

**The Commonwealth of Massachusetts**

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**Report**

**of the**

**SENATE COMMITTEES ON**

**POST AUDIT AND OVERSIGHT**

**and**

**GLOBAL WARMING AND CLIMATE CHANGE**

**entitled**

**THE COST OF INACTION:**

Climate Change in the Commonwealth

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July 30, 2008

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## **Senate Committee on Post Audit & Oversight**

### **Senator Marc R. Pacheco, Chairman**

It shall be the duty of the Senate Committee on Post Audit and Oversight (established under Section 63 of Chapter 3 of the General Laws) to oversee the development and implementation of legislative auditing programs conducted by the Legislative Post Audit and Oversight Bureau with particular emphasis on performance auditing. The Committee shall have the power to summon witnesses, administer oaths, take testimony and compel the production of books, papers, documents and other evidence in connection with any authorized examination or review. If the Committee shall deem special studies or investigations to be necessary, they may direct their legislative auditors to undertake such studies or investigations.

## **Senate Committee on Global Warming & Climate Change**

### **Senator Marc R. Pacheco, Chairman**

It shall be the duty of the Senate Committee on Global Warming and Climate Change to investigate the issues involving global warming and climate change, including but not limited to carbon emissions, greenhouse gas emissions and renewable energies. The committee will explore viable solutions and other innovations that stimulate our economy, promote jobs, and protect our security and environment. The Committee may hold hearings, as needed, to investigate and gather information. The committee shall report, from time to time, with recommendations for legislative action based on their review or on the findings of the investigations. The committee shall have the authority to develop and report legislative proposals pertaining to global warming and climate change, which shall be referred to the Senate Committee on Ways and Means.

This report was prepared by Committee staff, including **Jessica Nordstrom**, Director, Global Warming and Climate Change Committee; **Sridevi Reddy**, Director, Post Audit and Oversight Committee; **Kate Garrett**, General Counsel and **Natalia Pelayo**, Communications Director.

The Committee would acknowledge the contributions from Senator Pacheco's office, including Mary Wasyluk, Chief of Staff; Ilda Marques, Executive Assistant; Charles Basler, Director of Constituent Services; Ryan Colton, Director of District Affairs and Charles Keller, Intern.

The Committee would also like to acknowledge the assistance of members of the Massachusetts Climate Coalition, Environmental Entrepreneurs (E2) and all individuals who testified and participated in the regional hearings held by the Senate Committee on Global Warming and Climate Change.

## **EXECUTIVE SUMMARY •**

This joint report of the Senate Committee on Global Warming and Climate Change and the Senate Committee on Post Audit and Oversight outlines the consequences the Commonwealth will face if it fails to address the most pressing problem of our time: climate change. Momentum is growing for Massachusetts to act on reducing its greenhouse gas emissions. If the Commonwealth fails to take immediate action, the state will be at risk of losing a competitive advantage in the emerging green economy and lose federal “early mover benefits.” Delaying measures to mitigate global warming will cost the state significantly more in the future. It will also create an environmental crisis that will take increased efforts – far beyond the ones outlined in this report – to address.

Throughout 2007, the Senate Committee on Global Warming and Climate Change (“Committee”) held a series of hearings across the state on issues associated with global warming, including environmental and health impacts, the state of our oceans, energy and buildings. These hearings allowed the committee to investigate a broad range of issues and provided a forum for discussion with experts on this complex problem. In addition to the hearings, the Committee investigated the costs and benefits of acting on climate change, as well as the impact of the transportation sector on global warming.

The common theme that emerged from the committee’s investigations was the need to immediately reduce carbon emissions in order to mitigate the effects of climate change on the Commonwealth. The solution is to adopt a comprehensive cap on carbon.

### ***Global Warming at a Glance***

- The Northeast region is the world’s 7<sup>th</sup> largest emitter of greenhouse gases. Massachusetts is responsible for 44 percent of the New England region’s emissions.
- In the Northeast region, the transportation sector emits the largest share of greenhouse gases (38 percent).
- Under a “business as usual” scenario, by 2070 temperatures would rise to the point that the climate in Massachusetts would feel more like the climate of South Carolina.

### ***Environmental Costs of Global Warming***

- If the Commonwealth fails to adopt a carbon cap, and emissions continue to rise, scientists predict that we will face an environmental crisis of unprecedented magnitude. Hurricanes, tornadoes and floods, already causing tremendous damage, will continue to devastate the environment and the economy.
- There will be an increase in coastal erosion, sea levels, ocean temperatures, severe storm events and hotter days. Vast arrays of plant and animal species would not be able to adapt and would be vulnerable to extinction.

### ***Serious Economic Consequences of Global Warming***

- Postponing action on climate change will put existing businesses, including the agricultural, fishing and tourism industries, at a severe disadvantage in the near term.
- The Stern Review on The Economics of Climate Change concluded that, “[t]he benefits of strong and early action far outweigh the economic costs of not acting.”<sup>i</sup> “If we don’t act, the overall costs and risks of climate change will be equivalent to losing at least five percent of global GDP each year, now and forever,” according to the Stern Review. “If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20 percent of GDP or more.”<sup>ii</sup>
- A report from Tufts University estimated that if the United States does not act to solve the global warming crisis, it will cost the economy \$3.8 trillion annually by 2100.<sup>iii</sup> According to the study, hurricane damage, real estate losses and increased energy and water costs as a result of climate change will account for \$1.9 trillion of the projected \$3.8 trillion increase by 2100.<sup>iv</sup> By 2025, those four categories will cost the United States \$271 billion.<sup>v</sup>
- An increase in storm intensity will lead to greater spending in emergency funding for coastal communities, as well as higher insurance rates for the 75 percent of the population that live along the coastline. According to the “Cost of Climate Change” report, as the sea surface temperature continues to rise due to global warming, an increase in category 4 and 5 hurricanes will cost the U.S. \$422 billion in annual damages by 2100.<sup>vi</sup>
- A modest cap-and-trade system would cost less than \$20 per household annually and have no negative impact on employment, according to an independent MIT study.<sup>vii</sup>

### ***Economic Benefits of Putting a Cap on Carbon Emissions***

- An economy-wide carbon cap would stimulate the green economy, a new rapidly expanding sector consisting of new jobs in clean energy manufacturing, technology, research and development.
- States that support this growing sector early will effectively spur local job creation, spark technological innovation, capture venture capital funding and establish new industries. Following passage of California’s Global Warming Solutions Act, the state saw a sharp increase in venture capital investment.
- New clean energy companies are more likely to succeed in a regulatory environment that creates a level playing field by putting a cap on carbon emissions, according to recent research conducted by an economist at the Massachusetts Institute of Technology. A carbon cap puts these clean energy companies in a better position to succeed because all companies will have to address carbon emissions. Under the “business as usual” scenario, subsidies and tax incentives for fossil fuel industries hinder the success of new clean energy ventures.

- Massachusetts is an attractive location for the establishment of new green companies. The Commonwealth's progressive universities, educated workforce, and focus on innovation make the state an ideal place for the green marketplace to take hold. The clean energy industry in Massachusetts has already helped increase job growth throughout the state and is poised to become the tenth largest sector in the state.

Massachusetts has great potential to not only help mitigate the worst impacts of global warming, but also create an environment for the green economy to grow. However, this potential will not be realized unless we take action now.

## • INTRODUCTION •

Global climate change is by far the most complex and pressing issue of our time. It directly impacts everything from air quality, sea level, temperature and agriculture, to the spread of disease and our economy.

Over the last century, greenhouse gas emissions – primarily in the form of carbon dioxide (CO<sub>2</sub>) – have increased at an alarming and historic rate. As a result, global temperatures have risen substantially. These changes in emissions levels are mainly due to human activity and will continue to rise without immediate mitigation.

The Commonwealth of Massachusetts plays a large role in contributing to global climate change. According to the Union of Concerned Scientists, the Northeast is the world's 7<sup>th</sup> largest emitter of greenhouse gases.<sup>viii</sup> This means that combined, the Northeast states produce more emissions than all of Italy, Brazil or Canada. According to a report released by the Environment Massachusetts Research and Policy Center, the Commonwealth is accountable for 44 percent of all emissions in New England.<sup>ix</sup> Massachusetts, therefore, needs to be a leader by developing and adopting bold solutions to this complex problem.

In February 2007, former Senate President Robert Travaglini, with the support of current Senate President Therese Murray, announced the formation of a new Senate Committee on Global Warming and Climate Change. A bi-partisan effort, the Committee's mission is to address climate change and raise public awareness, as well as to investigate new technologies and methods to reduce the state's dependence on fossil fuels. The ultimate goal of the Committee is to make the Commonwealth of Massachusetts an innovative leader on the issues and solutions concerning climate change.

The first state committee on climate change in the nation, the Committee has the authority to investigate, hold hearings and present legislative solutions to reduce greenhouse gases. Partnering with local legislative leaders, the Committee held regional hearings across the Commonwealth. These hearings enabled the Committee to have in-depth conversations about the various issues associated with global warming, such as green buildings, transportation, environmental and health impacts, energy and the economy. They also provided a forum to discuss and develop legislative solutions.

Massachusetts has come so far already. The "Regional Greenhouse Gas Initiative" (RGGI) is an important landmark agreement by Northeast states to reduce carbon dioxide emissions from power plants. The work by both the House and the Senate to pass the "Green Communities Act" into law (Ch. 169 of the Acts of 2008) goes a long way to promote energy efficiency and renewable energy in Massachusetts. Under the Patrick Administration's first year of office, more has been done to curb global warming than what had been accomplished in the previous 16 years combined.

Through a series of regional hearings the Committee held across the Commonwealth, it became evident that these accomplishments are not enough. Massachusetts needs to build upon these

previous efforts if it is to avoid the worst impacts of global warming. The most effective way to combat global warming is to significantly reduce greenhouse gas emissions. It is imperative that the Commonwealth adopt a comprehensive, long-term plan to do so.

The Committee compiled suggestions and solutions from the hearings into legislation called the “Global Warming Solutions Act” (S2540). At the heart of this comprehensive policy are mid and long-term goals to cap carbon dioxide emissions across all sectors of the economy. The long-term target mandates an 80 percent reduction in emissions from 1990 levels by the year 2050. To ensure that the Commonwealth can achieve this goal, the legislation also sets a mid-term requirement to reduce emissions incrementally by 2020. These targets have the support of a diverse and growing coalition of scientists, environmental advocates, economists, business leaders, and students, as well as local, state and federal elected officials. Passage of the “Global Warming Solutions Act” will not only help save the environment and reduce the public health impacts of climate change, it will also make Massachusetts a hub for the growing green economy.

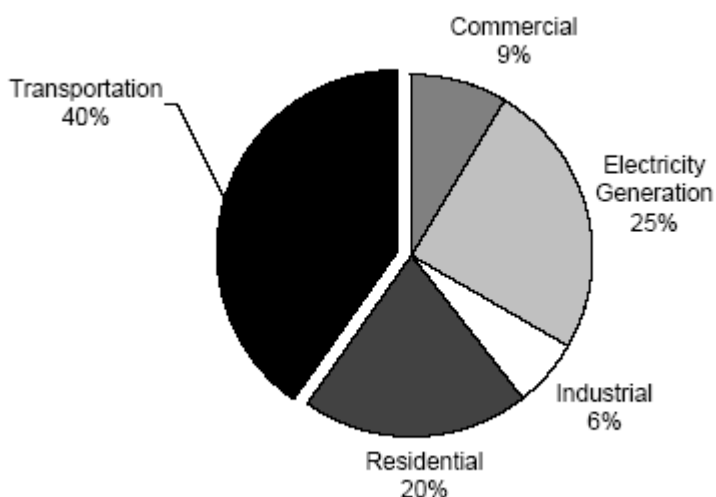
It is evident that the Commonwealth can not afford to conduct business as usual when it comes to global warming. This report explores the steep cost of inaction, for both the environment and economy, and demonstrates that the Commonwealth can achieve these goals *today*. It is imperative that the leaders of the state work together to enact local solutions to this global problem.

## • REGIONAL HEARINGS •

According to leading scientists throughout the world, human activity, primarily the burning of fossil fuels, has increased the amount of heat-trapping gases in our atmosphere to an historic level. The intensity in greenhouse gases, such as carbon dioxide (CO<sub>2</sub>), has drastically altered the earth's climate. From an increase in severe weather events and higher temperatures, to the rise in sea levels and increased coastal erosion, the dramatic effects of global climate change are already taking place throughout the Commonwealth. In order to avoid the worst effects of global warming, states must immediately stabilize and reverse greenhouse gas emissions.

The three largest contributing sectors to global warming are, in order of magnitude, transportation, buildings and electricity. In the region, transportation emits the largest amount of carbon dioxide (40 percent), while buildings and energy generation each contribute nearly another third [see chart below]. The impacts are widespread. Global warming affects everything: the spread of disease, the cost of food, the quality of our air and water, rise in sea level, public safety and infrastructure, and the ability of coastal homeowners to insure their properties.

### Emissions of Carbon Dioxide by Sector in New England, 2004



Source: Environment Massachusetts Research & Policy Center and Clean Water Fund

In order to gather facts, educate the public and discuss potential policy solutions, the Committee organized a series of regional hearings across the state. Prominent scientists, academics, environmental advocates, economists, citizen organizers, students, as well as leaders in federal, state and local government, were invited to testify. All of the hearings were chaired by state Senator Marc R. Pacheco (D-Taunton) and legislative leaders throughout Massachusetts were encouraged to participate. The hearings enabled the Committee to have in-depth conversations about the various issues associated with global warming: buildings, transportation, environmental and health impacts, the economy, energy and technology.



## Science and Impacts of Global Warming

In an unprecedented event held at the State House on April 23, 2007, national and state environmental leaders came together at the Committee's first hearing. Congressman Edward J. Markey, Chair of the Select Committee on Energy Independence and Global Warming, kicked off the hearing with the chilling message that "either we are going to live together or we're going to destroy the planet together."<sup>x</sup> Other speakers included Ian Bowles, Secretary of Executive Office of Environmental Affairs, Jim Milkey, Massachusetts Attorney General's Chief of Environmental Protection Division, and James W. Hunt, III, the City of Boston's Chief of Environmental and Energy Services.

Dr. Bruce Anderson, Associate Chair for the Department of Geography and Environment at Boston University explained the science behind global warming, dispelling any doubts that climate change is a myth. He showed the effects - rise in temperatures, historic increase in extreme storm events, coastal flooding, higher sea levels - are already occurring throughout New England.

Dr. Anderson testified that "historically, the concentrations of carbon dioxide, in parts per million (ppm), over the last 400,000 years have never risen above 300 ppm until about 100 years ago, coinciding with the industrial revolution. Presently the concentrations are at 375 ppm." In his research Dr. Anderson considered two scenarios for emissions over the next 100 years: the first called the "business-as-usual" trajectory and the second the "low emissions" trajectory.

The "business-as-usual" scenario assumes that no efforts are made to mitigate greenhouse gas emissions levels. The result is an increase in CO<sub>2</sub> concentration levels to about 1000 ppm within the next 100 years, four times the levels during pre-industrial times.<sup>xi</sup> The "low emissions" scenario involves mitigation measures that significantly reduce emissions levels. Under this scenario, concentrations reach 500 ppm by the middle of the century. Meanwhile, reducing emission levels 80 percent by the year 2050 - as required by several other states, including California, New Jersey and Connecticut - would result in an increase in carbon dioxide to 450 ppm, 17 percent greater than present day concentrations.<sup>xii</sup>

Present concentrations of carbon dioxide are already having visible impacts on the region's environment, health and economy. The northeast is experiencing warmer winters and summers, more severe storm events, a rise in ocean levels and temperatures, and an increase in the number of summer days over 100 degrees. If we continue under the business-as-usual scenario, temperatures will increase between 5-14 degrees Fahrenheit, turning Massachusetts summers into ones typically found in South Carolina.<sup>xiii</sup> Extreme storm events, such as massive floods that threaten infrastructure and public safety, will increase by 60-75 percent.<sup>xiv</sup> Without immediate mitigation efforts, New England as we know it will be drastically altered.

"We are already observing changes in physical and biological systems that had been projected to occur much later on in the century," said Dr. Paul Epstein, Associate Director of the Center for Health and the Global Environment at Harvard Medical School. "We must scale up solutions and

do it fast. Given the proper incentives, the solutions can promote health, protect the environment and stimulate the economy.”<sup>xv</sup>

The international scientific community, including the renowned Intergovernmental Panel on Climate Change (IPCC), agrees that at least an 80 percent reduction in emissions must be achieved by mid-century to avoid the worst effects of global climate change. We must start now to meet these reductions.

Solutions are at our finger tips, but they will take strong coordination, leadership and political will. Frank Gorke, former Director of Environment Massachusetts testified that the Commonwealth needs “[t]o put forth policy that will reduce global warming emissions by 80 percent from 1990 levels by the year 2050. To ensure that we get on the right path, we need to set short-term goals that reduce global warming emissions.”<sup>xvi</sup>

These actions, while perhaps initially daunting, will benefit both the environment and the economy. As Professor William Moomaw testified at the hearing, “The good news is that there are solutions that reduce the risk of climate change that provide opportunities to build a sustainable economy for the Commonwealth.”<sup>xvii</sup>

## **Green Buildings and Technologies**

On May 18, 2007, the Committee traveled to western Massachusetts to hold a regional hearing at the Northampton Superior Court on “Green Buildings and Technologies.” Co-chaired by Senator Stanley Rosenberg (D-Amherst), the hearing was critical because buildings consume a large percentage of the state’s energy resources and emit vast amounts of greenhouse gases into the atmosphere.

A prominent panel of experts spoke about green building designs, strategies and benefits. Green building design and construction practices give communities the opportunity to construct environmentally sound buildings, while reducing emissions, water and energy use. Building green also makes facilities healthier for occupants, thereby increasing overall productivity.

Jim Gomes, former President of the Environmental League of Massachusetts (ELM) testified that “together we can develop solutions...to make the heating, cooling and lighting of buildings more energy efficient.”<sup>xviii</sup> Also invited to testify was Eric Friedman, Director of State Sustainability for the Executive Office of Environmental and Energy (EEA), Marc Price, residential green building project manager for the Conservation Services Group (CSG), and Warran Leon, Director of the Renewable Energy Trust.

Seventy percent of the nation’s electricity<sup>xix</sup> and more than a third of the nation’s total energy resources are consumed by buildings.<sup>xx</sup> In 2006, residential buildings emitted 1.2 billion metric tons of carbon dioxide, 20 percent of the nation’s total emissions.<sup>xxi</sup> The problem stems from outdated building codes and planning practices, as well as facilities with poor insulation and energy-inefficient heating, cooling and lighting appliances. The lack of integrated design and planning practices in traditional buildings means 40 percent of construction and demolition

(C&D) waste is sent to overcrowded landfills.<sup>xxii</sup> Green building strategies and technologies reduce these environmental impacts.

The Leadership in Energy and Environmental Design (LEED) system provides guidelines and ratings for green building and design. Developed by the United States Green Building Council (USGBC), the voluntary system provides a checklist to measure and evaluate green building planning, design and construction practices. Facilities that meet LEED standards receive various levels of certification - Certified, Silver, Gold and Platinum – based on the credits accumulated from the checklist from the following eight major categories.

- LEED Certification Categories**

  1. Innovation and Design Process
  2. Location and Linkages
  3. Sustainable Sites
  4. Water Efficiency
  5. Energy and Atmosphere
  6. Materials and Resources
  7. Indoor Environmental Quality
  8. Awareness and Education

Green buildings design and construction practices give communities the opportunity to construct and retrofit homes, schools and offices to more environmentally sound facilities. The procedure reduces emissions, waste, water and energy use, in addition to providing a healthier environment for occupants and increasing workplace productivity. According to testimony from Rob Garrity, Director of the Massachusetts Climate Action Network, green buildings on average use 28 percent less water and 30 percent less energy than traditional structures.<sup>xxiii</sup>

A 2004 *Science* article conducted an analysis of existing technologies that can mitigate carbon emissions and divided them into 15 stabilization options. Increasing building efficiency via “energy efficient space heating and cooling, water heating, lighting, and refrigeration in residential and commercial buildings” was identified as an immediate way to combat global warming.<sup>xxiv</sup> Over the lifetime of a LEED certified home, carbon dioxide emissions are expected to be reduced an average of 100 metric tons.<sup>xxv</sup> “Building green homes is one of the best strategies for meeting the challenge of climate change because the technology to make substantial reductions in energy and carbon dioxide emissions already exists,” according to the U.S. Green Building Council.

Green buildings are commonly perceived as more expensive than traditional design. However, the financial benefits of building green outweigh the initial costs. A 30 percent energy savings on a 100,000 square foot facility yields \$60,000 in savings a year.<sup>xxvi</sup> Poor indoor environmental air quality in traditional buildings costs the country hundreds of billions of dollars a year in productivity and health costs.<sup>xxvii</sup> Better lighting, heating and ventilation control found in green buildings improve the health of occupants and also boosts productivity. In a Gold LEED

Certified facility, productivity has been shown to increase by 1.5 percent, equal to \$1,000 a year per employee, or five dollars per square foot annually.<sup>xxviii</sup> Over a twenty year span, the savings increase to \$35-55 per square foot each year.<sup>xxix</sup> When facilities incorporate these construction practices, there is also a higher resale value. Overall, building green provides a 40 percent return on initial investment.<sup>xxx</sup>

It is evident that green building technologies and practices have the potential to reduce greenhouse gas emissions from one of the largest emitting sectors. Jim Gomes pointed out at the hearing that building green means “saving the planet, while saving money.”

## **Environmental and Health Impacts**

On June 27, 2007, the Committee held a regional hearing on the “Environmental and Health Impacts” of global warming at the Northern Essex Community College. Co-chaired by Senator Stephen Baddor (D-Methuen) and Senator Bruce E. Tarr (R-Gloucester), the hearing provided a forum to discuss the impacts of climate change on the environment and the public’s health.

Panelists were invited to speak about the impact global warming has upon local forests, ecosystems, biodiversity, as well as how it affects people’s health. Speakers included Julie Wormser, former Director of Policy for the Appalachian Mountain Club, Steve Long, Government Relations Director for The Nature Conservancy, and Steven Nodzin, Associated Professor of Natural Sciences at Mount Ida College.

Global climate change is having harmful effects on the environment, which in turn negatively impacts public health. The Committee’s first regional hearing touched upon how climate change, if it continues to go unchecked, will lead to significantly higher temperatures, an increase in severe weather events, more intense levels of air pollution and a rise in sea levels. Panelists at this regional hearing testified how these changes will also take a significant toll on the state’s forests, coastal lands, biodiversity and public health.

Some of the most negative effects include increases in ozone levels, heat-related deaths and illnesses, air and water pollution, and loss of native species. Climate change also contributes to increased amounts of ground-level ozone, which can damage lung tissue and exacerbate respiratory illnesses, such as asthma. Warming of the earth’s atmosphere also generates an environment where disease-carrying insects thrive, increasing the risk of mosquito and tick-borne diseases, such as Lyme disease.

Julie Wormser highlighted how species evolve over hundreds and thousands of years. When environmental conditions change quickly, many species can not adapt and risk becoming extinct. The result can be catastrophic species loss. Worldwide, scientists estimate a 50 percent species loss due to global warming.<sup>xxxi</sup> “In less than 300 years we have set in motion a level of species extinction that is predicted to take five to ten million years to recover from,” Wormser testified.<sup>xxxii</sup>

### Case Study: Migratory Song Bird

A Dutch study made the correlation between climate change and the effects on the pied flycatcher, a migratory bird species in Europe. Chicks hatch in early spring when caterpillars, the flycatcher's main source of food, are in abundance. Warmer springs as a result of climate change mean that the caterpillar population peak earlier in the season, leaving the pied flycatcher hatchlings without a sufficient supply of food. According to the study, the consequence is the pied flycatcher's population has crashed 90 percent over the last two decades.

Source: *Nature* 441, 81-83 (4 May 2006) | doi:10.1038/nature04539

Forest and agricultural land management practices play a vital role in the strategy to reduce greenhouse gas emissions. According to the Pew Center on Global Climate Change, "forest and agricultural lands can be managed to store or 'sequester' carbon and reduce net emission."<sup>xxxiii</sup> Viable management options include land conservation, reforestation, reduced clear cutting, and increased amount of plantation acres.

What climate change means for New England forests is that they will become drier like California, making them more prone to forest fires. As local temperatures get warmer, Massachusetts forests will change from the traditional oak tree to more southern tree species, impacting local economies that rely on New England's unique fall foliage.

These changes are already taking place and have occurred at a more drastic pace than experts originally anticipated. Despite the best efforts, all effects of global warming can not be mitigated. Therefore, policy makers need to devise ways to adapt to the physical changes that have already begun and will continue to happen. Steve Long from The Nature Conservancy testified that it is imperative Massachusetts apply a two pronged policy approach to the problem: mitigation and adaptation strategies. Mitigation measures include strategies to slow and reverse emission levels, such as policies that cap all sources of greenhouse gas emissions at a certain level in order to avoid the worst effect of global warming. Adaptation measures identify, monitor and develop ways to manage and plan for the long-term effects that climate change will have on the natural and built environments. Examples include developing a flood and evacuation plan for downtown Boston in response to rising sea levels and increased storm patterns.

Mitigation measures will help prevent the worst impacts of climate change. Adaptation measures will help species, including humans, survive the unavoidable impacts of climate change. This two pronged policy approach is backed by Intergovernmental Panel on Climate Change (IPCC), the winner of the 2007 Nobel Peace Prize. In the Northeast, adaptation means adjusting to less snow, more extreme storms, eroding coastlines, rising sea levels, and

hotter summer days. These events are already having a profound impact on our ecosystems, economy, infrastructure and public safety.

## The State of Our Oceans

On August 2, 2007, the Committee held the fourth hearing in the series of regional events on “The State of Our Oceans.” Senator Robert O’Leary (D-Barnstable) co-chaired the event at the Cape Cod Community College, in the Lurusso Applied Technology Building (a LEED certified facility).

Marine scientists, educators, environmental advocates and business leaders testified about the impact that global warming is having on the state’s oceans, ecosystems, coastline and economy. Speakers included Robert Max Holmes, Associate Scientist at Woods Hole Research Center, Richard Delaney, Executive Director of the Provincetown Center for Coastal Studies, and John Bullard, President of Sea Education Associate (SEA) and former head of the first federal office of Sustainable Development under the Clinton Administration.

As the warming of the earth’s atmosphere causes icebergs to melt, ocean temperatures and levels continue to rise across the globe. This global problem, however, has many local consequences. In Massachusetts, sea level is projected to rise two to four times faster than it did in the past 100 years.<sup>xxxiv</sup>

The rise in temperatures and sea levels caused by global warming will also increase flooding and accelerate coastal erosion. In Cape Cod, coastal land is eroding at 25 acres a year due to sea level rise.<sup>xxxv</sup> Ecologically sensitive salt marshes, estuaries and wetlands are also threatened by the impact of global warming. A third of the Northeast’s commercial fish rely on these vulnerable estuaries and wetlands for food and protection.<sup>xxxvi</sup>

The change in temperatures and currents continue to affect the productivity and diversity of the Commonwealth’s historic fishing industry. Cod, herring, lobster, clams and scallop are just a few of the local species in jeopardy of survival as the temperature and level of ocean waters are altered. Dr. Rothschild pointed out that while fish populations have increased and decreased in a cyclical pattern for centuries, Massachusetts’ cod population is currently at an all time low. At the hearing Rothschild asked, “Is the cod disappearing forever?”<sup>xxxvii</sup>

The answer to that question is critical to the Commonwealth, since the fishing industry is a vital part of the state’s economy and the fabric of life for coastal communities. Commercial fishing is a \$425 million industry, creating more than 76,000 jobs throughout the Northeast in 2004.<sup>xxxviii</sup> New Bedford is considered “the number one fishing port in the United States” and in 2004 brought in \$206 million from harvesting scallops.<sup>xxxix</sup> Economic value is multiplied when you consider revenue from related businesses, such as seafood processing plants, recreational fishing and restaurants.

The coastline is home to 75 percent of the state’s population and the ability to insure coastal properties is a growing concern for these coastal homeowners. Rachel Harold, an insurance specialist at Ceres, testified how climate change impacts the insurance industry. Basically, insurance companies’ business is to manage risk and climate change is making these risks “more

severe, frequent and unpredictable.”<sup>xi</sup> Throughout the country, “weather related insurance losses rose to \$50 billion in 2005 from less than \$10 billion a decade earlier.”<sup>xi</sup>

In Massachusetts, more and more homeowners are finding their home insurance policy cancelled, despite having never filed a claim. In 2006, more than 9,000 coastal homes in Cape Cod were not insured due to increased risk.<sup>xii</sup> According to a Standard Times article, several insurance companies have chosen to leave Massachusetts all together because of the high risk to coastal property.<sup>xiii</sup> The “insurance industry is an incredible litmus test for economic health,” warned Harold. “The risks to the insurance industry and its consumers should be a big wake-up call for policy makers.”<sup>xiv</sup>

**Coastal Homeowner Insurance:**  
**Case Study**

ABC News did an expose on how the changes in the insurance industry impact local Cape Cod residents. Doug Azarian of Cape Cod said that his homeowner insurance was cancelled, despite 15 years without any damage or filing a claim. Another Cape Cod resident, Mary Poss, found that her policy was not renewed. “Like her neighbors, a state program now provides insurance, but her premium has tripled. And after 30 years, she may be forced to move.”

Source: <http://abcnews.go.com>

Climate change has already started to have a visible impact upon the Commonwealth’s vulnerable oceans, coastlands, marine environments, as well as the state’s local economy. The rise in temperature and sea level caused by global warming will continue to accelerate coastal erosion, increase flooding, multiply severe storms and threaten ecologically sensitive salt marshes and estuaries.

## **Energy and Utilities**

On September 24, 2007, the Committee held a regional hearing at the Massachusetts College of Liberal Arts (MCLA) on “Energy and Utilities”. Co-chaired by Senator Benjamin Downing (D-Adams), the hearing addressed concerns with energy supply and demand, alternative energy and energy efficiency, as well as how energy markets impact consumers.

Experts on energy distribution, generation, renewable energy, energy efficiency and local “green” business leaders were invited to testify. Speakers included Rodney Powell, President of Western Massachusetts Electric Company, Laura Dubester, Director of the Center for Ecological Technology, and Lee Harrison, Executive VP of Berkshire Biodiesel. A large student population also turned out in support of finding local solutions to climate change.

The hearing highlighted the fact that if consumers' energy needs are to be met, while significantly curbing greenhouse gas emissions, Massachusetts can not continue to conduct business as usual. Energy efficiency and conservation efforts need to be improved. The amount of power generated from clean, renewable energy sources, such as solar and wind, must be increased.

### ***Distribution and Generation***

ISO-New England (ISO-NE), the non-profit company that oversees New England's electric power system, gave a high level overview of the energy distribution system. ISO-NE's main responsibilities are energy reliability, markets and planning. They testified that fuel diversity, ways to build alternative energy resources and an increase in energy efficiency opportunities are crucial to ensuring a steady energy market as demand grows.

One of the key issues in New England is making sure that energy demand can be met during peak summer hours. New England's power grid consists of 31,000 megawatts (MW) of generating capacity, with the system peaking at up to 28,130 MW during the hottest summer days. The system needs to have that much generating capacity online all year to ensure there is enough energy to reliably supply consumers during the hottest summer days, when air conditioning use is maximized. The trend in peak growth is projected to continue at approximately 500 MW over the next decade.<sup>xlv</sup> This means that after the year 2020, a business-as-usual trajectory would lead to a requirement of at least 39,000 MW to meet the peak demand level.<sup>xlvi</sup>

Rodney Powell, President of Western Massachusetts Electric, testified that even though their customer base has remained stable, the total demand for electricity has risen 79 percent since 2000.<sup>xlvii</sup> Increased demand in energy drives the need for additional generating capacity, typically in the form of new power plants. However, dependence on fossil fuels is not sustainable and is a leading contributor to global warming. Fortunately, there are other possible routes to meet consumers' growing energy needs. Increases in energy efficiency, demand response (i.e., on-demand energy conservation tools), and renewable energy measures effectively reduce demand, while cutting greenhouse gas emissions.

### ***Energy Efficiency***

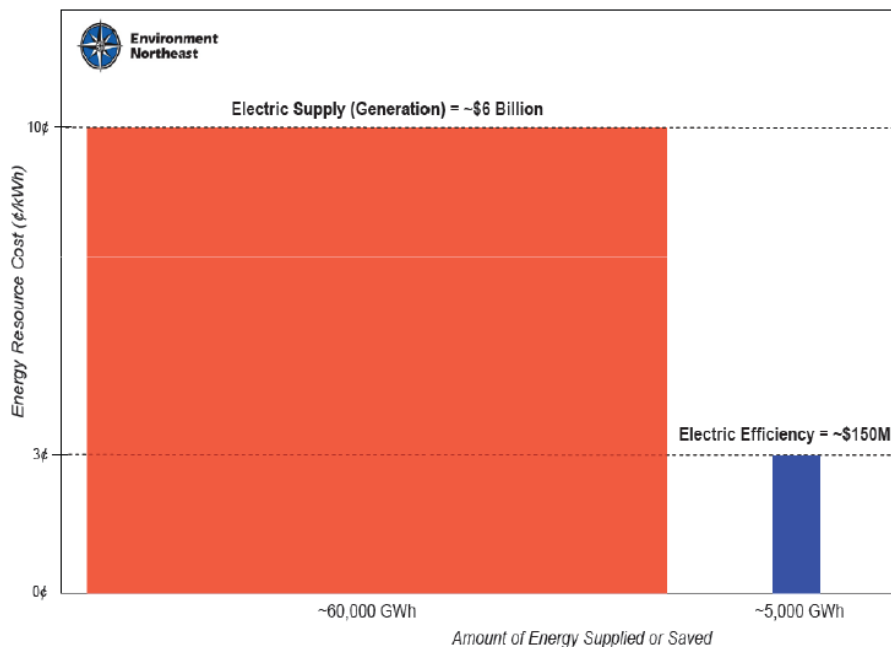
Energy efficiency is the most cost effective way to meet demand, while at the same time reducing energy generation. Energy efficiency is available at a cost that is a third less than electricity supply and the savings can be passed onto ratepayers. "Efficiency costs 3.2 cents per kWh, while new electric supply costs roughly 10 cents per kWh. On the gas side, efficiency resources cost 25 cents per therm while new supply costs roughly \$1.10 per therm," according to written testimony from Dan Valianti, Ceres' Northeast Climate and Energy Manager.<sup>xlviii</sup>

Energy efficiency programs are administered by utility companies and funded through a small system benefit charge (SBC) on all electricity bills. The program has invested approximately \$150 million a year in efficiency, yielding \$500 million a year in savings, a nearly four to one return on investment.<sup>xlix</sup> Programs include rebates for energy efficient lighting and appliances, retrofitting industrial electrical systems, energy efficient planning and design, and reimbursements for energy audits for homes and businesses. Efficiency can be provided at a



small portion of the cost of electricity supply, saving consumers \$5 per megawatt hour (MWh). Despite this success, the Commonwealth invests almost fifty times more in electric supply than energy efficiency, at least \$6 billion dollars per year.<sup>1</sup>

## MA Supply Spending vs. Efficiency Investment



The economic benefits of efficiency go beyond saving ratepayers money. Massachusetts electric efficiency programs have created more than 1,770 non-utility jobs, as well as led to a \$139 million increase in Gross State Product and a \$62 million increase in customer savings.<sup>li</sup> In 2007, the Boston Globe reported that energy efficiency could “create 3,500 jobs for people selling energy-efficiency products and services.”<sup>lii</sup> A report issued by Connecticut, “indicates that they can reduce load growth in the state to zero and save consumers \$1.8 billion.”<sup>liii</sup>

Least cost procurement is a policy that requires energy distributors to choose the most cost effective option available. Since energy efficiency resources are available at a cost significantly less than energy supply, least cost procurement reduces demand and greenhouse gas emissions, while saving ratepayers money. Sam Krasnow, attorney for Environment Northeast, testified that moving forward, Massachusetts needs to meet future energy needs by swapping dirty generation, such as coal, for investments in energy efficiency technology and clean resources like solar and wind energy.<sup>liv</sup>

By reducing the need for more supply, energy efficiency also effectively reduces greenhouse gas emissions. The \$150 million invested in energy efficiency each year has reduced 3 million metric tons of CO<sub>2</sub>, just from the electric sector alone. Efficiency essentially provides the same quality of service to consumers, while using less energy and protecting the environment.

### ***Renewable Energy***

Renewable energy also reduces greenhouse gas emissions by displacing traditionally dirty generation with clean energy. Since renewable energy is a domestic resource, it also spurs local economic development and promotes national energy security. The Commonwealth has tremendous potential to expand wind and solar capabilities. The Massachusetts Technology Collaborative is a quasi-state agency that promotes renewable energy by providing grants from the Massachusetts Renewable Energy Trust Fund so businesses and residents can conduct renewable energy feasibility assessments and install renewables, such as wind turbines and solar panels.

Twenty-five states have Renewable Portfolio Standards (RPS), a regulatory policy that mandates that utilities deliver to their customers a specific percentage of power generated by renewable energy sources. Massachusetts' RPS requires energy suppliers to obtain four percent of their electricity from new renewable energy sources - such as wind, solar and sustainable biomass - by 2009, with an increase to 15 percent by 2020 and 25 percent by 2030.

RPS policies successfully stimulate development of new renewable energy technologies. Half of all wind projects in the United States have been made possible through RPS mechanisms. In New England “[u]p to 20 percent of the region’s future installed generating capacity could be in the form of large wind farms (the most viable renewable technology currently available)...”<sup>lv</sup> Under the RPS, the Commonwealth already is avoiding over half a million tons of CO<sub>2</sub> emissions a year. Renewable energy reduces energy demand and greenhouse gas emissions, while providing energy security and creating local jobs.

### ***Demand Response***

Demand response programs work by encouraging consumers, usually through financial incentives, to reduce the amount of energy they use during high-demand times. Demand response mechanisms avoid energy use or shift energy use from on-peak hours to off-peak hours, thereby reducing emissions effectively and economically. A key finding from an analysis on meeting the region’s future energy needs shows that “demand-side resources appear to provide capacity and energy to the system at relatively low capital costs and with low emissions relative to other sources.”<sup>lvi</sup>

ISO-NE recently established a new system that will administer payments to entities that work with customers to voluntarily reduce their energy demand through dedicated control systems, load shedding or reduction and onsite electrical generation. Demand response programs are an effective way to reduce demand, enhance reliability and reduce greenhouse gas emissions. The capacities of electrical systems generally are dictated by the amount of energy needed during peak hours. Since demand response effectively lowers peak demand, it also reduces the amount of generating capacity and number of power plants needed. “Investments in efficiency, demand resources, and renewables will save the region hundreds of millions, if not billions of dollars. Moreover, these are the types of efforts that will be needed to slow, stop and reverse the devastating man-made effects of global warming,” according to Dan Valianti of CERES.<sup>lvii</sup>

Energy efficiency, renewable energy and demand response mechanisms can effectively reduce the amount of energy that is needed throughout Massachusetts. Sufficient demand resources,

including energy efficiency and demand response, are available to at least meet all new demand for electricity and keep demand flat (i.e. avoid “load growth” entirely). It is encouraging to note that the Patrick Administration has committed to meeting all load growth by deploying these clean energy resources.

## Transportation

In addition to its regional hearings, the Committee investigated the impacts of the state’s transportation sector on global warming emissions. This sector contributes more than 40 percent of the state’s carbon dioxide, the main pollutant involved in global warming.<sup>lviii</sup> The data show an 18 percent increase in carbon dioxide emissions from transportation in Massachusetts from 1990 to 2005.<sup>lix</sup> This is not surprising given that the number of vehicle miles traveled in the region has also increased by almost 70 percent over the last 25 years.<sup>lx</sup> This trend is expected to continue, leading to an additional 24 percent increase in vehicle miles traveled by 2018.<sup>lxi</sup> The three main tools for reducing global warming pollution from vehicles are reducing vehicle miles traveled, using lower carbon fuels and improving vehicle fuel efficiency.<sup>lxii</sup>

### *Reducing Vehicle Miles Traveled*

A substantial portion of the state’s vehicle emissions (five to eight percent) are attributable to commuting.<sup>lxiii</sup> Just two percent of Massachusetts residents travel more than 30 miles to work by car, but they are responsible for 11 percent of the carbon dioxide emissions related to commuting.<sup>lxiv</sup> In addition to increasing air pollution and wear and tear on our highways, traffic congestion related to commuting results in the consumption of an additional 130 million gallons of gasoline per year in the Boston area alone.<sup>lxv</sup> This costs the Commonwealth approximately \$1.4 billion in wasted time and fuel.<sup>lxvi</sup>

Increasing public transit, carpooling and rideshare options for commuters can significantly reduce greenhouse gas emissions and save on fuel costs. Massachusetts has the most extensive public transit system in New England, with rail transit delivering the largest reductions in global warming emissions.<sup>lxvii</sup> In 2005, the state avoided 1.7 million metric tons of carbon dioxide emissions by moving passengers via public transit, which is equivalent to taking 310,000 cars off the road, and saved more than 240 million gallons of gasoline.<sup>lxviii</sup>

In addition to reducing vehicle miles traveled via enhanced transit options, smart growth and transit-oriented development should be promoted by local and regional planning agencies.<sup>lxix</sup> By encouraging more compact development around transit hubs, many commuters can reduce the need to use passenger cars for trips to work. As gasoline prices continue to climb, communities that cluster housing and retail development in a pedestrian-oriented setting will become more appealing to a wider range of residents.

### *Improving Vehicle Efficiency*

What steps is Massachusetts taking to improve vehicle efficiency? Massachusetts has joined with 11 other states in adopting the Clean Cars Program.<sup>lxx</sup> This program sets strong emissions standards and promotes low-emission vehicles and zero-emission vehicles (hybrids, fuel cell vehicles and electric vehicles).<sup>lxxi</sup> However the states’ implementation of the Clean Cars Program

is being held up by the federal government. Before California can implement the program, the EPA must grant the state a waiver from federal pre-emption under the Clean Air Act. Once the waiver is granted, Massachusetts and other states may adopt California's standards. In December 2007, the EPA denied California's waiver request.<sup>lxxii</sup> Massachusetts joined with 15 other states that are intervening in a subsequent lawsuit brought by California against the EPA.<sup>lxxiii</sup>

### ***Promoting Lower Carbon Fuels***

Massachusetts recently acted to promote lower emission fuels by passing a biofuels bill that includes a low carbon fuel standard. The bill - the "Clean Energy Biofuels Act" - was signed into law on July 28, 2008; it requires that biofuels yield at least a 50 percent reduction in lifecycle greenhouse gas emissions and also directs the Secretary of Energy and Environmental Affairs to work to establish a regional Low Carbon Fuel Standard with the states that are participating in the Regional Greenhouse Gas Initiative. Although the Act has the potential to reduce transportation emissions, only an economy-wide carbon cap would ensure the necessary reductions in emissions across all sectors.

## • SOLUTION: CAP GLOBAL WARMING EMISSIONS •

In *Massachusetts v. EPA*, even the United States Supreme Court recognized the crisis of global warming stating that “[t]he harms associated with climate change are serious and well recognized.”<sup>lxxiv</sup> As lead petitioner, Massachusetts led this landmark environmental case in which the Supreme Court concluded that that United States Environmental Protection Agency has the authority to monitor and regulate greenhouse gases including carbon dioxide. Massachusetts had made the argument that global warming was raising the sea level along its coast, presenting the state with a “risk of catastrophic harm” that “would be reduced to some extent”<sup>lxxv</sup> if the federal government regulated certain greenhouse gases.

Given Massachusetts’ own acknowledgment in *Massachusetts v. EPA* of the dangers global warming presents to the environment, one would expect that the state would move forward with every effort aimed at reducing greenhouse gases in order to combat global warming. Regarding the *Massachusetts* decision, Attorney General Martha Coakley stated, “For the last several years, it has been the states that have led the way and that have filled the void left by the federal government.”<sup>lxxvi</sup> By passing a strong cap on carbon, such as the one found in the “Global Warming Solutions Act”, Massachusetts can once again lead the nation in setting much needed environmental policy and help spearhead the fight against global warming.

### ***The Need to Cap Carbon Emissions Across all Sectors***

Greenhouse gases, primarily from the burning of fossil fuels, have accumulated in the earth's atmosphere over time, trapping heat and increasing the earth's temperature.<sup>lxxvii</sup> Across the Northeast, average winter temperatures increased a total of four degrees Fahrenheit from 1970 to 2000.<sup>lxxviii</sup>

It is evident that without immediate mitigation action, greenhouse gas emission levels will continue to rise. This will impact all of Massachusetts in the form of more severe storms, higher temperatures, increased coastal erosion, permanent loss of local species, and extraordinary damage to public infrastructure and private property, which will continue to drain state resources.

According to a report published by the Environment Massachusetts Research & Policy Center, floods caused more property damage and loss of life in the 20<sup>th</sup> century than any other natural disaster. New England was one of the regions that saw the largest increase in extreme precipitation frequency.

This also means that the Commonwealth’s infrastructure and property are in serious jeopardy. Sea level along Boston’s coastline could rise at least 24 inches,<sup>lxxix</sup> causing \$94 billion in property damage, plus the cost of emergency services.<sup>lxxx</sup> The Commonwealth has already experienced the expensive and dramatic effects of severe storms. The flood of 2005, which threatened to breach the Whittenton Pond Dam in Taunton, cost the state nearly \$15 million dollars in public funding.<sup>lxxxii</sup>

Massachusetts can do its part to avoid the worst global warming scenario if it adopts strong policies that significantly reduce greenhouse gas emissions across all sectors. The international scientific community agrees that emission levels need to be reduced 80 percent by the year 2050. To get the state on the right track, meaningful mid-term reductions are critical.

***Massachusetts is Well Situated to Make Meaningful Mid-Term Emissions Reductions***

Other states have already passed laws that will significantly reduce their emissions. California, Florida, Minnesota, Oregon and Connecticut have adopted carbon caps that set interim reductions in emissions by 2020. Massachusetts, a traditionally progressive state in terms of environmental policy, should follow their lead and join the handful of states that are ahead of the curve in addressing global warming.

Reducing emissions on the order of 15 to 20 percent below 1990 levels by 2020 is consistent with the reductions recommended by the scientific community. It would also put Massachusetts on a more reasonable trajectory to meet the sharper emissions reductions required by mid-century. In addition, Massachusetts is particularly well situated to make such an emissions reduction commitment. Since 1990, Massachusetts’ emissions rates have remained relatively stable, while Connecticut’s emissions have increased, and the emissions of other states have escalated at an even more dramatic (and alarming) rate.<sup>lxxxii</sup>

Data compiled by the Conservation Law Foundation (CLF) show that the mid-term emissions limit in the “Global Warming Solutions Act” is in line with what other states have established.<sup>lxxxiii</sup> The mid-term emissions reduction required in the carbon cap legislation is comparable to the targets set by other states including Connecticut, Florida, Minnesota and Oregon.<sup>lxxxiv</sup> The table below shows how the emission reduction targets of various states compare, using data compiled from most recent year (2005) that comprehensive information was available.

**Comparison of State GHG Reduction Policies<sup>lxxxv</sup>**

State	2020 Target	1990 Emissions Level (in MMTCO2E)	2005 Emissions Level (in MMTCO2E)	2020 Target Emissions Level (in MMTCO2E)	Targeted Reduction from 2005 Level (in MMTCO2E)	Targeted Percentage Reduction from 2005 Level
CT	10 % below 1990 level	44.99	48.74	40.49	8.25	16.9 %
FL	1990 level	209.52	293.66	209.52	84.14	28.6 %
MN	22.5 % below 2005 level*	119	157.1	121.76	35.34	22.5 %
OR	10 % below 1990 level <sup>+</sup>	55.5	69.95	49.95	20.0	28.5 %

\* Minnesota law calls for a 15% reduction from 2005 levels by 2015 and 30% by 2025; for the purposes of this table, pro rata emissions reductions over time are assumed. By contrast to the other states included in Table 1, CO2 emissions only comprise about 64% of Minnesota's total greenhouse gas emissions (compared to 80-90% for other states). While such non-CO2 emissions may be generally more difficult to quantify, Minnesota's calculation of aggregate greenhouse gas emissions appears to have been calculated with sufficient integrity to be included here. Oregon calculated its CO2e data based on electricity consumption rather than in-state production alone. This affected the percentage of Oregon's total greenhouse gas emissions derived from CO2 emissions, but should not affect the use of these calculations for comparison.

### ***Massachusetts Can Reduce its Emissions Now***

The Commonwealth needs to get on track by reducing emissions today if it intends to reduce emissions 80 percent by 2050. The state has the technology, expertise, resources and intellectual capacity at its disposal to accomplish these reductions today. Massachusetts can reduce emissions substantially in the mid-term through modest changes in electric power generation, energy efficiency, residential and business fuel consumption, and advancements in the transportation sector.<sup>lxxxvi</sup>

Compared to other states, Massachusetts is well-positioned to adapt its fuel mix for electric power generation to lower-emitting alternatives. Currently, the Commonwealth generates 83 percent of its electricity from carbon-intensive fossil fuels.<sup>lxxxvii</sup> About half of its electric power, or 40.3 percent, is generated from coal and petroleum.<sup>lxxxviii</sup> With such a large amount of power generated by fossil fuels, Massachusetts can make small changes in its fuel mix that will yield large reductions in emissions. Solar, biomass and wind generation currently account for less than five percent of the state's electric generation. Other non-emitting sources, such as nuclear and hydropower, account for only 16 percent of generation.<sup>lxxxix</sup> By contrast, Connecticut generates 50 percent of its electricity from non-emitting sources.<sup>xc</sup>

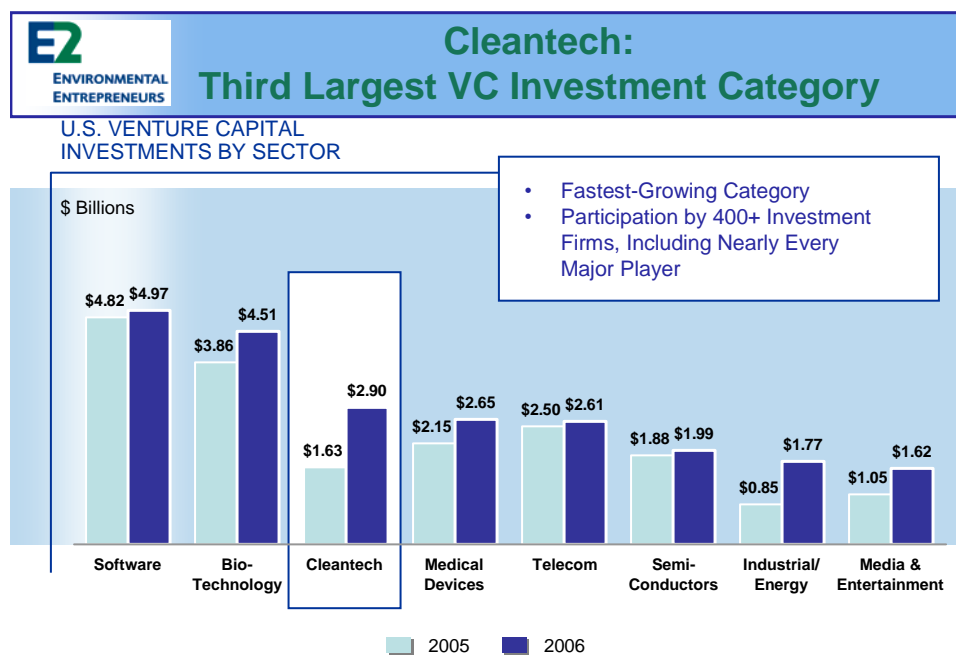
Policies are already in place that will effectively shift the Commonwealth's electric generation from fossil fuels to technologies that will reduce emissions. The "Green Communities Act," recently signed into law by Governor Patrick, will ratchet up the state's RPS. By 2020, electric companies will be required to obtain approximately 15 percent of their electric supply from new renewable energy generation sources, up from 3.5 percent today. By joining the Regional Greenhouse Gas Initiative (RGGI), Massachusetts is one of nine states participating in a regional cap-and-trade system that will limit emissions from electric generators. By requiring generators to purchase emission allowances (and directing at least 80 percent of the revenues toward energy efficiency programs), RGGI will further promote renewable energy, energy efficiency and low-emitting generation.

While these policies are important steps in the fight against global warming, Massachusetts needs to build upon these efforts in order to successfully reduce emissions 80 percent by mid-century. A carbon cap, such as the one found in the "Global Warming Solutions Act," is a necessary complement to these policies.

## • ECONOMIC BENEFITS •

### *The Green Economy: A Fast-Growing Sector*

The clean, green technology industry (“cleantech”) is the fastest growing sector of the economy. “According to CleanEdge Inc., an independent analyst firm, the market for renewable energy expanded from \$9.5 billion in 2002 to over \$55.4 billion in 2006, nearly a six fold increase in just four years. By 2016, it is expected to grow to over \$226 billion.”<sup>xcii</sup> As oil prices continue to rise and as policy makers implement innovative energy initiatives, cleantech is becoming a highly attractive market for investors. In 2006, cleantech became the third largest venture capital investment category. With guidance and effort, the clean energy sector could represent 40 million jobs and \$4.6 trillion in returns throughout the United States.<sup>xciii</sup>

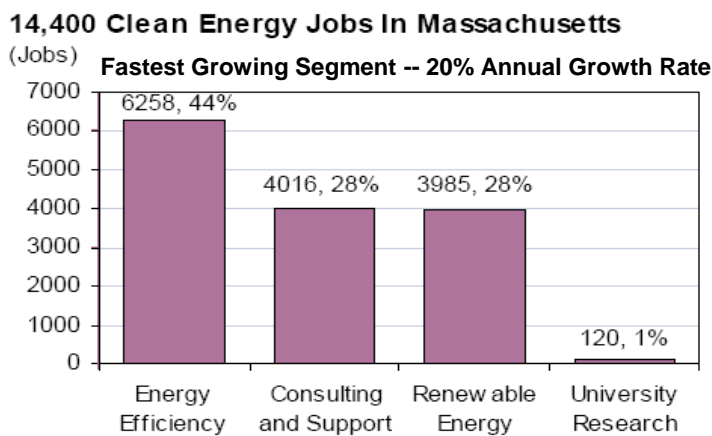


Source: Cleantech Venture Network, 2006

A robust clean energy sector will result in the creation of thousands of new “green collar” jobs: an economy full of workers installing solar panels, weatherizing homes, developing biofuels, manufacturing hybrid cars and building large wind turbines. Many view these new jobs as a necessity for a successful economy, at a time when many positions are being lost to overseas manufacturing and outsourcing.<sup>xciii</sup> “The commitment to a clean energy economy will not only lead to quality jobs in manufacturing unions and the building trades,” says Leo W. Gerard, international president of the United Steelworkers. “It will help stop good-paying jobs from continuing to be exported.”<sup>xciv</sup>



The Commonwealth has recognized the tremendous potential in the green economy and is beginning to take hold of this new and prosperous industry. A recent report by the Massachusetts Technology Collaborative found that jobs in the clean energy sector are predicted to grow by 20 percent over the next year, three times greater than the next fastest-growing sector in the Commonwealth grew over the last year.<sup>xcv</sup> There are currently 14,400 Massachusetts jobs in the clean energy sector and it is poised to be the tenth largest industry in the state.<sup>xcvi</sup>



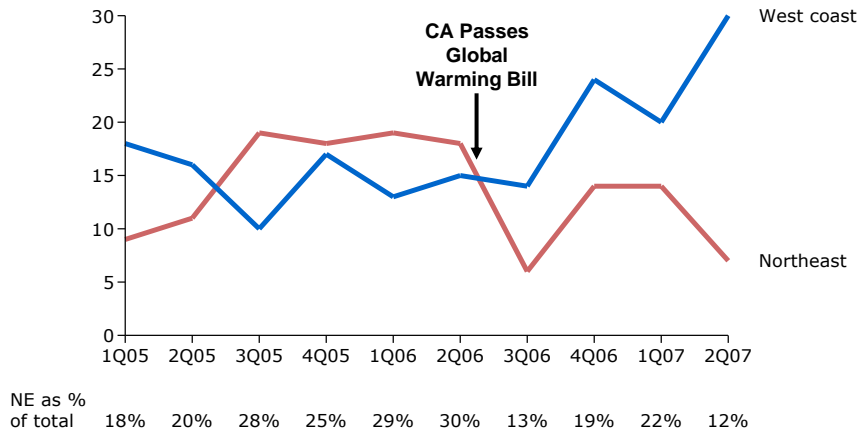
Massachusetts has the second highest number of technology jobs in the nation, ranking only behind Virginia.<sup>xcvii</sup> In order to strengthen and grow the green economy, the right signal must be sent to venture capitalists, manufacturers, researchers and developers that the Commonwealth is ready to become a hub for the green economy. “We have seen high tech and biotech change the economic landscape of Massachusetts,” according to E2.<sup>xcviii</sup> “Now clean energy – technology that supports energy efficiency and renewable fuels, while reducing harmful greenhouse gas pollution – is poised to become the region’s next economic engine of change for decades to come, but only if we create the right policy framework.”<sup>xcix</sup>

***A Cap on Carbon Will Make Massachusetts a Leader in the Green Economy***

In order for Massachusetts to be at the forefront of the green, clean industry, state leaders must promote innovative energy policies and enact the proper regulations for this sector to develop. Such policies will send a strong message to venture capitalists that the Commonwealth of Massachusetts is serious about clean, renewable energy. When California signed its global warming legislation (AB 32) into law, it effectively stimulated the cleantech sector throughout the state. The following chart shows a significant spike in the number of companies receiving investments from venture capitalists after California passed its global warming bill.

## Northeast Lags in VC Investment

Number of companies receiving investments



Source: Cleantech Group

4

According to the Massachusetts Clean Energy Census, industry leaders view California as the “most supportive region for building a clean energy cluster.”<sup>c</sup> This support is partly attributable to California’s state energy policies, as well as its efforts to limit greenhouse gas emissions.<sup>ci</sup> A report issued in 2006 by the University of California, Berkeley concluded that California’s law (AB 32) “would actually boost the state’s GDP by \$60 billion and create 17,000 jobs by 2020 as the state’s entrepreneurial tech culture churns out new companies to meet the need for energy efficiency.”<sup>cii</sup> Since California set emission goals into an enforceable law, an industry replete with innovative green, clean technology was forced to emerge to respond to the state’s immediate need to reduce carbon emissions. By passing a carbon cap bill, California not only meaningfully addressed global warming, but also created an entirely new market for the green industry to flourish.

The passage of a similar carbon cap policy in Massachusetts would send a clear message to venture capitalists that the Commonwealth is serious about energy efficiency and renewable energy. Massachusetts must mandate a reduction in greenhouse gas emissions, rather than simply depend on industries to voluntarily accept and comply with goals. In doing so, Massachusetts will require companies to address their contributions to climate change, which in turn will spur the clean, green economy in the Commonwealth. In the absence of such legislation, Massachusetts will lose its opportunity to become the new leader of the green economy and its chance to create a rich market for green jobs. With its intellectual capacity and workforce, as well as its research and development capabilities, this emerging green economy holds great hope for Massachusetts’ future economy. However, this goal cannot become a reality without first putting in place policies that will promote energy efficiency and laws that will give way to a sustainable green marketplace.

### ***A Carbon Cap will Support New Green Companies***

Not only will the “Global Warming Solutions Act” send a clear message to venture capitalists that the Commonwealth of Massachusetts is serious about clean energy, it will also help new clean energy start-ups succeed. A recent report from MIT found a dramatic increase in economic performance and dramatic decrease in failure rates of new “green” companies if the appropriate government policies existed.<sup>ciii</sup> Of all the available policies, the report concluded that a cap on carbon is the most effective policy to stimulate economic growth and help new green companies succeed.

The report explored why clean energy companies continue to fail at a higher rate than traditional energy companies. The United States’ support of and dependence on fossil fuels has created an “uneven playing field” which hinders the clean energy industry from taking hold in the United States. Clean energy companies face substantial challenges to succeed due to unsupportive federal policies. It is clear from the various clean energy businesses that were studied for this report that the implementation of “green” energy policies is essential in order for these new “green” ventures to survive and thrive.

The report found that with a cap on carbon in place, new clean energy companies were five times more likely to succeed. “The model showed that a strong carbon policy, such as that proposed in the Massachusetts Global Warming Solutions Act, had the greatest impact of all policies modeled.”<sup>civ</sup>

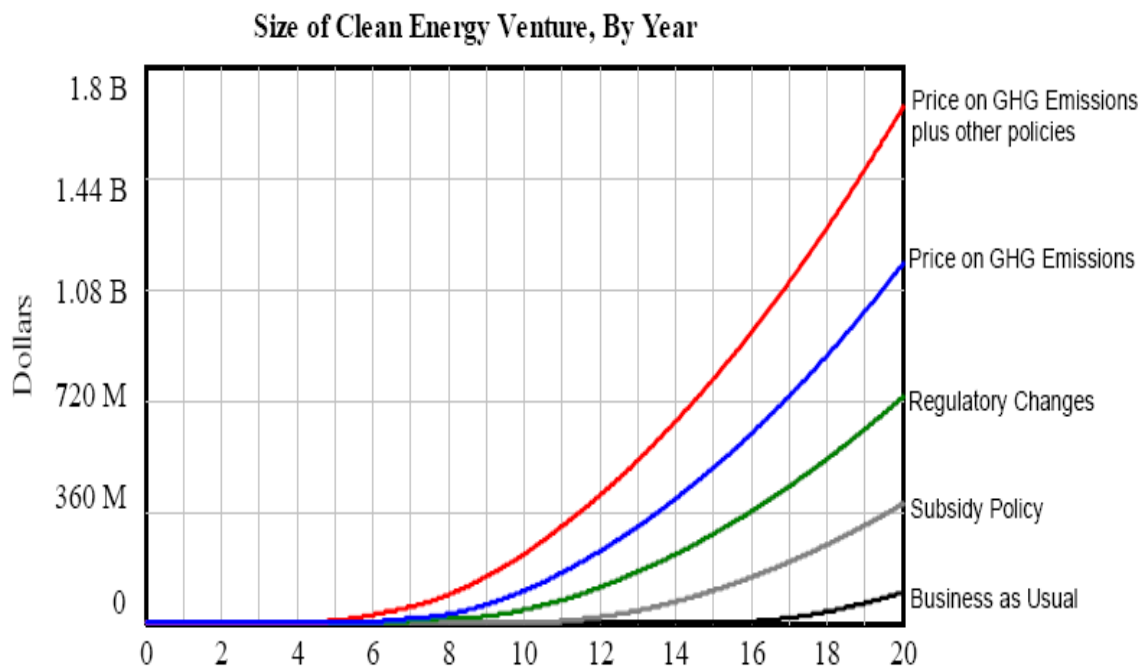


Figure 1: U.S. clean energy businesses grow sooner, faster and larger with a price on GHG emissions

Countries in Europe and Asia have already begun to greatly invest in this new industry. Senator Maria Cantwell who recently spearheaded meetings between the United States and China to discuss clean energy stated, “If the United States can sell (the Chinese) energy solutions just like we've sold them software and airplanes and coffee, that's going to be a good thing for the United States.”<sup>cv</sup>

Massachusetts has the opportunity to help lead the nation in developing this promising industry by creating a supportive environment for small, green start-ups to grow. States that have already taken bold legislative action dealing with climate change are already poised to become front runners in this new industry. The “green” manufacturing sector represents a sub-sector of manufacturing that has much potential in the Commonwealth. The Commonwealth has a unique opportunity to leverage its existing strength in the manufacturing industry by expanding its reach into the green sector. The decision of Evergreen Solar, Inc., a company which manufactures solar power products, to open a new facility in Massachusetts is indicative of the potential of the “green” economy in Massachusetts. The new facility is expected to double the number of Evergreen employees in Massachusetts to 600.<sup>cv</sup>

The green manufacturing industry should continue to be promoted on both the national and international level. As green technology gains momentum around the world, the Commonwealth must work to become an international center for green manufacturing and clean energy technology, exporting its products around the world. Clean energy is likely to become the world’s largest industry over the next few decades. “Massachusetts policy makers must decide whether they will encourage that growth to take place here in the Commonwealth or cede our natural advantages to other states like California that have taken bolder action on global warming.”<sup>cvii</sup>

### ***The Need to Capture Federal “Early Mover” Benefits***

The federal government has, unfortunately, failed to pass comprehensive global warming legislation. The bi-partisan Lieberman-Warner “Climate Security Act” (S3036) would have reduced greenhouse gas emissions 15 percent by 2020 and 70 percent by 2050, but this legislation was narrowly defeated by a Republican led filibuster in the Senate. Instead of debating the merits of the legislation, the federal government chose to ignore the country’s growing dependency on foreign fossil fuels, rising gas prices and the impacts of global warming. The filibuster was backed by President Bush, who threatened to veto the legislation if it passed.

States, however, continue to drive the discussion at the federal level and it is widely anticipated that in 2009, a new federal administration will push Congress to act on global warming. States that adopt climate change laws before Congress acts are expected to be rewarded as “early movers” in the federal legislation. Specifically, the leading pending federal legislation includes a section benefiting states that have already enacted a stringent carbon cap by allocating to these states two percent of the Emission Allowance Account.<sup>cviii</sup> Massachusetts would qualify for these benefits if the “Global Warming Solutions Act” is passed into law, because the greenhouse gas reduction targets in the bill are more stringent than the proposed nationwide targets. However, such benefits can be realized only if the “Global Warming Solutions Act” is enacted before the federal legislation is passed.

California, New Jersey, Hawaii, Washington and Connecticut are among the states that have already established carbon reduction programs and will benefit by having a head start and being at the forefront of combating global warming. In addition to benefits received from the federal government, states that act early on global warming will reap the economic advantages associated with such legislation. “If we simply wait until federal legislation caps greenhouse gases for us, then the bulk of Massachusetts companies will move with the crowd,” said Nick d’Arbeloff, co-director of the New England Clean Energy Council, a trade group formed in 2007 to accelerate New England’s clean energy economy. “If we pass the Global Warming Solutions Act, Massachusetts employers will be ahead of the pack, streamlining their operations in advance of the federal mandate, and gaining first-mover advantage in their respective markets. Bottom line, we believe that Massachusetts employers will ultimately be stronger and healthier competitors as a result of this legislation.”

States that take early action on global warming legislation also gain reduced energy costs through efficiency, benefits from competitive alternative power/fuel sources, improved public health from cleaner air and an influx of new competitive industries.<sup>cx</sup> California is already profiting from early legislative action on global warming. A recent study by the California Climate Action Team showed that by 2020, an investment of \$8.1 billion in energy efficiency strategies would result in a savings on energy costs of \$17.3 billion, a net benefit of \$9.2 billion for California.<sup>cx</sup> Massachusetts should do everything in its power to take advantage of these increased opportunities.

## •CONCLUSION•

It is clear that the economic and environmental benefits of addressing global warming far outweigh the costs. Massachusetts needs to play an important role in solving climate change by adopting a comprehensive cap on carbon. Fortunately, the state has a legislative vehicle, the “Global Warming Solutions Act,” which will help mitigate the worst effects of climate change, while making the state the hub for the emerging green economy.

The emissions reduction targets in the bill match those in the “U.S. Scientists and Economists Call for Swift and Deep Cuts in Greenhouse Gas Emissions” issued in May 2008 and signed by more than 1,700 leading U.S. scientists and economists, including 145 in Massachusetts.<sup>cxix</sup> “The science is clear: to prevent the worst effects of global warming we have to cut out global warming pollution on the order of 80 percent by mid-century,” said John Rogers, senior energy analyst at the Union of Concerned Scientists.

Not only will a strong cap help save the environment, but it will also help to spur economic growth throughout the Commonwealth. In light of this fact, business leaders have also come out in strong support of a cap on carbon. Passage of the bill has the support of Environmental Entrepreneurs (E2), a national community of more than 800 business leaders. Eighty of them are located in Massachusetts and believe that “aggressive steps to limit global warming emissions will stimulate jobs; grow the economy; and position Massachusetts to be a leader in the new Clean Energy Economy.”<sup>cxii</sup>

As Frank Gorke, former Director of Environment Massachusetts, said at the first regional hearing, “adopting a cap on global warming pollution will send the message to polluters that they cannot continue their polluting ways. It will also get investors and engineers focused on deploying and developing solutions to our pollution problems. Many of these solutions – energy efficiency, renewable fuels – are already at our fingertips. A strong cap on global warming will ensure that we put those solutions to work today so we can hit our short-term pollution reduction targets. And, a strong cap will also drive the innovation we need to hit our long term goals.”<sup>cxiii</sup> It is critical that we continue to work together to mitigate the worst effects of global warming.

To ensure that there is a tomorrow for future generations, we must develop and adopt comprehensive solutions today. It is imperative that we act now. The cost of inaction is too great.

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- <sup>i</sup> Nicholas, S., “Stern Review: The Economics of Climate Change”, (Cambridge University Press, 2007), p. vi.
- <sup>ii</sup> Ibid.
- <sup>iii</sup> Ackerman, F. and Stanton, “The Cost of Climate Change: What we Will Pay if Global Warming Continues Unchecked”, Global Development and Stockholm Environment Institute-US Center (Tufts University, May 2008), p. iv.
- <sup>iv</sup> Ibid.
- <sup>v</sup> Ibid., p. 5.
- <sup>vi</sup> “The Cost of Climate Change: What We’ll Pay if Global Warming Continues Unchecked.” by Frank Ackerman and Elizabeth A. Stanton. May 2008.
- <sup>vii</sup> <http://www.fightglobalwarming.com/page.cfm?tagID=274>
- <sup>viii</sup> Union of Concerned Scientists, Confronting Climate Change in the U.S. Northeast, (UCS Publications 2007), p. 107.
- <sup>ix</sup> Environment Massachusetts Research & Policy Center, Falling Behind: New England Must Act Now to Reduce Global Warming Pollution, (Boston: MA, 2008), p.15.
- <sup>x</sup> Testimony of Congressman Edward J. Markey, before the Senate Committee on Global Warming and Climate Change (April 23, 2007).
- <sup>xi</sup> Testimony of Bruce T. Anderson, before the Senate Committee on Global Warming and Climate Change, “Climate Change Impacts Upon the Northeast US,” (April 23, 2007).
- <sup>xii</sup> Ibid.
- <sup>xiii</sup> Union of Concerned Scientists, Confronting Climate Change in the U.S. Northeast, (UCS Publications, 2007), p. 3-6.
- <sup>xiv</sup> Testimony of Bruce T. Anderson before the Senate Committee on Global Warming and Climate Change, “Climate Change Impacts Upon the Northeast US,” (April 23, 2007).
- <sup>xv</sup> Testimony of Dr. Paul Epstein, before the Senate Committee on Global Warming and Climate Change, (April 23, 2007).
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