

Rising to the Challenge:

Assessing the Massachusetts Response to Climate Change

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Clean Energy States Alliance (CESA) is a national nonprofit organization dedicated to advancing state and local efforts to implement smart clean energy policies, programs, technology innovation, and financing tools to drive increased investment and market making. CESA works with the leading state and public clean energy programs and provides information sharing and technical assistance to states and local governments on “best in class” clean energy programs and policies. CESA also facilitates collaborative networks to coordinate efforts between states, federal agencies, and other stakeholders to leverage accelerated progress on deploying clean energy projects and markets.

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One the cover: The Jiminy Peak windturbine, nicknamed Zephyr, under construction.
Photo Credit: Roman Iwasiwka

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By Warren Leon
Sonia Hamel
Benjamin Forman
Val Stori

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April 2012

Dear Friend:

MassINC is proud to present *Rising to the Challenge*, the first independent assessment of the state's ambitious and comprehensive response to climate change.

This report builds on MassINC public opinion research released last April, which demonstrated that a majority of residents want state and local government to take steps to address Global Warming, but few residents have any knowledge of the impressive effort that leaders on Beacon Hill and within state and local governments across the Commonwealth have fashioned in response to the problem.

Climate change is the challenge of our age. For the obvious reason – failing to respond could alter the environment with profound and dire consequences – but also because it is a critical test of government's ability to accomplish something complex for the common good.

As this report shows, Massachusetts has been a true laboratory of democracy on this issue. Working across agencies, across levels of government, and across state and national boundaries, we have put in place an array of sophisticated programs and policies to curb our greenhouse gas emissions without inhibiting economic growth or degrading our quality of life. Our progress to date is truly astounding.

Yet with any undertaking of this magnitude and difficulty, it is inevitable that we will run into stumbling blocks. This report catalogs the challenges we are likely to face and demonstrates that there is more work to do to meet the reduction targets the state is legally obligated to achieve. Overcoming these obstacles will require deep public commitment and resolve.

Toward that end, this report seeks to make a contribution by describing the various threads of our policy, and the choices and tradeoffs we will face in the coming years as we weave them into an effective response. We hope that this study provides a resource for civic leaders working to inform and engage residents on these important issues.

We thank the many advisors who contributed to this project by offering their guidance, ideas, and critiques. While they are too numerous to name individually, we are extraordinarily grateful for their time and insight. We would also like to express our gratitude to our partners at the Clean Energy States Alliance. The extreme dedication of Warren Leon and his colleagues are evidenced in this thorough and thoughtful analysis.

MassINC's mission is to provide solid, objective research to inform critical policy debates. We hope you find *Rising to the Challenge* a provocative and timely resource. As always, we welcome your feedback and invite you to become more involved in our work.

Sincerely,



Greg Torres

President

MassINC

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TABLE OF CONTENTS

Executive Summary	5
1. The State’s Response to Global Warming	7
2. How Successful Is the Massachusetts Response to Global Warming?	9
Is the State on Track to Meet Its Targets?	9
Is the State Successful in Four Key Realms?	11
Is the State Playing a Leadership Role?	17
3. The Economic Costs and Benefits of Climate Change Action.	18
The Costs of Adaptation, Smart Growth, and Transportation Measures	20
4. Global Warming Action at the Community Level	21
Introduction	23
I. The Massachusetts Response to the Climate Change Challenge	25
Scientific Views of the Threat to Massachusetts	25
The Barriers to Government Action.	26
The Commonwealth’s Serious Response	27
The Importance of State Action	30
But Is It Working?	31
II. How Successful Is Massachusetts? Views through Three Lenses	33
1. Is the State on Track to Meet Its Targets?.	33
An Assessment of Progress towards the 2020 Target.	34
The 2050 Target	44
2. Is the State Successful in the Four Key Realms of Energy Efficiency, Electricity Generation, Transportation and Land Use, and Adaptation?	46
Energy Efficiency	46
Electricity Generation	50
Transportation and Land Use	56
Adaptation	63

3. Is the State Playing a Leadership Role?	66
Providing Regional Leadership	66
Developing Policies and Testing Strategies that Others Can Emulate	68
Nurturing Technologies and Businesses	70
III. The Economic Costs and Benefits of Climate Change Action	75
The State’s Assessment of Costs and Benefits of Efficiency and Renewables	76
High Prices Not Primarily Caused by State Policies	76
Strong Evidence that Efficiency Has Been Cost Effective	77
The Renewable Portfolio Standard Has Recently Saved Ratepayers Money but May or May Not in the Future	78
The Costs and Benefits of Local Clean Energy Generation Are Unclear	79
The Costs of Adaptation, Smart Growth, and Transportation Measures	81
Rates versus Bills	81
The Costs of Inaction	82
IV. Global Warming Action at the Community Level	85
What Is the Green Communities Program and Why Is It Successful?	86
Community-Level Outreach	88
Partnerships between Municipalities and Utilities	88
Sharing Information with Municipalities	90
Community-Level Activities Worthy of Replication	90
More to Do	93
Appendix A: An Inventory of Massachusetts Greenhouse Gas Emissions	95
Appendix B: Results of Survey of Green Communities	96
Appendix C: Regional Initiatives	99
New England Governors and Eastern Canadian Premiers (NEG-ECP)	99
Regional Clean Fuel Standard	99
Regional Greenhouse Gas Initiative	99
Regional Transportation and Climate Initiative (TCI)	100
Appendix D: Other States’ Programs	102
California	102
Connecticut	104
Maryland	106
New York	108
Oregon	111
Vermont	113
Appendix E: Possible Models for Massachusetts from around the World	116
Canada’s National Capital Region: Integrated Land Use and Transportation Planning	116
European Union: Roadmap to 2050	116
Finland: Action Plan for an Energy-Smart Built Environment	117
London: Climate Change Action Plan	118
Netherlands: Climate Change Adaptation	118
New York City: Greener, Greater Buildings Plan	119
United Kingdom: Governance and Implementation	121
Appendix F: Individuals Interviewed or Consulted	124

Rising to the Challenge:

Assessing the Massachusetts Response to Climate Change

EXECUTIVE SUMMARY

On July 2, 2008 Governor Deval Patrick signed the landmark *Green Communities Act* proclaiming: “Climate change is the challenge of our times and we in Massachusetts are rising to that challenge.”* Massachusetts is indeed rising to the challenge, but will we succeed in reaching the greenhouse gas reduction targets we have committed to achieving?

This question is critical because Massachusetts has much at stake. If global emissions are not significantly reduced, credible projections suggest the state will face sea level rise of two to six feet. Hundred-year floods will likely occur every few years. Summers would bring 30 to 60 days with temperatures over 90 degrees. These threats can only be avoided if political entities around the world do their part to reduce emissions of carbon dioxide and other greenhouse gases.

In this spirit, Massachusetts has pledged to reduce greenhouse gas emissions 25 percent from 1990 levels by 2020 and 80 percent below 1990 levels by 2050. This report examines how far along the state is with implementing climate change actions to achieve these goals.

We place particular focus on the state’s trajectory toward the 2020 target. By reaching this interim goal, Massachusetts will show that significant greenhouse gas reduction is possible and can influence others to take action.

With eight years remaining to cut emissions 25 percent, this is the moment to take stock of our progress. Implementation is well underway, but there is still time to make any necessary adjustments to meet the 25 percent target.

While progress toward these targets provides one frame for assessing the state’s response to climate change, given the complexity of the challenge, it is important to look more broadly as well. The report examines other topics, such as the state’s preparations for adapting to a changing climate, the state’s leadership role nationally and internationally, and the extent to which the state is cost-effectively pursuing emissions reductions. We present this comprehensive review of the Massachusetts response in four sections:

- Section 1 provides a primer on the climate change problem, the urgent need for state and local action, and the policy response in Massachusetts to date.
- Section 2 assesses the state’s comprehensive response to climate change, answering three key questions: Is the state on track to meet its targets? Is the state successful in the key realms of energy efficiency, electricity generation, transportation and land use, and adaptation? And is the state playing a leadership role?
- Section 3 compares the economic costs of addressing climate change to the economic benefits of the policies that the state is implementing.
- Section 4 examines the achievements of local climate change action in cities and towns across the state.

* Citations for material in the executive summary are listed in the related sections in the main body of this report.

To prepare this thorough, impartial assessment of climate change activity in Massachusetts, we reviewed the rich compendium of information that is included in reports and other documents produced by state agencies. We interviewed more than three dozen state officials and stakeholders to understand their viewpoints and to get answers to specific questions about various programs. We learned about the opinions of an even wider group of stakeholders by reading commentary on the

Massachusetts climate response, including all the November 2011 testimony provided to the Joint Committee of Telecommunications, Utilities, and Energy on the *Green Communities Act*. To put Massachusetts's activities into perspective, we studied the climate change responses of six other leading states and examined particularly intriguing program ideas from around the world.

While this review led us to conclude that more work remains before citizens can be assured

Overview of Findings and Recommendations

Our overarching conclusion is that, although Massachusetts has implemented many effective and indeed nation-leading programs, there is a real likelihood that the state will fall short of its 2020 greenhouse gas reduction goal. To ensure Massachusetts hits the target it is legally bound to achieve, the state must accelerate its effort.

While renewed focus and additional action is required, achieving the 2020 target is within reach because the state's response to date provides a very strong foundation. More specifically:

- **Massachusetts state government—across several administrations and in both the executive and legislative branches—has taken the climate change problem seriously and has adopted many important policies and programs.** Governor Deval Patrick, in particular, and state government, in general, have shown leadership when it comes to climate change action.

- **The Massachusetts Clean Energy and Climate Change Plan for 2020, which was issued in 2010, is based on solid analysis and identifies an array of appropriate, logical actions.** The plan indicates that a 25 percent emissions reduction by 2020 is feasible and realistic.
- **The state is making good progress on many of the initiatives that were put in place in the three years before the climate plan was announced in December 2010.** Among the initiatives that are generally progressing well are the state's energy efficiency programs, the renewable portfolio standard, the Green Communities program, and the Leading by Example program. Those programs are achieving meaningful results and appear to be effectively managed.

However, there are several ways in which the state's climate change plan implementation could and should be better:

- **There is insufficient direction of overall implementation.** Even though climate change activities are better coordinated in Massachusetts than in most other leading states and the various key players in the different departments and agencies appear to work cooperatively, the current degree of coordination is inadequate given the importance and complexity of the greenhouse gas reduction tasks. It is not sufficiently clear who exactly is in charge of the overall effort.
- **Progress indicators and metrics are not clear and progress monitoring is insufficient.** The climate plan did not include a full work plan and one has not been developed since its release, nor has a tracking and monitoring system been put into place. For some pre-existing activities, such as oversight of the utilities' energy efficiency programs and the renewable portfolio standard, there is extensive monitoring and solid data. But for many of the items in the plan, it is hard for state officials or outside stakeholders to know what the specific expecta-

that Massachusetts will meet its mark, we want to establish at the outset that this finding is neither shocking nor disheartening given the state's ambitious goal. In the last analysis, success will only be achieved through continued thoughtful, determined action. Toward that end, this report seeks to provide useful guidance.

1. The State's Response to Global Warming

Massachusetts's leadership in energy efficiency, dating back to the 1980s, provided a solid foundation for action to address global warming starting in the 1990s. In 1997, the legislature passed important legislation establishing dedicated funds for energy efficiency and renewable energy. In 1998, the state started its first climate planning, holding stakeholder meetings and public discus-

tions or measures of progress are or whether the state is on track to meet those expectations.

- **The government response to climate change needs more visibility.** To build long-term public support for climate change action and to encourage citizens to get involved in addressing the problem, it is important for government to educate the public about the threat of global warming, the fact that it requires a sustained response, and the actions the government is taking to address it. Although Massachusetts leaders have discussed climate change, the focus has recently been so heavily on the economic benefits of building a clean energy industry that the climate change message has been barely visible to the public. Even though the current political/economic climate makes it difficult, it is important for state government to talk directly and forcefully about the threat of climate change and what is being done to address it.

- **The implementation of new initiatives and activities is lagging.** Many of the new initiatives and activities that the plan called for have been slow to launch. Among them are clean car consumer incentives, stationary equipment refrigerant management, pay-as-you-drive insurance, GreenDOT, deep energy efficiency improvements for buildings, and the regional clean fuel standard (low-carbon fuel standard). Because there are only eight years until 2020, these initiatives must be implemented quickly in order to achieve the desired results by that date.

This leads us to four primary recommendations:

1. The Governor should appoint a single individual to be responsible for directing the overall effort and keeping track of progress in all departments.
2. The state should set up an effective, transparent progress tracking and monitoring system. For each item in the climate plan, there should be

year-by-year milestones, metrics, progress indicators, and a methodology to determine whether the state is on track to meet its goals.

3. The state should make a concerted effort to inform the public that there is a coherent climate change plan with specific goals and actions to reduce the state's greenhouse gas emissions. The Commonwealth should create a public education campaign explaining what citizens can do to help achieve the Massachusetts climate targets.
4. The state should reassess the 2020 plan's lagging initiatives and determine whether these efforts can still feasibly achieve the reductions they were responsible for producing. To the extent that they can still generate reductions in time, the state should accelerate implementation. To compensate for programs that are no longer realistic or will take longer to generate measurable reductions, the state should look for viable replacement strategies.

sions on how and what action to take. Shortly after that, Massachusetts's government officials helped convince other governments in the region to address global warming.

Then, when Governor Deval Patrick took office in 2007, there was a dramatic increase in activity:

- The Governor signed Massachusetts onto the Regional Greenhouse Gas Initiative, a region-wide, market-based program to reduce emissions from all power plants larger than 25 megawatts and to create an active carbon market and an auction that generates energy efficiency funding. The initiative had been developed under the Romney Administration but Governor Romney eventually withdrew Massachusetts from the program.
- *The Green Communities Act* of 2008 required utilities to undertake all investments in energy efficiency that are less expensive than purchasing additional power, strengthened the state's renewable portfolio standard (a requirement that electricity supplies get an increasing share of their electricity from clean energy sources), required utilities to enter into long-term contracts with renewable energy generating facilities, established a Green Communities Program, and included other provisions to support and increase net metering (a policy allowing customers to receive credit at retail rates for electricity they generate onsite) and green buildings.
- *The Global Warming Solutions Act* placed more specific legislative, regulatory, and administrative initiatives into an overarching framework and provided a legal mandate for greenhouse gas emission reductions. It established a statewide legislative goal of reducing emissions to 80 percent below 1990 levels by 2050. It directed the Secretary of Energy and Environmental Affairs to determine a

2020 goal, which was ultimately set at an ambitious 25 percent below 1990 levels, and to produce a plan to meet that goal. It also provided state agencies with broad authority to regulate greenhouse gas emissions and required them to issue regulations.

- The state's energy and environmental agencies were combined into a single secretariat, the Executive Office of Energy and Environmental Affairs, making interdepartmental coordination on global warming easier.
- Two other laws—the *Oceans Act* and the *Green Jobs Act*—also contributed to the state's climate change response, but in more modest ways.

Taken together, all this legislation and action was an impressive and far-reaching accomplishment. What made it possible was bipartisan commitment and leadership in both the executive and legislative branches, and strong cooperation among the branches. In fact, when passing the *Global Warming Solutions Act*, not a single dissenting vote was cast. The Governor made it clear throughout 2007 and 2008 that clean energy was one of his top priorities.

In December 2010, the Executive Office of Energy and Environmental Affairs released the 2020 climate plan mandated by the *Global Warming Solutions Act*. The plan set out a series of policies and initiatives that it projected would lead to a 27 percent reduction in emissions from 1990 levels by 2020, slightly more than the 25 percent target. Reflecting the uncertainties inherent in any predictions of the future, the plan indicated that the ultimate end result of the proposed actions could be anywhere from 18 percent to 33 percent below 1990 levels.

2. How Successful Is the Massachusetts Response to Global Warming?

We assess Massachusetts's progress in addressing climate change by asking three questions, each of which illuminates a part of the picture and provides additional perspectives: (1) Is the state on track to meet its targets? (2) Is the state successful in the four key realms of energy efficiency, electricity generation, transportation and land use, and adaptation? (3) Is the state playing a leadership role?

Is the State on Track to Meet Its Targets?

The 2020 Goal

It is unclear whether Massachusetts will meet the 25 percent by 2020 greenhouse gas reduction target, partly because the state does not have control over key factors, such as the rate of economic growth, gasoline prices, natural gas prices, and federal policy. Because there is not any publicly accessible central scorecard of emissions, milestones, and projected effects of different initiatives, it is difficult for an outside analyst—or even someone within state government—to know how well or poorly some state programs are performing and how outside factors will affect the state's ability to meet the 2020 target. For example, because some of the reductions up to now have occurred as a result of a poor economy, it would be wise to evaluate what a revival in the economy could mean for emissions.

Looking at all the initiatives in the plan for 2020, the most significant likely or possible deviations to the plan's results on both the positive and negative sides are:

- The initial projections in the plan totaled 27 percent, providing a 2 percent cushion.
- The likely continuation of low natural gas prices may yield some greater than anticipated reduction in emissions because of less use of coal and oil.

- Without expanded electricity transmission from Quebec, which still faces significant hurdles, it will be impossible to achieve the 5.4 percent emissions reduction target attributed to clean energy imports.
- Many of the more difficult initiatives, totaling a projected 7.1 percent emissions reduction, are not currently at a point where it is reasonable to expect that they will all achieve their targets. A more reasonable current estimate might be that they will only achieve half of that or less.

Because the potential shortfalls could be significant, it is important for the state to begin to make concrete plans now for how it will make up the gaps, if necessary. The initial priority should be to assess realistically all those initiatives in the 7.1 percent category of potential shortfalls, to determine their likely results. A prompt assessment could help state officials decide if they need to move faster and how.

At the same time as the state reviews the 7.1 percent of unknowns, it should give attention to the transmission constraints that limit the ability of clean energy imports from Canada to reach Massachusetts, and even impede some potential wind farms in northern Maine from participating in the Massachusetts renewable portfolio standard. There is opposition in northern New England to expanded transmission, as well as some concerns about costs being imposed on ratepayers.

It is also possible that the state has taken actions that will yield unexpected emissions reduction dividends. For example, the Department of Environmental Protection's innovative new Clean Energy Results Program may achieve additional emission reductions from activities, such as diverting organic material from landfills. State officials should therefore determine whether there will be potential positive effects of any new

The Massachusetts 2020 Climate Plan: Reduction Target by Category and Strategy

BUILDINGS	9.8%**
All cost-effective energy efficiency/RGGI	7.1
Advanced building energy codes	1.6
“Deep” energy efficiency improvements for buildings	.2
Expanding energy efficiency programs to C/I heating oil	.1
Developing a mature market for solar thermal water/space heating	.1
Tree retention & planting to reduce heating and cooling loads	.1
Federal appliance and product standards	.6
ELECTRICITY GENERATION	7.7%**
Expanded Renewable Portfolio Standard (RPS)	1.2
More stringent EPA power plant rules	1.2
Clean energy imports	5.4
TRANSPORTATION	7.6%**
Federal & California vehicle efficiency and GHG emissions standards	2.6
Federal emissions & fuel efficiency standards for medium & heavy-duty vehicles	.3
Federal renewable fuel standard & regional low-carbon fuel standard	1.6
Clean car consumer incentives	.5
Pay As Your Drive (PAYD) auto insurance	1.1
Sustainable Development Principles	.1
GreenDOT	1.2
Smart growth policy package	.4
NON-ENERGY EMISSIONS	2.0%**
Reducing emissions from motor vehicle air conditioning	.3
Stationary equipment refrigerant management	1.3
Reducing SF6 emissions from gas-insulated switchgear	.2
Reducing GHG emissions from plastics	.3
TOTAL	27%**

*Information drawn from *Massachusetts Clean Energy and Climate Plan for 2020*.

**To avoid double-counting, the plan’s authors adjusted the subtotals downward to account for overlap among individual policies.

initiatives that were not included in the climate plan. Finally, the state should find additional ways to reduce emissions in order to compensate for possible shortfalls. In addition to the recommendations below for securing further emissions reductions, the state could consider whether it would be possible to move even faster than currently planned in implementing energy efficiency.

Recommendations:

□ Massachusetts should push hard to strengthen RGGI because that is the most obvious near-term opportunity for additional reductions. The RGGI states are currently in the middle of a program review that was specified in the original agreement and it appears that the state supports some form of RGGI enhancement. There are several different ways in which the program could be modified to achieve additional reductions by 2020, but the important thing is to do something to enhance RGGI’s future impact. In addition, the state should consider expanding the sectors covered under the RGGI program to include transportation, industrial sources, or other sectors.

□ The state should use the considerable regulatory authority granted under the *Global Warming Solutions Act* to ensure additional emissions reductions by 2020. In fact, that Act tells state agencies to “promulgate regulations that reduce energy use, increase efficiency and encourage renewable sources of energy in the sectors of energy generation, buildings and transportation.”

□ The state should focus on reducing leaks of methane from aging natural gas pipelines. Per molecule, methane is 21 times more potent as a greenhouse gas than carbon dioxide, so even small leaks can have a big impact. Although the natural gas distribution companies have been gradually replacing older pipes and repairing leaks, they have some perverse financial incentives that tend to discourage them from prioritizing leak repair and infrastructure replacement unless there is clear risk to public health and safety. It is not clear how much gas is currently leaking, so an initial step should be for the Department of Environment Protection and the Department of Public Utili-

ties to work with the gas companies to develop and agree on an accurate estimate of the extent of the problem. Then, the rate compensation structure should be adjusted so companies have an incentive to fix leaks.

□ The state government should either decide to work more aggressively to help overcome the difficult barriers to increased transmission or acknowledge that the goal of a 5.4 percent emissions reduction from clean energy imports may need to be revised downward or even eliminated.

The 2050 Goal

The Commonwealth has 30 additional years to achieve its 2050 goal, but that will not make the task easier. An 80 percent reduction in emissions is a daunting challenge and it will not be achieved simply by extending the same strategies that can meet the 2020 goal.

It is difficult for politicians and state governments to focus on anything decades into the future, yet there are modest ways in which government officials can and should address the long-term. Some of the near-term actions included in the current climate plan, including those related to building codes and smart growth, can make it easier to achieve the longer-term goal and early action can make a difference. Another thing the state can do now to prepare for achieving the 2050 goal is to identify especially relevant future technologies for which there are valid other reasons for providing near-term support.

For political leaders and stakeholders to understand the types of choices that will need to be made to reach the 2050 goal, they need more information than they currently have about the technologies and strategies that could fit into an effective long-term plan. Because government leaders will not likely have the time or resources to think intensively about the period beyond 2020, the private sector should assist the state

by envisioning the technologies, strategies, and policies needed for 2050.

Recommendation:

□ NGOs, foundations, and academics should launch a visioning exercise with the cooperation of state government. These groups should produce a report showing options for how an 80 percent reduction in greenhouse gas emissions could be achieved by 2050. The study should examine how other leading jurisdictions, such as California and European countries, are planning to reach this magnitude of reductions. It should be done on a regional New England basis and be carried out with relatively modest resources in less than a year. To support this activity, the state should publicly declare that it understands that preparation for achieving its 2050 goal is necessary and that the visioning exercise is a useful way to jump-start planning.

Is the State Successful in the Four Key Realms of Energy Efficiency, Electricity Generation, Transportation and Land Use, and Adaptation?

Energy Efficiency

Massachusetts has been most successful in implementing energy efficiency—both in terms of gross greenhouse gas reductions and in comparison to other states. Because of the state's long history in energy efficiency, when the push to accelerate energy-efficiency investment started to be made in the mid-2000s, there was already the infrastructure and expertise in place to oversee and implement those investments.

Two provisions in the 2008 *Green Communities Act* have been especially important to the successful expansion of energy efficiency programs: the requirement to implement all cost-effective energy efficiency and the establishment of the Massachusetts Energy Efficiency Advisory Council. Spending on energy efficiency has risen

dramatically, with the budget for electric utilities' efficiency efforts reaching \$401 million in 2011. This gave Massachusetts the highest per capita spending on electricity-related efficiency and second-highest spending on efficiency for natural gas customers. The current plans developed by the utilities and approved by the Advisory Council aim to achieve a 2012 savings equal to 2.4 percent of electricity sales and 1.15 percent of natural gas sales. Preliminary results indicate that the electric program administrators met 99 percent of their savings targets and the gas program administrators met 83 percent of their savings targets in 2010. The 2011 results are likely to be nearly as successful.

Most stakeholders within the state appear to be broadly satisfied with the overall delivery and results of the energy efficiency programs. In October 2011 the American Council for an Energy Efficient Economy ranked Massachusetts first in its annual energy efficiency rankings. This was the first time that California was displaced from the top spot.

Despite the aggressive, successful way that the state and utilities have implemented energy efficiency over the past few years, the path forward will not be easy. The state's climate change plan assumes that there will be a continued increase in the percentage of revenues that utilities spend on efficiency. That may be hard to sustain. Policy-makers should not be sanguine about the future performance of the efficiency program based only on its past successes. They will need to continue to innovate and refine the existing programs, seeking new effective energy reduction strategies to enable future rounds of reductions.

Electricity Generation

A state can reduce the greenhouse gas emissions associated with electricity generation both by reducing the climate impacts from fossil fuel generation and by bringing less polluting, renewable energy generators online. Massachusetts has



taken important steps in both areas. Yet, in the case of reducing emissions from fossil fuel generation, market forces have played a bigger role in closing and scaling back fossil-fuel facilities. High prices for oil and low prices for natural gas first sharply reduced output from oil-burning powerplants and more recently replaced some coal generation with natural gas. Because natural gas emits much less carbon dioxide than either coal or oil, this has led to large reductions in emissions.

While market conditions have been favorable, the state has also been especially bold in promoting renewable energy. Its most important renewable policy is the renewable portfolio standard (RPS). This ambitious initiative has been well-managed by the Department of Energy Resources. A variety of other state programs and policies have encouraged renewable energy development, including net metering, Massachusetts Clean Energy Center incentives, and utility purchases. Collectively, they have been responsible for bringing a significant quantity of renewable energy online throughout New England.

In 2010, the last year for which full data are available, five percent of the electricity supply was



Photo Credit: Massachusetts Executive Office of Energy and Environmental Affairs

required to come from renewable energy projects completed after the start of 1998. In complying with this requirement, electricity suppliers relied overwhelmingly on out-of-state facilities that used three energy sources: wind, landfill gas, and woody biomass.

The RPS percentage is slated to increase one percent annually, reaching 15 percent in 2020. If the RPS remains on track, it is probable that the vast majority of new renewable capacity by 2020 will be powered by wind. However, if natural gas prices remain low and the federal government neither renews the Production Tax Credit for wind energy nor substitutes a comparable incentive, it could become more difficult to develop wind projects. Massachusetts needs to monitor federal policy and market conditions closely to determine if any changes in the state's renewable energy policies are warranted.

Recommendation:

- ❑ To help ensure that significant renewable generation is added to the electricity supply, the state should implement additional measures to help renewable energy projects secure financing and/or long-term contracts.

The state has previously taken useful steps to address this issue and legislation recently debated in the Senate proposes to require the investor-owned utilities to enter into additional long-term contracts with renewable generators. Such contracts could reduce the cost of developing renewable energy facilities. Other measures related to financing renewable projects should also be considered.

Looking forward, the three big potential sources of renewable energy for the Massachu-

Recently built wind turbines at the MWRA Deer Island Sewage Treatment Plant (left) and Allen Farm in Chilmark were made possible by state support.

STATE PROGRAMS AND POLICIES HAVE ENCOURAGED RENEWABLE ENERGY DEVELOPMENT.

setts electricity supply are wind from the north (northern Maine and Canada), offshore wind, and hydroelectric from Canada. Wind from the north is likely to continue to be developed gradually and will remain an important resource. The other two resources have even greater potential, but they require special attention from the state.

The offshore wind potential is tremendous,

especially in deep waters. The amount of wind energy that could be secured off the coast dwarfs the amount that can be reasonably expected to be developed on land in the region. Although the costs for offshore wind projects are currently high, they will come down over time and the potential resource is so great that Massachusetts should continue to devote significant attention to it.

Large-scale hydroelectric, in contrast, is a

THE STATE HAS THE POWER TO TAKE MEANINGFUL ACTIONS TO REDUCE TRANSPORTATION EMISSIONS.

well-established, low-cost technology that does not require subsidies and is not included in the RPS. The province of Quebec has plans for significantly expanding its output of hydroelectric power and wants to sell some of it to New England. This could be a good way to bring down Massachusetts greenhouse gas emissions cost-effectively. But for the state to achieve its climate change goals and to maintain momentum behind renewable energy technologies, it is important for hydroelectric power from Canada to be additional to the RPS goals, rather than a replacement for them.

Compared to the potential to develop large-scale wind offshore or import renewable energy from out of state, the renewable energy possibilities on land within Massachusetts are much more modest. From a near-term, greenhouse gas reduction perspective, instate projects cannot and will not achieve anywhere near as much. Although they will not be major contributors to achieving the state's 2020 climate reduction target, there may be economic development benefits and other valid reasons for supporting solar, community wind, and other instate renewables.

Transportation

Transportation is responsible for 36 percent of Massachusetts's greenhouse gas emissions, the largest share by sector, and perhaps the hardest to tackle.

The most significant progress in reducing transportation emissions is coming from the federal government's improved fuel economy standards, which will cut emissions from cars and light trucks by approximately 21 percent by 2030. However, because of projected increases in the number of miles people drive, just improving the efficiency of vehicles will not be sufficient to reduce transportation sector greenhouse gas emissions significantly.

The state has only partial influence over many of the key factors in emissions—people's choice of vehicles, the fuels they use, and the total vehicle miles traveled. Moreover, many other issues—from the safety of bridges to the MBTA's budget woes and road repairs—compete for transportation officials' attention. Nevertheless, the state has the power to take meaningful action to reduce transportation emissions and the state climate change plan identifies some good strategies for doing so. Two particularly important pieces are GreenDOT and the Regional Clean Fuels Standard.

GreenDOT. Under the Patrick administration, there has been an attempt to integrate environmental sustainability into the conversations and decision-making within the Massachusetts Department of Transportation (MassDOT). There is evidence of a gradual, but real, culture shift within the bureaucracy.

In mid-2010, the Department launched GreenDOT as a "comprehensive environmental responsibility and sustainability initiative that will make MassDOT a national leader in 'greening' the state transportation system." No other state department of transportation has articulated such clearly stated and comprehensive sustainability goals. To make that vision a reality and to reach the climate goals established will require enhanced management within MassDOT, as well as collaboration among the state's many partners in the transportation arena, including local governments and the 13 regional metropolitan planning organizations

(MPOs) across the state.

GreenDOT has clearly tried to point the transportation system in a climate friendly direction. Although it has started some interesting, useful activities, its implementation has been inconsistent for a policy that is supposed to be a high priority. With the current slow pace and poorly resourced way it is proceeding, it is difficult to believe that GreenDOT will achieve the emissions reductions projected for 2020.

This is especially the case because other forces are pulling in the opposite direction. With fare increases and service cutbacks pending for the MBTA, some residents will switch some of their trips to cars, increasing emissions. And cutbacks in some categories of federal funding will likely hamper the state's ability to launch major new efforts to reduce single occupancy travel.

Recommendations:

❑ Because the MBTA represents one of the state's most effective existing strategies for constraining greenhouse gas emissions, it is counter-productive to reduce ridership. Although the financial challenges are daunting, the legislature and the Governor should work on providing sufficient long-term funding for public transportation so that ridership can expand rather than contract.

❑ MassDOT is scheduled to announce its GreenDOT implementation plan this spring. It would be highly desirable for that plan to explain in detail how GreenDOT will achieve its 2020 climate goal and how staff across the agency will be assigned roles, responsibilities, and management targets. The plan should include interim metrics and milestones.

Regional Clean Fuel Standard. The state's climate plan included a Regional Low Carbon Fuel Standard (the previous name for the Clean Fuel Standard) as one of its major programs. The program was conceived as a variation on California's

Low Carbon Fuel Standard, which was established in 2007 and was designed to reduce the carbon intensity of transportation fuels used in California by at least 10 percent by 2020. In November 2007, Governor Patrick, along with Senate President Murray and House Speaker DiMasi announced an Advanced Biofuels Task Force that ultimately led to the legislature passing a law requiring that the state seek to create a low carbon fuel standard with the other states in the northeast.

Agency staff members from Massachusetts took a leading role in guiding the technical team to develop the regional program. This led to a Memorandum of Understanding in December 2009 signed by the governors of the 11 northeast states.

While the 11 states in the northeast are currently developing a framework for the standard, a California judge earlier this year granted a request for a preliminary injunction against the California standard on the grounds that it is preempted by the federal Renewable Fuel Standard, making it unconstitutional under the dormant commerce clause of the Constitution. Although California is said to have a strong case and its standard could be upheld, Massachusetts would be wise to move forward with other policies and programs related to electric vehicle deployment and natural gas use. The state should also continue to work with the other northeast states on cooperative efforts.

Land Use

More broadly, transportation investments shape land use patterns, which affect greenhouse gas emissions by influencing travel patterns and the built environment. The state's climate plan recognizes the relationship between transportation and land use and includes a "smart growth policy package" aimed at facilitating more compact development. Like those in other leading smart growth states, the Commonwealth's policies have so far had only modest success. However, Massachusetts continues to implement smart

growth policy innovations in ways that could be meaningful to reaching the 2050 reduction target if the state can maintain this focus.

Unfortunately, in implementing smart growth strategies, state law still makes it difficult for communities to facilitate more compact and energy efficient development in two respects. First, local governments are restricted in their ability to generate revenue, which makes them heavily reliant on local property taxes and creates fiscal incentives that tend to produce larger housing units and decentralized development. Second, while communities have the ability to regulate zoning, restrictions in the state's outdated zoning statutes make it difficult for municipalities to manage growth.

To reduce fiscal disincentives for more compact development, in 2003, the legislature enacted Chapters 40R and 40S, which provide communities with incentives for zoning and permitting housing in higher density smart growth districts. As a result, the state has approved 33 smart growth districts providing for more than 10,000 units of new housing. However, communities worry that the state will not fulfill its obligations to reimburse municipalities for new school costs, because funding is running out.

State government is well positioned to encourage compact development by making greenhouse gas impacts a consideration in determining where the state invests its own resources and locates key public infrastructure. The state has been attempting to do this since 2004, when the Romney administration issued the state's first Sustainable Development Principles and established Commonwealth Capital, which used municipal planning and regulation as a factor in awarding state grants and loans. The Patrick administration updated the Sustainable Development Principles in 2009. Although it discontinued Commonwealth Capital for the current fiscal year, it continues to target state investment in other ways and has policies that emphasize smart growth.

Another major stumbling block for efforts to

promote sustainable land use in Massachusetts is the long-held aversion to regional coordination. The Patrick administration has intelligently used priority funding as an opportunity to promote regional collaboration. This effort began on the South Coast, where communities came together to prepare an unprecedented regional land use plan in preparation for the proposed South Coast Rail corridor. The Patrick administration is now using the South Coast model to develop a similar regional land use plan for 37 growing communities along Interstate-495.

Recommendations:

❑ The legislature should establish some ongoing revenue measure so that the development of smart growth districts under Chapter 40S can continue.

❑ The state legislature should pass zoning reform. If comprehensive zoning reform turns out to be unachievable, the legislature should expedite passage of components of currently pending legislation that will lead to more efficient development patterns and reduce greenhouse gas emissions.

❑ The state should undertake additional regional planning efforts and target state funding according to the priority development and protection areas identified in these plans.

Adapting to a Changing Climate

Because the climate has already begun to change, residents of Massachusetts have had to begin adjusting to those changes in modest ways. As the climate changes more dramatically, the adaptations will need to be greater. It makes sense for residents, as well as state government, to prepare ahead of time for some of the likely future changes, rather than react to changes after they occur and the damage is done.

Many state agencies have been working for at least several years to consider what global warming

could mean for their operations and to prepare to adapt to climate change. Two of them deserve special recognition for their work to prepare for global warming: the Massachusetts Office of Coastal Zone Management and the Massachusetts Division of Fisheries and Wildlife.

The Commonwealth moved adaptation planning along significantly when the *Global Warming Solutions Act* required the Executive Office for Energy and Environmental Affairs, with the help of a specially convened advisory committee, to analyze and recommend strategies for adapting to the predicted impacts of climate change. The resulting report, which appeared in September 2011, was an unusually comprehensive and rigorous piece of research and analysis. Virtually all of its many recommendations are logical and well-supported by research.

Yet, despite the quality of the analysis, the report has not served, so far, as a loud call to action. It has received little attention beyond the network of people who were involved in producing it or who are already engaged in activities to manage the impacts of climate change. Part of the reason is that the report sidestepped setting priorities. To make more rapid progress on climate change adaptation, the state needs agreed-upon priorities, clear targets, and defined metrics.

Recommendation:

- ❑ The Executive Office of Energy and Environmental Affairs should move quickly to dissect the climate adaptation report and identify a few well-defined priority actions and goals for the next several years.

Is the State Playing a Leadership Role?

Massachusetts will be a good global citizen simply by meeting the goals in the state's climate action plan and thereby doing its fair share toward bringing down global greenhouse gas emissions. Yet there is the opportunity to do more by influencing players outside its borders in the following four ways:

- **Demonstrating that state action can produce reductions.** Governments and people across the country will be watching to see whether states like Massachusetts, with ambitious commitments to 2020 emission reductions, follow through on those commitments and achieve their goals.
- **Providing regional leadership by encouraging other nearby states to take collective action.** This is especially important in the case of Massachusetts, because it is the biggest state in New England and has historically been a policy leader. Massachusetts played an important role in forging an agreement among the New England Governors and eastern Canadian Premiers and in developing RGGI. Among the specific other climate-related actions in which Massachusetts has also led the region include advancing efficient use of biomass, encouraging regional transportation policy, supporting offshore wind, and implementing a strong renewable portfolio standard.
- **Developing policies and testing strategies that others can emulate.** Good ideas that are implemented in one place can and do often spread near and far. Massachusetts has already developed some exemplary practices, programs, and policies that have been copied elsewhere and there are many more opportunities for Massachusetts to play this role. Ways in which Massachusetts has already been a climate action model for others or will likely become a model include committing to all cost-effective efficiency, organizing a combined energy and environment secretariat, creating the Green Communities program, communicating economic development benefits, establishing GreenDOT, encouraging adaptation of a stretch building energy code, and considering climate impacts in MEPA project reviews.

• **Nurturing technologies and businesses that can play an important part in addressing climate change.** The world needs businesses to continually commercialize new and improved technologies and mitigation strategies. A state can help this process of innovation by providing assistance—financial and otherwise—to businesses and technologies that have the potential to have a significant impact, both in the state and beyond. Because Massachusetts is a major center for research, innovation, and start-up companies, it has greater potential than most states to influence the introduction of valuable technologies and strategies for climate change mitigation and adaptation. The Massachusetts Clean Energy Center has vigorously and effectively undertaken a variety of activities to assist individual clean energy businesses and build a clean energy industry cluster.

Recommendations:

- ❑ Massachusetts state officials should give even greater attention to promoting, leading, and shaping regional initiatives.

- ❑ The Clean Energy Center should make a company’s potential to reduce global greenhouse gas emissions an explicit factor in decisions about investments.

3. The Economic Costs and Benefits of Climate Change Action

There is considerable disagreement about how much it will cost to address climate change and how much public funding should go to dealing with the problem.

Part of the challenge in assessing the costs and benefits of climate change action is to track the many ways government policies and programs ripple out through the economy. Take the case of the development of a renewable energy project

in the state. If it creates jobs for people installing and maintaining the equipment, then that needs to be considered. But there would be a negative economic impact if the project causes electricity rates to go up, leaving consumers with less money to spend. Healthcare savings associated with reduced air pollution, and the many other indirect costs and benefits should also be considered.

Although it is beyond the scope of this report to undertake the very substantial task of fully assessing all the costs and benefits of the many policies and programs that are collectively designed to address the threat of climate change, we can make some general observations to help frame the discussion about costs and benefits. A good starting point for looking at this subject is a useful study that the legislature requested as part of the *Economic Development Reorganization Act* of 2010. The Executive Office of Housing and Economic Development and the Executive Office of Energy and Environmental Affairs analyzed the costs and benefits of the state’s energy efficiency and renewable energy programs. Their report reached four conclusions that are sound but require further discussion and qualification:

1. **The high cost of electricity in Massachusetts is not primarily the result of state policies.** As the state report points out, the main reason that electricity prices are higher in Massachusetts than in most other states is “that Massachusetts has virtually no indigenous energy resources, requiring us to import almost all of our energy resources from outside the region or overseas.”

2. **The benefits of energy efficiency have been substantial.** Because of their scale, the energy-efficiency programs impose the highest upfront costs of any of the clean energy programs, but also yield significant returns on investment, making their benefits far outweigh the costs. Sophisticated methodologies developed over the past several decades help state regulators measure the costs

and benefits of efficiency programs. The central conclusion is that it costs more to build additional powerplants and additional transmission than it does to eliminate the need for those powerplants by implementing energy efficiency measures that reduce electricity demand. The process of developing the utilities' efficiency plans is designed to select efficiency efforts that meet the test of being cheaper than building new generation.

When the efficiency program administrators from the state's investor-owned electric utilities and municipal aggregator submitted their current three-year plans, they were required to include benefit-cost analyses. Their projections showed that the benefits would outweigh the costs roughly three to one. Even if one assumes that there is some margin of error in the analysis, the ratio of benefits to costs is so high that there can be little doubt that current efficiency efforts are economically desirable. Using a different methodology, the Analysis Group in late-2011 published an assessment of the efficiency spending in Massachusetts related to the Regional Greenhouse Gas Initiative and concluded that the benefits of efficiency spending far outweighed the costs, including reducing electricity rates and increasing the number of jobs.

The rosy picture of the economics of efficiency programs needs to be qualified in two ways, however. First, even if energy efficiency initiatives benefit the economy as a whole, not everyone benefits equally. Some businesses and residents are in a good position to take advantage of the various efficiency incentives and programs, while other businesses and residents are not, for a variety of reasons. Second, as Massachusetts goes deeper and broader in the efficiency market, some actions may be more costly, and certain efficiency measures may not be as cost-effective in the future. There has been a great deal of so-called "low-hanging fruit," but that could eventually all be picked. Based on past experience, there is a good chance, but no guarantee, that new technologies will come

on the market to make further rounds of cost-effective efficiency possible.

3. **The state's renewable portfolio standard (RPS) has so far provided cost savings.** Electricity suppliers are required to get a share of their electricity from renewable energy. They do that by purchasing renewable energy certificates (RECs) from eligible renewable energy generating facilities. Those certificates in effect represent the difference in price between power from renewable energy and from conventional fossil fuel generators. Electric distribution companies pass on the additional cost of procuring REC's to their default service customers and competitive retail suppliers incorporate the additional costs into the price they charge customers.

Counterbalancing the extra money spent for the certificates is a price suppression factor that reduces wholesale electricity prices because

ANALYSES PROJECT THE BENEFITS OF UTILITY EFFICIENCY PROGRAMS TO OUTWEIGH THE COSTS THREE TO ONE.

the highest-priced electricity generators (peaking facilities) do not need to come online as frequently. Based on data from the Department of Energy Resources, the price suppression effect has recently been greater than the premiums paid for renewable energy certificates, meaning that it has saved ratepayers money to bring large-scale renewable energy online.

It is not, however, guaranteed that the renewable portfolio standard will continue to provide savings in the future. The state report assumes that the cost of renewable energy certificates will remain at \$20 per megawatt hour. Some certificates have recently traded at more than \$50. If the price stays at that elevated level, the cost of the certificates would be greater than the price suppression benefits. That would not mean that the state's renewable portfolio standard policy should



Weatherization and other energy efficiency activities have expanded significantly in recent years.

be abandoned, since it is certainly worth spending some money to diversify the electricity supply and reduce emissions. On the other hand, it will be important to monitor the situation carefully to see if modifications should be made.

4. The immediate direct economic benefits of local energy generation initiatives, such as solar and offshore wind, do not outweigh the costs to ratepayers, especially if one looks only at electricity rates, according to the state's cost-benefit report. Compared to the large out-of-state renewable energy facilities (mainly wind, landfill gas, and biomass) that are the primary source of renewable energy certificates for the main tier of the state's renewable portfolio standard, solar generation requires higher public incentives that are financed in part by a system benefits charge and annual reconciliations that are included in electric bills of the state's distribution companies. State officials justify the spending by explaining that it produces other sorts of economic benefits—creating local clean energy jobs, supporting local clean energy businesses, and contributing to the growth of a vibrant clean energy industry sector. Although state officials and clean energy advocates can point to the considerable growth of the clean energy industry as a whole, there is little detailed data on how much of that growth is linked to public spending on a particular initiative,

such as solar installation incentives. It would be desirable for the state, working with the utilities and various stakeholder groups, to analyze more fully the costs and benefits of some of the state's sector development activities, especially for solar, keeping in mind that the cost of solar installations has been declining rapidly.

It is good that the State Senate, as part of legislation to update the *Green Communities Act*, has been seeking to identify ways to reduce rates that can receive the support of a wide range of stakeholders. Even after that legislation passes, the groups should continue to work together to implement strategies that can especially help those people and businesses that are not in a good position to benefit significantly from the state's clean energy activities. Some potential solutions are well known, such as reducing electricity use at peak times and bringing in low-priced clean power from northern New England or Canada. However, there could be more cooperation and focus on implementing such solutions.

Recommendations:

❑ The state should monitor the costs of solar closely and make adjustments to its solar program if necessary. Up to now the state's solar programs have not been a significant factor in overall electricity prices, because the quantity of solar installed represents a small share of total electricity generation. But, as the installation targets for solar increase over time, it could become a larger driver of electricity prices, especially if the cost of installations does not continue to fall.

❑ State leaders, the business community, and environmental and clean energy advocates should work together more closely to see if they can agree on strategies to help reduce rates without sacrificing climate change or clean energy goals.

The Costs of Adaptation, Smart Growth, and Transportation Measures

The state cost-benefit study looked only at energy efficiency and clean energy. The economic costs and benefits of other aspects of the state's response to climate change have been less studied.

In the case of enhancing resilience to climate change impacts, it is improbable that near-term actions represent the optimal economic development strategy for maximizing immediate economic growth. Instead, they will reduce the risk of economic harm. In this situation, the standard for judging the state's policies and programs should be whether the state is getting the maximum amount of climate protection for the least cost.

For transportation and smart growth initiatives, the cost-benefit approach will vary depending upon the program. In some cases, such as improved transit, costs can be compared to demonstrable reductions in congestion. Stronger public transportation systems can also lead to more efficient land assembly and a more productive economy, but these longer-term gains are not easy to quantify.

Reduced reliance on imported fuel is another area where climate change action should produce compelling and measurable economic benefits. Massachusetts, like the rest of the country, is facing increased energy costs for transportation because of the recent spike in gasoline and oil prices. Massachusetts residents and businesses currently spend more than \$10 billion annually on transportation fuels. If even a small portion of the energy required to move people could be saved, many millions of dollars a year would be returned to the state economy.

4. Global Warming Action at the Community Level

Massachusetts is a national leader in climate change action at the local level. It has achieved results through a combination of strong interest among municipal officials, aggressive action on the part of local climate change activists, and

favorable state policies that support and encourage municipal action.

The Green Communities Program has been especially successful. Eighty-six municipalities, representing 42 percent of the state population, have met the requirements under the *Green Communities Act* to become a Green Community. To achieve that recognition, they needed to clear several relatively high hurdles, including adopting the stretch energy code (a code that requires more efficient buildings than the standard state code), making zoning more favorable for renewable energy projects, and putting in place a plan to reduce municipal energy use by 20 percent within five years. The cities and towns have been diligent, in part because of the incentive of state grants ranging in size from \$130,725 to \$1 million. But according to a survey conducted for this report, the availability of grant funding was the primary motivation for less than one-quarter of the communities. More local government officials stated that the first motivation was a pre-existing desire to reduce municipal energy use.

MASSACHUSETTS IS A NATIONAL LEADER IN CLIMATE CHANGE ACTION AT THE LOCAL LEVEL.

The municipal officials involved in the Green Communities Program feel very good about the effect of their activities on their municipalities and are pleased with the state's administration of the program. The Green Communities Program has been so successful because it was designed to help municipalities do something they already had a desire to do (save energy). In addition, the program is user-friendly. The state has managed it well and carried out effective outreach to local governments. The state also offers MassEnergyInsight, a helpful, free, web-based tool that local governments can use to understand their energy consumption, create a baseline, and analyze changes to their energy use over time.

Although a good start has been made at addressing climate change at the community level, the state will need to take additional steps to maintain the momentum.

While the Green Communities Program focuses on municipal regulations and municipal facilities, there are also efforts underway in many communities to encourage residents and businesses to reduce their greenhouse gas emissions and to make it easier for them to do so. In some cases, the municipal government is the driving force behind the outreach effort, but in other cases grassroots climate action organizations are leading the way.

One particularly important type of program that is presently being implemented in Boston and an increasing number of other cities and towns is

a partnership between the municipal government and the utilities to deliver energy efficiency services more widely and more effectively. It is too soon to know how successful these partnerships will be, but the early indications are positive.

Recommendation:

- The state should continue the grants to local governments under the Green Communities Program; encourage more communities to appoint and retain a municipal energy officer; regularly monitor and analyze how well the Green Communities are doing in achieving their five-year 20 percent energy reduction goal; encourage more community engagement to reduce citizen energy use; and do more outreach, information-sharing, and network-building among the Green Communities.