

energy tips
FOR INSTITUTIONS

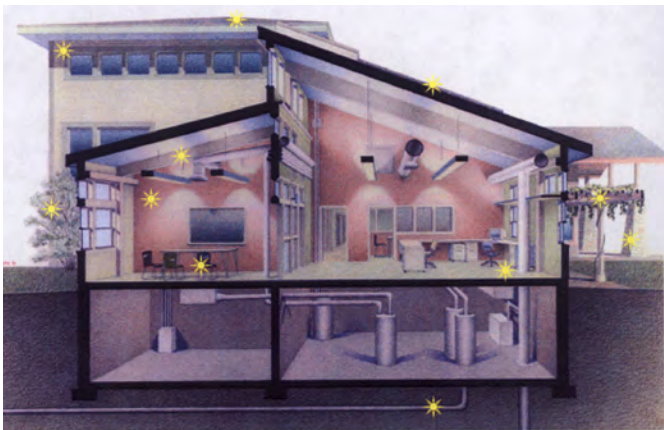
energy tips FOR LOWELL

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



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

RESOURCES

Building America
www.eere.energy.gov
www.newbuildings.org
www.buildinggreen.com
Green Guide for Health Care
www.gghc.org
Geothermal Consortium
www.geoexchange.org
SBIC Sustainable Buildings Industry Council www.sbicouncil.org
National Technical Information Service www.ntis.gov
Center for Renewable Energy & Sustainable Technologies-
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.

massave.com

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

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

Energy Efficiency & Historic Preservation www.nol.org/home/NEO/rebuildbook.pdf

Massachusetts Historical Commission www.sec.state.ma.us/mhc

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

Whole Building Design Guide www.wbdg.org

Assoc.for Preservation Technology NEast www.waptne.org

National Trust for Historic Preservation www.nthp.org

Lowell Historic Board 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 its 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

Energy Efficiency & Renewable Energy
eere.energy.gov

Energy Information Admins. - eia.gov
energycodes.gov

energysavers.gov

NREL - National Renewable Energy
Laboratory 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

Municipal Climate Action Plan
www.massclimateaction.org

Mass.Municipal Assoc. 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

SCHOTT
solar
Cogeneration
Ze-gen - Attleboro



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