

MASSACHUSETTS DIVISION OF ENERGY RESOURCES



Rebuild Massachusetts

**Final Report for Rebuild Grant R101321
Ending December 31, 2006**

**Sponsored by the United States Department of Energy
Rebuild America Program**

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PROGRAM RESOURCES AND GOALS

The Rebuild Massachusetts Program (Program) brings together the public and private sector in a partnership to help communities be more environmentally and economically sound through smarter energy management. In November 2004, the Massachusetts Division of Energy Resources (DOER) received a grant of \$130,000 in federal funds for the continuation of the statewide Program established in 2000. Additionally, the Program benefits from strong support provided by most of the state's major electric and gas utilities, the Northeast Energy Efficiency Council (NEEC), the state's Department of Housing and Community Development and both state and local government officials.

The project leader, Eileen McHugh, creates grant proposals, coordinates state level partners, manages outreach strategy, and oversees project progress. She also performs community partnership outreach and recruitment, is the operational liaison with NEEC and partner utilities, coordinates technical assistance to community partners and tracks, and reports project status.

As the representative for the statewide Program, DOER acts as a single gateway for other state agencies and local communities to access the wealth of resources, information, and assistance by which they can integrate and manage a variety of locally defined energy initiatives.

Key resource links include:

- DOER's Energy Conservation Improvement Program that provided bond funded assistance for capital improvements, rehabilitation, and construction for public schools and performance contracting.
- Energy Efficiency Programs administered by investor owned utilities partnering with the Program.
- Business Partners who provide technical workshops/seminars.

The program supports energy conservation and efficiency in priority target sectors, including schools, municipalities, and public housing. Outreach includes coordinating existing resources by identifying development opportunities to increase incorporation of energy and water efficiency in buildings and neighborhoods where other public and private investments are occurring.

A primary goal is to advocate for and support the adoption and institutionalization of energy efficiency into planning and investment as "business as usual". DOER has been able to quickly form and assist municipal, institutional, and public subsidized housing partnerships towards accelerating locally defined energy efficiency improvements by focusing resources on partners with demonstrated action. This approach allows DOER to maximum effectiveness of its resources by grouping various efforts, thus increasing the ability to impact a higher number of buildings per partnership.

PROGRAM STRATEGY

DOER assists local partnerships with their efforts to plan and implement energy efficiency improvements within their communities and provides strong ongoing help to local projects.

The specific objectives are to provide state support and leadership to state and local government focusing on energy efficiency & conservation and to disseminate the results as models to communities and stakeholders to stimulate further adoption of resource efficiency as a standard part of planning and implementing energy efficiency investments. This comprehensive approach identifies opportunities where, 1) action has already taken place, 2) have current or potential projects in target sectors, or 3) have the potential for municipal-wide energy management planning. It supports the Program mission of fostering self-sufficient, action oriented partnerships with the potential to institutionalize change.

Support during this grant period that ended December 31, 2006 included:

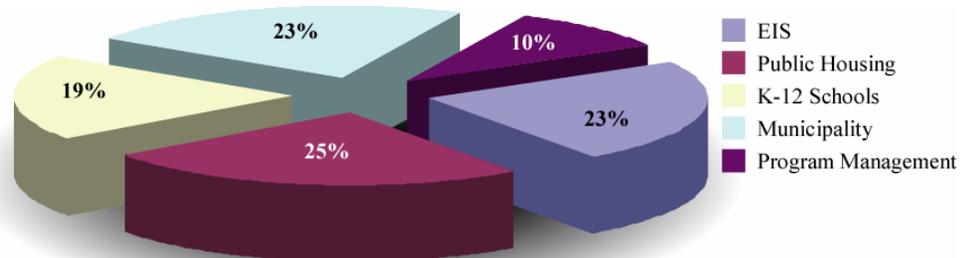
- Provided technical assistance to local partnerships for action plans.
- Created the “Energy Management Services” web page to foster a systemic and replicable approach to performance contracting. As part of this effort, the Program produced and published a guide to performance contracting, model RFR, and model contract that are available on DOER’s web site at www.mass.gov/doer.
- Organized technical workshops with local business partners.
- Organized meetings with individual partners and utility partners to assess needs and coordinate resources.
- Published a quarterly Rebuild Massachusetts Newsletter of statewide activities from local partnerships and as an educational tool.

This strategy furthered the fundamental goals of the Program to increase the number of high performance buildings by helping partnerships implement energy efficiency improvements.

BUDGET

The Program budget for contractual included technical assistance for supporting the Rebuild Energy Information System for communities, state buildings, and housing authorities (and in support of the PHEEP managed by the Massachusetts Department of Housing and Community Development). This budget also covered technical assistance to municipalities, Boston Housing Authority, and K-12 schools. Figure one illustrates the breakdown of investment by category.

Figure 1: Investment by Category



PROGRAM MANAGEMENT

With the growth and expansion of the Program, including the Public Housing Energy Efficiency Project, the addition of the MA Executive Office of Environmental Affairs (EOEA), and various investments from partners, DOER and DHCD found the need for a more systematic way of tracking all the Program investments.

Both agencies and NEEC representative, Peregrine Energy Group, designed a method (using Excel) to track and report all technical costs that includes not only Program costs but also PHEEP, EOEA, and municipal partner technical costs not included the grant.

COMMUNITY OUTREACH

DOER is the agency that establishes the state's energy efficiency goals; this Program provides state level field support to promote those goals. DOER attends meetings with existing and new partnerships to describe the available assistance and to assess their current viability and goals. The Program continues to support these partners in accordance with their own strategy and goals *Specific activities reported under individual partners.*

A detailed, targeted approach, coupled with the statewide network developed through the knowledge of projects evidencing the need and potential to expand, generates leads for new community alliances. Ultimately, the outreach and marketing strategy to stimulate local action is built around direct presentations to potential champions identified through the initial targeting and outreach process. The funded Program Manager continues to meet with and provide initial organizing assistance to the identified leads. Following are two examples of community outreach.

ICLEI

As part of the Program strategy to work with local governments where action has already taken place, DOER has worked with several communities that are members of the *Local Governments for Sustainability*, including Medford, Cambridge, Newton, and Somerville. DOER has also worked with Kim Lundgren, Director of the ICLEI Northeast Regional Capacity Center located in Boston.

In September 2005, DOER participated in the *Creative Funding for Clean Energy Projects* forum. Staff presented program information for local governments that assist in developing clean energy programs and specifics on how local governments can take advantage of these resources. The presentation included Rebuild Massachusetts and Energy Management Services, how local governments can get involved, the resources available, and how the Program can be integrated with clean energy programs.

Cape Light Compact NEED Project

In June 2005, two Massachusetts schools were honored for their energy education projects through the National Energy Education Development (NEED) project. Through the Cape Light Compact's NEED program, teachers are provided the training and tools for participating in the

project. Students benefit through enhanced energy curriculum in Cape and Vineyard schools. DOER participated in the award ceremony. Students received their awards on June 14, 2005. DOER also provided revue and grading for all submitted energy education projects.

ENERGY INFORMATION SYSTEM

	Completed Square Feet (sqft)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Total	133,500,000	NA	NA	NA

Energy Information System Initiative

Electric, Gas, Oil, and Water bills are the centerpiece of every energy and water savings investment project that the Program works on. Utility bills help the Program and our Program partners identify high priority energy projects, provide a benchmark of performance for potential savings, and help confirm that targeted energy savings have been achieved. At the same time, however, utility bills are surprisingly difficult and time consuming to collect and analyze. With this in mind, the Program supported an online energy information system (EIS) initiative that is designed to collect utility bill information electronically and summarize utility bill and building information.

The Energy Information System currently captures utility and building data for several MA state agencies that include MA DCAM, MA EOE, MA DOER, and MA DHCD. In addition, the EIS captures more detailed information for individual clients that received partial or full funding from these agencies, several schools, and a few cities and towns.

The total completed square footage listed for this initiative includes the total square footage for all the agencies that the EIS has either partial or full building information or partial or full utility bill information. The level of information available for any individual building depends significantly on the building’s location, utility service territories, and associated building and utility bill database supporting information accuracy and availability. Actual cost and MMBTU savings are not included in the summary because the EIS is primarily a support tool for individual projects and does not save energy directly.

Examples of current uses for the EIS include:

Energy Budget Analysis – The City of Cambridge uses the EIS to collect utility data for every department. It was very difficult (almost impossible) to summarize the total utility cost and consumption for all city buildings prior to the installation of the EIS.

Energy Performance Contract Data Collection – The Lynn Housing Authority and Watertown Housing Authority have used the EIS to collect and make available online baseline utility data for proposed energy efficiency investment RFRs.

Energy Education – The Town of Lincoln has used the EIS to summarize total energy and water cost and consumption numbers for all town facilities. This data will support three major near-term capital investment programs under consideration by the School, Town Building, and Library capital planning committees.

Energy Performance Contract Monitoring and Verification – the EIS is designed to allow DHCD and DOER to review the same utility bill information individual agencies and energy performance contractors receive. This will allow DHCD and DOER to monitor and summarize energy performance contract utility cost and consumptions savings as they occur rather than having to wait for agencies and energy performance contractors to provide this information.

Building Performance Energy and Water analysis – The Lawrence Housing Authority used the EIS to collect utility data for a US HUD energy audit. Future energy audits will be able to update the utility bill information automatically through the EIS and building performance indices calculated during the energy audit can be added to the EIS to monitor ongoing building performance.

Building Performance Benchmarking – The EIS has been designed to allow detailed building benchmarking. New Ecology, a non-profit energy service company uses the EIS to identify potential energy savings projects for Community Development Corporations. MA DHCD is reviewing all of the agencies “all-electric 667” developments to identify high cost, high use all-electric apartment buildings with elderly residents.

Rebuild MA has rolled out the EIS initiative in several phases:

Phase One:

MA Department of Housing and Community Development (DHCD) has partnered with DOER Rebuild Massachusetts program¹ to collect and manage utility bill information for housing authorities with an electronic energy information system. The Energy Information System (EIS) is designed to help DHCD and individual housing authorities better understand, report, and manage energy use and costs.

The purpose of the EIS Project was to determine whether a customized, web-based energy information system could eliminate the barriers that prevent public agencies (housing authorities, state government, and local governments) in Massachusetts from gaining access to, and making effective use of, energy information, and thus provide an easy method to enable those agencies to implement energy efficiency projects.

For public agencies, the primary source of energy usage information is their utility bills. Unfortunately, numerous barriers prevent public agencies in Massachusetts from acquiring and

¹ The EIS is being used today by DHCD, other state agencies, housing authorities, and cities and towns in Massachusetts, thanks to generous support from the Massachusetts Division of Energy Resources, Massachusetts Department of Housing and Community Development, Massachusetts Executive Office of Environmental Affairs, the Cape Light Compact, and four utilities: National Grid, NSTAR Electric and Gas, Western Massachusetts Electric, KeySpan

effectively using this energy information.

- There is no readily available analytical connection between utility bills, building performance, and occupant energy and water use.
- There is limited access to utility bills by the agency personnel responsible for energy management and building performance.
- Paper utility bills, which end up in file cabinets, are not an effective energy management tool.

Because of these barriers, many public agencies do not have useable energy information and, therefore, numerous energy efficiency opportunities are being lost. Rebuild MA and PHEEP undertook a demonstration project to determine whether these barriers could be addressed through a web-based energy information system.

Utility Data Collection

The input of utility data is one of the greatest challenges involved in providing effective energy information services to public agencies in Massachusetts. Given their many other responsibilities, agency staff simply do not have time to enter utility data manually.

Accordingly, utility direct data collection needs to be automated to the greatest extent possible. This applies to both the entry of historic information and the entry of new information over time. Automated data collection itself has challenges. While many Massachusetts utilities and energy suppliers provide electronic data, they use different protocols and data formats, including web pages, Excel spreadsheets, ASCII files, and email. The EIS must be sufficiently robust to accommodate all of these approaches.

One of the key elements of the EIS is automated data collection, however many municipal utilities simply do not provide electronic data in any format. Therefore, it might not be possible to avoid manual data entry altogether. To address these unique circumstances, the EIS is streamlining the process for entering manual data by developing predefined, data-entry spreadsheets designed specifically for target audiences, e.g., housing authorities and schools. Figure 2 includes a sample of a simple budget cost spreadsheet data entry form

Figure 2: Budget Cost Spreadsheet

Utility Budget - 2007				
Month	Budget Electricity	Budget Gas	Budget Oil	Budget Water/Sewer
January				
February				
March				
April				
May				
June				
July				
August				
September				
October				
November				
December				
Total	\$0	\$0	\$0	\$0

spreadsheets with meter account information listed by development and by building, development construction completion summary with numbers of apartments and size of apartments. Additional building data came from oral confirmation of building energy end uses with AHA's business manager. Building data from DHCD included a filtered report from DHCD's CIIS Data Table.

- **Lawrence Housing Authority** – The Lawrence Housing Authority (LHA) had detailed building information for two of their two state-funded developments. LHA had hired a consultant to collect this information and analyze the energy performance of these developments for an energy performance contract savings guarantee contract review. LHA's building information includes energy audit documentation, precise meter location and end use information, documentation of energy and water-related capital investment installations, and the consultant's analysis. One other LHA development has equivalent building information that was collected for an earlier energy performance contract. Building data for the rest of LHA's building portfolio will need to be collected from LHA management. For future potential consideration, LHA staff has installed a comprehensive energy management system in all of their developments. Trending data from this system could be collected to enhance the analysis of LHA's building energy use and mechanical system performance.
- **Boston Housing Authority** – As noted above, the work done for the energy master plan in 2001 greatly accelerated the collection of building and utility data for the five state-funded developments included in the Demonstration Project.

In anticipation of collecting building information for other housing authorities that do not have an energy master plan, Peregrine and DHCD investigated several alternative building resources, including GIS-related data, City Assessor data, and scanned copies of the original building site plans. The Energy Master Plan data combined with a BHA supplied apartment inventory list provide the most complete building information. The other building information resources were less useful.

- **Newton Schools** - Newton schools' energy manager prepared a spreadsheet with building square footage and associated utility account information. This information has been uploaded into the EIS database. Newton has contracted with an online maintenance and utility consumption service called School Dude© (a Rebuild America Allied Business Partner) to upgrade their internal maintenance and inventory practices. Several other cities and towns throughout Massachusetts and New England have procured similar services. Rebuild MA has uploaded a substantial amount of utility and building data onto the online EIS database and is ready to move forward with Newton to coordinate Rebuild's EIS resources with Newton's School Dude© services. For more details, see partner results.

Phase Two

Looking forward, DHCD proposes to continue to use the EIS to collect utility data for energy performance contract procurements as a reimbursable expense in the energy performance

contract. DHCD, DOER, and Rebuild Massachusetts have also agreed to develop a standard energy monitoring and verification report to document utility cost and consumption savings.

Data Collection and Reporting for Housing Authorities to Date

1. **Building data:** For Massachusetts state funded properties, DHCD has building data for 239 housing authorities encompassing over 7,400 buildings. They also have building data for federally-funded buildings, including, for the New England states:

MA 169 PHAs, 2,430 buildings	CT 66 PHAs, 2,075 buildings
ME 27 PHAs, 623 buildings	NH 17 PHAs, 525 buildings
RI 27 PHAs, 1,059 buildings	VT 9 PHAs, 156 buildings

2. **Electric utility data:** DHCD is collecting electric utility data for 201 housing authorities, with over 8,000 utility accounts. They are collecting data from all four of the state's investor-owned electric utilities: National Grid, NSTAR, Western Massachusetts Electric, and Fitchburg Gas and Electric.
3. **Gas utility data:** DHCD is currently collecting gas utility data for eight housing authorities with over 900 utility accounts. They are collecting data from the state's three largest investor-owned gas utilities: KeySpan, NSTAR Gas, and BayState Gas.
4. **Reporting on the EIS:** As of today, DHCD is reporting data on the EIS for the housing authorities listed below. Together, these housing authorities have over 1,000 electric utility accounts and consume 50,000,000 kWh of electricity per year.

Brookline	Newton	Salem
Chelsea	North Adams	Waltham
Haverhill	North Andover	Watertown
Lawrence	Northampton	Woburn
Lynn		

5. **Next authorities tentatively planned for the EIS.**

Amesbury	Fall River	Somerville
Attleboro	Ludlow	Springfield
Belmont	New Bedford	Taunton
Boston	Norton	Worcester
Cohasset	Saugus	

The system as envisioned will 1) prepare reports necessary for establishing performance contract baselines, 2) independently monitor results of energy efficiency improvements, 3) identify high users and spikes for further assessment and troubleshooting, 4) prepare financial reports and budgets, 5) quantify greenhouse gas emissions and savings, and 6) provide reliable utility histories, including various permutations of aggregations, for energy purchase decisions and contracts. **DHCD will report results under the Rebuild Massachusetts Public Housing Energy Efficiency Project.**

REBUILD MASSACHUSETTS RESULTS

Funding and Cost Share

GRANTEE	TOTAL OBLIGATED	TOTAL PAID	UNPAID BALANCE	REPORTED COSTS	UNCOSTED BALANCE
Division of Energy Resources	\$130,000	\$130,000	-0-	\$130,000	-0-
DOER Cost Share	\$106,000	\$106,000	-0-	\$106,000	-0-
Keyspan*	\$50,000	\$50,000	-0-	\$50,000	-0-
NGRID (Mass. Elec.) *	\$75,000	\$75,000	-0-	\$75,000	-0-
NSTAR*	\$75,000	\$75,000	-0-	\$75,000	-0-
Cape Light Compact	\$8,000	\$8,000	-0-	\$8,000	-0-

Outcome

Building Sector	Completed Square Feet (sqft)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Public Schools	1,488,405	\$251,127		\$955,860
Public Housing-BHA	300,000	\$85,000	10,380	\$750,000
Municipal Buildings	1,115,000	\$283,600		\$1,706,800
State Buildings (performance contracts)		\$5,583,856.00		\$50,804,561
Energy Information System	133,500,000	NA		
Results Total	136,403,405	\$6,203,583	10,380	\$54,217,221

LEAD PARTNERS

Investor Owned Utilities

The investor owned utility companies and a municipal aggregator currently active in the existing statewide program provide a major cost share for this grant. Total value is \$208,000 for technical assistance to local partnerships. In Massachusetts, the utility companies provide both direct energy services and administrate the State's demand side management program funds. Assistance to the Program during the grant period included both direct energy service support and DSM program support.

Direct Energy Service Support – Program clients (City, State, and Federal agencies) are often utility company's largest customers. These agencies fulfill important civic roles that utility companies understand and are eager to support. Direct energy service support services utility companies provided included new construction hookup and meter assistance, load building-related new technology financial support, and meter and utility bill technical support. Program staff and Peregrine Energy Group, for example, met with NSTAR program representatives and Newton stakeholders to discuss the electronic data transfer and payment of their electric bills.

The result was that the City of Newton decided to participate in electronic billing. In addition, two major utility providers agreed to provide large single files of customized monthly utility data for the city, state, and federal agencies that receive EIS online utility monitoring services. This is a difficult and time-consuming task for the two utility companies to perform. Once the initial setup was completed, however, it's now a routine process to capture historic utility bill information for new accounts and update new utility bill information for all existing accounts. A single file with all the information needed to populate the energy information database greatly simplifies the data entry and QC task and provides more complete utility data than utility companies can provide on their own websites.

Demand Side Management Service Support – As managers of the State’s Demand-Side Management (DSM) programs in their service territories the Massachusetts investor-owned utilities oversee several million dollars in energy efficiency investment projects each year. The Program staff works closely with the energy efficiency program managers at each utility to facilitate and maximize the level of technical support and investment the programs provide Rebuild partners. Two specific examples of this important partnership between DOER and the investor-owned utility DSM programs include the aforementioned City of Newton and Worcester School energy efficiency initiatives.

Individual utility commitments are part of the following overall Compilation of Energy Efficiency Program Statistics reported to DOER by Program Administrators for the Commercial and Industrial Sector (under which most municipalities and school departments fall).

Customer Sector	Cost SBC	Cost TRC	Annual MWh	Lifetime MWh
BCR-Activity				
C&I Lost Opportunity	\$22,988,851	\$26,105,290	61,293	971,964
Large C&I Retrofit	\$25,419,516	\$43,575,946	132,100	1,895,144
Small C&I Retrofit	\$17,653,405	\$22,025,245	38,336	500,436
Grand Total	\$123,483,001	\$163,836,883	454,726	5,123,738

Northeast Energy Efficiency Council, Inc. (NEEC)

NEEC, represented by Peregrine Energy Group (PEG), is a lead Program partner. It provides technical and logistical assistance for the Program and staffing for the Rebuild Boston Energy Initiative. PEG's staff contribution during the grant period included:

- Initial feasibility study of web-based Energy Information System included approximately \$5,000 in time contributed by J Kallio in addition to Peregrine Energy staff time.
- Research computer sleep programs offered by the EPA for school computers. (20 hrs beyond partial support from Rebuild and US DOE FEMP programs)
- Develop and present an integrated energy and health workshop at the Association of Energy Engineers Annual Conference (20 hrs beyond partial Rebuild support)
- Additional hours for the Cape Light Compact benchmark of county facilities in Barnstable, assist with the scope of work development for energy efficiency improvement, and assist with the application and certification for EnergyStar labels on two court houses (with support from by Barnstable County about \$13,000)

- For the Boston Housing Authority (BHA) provide technical support beyond available Rebuild resources for BHA's energy performance contracts, green building design, and integrated energy and health initiatives (205 hours beyond partial Rebuild support)

PEG's primary role is to provide support to local partnerships to define and plan energy management needs and coordinate implementation resources. PEG assists DOER with on-going program planning, outreach and market strategy development. PEG is also a lead partner in the Rebuild Massachusetts Public Housing Energy Efficiency Project.

Massachusetts Department of Housing and Community Development (DHCD)

Stan Kruszewski, of the DHCD, was a lead partner for the Program and manages the Rebuild America Public Housing Energy Efficiency Project. This project is targeted to small and medium sized Authorities, Authorities with both state and federally assisted public housing, and Authorities at which adjacent municipal facilities or public schools make conservation and co-generation collaborations feasible.

DHCD provides regulatory supervision for the two-hundred and thirty-five local Public Housing Authorities (PHA) in Massachusetts. The agency provides operating and utility subsidies, subject to appropriation, to approximately one third of the housing authorities. When Authorities undertake performance contracts, DHCD helps finance the conservation improvements by maintaining utility subsidies, if any, at current levels for the life of the performance contract in order to provide sufficient cash flow from which utility savings can be drawn.

DHCD also provides grants from Commonwealth issued bond funds, subject to annual bond cap limitations of less than \$60 million, for public housing capital improvements, modernization, and development. Results will be reported in the PHEEP final report for grant R101319.

Massachusetts Division of Capital Asset Management (DCAM)

DCAM is the primary state agency responsible for building design, construction, and major renovations of the Commonwealth's buildings. DCAM provides professional services to state agencies, including oversight of performance contracting. Recognizing that state facilities have a significant impact on resource use and related energy and water budgets, DCAM works to reduce these impacts and save resources wherever possible

DCAM's "Conservation Team" ensures that Commonwealth facilities attain practicable goals in sustainable design and construction as well as achieve optimal levels of energy and water efficiency for existing, renovated, and new buildings.

DCAM's Performance Contracting program provides necessary energy and water system upgrades without requiring up-front capital from the State. Energy Service Companies guarantee a net positive cash flow to the Commonwealth through reduced utility bills. Performance contracting projects allow DCAM to promote innovative and renewable technologies. The following data is reported to DOER under state statute for performance contracting.

	Total Annual Cost Savings (\$)	Total Energy Efficiency Investment (\$)
Bridgewater State Hospital	\$1,445,600	\$16,829,119
UMASS Medical Center	\$3,563,256	\$27,231,478
Bunker Hill Community College	\$55,000	\$1,806,964
McCormack Building	\$520,000	\$4,937,000
Total	\$5,583,856	\$50,804,561

MILESTONES

Milestones included the creation of model documents and a guide for performance contracting, assisting new partnerships create action plans (information under specific partner), presenting workshops for performance contracting, and publishing the Program newsletter.

Energy Management Services Web Page

A key element of the Program is to help municipalities with performance contracting. In January 2005, DOER published documents on its newly launched Energy Management Services (EMS) [web page](#). As part of this project, DOER worked with the Department of Housing and Community Development and the Division of Capital Asset Management to develop the documents. The EMS web page includes:

- Overview - a brief definition of this type of performance contracting
- Manuals and Documents
 - Energy Management Services Manual: This manual describes of the key elements of a performance contract, advantages and disadvantages, and RFR drafting guidelines. The manual also provides forms for a preliminary site assessment.
 - Model Request for Response for Energy Management Services and EMS Contract: This is the states model documents for municipalities and school departments. The document is consistent with model documents used for state buildings and housing authorities. Included in this document are:
 - Form for response submission
 - Minimum contractual terms
 - Cash flow statement form
 - Facility profile form
 - Response evaluation form
 - Form of energy audit agreement
 - Form of energy management services agreement
- Statute and Regulation
 - Copy of the enabling statute and DOER's regulation for performance contracting
 - Central Register: All public agencies must publish bid documents in the Central Register. This provides a link to this information.
- Forms and Certificates
 - Certificate of compliance checklist

- RFR submittal form for internet publishing
- Certificate of Eligibility

The web page provides a road map for cities and towns that are doing a performance contract. It contains information on what EMS is, the guide, model documents, and links to other state web sites for forms and certificates and other requirements under state statute. DOER also uses the web site to publish timely information such as presentations from the workshop.

Performance Contracting Workshop

In January 2005, DOER presented a one-day workshop. DOER coordinated conference site, speakers, registration, agenda, and materials with DOE's Rebuild America Business Partner Group, Johnson Controls. Rebuild Massachusetts marketed the workshop to all municipal procurement coordinators and recruited local speakers for presentations, coordinated presentations with DOE Rebuild Business Partners, and participated in planning calls. Johnson Controls sponsored the meeting.

DOER will recreate this workshop in April of 2007. Current sponsors include Johnson Controls, Siemens, Noresco, and Ameresco.

Newsletter

DOER publishes a quarterly newsletter on the agency's web page that highlights partner activity, announces special events, provides information about available resources, and presents tips & educational material. The newsletter is also broadcast via email.

The targeted audience is local government and school departments, which is underserved in some areas of implementing energy efficiency projects. For example, the state has a systematic process for developing a project using performance contracting for state buildings and housing authorities, but no such program exists for municipalities and K-12 schools; each individual municipality must develop their own project. DOER uses the Program (including the Guide and model documents developed under this grant) to assist in that effort along with the newsletter to provide education.

Subject matter included:

- Energy Education: The Cape Light Compact NEED project "*Plugging Energy into the Classroom*", highlighting local activities and award winners.
- Green Building Design in Public Housing: *Dynamic Interactions and Competing Objectives in Multifamily Green Building Design*
- Energy in Public Buildings: *Managing the Nightmare of Utility Data and Addressing Barriers of Manual Collection of Consumption Data*
- Performance Contracting: *Finding Money for Energy Efficiency Projects and Performance Contracting for Energy Efficiency Projects*

PARTNERSHIP RESULTS

Local partnership projects are able to take advantage of financial assistance for installed energy efficiency improvements through the state energy efficiency trust that is managed by DOER and administered by the utility companies. This support is an important component of the program's initiative for community level implementation of energy efficiency and energy management. On the community level, the Program works with the local stakeholders and the utility programs to support the local partnership goals. The Program provides technical assistance to help the local partnership determine opportunities and devise strategies to reach their long and short-term goals that emphasizes a comprehensive, community-wide approach that optimizes the available incentives.

The Energy Conservation Improvement Program

DOER administers the Energy Conservation Improvement Program (ECIP) to increase the energy efficiency of public schools by providing grants for capital improvements that reduce energy consumption and greenhouse gas emissions.

The grants are an effective tool to prevent the waste of public funds on needlessly high utility bills – public school systems realize cost savings for many years through this program. The typical ECIP project will reduce school systems energy costs for up to ten years, and the program-wide Internal Rate of Return on Investment, when combining state and local shares, is 22%.

ECIP provides energy conservation incentives and assured cost recovery for municipal schools by offering capital upgrade grants to public schools. Grants are used to fund approved capital energy conservation improvements that result in certain required levels of payback savings. DOER requires a combined payback of six years or less; however, the agency does retain the option of funding measures with a longer payback period if doing so will result in a more comprehensive project.

DOER provided funding for certified energy audits to identify projects eligible for ECIP funding. All funded improvements were required to have a minimum operational lifetime of twice the length of the payback period, so that each dollar of funding results in a minimum of two dollars in energy savings. Information gathered in the course of these audits is used to support applications to ECIP and as a basis for the school department's Request for Proposal. ECIP grants fund a portion of the total project costs and all applicants are required to make every attempt to leverage other non-state funds, such as those that may be available through utility incentive programs.

Results for period ending December 31, 2006:

	Completed Square Feet (sq.ft.)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Swampscott Public Schools	164,995	\$11,157		\$70,315
Wakefield Public Schools	446,799	\$48,274		\$200,000
Gloucester Public Schools	369,551	\$36,768		\$200,000
Belmont Public Schools	273,186	\$63,700		\$200,000
Barnstable Public Schools	162,711	\$77,392		\$200,000
Ipswich Public Schools	71,163	\$13,836		\$85,545
Total	1,488,405	\$251,127		\$955,860

City of Medford

	Completed Square Feet (sq.ft.)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Total	200,000	\$81,600		\$ 6,800.00

Background: Contact with the Medford Schools began in November 2003, with a kickoff meeting with representatives of the Medford Schools Dept., including the Chief Financial Officer, the then-facilities manager, network systems manager and Kim Lundgren, the Energy and Environmental Coordinator for the city of Medford.

Medford opened three new schools in the Fall of 2003 and also had concerns about the energy costs at the High School, a 40-year old building with numerous operational and energy problems. The High School and the three new schools were benchmarked using the EPA online Portfolio Manager. The High School achieved a score of nine out of a possible 100; the new schools were rated in the low 30's. An average school would be rated at 50. School Department staff was aware of the general nature of energy efficiency or lack thereof at the schools and expressed a strong interest in making improvements.

Web-based Real Time Metering: One consideration was a proposal by a private sector metering company to provide remote metering services for web-based monitoring of the High School's energy use on a 15-minute basis. This arrangement was eventually set up, although it required several months of work with Massachusetts Electric and the School Department to get needed permissions, determine which protocols were appropriate, purchase and install hardware, and establish the internet connection.

The web link and service is still operating but at this moment, we are not aware that the information provided is being put to any significant use by the Medford School Department. Analyzing patterns of energy use early in the monitoring we noted a regular substantial spike in

electric demand occurring regularly at 6:30 AM each day. This spike produced the greatest demand during some 24 hours periods and appeared to be the result of manually starting all systems for the start of the school day. Since a spike of such magnitude could affect the school's demand charge costs, there was some effort to mitigate it. Otherwise, the daily energy patterns show no difference. Figures 4 and 5 are weekly reports of daily energy use by hour for April 2005 and April 2004:

Figure 4: April 2005

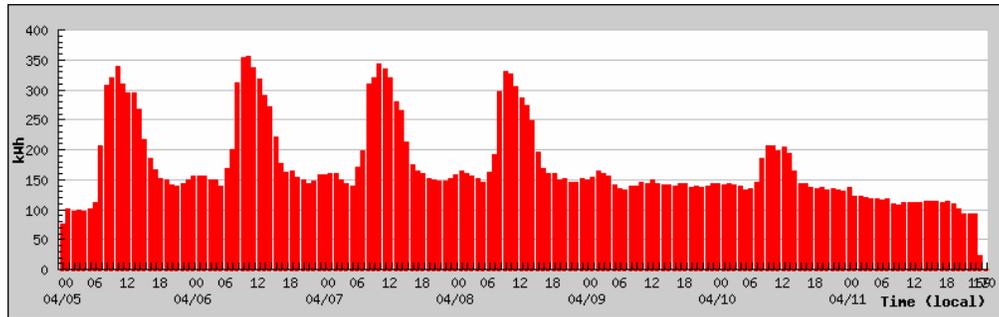
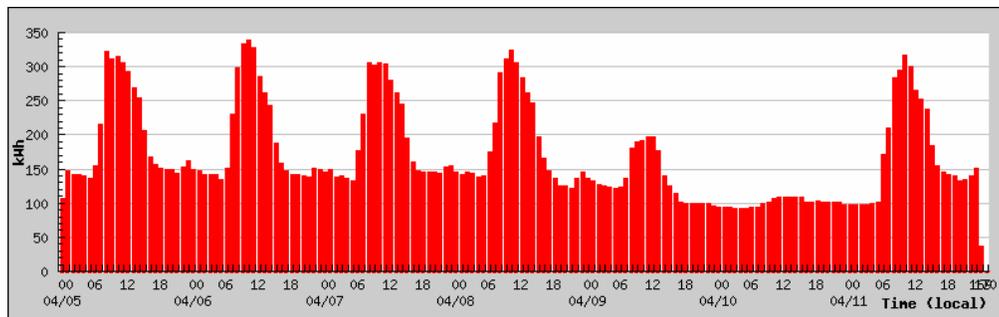


Figure 5: April 2004



Efforts were made by the meter service provider, Program staff and the Medford Energy and Environmental Coordinator to develop an energy efficiency plan for the High School, using a simple target, such as achieving a 10 percent reduction in electric use through behavioral and management changes. Key to such a plan was buy-in by the School Department facilities and maintenance staff. Although there was considerable discussion about the matter and some initial drafts of plans were put together for discussion purposes, no plan materialized and the efforts were dropped after several months.

Developing Baseline Materials for Nine Medford Schools: The initial estimation of energy use for the new Medford Schools – McGlynn, Andrews, Roberts, did not cover a full year. The analysis of the High School produced such a dismal result that although the data appeared to be adequate, re-visiting the school's energy performance seemed to be in order. Accordingly, Program staff began collecting utility account information for gas and electric accounts in January and February 2005, with the intent of re-running the baseline data with more historical data available. That process was interrupted by an accident causing data loss to the Program's contractor computer on which data was stored – data recovery was only partly successful in

recovering data and some gaps remain. Additional data was needed to run a new analysis. Staff has made inquiries to the School Department Facilities Manager, with no results to date.

Computer Initiative: Rebuild has had more success with the computer sleep initiative developed by the Environmental Protection Administration. The EPA has made software available that allows network administrators to enable power management routines that are a part of Microsoft Windows operating systems but are rarely enabled in computers operating on networks. In January 2005, the Medford Schools IT administrator and the McGlynn/Andrews schools network administrator tested the EPA software in their network environment, and monitored actual electric demand of sample computers – all computers in the schools are the same age and have essentially identical characteristics. Though the EPA software was not readily applicable to this network, system because of the type of network login procedures used, the software test caused the administrators to examine how computers are scheduled.

Staff estimated the electricity cost of the 1,000 computers on the network is costing the city \$102,000 annually, using very conservative assumptions. The administrators estimated that they could reduce computer operating hours by 71%, reducing the electric bill to \$31,000. Further, although the EPA software did not work in this environment, the network administrators were able to find another way to achieve the same result. Implementing all the savings opportunities achieved savings in excess of 80%. The McGlynn School occupies 106,000 square feet and the Andrews School is approximately the same size, therefore the savings obtained will apply to more than 200,000 square feet of school space.

Staff prepared a report of the savings and sent it to the School Department Facilities Manager and to the City Energy and Environmental Administrator. Yet no response has been received from the School Department.

Current Activity and Prospects for the Future: Considering that Medford has lost its primary energy efficiency champion and that the School Department has not exercised much initiative, there does not appear to be a strong case for continuing to try to enlist the School Department in taking actions to increase energy efficiency. We believe that some limited activity may be worth considering, if that activity can lead directly to energy-savings actions. We propose that based on past and current response from the School Department, there does not seem to be sufficient likelihood of active energy efficiency project development to justify expenditure of further Rebuild resources at this time.

Rebuild Boston

Boston Housing Authority

	Completed Square Feet (sq.ft.)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Total	300,000	\$85,000	10,380	\$750,000

Located on the East Boston waterfront and just outside Maverick Square, Maverick Landing offers a variety of living arrangements for low- and moderate-income individuals and families.

Guided by LEED standards, the development aggressively pursued energy savings and associated green building and healthy housing design and construction best practices.

A unique feature of the redevelopment is the green building initiative (at the phase one mid-rise building) made possible through a grant from the Massachusetts Technology Collaborative. The grant allowed the implementation of measures that produce valuable energy savings and new sources for renewable energy. Green building features include rooftop solar photovoltaic panels, energy efficient fiberglass windows, durable insulation and air sealing, EnergyStar appliances, lighting, and motors, and integrated pest management measures.

Maverick Landing has become the poster child for high performance green building in Massachusetts and has spawned numerous additional high performance building developments and green building programs. The development has drawn attention locally and nationally for the energy efficiency and renewable energy investments and development design. Rebuild's ongoing technical support has drawn attention to both the ongoing operation strengths and weaknesses from the development in order to maximize the performance of future high performance buildings.

Most of the primary equipment (PV system, 60 kW gas-fired cogeneration system, and Broad absorption chiller/boiler) have online real time monitoring capability. Additionally, the common electric, gas, and water utility bills are available online and each apartment's electric meter can be read manually each month.

The design and construction process included detailed energy modeling (DOE-2)1. In August 2005, Rebuild Massachusetts requested US DOE National Laboratory technical support to assist with the analysis of actual building performance.

Technical Assistance

The United States Department of Energy and the Massachusetts Division of Energy Resources provided significant technical assistance throughout the development of this project through the Rebuild America Program. The Rebuild Massachusetts Program funded our technical support contractor Peregrine Energy Group to identify energy and water saving opportunities and analyze the building's potential performance. Based on Rebuild's technical support Maverick Landing hosted the installation of several energy efficiency and renewable energy technical innovations with significant financial support from utility system benefit charge funds.

As an important follow up task, Rebuild Massachusetts worked with the development's management team (when they completed construction and residents moved in) to confirm that the building and energy-related equipment performance was as projected. Rebuild Massachusetts technical support contractor and project partners reviewed monthly utility bills and visited the development regularly to observe the equipment operation and to install temperature and humidity data loggers in apartments and common areas. This effort included a third party review of the building's energy performance by DOE Rebuild America research staff at Pacific Northwest National Laboratory (PNNL).

For the third party building performance review DOE research staff reviewed the technical specifications for the equipment, guided the installation of the data loggers, reviewed the original energy modeling (DOE 2) calculations and assumptions, and recalibrated the energy model to the development's actual bills, data logger readings, and energy control system trend log readings. Rebuild's project partners Peregrine Energy Group, Conservation Services Group, and Boston Housing Authority presented the results of these findings at the Multifamily Buildings conference in New York City in June 2006.

Equipment Performance Summaries

Table 1: First Year Energy & Water Consumption

End Uses	Target Total Use	Actual Total Use		Percent Difference
Gas Heating, A/C, Cogeneration, and DHW	76,390	88,000	Therms	15%
Apartment Lights & Appliances	435,400	350,000	kWh	-20%
Common Area Electricity	216,264	40,800	kWh	-81%
Water	10,452	5,475	CCF	-48%

Table 2: First Year Energy & Water Cost

End Uses	Target Total Use	Actual Total Use	Percent Difference
Gas Heating, A/C, Cogeneration, and DHW	\$84,429	\$105,087	24%
Apartment Lights & Appliances	\$65,310	\$45,500	-30%
Common Area Electricity	\$21,626	\$20,400	-6%
Water	\$62,714	\$43,800	-30%
Total	\$234,079	\$214,787	-8%

Rebuild Massachusetts performed a detailed analysis of the utility bills that compared the energy and water consumption projections with the first year of actual energy and water consumption. As seen in tables 1 and 2, actual energy and water consumption for the first year was relatively close to the projected consumption; actual energy use and cost was slightly higher than projected and actual water use and cost was lower than projected.

In addition to a detailed utility analysis, Rebuild reviewed the performance of

the individual renewable energy and high efficiency equipment components installed at Maverick. Generally, the equipment was complicated and more challenging to integrate into the building than standard efficiency equipment that the developer normally installs in multifamily buildings.

Solar PV - Figure 6 summarizes the PV equipment performance at Maverick Landing. The system generates slightly less than projected electricity. The five months with significantly lower kWh output indicate periods when the system was being worked on.

Figure 6: Solar PV System kWh Output

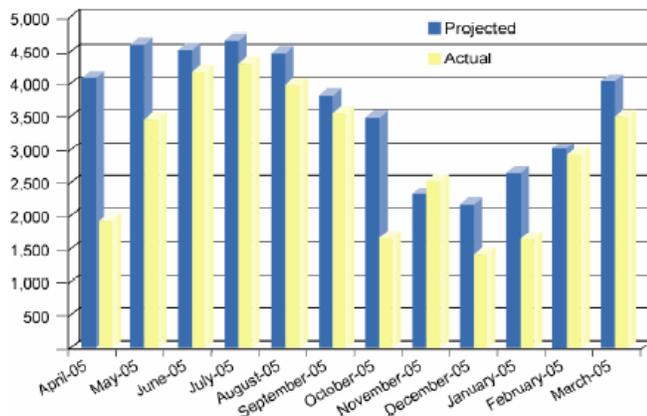


Table 3: Target Gas Chiller Cost Savings

Air conditioning System	Total Fuel Cost	Per Apartment Fuel Cost	Total Use	Per Apartment Use	Average Price	Note
Electric Chiller (kWh)	\$54,338	\$457	54,338	457	\$0.22	per kWh
Gas Chiller (kWh)	\$3,167	\$27	3,167	27	\$0.21	per kWh
Gas Chiller (Therms)	\$15,052	\$126	15,052	126	\$0.55	per Therm
	\$18,219	\$153				
Net Cost Savings	\$36,119	\$304				

Double Absorption Chiller – Table 3 summarizes the target savings for the double absorption chiller at Maverick Landing. The estimated gas use of about 18,000 therms was 20% higher than projected. The estimated gas cost

for cooling based on actual gas bills was about \$22,000 or 50% higher than projected. The primary driver for the higher cost was a significant price increase in the cost per therm (\$1.18/therm instead of \$.55/therm).

Ventilation system – As part of the high performance building design the development team sealed cracks and holes between apartments as an alternative to LEED’s “no smoking allowed” requirement and installed fresh air supply grilles to each apartment. The target air leakage requirement was an effective leakage area (ELA) of 1.25 square inches per 100 square feet of apartment surface area at 50 Pascals of pressure. The target airflow for the inlet supply grilles was 30-60 cfm per apartment. Measured leakage in a few selected apartments ranged from .73 to 1.90 ELA/ 100. Some apartments were below the standard and some apartments were above the standard. The average measured airflow supply in a few selected apartments was about 20 cfm with the fan blowers running in the apartment vertical fan coils. This is slightly below the target inlet airflow rate.

Cogeneration System – Figures 7 and 8 compare the thermal load performance of the cogeneration system in the first winter and summer. The cogeneration system ran at 60% output 24 hours per day during these first two periods. The system provides electricity for the common areas and thermal energy for heat and domestic hot water for the apartments. Based on the cogeneration’s thermal performance and electric and gas rate structures, the cogeneration system is most cost-effective when it runs during the peak electric hours (9-6 summer, 8-9 winter) and least cost-effective during off-peak electric hours.

Figure 7: Winter Cogeneration Performance

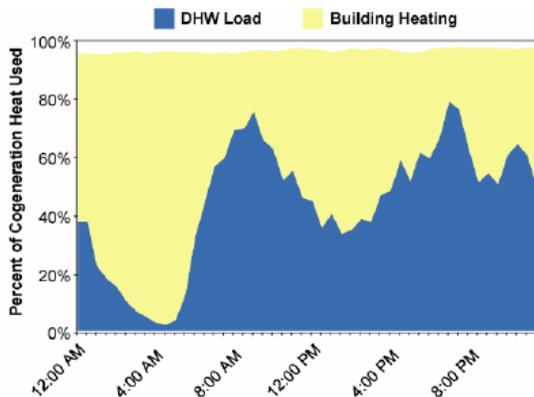
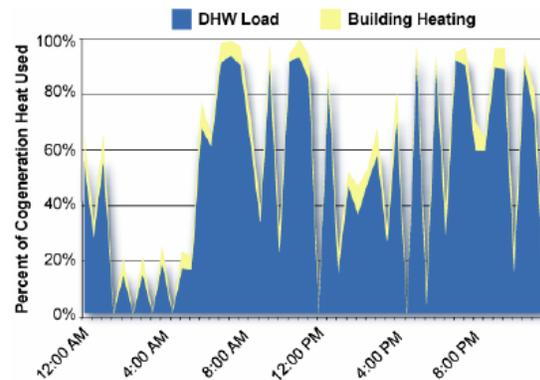


Figure 8: Spring Cogeneration Performance



Individual electric meters – In Boston, most public housing developments have centrally metered electricity. This was true for the Maverick development until it was torn down, replaced with new buildings, and individually metered for electricity. Figures 9 and 10 on the following page demonstrate the impact that individual utility bills had on the electricity consumption for each apartment. There are a number of reasons why the utility bills were higher the first month, however, the simple message is that high utility bills caught the residents’ attention and their utility consumption dropped significantly and remained lower than the first month’s bills in the following months.

Figure 9: First Electric Bill (4/2/05)

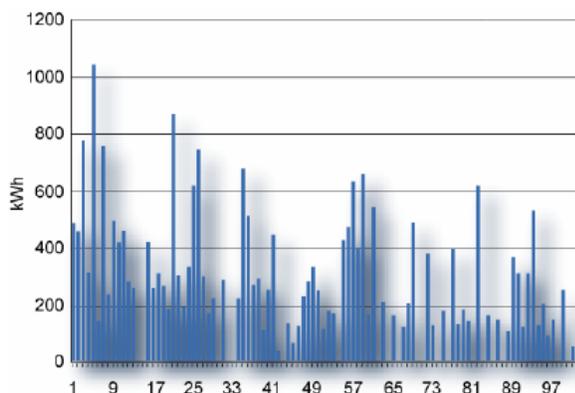
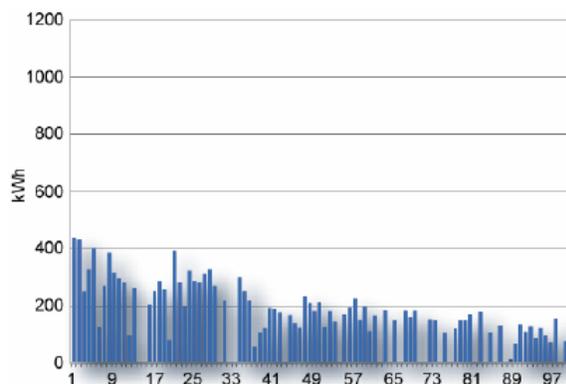


Figure 10: Second Electric Bill (4/29/05)



City of Cambridge

NOTE: This is a long-term, ongoing project. Investment and savings data are not available at this time.

In their 2005 Climate Protection Annual Report, Cambridge reported that the Public Works Department had undertaken a number of energy assessments of City-owned buildings and started implementing the recommended improvements. Boiler replacement, HVAC upgrades, lighting upgrades, and conversion of traffic signals to LEDs reduced electricity usage by 1,320,362 kilowatt-hours and 16,701 therms annually. However, the city had reached a milestone in its ability to track actual energy use. In FY06, the City projected that it would use 38,046,510 kilowatt-hours of electricity, 829,025 therms of natural gas, and 543,246 gallons of fuel oil.

January of 2005, during the height of the gas price crisis, Ellen Katz of Cambridge Department of Public Works called Eileen McHugh at DOER for some guidance regarding utility bill monitoring options. The City Manager had requested a bottom line answer to how much the City was paying for energy in all its properties. Ellen faced the challenge of collecting utility bills from all the different city agencies to answer the Manager's question. She understood the amount of work required to collect useful utility bill information because she had been creating her own spreadsheets of utility bill information for DPW managed accounts. Eileen suggested that Cambridge consider using Rebuild's EIS and provided a small cost share to help pay for the initial project start up.

Since that time Rebuild's contractor, Peregrine Energy Group, has worked closely with the City of Cambridge to collect over 20,000 gas and electric utility bills online for all of Cambridge's departments.

The initial focus was to work with Rebuild Massachusetts and the Rebuild Massachusetts Energy Information System (EIS) to implement a City of Cambridge. Activities included:

- Collecting monthly consumption data electronically from NSTAR.

- Quantifying the City's total energy consumption and expenditures (electricity, gas, heating oil)
- Tracking and reporting on consumption patterns by department, facility, and building use.
- Developing user-friendly, easy-to-read reports and charts for regular distribution to City officials and facility managers.
- Using the reporting information to identify and prioritize facilities for energy efficiency improvements

One of the key aspects of the EIS for the City is the ability to import energy data electronically from utility companies. This will significantly reduce the amount of time City departments spend entering data and will enable the City to focus on analysis and management.

The Energy Information System will track data from all City departments. The Department of Public Works will be the liaison for the City.

Supported by the Massachusetts Division of Energy Resources (DOER), the development of the first phase imported Department of Public Works data into the Cambridge EIS. Funded by the City, the second phase, customized EIS database includes all municipal buildings, including offices, schools, libraries, fire stations, recreational buildings, youth centers, and others.

The goal is to support the City's climate protection goals of reducing greenhouse gas emissions by 20% below 1990 levels by the year 2010. The actual savings required to meet this target will vary from building to building. The City will utilize the Energy Information System to compare its buildings with national and regional benchmarks, including the EnergyStar benchmarking system, and set appropriate reduction targets.

The improvements will complement the City's goals of providing a healthy work environment while serving as a leader in climate protection. As part of their effort, the City has completed a Gold-certified LEED building and is currently constructing or renovating three other green buildings.

The EIS has enabled the City to identify, for the first time, how much energy it consumes. The City can now use the EIS to analyze where its utility dollars are going, prepare budget projections and greenhouse gas emission inventories. Cambridge can compare consumption by category, i.e. buildings, streetlights, traffic signals, and park lighting, as well as expenditures by department and by facility. The EIS also provides immediate access to utility data history for energy audits.

Ongoing work includes developing a reporting system for managers, facilitating the EPA benchmarking process, and expanding the system to include vehicle fuels.

City of Newton

NOTE: This is a long-term, ongoing project. Investment and savings data is not available at this time.

Rebuild Massachusetts has been working with the Newton Public School Department since March 2005 to provide technical assistance in tracking energy usage. The initial vision of this project was to use the data to develop an energy efficiency plan for Newton schools.

Newton's focus is to work with the utility companies and the City's Energy Commission to discuss opportunities for energy performance contracting for energy-related capital purchases in City-owned buildings.

The Newton Schools Operation Department is targeting twenty-two school buildings to develop a methodology for tracking energy usage. Energy audits of all elementary and middle school buildings will provide the data necessary to develop a plan for improving performance of equipment, by either maintenance or replacement.

The Newton Public Buildings Department obtained energy audits of selected buildings and coordinated activities with the Newton Energy Commission. Local priorities include reducing energy costs and improving the environment in school buildings.

DOER worked with Carol Bock at the Newton Public School Department and David Tannozzini from the Newton Public Buildings Department. The Newton School Department gathered some baseline information; however, they were having difficulty gathering new utility data manually. To help overcome this barrier, the Program worked with "School Dude" (which Newton was using for the maintenance and operations) to upload utility data into their "Utility Direct".

DOER staff worked with the Energy Services Committee (ESC), assisting them in their examination of the feasibility of implementing a performance contract. The ESC released a final report to the Mayor of recommendations for moving forward on a comprehensive performance-contracting project for the City's public buildings. This project, along with savings from the street light conversion projected and other projects, will allow Newton to meet their goal for 20% reduction in energy use in City buildings (including K-12).

Estimated Net Present Value

- \$12 million project, 10-year project life, 4% discount rate.
- \$1,500,000 Cash Flow per year for 10 years
- Net Present Value: \$ 166,344
- Present value of expected cash flow: \$ 12,166,343.67

"Low Hanging Fruit" – Most lighting projects have been done in Newton's buildings (although new technologies continue to present opportunities). There are other high payback opportunities including training, hot water reduction devices, pipe insulation, steam traps, glazing reduction, heat recovery systems, occupancy sensing, and de-stratification fans. These opportunities are budgeted at \$1 million, saving \$250K/year (at FY06 costs). Four-year simple payback.

"Mid Hanging Fruit" - A primary opportunity is with equipment controls including a centralized building management system (BMS10). As an example, 2,000 additional points of monitoring/control for 80 buildings will cost in the range of \$2 million dollars and require

\$100K/year for operation and maintenance. This system (at FY06 energy costs) will save \$400K/year in utility costs - \$100K/year in additional maintenance costs = \$300K/year savings. Seven-year simple payback.

“High Hanging Fruit” – At FY06 costs, a multitude of energy services opportunities exist with simple paybacks of 8 years and higher. Cogeneration, Boilers, Windows, Solar Panels...Budgeting \$9 million dollars is used in this example with a \$950K/year savings. Nine to Ten year simple payback.

No more than a ten-year project life should be considered. A longer contract creates risk of future renovations and other uncertainties. A 10-year life also conforms to Ch. 25 11C, which the DOER supports.

Town of Lincoln

The vision of the Lincoln Planning Board is to use the Rebuild Lincoln initiative to develop effective energy management best practices for the Town. Energy and Water efficiency investments will help the Town meet both financial and environmental priorities and to address recent, and future, utility cost increases. The town will target all municipal facilities.

The initial focus of the Partnership is to quantify and monitor the energy and water consumption for all the Town facilities in order to document high priority facilities and ongoing energy and water consumption trends. Lincoln’s Planning Board will be the lead Town contact for the Partnership and will pull in additional town staff and government resources as appropriate.

The long-term goal for the Lincoln Energy Efficiency Initiative is to raise the energy performance of Town facilities to meet EnergyStar (top 25%) building performance criteria. The actual percent savings required to meet this target will vary significantly from building to building.

With recent utility price increases, the energy efficiency-related building improvements will fit in well with local priorities. In addition, two of Lincoln’s largest facilities – the elementary school and the library have recently completed capital needs studies that have identified large-scale energy-related investment priorities.

Work on the Partnership tasks has already begun with the collection of utility bills and building square footage for the Town’s facilities. In addition, the school department initiated a light fixture relamping project during the summer of 2004.

Town of Belmont

	Completed Square Feet (sq.ft.)	Total Annual Cost Savings (\$)	Total Annual Energy Savings (MMBTUs)	Total Energy Efficiency Investment (\$)
Belmont				
Total	817,907	\$202,000		\$ 1,700,000.00

DOER worked with Belmont over several years, providing assistance to help the town create an RFR to solicit responses for an energy efficiency project. DOER provided technical assistance under the Program to review Belmont's bidding documents and responses. Included in the RFR building inventory was seven school buildings (comprising 700 square feet), the local police department, and the town library that had a total annual utility cost of \$933,000 in 2002.

The town is one of approximately forty towns with municipally owned utility companies. As such, they do not participate in the state's energy efficiency trust (only investor owned utilities participate). This makes the town an excellent example for other cities and towns (with municipal gas and electric companies) seeking alternative financing methods to implement energy efficiency measures.

Belmont targeted 817,907 square feet in thirteen facilities, including school and municipal buildings, for implementing energy efficiency upgrades using a performance contract. Following interviews with the two companies who had submitted responses, the Town proceeded with negotiating an agreement with Noresco.

Lighting-related improvements account for about 50 percent of the overall project savings. Energy conservation measures included lighting improvements and controls, specifically 21,081 light bulbs and 8,346 ballasts. Water conservation measures included upgrading 475 plumbing fixtures. Other money-saving measures include energy-monitoring systems in three elementary schools, boiler controllers, and an insulating cover for the high school swimming pool.

Energy Conservation Highlights:

- Lighting & Lighting Controls
 - 22,371 New Lamps, 8136 New Ballasts
 - 482 Occupancy Sensors
- Energy Management System Upgrades
 - Repair / replace underlying pneumatic controls
 - New PC's at each building for control and monitoring
- Boiler Controls
- Domestic Water Conservation
 - Replace 210 toilets, Retrofit 71 urinals, Install faucet flow controls
- High School Pool Cover
- High School Rooftop Unit Replacements

City of Worcester

The Program started working with the City of Worcester after the DOER received a request to attend a meeting from Representative Binienda's office. Marybeth Campbell, Senior Research Analyst, Joint Committee on Energy called a meeting at the Massachusetts Technology Collaborative (they manage the state renewable energy funds). Subsequent to this meeting DOER met with the City Manager, Michael O'Brien, State Representative John Binienda, State Representative John Frisolo, State Senator Harriette Chandler, and Jill PeGallis & Jeff Lassey

from the Worcester School Department in Worcester. Also at the meeting was Tom Coughlin of NGRID.

As a first step following our initial meeting with the City, we received a complete list of Worcester school facilities, total square feet per building, and one - three years of energy use (electric, gas, and oil). With information on total annual energy use and cost per building, the Program benchmarked the then current energy intensity of the buildings and compared them to the performance of other schools in MA/ New England. This helped document the performance status of existing buildings and begin to assess the potential level of investment/ savings that might be possible in the school facilities.

As a follow-up, DOER requested a meeting with representatives of the school department and the investor owned utility company, NGRID. Following is a list of school buildings where energy efficiency upgrades were installed by NGRID.

Prgm	Name	Sq. Ft.	Life KW	MWH	Annl KW	Annl KWH	Investment
EI	Burncoat High School	144,388	38	252	3	16,802	\$9,990
EI	Burncoat Middle School	147,296	54	149	4	9,957	\$5,920
EI	Chandler Elementary	102,086	0	1,361	0	90,713	\$34,752
SBS	City Of Worcester Fire	UNK	45	295	3	21,815	\$16,234
SBS	City Of Worcester Schools	75,836	332	1,283	26	108,358	80,733
SBS	City Of Worcester Fire	UNK	28	100	3	8,386	\$0
SBS	Clark Street Community	38,250	12	55	1	4,978	\$9,429
EI	Doherty High School	168,126	30	211	2	14,079	\$8,696
EI	Elm Park Community	66,651	239	793	18	61,562	58,996
SBS	Flagg Street Elementary School	43,617	13	71	1	6,633	12,025
EI	Goddard School	119,972	45	299	3	19,914	\$11,840
SBS	Jacob Hiatt Elementary School	52,000	379	1,182	29	97,711	66,481
SBS	May Street Elementary School	35,912	54	214	4	18,032	19,063
SBS	Mill Swan Elementary School	35,539	14	66	1	5,787	\$9,484
EI	South High School	246,000	50	373	10	74,676	\$44,400
SBS	West Tatnuck Elementary School	41,384	41	154	3	12,618	67,221
EI	Worcester Centrum	UNK	1,196	3,064	80	204,258	\$52,000
EI	Worcester East Middle School	155,392	104	1,490	8	114,619	\$37,972
D2	Worcester Public Schools	68,512	3,966	14,409	248	900,571	\$361,475
D2	Worcester RTA (Rapid Transit Services)	UNK	164	1,073	11	71,523	\$4,850
	Total	154,0961	34,720	137,401	2,209	9,296,625	\$911,561

Worcester has hired a consultant to put together a performance contracting project that will include not only the K-12 schools but other municipal buildings as well.