubon.org)*



*Photovoltaic Modules with a Heliostats Data Monitoring System installed at Worcester Polytechnic Institute.*

### RESOURCES

Building America  
[www.eere.energy.gov](http://www.eere.energy.gov)

[www.newbuildings.org](http://www.newbuildings.org)

[www.buildinggreen.com](http://www.buildinggreen.com)

Green Guide for Health Care  
[www.gghc.org](http://www.gghc.org)

Geothermal Consortium  
[www.geoexchange.org](http://www.geoexchange.org)

SBIC Sustainable Buildings Industry Council  
[www.sbicouncil.org](http://www.sbicouncil.org)

National Technical Information Service  
[www.ntis.gov](http://www.ntis.gov)

Center for Renewable Energy & Sustainable Technologies  
[www.crest.org](http://www.crest.org)

Facilities Manager Magazine



*Medical Area Total Energy Plant located in the Longwood Medical Area serves steam, chilled water, and electricity to 9 million sq feet of LMA facilities.*



*UTEC's LEED addition - 34.5 kw of PVs & electric car charging station*



*MATCH School - Boston Charter School - PVs, efficient lighting & windows. HMFH, Archs.*



*Artists for Humanity  
Arrowstreet, Architect*

## Some noteworthy institutional and non-profit building

### UNIVERSITIES

- Harvard University - PVs, Geothermal, 50 LEED certified projects
- MIT Brain & Cognitive Sciences Complex - Hi performance envelope, Heat recover.
- Worcester Institute of Technology - PVs
- Northeastern - Curry Student Ctr. - PVs
- Tufts Sophia Gordon Hall Dorms - Solar HW & PVs

### HOSPITALS

- Longwood Hospitals, Boston- Cogeneration
- Bay State Health Center, Springfield, LEED Silver CDQ dehumidification system

### NON-PROFITS

- Artists for Humanity, S. Boston - PVs, Natural light
- Doyle Conservation Center, Leominster - PVs, Geothermal wells, Efficient windows
- Audubon Nature Center, Mattapan - Geothermal heat pumps, PVs
- Gilman Ordway Bldg at the Woods Hole Research Ctr, Falmouth - PVs, Geothermal
- MATCH Charter High School, Boston - PVs, Efficient lighting & Windows
- Lowell Quilt Museum - Geothermal system

## Grants

### COMMONWEALTH SOLAR

\$ .45/K DC to \$2250 for solar PVs

### NATIONAL GRID - Gas & Electric Retrofit,

HVAC, Hot water, Equipment, etc.

Custom Retrofit 50% to \$10K

Direct Install - 70%, Lighting & Controls.

New Construction - 70%, Electric; 50%, Gas.

[masssave.com](http://masssave.com)

Cogen - \$750/kWh 781-907-2196

# energy tips

## FOR LOWELL

# Historic Buildings

Special issues and concerns arise when trying to retrofit an older historic building to meet today's power and energy requirements.

Although upgrading appliances, lighting, and heating systems is often readily accomplished, tightening the building envelope, providing circulation for the HVAC systems, and other processes can create many challenges. Often historically significant structural and mechanical components do not meet today's standards and/or codes.

Older sturdy masonry buildings do provide a lot of thermal mass which can even out loads in the summer, but in the winter their position on the skin of the building can often just accelerate the rate of conductance of heat to the outside of the building.

The sometimes tall windows provided lots of natural daylight, but the single panes hemorrhage BTUs to the outside of the building.

Often the architect will specify the necessary insulation on the interior of the building to maintain the integrity of the building envelope.

Many window manufacturers now offer energy efficient windows in historical styles.

By exploring innovative alternatives, it is possible to upgrade these valuable resources to meet today's stringent energy requirements.

*Cellulose loosefill insulation being blown into attic  
tasconindustries.com*



*Energy efficient boiler*



### SOME APPROPRIATE TECHNOLOGIES

- Insulation: blown in cellulose insulation
- Sealing air leaks, controlling moisture
- Energy efficient windows/interior storms
- High efficiency boilers
- Geothermal heat pump
- Perimeter indirect florescents
- Rooftop photovoltaics



*interior storms  
stormwindow.com*



The 1.3 million sq.foot. Monarch Mill in Lawrence is heated & cooled with 60 geothermal 150 foot deep shafts  
Geothermal pumps in Quilt Museum



## The greening of some historic buildings

Trinity Church, Boston - Geothermal heat pumps

Anwelt Manufacturing Complex, Fitchburg -  
Huge array of photovoltaics and geothermal heat pumps. Mixed income apartments, charter school, and office space

Cambridge City Hall Annex (Leed gold) - PVs,  
Geothermal heat pump, Efficient lighting

Lawrence Community Works (Leed gold)-  
Energy efficiency & PVs

Chase Mill, Burlington,VT - Efficient heating & cooling, Fans, Pumps, & Lighting

Monarch Mills, Lawrence, MA- Geothermal

Whitin Mill Redevelopment, Whitinsville -  
Mechanical systems, Envelope & Hydro power

*PVs on trellis structures at Fitchburg Mill 's Anwelt Heritage Apartments power its geothermal pumps.  
mass.innovation.com*



### LIST of RESOURCES & INFORMATION

Preservation Brief 3: Conserving Energy in Historic Buildings [www.cr.nps.gov/hps/tps/briefs/brief03.htm](http://www.cr.nps.gov/hps/tps/briefs/brief03.htm)

Energy Efficiency & Historic Preservation [www.nol.org/home/NEO/rebuildbook.pdf](http://www.nol.org/home/NEO/rebuildbook.pdf)

Massachusetts Historical Commission [www.sec.state.ma.us/mhc](http://www.sec.state.ma.us/mhc)

Energy Efficient Rehab Advisor <http://rehabadvisor.pathnet.org/>

Whole Building Design Guide [www.wbdg.org](http://www.wbdg.org)

Assoc.for Preservation Technology NEast [www.waptne.org](http://www.waptne.org)

National Trust for Historic Preservation [www.nthp.org](http://www.nthp.org)

Lowell Historic Board [www.historiclowell.net](http://www.historiclowell.net)

## Grants, Rebates, Credits

COMMONWEALTH SOLAR - to \$.85 K DC to \$4250;  
25%, Solar hot water.

MASSACHUSETTS HISTORIC COMMISSION-  
Mass.Preservation Projects Fund Round 19

FEDERAL, STATE, UTILITIES funding  
See specific land use category

# energy tips FOR LOWELL

## Public/Government

Government entities and agencies have a lot of control and options of how they can impact energy use in their district. Many agencies within the Federal Government have energy related policies, including the Army, Navy, and Air Force, GSA, State Dept, and the Dept of the Interior, together with DOE & EPA. Many require LEED certification for any new facilities constructed for them.



*DOE's NREL neutral energy headquarters in Colorado  
Natural daylight, PVs, Storm water retention.*

*About 40 states have energy sections in their building codes and almost 20 require LEED certification in all new State buildings.*

*Many have additional regulations that affect utility companies operating within their region. Some buy green energy.*

*Many offer grants and/or tax credits to residents & businesses for alternative energy installation.*



*The Lowell Justice Center is aiming to be energy neutral*

Municipalities can require ENERGY STAR or LEED in their own buildings and many encourage the private sector to do the same.

Boston provides grants to new projects for green feasibility studies, and implemented one of the first green building codes.

Lowell entered into a EPC (Energy Performance Contract) with Ameresco for \$20 million of energy retrofits on 50 of it's buildings. An energy service company (ECSO) funds the capital expense of energy efficiency improvements and then makes its profits in the energy savings achieved over a specific period of time

The Metropolitan Area Planning Council selected Ameresco as the regional Energy Services Company. Now 14 cities are signing contracts to upgrade their municipal facilities.

### RESOURCES & CONTACTS

US Department of Energy - [doe.gov](http://doe.gov)

Energy Efficiency & Renewable Energy  
[eere.energy.gov](http://eere.energy.gov)

Energy Information Admins. - [eia.gov](http://eia.gov)  
[energycodes.gov](http://energycodes.gov)  
[energysavers.gov](http://energysavers.gov)

NREL - National Renewable Energy  
Laboratory [www.nrel.gov](http://www.nrel.gov)

Mass Office of Energy Resources - DOER

Mass Energy & Environmental Affairs -  
"Clean Energy & Climate Plan for 2020"

Green Communities Act 2007 -  
[www.greencommunities.com](http://www.greencommunities.com)

Municipal Climate Action Plan  
[www.massclimateaction.org](http://www.massclimateaction.org)

Mass.Municipal Assoc. [www.mma.org](http://www.mma.org)



Capuano Early Childhood Center, Somerville- PV array, small wind turbine, & natural light HMFA Architects

N Adams Public Library with 12kW of PVs & a geothermal heat pump



The North Shore Community College has just opened a Health Professions & Student Services building that is the first state ZNEB (Zero Net Energy Building) and LEED gold. It uses a combination of ventilation, lighting, a green roof, building orientation, chilled beams, geothermal energy, and photovoltaics.



U Mass Amherst Cogeneration Plant

## Government and Public Buildings

### FEDERAL GOVERNMENT

- EPA Headquarters, Chelmsford - PVs, Lighting, Geothermal
- GSA rehab of McCormick PO/Courthouse with a Green roof, PVs, daylight use, etc.
- National Parks - 700 PV installations

### STATE GOVERNMENT

- DCAM's Justice Centers in Worcester & Fall River
- Mt. Wachusett Community College.- Biomass heat & power, PVs & Wind
- UMass Amherst - PVs, Cogeneration
- Worcester Medical Center - Cogeneration

### MUNICIPAL FACILITIES

- Boston - LED street lights
- Cambridge City Hall Annex- PVs, geothermal
- Franklin Regional Transit Center - Net zero.
- North Adams Library - Geothermal, PVs

### PUBLIC SCHOOLS

- Cambridge Rindge & Latin School- PVs, Wind.
- Carlton Elem School, Salem - PVs, Wind
- Capuano Early Childhood Center, Somerville - PVs, Skylights, Wind turbine
- Whitman-Hanson Regional High School - PVs, Efficient condensing boilers, Exterior insulation.

## Grants & Incentives

### COMMONWEALTH SOLAR

\$.45/W/DC to \$2250 for PVs, 25% for solar thermal.

NATIONAL GRID offers free audits and efficiency incentives.



**Worcester Smart Grid;** a network for electricity transmission and distribution that uses 2 way communications, advanced sensors, & specialized computers to improve the efficiency, reliability, & safety of electricity delivery & use.

# energy tips

## FOR LOWELL

# Investors

It can be very confusing and difficult for the average layman to invest in alternative energy. The easiest way to start is with one of the clean energy mutual funds.

Four funds that offer a diversified “green” portfolio are:

<i>PBW</i>	Power Shares Wilder Hill Clean Energy
<i>WGGFX</i>	Winslow Green Growth Funds
<i>NALFX</i>	New Alternatives Fund
<i>GAAEX</i>	Guinness Atkinson Alternative Energy Fund

The Massachusetts Green Energy Fund invests in Massachusetts energy companies. Their portfolio includes:

- KONARKA - Lowell, thin film PVs
- PROTONEX- Southborough, Fuel Cells &
- LILLIPUTIAN SYSTEMS - Woburn, Fuel Cells

Some active companies located in Lowell include:

KONARKA - A UML spinoff located in the Boott Mill who have a “Power Plastic” patent and specialize in thin film photovoltaics.



METABOLIX- Bioplastics; biobased chemicals; crop based technology



Some of the more notable companies located in Massachusetts include:

### Photovoltaics

- Stellaris - Andover
- Spire - Bedford SPIR



### Fuel Cells

- Nuvera - Billerica
- Protonex - Southborough
- Lilliputian - Woburn
- Ztek - Woburn



### Wind & Hydro

- Solectria Renewables - Lawrence
- Louis Berger - Boston



### Batteries

- Schaefer, Inc. - Woburn
- Battery & Capacitor Technology Co.- Worcester



### Inverters

- Schaefer - Hopkinton
- RWE Schott Solar Inc.- Billerica
- Solectria Renewables - Lawrence



NOTE:  
MTC provides an extra allowance for utilizing products made in Massachusetts



# Resources

## ORGANIZATIONS

U.S. Green Building Council  
[www.usgbc.org](http://www.usgbc.org)

Massachusetts Climate Action Network  
[www.massclimateaction.org](http://www.massclimateaction.org)

Northeast Sustainable Energy Association (NESEA)  
[www.nesea.org](http://www.nesea.org)

New Buildings Institute  
[www.newbuildings.org](http://www.newbuildings.org)

Sustainable Buildings Industry Council  
[www.sbicouncil.org](http://www.sbicouncil.org)

Massachusetts Technology Collaborative  
[www.masstech.org](http://www.masstech.org)

Alliance to Save Energy (ASE)  
[www.ase.org](http://www.ase.org)

American Council for an Energy-  
Efficient Economy (ACEEE)  
[www.aceee.org](http://www.aceee.org)

Building Performance Institute  
[www.bpi.org](http://www.bpi.org)

Energy & Environmental Building Association  
[www.eeba.org](http://www.eeba.org)

The Energy Foundation  
[www.ef.org](http://www.ef.org)

Home Energy Magazine  
[www.homeenergy.org](http://www.homeenergy.org)

Whole Building Design Guide  
[www.wbdg.org](http://www.wbdg.org)

Northeast Home Energy  
Rating Systems Alliance  
[www.energyratings.org](http://www.energyratings.org)

Coalition for Environmentally  
Responsible Economies  
[www.ceres.org](http://www.ceres.org)

Building Energy Research Laboratory  
[www.ecs.umass.edu/mie/labs/berl/](http://www.ecs.umass.edu/mie/labs/berl/)

Center for Efficiency & Renewable Energy  
at UMass Amherst [ceere.org](http://ceere.org)

Massachusetts Energy Efficiency Partnership  
at UMass Amherst [www.maeep.org](http://www.maeep.org)

Environmental Business Council of New England  
[www.ebc-ne.org](http://www.ebc-ne.org)

National Association of Home Builders  
[www.nahb.org](http://www.nahb.org)

## GOVERNMENT

City of Lowell Pollard Memorial Library  
Infrared thermometers and kilowatt meter on loan  
978-674-4120 [www.pollardmi.org](http://www.pollardmi.org)

Department of the Environment (DOE)  
[www.eere.energy.gov](http://www.eere.energy.gov)

ENERGYSTAR  
[www.energystar.gov](http://www.energystar.gov)

MA Division of Energy Resources  
[www.state.ma.us/doer](http://www.state.ma.us/doer)

The Partnership for Advancing  
Technology in Housing - HUD  
[www.pathnet.org](http://www.pathnet.org)

National Technical Information Service  
[www.ntis.gov](http://www.ntis.gov)

## TECHNOLOGIES

Boston Area Solar Energy Association  
[www.basea.org](http://www.basea.org)

American Solar Energy Association  
[www.ases.org](http://www.ases.org)

Solar Energy Industries Association SEIA  
[www.seia.org](http://www.seia.org)

Solar Electric Power Association  
[www.solarelectricpower.org](http://www.solarelectricpower.org)  
202-857-0898

Solar Rating and Certification Corporation  
(SECC)  
[www.solar-rating.org/about.htm](http://www.solar-rating.org/about.htm)  
407-638-1537

Geothermal Heat Pump Consortium  
[www.geoexchange.org](http://www.geoexchange.org)  
[www.ghpc.org](http://www.ghpc.org)

American Wind Energy Association  
[www.awea.org](http://www.awea.org)

Biodiesel America  
[www.biodiesel.org](http://www.biodiesel.org)

Association of Energy Engineers  
[www.aeecenter.org](http://www.aeecenter.org)

Renewable Electricity Certification Program  
[www.green-e.org](http://www.green-e.org)

Efficient Windows Collaborative  
[www.efficientwindows.org](http://www.efficientwindows.org)

American Society of Heating, Refrigeration,  
& Air Conditioning Engineers  
[www.ashrae.org](http://www.ashrae.org)

Illuminating Engineering Society  
of North America  
[www.iesna.org](http://www.iesna.org)

Distributed Energy Forum  
[www.deforum.org](http://www.deforum.org)

Fuel Cells 2000  
[www.fuelcells.org](http://www.fuelcells.org)

## MATERIALS, INSTALLERS

*The following suppliers & installers do not represent the only, best qualified, or recommended, but merely were the ones that we discovered first when searching for possibilities.*

[www.buildinggreen.com](http://www.buildinggreen.com)

Greenbuilding materials  
[www.oikos.com](http://www.oikos.com)

Eco Mall [www.ecomall.com](http://www.ecomall.com)

Building Resource Center  
[www.bostonbmrc](http://www.bostonbmrc)

Solar Energy Business Association of New England  
[www.sebane.org](http://www.sebane.org)

Bob Gagnon Plumbing & Heating  
Solar thermal, Lowell  
[www.bobgagnon.com](http://www.bobgagnon.com)

Borrego Solar  
Lowell PV installer [borregosolar.com](http://borregosolar.com)  
888-898-6273

Architectural Consulting Services;  
Jay Mason AIA, LEED AP; Sustainable design;  
978-459-2004; [acslowell.com](http://acslowell.com)

International Ground Source Heat Pump Installers  
[www.igshpi.okstae.edu](http://www.igshpi.okstae.edu)

Geothermal Drilling of New England  
Lowell geothermal installer  
978-453-8200

Ogden Wells [ogdenwells.com](http://ogdenwells.com)

[massachusettsinsulationcontractor.com](http://massachusettsinsulationcontractor.com)  
855-897-0854

Viridian Energy  
Green Electricity  
[www.viridian.com/savewithdave/default.aspx](http://www.viridian.com/savewithdave/default.aspx)

Next Step Living  
Energy audits, assessment, & contracting  
[nextsteplivinginc.com](http://nextsteplivinginc.com); 866-867-8729

[energystar.gov](http://energystar.gov)  
energy efficient appliance list

## ENERGY REBATES & CREDITS AVAILABLE for LOWELL PROPERTY OWNERS

	FEDERAL	STATE	Massachusetts CEC	National Grid	Mass Housing, HUD, other
HOMEOWNER	Tax Credit - 30% for renewables; PVs, Solar thermal, Wind, Geothermal. \$500/kW, Fuel Cells	Lesser of 15% or \$1K for renewables tax credit	\$ .85/kW, Solar PVs to \$4250 25%, Solar hot water; \$4/W to \$100K, Wind for multifamily  <i>masscec.com</i>	75% to \$2000, weatherization 1-866-527-7283 AC, Lighting, Controls, Heat pumps <i>masssave.com</i> to \$1500, condensing boiler; \$800, furnace; \$800, on demand water heater; \$500, heat recover vent etc. 1-800-232-0672 <i>www.gasnetworks.com</i>	FHA - Energy Efficient Mortgages & <i>Green Refinance Plus</i>
MULTI FAMILY +4	\$1.80/sq.foot for +4 story multifamily for 50% above ASHREA 90.1 model code			Multifamily Program provides efficient HVAC, hot water, lighting & controls 1-800-594-7277 Low income units; 1-617-348-6425 to \$750/kilowatt cogeneration	<i>Enterprise Green Communities</i> HUD <i>Green Healthy Homes Initiative</i> Low Income weatherization
RENTER CONDO OWNER				Rebates for energy efficient light fixtures, bulbs, refrigerators, thermostats.	
CONTRACTOR	\$2K each DU that cuts by 50% '04 inter. energy code	to \$8K/Unit for Energy Star		Major Renovations Program - 75% to \$2K, envelope upgrades. Free CFLs. <i>masssave.com</i> 1-800-628-8413	
RETAIL	Corporate tax deduction to \$1.80/sq ft for a building that's 50% more efficient than ASHREA Standard 90.1 2001 code <i>www.efficientbuildings.org</i>	Corporate tax deduction, deduct installation from net income.	\$ .45 /kW for SolarPVs to \$2250 25% Solar Thermal; \$4/W to \$100K. Wind for commercial \$5.20/W to \$130K, Wind for public.  <i>masscec.com</i>	Gas Retrofit - HVAC, Hot Water, Heat recover, Steam system upgrade, Process & Manufacturing equipment, Commercial cooling equipment.	
OFFICE				Electric Retrofit - Lighting, Controls, Motor VFDs, Demand control ventilation Process & manufacturing equip. 50% to \$10K <i>masssave.com</i>	
INDUSTRIAL				Custom Retrofit- with Engineering study Direct Install - to 70% for lighting & controls 1-800-332-3333	
INSTITUTIONAL				New Construction - 70% for electric; 50% to \$100K, gas	DOE Research Grants
PUBLIC				Cogeneration - 50% to \$750/kWh 781-907-2196 <i>mark.stafford@ngrid.com</i>	
HISTORIC	Same as above by use			Same as above by use	

