Worcester and Middlesex Counties (portions of each) Massachusetts

Ashburnham
Ashby
Athol
Ayer
Clinton
Fitchburg
Gardner
Groton
Harvard
Hubbardston
Lancaster
Leominster
Lunenburg
Petersham
Phillipston
Royalston
Shirley
Sterling
Templeton
Townsend
Westminster
Winchendon
and Devens

MONTACHUSETT REGION ENERGY PLAN

PHOTO COURTESY OF DANA ARMSTRONG/MWCC

10/21/2011

Prepared by the Montachusett Regional Planning Commission (MRPC) in partnership with Worcester Polytechnic Institute (WPI)

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Economic Development Administration (EDA)

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1. INTRODUCTION AND OVERVIEW

In October 2010, the Montachusett Regional Planning Commission (MRPC) was awarded a one year financial assistance award in the amount of $66,000 from the U.S. Department of Commerce's Economic Development Administration's Philadelphia Office to conduct a Regional Energy Plan for the Montachusett Region. The MRPC served as lead applicant for this project. MRPC is a unit of regional government created under the General Laws (MGL Chapter 40B, Sections 1-8). Regional planning commissions (agencies) provide planning advisory services and technical assistance to its 22 member communities. MRPC partnered with Worcester Polytechnic Institute (WPI) to develop the plan and the Montachusett Energy Advisory Committee, formed in January 2010, provided oversight of the project.

The entire Montachusett Region is the location and beneficiary of this plan. The Montachusett Region is located in Northern Central Massachusetts and consists of portions of both Worcester and Middlesex Counties. The region is comprised of Devens, the cities of Fitchburg, Leominster and Gardner and the towns of Ashburnham, Ashby, Athol, Ayer, Clinton, Groton, Harvard, Hubbardston, Lancaster, Lunenburg, Petersham, Phillipston, Royalston, Shirley, Sterling, Templeton, Townsend, Westminster and Winchendon. Population ranges widely from 1,234 persons in the Town of Petersham to a high of 40,759 in the City of Leominster, according to the 2010 U.S. Census.

It is a well-known fact that energy and fuel costs derived from fossil fuels are quickly sent out of our regional economy but, in contrast, renewable energy and energy efficiency keep more of those dollars in our local communities and regional economy. By reducing the total energy requirements in the region, improved energy efficiency will make increased reliance on renewable energy sources more practical and affordable. Moreover, renewables are not subject to fossil fuel price volatility – energy prices in a region with both efficiency and renewable energy are likely to see less volatility and lower average power prices, since price spikes will be reduced.

Efficiency and renewable energy also provide complementary economic development benefits by generating investment and employment in different sectors, which expands the total economic stimulus effect. Additionally, renewable energy also has a high job growth rate and there is an effort at Fitchburg State College and Mount Wachusett Community College to educate and train people in the skill areas necessary to fuel the clean energy transition.

The goal of this Regional Energy Plan is to promote the reduction of electricity used, energy used for transportation, and non-electric energy used for heating; replacement of fossil fuels with renewable sources, and reduce global climate change emissions. It is also hoped that this Regional Energy Plan will help the Commonwealth of Massachusetts meet its clean energy goals, as expressed in the Green Communities Act, the Global Warming Solutions Act and the policies of the Patrick Administration and result in sustainable green enhancements to energy efficiency and production within the Montachusett Region.

The scope of this project entailed the completion of seven tasks (see Appendix A). Tasks included

quarterly meetings of the Montachusett Advisory Committee to provide oversight of the project, a renewable energy regional inventory, energy model simulation forecasting that formulated by a team of WPI students along with faculty and a System Dynamics Consultant, design and construction of energy educational exhibits displayed at the 2011 American Planning Association National Conference in Boston, six community workshops, a wrap-up event, and of course this final report that includes both regional and local energy related recommendations.

A. Acknowledgements

The Montachusett Regional Planning Commission would like to thank the following contributors:

- The Montachusett Region Energy Advisory Committee who provided valuable input and oversight throughout study in its entirety. Special thanks to Sean Hamilton, manager of the Sterling Municipal Light Department, for continuing to chair this committee.

- **Worcester Polytechnic Institute (WPI)** and Professor Michael Radzicki along with a team of students that worked on energy model simulations as part of this project (pictured on right). Students included Michael P. Vaudreuil, Daniel R. Guerin, Mark R. Arnold, and Benjamin S. Timms.

- Presenters at the six regional workshops for their time and efforts to educate and inform the regions businesses, students, municipal leaders, and the general public. Speakers included: State Representative Stephen DiNatale, State Representative Dennis Rosa; Kelly Brown, MA Department of Energy Resources; Noreen Piazza, Lancaster Planning Director; Michael Radzicki, Professor, WPI and Sterling Planning Board Member; Donald McCauley of McCauley Lyman LLC and Minutemen Wind; John Fitch of Princeton Municipal Light; Joel Lindsay, Program Manager for Weston Solutions, and; Amy Barad, Project Manager with the Clean Energy Center. We would also like to thank our Chairman, Victor Koivumaki, for moderating the Regional Energy Plan Press Conference and Wrap-up Event.

- Participating residents, business owners, and public officials and all other stakeholders who participated in the Press Conference, the six workshops, and the Wrap-Up Celebration in October 2011. Moreover, events such as these need to be held in suitable locations. The support received from communities (Lancaster, Athol, and Clinton), Evergreen Solar, the Doyle Conservation Center, the Cosgrove Intake Facility, Mount Wachusett Community College (Gardner Campus), the Harvard Public Library and the Red Apple Farm in Phillipston was considerable.

2. THE PLANNING TEAM

A. Montachusett Region Energy Advisory Committee

The Montachusett Region Energy Advisory Committee (EAC) was formed in January 2010 prior to this grant award and it will remain intact indefinitely. This Committee has incorporated members over time leading to additional activities and accomplishments while serving as a model to others. In fact, the Energy Advisory Committee played a role in obtaining grant funds from the U.S. Department of Commerce, Economic Development Administration (EDA) in October 2010 to devise an energy plan for the Montachusett Region.

The Advisory Committee is comprised of representatives of both the private and public sectors including, among others, National Grid, Unitil, Planning Board Members, municipal planning staff, municipal light plants, MassDevelopment, Heywood Hospital, municipal emergency management directors, and environmental groups i.e. Nashua River Watershed Association. A complete listing of those serving on the Montachusett Energy Advisory Committee can be found in Appendix **B**.

MARCH 11, 2011 ENERGY ADVISORY COMMITTEE MEETING

Since the beginning of this particular project, the Energy Advisory Committee met a total of four times (November 19, 2010, March 11, 2011, May 13, 2011, and September 16, 2011) to provide oversight of grant activities. During these meetings, significant contributions and accomplishments were made ranging from the interview of the consultant responsible for oversight of WPI students to ensure a quality product, reviewing and providing input on the inventory of renewable energy facilities throughout the region, and commenting on the final draft report at the September meeting. In short, all meetings were well attended and significant input and contribution towards the project were realized. Agendas and meeting minutes can be found in Appendix **C.**

B. Worcester Polytechnic Institute

MRPC Staff collaborated with Michael Radzicki, Associate Professor of Social Science and Policy Studies at Worcester Polytechnic Institute and Sterling Planning Board Member, to form a team of four students. Student in-kind services were utilized to develop a System Dynamics computer simulation Regional Energy Model to forecast the energy demands for the Montachusett Region under a variety of simulations and scenarios.

Throughout the duration of the project, MRPC Staff was in regular contact with Professor Radzicki and the student team to assist their efforts. WPI Students presented initial work to the Energy Advisory Committee in March 2011 to obtain input and guidance. The students' final product was presented in May 2011**.** As part of the presentation, model runs were used for a number of situations such as increases in oil price, electrical demand, and green production of energy. Consultant Jennifer Andersen further refined the model during the summer months. The model simulation was available on MRPC's website for public use in October 2011.

C. System Dynamics Consultant

As part of the Regional Energy Plan project, a consultant was hired to provide oversight of WPI students facilitating and assuring the development of a quality product. MRPC staff worked to put together the Request for Qualifications (RFQ) and carefully adhered to federal and state procurement laws. Proposals were due on or before November 3rd at 1pm. MRPC received one proposal from Jennifer Andersen from Lancaster, Pennsylvania. MRPC's review committee, which included two MRPC staff members and Mike Radzicki (WPI Associate Professor), reviewed and ranked the proposal and recommended that Jennifer Andersen be interviewed by the Montachusett Region Energy Advisory Committee.

The Energy Advisory Committee met on November 19, 2010 where the consultant was interviewed. The Committee voted to recommend to MRPC Commission Members to hire Consultant Jennifer Andersen to provide WPI Student Oversight and ensure a quality product. Based on the recommendation of the Montachusett Regional Energy Advisory Committee, MRPC Commission Members voted to hire Jennifer Andersen at the monthly MRPC Meeting held on November 30, 2010. A contract was signed between MRPC and Jennifer Andersen on December 1, 2010.

The consultant worked diligently with the student team throughout the duration of the project and further refined the student's model during the summer months after the students work was completed in May. The model simulation is available on MRPC's website for public use as of October 2011.

3. PUBLIC PARTICIPATION AND INVOLVEMENT

From the beginning of the project, MRPC and its partners realized that, to be successful, the project must involve a large constituency. Broad-based public support would result in a plan that meets the needs and desires of the region and provide the groundwork for implementing recommendations.

Public participation and involvement, outlined below, included a widely publicized Press Conference to announce federal funding, six regional workshops, educational materials and exhibits, and a Wrap-Up event at the conclusion of the project. These events were widely advertised, well attended, and received much media attention. MRPC staff also presented updates on the study to MRPC Planning Commissioners and guests on a monthly basis at regularly scheduled Commission Meetings.

A. Press Conference

On October 22, 2010 MRPC held a widely publicized press conference at Evergreen Solar in Devens to announce federal funding for the project. The intention of the Press Conference was to raise awareness of the planning effort and engender stakeholder buy-in. Invited guests included local and state officials, town administrators, emergency management directors, utility providers, the business community and others.

More than 50 people attended. Speakers included: Victor Koivumaki, MRPC Chairman; Glenn Eaton, MRPC Executive Director; Sean Hamilton, Montachusett Region Energy Advisory Committee Chairman; State Representative Jennifer Benson; State Representative Stephen Dinatale; State Representative Dennis Rosa; John Hume, MRPC Director of Planning and Development and; Linnea Palmer Paton, a student at Worcester Polytechnic Institute. All speakers indicated the importance of renewable energy, energy conservation, and conducting this study. It received coverage from the Gardner News, Worcester Telegram, and Nashoba Publications. **(See Appendix D,** Outreach Efforts, Agenda, Press Coverage).

OCTOBER 22, 2010 REGIONAL ENERGY PLAN PRESS CONFERENCE AT EVERGREEN SOLAR, DEVENS

B. Six Community Workshops

Adhering to the scope of services within MRPC's contract with EDA, the MRPC hosted six energy related workshops that took place throughout various locations within the Montachusett Region. All six were widely publicized and open to the general public. Anyone interested was highly encouraged to attend including citizens, local and state officials, students, the regional business community and others. Attendance at all workshops was impressive, indicating much interest and importance throughout the region in energy related topics. Agendas and press coverage can be found in **Appendix E**. A description of each workshop follows. Moreover, PowerPoints and audio MP3 files can be found on MRPC's website at the following link http://www.mrpc.org/energyplan.htm.

- The **first** workshop was held on December 1, 2010 at Mount Wachusett Community College in Gardner. Professor Mike Radzicki and the students at WPI ran a Regional Energy Cafe to gather input from stakeholders to develop a system dynamics simulation model for future energy demands and needs within the Montachusett Region.

HELP FORMULATE A REGIONAL ENERGY FORECASTING MODEL WORKSHOP AT MOUNT WACHUSETT COMMUNITY COLLEGE, GARDNER

- The **second** workshop for this project was held in the Town of Lancaster's Town Hall on January 14th. A Massachusetts Department of Energy Resources staff member (Kelly Brown, Central MA Green Community Coordinator) presented initiatives and services to cities and towns on the path to becoming Green Communities. Lancaster, one of the first communities to become a designated Green Community, also provided valuable input.

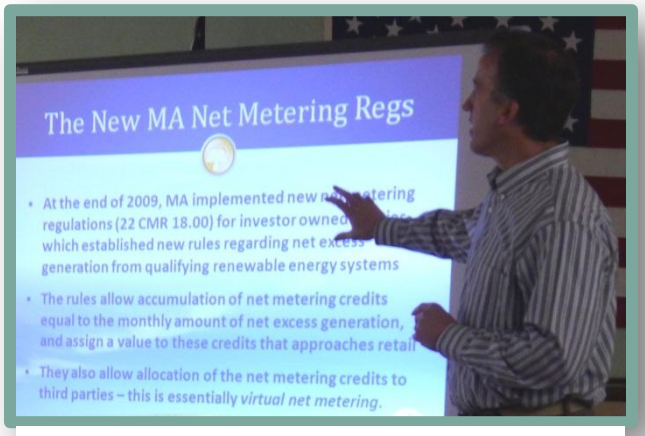
GREEN COMMUNITIES PROGRAM WORKSHOP AT LANCASTER TOWN HALL

- We had our **third** of six workshops on March 22, 2011 at the Doyle Conservation Center in Leominster. State Representative Dennis Rosa gave a legislative update on energy-related issues and Donald McCauley of McCauley Lyman LLC and Minutemen Wind and John Fitch of Princeton Municipal Light gave separate presentations on wind turbine siting.

  Guided tours of the Doyle Conservation Center were also available for attendees of the workshop. This facility provides a unique opportunity to demonstrate the importance and practicality of sustainable design. Photovoltaic panels, high-efficiency lighting and controls, a displacement ventilation system, high performance windows, a high performance building envelope, geothermal wells and carbon dioxide monitoring systems are all part of the building's sustainable design.

WIND TURBINE SITING WORKSHOP AT DOYLE CONSERVATION CENTER. LEOMINSTER

- We had our **fourth** workshop on May 5, 2011 at the Athol Town Hall. State Representative Stephen DiNatale gave a legislative update on energy-related issues and Joel Lindsay, Program Manager for Weston Solutions, gave a presentation on virtual net metering: how municipalities and businesses can generate renewable energy and sell it. New net metering rules for investor owned utilities in Massachusetts allow Towns or private developers to build renewable energy projects on private or public land, and credit the energy to their own facilities or sell it to third parties at close to a retail rate. It was discussed that these provisions were enacted in 2010 and have generated significant interest in new renewable energy development in the State.



NET METERING WORKSHOP HELD AT ATHOL TOWN HALL

- The fifth workshop took place in Clinton Town Hall on June 20. The workshop was about "Hydropower". Clinton Town Administrator Michael Ward opened the Workshop that included a tour of the Cosgrove Intake Facility at Wachusett Reservoir, an Update on Energy Related Legislation by Representative Stephen Dinatale, and a presentation by Amy Barad, Project Manager with the Clean Energy Center.

HYDRO POWER WORKSHOP AT CLINTON TOWN HALL AND COSGROVE INTAKE FACILITY TOUR

- The **sixth and final** workshop was held at the Harvard Public Library on September 29th. The "Solar in September" featured many speakers and was well attended. Senator Jamie Eldridge and Representative Stephen DiNatale gave legislative updates on energy issues. Kelly Brown of the MA Department of Energy and Environmental Affairs discussed incentive opportunities to help communities save money. Massachusetts Clean Energy Center representatives spoke about solar incentive programs. Members of the Harvard Energy Advisory Committee shared their experiences regarding becoming a Green Community and the selection of Solarize Mass solar installation discounts. New England Breeze Solar Installation President Mark Durrenberger discussed the project in Harvard. Real Estate Broker Victor Normand addressed relationships between solar installations, real estate property values and neighborhood desirability.

SOLAR IN SEPTEMBER WORKSHOP AT HARVARD PUBLIC LIBRARY

C. Energy Educational Exhibits

An educational exhibit was created and featured by MRPC staff members at the National American Planning Association (APA) Conference held in Boston, Massachusetts on April 9th through April 12th, 2011. Materials were also featured at all six scheduled workshops undertaken as part of this study. Materials development such as project descriptions, a renewable energy inventory and associated maps and other energy related information along with a web link on MRPC's website (http://www.mrpc.org/MREnergyPlan/index.htm) was initiated, distributed, and displayed. Additionally, this further assisted to help capture municipal and business decision-makers interest in committing to this study and the resulting recommendations.

APA CONFERENCE EXHIBIT, BOSTON, MA – APRIL 9 – 12, 2011

D. Wrap-Up Event

MRPC prepared for and conducted a Wrap-Up Event on Friday, October 21, 2011 at the Red Apple Farm in Phillipston, MA. The Red Apple Farm is 100% powered by sun and wind making it an ideal setting for this event (see www.redapplefarm.com). The event was a huge success with over 50 people attending. There were discussions of collaborative outreach and education, all work completed, and recommendations included in the report. Speakers included Congressman John Olver, Representative Stephen DiNatale, Kelly Brown from the Department of Energy Resources, Professor Michael Radzicki, Worcester Polytechnic Institute, Victor Koivumaki, Montachusett Regional Planning Commission, and Sean Hamilton, Montachusett Region Energy Advisory Committee. Also, staff from the MRPC and consultant Jennifer Andersen gave a PowerPoint on the


CONGRESSMAN JOHN OLVER SPEAKS AT WRAP UP EVENT

Regional Energy Plan. Press releases were submitted to local newspapers throughout the region, and the event was advertised on cable television. Invitations were forwarded to businesses, federal, state, and local politicians, educational institutions including Fitchburg State College and Mount Wachusett Community College, public and private sector economic development practitioners, community volunteers, planning boards, conservation commissions, zoning boards, selectmen and city councilors throughout the Montachusett Region. In short, invitations were extended to anyone with interest in the project. Athol Daily News, Gardner News and Fitchburg Sentinel and Enterprise also covered the event. Outreach efforts and press coverage of the event can be found in Appendix **F.**

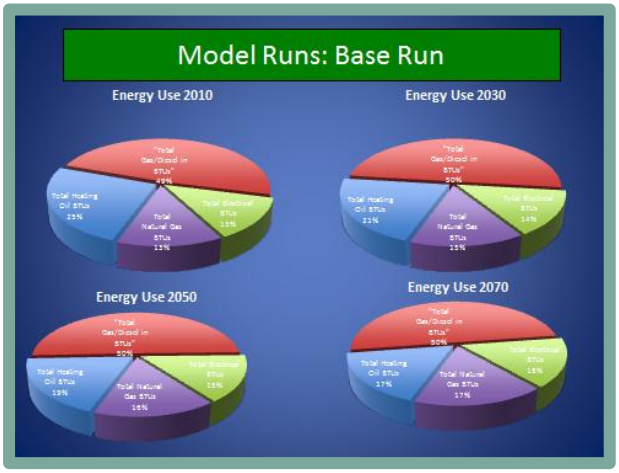
ATTENDEES AT WRAP EVENT THE EVENT

JENNIFER ANDERSEN PRESENTS THE ENERGY MODEL

4. ENERGY MODEL FORECASTING

As part of the development of the Montachusett Region Energy Plan, a simulation model was built based upon the system dynamics modeling methodology. This methodology evolved from the work of MIT Professor Jay W. Forrester in the 1950s. Forrester was an engineer by training and gradually adapted engineering principles to the study of social systems. System dynamics models are therefore feedback-rich, borrowing from the principles of control theory, which itself has evolved as an interdisciplinary field combining engineering and mathematics. Forrester applied his methodology to problems in industrial management[1] before turning his attention to the growth and stagnation of urban areas[2]. His work forms the theoretical basis of the model built for this project.

A. Why Model?



Setting up a computer simulation model can be time-consuming, even tedious. Along the way, many decisions have to be made regarding what should be included in the model, what can reasonably be left out, how much detail should be used to represent what is to be included, and so on. In the end, the model is always a simplification of reality. A legitimate question is "Why should we invest this time and effort?" The statistician George E.P. Box is credited with the words "All models are wrong, but some are useful." Forrester took this idea even further, pointing out that everyone uses models every day; after all, we don't have a school system in our heads, nor a company or a family. We have mental representations of these systems, and we make decisions based on them. These "mental models," just like any simulation model, are incomplete and subject to bias. Most significantly, however, is that mental models are difficult for others to discern; they are hidden from view.

One advantage to putting assumptions into a computer is that they are defined and available for examination. A group of people can use the process of building the model, as well as the model itself, to provoke conversation. Differences of opinion can be tested by simulating the model first with one viewpoint represented, and then with another, to see whether or not either make significant difference in the simulated outcome. When differences do occur, the structure of the model can help

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[1] Forrester JW. 1961. *Industrial Dynamics* MIT Press: Cambridge, MA. (Now available from Pegasus Communication, Waltham, MA).

[2] Forrester JW. 1969. *Urban Dynamics*. MIT Press: Cambridge, MA. (Now available from Pegasus Communication, Waltham, MA).

explain why one outcome is so much different from another. The value lies not in finding "the best" outcome, but in understanding what generates a particular desirable behavior pattern. Such controlled experimentation is not possible in real life, but a simulation model offers a convenient and risk-free laboratory to examine many plausible scenarios.

B. Scenario Planning for Energy Management

There are many approaches available to an organization wanting to create an energy plan, or any type of strategic plan. Planning for the future involves making assumptions about how the past and the present will influence and shape the future. Out of many possible paths, managing the future involves concentrating on a few desirable paths, while being aware of probable obstacles that will be on those paths. This too is part of our everyday lives. When we spy a dark cloud and take an umbrella along "just in case" or check the clock and take another route home because we know the normal route is most likely moving slowly due to traffic, we are performing a quick assessment of what could happen and then taking steps to counter any "glitches" we think we may encounter.

Using a simulation model, we can set up a formalized process of assessing possible future paths towards our goals. In the case of managing energy demand, the Montachusett region will be expected to do its part in meeting state-wide targets for lower greenhouse gas emissions in the coming decades. This is in response to the Global Warming Solutions Act signed by the Governor in 2008. Projecting what could happen over several decades involves much more uncertainty, and therefore more risk, than planning for tomorrow's weather or traffic situation. Scenario planning can be thought of as a specialized form of forecasting. Rather than point prediction ("Tomorrow's high temperature will be 82 degrees"), the focus is on understanding the various trajectories that energy demand could follow in the coming years, and how to influence them for the better.

C. Our Process for Building the Model

The simulation model has been built through a collaborative effort between the Montachusett Regional Planning Commission, Worcester Polytechnic Institute and a system dynamics consultant. The MRPC has provided domain knowledge about the region and its inhabitants, has gathered citizens to participate in a "World Café" facilitation session specifically to give input to the model building process, and has aided in gathering data for the model. Worcester Polytechnic Institute students have worked as a team, under the guidance of a system dynamics Professor serving as project advisor, to build the simulation model. WPI has a strong commitment to project-based student work and requires all students to complete several hands-on projects as part of their Bachelor degree education. Prior to the project, the students completed two courses in system dynamics modeling. This prepared them for building the model, but was not sufficient time to turn the model into a working application, complete with a user interface. This last task was handled by the consultant, who extended the students' work to create an interactive planning tool.

The World Café facilitation session was open to interested individuals of the Montachusett Region.

Participants were invited to react to a series of questions regarding energy demand in the region as well as what makes the region attractive (and unattractive). In small groups, they were asked to brainstorm ideas for each topic; groups dispersed and reformed for each topic to maximize the diversity of ideas. At the end of the brainstorming session, the facilitators (WPI Professor, assisted by the students and consultant) presented the ideas to the group as a whole. The discussion that followed focused on emerging patterns and themes that the students could use to prioritize their work in building the model. As stated earlier, model building involves deciding what to include and what to exclude from the model; the World Café session was the first step in that process.

D. The Paradox of Attraction

The questions at the World Café concerned the factors that will influence energy demand for the next 50 years and the factors that contribute to the attractiveness of the region. These ideas are closely intertwined. The state of Massachusetts seeks to build clean energy industries as a way of attracting jobs to the state and reducing dependence on energy sources located outside the state's borders. Simultaneously, the state wishes to lower greenhouse gas emissions by encouraging changes in energy use (conservation) and greater utilization of renewable energy sources. The Montachusett Region will participate in achieving these goals.

The "paradox of attraction" is an idea stemming from Forrester's work in Urban Dynamics. Given freedom of movement, the pursuit of progress in areas we would naturally like to see improve (better schools for our children, low unemployment, preserved natural areas, etc.) will eventually lead to more people moving into an area, until the pressures created by the new growth will counteract what made the place attractive in the first place. This is not to say that growth is bad, but rather that an area cannot remain more attractive than surrounding areas over the long term. The flow of people seeking to better their own situation, into and out of a city, town, state, or region, will eventually "even things out" so that the overall attractiveness of a particular place is not significantly different than neighboring areas.

It is important to note that absolute attractiveness cannot be quantified. The issue at hand is one of relative attractiveness. Assumptions can be made about what makes a place more or less attractive, including what appeals to particular age groups. As the various factors that contribute to attractiveness improve or decline over time, people move into or out of the area *in relatively greater or lesser quantities* than they would have done had these factors not changed.

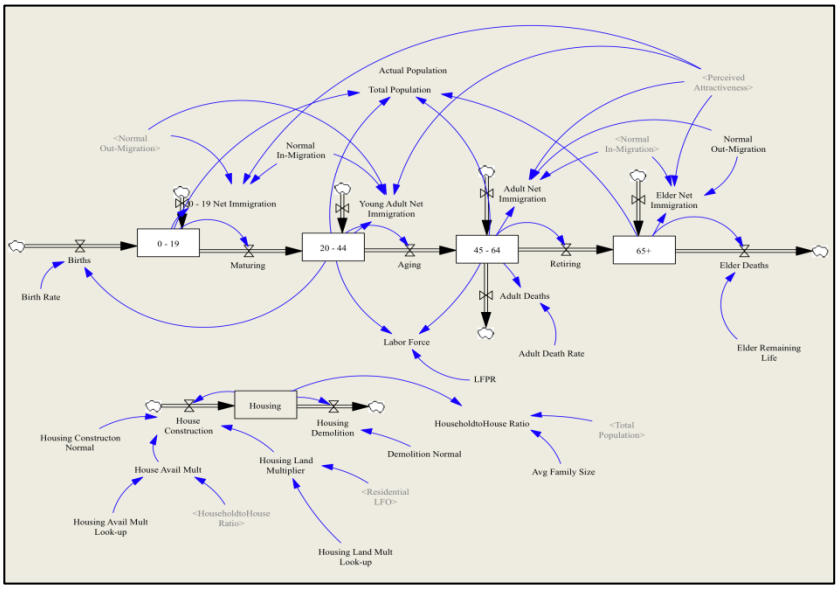
In terms of energy planning, if the Montachusett Region captures some of the job growth assumed to result from the Massachusetts Clean Energy and Climate Plan, the economy of the region will likely benefit. There will also be unintended consequences stemming from the new growth. People tend to move to areas of job creation. They build houses, enroll their children in their local schools and commute to work. They also add to the energy demand of the region. Using less energy per person helps to achieve the State goals, but what if there are many more people? The model built for this

project helps to investigate these concerns.

E. Model Sectors

The Montachusett Region physically consists of 22 communities. To examine energy demand for the region as a whole, the model aggregates all 22 communities into one virtual community. It does not distinguish between people living in Gardner or Fitchburg; they are all part of the same region. Similarly, migration of people between towns is not considered in this version of the model. The following is a brief overview of each sector of the model.

Demographics - The Flow of People



The population of the region is divided into four age groups, Children (0 – 19), Young Adults (20 – 44), Adults (45 – 64) and Elders (65+). The region has a birth rate by which Children are added to the population. Adults and Elders lose people to death. As time progresses in the model, people "age" by moving from one age group to the next.

The region experiences migration in each age group. A constant fraction of each age group is assumed to move into and out of the region at all times. This base level of migration is modified by the attractiveness of the region to each age group. For example, Young Adults are assumed to be concerned with school quality, so their attractiveness component has a higher emphasis on this factor.

The labor force is assumed to be comprised of the Young Adults and Adults age groups; although 16 – 18 year-olds often hold part-time jobs, their presence would be insignificant to the labor force of the region as a whole.

Houses, Businesses and Land Use

The region encompasses housing structures and businesses (both commercial and industrial), all of which occupy land and are assessed for tax purposes. Housing structures are assumed to be constructed when population outstrips available supply, but is also limited to the amount of land zoned for residential use.

Businesses can move into or out of the region, just as people can, but the factors driving such migration (factors of business attractiveness) are different than those affecting the migration of

people. The presence of businesses affects the migration of people through job creation.

Public Services (Schools, Fire Protection, Police Protection, Public Works)

The population of the region depends on public services just as any individual community would. Each of these areas is aggregated for the region. Budget requests that go unfulfilled can negatively affect the region's attractiveness. Schools are funded through a combination of local property taxes and state aid (Chapter 70 aid). Because the state ensures a per-student funding level closely on par with the national average, the model uses the ratio of local funding to state aid in the attractiveness calculation. Over time, if the region is prospering, the region would presumably shoulder more of the burden for educating its students and become less reliant on Chapter 70 aid.

Fire and police services are calculated according to the size of the region's population and national averages for ratios of service people to the population. The effectiveness of these services is also due to the equipment at their disposal. Unfunded requests for new hires and equipment purchases can therefore negatively affect the attractiveness of the region.

Changes in population also affect the level of spending for public works in the region. Over time, public works spending per person tends to grow, as new technology and/or methodologies are incorporated into residential and business expansion. Growing populations also stress the region's services by requiring more roads to be plowed, more trash to be picked up, and so on.

Budgeting of Scarce Resources

The budgeting calculations in the model allocate scarce resources according to a set of priorities. School funding is considered to have top priority, with all other needs equally weighted. This part of the model essentially closes the loop between population growth, which drives energy demand, and the attractiveness of the region. When an area is unable to fund the services its population considers important, the overall attractiveness will be lower than it would be if all services were fully funded.

Attraction to people and businesses

The components of attractiveness for people and businesses are largely derived from the other sectors of the model. A weighted average calculation is used to determine each composite attraction factor, which then drives the migration of people and businesses. It is assumed that children and young adults migrate according to the same factors; the adult age group is not considered to be of child-bearing age.

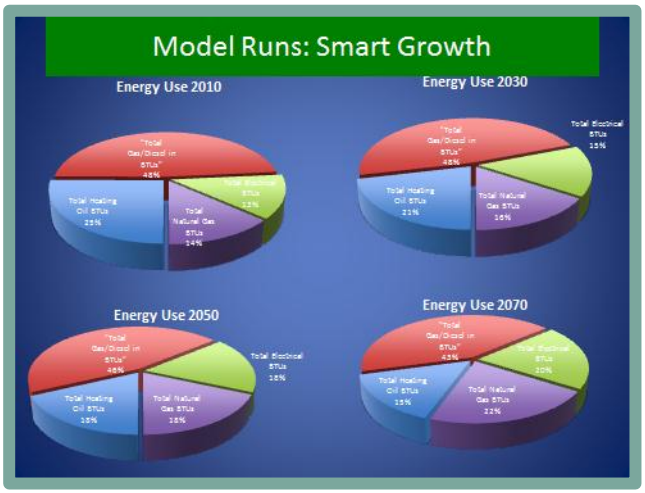
Energy demand

Energy demand is tracked for heating oil, natural gas, electricity and gas/diesel fuel. The increase or decrease in energy demand per capita for such non-renewable energy sources can be used as a metric for judging relative success or failure for various scenarios aimed at achieving energy conservation goals.

F. Results

The model has been used to run various scenarios concerning job growth, changes in the population age groups, energy use by homes and businesses, and others. Policies concerning "smart growth," whereby the region preserves open space and avoids sprawl, are very encouraging. The public may view more information about the model structure and see graphs showing scenario runs on the MRPC website (www.mrpc.org). Please keep in mind that upon request and at the conclusion of this study, MRPC can run additional model scenarios for MRPC communities. Here we present a brief overview of conclusions we have been able draw.

- Preserving open space and avoiding sprawl conserves energy (see Smart Growth model run) but can lead to less total energy savings, in the long term, than expected. This is because these measures also make a region more attractive to live and work, and therefore can spur migration of people into the area. So, even if energy-per-person drops, if enough people move into the area, the energy savings will be less overall. However, from a national, state, regional and local level it makes sense to work together to preserve open space and encourage smart growth leading to energy savings.



- Encouraging the use of hybrid and electric vehicles saves fuel such as gasoline and diesel but the region would see an increase in electricity demand (see Hybrids vs. Electric Cars model run). This version of the model does not include energy supply, so the assumption is that needed electricity could be supplied on demand. How the region would want to address supplying more electricity, through traditional or renewable means, would be a topic of further study. For example, an electric grid must be able to handle the sporadic input from solar or wind power without compromising reliability of power to end users.
- The Oil Embargo model run analysis underscores the fact that there would be long-lasting economic consequences to any extended interruption of the region's supply of imported oil. The model does not include energy prices, but we can assume that the price of oil would increase dramatically if world supply suddenly drops. Demand for other sources of energy, such as natural gas, would increase as a result, as consumers sought to maintain their living standard by retrofitting homes and businesses to use other types of fuel. A region that has other sources of supply readily available may do better than areas of the country wholly dependent on imported oil.
- Implementing changes such as those outlined in the Pickens Plan model run (based on ideas

from T. Boone Pickens, an oil and gas executive) is also supposed to address the problem of the country's dependence on imported oil, but proactively rather than reactively. Pickens advocates adapting the electrical grid for distributed wind and solar power generation. This would allow more natural gas to be diverted to the transportation sector. The full implications of the Pickens Plan are beyond the scope of this work, but similarly to the Smart Growth run, changing from traditional to renewable energy sources requires the same (or better) reliability in the experience of the end consumer in order to be feasible. Whether or not Massachusetts has the natural ability to generate the needed power using wind and solar supplies is an area for further study.

WPI's Report entitled "System Dynamics Computer Simulation Modeling to forecast the Energy Demands of the Montachusett Region Under a Variety of Simulations and Scenarios" as well as WPI's Power point presentation on the region's energy model are hereby incorporated into this report by reference and can be viewed at http://www.mrpc.org/MREnergyPlan/WPIReports.pdf

5. RENEWABLE ENERGY INVENTORY

An inventory of exiting renewable energy development throughout the Montachusett Region was conducted to identify and map renewable sources of electricity and heat that would contribute to the power generated in the region. The inventory consists of wind energy, solar photovoltaic energy, geothermal, landfill gas, hydro, and Biomass. This information was used in-part to support educational events that highlight and showcase existing renewable energy projects to educate the public. This information has been and will continue to be used for enhanced materials development such as fact sheets, rapid response articles, and websites to help capture municipal decision-makers interest in committing to a portion of our region's renewable energy program. This inventory has been formatted to facilitate its update on a yearly basis.

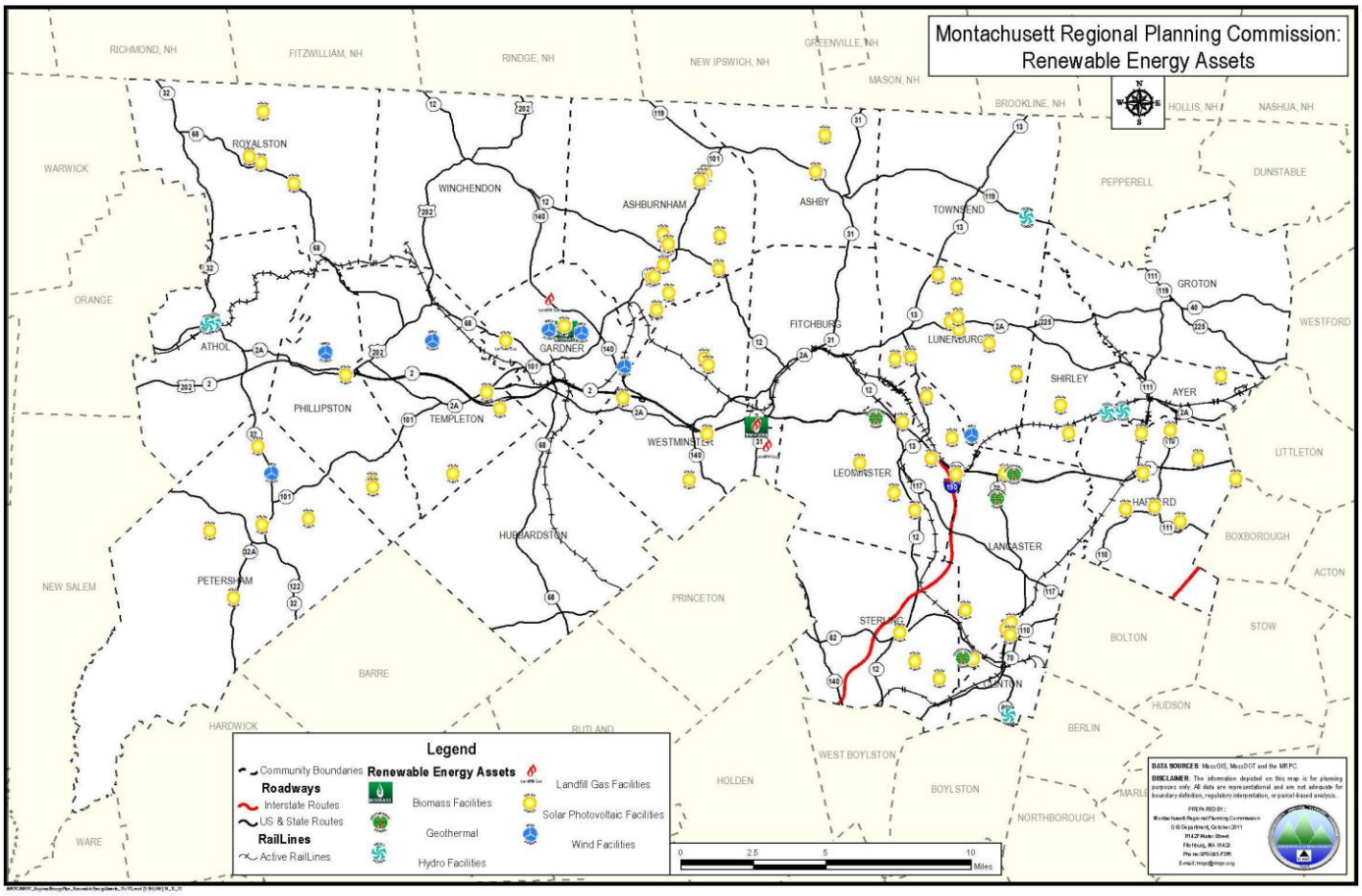
MRPC obtained locations for renewable energy by reaching out to the Building Departments in each of the 22 communities in the Montachusett Region. Letters were mailed out in February 2011 to the municipal building staff that asked if they were aware of any solar panels, wind energy systems (large or small), geothermal, landfill gas, hydro or biomass systems in their community since a home, commercial or industrial building would need a building permit to install many of these systems. MRPC provided a self-addressed stamped envelope with a form to fill out to provide a list of any renewable system in their community. If the community didn't respond a phone call was made in March 2011 and then a second letter was mailed in July 2011. MRPC was able to obtain information regarding local renewable energy systems within 18 of its 22 communities. To view these renewable energy systems, see map that follows on the next page. The communities that we did not have data from are Fitchburg, Groton, Hubbardston and Winchendon.

MRPC's Geographic Information Systems (GIS) Staff created a data set indicating locations of renewable energy sources that MRPC's Comprehensive Planning Department assembled based on the information provided by the Building Departments. The categories include Biomass Facilities, Geothermal, Hydro Facilities, Landfill Gas Facilities, Wind Facilities, and Solar Photovoltaic Facilities (this category includes private residencies using solar panels as well as business entities). Each record in the renewable energy sources data set survey results had an address associated with it. Using the address data, points were created through GIS analysis to create a spatial location associated with that renewable energy location/resource. The GIS process used is a method referred to as Geocoding. The geocoding tool takes a spreadsheet of address data and cross references it with a GIS location address matching data set resulting in automaticity of point locations spatially.

However geocoding is not always able to provide a 100% match for every record with an address data set. Sometimes there are addresses that do not match and need to be located manually. Therefore the combination of both parcel data and aerial imagery was utilized to create a manual spatial location for remaining renewable energy records that were not matched using the geocoding analysis tool. The address was located within the parcel data and then the aerial image was used to create the location

point directly on the exact building or location of the particular renewable energy resource. Once every renewable energy resource location within the Montachusett Region was created, the symbology was assigned to each of the categories (Biomass Facilities, Geothermal, Hydro Facilities, Landfill Gas Facilities, Wind Facilities, and Solar Photovoltaic Facilities) in order to make the map easily readable to all users. The final product resulted in a Montachusett Region-wide map indicating all sources of renewable energy. This map will be periodically updated.

A. Renewable Energy Assets Map



B. Renewable Energy Assets Address List

The table that follows depicts the addresses of the renewable energy assets shown in the map on the previous page.

Type	*Size (Kw)*	*Street Address*	*Community*	*Property*
Solar	10.6	24 Williams Road	Ashburnham	Ashburnham Municipal Light
Solar	16.8	10 Oakmont Drive	Ashburnham	Oakmont Regional High School
Solar	16.8	99 Central Street	Ashburnham	Ashburnham Public Safety Building
Solar	5	Jewell Hill Road	Ashburnham	Residence
Solar	10	Cushing Street	Ashburnham	Residence
Solar	10	Ashby Road	Ashburnham	Residence
Solar	6.3	Ashby Road	Ashburnham	Residence
Solar	10	Ashby Road	Ashburnham	Residence
Solar	4	Cashman Hill Road	Ashburnham	Residence
Solar	5	Hastings Road	Ashburnham	Residence
Solar	4.5	Russell Hill Road	Ashburnham	Residence
Solar	3.37	Cushing Street	Ashburnham	Residence
Solar		Frost Road	Ashby	Residence
Solar		692 Main Street	Ashby	Residence
Hydro		121 Crescent Street	Athol	LS Starrett Company
Hydro		134 Chestnut Hill Ave	Athol	LP Athol Cresticon Hydroelectric Rehabilitation
Solar		Doe Valley Road	Athol	Residence
Solar		Yale Avenue	Athol	Residence
Solar		Laurel Street	Athol	Residence
Solar		Miles Road	Athol	Residence
Solar	5.6	Orchid Lane	Ayer	Residence
Hydro		323 West Main Street	Ayer	Grady Research
Hydro		301 Boylston Street	Clinton	Cosgrove Intake Facility
Solar		444 Green Street	Gardner	MWCC
Landfill Gas		744 West Street	Gardner	Transfer Station
Biomass		444 Green Street	Gardner	MWCC
Wind		444 Green Street	Gardner	MWCC
Wind		500 Colony Road	Gardner	No. Central Correctional Institution
Solar	152	325 Ayer Road	Harvard	Retail/Office Development
Solar	5	15 Elm Street	Harvard	Senior Center
Solar		Slough Road	Harvard	Residence
Solar	5	Old Mill Road	Harvard	Residence

Solar	5	Old Shirley Road	Harvard	Unknown
Solar	5	Madigan Lane	Harvard	Residence
Solar	5	Littleton Country Road	Harvard	Unknown
Solar	5	Quarry Lane	Harvard	Residence
Solar		Fort Pond Road	Lancaster	Residence
Solar		Nicholas Drive	Lancaster	Residence
Solar		Mill Street	Lancaster	Residence
Solar		Bolton Road	Lancaster	Residence
Solar		South Meadow Road	Lancaster	Residence
Solar		Carter Street	Lancaster	Residence
Geothermal		Moffett Street	Lancaster	Residence
Geothermal		Fort Pond Inn Road	Lancaster	Unknown
Geothermal		Lunenburg Road	Lancaster	Unknown
Solar	5	Avon Street	Leominster	Residence
Solar	3.69	Farm Hill Road	Leominster	Residence
Solar		925 Mechanic Street	Leominster	Gove Farm
Solar	4.8	Pheasant Run Circle	Leominster	Residence
Solar		92 Wildflower Road	Leominster	Residence
Solar	307.9	115 Erdman Way	Leominster	BJs Warehouse
Solar		25 Mohawk Drive	Leominster	Mohawk Drive Corporation
Solar		42A Terrace Drive	Leominster	Litchfield Terrace Apts.
Geothermal		325 Lindell Avenue	Leominster	North County Land Trust
Solar		325 Lindell Avenue	Leominster	North County Land Trust
Solar	100	Northfield Rd	Lunenburg	Residence
Solar	4.2	Pleasant Street	Lunenburg	Residence
Solar		Arbor Street	Lunenburg	Residence
Solar		Burrage Street	Lunenburg	Residence
Solar		Main Street	Lunenburg	Residence
Solar		Valley Road	Lunenburg	Residence
Wind	0.4	Lancaster Ave	Lunenburg	Residence
Solar		308 Electric Ave	Lunenburg	Lakeview Nurseries
Solar	5.7	Whiting Street	Lunenburg	Residence
Solar	3.78	Holman Street	Lunenburg	Residence
Solar	4.3	324 Electric Ave	Lunenburg	Retail Development
Solar		Sunset Lane	Petersham	Residence
Solar		Maple Lane	Petersham	Residence
Solar		324 N. Main Street	Petersham	Fisher Museum
Solar		West Road	Petersham	Residence
Solar		Hardwick Road	Petersham	Residence
Wind		North Main Street	Petersham	Residence
Solar	0.285	Narrow Lane	Phillipston	Residence
Solar	0.22	Narrow Lane	Phillipston	Residence
Solar		35 State Road	Phillipston	King Phillip Restaurant
Solar	9.84	455 Highland Ave	Phillipston	Red Apple Farm
Wind	15	455 Highland Ave	Phillipston	Red Apple Farm

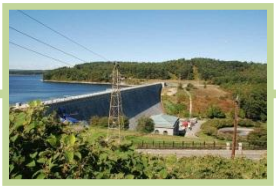
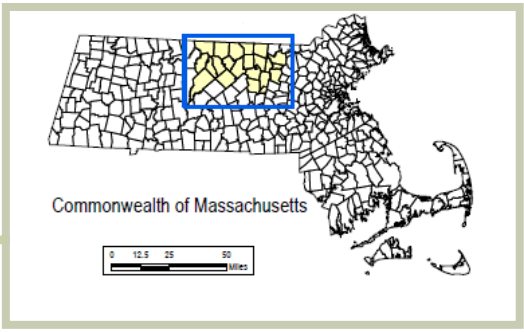
Solar	200	North Fitzwilliam Road	Royalston	Residence
Solar	210	North Fitzwilliam Road	Royalston	Residence
Solar	250	122 North Fitzwilliam Road	Royalston	Royalston Custom Oak Timber Frames
Solar	3.6	South Royalston Road	Royalston	Residence
Solar	65	2 Shaker Road	Shirley	Phoenix Park
Solar	4.83	Benjamin Road	Shirley	Residence
Solar		109 Chace Hill Road	Sterling	Rocky Acres Farm
Solar	220	Kendall Hill Road	Sterling	Residence
Solar		2 Leominster Road	Sterling	Unknown
Solar		12 South Main Street	Templeton	Unknown
Solar		Turner Lane	Templeton	Residence
Solar		White Circle	Templeton	Residence
Wind		464 Baldwinville Road	Templeton	Naragansett Regional School District
Hydro		72 Main Street	Townsend	Townsend Historical Society
Landfill Gas	3200	101 Fitchburg Rd.	Westminster	Fitchburg Landfill
Solar	4.5	Narrows Road	Westminster	Residence
Biomass	18000	2 Rowtier Drive	Westminster	Fitchburg Power Station
Landfill Gas		2 Rowtier Drive	Westminster	Fitchburg Power Station
Solar	4	South Ashburnham Rd	Westminster	Residence
Solar	5.67	South Ashburnham Rd	Westminster	Unknown
Solar	3.52	Sunset Road	Westminster	Residence
Solar	5.5	West Princeton Rd	Westminster	Residence

6. REGIONAL ENERGY ISSUES, RECOMMENDATIONS, AND NEXT STEPS

The Montachusett Region

Recommendations for a clean-energy future



A:Overview: For the Montachusett Region to have a prosperous and sustainable future, effort should be taken on the local level to ensure that integration of renewable energy sources is encouraged, supported, and made easy through municipal intervention. There are many reasons why utilization of renewable energy is necessary on the national, state, regional and local level. First and foremost, traditional fuel sources are expensive, and as international supply declines and demand rises, prices will have negative effects on internal and external regional investment. Second, renewable energy sources are clean, abundant and accessible here in our region. Thirdly, as renewable energy replaces fossil fuel consumption, air quality for Greater North Central Massachusetts will increase as harmful emissions decline. Lastly, and of significant importance to our Region, renewable energy can create new industries, revive manufacturing, and bring about new opportunities for municipal revenue.

Renewable energy can create new industries, revive manufacturing, and bring about new opportunities for municipal revenue.

There are many steps cities and towns within the Montachusett Region can take to ensure renewable energy is "made easy". First, local governments should maintain and update land use regulations relating to wind energy placement, solar permitting, geothermal processes, hydropower, and so on. Even if some of these sources of electricity do not seem attractive to your particular city or town, it is best to plan ahead, as often times conditions do change. To ensure renewable energy sources are integrated into local specific strategic and scenario plans, each city and town should have an Energy Advisory Committee. Energy Advisory Committees play an important role utilizing research, analysis and providing recommendations regarding energy

WHAT IS NET METERING? MA state regulation allows customers to receive value during periods when their eligible on-site distributed generation (such as a wind turbine, solar array or geothermal) generates more electricity than they use. That is, the electric meter runs backward whenever a customer's net metered facility is producing more power than is being consumed and their account gets net metering credits for net excess generation at the end of the customer's monthly billing period.

conservation, energy efficiency, and allow for an easier conversion to renewables. Energy Advisory Committees can work on the local level to implement new policies, determine cost benefits and gain public support and participation for green energy projects.

Aside from Energy Advisory Committees, each town should make it easy for residents to learn more about renewable energy opportunities by using their town websites. On each website, there should be a link specifically for energy resources, a link to the state of Massachusetts' Renewable Energy Toolkit, and any local events or public hearings regarding site placement of renewable projects. The more residents are educated about the necessary and inevitable conversion to renewable energy, the greater opportunities for real public participation to occur. Residents should also be educated about net metering, which provides the financial incentive to use renewable energy sources, especially in a region with statistically high utility rates. As the Montachusett Region moves forward with plans for a future with renewable energy, public participation will make the process easy, transparent and rewarding for all parties involved.

Become a Green Community: Of the 22 cities and towns in the Montachusett Region, five are considered a "green community" by the Massachusetts Department of Energy Resources. Becoming a DOER green community is a title awarded to accepted applicants of the States Green Communities Grant Program. The goal of the program is to help cities and towns maximize energy efficiency in public buildings, including schools, city halls, and public works and public safety buildings as well as generate clean energy from renewable sources; and manage rising energy costs. To be an eligible grant recipient, cities and towns must carry out all or a portion of the tasks covered by the program.

Become a Massachusetts DOER Green Community by:

- studying, designing, constructing and implementing energy efficiency activities;
- procuring energy management services;
- installing energy management systems;
- adopting demand-side reduction initiatives or energy efficiency policies; and,
- siting activities and construction of a renewable energy generating facility on municipally- owned land.

Created in 2008 by the Green Communities Act, the Green Communities Division's charge is to guide all 351 cities and towns along a path of enhanced energy efficiency and renewable energy toward zero net energy. Whether they are advanced energy savers or newcomers to this field, each municipality will be well served by the energy experts in the Green Communities Division.

A. Recommendation Highlights

For the Region

1.) Continue energy education/outreach/workshops. The need for renewable energy should been seen as a high priority across the region and be supported by municipalities and elected officials, business leaders, residents, utility companies and others.

2.) MRPC, the Comprehensive Economic Development Strategy (CEDS) Committee, and the Montachusett Regions' Energy Advisory Committee (EAC) should move forward with planning and implementation strategies by continually seeking and securing additional energy related state and federal funding opportunities.

3.) Energy conservation and efficiency in the regional and local transportation sector should be promoted through effective land use planning, investments targeted to encourage use of alternative transportation modes (bicycle and pedestrian,

public transportation, rail), and funding for infrastructure to support alternative fueled vehicles.

4.) Businesses and projects that will increase the use of renewable energy and smart grid technology across the region should be supported. MRPC and the CEDS Committee could assist with this recommendation.

5.) Identify ways renewables can assist communities to reach broader climate changes, environmental and sustainability goals.

6.) Identify how solar can contribute to community revitalization through placement on Brownfields and vacant industrial space to enhance economic competitiveness.

On the Local Level

1.) Municipalities should take the lead on renewable energy integration into existing day to day operations by establishing a municipal energy committee to oversee development of energy plans and implementation projects.

2.) Identify specific strategies for reducing municipal energy consumption (buildings, vehicles, machinery and equipment, lighting and operations) by developing a comprehensive municipal energy plan.

3.) Municipalities should have a complete energy audit to identify short and long term actions that will save energy. An energy audit will establish where and how energy is being used in your buildings and facilities. It identifies opportunities and provides recommendations for energy and cost savings.

4.) Become a Green Community. A designated Green Community demonstrates a commitment to reducing energy consumption, pursuing clean renewable and alternative energy projects, and providing economic development in the clean energy sector.

5.) Explore net metering and how it will benefit your community.

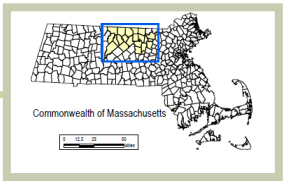
6.) Make sure your community has renewable energy bylaws/ordinances in place.

7.) Projects or policies that encourage regionalization, relocalization, and sustainable development practices promoting smart growth should be supported.

8.) Municipalities should encourage residents to take action on the individual level by creating pamphlets that educate about renewable energy options.

9.) Forge public/private partnerships for renewable energy.

10.) Consider solar placement on vacant buildings to attract business. Determine the feasibility of municipal intervention for renewable placement on privately owned buildings through local renewal/revitalization planning. Consider utilizing these energy incentives for businesses that create jobs.



B. Recommendations for Action

Regionally

1. ***Continue energy education/outreach/workshops. The need for renewable energy should been seen as a high priority across the region and be supported by municipalities and elected officials, business leaders, residents, utility companies and others.***

As part of this project, MRPC worked to organize a series of energy related workshops throughout the Montachusett Region (see page 7). All workshops were well attended by a broad spectrum of attendees indicating value to the region.

COSGROVE INTAKE FACILITY AT WACHUSETT

MRPC should continue to organize and sponsor energy related workshops to underscore the importance of renewable energy to the Montachusett Region, facilitate contacts with experts in the field of energy while providing educational opportunities to enhance energy conservation and development.

2. *MRPC, the Comprehensive Economic Development Strategy (CEDS) Committee, and the Montachusett Regions' Energy Advisory Committee (EAC) should move forward with planning and implementation strategies by continually seeking and securing additional energy related state and federal funding opportunities.*

There was consensus among CEDS and EAC Members, at March and April 2011 meetings respectively, that MRPC Staff should seek funding for a study concerning the Siting of Renewable Energy Facilities including wind, geothermal, hydropower, solar, and renewable energy manufacturing. This would help to facilitate private sector development of such facilities while assisting municipalities in the decision making process in terms of siting renewable energy projects in appropriate locations (including brownfields sites) and streamlining the permitting process. This study will also enhance job opportunities in the region.

Educational partnerships in any future study are highly encouraged. Public education on the need for renewable energy in schools and community centers across the Montachusett Region should be supported. Energy issues should be integrated in the curriculum through all grade levels. Specific training in skills needed in energy-efficient building construction (weatherization/insulation, design, installation, and repair of solar and other renewable energy systems) should be taught in vocational programs. Colleges should offer opportunities to develop expertise and experience in energy conservation/efficiency and sustainable economies.

3. ***Energy conservation and efficiency in the regional and local transportation sector should be promoted through effective land use planning, investments targeted to encourage use of alternative transportation modes (bicycle and pedestrian, public transportation, rail), and funding for infrastructure to support alternative fueled vehicles. The regional and local transportation sector should:***

NORTH LEOMINSTER RAIL

a. Support a land use pattern that directs development to established growth centers which locates residential neighborhoods close to business and service centers.
b. Encourage ridesharing and carpooling through education efforts.
c. Maintain sidewalks and make available bike paths that connect important destinations. Maintain roadways that serve, or could serve as important bicycle commuting or travel routes so that they are safe for bicyclists.
d. Establish educational programs, possibly coordinated by local governments, and health care organizations that will encourage people to walk or bicycle to local destinations.
e. Encourage consumers to purchase needed goods locally whenever possible and avoid travel to shopping centers located outside the region.
f. Encourage drivers to heed speed limits and avoid rapid accelerations and other behaviors that reduce fuel efficiency.
g. Support development of alternative fuel vehicles and local infrastructure needed for their widespread use. For example, development of bike paths to support bicycle and other human powered vehicle use, as well as public education to increase awareness and understanding of the needs of these users. Municipalities should provide safe storage spaces for these vehicles.

4. ***Businesses and projects that will increase the use of renewable energy and smart grid technology across the region should be supported. MRPC and the CEDS Committee could assist with this. Businesses should also be encouraged to:***

a. Conduct an energy audit and every five years thereafter and then implementing all feasible recommendations of your energy audit within two years.
b. Participate in their municipality's energy conservation and efficiency programs and supporting green buildings, energy efficiency, smart growth, public transportation, clean fuels, efficient vehicles and sustainable development.

c. Donate money to support local energy efficiency efforts, including but not limited to compact fluorescent bulb sales, clean energy home tours, home installation workshops, home energy audits, weatherizing, idling reduction programs, and solar hot water heater sales.
d. Incorporate clean energy systems into all operations including siting a clean energy system in or on your building(s) or property and purchasing clean energy.
e. Include energy conservation measures (Commercial Building Energy Standards) on new buildings, additions, and reconstruction of existing buildings and incorporate solar, biomass, and other renewable energy technologies as appropriate.

5. *Identify ways renewables can assist communities to reach broader climate changes, environmental and sustainability goals*

a. Work to align regional energy recommendations with Massachusetts state benchmarks and establish measurable to track the progress of the Montachusett Region's dependence away from traditional energy sources.

6. *Identify how solar can contribute to community revitalization through placement on Brownfields and vacant industrial space to enhance economic competitiveness.*

a. Many municipalities across the country are considering how to take advantage of emerging incentives to support placement of renewables on their underutilized Brownfields properties. Development of solar projects on these sites offers a great solution to the collective challenge of developing renewable energy sources and reusing Brownfields sites at the same time. Examples across the nation have featured the development of renewables on closed landfills. This technique has resulted in one of the largest solar developments in the Northeast.

For Municipalities

1. *Municipalities should take the lead on renewable energy integration into existing day to day operations by establishing a municipal energy committee to oversee development of energy plans and implementation projects.*

a. Collaboration with municipal planning and building departments and boards to develop and adopt bylaws or

ENERGY PLAN PRESS CONFERENCE: COLLABORATION IS KEY FOR PROGRESS!

ordinances, to require or give incentives to encourage green buildings, energy efficiency, renewable energy production, public transportation, smart growth, clean fuels, efficient vehicles, and sustainable development.

b. Work with municipal government to conduct energy audits, implement recommended improvements and build renewable energy systems.
c. Seek funding to support appropriate siting and installation of renewable energy systems on municipal property and in the community.
d. Collaborate with energy committees throughout the region to share ideas, lobby elected officials to assure prompt adoption and implementation of this plan's policy recommendations, and continue the development of a clean energy future for the region.
e. Provide public education regarding clean energy in collaboration with non-profits, advocacy groups, planning commissions, and educational institutions. Larger communities should consider hiring a part or full-time energy/sustainability coordinator to lead energy conservation and efficiency efforts within local government and to develop local energy education programs.
f. An energy committee could also work to create a regional list of resources for renewable energy incentives, manufacturers, suppliers and installers. This list could be made available and accessible through each city/town website.

2. *Identify specific strategies for reducing municipal energy consumption (buildings, vehicles, machinery and equipment, lighting and operations) by developing a comprehensive municipal energy plan. Such a plan could include:*

a. An inventory of existing municipal assets, energy use, and locally available energy resources; Specific strategies for reducing municipal energy consumption (buildings, vehicles, machinery and equipment, lighting, and operations);
b. Policies, regulations, and incentives to encourage energy conservation in site planning and building design;
c. A resource guide to assist local residents and businesses in obtaining advice and assistance in improving energy conservation and efficiency.

3. *Municipalities should have a complete energy audit to identify short and long term actions that will save energy. An energy audit will establish where and how energy is being used in your buildings and facilities. It identifies opportunities and provides recommendations for energy and cost savings.*

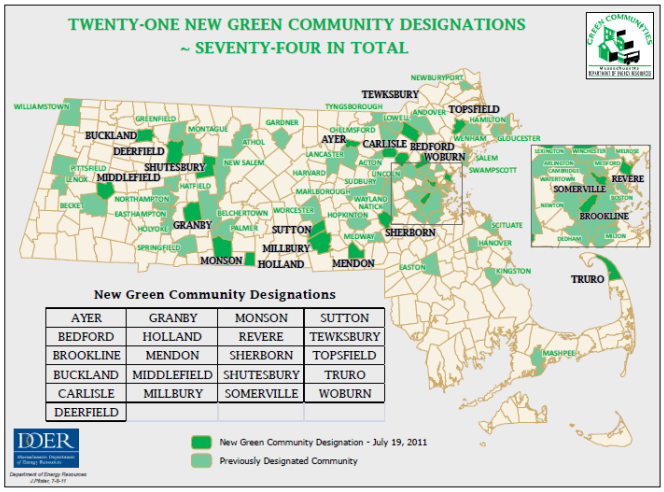
a. Calculating your municipality's energy footprint is a necessary step in identifying

opportunities to reduce energy use and costs. The benefits of an energy audit are lower electrical, natural gas, steam and water costs; reducing greenhouse gas emissions and air pollution and addressing indoor air quality and lighting quality.

b. Energy conservation measures should also be undertaken during the siting, design and construction or reconstruction of buildings. Contact the MA Department of Energy Resources to learn more about their energy audit programs for municipalities.

4. ***Become a Green Community. To date, five municipalities throughout the Montachusett Region are designated as "Green Communities". The Green Communities Designation and Grant Program, an initiative of the Green Communities Division, works with municipalities toward qualification as a Green Community and provides funding to qualified municipalities for energy efficiency and renewable energy initiatives.***

Aligning municipal energy plans with active state programs will catalyze more opportunities on the local level.



The five communities in the Montachusett Region that are designated as Green Communities are: *Athol, Ayer, Gardner, Harvard and Lancaster*. By meeting five rigorous qualification criteria, a designated Green Community demonstrates a commitment to reducing energy consumption, pursuing clean renewable and alternative energy projects, and providing economic development in the clean energy sector. More information can be found on the states website for energy and environmental affairs at www.ma.gov.eoeea

MAP OF 2011 MASSACHUSETTS GREEN COMMUNITIES

5. ***Explore Net Metering. MRPC held a workshop on Net Metering in Athol Town Hall in April 2011.***

a. Net Metering is a MA state regulation allowing customers to receive value during periods when their eligible on-site distributed generation (such as a wind turbine, solar array or geothermal) generates more electricity than they use. That is, the electric meter runs

backward whenever a customer's net metered facility is producing more power than is being consumed. In addition, the customer's account gets net metering credits for net excess generation at the end of the customer's monthly billing period. *A power point presentation can be found at www.mrpc.org/MREnergyPlan/epw4bpowerpoint050511.PDF* .This document explains net metering in greater detail.

6. ***Make sure your community has renewable energy bylaws/ordinances in place. Currently, just 9 out of a total of 22 Montachusett communities have Wind Energy Conversion System Bylaws.***

   a. Upon request, MRPC can also assist municipalities in the development of bylaws. Keep in mind that there have been many recent technological advances in development of renewable energy – your current bylaw may need to be updated.

7. ***Projects or policies that encourage regionalization, relocalization, and sustainable development practices promoting smart growth should be supported.***

   a. Moreover, new zoning regulations to allow more compact development that require fewer streets, less infrastructure and more open space will save developers installation costs and save municipality's maintenance costs.

Sustainable Development: Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Relocalization: Relocalization is an essential adaptation to the depletion of non-renewable resources (oil, natural gas, coal, and even water), and a solution to global warming and other ecological crises. It focuses on local and sustainable production of food, energy, and goods, in tune with the ecological bounds of each region. It is a logical and inevitable replacement for the failing religion of perpetual economic growth.

Regionalization: Encouraging municipalities to collaborate on a regional level to reduce costs and save energy.

8. ***Municipalities and local energy committees should encourage their residents to:***

   a. Complete a home energy audit and make cost effective weatherization improvements.
   b. Consider energy use and costs when making decisions about vehicle purchases and use as well as where to live (i.e. proximity to work, school, services).

   c. Buy local products and support local economic progress wherever possible and even plant a vegetable garden at home or as part of a community garden and learn to store and prepare home grown produce. Residents should also be encouraged to patronize local farmers'

markets.

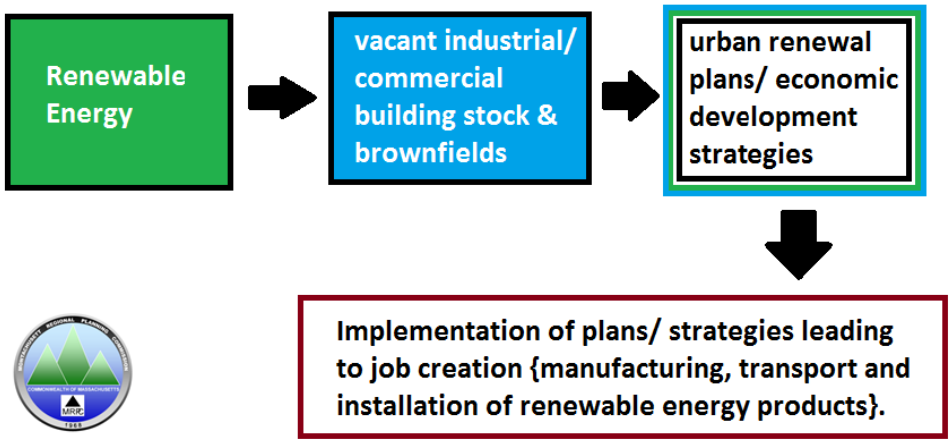
d. Participate and volunteer with local groups that are working on energy conservation and local food/economy projects.

e. Municipalities should encourage residents to take action on the individual level by creating pamphlets that educate about renewable energy options.

9. Forge public/private partnerships for renewable energy.

a. Utilize Massachusetts DOER financial incentives that may supply funds to cities/ towns to power municipal buildings with renewable energy and partner with a private agency for placement/ installation, creating jobs etc.

10. Consider solar placement on vacant buildings to attract business. Determine the feasibility of municipal intervention for renewable placement on privately owned buildings through local renewal/revitalization planning. Consider utilizing these energy incentives for businesses that create jobs.



7. APPENDICES