

# **A Green Initiative: The Green Communities Act**

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**Project Abstract**

Our project's focus is the Green Communities Act of Massachusetts. Massachusetts takes a huge step forward by adopting clean energy technology. With the down economy, "going green" is looking attractive to state and federal legislatures. Our methods include interviewing businesses, utilities, towns and homeowners on their opinions of the act. We analyzed the information gathered along with advancements made by the policy. The project identifies the effectiveness of the action that the state is taking regarding renewable/clean energy sources.

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### **The Green Communities Act**

Green house gases are something that governments have put on the “back burner”, to say, up until recently. Scientists have brought up discoveries of the effects that man made pollutants have on the earth and its atmosphere. Politicians and local governments have recently come to realize something must be done about it. For millions of years the Earth has been releasing these gases on its own through normal life cycles of animals and volcanic activity. The atmosphere has been able to compensate for these additions over time by balancing the natural carbon cycle. The cycle consists of three different phases; weathering, subduction and volcanism. Carbon is used by plants in photosynthesis or reacts with minerals in the air to form limestone, which is then dissolved into the ocean and eventually returned to the mantle through the sea floor. Carbon isn't the only major contributor here, methane, nitrous oxide and CFC's also play a big part in overloading and damaging the atmosphere. Photochemical changes and cosmic rays filter out these gases which have the ability to turn into ozone damaging compounds. Humans have not helped the natural cycle of maintaining the carbon level in the atmosphere. Since the industrial revolution, people have been accelerating the natural carbon cycle by adding massive amounts of carbon emissions into the atmosphere. From 1800 to 2004 the global carbon usage has increased by 8000 million metric tons per year.<sup>1</sup> That means that there is a lot more greenhouse gases being pumped out than the earth is normally use to and able to adapt to. The atmosphere can only keep up with recycling a

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<sup>1</sup> Gibbons , Whit. "Global Warming Has Many Effects." *University of Georgia* 27 Jan 2008 Web.5 Dec 2008. <<http://www.uga.edu/srel/ecoviews/ecoview080127.htm>>.

certain amount of emissions; the excess carbon in the atmosphere has led to the global warming problem we face today.

Greenhouse gases are named that way for a reason. They act as a greenhouse would trap heat. The sun's energy penetrates the earth's atmosphere all the time, generating heat and light for the planet. Usually heat energy enters the atmosphere; some is absorbed while a majority of it is reflected. This causes the earth to be able to maintain its warmth and create a habit suitable for life as we know it. As the human race pollutes the air more, the amount of greenhouse gases that is in the atmosphere increases. The more pollutants there are, the more heat energy that gets trapped in the atmosphere, which leads to global climate effects. Since 1970, the average temperature of the planet has increased a total of one degree Fahrenheit.<sup>2</sup> One degree seems like a miniscule amount to most people, but on a global scale it can have serious effects. Imagine the earth's average temperature rising ten degrees. That could have catastrophic effects on the planet. The polar ice caps would be severely compromised causing sea levels to rise and engulf the coasts of a lot of major countries. Some other effects of global warming would be erratic weather patterns, extinction of species and adverse effects on plant life.<sup>3</sup> At the rate humans are currently going, this could be a very realistic future. When informed by scientists, lawmakers have realized the severity of the situation and have put in motion legislation to offset the output of green house gases.

Our tradition of having reliance on fossil fuels is starting to fade away into the background as the nation now starts to push new energy onto the center stage. At a national

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<sup>2</sup> Gibbons , Whit. "Global Warming Has Many Effects." *University of Georgia* 27 Jan 2008 Web.5 Dec 2008. <<http://www.uga.edu/srel/ecoviews/ecoview080127.htm>>.

<sup>3</sup> Gibbons , Whit. "Global Warming Has Many Effects." *University of Georgia* 27 Jan 2008 Web.5 Dec 2008. <<http://www.uga.edu/srel/ecoviews/ecoview080127.htm>>.

level, the Obama administration is realizing the need to invest in shading the country a darker shade of green. Included in the ARRA (American Recovery and Reinvestment Act) are billions of dollars aimed at energy and infrastructure projects. That's a significant amount of money that should be put to good use in a state of recession. There's one state which is taking advantage of every cent of it. Massachusetts is taking a huge step forward in adopting clean and renewable energy technology for the Commonwealth.

The Green Communities Act of Massachusetts was signed into law by Governor Deval Patrick on July 2<sup>nd</sup> 2008.<sup>4</sup> At a time when the economy isn't so promising, "going green" is looking more attractive to state and federal governments. The state is channeling money towards environmentally friendly and money saving projects. These technologies have the potential to create huge benefits for both the environment and the economy. The creation of jobs and potential for savings can help the state shine a green light on these dark times.

The act attempts to increase usage of clean technology in all aspects of the state. It has the intentions of proportionally decreasing the output of green house gases from the Commonwealth. The act is broken into various parts that take into consideration all aspects of energy consumption and greenhouse gas production. The four main goals of the act are:

- (1) Decreasing 25% of the total electric load by grid management
- (2) Meeting 20% of the total electric load with renewable and alternative energy generation

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<sup>4</sup> "Governor Patrick Signs Energy Bill Promoting Cost Savings, Renewable and Clean Energy Technology." *Mass.gov*. 02 Jul 2008. Commonwealth of Massachusetts. 2 Dec 2008  
<[http://www.mass.gov/?pageID=gov3pressrelease&L=1&L0=Home&sid=Agov3&b=pressrelease&f=080702\\_bill\\_energy\\_clean&csid=Agov3](http://www.mass.gov/?pageID=gov3pressrelease&L=1&L0=Home&sid=Agov3&b=pressrelease&f=080702_bill_energy_clean&csid=Agov3)>.

(3) Reducing the usage of fossil fuels by 10% from year 2007 levels by 2020

(4) Creating a plan to reduce the total energy consumption by the state by 10%.<sup>5</sup>

The state is setting a high mark for itself. These goals are seen as a challenge to the state as a whole. The Patrick administration is pushing hard for these goals to be met. If these goals are met, it will loosen the state's dependence on foreign oil, reduce its carbon footprint and create an expanding market for the green economy.

With the Green Communities Act coming into effect at the beginning of this year, there has been a steady increase in the interest of the use of renewable energy. The act spans a large range in regards to whom and what it affects. The GCA will influence towns, businesses, utilities and even the average home owner. Looking into the effects and feasibilities of certain portions of the act with respect to each individual sector is the only way to determine what this piece of legislation is doing for Massachusetts.

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<sup>5</sup> Chapter 169 of the Acts of 2008: An Act Relative to Green Communities. 2 Jul 2008. Commonwealth of Massachusetts. 22 Apr 2009. <<http://www.mass.gov/legis/laws/seslaw08/sl080169.htm>>



## **Research Methods**

***Mission Statement:*** *The focus of this project is to examine the Green Communities Act and its effects on the many various sectors of society as well as its impact on how the people of Massachusetts live their lives.*

In order to get a good feel for how Green Communities Act will change the standards for clean energy, we must dig deep into the affected areas. The only way to efficiently measure the early impact of a policy is to analyze each sector individually. A lot of the research that we did involved asking certain people around the state about the GCA. Whether through making a phone call or visiting a local town official, we asked a lot of questions. (Questions for each individual issue can be found within Appendix A of this report.) Each section of the GCA was analyzed independently to obtain accurate results.

State utilities and generating companies are seeing calls for big changes when it comes to the GCA. Feasibility was the focus point of our questions, and whether they felt some of the goals in the act that relate to them can in fact be completed. We were also curious to see what they would say about net metering and what kind of impact it has on them. Another group of people that we talked to were the town managers that surround the city of Worcester, Massachusetts. We centered some of our questions around how they felt the progress was going and what impact the act was having on their own community. Because the implementation will be a long process, we wanted to hear the goals they set for their town

years down the road. These interviews were done over the phone or, because some of these towns are close to WPI, in person. Not everyone is directly involved with the Green Communities Act, so we developed a survey for those people. They included students, teachers, and homeowners. We wanted to see how they felt, overall, about alternative energy and whether they were knowledgeable about the GCA. This was beneficial because we could see if people were aware of the changes being made. They even had a few original ideas or suggestions to better the environment. We also wanted to see if the economy is having any effect on the financial aspects of the act. With new codes being developed, we were curious to see how they will pan out in the future.

Like stated earlier, these interviews and surveys were done through the phone or face-to-face interviews, wherever they requested to meet. However, before we could conduct these interviews, we got approval by WPI's Institutional Review Board. Finding answers to these questions was crucial to the effectiveness of our IQP.

Massachusetts has taken a huge step forward in passing the Green Communities Act. There are many innovative policies that are to be implemented into the rules and regulations concerning energy and environmental pollution. At the conclusion of our IQP we discuss what we have learned, success and failures of the policy, the outlook of the act in coming years and propose further points of research for future study.

## **Research and Discussion**

*In the following pages we will discuss each sector individually in regards to how it has been affected by the Green Communities Act of Massachusetts. The act touches on a broad range of sectors. We chose to divide the act into four main sections: Utilities, Businesses, Towns/Cities and Commonwealth citizens.*

### **Utilities**

Utility companies can play a very important role in the expansion of renewable energy and the increase in energy efficiency. The Green Communities Act creates greater incentives for utility companies to promote responsible energy use and the growth of green energy in all sectors.

The Green Communities Act gives greater guidelines as to how much distributed energy must be from renewable energy sources. To help foster the growth of renewable resources, the GCA provides new net-metering guidelines to promote individual renewables and defines solar generation limits for utilities. Utilities have already begun planning for solar generators throughout the state. Further support for the growth of utility projects is provided through a strong system of funding from billing charges and cap-and-trade auctions.

Utility companies have pushed for energy efficiency through energy efficiency programs and energy audits. This is reinforced through the GCA-mandated energy efficiency plans that are required in three year intervals. There is also a push to upgrade the aging electric grid to a smart grid which allows customers to receive electricity purchasing data from their meters. The

Act is spurring on these upgrades by requiring utility companies to undertake smart grid pilot programs to test the potential of these systems.

Overall, the Green Communities Act has the potential to ease possible concerns regarding a switch to renewable energy and to help green energy flourish in Massachusetts.

### **Distributing Green Energy**

Many customers want to get their power from renewable energy sources. There are a number of utility-run programs that let customers get their energy from renewable sources. Though this option usually costs extra, it is a good way to foster the growth of renewable energy resources.

National Grid's GreenUp program allows customers to purchase their energy from renewable providers while keeping National Grid as their utility company. Customers can buy either all or some of their energy from renewable sources. This program was ranked as one of the top 10 green power programs in the country by the Department of Energy's Renewable Energy Laboratory<sup>6</sup>. This program also lets customers earn clean energy grants for their community from the Massachusetts Technology Collaborative's Clean Energy Choice program<sup>7</sup>.

The NSTAR Solar program helps customers to evaluate their home energy usage and the possibilities for solar panel installation. This program is coupled with a \$2/W installation rebate

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<sup>6</sup> National Grid offers 'GreenUp' to Swampscott customers. 27 March 2009. GateHouse Media, Inc. 6 April 2009. <<http://www.wickedlocal.com/swampscott/news/x141587732/National-Grid-offer-GreenUp-to-Swampscott-customers>>.

<sup>7</sup> Renewable Energy. 2009. National Grid. 6 April 2009. <[https://www.nationalgridus.com/masselectric/home/energychoice/3\\_renewable.asp](https://www.nationalgridus.com/masselectric/home/energychoice/3_renewable.asp)>.

from Commonwealth Solar. This program helps to foster home solar energy sources. Home solar installation will generally cost around \$10000 and has a 10-15 year payback period<sup>8</sup>.

The NSTAR Green program began in July 2007, with service beginning in July of the following year<sup>9</sup>. This program allows customers to buy half or all of their energy from wind power sources<sup>10</sup>. The wind power is supplied through 10 year contracts with the Maple Ridge Wind Farm in New York and the Kibby Wind Power Project in Maine<sup>11</sup>. Customers receiving half of their energy from NSTAR Green will pay an extra .84¢ per kWh while receiving all of their energy from wind sources will cost an additional 1.4¢ per kWh<sup>12</sup>.

The Cape Light Compact Green program helps to foster renewable energy resources, lets customers accrue matching grants for their local community and helps fund low-income renewable projects<sup>13</sup>. The Cape Light Compact program lets customers buy all or half of their energy from renewable sources, including hydropower, wind, landfill gas, and solar<sup>14</sup>. This program will generally cost an additional 1.79¢/kWh<sup>15</sup>.

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<sup>8</sup> NSTAR Solar. 2009. NSTAR. 6 April 2009.

<[http://www.nstar.com/residential/customer\\_information/nstar\\_solar/nstar\\_solar.asp](http://www.nstar.com/residential/customer_information/nstar_solar/nstar_solar.asp)>.

<sup>9</sup> NSTAR Green Allows Customers to Buy Wind Energy (at a price). 1 May 2008. The Boston Globe. 6 April 2009.

<[http://www.boston.com/lifestyle/green/greenblog/2008/05/nstar\\_green\\_allows\\_customers\\_to\\_buy\\_wind\\_energy\\_at\\_a\\_price.html](http://www.boston.com/lifestyle/green/greenblog/2008/05/nstar_green_allows_customers_to_buy_wind_energy_at_a_price.html)>.

<sup>10</sup> NSTAR goes Green: Unique Program Offers Renewable Option for Customers. 24 July 2007. NSTAR. 6 April 2009. <[http://www.nstaronline.com/ss3/nstar\\_news/press\\_releases/2007/nstar-green.asp](http://www.nstaronline.com/ss3/nstar_news/press_releases/2007/nstar-green.asp)>.

<sup>11</sup> Green Power Marketing. May 2008. United States Department of Energy: Energy Efficiency and Renewable Energy. 6 April 2009.

<<http://apps3.eere.energy.gov/greenpower/markets/marketing.shtml?page=2&companyid=301>>.

<sup>12</sup> NSTAR Green. 2009. NSTAR. 6 April 2009.

<[http://www.nstar.com/residential/customer\\_information/nstar\\_green/nstar\\_green.asp](http://www.nstar.com/residential/customer_information/nstar_green/nstar_green.asp)>.

<sup>13</sup> Clean Energy Choice. Massachusetts Technology Collaborative. 6 April 2009.

<<http://www.masstech.org/cleanenergyorg/option3.htm>>.

<sup>14</sup> Cape Light Compact Green. 2009. Cape Light Compact. 6 April 2009. <<http://www.capelight-compact.org/clcgreen.html>>.

<sup>15</sup> Green Power Marketing. May 2005. United States Department of Energy: Energy Efficiency and Renewable Energy. 6 April 2009.

<<http://apps3.eere.energy.gov/greenpower/markets/marketing.shtml?page=2&companyid=400>>.

There are a number of utility-run programs that will distribute renewable energy to customers. Although these programs usually come with an additional charge per month, they are also an effective way to promote the expansion of renewable energy sources. These programs help to fund many types of renewables, among them solar, wind, and hydropower sources. In the long term, these programs should prove to be reliable ways for customers to contribute to renewable energy without buying generators themselves.

### **Energy Audits and Energy Efficiency**

Energy audits can help to greatly increase the energy efficiency of homes and businesses. These audits help to tell the customer how much energy he or she is using and how to decrease energy usage. Energy audits are offered as part of some special utility programs.

Western Massachusetts Electric's Energy Audit and Focused Study Program is aimed towards businesses using more than 350 kW per month in electricity. The energy audit involves analyzing the energy usage around the business and giving recommendations. The focused study is more involved and gives a cost-benefit analysis and efficiency conclusions. The customer pays one-half of the cost of the audit while WMECO pays the other half, with WMECO refunding the customer's payment if efficiency measures are put into effect<sup>16</sup>.

If homeowners are considering the installation of solar panels, the NSTAR Solar program can be helpful in evaluating solar possibilities. The program gives customers a complimentary

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<sup>16</sup> Energy Audit and Focused Study. 2009. Western Massachusetts Electric Company. 12 April 2009. <<http://www.wmeco.com/business/saveenergy/energyefficiencyprograms/energyaudit.aspx>>.

energy audit and solar energy assessment in order to see how suited a home is for solar energy and how much it could help a customer<sup>17</sup>.

National Grid and Unitil both supply small business energy efficiency programs. The National Grid Small Business program gives the customer a free energy audit and efficiency recommendations along with a rebate of 70% of equipment installation costs. This equipment includes lighting upgrades, programmable thermostats and occupancy sensors<sup>18</sup>. The Unitil Small Business Services provide a free energy audit along with an energy efficiency proposal and installation rebate. The equipment includes efficient motors and refrigeration along with lighting upgrades<sup>19</sup>. Both of these programs can help cut small business costs.

Cape Light Compact's Home Energy Audit provides the customer with a free energy evaluation of his or her home along with a report detailing the results and methods for greater energy efficiency. The program has incentives for various efficiency measures which include lighting and appliance upgrades as well as water systems<sup>20</sup>.

Cape Light Compact is also running an energy efficiency pilot program. The Smart Energy Monitoring Pilot Project will use technology from GroundedPower, Inc to see how customers can use this technology to help with energy efficiency. According to Cape Light, "Cape Light Compact's Smart Energy Monitoring Pilot Project involves the installation of whole-house wireless monitors, an optional appliance monitor, and a wireless base station that will

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<sup>17</sup> NSTAR Solar. 2009. NSTAR. 12 April 2009.

<[http://www.nstar.com/residential/customer\\_information/nstar\\_solar/nstar\\_solar.asp](http://www.nstar.com/residential/customer_information/nstar_solar/nstar_solar.asp)>.

<sup>18</sup> Small Business Program. 2009. National Grid. 13 April 2009.

<[http://www.nationalgridus.com/masselectric/business/energyeff/3\\_small.asp](http://www.nationalgridus.com/masselectric/business/energyeff/3_small.asp)>.

<sup>19</sup> Energy Efficiency Programs: Small Business Services. 2009. Unitil Corporation. 13 April 2009.

<[http://services.unitil.com/fge/bus\\_energy\\_efficiency\\_programs.asp?t=1](http://services.unitil.com/fge/bus_energy_efficiency_programs.asp?t=1)>.

<sup>20</sup> Home Energy Audit. 2009. Cape Light Compact. 13 April 2009.

<[http://www.capelightcompact.org/home\\_energy\\_audit.html](http://www.capelightcompact.org/home_energy_audit.html)>.

upload real-time data to web-enabled software that provides the homeowner with detailed information on how much energy is being used, when it is being used, how much it costs, and actions that could reduce energy consumption and promote savings<sup>21</sup>.” The project also gives customers the option of using a communications network to evaluate their use of the energy efficiency services.

Utility companies have a number of programs designed to help homes and businesses achieve better energy efficiency. These programs usually involve reports on an individual’s energy efficiency and ways to improve upon it. These programs can help customers get on the right track to use less energy and save money.

### **Funding and Economy**

Funding and the economy are pivotal considerations when looking at renewable energy projects. Funding for utility-based energy efficiency programs comes from a number of sources that are dictated in the GCA.

Section 11 of the Green Communities Act places two charges on customers to fund utility-run green projects. The first is a .25 ¢/kWh charge to fund energy efficiency programs. The second is a .05 ¢/kWh charge to fund “the development and promotion of renewable energy projects.”<sup>22</sup> These micro-charges will be minor for an individual consumer but will add up to very useful money being put towards green programs.

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<sup>21</sup> Cape Light Compact Launches Residential Smart Energy Monitoring Pilot Project. 6 Feb 2009. Cape Light Compact. 13 April 2009. <[http://www.capelightcompact.org/documents/Pressrelease-SmartEnergyMonitorfinal\\_000.pdf](http://www.capelightcompact.org/documents/Pressrelease-SmartEnergyMonitorfinal_000.pdf)>.

<sup>22</sup> Chapter 169 of the Acts of 2008. 2 July 2008. Commonwealth of Massachusetts. 13 April 2009.



Funds will also be available from the Regional Greenhouse Gas Initiative. (RGGI) These funds are built up from cap and trade auctions and are allotted to the five major Massachusetts utility companies. In 2008, \$5.9 million was put towards utility-run energy efficiency programs. All of the cap and trade auction profits are set to be allotted to the energy efficiency programs in 2009, which total \$15.4 million<sup>23</sup>.

The current economic situation is hurting all business sectors. This means that utility customers will increasingly be looking to save money through more energy efficiency. With the advent of the Green Communities Act, the utility companies have an incentive to promote energy efficiency, which should be advantageous to both customers and utility companies.

Utilities offer funding for independent renewable energy development and energy efficiency through rebate grants. These rebates can provide a great incentive for green-minded customers to implement their own personal efficiency and renewable energy projects, such as solar cells and energy efficient lighting. Many of these programs were discussed previously in this document.

Cost is always a concern for any program, especially for programs in an expanding economic sector. The Green Communities Act provides many methods of funding the build-up of renewable energy sources and energy efficiency programs. These methods should help to quickly expand green energy projects and increase personal energy efficiency for homes and businesses throughout the Commonwealth.

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<sup>23</sup> <http://www.mass.gov/legis/laws/seslaw08/sl080169.htm>.  
Update on RGGI Auction Proceeds and the Programs to be Funded. 20 March 2009. Massachusetts Department of Energy Resources. 13 April 2009. <http://www.mass.gov/Eoeea/docs/doer/rggi/rggi-proceeds--mar-20-2009.pdf>.

### **Educating the Grid**

Smart grid systems allow for greater monitoring and control of energy demand through the use of advanced metering infrastructure (AMI), a two-way energy monitoring system. These systems allow utility companies to know how much power is being used at any given time and to increase or decrease energy distribution to compensate for these changes. With smart grid demand response programs, customers can change their behavior by reducing energy consumption during costlier peak hours when energy supplies could be strained. This can be combined with smart grid appliances which monitor real-time electricity prices and change their energy usage accordingly. As part of the Green Communities Act, utility companies were required to submit a smart grid pilot program proposal and enact it when approved<sup>24</sup> (Section 85).

Unitil has had its smart grid advanced metering infrastructure in place since 2007. They are currently working to test some of the possible applications of the smart grid system<sup>25</sup>. These applications include better methods for dealing with power outages and shifting power use away from peak load hours with demand response programs. Overall, the goals of Unitil's smart grid systems are operational efficiency and efficient power usage<sup>26</sup>.

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<sup>24</sup> Chapter 169 of the Acts of 2008: An Act Relative to Green Communities. 2 July 2008. Commonwealth of Massachusetts. 5 April 2009. <<http://www.mass.gov/legis/laws/seslaw08/s1080169.htm>>.

<sup>25</sup> Utilities Plan to Let Consumers Watch Energy Use. 31 March 2009. The Boston Globe. 5 April 2009. <[http://www.boston.com/business/technology/articles/2009/03/31/utilities\\_plan\\_to\\_let\\_consumers\\_watch\\_energy\\_use/](http://www.boston.com/business/technology/articles/2009/03/31/utilities_plan_to_let_consumers_watch_energy_use/)>.

<sup>26</sup> Moving Towards a Smarter Energy Future. October 2008. Unitil Corporation. 5 April 2009. <[http://services.unitil.com/ceco/leadarticle/2008\\_Oct\\_NH.pdf](http://services.unitil.com/ceco/leadarticle/2008_Oct_NH.pdf)>.

NSTAR's smart grid plan involves working with Tendril Networks, Inc. to provide customers energy usage information and facilitate demand response<sup>27</sup>. The pilot program will send real-time information on energy consumption and prices to customers' computers, allowing customers to abrogate their energy use during high load hours. The system can also inform customers of possible incentives for lessening energy use during peak hours<sup>28</sup>. The program will involve around 3000 residential customers in Newton and Hopkinton and should be launched sometime next year<sup>29</sup>.

Western Massachusetts Electric Company's smart grid pilot program involves giving different billing options to low-income residents<sup>30</sup>. The initial plan will include 600-800 low-income customers. One of the billing options will be a discounted rate for the first 300 kWh of power that is used each month<sup>31</sup>.

National Grid has a very ambitious 2 year, \$57 million pilot program which will involve 15000 meters in and around the city of Worcester. Customers will be able to receive real-time energy information through the internet and text messages and will have the option for demand response programs. This program will cost customers around 50¢ per month, but is

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<sup>27</sup> Utilities Plan to Let Consumers Watch Energy Use. 31 March 2009. The Boston Globe. 5 April 2009. <[http://www.boston.com/business/technology/articles/2009/03/31/utilities\\_plan\\_to\\_let\\_consumers\\_watch\\_energy\\_use/](http://www.boston.com/business/technology/articles/2009/03/31/utilities_plan_to_let_consumers_watch_energy_use/)>.

<sup>28</sup> NSTAR Unveils Smart Grid Program. 9 April 2009. Transmission and Distribution World. 28 April 2009. <[http://tdworld.com/info\\_systems/highlights/nstar-smart-grid-program-0409/](http://tdworld.com/info_systems/highlights/nstar-smart-grid-program-0409/)>.

<sup>29</sup> NSTAR Smart Grid Coming to Home Computer. 31 March 2009. Boston Business Journal. 5 April 2009. <<http://www.bizjournals.com/boston/stories/2009/03/30/daily38.html>>.

<sup>30</sup> Viscarolasaga, Efrain. Worcester among Proposed Smart Grid Sites. 2 April 2009. American City Business Journals, Inc. 5 April 2009. <<http://www.masshightech.com/stories/2009/03/30/daily43-Worcester-among-proposed-smart-grid-sites.html>>.

<sup>31</sup> Utilities Plan to Let Consumers Watch Energy Use. 31 March 2009. The Boston Globe. 5 April 2009. <[http://www.boston.com/business/technology/articles/2009/03/31/utilities\\_plan\\_to\\_let\\_consumers\\_watch\\_energy\\_use/](http://www.boston.com/business/technology/articles/2009/03/31/utilities_plan_to_let_consumers_watch_energy_use/)>.

expected to yield a 5% savings on energy bills<sup>32</sup>. National Grid has stated that it is ready to begin the development of the program as soon as it is approved and that the program will begin in 9-12 months<sup>33</sup>.

The GCA-mandated smart grid pilot programs are being embraced by utility companies. These pilot programs should be in place in the next year or so and will revolutionize the use and distribution of power. Smart grid programs will reduce the consumption of energy and save customers money.

### **Renewable Energy Projects**

Utility companies are working on a number of renewable energy projects. These projects will help to provide more electricity from green sources. Since the Green Communities Act specifically allows utility companies to own up to 50 MW of solar capacity, this section will mainly focus on utility-run solar power projects with some discussion of wind turbine projects.

The Unitil Corporation, which does business in both Massachusetts and New Hampshire, is running a pilot wind energy project in Hampton, NH<sup>34</sup>. This project uses a normal small-scale wind turbine placed atop a company utility pole. The top output of the wind turbine is 2.4 kW

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<sup>32</sup> National Grid plans smart grid test in Massachusetts. 5 April 2009. Smart Meters. 5 April 2009.

<<http://www.smartmeters.com/the-news/499-national-grid-plans-smart-grid-test-in-massachusetts.html>>.

<sup>33</sup> National Grid Announces Plan for Smart Grid Pilot in Worcester, Massachusetts. 31 March 2009. FOX Business. 5 April 2009. <<http://www.foxbusiness.com/story/national-grid-announces-plan-smart-grid-pilot-worcester-massachusetts/>>.

<sup>34</sup> Primer on Wind Power. Unitil Corporation. 20 April 2009. <[http://www.unitil.com/green/articles/Primer\\_Wind.pdf](http://www.unitil.com/green/articles/Primer_Wind.pdf)>.

and will generally generate 400 kW of energy per month. As the project continues, the company has also looked further at Hampton and the Concord area for other wind turbines<sup>35</sup>.

National Grid's solar energy plan has two stages. The first stage involves the installation of solar panels on company property in Haverhill, Everett, Revere and Dorchester. These solar installations will total 5 MW of power, which should be enough to power around 12,000 homes<sup>36</sup>. The second stage of this plan will involve giving solar panel installation options to residential and commercial customers<sup>37</sup>.

Western Massachusetts Electric Company (WMECO) has a solar energy plan with the goal of 6 MW of solar capacity and an initial project cost of \$42 million<sup>38</sup>. The initial cost of this program to the customer should be roughly one dollar per month and should power around 15,000 homes. The plan cites eight possible locations for solar facilities, in the cities of Springfield, Pittsfield, Ludlow, and Amherst<sup>39</sup>. WMECO has also stated interest in future expansion of the program, with the possibility of 15 MW of solar power generation by 2012<sup>40</sup>.

Overall, utilities are working hard to test the potential of wind and solar power facilities. The energy goals of the Green Communities Act have spurred the growth of all renewable

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<sup>35</sup> Morse, Susan. Unitil Wind Turbine Draws Plenty of Interest. 3 June 2008. Seacoast Media Group. 20 April 2009. <<http://www.seacoastonline.com/apps/pbcs.dll/article?AID=/20080603/NEWS/806030341>>.

<sup>36</sup> Cantwell, Bill. Haverhill Chosen as Home to Solar Power Station. 3 October 2008. The Eagle-Tribune. 20 April 2009. <[http://www.eagletribune.com/punewshh/local\\_story\\_277113614.html](http://www.eagletribune.com/punewshh/local_story_277113614.html)>.

<sup>37</sup> Ailworth, Erin. National Grid Proposes More Solar Power. 2 October 2008. The Boston Globe. 20 April 2009. <[http://www.boston.com/business/technology/articles/2008/10/02/national\\_grid\\_proposes\\_more\\_solar\\_po](http://www.boston.com/business/technology/articles/2008/10/02/national_grid_proposes_more_solar_power/)wer/>.

<sup>38</sup> Western Massachusetts Electric Company Files Solar Plan. 16 February 2009. SustainableBusiness.com. 20 April 2009. <<http://www.sustainablebusiness.com/index.cfm/go/news.display/id/17671>>.

<sup>39</sup> WMECO Announces Solar Energy Plan for Western Massachusetts. 12 February 2009. Reuters. 20 April 2009. <<http://www.reuters.com/article/pressRelease/idUS260577+12-Feb-2009+PRN20090212>>.

<sup>40</sup> WMECO Files Request to Implement Solar Energy Program. 17 February 2009. Energy Business Review. 20 April 2009. <[http://www.energy-business-review.com/news/wmeco\\_files\\_request\\_to\\_implement\\_solar\\_energy\\_program\\_170209](http://www.energy-business-review.com/news/wmeco_files_request_to_implement_solar_energy_program_170209)>.

energy sources, including those run by utilities. These projects have the potential to power thousands of homes without environmental consequences.

The Green Communities Act is a great initiative that will make Massachusetts a leader in renewable energy. A main goal of the Act, 20% of energy from renewables by 2020, would not be achievable without the active cooperation of utilities. The utility-based portions of this act help to ensure that utility companies can help promote renewable energy generation without an overwhelming impact on the profitability of the companies. The expansion of net-metering programs creates two-way communication between utilities and residence, as well as provides incentives to individuals to use renewable generation. There are also programs that allow customers to buy energy from renewable sources if they don't feel they can buy solar or wind generators themselves.

The Act also successfully promotes energy efficiency. Along with making it easier for utility companies to promote energy efficiency, the Act mandates utility companies to submit an energy efficiency plan every three years. Many utility companies now also offer energy auditing services to help customers to find ways to conserve energy in their homes and businesses.

Overall, the GCA has led the way to providing a better, greener energy future. With a strong funding system in place and utilities actively pursuing the Act's objectives, the Green

Communities Act is providing a strong push for green energy development and seems on track to reach its goals.

### **Businesses**

If every year had a color associated with it, 2009's would definitely be green. Green is the color that is aiming to save the state from the slumbering economy. The Green Communities Act is expected to help local businesses in a big way. Promoting the growth of industry is one of the major aspects that can be taken from the GCA. While most of the legislation isn't exactly directed at green businesses, the increase in funding and projects should create a wave of growth in renewables. It will be interesting to see if this green life vest will be able to keep the Massachusetts economy afloat.

### **The Green Economy**

The economy is thought to play a huge role in the success or failure of the Green Communities Act. The act has many doubters due to these times, but also many supporters who see the opportunity for green. A reason for passing the act is to stimulate jobs and the economy within the energy sector of the state. The clean technology sector may benefit from the American Recovery and Reinvestment Act more than any other group in the state.<sup>41</sup> Combine that with the GCA and watch the seeds of green companies will begin to grow. Clean tech companies are beginning to become more abundant as the demand and number of projects begins to take off. Recently, investment in renewable and energy efficient companies

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<sup>41</sup> O'Connor, John. "Clean tech opportunities and challenges from the stimulus plan." Mass High Tech. 6 Mar 2009. Mass High Tech. 6 Mar 2009 <<http://masshightech.com/stories/2009/03/02/editorial3-clean-tech-opportunities-and-challenges-from-the-stimulus-plan.html>>.



on the global market place has hit an all time high of \$4.6 billion.<sup>42</sup> This can be related to the global push towards sustainability. Greater Boston is ranked number five in places for the incubation of clean-tech clusters and Massachusetts is ranked second for renewable energy investments, behind California.<sup>43</sup> The state's strong push for bringing new companies is a perfect way for the job market to expand in the clean sector.

Despite the current global economic breakdown, there is still a strong fighting chance for progress to be made in the area of renewable energy. Oil prices are not as high as they were a year ago but regardless, the need for more efficient sources is becoming a priority for the state. Energy consumption in the state is only going to go in one direction: up. With a gradual increase in demand, there will also have to be an increase on the supply side. With the new legislation, the supply side will be pushing towards greener resources. The cost of fossil fuels is expected to increase over time due to the effort to drill and tap into new resources. It will require companies to dig deeper and go further offshore to find new deposits. Many of these variables go into the equation that's proving to both government officials and investors that green is the smart way to go. There has been a major transformation of green energy from an environmental interest to an economic and national security interest. Instead of just being used to decrease the emission of greenhouse gasses, these technologies are now being called

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<sup>42</sup> Global Investment In Cleantech." Clean Energy Stock. 18 Dec 2008. Clean Energy new. 2 Mar 2009 <<http://cleanenergynews.blogspot.com/2008/12/global-investment-in-cleantech.html>>.

<sup>43</sup> Karlenzig, Warren. "Top US Citites for Cleantech Incubation Cluster." Sustainlane. 1 Mar 2009 <<http://www.sustainlane.us/articles/cleantech.jsp>>.

into action to battle against unemployment and recession.<sup>44</sup> The GCA is expected to more than double the rate of increase of the usage of renewable technologies.

### **Employment in Renewables**

Just how much growth is in, or is expected to hit the energy sector? The state is taking a huge part in ensuring the growth in the sector continues to increase for years to come. The Massachusetts Executive Office of Energy and Environmental Affairs issued a report identifying state owned lands to possibly be used for efficient and renewable energy. The theoretical numbers are: 95MW of power creation by using existing state buildings and facilities, 946MW of large scale wind production on state lands and doubling the state's current savings of \$25 million per year with energy efficiency investments.<sup>45</sup> These released numbers greatly exceed the goals of the GCA, but it gives hope to those companies interested in investing in the state.

The following table gives the numbers of clean energy jobs and companies in the state. Also included is the project growth for each sector respectively. The jobs numbers exceed the expectations of two years prior.

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<sup>44</sup> Robinson, Jackson. "Despite Economy, Prospects For Green Energy Remain Strong." *Matter Network* 31 Mar 2009 4 Apr 2009

<sup>45</sup> Viscarolasaga, Efrain. "Mass. Report reveals renewable energy potential locales." *Mass High Tech*. 24 Feb 2009. 2 Mar 2009 <<http://masshightech.com/stories/2009/02/23/daily26-Mass-report-reveals-renewable-energy-potential-locals.html>>.

Tables of Clean Tech Jobs and Outlooks in Massachusetts

<b>Clean energy jobs in Massachusetts as of 2007</b>	
Energy efficiency	6,258
Consulting/support	4,016
Renewable energy	3,985
University research	120
<b>Total jobs</b>	<b>14,400</b>

<b>Clean energy companies in Massachusetts as of 2007</b>	
Energy efficiency	152
Consulting/support	182
Renewable energy	209
University research	13
<b>Total companies</b>	<b>556</b>

<b>Projected growth rates in clean energy employment</b>	
<b>Sector</b>	<b>Growth Rate</b>
Energy efficiency	25%
Consulting and support	18%
Renewable energy	30%
University research	11%
<b>Revenue ranges</b>	<b>Respondents</b>
Less than \$1M	105
\$1M-\$10M	66
\$10M-\$25M	13
\$25M-\$100M	9
More than \$100M	21
No answer	39

*SOURCE: Massachusetts Technology Collaborative Renewable Energy Trust, Massachusetts Clean Energy Industry Census 2007*

Companies are making a splash in Massachusetts because of the goals set by the Green Communities Act. In 2007 there were 51 new solar installers in the state. At the end of 2008, this number tripled to more than 150.<sup>46</sup> This is a 300% increase from the amount in 2007, greatly surpassing the estimated numbers at that time. Evergreen Solar, a manufacturer of solar panels, constructed its first American manufacturing plant in Devens, MA. The choice to develop here was mostly due to the Commonwealth's promise of reaching 250MW of solar in the decade.<sup>47</sup> This plant is expected to create 700 new jobs in the industry.<sup>48</sup> Konarka has landed \$5 million from the state to open a New Bedford facility for photovoltaic development.<sup>49</sup> Beacon Power has received \$3 million in a contract with the U.S. Naval Sea Command to develop a flywheel energy storage system for the Navy. The Scuderi Group LLC has received \$35 million in funding for developing a split cylinder fuel-efficient combustion engine.<sup>50</sup> Groups like Clean Connect are starting to help clean tech companies flourish by supply resources for their prosperity and growth in the state.<sup>51</sup> In addition to independent companies installing their own

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<sup>46</sup> Mass High Tech Staff, "Mass. clean energy in numbers." [Mass High Tech](http://masshightech.com/stories/2009/02/09/focus2-Mass-clean-energy-in-numbers.html). 13 Feb 2009. 17 Feb 2009 <<http://masshightech.com/stories/2009/02/09/focus2-Mass-clean-energy-in-numbers.html>>.

<sup>47</sup> "Massachusetts Accelerates Renewable Energy Industries." [Renewable Energy World](http://renewableenergyworld.com/rea/news/article/2007/08/massachusetts-accelerates-renewable-energy-industries-49613). 10 Aug 2007. Renewable Energy Access. 15 Feb 2009 <<http://renewableenergyworld.com/rea/news/article/2007/08/massachusetts-accelerates-renewable-energy-industries-49613>>

<sup>48</sup> Mass High Tech Staff, "Clean Tech startups get support in recession." [Mass High Tech](http://masshightech.com/stories/2009/02/16/daily29-clean-tech-startups-gets-support-in-recession.html). 18 Feb 2009. 26 Feb 2009 <<http://masshightech.com/stories/2009/02/16/daily29-clean-tech-startups-gets-support-in-recession.html>>.

<sup>49</sup> Stone, Andy. "Sun Worshipers." [Forbes](http://www.forbes.com) 11 aug 2008: 34

<sup>50</sup> Mass High Tech Staff, "New England clean tech companies, agencies closing deals." [Mass High Tech](http://masshightech.com/stories/2009/02/09/focus4-new-england-clean-tech-companies-agencies-closing-deal.html). 13 Feb 2009. 21 Feb 2009 <<http://masshightech.com/stories/2009/02/09/focus4-new-england-clean-tech-companies-agencies-closing-deal.html>>.

<sup>51</sup> Mass High Tech Staff, "Clean Tech startups get support in recession." [Mass High Tech](http://masshightech.com/stories/2009/02/16/daily29-clean-tech-startups-gets-support-in-recession.html). 18 Feb 2009. 26 Feb 2009 <<http://masshightech.com/stories/2009/02/16/daily29-clean-tech-startups-gets-support-in-recession.html>>.

power, utility companies are all using businesses in Massachusetts as contractors for their projects. The more the demand increases, the greater the price drop of the technology will be. Just the cost of solar is expected to drop almost four dollars per watt by 2015<sup>52</sup>. This will likely lead to an even further increase in the number of panels produced every year. These are only a few examples of companies providing opportunities on the production side for growth in the job market.

There are still other aspects to consider when analyzing the future growth in jobs. With all of the new technologies being implemented across the state there is going to be an increase in demand for technicians. The state will need more installers, service techs, auditors, contractors and many other professions. To compensate for the lack of trained professionals in this area, the Green Jobs Act was passed to create job training programs to fill the positions of the growing market. Progress in the green sector can already be seen since the passing of the act last year. Clean tech company executives predict a 30% job growth in the next year alone.<sup>53</sup> Training in these specialties should also see an increase. Programs at local colleges and universities are training people in fields to keep up to date with new energy technology being implemented in the field. Solar hot water has seen a large growth in regards to the numbers of jobs. This is due to the 30%, no limit rebate on the installation of the systems and the average pay back period of three to five years. This is just another example to show how positively the Green Communities act is having an impact on job growth in the state. As the act continues to develop and grow, expect to see further increases in the green sector. Also, oil related

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<sup>52</sup> Stone, Andy. "Sun Worshippers." *Forbes* 11 aug 2008: 34

<sup>53</sup> "Massachusetts Accelerates Renewable Energy Industries." *Renewable Energy World*. 10 Aug 2007. Renewable Energy Access. 15 Feb 2009 <<http://renewableenergyworld.com/rea/news/article/2007/08/massachusetts-accelerates-renewable-energy-industries-49613>>

industries should be adversely affected due to the Commonwealth letting go of their fossil fuel ties.

### **Coping with the Down Market**

The economy has been hit hard and has been taking a downward spiral. Every industry has been affected. Cutting jobs, company closings and federal bailouts have been a common theme in the news over the past months. The state and federal governments needed to find a way to turn things around, and fast. One of the best and most prominent solutions came in the form of energy. Not just any form of it - green energy. The push has ignited a spark that has created many opportunities for those in green industries.

Most people think that "Going green is hard to do when you're going broke"<sup>54</sup>. Initially this is a true statement because of the high-start up costs typically associated with green technologies. Since the passage of the Green Communities Act, it's all about to change. The government and the Massachusetts Technology Collaborative are now providing most, if not all of the money up front. This takes a large burden off the shoulders of those planning or thinking about installing green energy technologies. Making everything more affordable is a sound that clean-tech companies are enjoying to hear.

There's a lot of money floating around that's all aimed at green investing. The key to the success or failure of the state's new green initiative is going to be in funneling the cash in the right directions. Companies are all competing for the numerous state funded projects that

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<sup>54</sup> Johnson, Paul. "Going green doesn't have to mean going broke." *The Boston Globe* 24 Jan 2009 Web. 4 Apr 2009.  
<[http://www.boston.com/bostonglobe/editorial\\_opinion/oped/articles/2009/01/24/going\\_green\\_doesnt\\_have\\_to\\_mean\\_going\\_broke/](http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2009/01/24/going_green_doesnt_have_to_mean_going_broke/)>

are springing up throughout the state. The government has to effectively invest in each project. Each venture should be both cost effective and have the largest effect possible on the economy. This can be done by spanning many areas of the green economy so that the money used can make a much bigger splash. The state has started this trend by backing solar, wind and hybrid technology projects. The Commonwealth must continue this trend to see a positive result once the rest of the legislation kicks in.

Some companies pointed out one major downside of the Commonwealth: the state must cease to invest in fossil fuel power plants. The Patrick administration has made it a clear goal to increase the use of renewable energy sources throughout the state. The only problem is that plans for new fossil fuel power plants are still being passed. This only continues to have a negative effect on the green sector of the economy. The entity in charge of this permitting process is the EFSB (Energy Facilities Siting Board) headed by the Secretary for Energy and the Environment.<sup>55</sup> Once no new plants are passed, the need for renewable energy sources will continue to grow as the overall energy demand increases. There is still a push for this portion of legislation to get finalized.

The final portion of the Green Communities Program (one section of the GCA) was finalized and signed into effect on Earth Day 2009. This is the section that allows cities and towns to get state funding for municipal projects. This gives cities and towns the ability to dip into the \$10 million dollar pool that will be replenished each year. Also expect to see an increase in the overall dollar amount as cities/towns get more involved. In these economic

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<sup>55</sup> Simko, Austin. "Grid Updates Will Energize The Bay State." *Worcester Business Journal* 02 Mar 2009 Web.20 Apr 2009.

times, this is yet another green light for companies. It will offer businesses an even greater opportunity to market their products and services. The added cash flow will be even more helpful to the growth of green business in the state.

While layoffs and decreasing revenues seem to plague the entire state, the opposite can be seen in green industries. Most renewable companies are hiring despite the economy. Some companies that are hiring are: Aeronautica Power, Conservation Services Group, Boston Power Incorporated, Evergreen Solar, Great Point Energy, Sebestra and Little Foot Energy.<sup>56</sup> These are only some of the many businesses looking to increase their staff. Thus far, the governor has kept his promise in the creation of new jobs across the state.

As a majority of the programs come into effect, it will be interesting to see if the green sector of the economy will continue to thrive through these dark economic times. Right now, the future is looking bright for clean-tech companies in Massachusetts. If the state follows through with the high goals its setting, progress will continue. State funding for projects will encourage competition and the strongest businesses will come up on top. The same can be said for technology. The competition will drive evolution creating more efficient and less expensive renewable sources. Overall, the state's legislation is steering the green economy. Hopes are high that it will further grow into something that will save the state from this down market.

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<sup>56</sup> "Mass Clean-Tech Companies That are Hiring." *The Boston Globe* 01 Apr 2009 Web. 19 Apr 2009. <<http://www.boston.com/business/gallery/renewablejobs/>>.



### **All the Way to Zero: ZNEB**

The state currently has standards in place for the construction and renovation of green buildings. The standards are currently called the Massachusetts LEED Certification. It is not a requirement for buildings to be constructed with green ideals in mind. It is a money saver over time and can also be used to market the building. The certification is a rating system based on an allowable number of points for each section of building codes. The certifications levels are: certified, silver, gold and platinum. There are seven sections on which each building can be rated. The sections are: sustainable sites, water efficiency, energy and atmosphere, materials and resources, indoor environmental quality, innovation in design and regional priority.<sup>57</sup> This system provides contractors with a standard to go by. Each certification lets the buyer/owner know how energy efficient the building is that they will be purchasing or moving into. This was a great way to start off the state movement towards creating buildings with a smaller environmental footprint. It's only a start though, and much greater movement is soon to be pushed through by the state government.

The Patrick administration is pushing for something that was once thought never to have the ability to be done. Zero Net Energy Buildings are in the cross hairs for the state of Massachusetts. Buildings in the Commonwealth consume 54% of all the energy distributed in the state.<sup>58</sup> That's a lot of fossil fuels being burned and money wasted each year. Picture a building that uses as much energy as it creates; the overall impact on the environment would

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<sup>57</sup> "LEED 2009." *Mass.gov*. 10 Nov 2008. US Green Building Council. 22 Apr 2009  
<<http://www.usgbc.org/ShowFile.aspx?DocumentID=5546>>.

<sup>58</sup> "Getting To Zero." *Mass.gov*. 11 Mar 2009. Zero Net Energy Building Task Force. 25 Apr 2009  
<[http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)>.

be close to zero. This is the dream of the Patrick administration. Last year the Zero Net Energy Task Force was created and Patrick directed them to research the feasibility and benefits of it.

The three main goals that were given to the task force were:

- Point the way toward broad marketability of zero net energy residential and commercial buildings in the private sector by 2020, and universal adoption of zero net energy buildings for new construction by 2030;
- Specify an interim standard for state-owned construction that is significantly more stringent than the current Mass LEED Plus benchmark; and
- Develop specifications for the first state-owned zero net energy building by January 1, 2010.<sup>59</sup>

These goals have given the committee a task to create headway for one of the most revolutionary goals in building construction to date. The first major accomplishment was the issuance of their report in March of 2009. In the report a zero net energy building is defined as ***“A zero net energy building is one that is optimally efficient and, over the course of a year, generates energy onsite, using clean renewable resources, in a quantity equal to or greater than the total amount of energy consumed onsite.”***<sup>60</sup> The committee understands that some energy must be consumed for heating. We do live in the northeast and it does tend to get pretty cold. With solar, wind and other resources the building can counteract that energy used over the period of a year. As defined in the goals, an overall standard would further drive the development of the technology making buildings overtime more energy efficient. With the advances in green building technology, the task force created a competition in which

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<sup>59</sup> "Getting To Zero." *Mass.gov*. 11 Mar 2009. Zero Net Energy Building Task Force. 25 Apr 2009 <[http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)>.

<sup>60</sup> "Getting To Zero." *Mass.gov*. 11 Mar 2009. Zero Net Energy Building Task Force. 25 Apr 2009 <[http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)>.

contractors competed in designing homes that would be close to zero net energy usage. This produced about seven different residential buildings to be used as models for zero net energy code. They also set up three model projects of state owned ZNEB's (Zero Net Energy Buildings). These locations are: The Division of Wildlife Headquarters, The North Shore Community College Health Services Building and the Lowell Trial Court.<sup>61</sup> From these model homes and facilities the task force set up an initial set of specifications to be met in the future construction of ZNEB. The specifications include: energy analysis, implemented technologies, heating and ventilation, materials of construction, insulation and annual cost benefit analysis. In accordance with the specifications, the task force also came up with over thirty recommendations for the state to further the feasibility of obtaining zero net energy buildings in the Commonwealth. These range from changes in policy to tax incentives/rebates to programs to further advance technology. Dates of target implementation are paired with each recommendation provided by the task force. Most of the dates selected will occur within the next two years. If the government follows through in pursuing ZNEB, this report could set up ground-breaking reform in the way buildings are constructed in the state.

If the dream of making zero net energy buildings a common practice found throughout the state comes true, the effect on the green sector of the economy would be, simply stated, *huge*. New constructions and renovations would ideally be retrofitted with renewable and energy efficient technologies. These would include solar electric and hot water, next-gen windows, geothermal systems, efficient insulation, LED lighting smart grid connections and

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<sup>61</sup> "Getting To Zero." *Mass.gov*. 11 Mar 2009. Zero Net Energy Building Task Force. 25 Apr 2009 <[http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb\\_taskforce\\_report.pdf](http://www.mass.gov/Eoeea/docs/eea/press/publications/zneb_taskforce_report.pdf)>.

possibly fuel cell technology. Each area would have their benefits respectively. Businesses would be able to tap into to vast, constantly expanding market place. This would again create competition driving the start-up costs down significantly. The Patrick administration is aiming low, as low as energy consumption can possibly get. They are setting high goals that could one day be reached with enough research and funding. For the mean time, expect to see small but persistent changes over time when it comes to the construction of buildings in the state.

### **Breaking Ground**

There are three major words that run through one's head when purchasing in renewable energy sources: return on investment. This is what makes or breaks it for most green companies in the state. Customers who are considering acquiring a renewable system for energy generation want to know how long it will take for them to start actually saving money. The equipment and installation costs for a solar array or efficiency projects can be pretty pricy for many. Companies are looking to the state and federal government to provide ways to make the technology feasible for their customers. As the number of installations increase, the price of the equipment will start to decrease accelerating the sector of the economy. A wave of funding coming in from the GCA and federal stimulus is expected to jump start the green collared industries. People now have a vast array of resources where they can receive funding or get certain rebates on renewable and energy efficient projects. Utilities are required to meet the renewable portfolio demands set forth by the state. They are receiving

assistance for getting the ball rolling from the Renewable Energy Trust Fund and slight energy rate increases. This is pushing projects into the planning and ground breaking phases.

Communities that are trying to be considered green can now tap into the \$10 million pool set aside for investments; which is expected to grow in the coming years. Homeowners have an extension on the 30%, no limit rebate for solar hot water which is creating a large number of new projects because of the quick return on investment. The act is stimulating the Massachusetts energy economy in a big way. Project seeds are being planted and in the future we will all reap the benefits from the state's renewable investments.

New contractors are coming to the state because of the surge in demand for alternative energy projects. Contractors that have already been here now find themselves getting trained in how to complete new installations so that they can also take part in the growth. Funding is becoming more accessible and wide spread for renewable and efficient energy. There are a huge number of projects still in the planning phases waiting in the wings to get approved. With the expedited approval process as mandated by the Green Communities Act, we can expect to see multiple ground breakings in the very near future.

Companies such as Landerholm Electric Company are really taking advantage of the opportunities provided by the act. The firm has scored a contract to install the largest solar array of its kind in New England. The project was delayed because of funding and permitting process. Now that the GCA has been put into effect West Bridgewater could be taking in a lot more sun in the near future. The project is expected to break ground by mid-May and be

finished by October. The site would cover nine acres of solar panels.<sup>62</sup> This is only one example of the industry moving forward at a rapid pace.

Ansar Energy, LLC, has shown interest in constructing renewable energy facilities. Ansar Energy has proposed a 100 MW project involving 3 facilities across Massachusetts. The solar projects are planned to be operating in Greensboro, Attleboro, and Worcester. According to the company, "one-third of the financing would come from government loans or grants, with the balance from power purchase agreements with utilities."<sup>63</sup> The timeline for completion on this project has not yet been released. It resides in the planning and approval phases of the project. The project proposal is necessary due to the renewable portfolio demands set forth by the GCA on utility companies in Massachusetts. Now contractors and utilities are working with each other to find new opportunities to implant the new technologies in the most effective places. The projects are usually aimed at areas of low value where not much else could be done with the area. A similar site in Norton, is looking to use an old capped off landfill for its solar farm. Ansar would come in and install the facility that would end up yielding the town \$10,000-\$15,000 per acre per year when they sold the energy to utility companies.<sup>64</sup> This could be used to help cure the towns' budget problems. This could be made a model for other communities around the state.

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<sup>62</sup> Churchill, Sandra. "West Bridgewater Solar Farm Could be Done by Fall." *Enterprise New* 13 Apr 2009 Web.13 Apr 2009. <<http://www.enterpriseneews.com/business/x213965967/West-Bridgewater-solar-farm-could-be-done-by-fall>>.

<sup>63</sup> Solar Energy push makes way to Worcester Regional Airport. 13 February 2009. Worcester Telegram & Gazette News. 06 March 2009. <<http://www.telegram.com/article/20090213/NEWS/902130323/1116>>.

<sup>64</sup> McInerney, Katherine. "Developer Could Bring Solar Energy, Cash to Norton." *Wicked Local* 03 Apr 2009 Web.9 Apr 2009. <<http://www.wickedlocal.com/norton/news/x1098985316/Developer-could-bring-solar-energy-cash-to-Norton>>.

### **Opinions of the Act**

The Green Communities Act is revolutionary piece of legislation that has created a buzz around the state regarding the possibilities that could be created from it. Yet when analyzing the act, one has to take into consideration both ends of the spectrum. The overall view of the act is held in high regard and many companies are waiting for the bulk of its programs and legislation to come into effect. Sebestra thinks that the GCA is all talk and no action. They sense that the act is aimed in the right direction but the legislation itself doesn't create enough waves in regards to really making vast improvements to the businesses in the state. The tax incentives are extended but the company thinks the industry is going to need more of a shove to get things really rolling.

A firm who wishes to remain anonymous considers the Green Communities Act as part a temporary, environmental friendly "dot com bubble". Right now the number of companies breaking onto the alternative energy stage is growing because of all the publicity of the act and federal stimulus. They sense that after the initial surge of funding and projects, only the larger firms may be able to stick it out.

Sitting on the opposite end, many companies are excited to see the state trying to sever our ties to fossil fuels. Many have seen large growth, whether it be in renewables or simply the installation of better insulation materials. Alteris Inc. is waiting for the completion and passing of the neighborhood net metering portion of the act. When net metering is approved, companies or persons can construct their own renewable energy generation site. They then can sell their energy back to the grid in retail rather than the wholesale rate provided by the

utility companies. An example would be a contractor installing a turbine then selling power to homes and businesses around the area or a supermarket using its roof space for solar panels and then selling the power to the surrounding shops.

Overall green companies see the act as an opportunity for advancement in their sector. This carbon reducing legislation is finally taking the technologies and moving them up to the commercial level allowing for more deployment into the Commonwealth. Aside from the business end of things, it will also provoke more research and development which will further the efficiency and power producing capacity of the technologies. The act assists the customer to produce the capital necessary to break ground on renewable projects, even during these down economic times. This is an important aspect of renewable, because once construction is complete, the system usually starts to pay itself off.

Businesses have high hopes for the act and the benefits that could come from it. The economy is still cruising pretty low so the amount of money left for capital investments is minimal. As the finances come about, the growth in the green sector of the economy will become more prominent to the untrained eye. Governor Patrick is banking on the green sector to create a new source of income and jobs for the state. Let's hope he gets it right the first time through.



### **Cities and Towns**

The Green Communities Act will clearly have a significant impact on the towns and cities in Massachusetts. The overall goal of the act is to get as many towns and communities to be labeled as a “Green Communities” as possible. Although, it won’t be easy for a town to meet the requirements of being a green community, once a town does, the opportunities are endless. However, before a town/city can be labeled with this title it will have to meet certain criteria first. These include:

1. Provide as-of-right siting for renewable or alternative energy facilities in self-designated areas
2. Adopt a streamlined permitting process to site such facilities
3. Establish an energy use baseline inventory for municipal buildings and vehicles and reduce the baseline by 20 percent over five years
4. Purchase fuel-efficient vehicles when available and practicable
5. Require new residential and commercial construction to minimize, to the extent feasible, the life-cycle cost of the facility through energy efficiency and renewable and alternative energy technologies<sup>65</sup>

In this section of the paper we will look into the Green Communities Act and what effect it is having on towns/cities around the Commonwealth. In order to see what is happening in regards to the act we had to conduct a number of interviews and do extensive research.

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<sup>65</sup> "Massachusetts' Green Communities Act." *Middleboro Review*. 01 Jul 2008. 29 Apr 2009 <<http://middlebororeview.blogspot.com/2008/07/massachusetts-green-communities-act.html>>.

### Committees

Successful implementation of the Green Communities Act is going to take a lot of hard work from all people involved. Many of the towns and cities are forming some type of advisory council or committee to help their town's residents. They are usually in charge of helping their respective town become greener. It could be anything from projects they plan on doing or tips for residents on how to save energy. The number of committees seems to be growing as we speak, and more residents are taking initiative.

The city of Newton, Massachusetts, outside of Boston, has been very active with its committee and efforts to become greener. Clean Energy Newton is the website where they would like to educate, promote, and communicate green technologies to others. On the website Newton is trying to promote a new energy resource by joining New England Wind Futures. This option of joining is available to all businesses and residents in the state of Massachusetts. The program began to create more wind energy in New England. New England Wind Futures feels wind can benefit many things such as, the environment, economy, and climate. Because wind turbines face such a large upfront cost, they established the New England Wind Fund, which will provide financial assistance for the development of wind projects.<sup>66</sup>

Newton seems to be doing a lot to promote solar energy. Newton Solar Energy is for individuals who get plenty of sunshine and would like to install solar energy panels. They hope homeowners will see their meter go back about \$1 a day. Their goal is to have 500 solar roofs in Newton by 2010. Newton South High School has installed a solar power plant. The

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<sup>66</sup> Mass energies consumer alliance. from <http://www.ci.newton.ma.us/greenergy/index.html>

installation marks the largest installation at a public school in New England. The installation was funded by the Massachusetts Renewable Trust Fund. Clean Energy Choice is something Newton is looking to get into. But, in order to get involved they need to come up with the finances. They decided to make a deal with every donation that is made. If somebody makes a donation of \$50 or more to the program, an equivalent amount will go to renewable energy projects on the public schools in Newton or for energy efficiency projects in low income housing. The Green Decade Coalition/Newton is trying to promote, educate and communicate to others. Their education is done through workshops, speakers, tours, and school programs. Green Decade is also trying to promote recycling, energy efficiency and also send out green newsletters to keep people informed. Newton is doing a great deal in regards to green technologies, but they are not the only ones.<sup>67</sup>

Some towns are getting a boost from their residents and their desire to help the environment. Clinton, Massachusetts in Worcester County started a committee that was brought forth by its residents. After looking at some of the figures and numbers from previous years, the residents saw the need to save money and reduce some of the energy costs. In Holden, Massachusetts town manager Brian Bullock says there has been an increasing curiosity of residents trying to become smarter with their energy usage. One resident in Holden has even installed solar panels on his entire roof at his home. Bullock feels that the residents will push the towns and not towns pushing the residents. Hanover, Massachusetts is starting a "green district." What they hope to do with this is help them qualify as a Green Community as well as bring some green businesses to their town and support the industry as a whole. In

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<sup>67</sup> Green energy Newton. from <http://www.ci.newton.ma.us/greenergy/index.html>

Paxton, Charles Blanchard reports that permits for the installation of pellet stoves, an alternative heating source, are piling up on his desk.

Orleans, on Cape Cod, Massachusetts, is now in the second year with its committee. The “Renewable Energy/Wind Power Committee” is comprised of 5 individuals. These five individuals will complete a term over eighteen months and must “possess knowledge, experience and interest in renewable energy/wind power modalities and appropriate supportive technologies.<sup>68</sup>” Those on the committee will be working with other members of the town (selectmen, administrator, director of planning) to complete their tasks. The committee’s work is diverse and quite lengthy. The committee will : Work with town officials and others to find appropriate alternative energies, Identify properties that support the siting of renewable energies, meet with officials and attend conferences/ meetings, provide a complete action plan for all projects, develop and maintain a project schedule, and provide quarterly reports to the town administrator.

Allen Kolchinsky, a member of the committee, informed me about the Wind Workshop in Yarmouth on April 17<sup>th</sup>, 2009. Their target audience is anyone interested in improving the environment but especially, municipal officials, consultants, and town planners/engineers. They will speak on the new developments made at different levels, as well as, permitting, financing, net metering, regulations and the Green Communities Act. In order for people to generate

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<sup>68</sup> Wind Turbine. February 2009. Town of Orleans. 11 March 2009.  
<[http://www.town.orleans.ma.us/Pages/OrleansMA\\_BComm/docs/windreport.pdf](http://www.town.orleans.ma.us/Pages/OrleansMA_BComm/docs/windreport.pdf)>.

ideas from others there, or see what others did, they will show successful community based wind projects.<sup>69</sup>

The Town of Orleans had an economic feasibility study done to construct a commercial-scale wind turbine. The report was quite lengthy and included review and analysis of several different categories. Some of the analysis included, but wasn't limited too : evaluation of prior reports, existing published wind data; review of the electricity usage and rates, estimates of construction, operation and maintenance costs, the assessment of Renewable Energy Certificate credits associated with development of a single commercial-scale wind turbine in the Town watershed property. With the way the economy is today, there is a big issue with finances for implementing green technologies. After the economic analysis was done some conclusions were drawn. The following figures are based on the design, permit and construction of a single 600 kW wind turbine: Overall cost- \$2,300,000, Net Present Value- \$859,000 using a discount rate over 20 years, Average Net annual cash flows of \$70,000 with a new cash flow of \$1,400,000 over 20 years. They expect a positive cash flow by its fifth year of operation. Several factors can influence the economic performance of the project such as: including actual wind speeds, reduced costs from potential grant funding, changes in energy rates and final net metering rules. Overall, the project seems attractive with a 1.31 benefit to cost ratio.<sup>70</sup>

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<sup>69</sup> Charge to the renewable energy/wind power committee. from [http://www.town.orleans.ma.us/Pages/OrleansMA\\_BComm/docs/renewcharge.pdf](http://www.town.orleans.ma.us/Pages/OrleansMA_BComm/docs/renewcharge.pdf)

<sup>70</sup> Wind power financial feasibility study report. Retrieved Feb 2009, from [http://www.town.orleans.ma.us/Pages/OrleansMA\\_BComm/docs/windreport.pdf](http://www.town.orleans.ma.us/Pages/OrleansMA_BComm/docs/windreport.pdf)

With the passing of the Green Communities Act it seems that more towns/cities are taking a progressive approach towards becoming green. If more towns can form committees, or make greater efforts to adopt renewable energies, Massachusetts will be at the top of the United States list for pioneering green technologies, alongside California.

### **City/Town Projects**

A lot of focus was put on the construction of energy efficient buildings when the Green Communities act was passed... Four out of the five qualifications to become a “green community” include some type of relation to new construction, permitting process, or renewable facilities. Many of the towns/cities are trying to take advantage of these huge opportunities and have their buildings become more energy efficient.

What are the towns in Massachusetts doing to work with these requirements? In order to find out what some of the towns are doing we had to conduct a few interviews over the phone, or through e-mail, with town managers. After speaking with Michael Ward, town manager of Clinton, Mass, he informed us that Clinton is looking to get involved with the as-of-right siting policy in the GCA. Clinton has looked at a few buildings and will continue to look at several more. An inventory of all municipal buildings will be taken to see what buildings could use improvements to their energy efficiency. Michael also informed us that Clinton would like to work with a company to increase the town’s energy efficiency and reduce energy costs. The plan is to have companies come to them with a proposal and help them increase their energy efficiency by 20%. Whatever savings the town sees, they will help pay back the company.

Clinton has a Senior Center building in the proposal stage that would make the building energy efficient. Even though this is the only energy efficient building planned, the town's building committee's will utilize green design features and will look into a geothermal system for heating.

As mentioned earlier, Newton has enacted quite a few initiatives in regards to green technology, and the same goes for their energy efficient buildings. South High installed solar panels in 2005 and the whole project took about two years to complete because the general contractor for the school was not quite interested. It produces 60,000 kWh/year. North High, the next project, will also have a solar instillation that produces 60,000 kWh/year. Both North and South High will have solar and rain water storage, while North expects to receive a LEED Silver certification.

What is LEED? LEED is the acronym for Leadership in Energy and Environmental Design. The United States Green Building Councils created LEED as a rating system for green buildings. LEED recognizes five key areas of human and environmental health to promote a whole-building approach to sustainability. The five areas include: sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. Based on the type of project that is being worked on, there will be a different rating system for each design. The specific programs include: LEED-New Construction, LEED-Existing Buildings, LEED-Commercial Interiors, LEED-Core and Shell, LEED-Homes, LEED-Neighborhood Development, LEED-Schools. Once the points are tallied up, they are then given a specific rating based on the

point total. From the maximum points to the least, the ratings are Platinum, Gold, Silver, and certified.<sup>71</sup>

Newton also has plans to work with their Kyoto project. This project was named after the Kyoto Protocol which is an international effort for all countries to reduce CO2 emissions; the U.S. is yet to sign it. The Kyoto Project was established in 2002 to help homeowners. It is used to help homeowners identify what can be done in a home to become more climate friendly. A Kyoto Coordinator will sit down with a homeowner and explain the steps to take. He or She “explains how the utility rebate and audit system works, sits down with you after you have a utility audit, and develops a CO2 baseline and climate action plan for you to implement for your home.”<sup>72</sup> The coordinator will also recommend green energy options and biodiesel sources for home heating.

Hanover, Massachusetts is another town that seems to be proactive in regards to the GCA. Based on their Energy Advisory Committee, they have eight objectives, two of which relate directly to the GCA and its construction and permitting process. These two objectives are: 1) Work with town officials to establish regulations for all new residential, commercial and industrial construction that promotes energy efficiency, conservation or alternative power generation in conjunction with the Green Communities Act to minimize life-cycle energy costs, 2) Per the Green Communities Act, adopt as-of-right siting, in designated locations, for Renewable Energy/Alternative Energy ‘Generation’, and/or RE/AE ‘Research

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<sup>71</sup> "What is LEED?." *Missouri Families* 03/17/2007 Web.23 Apr 2009. <<http://missourifamilies.org/quick/housingqa/housingqa42.htm>>.

<sup>72</sup> "Kyoto Project." *Green Decade* Web.23 Apr 2009. <[http://www.greendecade.org/energy\\_kyoto.html](http://www.greendecade.org/energy_kyoto.html)>.



and Development' and/or RE/AE 'Manufacturing', and adopt expedited 12 month application/permitting process. Linda Kakulski, a member of the energy committee, answered a few questions regarding the GCA. Hanover currently has some construction projects that are working to become more energy efficient. They include the construction of the new high school, senior center, and Habitat for Humanity homes. Once Hanover is qualified as a green community, it hopes to use some of that money towards making their buildings more energy efficient and to help fund wind turbines and solar panels. By utilizing the buildings and turbines, Hanover hopes to lower their energy costs in the future. Hanover has also looked into installing some wind turbines. In Mid-February the town conducted a feasibility analysis of installing wind turbines. After the feasibility study was completed, Hanover found they could save hundreds of thousands of dollars on electricity by installing two wind-powered turbines. Two of the potential sites for installing wind turbines include the Hanover High School and Cedar Street Elementary School, with an estimated cost for installation of \$1.6 million. According to the study it would take them an estimated 12 years to help pay off, but would accrue savings of 3.5 million over a 25 year period. After speaking with Linda Kakulski, she informed us that Hanover is still working on a wind turbine project, but this one is even bigger than originally proposed.<sup>73</sup> Also, Sustainable South Shore has recently offered Hanover home owners a thermal imaging energy audit program. Home owners have been very lively by installing new insulation, storm windows and sealing air leaks.

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<sup>73</sup> "Wind Power Picking up Steam." *Wicked Local-Hanover* Web.23 Apr 2009. <<http://www.wickedlocal.com/hanover/archive/x101052938>>.

Expediting permitting and as-of-right siting will help influence more projects to use a green design. Not only will these green designs help clean up the environment, but it will also save towns/cities money in the long run.

### **Negatives**

However, all towns are not making the leap towards becoming a Green Community. Western and Central Massachusetts seems to be making strides in the right direction, but based on the research it seems like Eastern Massachusetts is taking the most initiative to lead this charge against the excess usage of non-renewable energies.

When speaking with a local town manager about the Green Communities Act, it didn't exactly turn out the way I had expected. The first time he heard about the GCA was on February 20<sup>th</sup>, 2009! The act was signed Mid-July of 2008 and put into law in January 2009. It was in an e-mail from Meg Lusardi, Head of Green Communities Program, that he found out about it. She wanted answers by March 23<sup>rd</sup>. This led us into our discussion of Massachusetts Public Policy. He explained how the state will have great ideas for a new law or act, but the implementation process needs some help. They don't set money aside or give people the proper direction needed to move forward. Also, they are not putting someone in charge of running programs and sometimes don't even tell the towns about them. Why don't they tell you about the laws? He said it's very much a top down process where the people on the inside have all the knowledge and it gets lost along the way down the system. Also, when the laws are passed they don't think about the results and what will happen down the road. At the time of the interview,

he had so many other things on his plate that he couldn't even take a look at the Green Communities Act.

Although it may be shocking to read about a town manager not knowing about the GCA so late in the process, it may be something to consider. Massachusetts may have to look at a new public policy approach.

### **Net Metering**

One way Massachusetts is trying to promote renewable energy is through Net-Metering. In the Green Communities Act net-metering was discussed for both homeowners and utility companies.

Net metering lets customers who generate their own renewable power send excess electricity that they generate back to their electric distribution company. This will offset their electric bill for the power they purchase from the grid when their renewable energy installation isn't meeting their full needs. This can be done for installations up to 2 megawatts.

Massachusetts hopes net-metering will make renewable power more advantageous for consumers who install it for their own use. In the past, the state restricted net-metering to on-site generation with a capacity of 60 kilowatts or less. Now, with the 2 megawatts allowance, consumers offset their electric bills with the extra power they don't use, and at a higher retail price, rather than the lower wholesale rate allowed in the past. Paul Gromer, of the Solar Energy Business Association of New England, feels the solar industry will get a big boost from the passage of the act, especially with the net metering. "They will make solar power more

affordable and help the solar industry to create new, green jobs across Massachusetts.”<sup>74</sup>

Municipalities may also be able to reap the net metering benefits. For example, they may be able to see the benefits for each wind turbine they install for their own use with a capacity up to 2 megawatts. One town which is looking to take advantage of the benefits from the net metering provisions is Falmouth. Falmouth plans to install a new 1.65 megawatt wind turbine early in the summer of 2009.

The net metering credits are broken down into three classes. Class 1: 60 kW or less (all technologies), Class 2: >60 kW-1Mw (solar, wind, agricultural business), and Class 3: 1 mW-2mW (solar, wind, agricultural business). Net-excess will be carried over month to month indefinitely. The GCA also provides neighborhood net metering. This allows credits for renewable power generation to be shared among neighboring households. Neighborhood Net Metering is for all three net metering classes that serve the energy needs of a group of 10 or more residential customers in a single neighborhood.<sup>75</sup>

Net metering will not only benefit the consumers who take advantage of it, but the solar industry in general. As net metering takes off it, seems likely that neighborhood net metering will as well. Those who decide to take advantage of net metering can help others jump on the bandwagon through neighborhood net metering.

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<sup>74</sup> *First Wind* Web.27 Apr 2009. <<http://www.firstwind.com/aboutfirstwind/news.cfm?ID=35806014-3f74-4b35-a348-494833293ecd&test>>.

<sup>75</sup> "Massachusetts-Net Metering." *DSIRE* 04/09/2009 Web.27 Apr 2009. <[http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive\\_Code=MA01R&state=MA&CurrentPageID](http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=MA01R&state=MA&CurrentPageID)>

### **Fuel Efficient Vehicles**

Fuel efficient vehicles have been a hot topic for a few years. As oil prices reached all time highs last year, people were looking for an alternative solution. Hybrid vehicles seemed like that solution.

We found that homeowners and students are aware of hybrid or alternative fuel vehicles. Part of the reason for this response was that they are often exposed to this through commercials and car companies' advertising. Like most companies in the auto industry, the Green Communities Act has made a push to promote hybrid vehicles. The act will direct the State of Massachusetts to purchase new alternative fuel or hybrid vehicles to the maximum extent feasible to replace the old vehicles. Also, it requires that the state have at least 50 percent of its vehicles be hybrid or alternative fuel by 2018.<sup>76</sup>

Littleton, Massachusetts has been one of the towns to mull over the decision on whether or not to start buying fuel efficient vehicles, and if so, in what town department. They decided to replace Police Chief Kelly's car. The main concern Littleton has, along with many other towns, is the price. The question arises, how much is too much? With a conventional cruiser being about \$25,000, and the SUV hybrid at \$45-50,000 one can see the predicament. The town is already facing budget issues and in turn has to cut back employment wages and some of the library hours. If Littleton were to qualify as a "green community," they would be able to see a lot of money thrown their way from the Green Communities Program. Would it be a good idea to miss out on millions of dollars, just because they don't want to spend a few

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<sup>76</sup> "Summary of Green Communities Act." *Conservation Law Foundation* Web.27 Apr 2009.  
<[http://www.clf.org/uploadedFiles/CLF%20Green%20Communities%20Summary\\_6-24-08FINAL.pdf](http://www.clf.org/uploadedFiles/CLF%20Green%20Communities%20Summary_6-24-08FINAL.pdf)>.

extra thousands the next few years? Police Chief Kelly feels if the question is purely economical you shouldn't go after the new vehicle, but if it is an ecology question, it is a no brainer. The Light and Water department in Littleton is also looking at purchasing fuel efficient vehicles.<sup>77</sup>

Money seems to be coming in all directions to try and promote hybrid vehicles. Similar to the GCA, President Obama's Stimulus plan has funds allocated for fuel efficient vehicles. Eastham has been looking very strongly at buying hybrid vehicles. They just looked at the Ford Escape Hybrid for their most recent purchase, however it was too expensive. Even with that being said, some of the Lower Cape Town's have different views about trying to acquire fuel efficient vehicles. John Kelly confirms Orleans, Mass is aware of the rebates for hybrid vehicles, but has no plans to purchase vehicles in the near future. Similarly, Brewster is another town which doesn't see hybrid vehicles in their future. Brewster "rolls down" their Ford Explorers from the police department to be used as inspectional vehicles at Town Hall. The SUV's will be used in the event of a weather emergency. When asked why they don't buy fuel-efficient vehicles, Charles Sumner Town Administrator, explained "It just works out better for us this way." "It's better than having four-wheel-drive cruisers just sitting at the station to be used in the case of bad weather."<sup>78</sup>

A few other towns have looked into, or already, put fuel efficient vehicles into use. Newton, Mass has four hybrid cars and two b-20 trucks. Hanover does not have any hybrid vehicles. However, Linda Kakulkis informed us that Hanover is telling each town department to

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<sup>77</sup> "Buying the police chief a hybrid cruiser mulled." *Wicked Local-Littleton* 02/25/2009 Web.27 Apr 2009. <<http://www.wickedlocal.com/littleton/news/x1959825187/Buying-the-police-chief-a-hybrid-cruiser-mulled>>.

<sup>78</sup> "Hybrids not on horizon for lower cape towns." *Cape Cod Today* 04/13/2009 Web.27 Apr 2009. <<http://www.capecodtoday.com/blogs/index.php/2009/04/13/hybrids-not-on-the-horizon-for-lower-cap?blog=53>>.

consider buying them and informed the departments about the new grant from the DOER for fuel-efficient vehicles. Similar to Littleton, Clinton has fuel efficient vehicles but only in its police force.

Within the near future, towns will be forced to start looking at fuel efficient vehicles. Although 50% seems like a lot, towns have until 2018 to accomplish this task. Once the economy turns around, the pricing will no longer be an issue for these towns who are hesitant to buy today.

### **Funding**

Some cities/towns have concerns adopting green technologies. One of the main concerns is the money that must be set aside in order to allow this adoption to happen. However, Massachusetts and the federal government are trying to work their way around that concern by offering a few options for municipals in Massachusetts.

The most recent funding was issued by President Barack Obama's stimulus plan. When the American Recovery and Reinvestment Act was signed into law on February 17<sup>th</sup>, 2009 \$787 billion was put towards revitalizing the economy. The president delegated money to different industries and markets. Green Technology was one of the top priorities and received a lot of money to make this turn around happen. Roughly \$61.3 Billion was put towards the energy sector. The goal of clean, efficient, American energy is "To put people back to work today and reduce our dependence on foreign oil tomorrow. We are seeking to double our renewable

energy production and renovate public buildings to make them more energy efficient<sup>79</sup>.” The Natural Resources Defense Council feels the stimulus package will help jumpstart the current economy, allow for future growth and help us meet our needs of the 21<sup>st</sup> century. Within the entire energy package there were four main areas the President wished to target: Smart Grid /Advanced Battery Technology/Energy Efficiency (\$34 billion); Landmark Energy Savings at Home (\$5 billion); Tax Incentives to Spur Energy Savings and Green Jobs (\$20 billion over 10 years); and Modernizing Federal Infrastructure & Housing to Lower Energy Costs (\$10 billion).

The smart Grid, Battery, and Energy efficiency initiative (\$34 billion) will be focusing on a diverse group of things, including the Smart Grid. The Smart Grid will modernize the electricity grid to make it more efficient and reliable. President Obama has a strong passion for something similar to a smart grid, smart meters. At any given time, a homeowner could look at his or her smart meter, and this device will tell him or her how much electricity is being used. The smart meter can be used anywhere, especially at an office or somebody’s residence. The information will then be sent to the utility company providing the electricity or directly to homeowner. A utility company can view how much energy is being used in different places or a property holder can determine his or her own energy usage.

To ease credit constraints for renewable energy investors, there is a guaranteed \$60 billion in loans. These loans will begin over the next 2 years, for renewable energy power generation and electric transmission projects. \$6.3 billion is being used to help state and local

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<sup>79</sup> <sup>79</sup> Pelosi, Nancy. "American Recovery and Reinvestment Act." Web. 13 Apr 2009. <<http://www.speaker.gov/newsroom/legislation?id=0273#energy>>.



governments reduce energy usage and achieve greater energy efficiency. Rebates will also be provided to consumers to buy energy efficient appliances and replace the old ones. By taking advantage of this opportunity the benefits will be seen in the reduction of energy bills.<sup>80</sup>

Through weatherization, President Obama would like to improve energy efficiency for up to one million modest-income homes. By expanding the number of families and the aid level, this program will help save modest-income families on average \$350 per year and also create 90,000 jobs. \$5 billion has been set aside to help achieve this objective.

Not only is the ARRA trying to help companies and businesses save money, but also homeowners. The Stimulus Plan will be extending and expanding efficient doors and home insulations. With the next generation of cars right around the corner, the ARRA will be providing tax credits for families who purchase plug-in hybrids and all electric tax credits through 2010. Homeowners can benefit from this by investing in new furnaces, energy vehicles up. There will also be incentives to install alternative fuel pumps for consumers.

\$10 billion will be used to help modernize the federal infrastructure and lower energy costs. Upgrading federal buildings will save taxpayers over \$1 billion and cut the federal buildings' energy costs by 25%. Investments will also be used for Department of Defense buildings, public housing, and low-income housing.<sup>81</sup>

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<sup>80</sup> Pelosi, Nancy. "American Recovery and Reinvestment Act." Web.13 Apr 2009. <<http://www.speaker.gov/newsroom/legislation?id=0273#energy>>.

<sup>81</sup> Pelosi, Nancy. "American Recovery and Reinvestment Act." Web.13 Apr 2009. <<http://www.speaker.gov/newsroom/legislation?id=0273#energy>>.

The Green Communities Program was formed to serve as the hub for all matters related to energy efficiency in the state of Massachusetts. “The goal of the Green Communities Program is to enable cities and towns to maximize opportunities to save energy in schools, city halls, firehouses, and other public buildings; to generate some of their energy needs from wind, solar, and forest trimmings; and to make other decisions that reduce their environmental impact and carbon footprint, and ultimately, to put the Commonwealth at the hub of the 21<sup>st</sup> century clean energy economy.”<sup>82</sup>

Within the program there is a Green Communities Grant Program. The grant will provide up to \$10 million annually in loans and grants to the towns that qualify as a “Green Community.” However, there are several steps towns must take in order to qualify and benefit from the grants/loans. The qualification criteria includes: “File an application, Adopt as-of-right siting, in designated locations, for RE/AE generation, or RE/AE R&D, or RE/AE manufacturing, Adopt expedited (12 month) application/permitting process, Establish an energy use baseline inventory with a program to reduce baseline by 20% in 5 years, Purchase only fuel-efficient vehicles, Require all new residential construction > 3000 ft<sup>2</sup>, and new commercial and industrial real estate construction to minimize life-cycle energy costs.”<sup>83</sup> The Green Communities Program was launched on Earth Day, April 22<sup>nd</sup> 2009.

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<sup>82</sup> Green Communities Program." Web.13 Apr 2009.  
<(http://www.mass.gov/?pageID=eoeaterminal&L=5&L0=Home&L1=Energy%2C+Utilities+%26+Clean+Technologies&L2=Renewable+Energy&L3=Renewable+Portfolio+Standard&L4=Green+Communities&sid=Eoeea&b=terminalcontent&f=doer\_rps\_gc\_green\_comm\_div&csid=Eoeea) >.

<sup>83</sup> "Green Communities Act- Sustaining Sudbury." Web.13 Apr 2009.  
<www.sudburyedc.org/files/GreenCommunities.ppt

The Renewable Energy Trust is an organization based off of the Massachusetts Technology Collaborative. The GCA establishes a new governing board and requires development of a five year strategic plan on the already existing Renewable Energy Trust Fund.<sup>84</sup> The trust was established to maximize environmental and economic benefits by promoting clean energy technologies to the Commonwealth's citizens. The Renewable Energy Trust Fund will finance most things that are helping the movement towards Massachusetts becoming green. The trust will help fund just about anyone including: Individuals, businesses non-profits, communities and housing.<sup>85</sup>

The Regional Greenhouse Gas Initiative Fund was also established to help finance different areas related to green technologies. This fund will help finance the GCA, provide interest-free loans for those towns working on energy efficiency projects that don't qualify as a "green community", and will reimburse communities for property tax losses due to mandates of the Greenhouse Gas Initiative.<sup>86</sup> However, the Regional Greenhouse Gas Initiative (RGGI) is made up of ten states in the Northeast who want to limit greenhouse gas emissions. The goal is to cap CO2 emissions and have a 10% reduction by 2018. Not only is the RGGI fund looking to help reduce CO2 emissions but also, help out the customers and improve the local economies.

President Obama's money that was set aside for green technologies will raise eyebrows on a national level while the Green Communities Program will in the Commonwealth. The

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<sup>84</sup> "Summary Of Green Communities Act." Web.13 Apr 2009.

<[http://www.clf.org/uploadedFiles/CLF%20Green%20Communities%20Summary\\_6-24-08FINAL.pdf](http://www.clf.org/uploadedFiles/CLF%20Green%20Communities%20Summary_6-24-08FINAL.pdf)>.

<sup>85</sup> "Renewable Energy Trust." Web.13 Apr 2009. <<http://www.masstech.org/IS/index.html>>.

<sup>86</sup> "Massachusetts Green Communities Act." *Middleboro Review* 07/01/2008 Web.13 Apr 2009. <<http://middlebororeview.blogspot.com/2008/07/massachusetts-green-communities-act.html>>.

funding for the projects and buildings should make people aware that this is a top priority throughout the United States. If the funding continues at this level, or increases, there is stopping the revolutionary changes happening in Massachusetts.

If everything stays as it is and the act heads in the right direction, there is no obstacle to the Green Communities Act becoming something special. Towns/Cities have already been taking action by forming committees and task forces to address their energy concerns. The economy today is not where anyone would like it to be. But, with the passage of the Green Communities Program, municipals can overcome these tough financial times. If a town is not a green community, it will still have President Obama's stimulus plan money to dip into. Net metering and fuel efficient vehicles are two of the driving forces behind the success for this piece of legislation. A growth in consumers take advantage of these two quality options will result in the state being more energy efficient. As the projects continue, it's a constant visual reminder to citizens of what the state is trying to do. Seeing a wind turbine or solar panel project being constructed will make people think about where Governor Patrick sees the state's bright future. The towns of Massachusetts will be the powerhouse that floats or sinks the Green Communities Act.

### **Survey Evaluation**

The Green Communities Act is still in the early stages of its legislation. The publicity of the act is still considered questionable. We wanted to see how much splash the act has made

with regards to Massachusetts citizens. We compiled an online survey consisting of many different types of questions related to renewable energy, energy efficiency and the act itself. This survey looked at various areas, including public interest, knowledge of the GCA, opinions of the Act, and the programs related to the Act. We utilized SurveyMonkey.com to invite local individuals to participate in our survey and 350 responded.

Part of the survey analyzes the perceived change in renewable energy efficiency in the subject's campus or community. These questions were posed because of our interest in determining how noticeable changes in energy usage are to an average citizen. 64% of the people surveyed felt that they have put moderate effort into adapting energy efficient behavior to their lifestyle. Most people are taking small steps towards energy efficiency, but we feel that people must take bigger steps to take full advantage of what the GCA offers. The most popular energy efficiency technology that was used was energy efficient lighting at 80%. The relative cost of this is the most likely reason that it is the most popular choice for reducing personal energy consumption. Yet, 20% of respondents stated that they use no additional technologies to lower their personal energy usage. When questioned on which technologies they would be willing to use, the top two choices of respondents were hybrid vehicles and solar panels. The reason for the choice in vehicles could be related to the frequent exposure to the day-to-day expenditures of filling up their gas tanks. This gives them a visual reminder of how much money they are spending. Other reasons include the publicity of the technology by the auto industry and media, as well as rising oil prices. Electric and hot water solar panels are a

common respond due to the ease of installation, rebates and the payback period involved with each.

When questioned on what prevents people from using these technologies, financing was the top response. This is understandable because of tightening spending and the expenses involved with these green technologies. Some feel that the payback period for the investment takes too long to recoup the initial losses. Others think that the technology has not been developed to the point where its efficiency is up to par with their needs. Many respondents were college age students who do not own a residence and therefore cannot make changes to their facility's carbon footprint.

When asked if they have noticed any change in their campus' energy consumption, 63% of people answered that they perceived a moderate change. One reason for this could be WPI's local campus projects involving energy efficiency and green buildings, such as the LEED certified East Hall dorms and Bartlett Center. Recently, WPI has had a strong push for green energy events including a "Green Week" that focused on creating awareness of the environment. The campus has also created a Sustainability Task Force, created reserve spaces for hybrid vehicles and hosted a green entrepreneurship forum and a green job fair. There was also a sustainability poster competition which we took part in (See Appendix C).

Respondent perception indicated a general feeling that state and local governments are generally not active on the green energy front. This question was posed before they were informed on the Green Communities Act. This could be due to this act being the first that deals with a widespread response to green energy technology. The Act is still in its early stages and

there has been little push to adapt to the demands of the legislation. A large number of those who answered viewed their local utility company's efforts as lacking. In the past, utilities have not been overly concerned with informing customers about renewable energy and undertaking energy efficiency projects, as the utility's profits come from the sale of more electricity, not less. The Act now makes it necessary for utility companies to make a major push into these areas. Later, when asked about their interest in getting involved with clean energy programs in their campus or local community, 52% of people said that they would be slightly or not at all interested in this course of action. This is contradictory of the earlier questions, as someone must take initiative and move forward on the green energy front. The Massachusetts government is taking this initiative in their stead.

The rest of the survey dealt with the Green Communities Act itself and informed participants of the basics of the act (See Appendix B). We described when the act was passed, the goals of the act, and what the GCA is trying to accomplish for the future. 62% of those surveyed said that they had no knowledge whatsoever of the GCA. Since the Act is so recent, many of those questioned had likely not had an opportunity to learn about the Act. When asked about which of the Act's goals are most feasible, the participants responded that having 20% of the state's energy provided from renewable sources by 2020 was most likely to be accomplished. This is most likely due to the fact that this goal deals with the construction of new resources rather than demand reduction, which involves personal choice rather than the building and restructuring of infrastructure.

Part of meeting the goals of the Act involves the construction of numerous wind turbine structures around the Commonwealth. When asked about their feelings involving the development of wind energy in the state, over 92% of the respondents were in favor of the build-up of wind energy resources. Locally, people have seen wind turbines distributed sparsely throughout the state, including regional high school such as Holy Name High School in Worcester. Many people mentioned the usage of wind turbines in Europe, which are widespread and used as a viable and reliable source of energy. The positive qualities of wind energy are its environmental-friendliness, safety, and relative inexpensiveness. As soon as the turbine is paid off, it generates free energy under ideal circumstances. Some, however, feel that the turbines take away from the local landscape, harm wildlife, and are too inefficient to warrant use. Also, there are some who feel that wind turbines do not provide enough energy to the grid to make a dent in the overall energy use. The technology also needs maintenance to keep running due to the relative age of the wind turbine systems. Generally, though, there was a positive response to the expansion of wind power in the state.

When a question on net metering was posed, 47% of survey participants answered that they were somewhat interested in the benefits of net metering. This hesitancy could be due to the expensive start-up costs and the lack of widespread knowledge about net metering options. However, if customers begin to use net metering, it is likely to spread quickly with plentiful rebates and the neighborhood net metering options. Some of this could also be due to the current state of the economy, so improvement in this area could be expected as the economy improves and as new net metering legislation is passed.



Over 50% of people questioned about free energy audits responded that they were likely or very likely to apply to one in the near future. This could be the case because people want to know ways to save money on their monthly energy bills and be more efficient in their energy use. They could be advised to do things as basic as the installation of energy efficient lighting or as complex as installing a high efficiency hot water boiler.

When asked if they knew if their town was taking any steps in regards to the GCA, over 70% of respondents said that they were unsure of any actions taking on the part of their community. Many people mentioned that their town was making budget cuts and would be unable to cope with any costs of renewable energy projects at this time. But, there were those who have seen their local utilities purchase hybrid vehicles, the development of solar panels for local schools, and town governments working on zoning regulations for solar panels and wind turbines. Due to the nature of a collegiate setting, some of the participants were not from Massachusetts and therefore were unable to respond accurately to the question.

An overwhelming 92% majority of respondents stated that they felt the Commonwealth was taking a step in the right direction with the passage of the Green Communities Act. This shows that public opinion is firmly backing the Patrick administration's push to stimulate the green economy, safeguard the environment, and reduce dependence on foreign oil. This is a good sign since the effort will take the full support of the Commonwealth to accomplish its high-reaching goals. This survey gave us a perception of how the people felt and perceived the legislation. A copy of our survey can be seen in Appendix B of this report.

### **Conclusion**

The Green Communities Act is a valuable piece of legislation that will furnish the state with a brighter, greener future. In order for Massachusetts to see the potential of the act, all parties must pursue the goals in earnest. If the goals are reached, the state will be equivalent to or surpassing the standards set by California. The state is taking a leadership role on a national scale when it comes to the area of energy reform. Expect to see many other states follow in suit with the example set by the Commonwealth.

Our study of the act was conducted shortly after the overall completion and signing of the legislation. We were unable to see the true affects that are sure to happen in the near future. Portions of the act still are not at their finishing point and will require further time and effort to tweak the sections to perfection. From what we learned, the act is promising in its goals and high aspirations to go green. Many of the agendas are innovative and first of their kind. This is their first run-through of the policies put into play. The state is still in the process of seeing what will and will not work for bettering both the environment and the economy. As time goes on, expect to see some revision and new drafts of certain programs as their failures or successes come to the forefront.

The act is beginning to make the use of renewables throughout the state more common. The green façade of Massachusetts legislation is creating a stronger presence of clean energy development. With green technology growing by leaps and bounds, the economy should be expected to follow suit. The unemployment rate is Massachusetts as of March 2009

is 8.2%.<sup>87</sup> Through programs such as the Green Jobs Act, the Patrick administration is combating this rising rate. Businesses are already starting to increase in numbers because of the hype created by the state government. This itself will draw in more employers who will in turn, access the labor resources of the state.

Attention to the Green Communities act is being offered through speakers and workshops in communities and campuses state-wide. Schools are starting to include courses in renewable energy subjects to train students to fill the need for green collared workers. Since there will be a sharp increase in green jobs from previous levels, there is a need to have trained professionals to operate in these new sectors. The state may soon see a large portion of its income coming from green-related technologies.

The utility company aspects of the Act increase the likelihood of the state's success in its green energy goals. The Act lets utility companies own solar generation capacity, which gives them an incentive to build these clean energy structures. The Act also makes it much easier for consumers to get involved with the growth and promotion of renewable energy resources through the ability to purchase their energy from renewable sources. Customers can also take advantage of net metering incentives by owning their own renewable power generators and putting any excess energy back into the system.

In order for the Green Communities Act to succeed, Massachusetts needs as many towns/cities as possible to be labeled as a "Green Community." The Green Communities

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<sup>87</sup> "Unemployment Rate: Massachusetts." *Google*. 01 Mar 2009. U.S. Department of Labor. 30 Apr 2009  
<[http://www.google.com/publicdata?ds=usunemployment&met=unemployment\\_rate&idim=state:ST250000&q=unemployment+rate+in+massachusetts](http://www.google.com/publicdata?ds=usunemployment&met=unemployment_rate&idim=state:ST250000&q=unemployment+rate+in+massachusetts)>.

Program, and other sources of funding, will help with financing of their proposed green technology projects. This could provide savings to the communities or possible savings from net metering. As of now, towns are starting to make headway to comply with the Green Communities Act by forming committees and task forces to assess their energy concerns. Homeowners have also been leading the charge by adding solar panels to their homes or purchasing fuel efficient vehicles.

With the proper effort the Green Communities Act can bring us to the pinnacle of green technology by the end of the next decade. Revolutionary ideas and goals are the driving forces which will propel the state to such a level. The Green Communities Act hopes to turn the state, the environment, and everyone's pockets a darker shade of green.

**Possible Topics For Further Research**

- Will the Massachusetts economy continue to grow in the green sector? How much growth will be made in the next year? Ten years?
- What do the utility companies' energy efficiency plans consist of and what improvements can be made to them?
- In 2010, how has the issued standard for Zero Net Energy Buildings been applied to state owned renovations and construction?
- Will there be an increase in construction projects utilizing green design or technologies? Will new building codes affect the projects?
- How will the \$10 million dollar pool assist communities in completing their energy projects? Is it enough? Should more be added to the pool? How many towns/cities are indulging into these funds?

- Will residents take advantage of net metering? If so is there a ripple affect from it?
- Part of the GCA required utilities to inform customers of opportunities to receive energy from non-utility energy suppliers. How has this program progressed so far? How are utilities reacting to this requirement? Is this mandate increasing the use of non-utility energy suppliers?
- Will towns take advantage of fuel efficient vehicles in their fleets? What departments seem to follow this trend?
- Has the Green Communities Act influenced other parts of the country to pass forms of similar legislation?
- Will the number of renewable energy businesses continue to grow or will it inflate, burst then drop off as some have warned before?
- What percent of the workforce is involved with green technologies? Has the GCA improved the unemployment rate? What has been the growth in numbers of jobs since the passing of the act?
- What changes can be seen on college campus regarding energy usage? WPI changes?
- What has been the impact of the Energy Efficiency Advisory Council on the growth of green energy and the GCA?
- How much GCA project funding will be gained from the 2010 cap-and-trade auctions?

- What has the EPS (Energy Pay and Save) pilot program achieved so far? Is it effective in its means and methods of savings?
- Further investigation of opinions about the GCA from utility companies, businesses, communities and the opinions of residents about the progress in green energy goals.
- Has progress been made on the projects mentioned within this report? How many of the projects have been completed within one year of their approval date? Have the projects been effective sources to their users?
- How has the technology involved with renewables evolved overtime since the passing of the GCA? What advances have been made?
- What is the status of the GCA educational outreach pilot program?
- How much renewable project funding will be acquired through the micro charges to customers?
- How much income have the GCA funding programs yielded so far for the construction of renewable energy projects?
- How are the utility companies' renewable energy projects progressing so far?
- How have the smart grid pilot programs progressed so far?
- Has the overall knowledge and interest of the Green Communities Act increased?
- How has the stimulus plan affected projects in the state?

- How effective is this piece of legislation and what effort has the Patrick administration provided to reach their goals?

### **Acknowledgements**

This IQP consumed many hours of those involved. We would like to thank Professor Kent Rissmiller for his time and effort in guiding us through this experience. Without his



assistance this project would not be half of what it is now. We would also like to thank all of the town managers, businesses and utility companies that made an effort to answer the questions we had for them. We appreciate the time you took out of your busy schedules to assist us in our research project. Finally, we thank all the members of the WPI community who participated in our survey. The results really gave us a feel for your overall knowledge of the Green Communities Act.

## **Appendices**

### **Appendix A: Research Questions**

Town Managers

- Has your town made any significant efforts to implement the Green Communities Act?
- What aspects of the GCA are high priorities?
- Are there any parts of the GCA that seem unlikely to be accomplished in the near future?
- Has the current economic downturn affected your actions regarding the Act?
- How has the state government assisted you in implementing the GCA?
- How many hybrid or alternative energy vehicles does your town currently have in operation?
- In the act it says that 50% of all vehicles owned and operated by the commonwealth are to be hybrid by 2018, does this seem like a feasible goal?  
What areas are likely to receive hybrid vehicles first?
- Has there been any renovations or new constructions that have utilized energy efficient or water efficient technologies?
- Have you seen any effort by members of your community to implanted energy saving technologies at home?
- Has your town done anything in regards to applying to the Green Communities Program?
- How easy or difficult is it for your town to meet the qualifications for becoming a Green Community?
- What future do you see for the GCA and its effects on the town?

Utilities

- The Green Communities Act stipulates that utility companies submit an energy efficiency plan to the DPU. Has your company finalized an energy efficiency plan? If so, can you comment on some of your plans and goals?
- The Green Communities Act puts limits on the amount of solar energy generators that utility companies can own or operate. How does this affect your plans for renewable energy distribution going forward?
- Do you believe that the required yearly increase in the amount of renewable energy provided to consumers is feasible?
- The Green Communities Act provides new guidelines on net-metering for renewable energy generation. Can you give us your opinion on net-metering and do you believe that it is the best way to foster the growth of renewable energy sources?
- The Act also states that municipalities can operate “small renewable energy generation facilities.” How widespread do you believe that municipal renewable energy generation will become?
- The Act mandates that utility companies submit a plan detailing a “smart grid pilot program. Have you completed that plan, and if you have, can you tell us about the program and its goals?
- Are there any portions of the GCA that affect your company that you do not believe to be feasible or believe should be changed?
- The goals of the Act state that by 2020, 20% of the state’s electric load should be met by “new, renewable and alternative energy generation” and that 25% should be met with


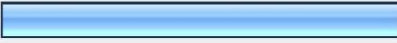

demand side resources. Do you believe these goals to be feasible? If not, what goals would you put in their place?


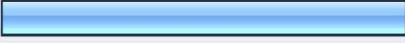
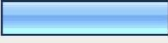
Businesses & Contractors

- How has the GCA affected your business/trade?
- How many “green houses” have you built or helped build?
- Has the economy affected green energy progress?
- Are people upgrading to use green energy?
- How much growth do you expect to see in the are of green building construction?

**Appendix B: Survey**

**Energy In Massachusetts Survey**

1. Have you noticed any changes towards energy consumption around your campus or community?			Response Percent	Response Count
Significant Changes			7.8%	27
Moderate Changes			62.9%	217
No Change			29.3%	101
	<i>answered question</i>			345
	<i>skipped question</i>			1



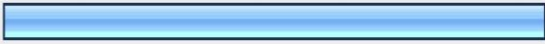

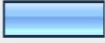
2. How much effort have you geared towards adapting clean/efficient technology into your lifestyle(Energy efficient appliances, hybrid technologies etc.)?			Response Percent	Response Count
Significant effort			9.9%	34
Moderate effort			64.1%	221
None at all			26.1%	90
	<i>answered question</i>			345
	<i>skipped question</i>			1

3. Out of the following clean energy technologies which ones do you currently use:

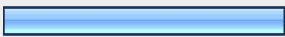
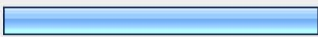
		Response Percent	Response Count
Hot water solar panels		2.0%	7
Electric solar panels		1.4%	5
Hybrid/alternative fuel vehicles		6.4%	22
Geothermal		0.6%	2
Wind Energy		2.3%	8
Energy efficient lighting		79.1%	273
None		19.7%	68
	<i>answered question</i>		345
	<i>skipped question</i>		1


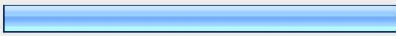
4. Out of the ones that you did not check, which would you be willing to use:

		Response Percent	Response Count
Hot water solar panels		61.3%	211
Electric solar panels		68.0%	234
Hybrid/alternative fuel vehicles		69.2%	238
Geothermal		46.5%	160
Wind energy		66.9%	230
Energy efficient lighting		28.8%	99
None		1.7%	6
	<i>answered question</i>		344
	<i>skipped question</i>		2

5. What do you feel is preventing you from using the technologies previously mentioned?			Response Percent	Response Count
Knowledge of technology			26.0%	89
Availability			55.6%	190
<b>Financing</b>			86.0%	294
Siting requirements			21.9%	75
Other (please specify)			15.5%	53
		<i>answered question</i>		342
		<i>skipped question</i>		4



6. Do you feel your local and state government has tried to make Massachusetts a greener community thus far?			Response Percent	Response Count
Yes			47.0%	158
No			53.0%	178
			<i>answered question</i>	336
			<i>skipped question</i>	10

7. Do you feel your local utility has tried to make Massachusetts a greener community thus far?			Response Percent	Response Count
Yes			33.7%	112
No			66.3%	220
			<i>answered question</i>	332
			<i>skipped question</i>	14

8. How knowledgeable of the Green Communities Act are you?

		Response Percent	Response Count
Very much		4.4%	15
Somewhat		33.5%	115
Not at all		62.1%	213
		<i>answered question</i>	343
		<i>skipped question</i>	3


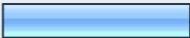
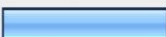
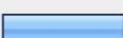
9. Which of the previously mentioned goals do you feel will be the most feasible?

		Response Percent	Response Count
(1)		15.0%	51
(2)		33.0%	112
(3)		23.6%	80
(4)		28.3%	96
		<i>answered question</i>	339
		<i>skipped question</i>	7




10. In achieving these goals, the state has put pressure on utilities to meet regulations of a renewable energy portfolio. This involves the instillation of wind turbines which tend to be very tall. Are you for or against the development of wind energy in the state?

		Response Percent	Response Count
In favor		92.4%	317
Opposed		7.6%	26
		Reasons for your answer?	165
		<i>answered question</i>	343
		<i>skipped question</i>	3

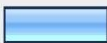
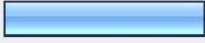

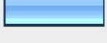
11. As part of the Green Communities Act, utilities now provide free energy audits for the home. This audit will show a homeowner where they can save money and energy by making changes in certain areas. How likely will you be to obtain an energy audit?

		Response Percent	Response Count
Very likely		24.3%	83
Likely		30.1%	103
Somewhat		26.3%	90
Not at all		19.3%	66
		<i>answered question</i>	342
		<i>skipped question</i>	4


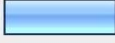
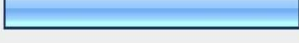

12. Has your city or town taken any action in regards to energy because of the Green Communities act (Purchasing hybrid vehicles, creating an energy council, renovation of building, etc.)?

		Response Percent	Response Count
Yes		11.1%	38
No		14.9%	51
I'm not sure		74.0%	253
		Specify if possible	33
		<i>answered question</i>	342
		<i>skipped question</i>	4


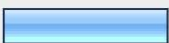

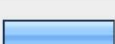
13. How interested would you be in getting involved to create clean and efficient energy resources in your community/campus?

		Response Percent	Response Count
Very interested		16.1%	55
Interested		31.9%	109
<b>Slightly Interested</b>		<b>36.5%</b>	<b>125</b>
Not at all		15.5%	53
		<i>answered question</i>	<b>342</b>
		<i>skipped question</i>	<b>4</b>

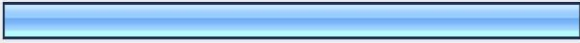

14. Net Metering is now available in Massachusetts. It permits people who own small renewable energy generators to sell their excess energy into the grid at favorable rates deducting from their energy bill. With this new policy enacted, how likely are you or your family to purchase a renewable energy source for your home?

		Response Percent	Response Count
Very likely		8.0%	27
Likely		17.6%	59
<b>Somewhat</b>		<b>47.0%</b>	<b>158</b>
Not at all		27.4%	92
		<i>answered question</i>	<b>336</b>
		<i>skipped question</i>	<b>10</b>

15. Energy Pay and Save is pilot program designed to allow homeowners to purchase and install renewable energy systems by paying the cost of the system over time on their electric bill. The excess charge on the bill shall not exceed the energy savings over the given year. How likely are you or your family to purchase a renewable energy system if the previous described program is in effect?

		Response Percent	Response Count
Very likely		13.0%	44
Likely		25.7%	87
Somewhat		43.8%	148
Not at all		17.5%	59
		<i>answered question</i>	338
		<i>skipped question</i>	8

16. Do you feel Massachusetts is taking a step in the right direction with the passing of the Green Communities Act?

		Response Percent	Response Count
Yes		92.0%	309
No		8.0%	27
		<i>answered question</i>	336
		<i>skipped question</i>	10

**Appendix C: Sustainability Poster**

# The Green Communities Act

*Turning The State, The Environment and Everyone's Pockets A Darker Shade of Green*

*How Is It Affecting YOU?*

## Businesses

- Increase in demand for renewables from State backed projects
- Stimulation of new jobs by attracting new companies to the State.
- State Ranked #2 in Renewable Energy Investments

## Communities

- Task forces being created to assess energy situations
- Municipals Aiming to be Green to tap into special resources
- State assisted funding through the Renewable Energy Trust Fund

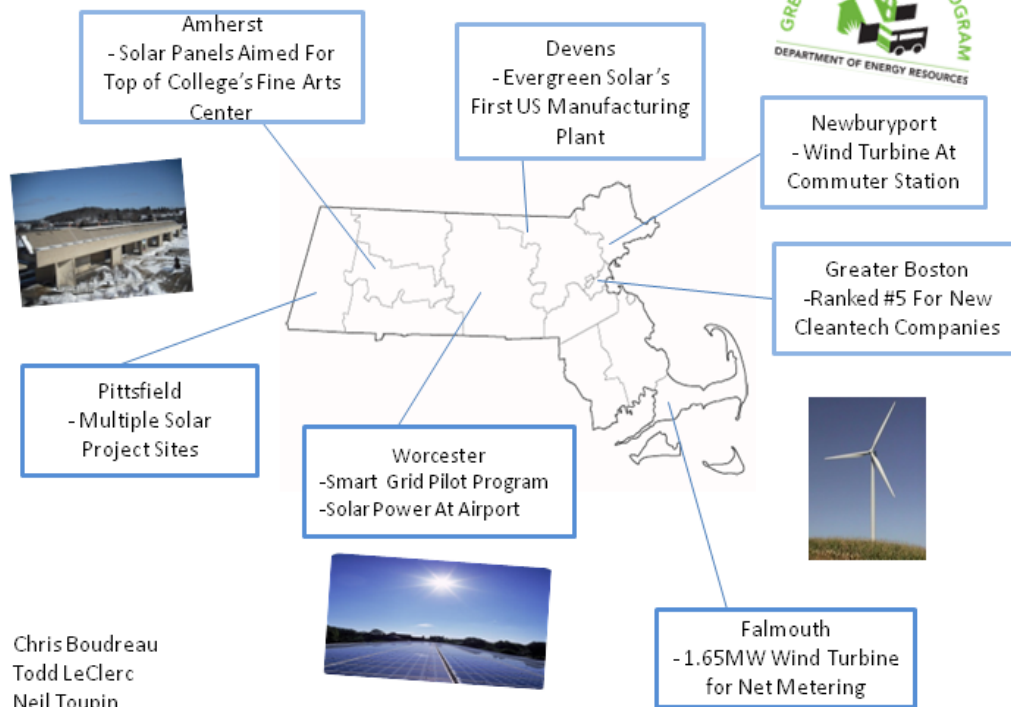
## Utilities

- Smart grid pilot programs to try and reduce energy demand from the grid
- Utilities Breaking Ground on New Solar Projects
- 20% of Energy Needs Provided From Renewables by 2020

## Homeowners

- Free energy audits provided by utility companies
- Rebate programs for the installation of renewable/efficient technologies
- Ability to tap into the benefits of Net Metering

*Where Is It Happening?*



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