Assessing the Commonwealth’s progress toward meeting the 2020 GHG emissions reduction required by the Global Warming Solutions Act
The Global Warming Solutions Project (GWSP) is a multi-year initiative supporting a network of diverse stakeholders, each of whom wants to help the Commonwealth honor its climate commitments by meeting the GHG reductions mandated by the GWSA. The network is coordinated by ELM and comprised of stakeholders from business, labor, academia, and environmental, public health, planning, and environmental justice organizations. GWSP members engage in joint action and advocacy on shared priorities. The members strengthen connections between each other and their constituencies, as well as across coalitions and networks. The network independently assesses the state's progress on achieving its GHG emissions reductions targets: 20% below 1990 levels by 2020, at least 80% below 1990 levels by 2050.
Global Warming Solutions Project (GWSP)

Coordinated by:

Environmental League of Massachusetts

GWSP members:
Better Future Project
Clean Water Action
Conservation Law Foundation
Environment Northeast
Environmental Entrepreneurs
Health Care Without Harm
Mass Energy Consumers Alliance
Massachusetts Climate Action Network
Massachusetts Interfaith Power & Light
Metropolitan Area Planning Council
National Consumer Law Center
Northeast Energy Efficiency Partnerships
UMass-Boston Center for Sustainable Enterprise and Regional Competitiveness

Other partners:
Boston and New England Maritime Trades Council, AFL-CIO
Blue Cross Blue Shield/MA
EcoLogical Solutions
EMD Millipore Corporation
IBEW Local #103
Saunders Hotel Group
Transportation for Massachusetts

Note: GWSP is a collaborative network of diverse stakeholders each committed to seeing Massachusetts meet the GHG emissions reduction required by the GWSA. GWSP is coordinated by the Environmental League of Massachusetts.

Project members and other partners support the general conclusions and recommendations of this Scorecard; however, this should not be understood to imply their support for each and every element of this document.
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Executive Summary

The Patrick Administration’s successful clean energy initiatives have made Massachusetts a leader in energy efficiency, renewable energy and climate protection. In this report, the members of the Global Warming Solutions Project (GWSP), a diverse stakeholder network whose members are committed to ensuring Massachusetts achieves the objectives of the GWSA, have evaluated the state’s progress in reaching its requirements and offer proposals for action in 2014.

Under the terms of the 2008 Global Warming Solutions Act (GWSA) and the 2010 Clean Energy and Climate Plan for 2020 (the “2020 Plan”) Massachusetts is required to reduce its greenhouse gas (GHG) emissions 25% below the 1990 level by 2020 and at least 80% by 2050. While many states have adopted emissions goals, Massachusetts’ reduction target is among the strongest in the country, and is a legal mandate. Our assessment, shown below, is that the state will reduce GHG emissions about 20% by 2020. To reach the 25% mandate, further state action is needed, on an expedited basis.

<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Energy &amp; Climate Plan 2020 forecast (middle case) – December 2010</td>
</tr>
<tr>
<td>2020 reduction required by Global Warming Solutions Act</td>
</tr>
<tr>
<td>Global Warming Solutions Project Scorecard estimate – March 2014</td>
</tr>
<tr>
<td>Difference between GWSA mandate &amp; GWSP Scorecard estimate (March 2014)</td>
</tr>
</tbody>
</table>
GWSP Forecast of Greenhouse Gas Emission Reductions
(as % of reductions in the Dec. 2010 Clean Energy & Climate Plan)

<table>
<thead>
<tr>
<th>Sector</th>
<th>% of the reduction mandate we expect to be reached by 2020† (without intensified effort)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings &amp; Energy Efficiency</td>
<td>87%</td>
</tr>
<tr>
<td>Electricity Supply</td>
<td>88%</td>
</tr>
<tr>
<td>Transportation &amp; Land Use</td>
<td>63%</td>
</tr>
<tr>
<td>Non-Energy Emissions</td>
<td>74%</td>
</tr>
<tr>
<td>All Sectors Weighted &amp; Combined</td>
<td>81%</td>
</tr>
</tbody>
</table>

†The Clean Energy and Climate Plan for 2020 included emissions reduction programs totaling to a 27% reduction from 1990 emissions, 2% more than is legally required. These numbers are adjusted so that they are relative to the 25% requirement.

Key Findings

The GWSP members have scored the State on 28 policies that it committed to implement when it released the 2020 Plan in 2010. The Scorecard indicates that the state has performed strongly to date.

11% GHG Reduction achieved by 2010: According to the State’s GHG inventory, emissions fell by 11% between 1990 and 2010, getting us a substantial distance toward the 25% requirement in 2020.

GHG emissions likely to fall 20% by 2020: Given the current status of the policies, we estimate that by 2020 GHG emissions in Massachusetts will fall about 20% below 1990 level, or four-fifths of the legal mandate.

The state needs to take additional steps expeditiously: To reach the required 25% reduction by 2020 the State must take further steps to implement policies that are currently in their formative stages, and to enhance policies that are not currently on track to achieve their full potential.

Readily-available policies can get us to the 25% requirement: We have identified more than a dozen policies that in combination can achieve well above the 5% additional GHG reduction needed by 2020. Most of these are part of the 2020 Plan, a few were not. Most can be implemented by the Governor through administrative actions, a few require new legislation.

Policies must also support reaching the 2050 GHG mandate: Massachusetts can also reach the long-range requirement of at least an 80% emissions reduction by 2050, but to do so the state must not lock us in to significant emissions from new, long-lasting fossil-fuel facilities, such as natural gas pipelines and electric generating plants.
Actionable steps for Massachusetts to take in 2014 to ensure the 2020 GHG emissions reduction requirement is met

The policy changes listed below are, in total, more than sufficient to close the 5% gap between our current estimate of a 20% GHG reduction in 2020 and the legally required 25%. Detailed explanations of each policy are provided in the full report.

Overall
- Promulgate regulations setting declining annual emissions limits by source of emissions, as required by the Global Warming Solutions Act

Energy Efficiency
- Meet the electricity and heating fuel efficiency targets in the 2013-2015 Three Year Plan
- Acknowledge the real cost of CO₂ in evaluating the benefits of efficiency measures
- Adopt an updated version of the Stretch Code

Electricity Generation and Renewable Energy
- Encourage appropriately-sited, cost-effective transmission lines to bring additional renewable power into Massachusetts
- Add renewable thermal energy to the state’s Alternative Energy Portfolio Standard

Transportation and Land Use
- Promulgate regulations to codify MassDOT’s effort to triple the share of travel in Massachusetts being done by bicycling, transit and walking by 2030
- Pass zoning reform legislation
- Begin mileage reduction pilot program for auto insurance
- Prevent motor fuel and heating oil GHG emissions from rising due to imports of Canadian Tar Sands-derived oil
- Do “smart driving” education on how to save gas by driving more carefully and maintaining your car better

Non-Energy Emissions
- Cut methane leaks from natural gas pipelines
- Cut leakage of high-GHG gases from large refrigeration systems

Other Related Issues
- Ensure that all communities have equal access to the benefits of a clean energy future and that no communities bear a disproportionate burden of the expected impacts from climate change
THE MASSACHUSETTS CLEAN ENERGY AND CLIMATE SCORECARD
March 2014

Introduction

There is no doubt that the Patrick Administration’s aggressive clean energy initiatives have made Massachusetts a leader in energy efficiency, renewable energy and emissions reductions. The Governor has personally been a leader in reorienting Massachusetts’ energy policies and programs to favor locally made, clean energy. Widely acknowledged, the capacity of his Administration to take action on clean energy and climate protection has been hugely impressive.

Under the terms of the 2008 Global Warming Solutions Act (“the Act”) and the 2010 Clean Energy and Climate Plan for 2020 (“the 2020 Plan”) Massachusetts is required to reduce its GHG emissions 25% below the 1990 level by 2020 and at least 80% by 2050. While many states have adopted emissions targets and goals, Massachusetts’ is among the toughest in the country. The following analysis must be viewed in the context of highly ambitious legal mandates.

This scorecard was developed by members of the Global Warming Solutions Project (GWSP), a collaborative network of stakeholders committed to addressing climate change in a comprehensive way and to ensuring Massachusetts achieves the objectives of the GWSA. It evaluates the State’s progress in reaching its requirements and recommends additional steps to take in 2014 to advance this urgent work. The degree of progress results not only from the state government’s own actions, but also from actions by the federal government, other state governments in the region, and from independent factors such as changes in fossil fuel prices.

Figure 1: Massachusetts’ Legally Required Greenhouse Gas Reductions

The Scorecard assesses progress in getting from 94 million tons/year of GHG emissions in 1990 (first column) to the 2020 mandate of 71 tons/year (fourth column).
GWSP Scorecard:
2010 Clean Energy & Climate Plan Forecast Compared With 2014 Global Warming Solutions Project Estimate

Figure 2: Economy-wide 2020 Greenhouse Gas Emissions Reduction Below 1990 Levels

| Clean Energy & Climate Plan 2020 forecast (middle case) – December 2010 | 27% |
| 2020 reduction required by Global Warming Solutions Act | 25% |
| Global Warming Solutions Project Scorecard estimate – March 2014 | 20% |
| **Difference Between GWSA Mandate & GWSP Scorecard estimate (March 2014)** | -5% |

Figure 3: GWSP Forecast of Greenhouse Gas Emission Reductions
(as % of reductions in the Dec. 2010 Clean Energy & Climate Plan)

<table>
<thead>
<tr>
<th>Sector</th>
<th>% of the reduction mandate we expect to be reached by 2020(^1) (without intensified effort)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings &amp; Energy Efficiency</td>
<td>87%</td>
</tr>
<tr>
<td>Electricity Supply</td>
<td>88%</td>
</tr>
<tr>
<td>Transportation &amp; Land Use</td>
<td>63%</td>
</tr>
<tr>
<td>Non-Energy Emissions</td>
<td>74%</td>
</tr>
<tr>
<td><strong>All Sectors Weighted &amp; Combined</strong></td>
<td><strong>81%</strong></td>
</tr>
</tbody>
</table>

\(^1\)The *Clean Energy and Climate Plan for 2020* included emissions reduction programs totaling to a 27% reduction from 1990 emissions, 2% more than is legally required. These numbers are adjusted so that they are relative to the 25% requirement.
### Figure 4: Measures and Policies in 2010 Clean Energy & Climate Plan Forecast vs. 2014 GWSP Estimates

<table>
<thead>
<tr>
<th>Measures and Policies</th>
<th>2020 Plan (December 2010)</th>
<th>GWSP estimate (March 2014)</th>
<th>Difference between 12/10 Plan and 2/14 estimate of % emissions reduced</th>
<th>% of 25% reduction mandate forecast to be reached by 2020* (w/out intensified effort)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Buildings and Energy Efficiency</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electric energy efficiency</td>
<td>5.0%</td>
<td>3.9%</td>
<td>-1.1%</td>
<td>87%</td>
</tr>
<tr>
<td>Natural gas, heating oil energy efficiency</td>
<td>2.1%</td>
<td>1.3%</td>
<td>-0.8%</td>
<td></td>
</tr>
<tr>
<td>Advanced building energy codes</td>
<td>1.6%</td>
<td>1.2%</td>
<td>-0.4%</td>
<td></td>
</tr>
<tr>
<td>Federal appliance and product standards</td>
<td>0.6%</td>
<td>0.4%</td>
<td>-0.2%</td>
<td></td>
</tr>
<tr>
<td>MEPA GHG policy and protocol</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>“Deep” energy efficiency improvements for buildings</td>
<td>0.2%</td>
<td>0.0%</td>
<td>-0.2%</td>
<td></td>
</tr>
<tr>
<td>Expanding energy efficiency programs to commercial/industrial use of heating oil</td>
<td>0.1%</td>
<td>0.0%</td>
<td>-0.1%</td>
<td></td>
</tr>
<tr>
<td>Tree retention and planting to reduce heating and cooling loads</td>
<td>0.1%</td>
<td>0.1%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Develop a mature market for renewable thermal heating</td>
<td>0.1%</td>
<td>0.7%</td>
<td>0.6%</td>
<td></td>
</tr>
<tr>
<td><strong>Electricity Supply</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expanded Renewable Portfolio Standard (RPS)</td>
<td>1.2%</td>
<td>1.2%</td>
<td>0.0%</td>
<td>88%</td>
</tr>
<tr>
<td>More stringent EPA power plant rules cause shutdown of inefficient coal-fired plants</td>
<td>1.2%</td>
<td>1.2%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Clean energy imports</td>
<td>5.4%</td>
<td>0.3%</td>
<td>-5.1%</td>
<td></td>
</tr>
<tr>
<td>Measures and Policies</td>
<td>Estimated % reduction of 1990 emissions by 2020</td>
<td>Difference between 12/10 Plan and 2/14 estimate of % emissions reduced</td>
<td>% of 25% reduction mandate forecast to be reached by 2020* (w/out intensified effort)</td>
<td></td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------------------------------</td>
<td>------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2020 Plan (December 2010)</td>
<td>GWSP estimate (March 2014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brayton Point Power Plant shuts down</td>
<td>0.0%</td>
<td>3.7%</td>
<td>3.7%</td>
<td></td>
</tr>
<tr>
<td>Transportation and Land Use</td>
<td>7.8%</td>
<td>4.6%</td>
<td>-3.2</td>
<td>63%</td>
</tr>
<tr>
<td>Federal and California vehicle efficiency and GHG standards</td>
<td>2.6%</td>
<td>2.6%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Federal emissions and fuel efficiency standards for medium and heavy duty vehicles</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>Federal renewable fuel standard and regional clean fuel standard (formerly called low carbon fuel standard)</td>
<td>1.6%</td>
<td>0.5%</td>
<td>-1.0%¹</td>
<td></td>
</tr>
<tr>
<td>Mileage Reduction Pilot program (Pay-As-You-Drive auto insurance)</td>
<td>1.1%</td>
<td>0.3%</td>
<td>-0.8%</td>
<td></td>
</tr>
<tr>
<td>Clean car consumer incentives (auto sales tax varying by GHG emissions/mile)</td>
<td>0.5%</td>
<td>0.0%</td>
<td>-0.5%</td>
<td></td>
</tr>
<tr>
<td>Electric vehicles</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.1%</td>
<td></td>
</tr>
<tr>
<td>GreenDOT (all measures except transportation planning)</td>
<td>1.2%</td>
<td>0.5%</td>
<td>-0.7%</td>
<td></td>
</tr>
<tr>
<td>bike, pedestrian, transit investments</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
<td></td>
</tr>
<tr>
<td>operations efficiency, development project mitigation, consumer choice</td>
<td>0.5%</td>
<td>0.3%</td>
<td>-0.2%</td>
<td></td>
</tr>
<tr>
<td>smart-driving education for light duty vehicles (speed, acceleration, maintenance)</td>
<td>0.4%</td>
<td>0.0%</td>
<td>-0.4%</td>
<td></td>
</tr>
<tr>
<td>smart-driving education for heavy-duty vehicles</td>
<td>0.1%</td>
<td>0.0%</td>
<td>-0.1%</td>
<td></td>
</tr>
</tbody>
</table>

¹ Difference does not match subtraction of column 2 from column 1 in this row due to rounding.
## Measures and Policies

<table>
<thead>
<tr>
<th>Measures and Policies</th>
<th>Estimated % reduction of 1990 emissions by 2020</th>
<th>Difference between 12/10 Plan and 2/14 estimate of % emissions reduced</th>
<th>% of 25% reduction mandate forecast to be reached by 2020* (w/out intensified effort)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2020 Plan (December 2010)</td>
<td>GWSP estimate (March 2014)</td>
<td></td>
</tr>
<tr>
<td>Smart Growth Policy Package (including transportation planning and Sustainable Development Principles)</td>
<td>0.5%</td>
<td>0.3%</td>
<td>-0.2%</td>
</tr>
<tr>
<td><strong>Non-Energy Emissions</strong></td>
<td>2.0%</td>
<td>1.4%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>Reducing GHG emissions from motor vehicle air conditioning</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Stationary equipment refrigeration management</td>
<td>1.2%</td>
<td>0.6%</td>
<td>-0.6%</td>
</tr>
<tr>
<td>Reducing SF6 emissions from gas-insulated switchgear (in electricity distribution systems)</td>
<td>0.2%</td>
<td>0.2%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Reduce GHG emissions from plastics (through greater recycling)</td>
<td>0.3%</td>
<td>0.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td><strong>All Sectors Combined</strong></td>
<td>27%</td>
<td>20%</td>
<td>-7%</td>
</tr>
</tbody>
</table>

* The *Clean Energy and Climate Plan for 2020* has emission reductions totaling 27% of 1990 emissions, 2% more than is legally required. To account for this, we have adjusted the numbers in this column by taking (GWSP estimate/CECP forecast) and multiplying by 27%/25% = 1.08, so that the numbers are now relative to the 25% requirement.

** In the 2020 Plan, the policy was termed “solar thermal.” Due to expanded policies by the Patrick administration, we have renamed it here to be “renewable thermal,” which includes other forms besides solar, such as biomass and high efficiency heat pumps.
Key Findings
The GWSP members have scored the State on 28 policies in four economic sectors that the State committed to implement when it released the 2020 Plan in December 2010. The Scorecard indicates that the state has performed strongly to date.

Emissions fell 11% between 1990 and 2010: According to the State’s GHG inventory, emissions fell by 11% between 1990 and 2010, getting us a substantial distance toward the 25% requirement for 2020.

GHG emissions likely to fall 20% by 2020: Given the current status of the policies, we estimate that by 2020 GHG emissions in Massachusetts will fall by about 20% compared to 1990, or four-fifths of the legal mandate.

The state needs to take additional steps expeditiously: To reach the required 25% reduction the State must take further steps to implement policies that are currently in their formative stages, and to enhance policies that are not currently on track to achieve their full potential.

Readily-available policies can get us to the 25% requirement: We have identified more than a dozen policies that in combination can achieve well more than the 5% additional GHG reduction needed by 2020. Most of these are part of the 2020 Plan, a few were not. Most can be implemented by the Governor through administrative actions, a few require new legislation.

Policies must actively support reaching the 2050 GHG mandate: Massachusetts can also reach the long-range emissions-reduction requirement of at least an 80% reduction by 2050, but to do so the state must not lock us in to significant emissions from new, long-lasting fossil-fuel facilities, such as natural gas pipelines and electric generating plants.

We encourage Governor Patrick to use his remaining time in office to take steps that will put Massachusetts fully on track to achieve the required 25% GHG reduction by 2020. We further urge that the State’s next governor, who will take office in January 2015, follow up expeditiously on the priority actions that we have identified.

Actionable steps to take in 2014 to ensure that Massachusetts meets the 2020 requirement
The Patrick Administration has many reasons to be proud of what it has achieved so far on climate change. And yet there remains a great deal to do. We have every confidence that if encouraged, the Administration will step up this vitally important work during its last 10 months, continuing to press for changes and programs that will help the people and businesses of the Commonwealth and to cement its legacy. The following are actionable, practical strategies that the administration and the legislature can put into place this year to drive additional savings for the Commonwealth and to position the state more firmly to reach the 2020 reduction requirements.

The policy changes listed below are, in total, substantially more than sufficient to close the 5% gap between our current estimate of a 20% GHG reduction in 2020 and the legally required 25%.
Overall

**Promulgate regulations setting declining annual emissions limits:** Section (3)(d) of the Global Warming Solutions Act says “The department shall promulgate regulations establishing a desired level of declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gas emissions.” The Patrick administration should implement this requirement before leaving office.

**Energy Efficiency**

**Meet efficiency targets:** Direct the Department of Energy Resources to impress upon the efficiency program administrators (PAs – the electric and gas utilities and the Cape Light Compact) the necessity of meeting their efficiency goals for 2014 and 2015 (the remaining years of the current Three-Year Plan).

Electric, gas, and heating oil energy efficiency are the largest component of the 2020 plan. The PAs were substantially short of their targets for the 2010-2012 Three Year Plan, and it appears likely that they were short in 2013. It is essential that the targets be met in 2014 and beyond.

**Acknowledge the real cost of CO\textsubscript{2}:** Instruct the DOER to prioritize Dept. of Public Utilities docket # 11-120, establishing an appropriately higher CO\textsubscript{2} reduction value based on the avoided cost per ton of carbon in compliance with the Global Warming Solutions Act.

The PAs can only provide incentives for efficiency measures that are “cost effective,” meaning that benefits are greater than costs over the lifetime of the measures, or measures that are otherwise cheaper than energy supply. Reducing CO\textsubscript{2} emissions is one of the benefits, but the PAs and the Department of Public Utilities give this reduction a low value at present. Yet the state is required to meet CO\textsubscript{2} reduction percentages in 2020 (25%) and 2050 (80%). As a result, a more accurate method for valuing the benefit of reduced CO\textsubscript{2} emissions would be through the development of an abatement cost curve based on actual Massachusetts-specific data.

Until that occurs, one method of valuing CO\textsubscript{2} reductions for purposes of the efficiency cost-effectiveness calculations is by estimating the costs of the measures the state would most likely have to use to meet the reduction percentages instead -- such as more renewable energy development. Using this method until an abatement cost curve is developed would provide a more accurate value for CO\textsubscript{2} reductions, which in turn would increase the benefits of additional efficiency measures, and allow additional measures to pass the cost-effectiveness test.

**Adopt new stretch code:** Instruct the Commissioner of the Dept. of Public Safety to propose that the Board of Building Regulation and Standards adopt a new version of the “stretch” energy code.

Cities and towns that wish to be designated by the state as “green communities” must adopt a local-option addition to the state’s building code, called the stretch code, which institutes stricter energy efficiency requirements for new construction and major renovation of buildings. As of October 2013, 134 communities had adopted the first version of the stretch code.\(^1\) But as the state has now adopted a newer version of the “base” energy code, the International Energy Conservation Code, it is necessary to implement a new stretch code -- but the state is far behind schedule in doing so.
Electricity Generation and Renewable Energy

**Build renewables-oriented transmission lines:** Cost-effective methods of providing more renewable energy without new transmission lines, such as distributed generation, should have top priority, as should forms of renewable energy that are eligible for the state’s Renewable Portfolio Standard (RPS).

Beyond that, the Commonwealth should encourage the construction of cost-effective transmission lines that would enable the state to tap into additional renewable energy from throughout Massachusetts, and imported from beyond the state’s borders. New lines, however, should be designed to meet local environmental concerns, and should apportion costs fairly among generators, transmission companies, and ratepayers in each state.

The 2020 Plan projects “Clean Energy Imports,” which are expected to primarily be hydro power from Hydro Quebec, to yield a 5.4% reduction in GHG emissions in 2020, one of the largest items in the Plan. The existing transmission line from Quebec to New England is close to capacity. While several new lines have been proposed, none are close to obtaining necessary regulatory approvals.

**Add renewable thermal to the Alternative Energy Portfolio Standard:** Push for legislation that would add renewable thermal energy to the technologies eligible for the state’s Alternative Portfolio Standard (APS). The Executive Office of Energy & Environmental Affairs (EEA) is advocating for such legislation; direct participation by Governor Patrick would strengthen the effort. Being part of the APS should add significantly to the incentives available for implementing renewable thermal, and thus speed its adoption.

Transportation and Land Use

**Promulgate regulations to codify MassDOT’s effort to increase use of non-auto transportation:** In October 2012, MassDOT announced a “mode shift” goal to triple the share of travel in Massachusetts being done by bicycling, transit and walking by 2030. Accomplishing this effort is essential to reaching not only the 2020 but also the 2050 GHG reduction mandates.

**Pass zoning reform legislation:** Pass legislation that provides municipalities a better framework for planning and zoning, enhanced tools to plan for and manage growth, and incentives to reduce VMT and GHG emissions through better development. Such legislation is part of the Smart Growth Policy Package on pages 68-69 of the 2020 Plan.

**Begin mileage reduction pilot program:** Instruct MassDOT/Department of Insurance to resolve any remaining issues and expedite implementation of the Mileage Reduction Pilot program (a program being pursued in lieu of the program known as PAYD, or pay-as-you-drive auto insurance).

The consortium that MassDOT chose through an RFP process to conduct the PAYD pilot has experienced long delays. The state agencies involved in these delays should resolve the administrative issues quickly so that this important program can be conducted, with the hoped-for result that after three years of a pilot, insurance that rewards drivers for driving fewer miles
can be offered more widely in Massachusetts. The 2020 Plan stated that a study had shown broad usage of PAYD could yield a 5% reduction in vehicle miles traveled.  

**Prevent motor fuel emissions from rising:** In the absence of a regional Clean Fuel Standard, large-scale imports of Canadian Tar Sands-derived oil threaten to raise the average emissions level of motor fuel and heating oil in Massachusetts. The state should promulgate regulations to prevent such an increase from taking place, and work with other states to do likewise.  

**Do “smart driving” education:** Instruct MassDOT to begin a serious “smart driving” educational effort, that would include educating drivers about the large gas savings from reducing speed, accelerating more gently, keeping tires inflated correctly, and maintaining their cars properly.  

Analysis conducted for the 2020 Plan found that shifts in driver behavior could yield some of the largest fuel savings among the variety of measures planned for the GreenDOT program. The EPA estimated that fuel efficiency could be improved by up to 33%.  

**Non-Energy Emissions**

**Cut methane leaks:** Support legislation to reduce methane leaks from the natural gas distribution system – such as S1580, H. 2765, H. 3873.  

Recent evidence shows that leaks of methane from natural gas pipelines in Massachusetts are more extensive than previously thought. Because methane is at least 34 times as powerful a greenhouse gas as CO₂ per pound, such leaks are a serious problem for controlling our GHG emissions, especially as natural gas continues to gain market share for heating relative to fuel oil and electricity.  

**Cut refrigerant leakage:** Instruct MassDEP to follow California’s lead and promulgate regulations requiring that owners of large commercial refrigeration systems reduce leaks of high-GHG potential gases from the systems (2020 Plan pages 75-76)  

Such leaks are one of the largest non-energy source of GHG emissions in Massachusetts, with the 2020 Plan estimating that regulations requiring owners of refrigeration systems, such as supermarkets, to reduce leakage could cut GHG emissions by 1.2 million tons in 2020. California implemented such a regulation, beginning in November of 2010, and Massachusetts could follow its lead.  

**Other Related Issues**

**Equity in Program Planning and Delivery:** It is vital to ensure that all communities have equal rights to the benefits of a clean energy future, with none bearing a disproportionate burden from the expected impacts of climate change. To achieve this, the Patrick Administration should mandate equity in all its climate planning, especially in adaptation planning, to ensure that the adaptation needs of low-income and communities of color are prioritized.
POLICY ANALYSIS BY SECTOR

The Clean Energy & Climate Plan for 2020 consisted of the following 28 policies and programs. Here we have provided background for each and have assessed the status of its implementation. Also provided is the percent emission reduction as forecast by the 2020 Plan and what GWSP estimates will actually be achieved by 2020 based on our analysis.

BUILDINGS AND ENERGY EFFICIENCY

Policy: Electric energy efficiency
(2020 Plan: 5.0% of overall GHG emissions; 2014 Scorecard: 3.9%)

Background
The State has been clear that energy efficiency is a key component of its climate strategy. The largest part of this strategy is the “all cost-effective energy efficiency” requirement in the Green Communities Act and the use of energy efficiency as the “first fuel.” This is proving to be an effective approach in which the law requires utilities to purchase available energy efficiency whenever it is less expensive than supply options. As a result, the utilities have made and are continuing to make major investments in energy efficiency.

Progress
In total, the 2010-2012 three-year statewide energy efficiency plans delivered nearly 1.4 million metric tons of greenhouse gas reductions. This is due to energy savings equivalent to the annual electricity consumption of over 314,000 homes and the natural gas usage of 52,000 homes.

The three-year plan results and the state laws that prioritize energy efficiency and efficient building codes are a significant factor in Massachusetts earning the No. 1 ranking in the American Council for an Energy Efficient Economy’s (ACEEE) State Energy Efficiency Scorecard in 2011, 2012 and 2013. Each year ACEEE has credited the Commonwealth’s “continued commitment to energy efficiency under its Green Communities Act of 2008” for the ranking. Massachusetts is investing more in energy efficiency per capita than any other state. Despite such a stellar track record, there is room for improvement well within the ability of the Patrick Administration, the utilities and other stakeholders to achieve before the end of this gubernatorial term, as discussed below.

Recent reductions in natural gas prices compared to historic levels have presented challenges to investment in energy efficiency as such investments save less money than before. But low prices at present also mean that consumers have more disposable income with which to invest in efficiency and remodeling projects.

That being said, the Scorecard substantially reduces the expected electric efficiency emissions reductions compared to the forecast in the 2020 Plan, for three reasons. First, the annual reduction targets adopted by the efficiency Program Administrators (PAs) and the Energy Efficiency Advisory Council (EEAC), and approved by the Department of Public Utilities, are slightly lower than the projections used in the 2020 Plan. In the 2020 Plan, savings are expected to rise slightly each year after 2012, to 2.5% in 2013, 2.6% in 2014, and 2.7% in 2015, topping...
out at 2.9% savings for the current year’s programs as a fraction of total electricity sales in 2018 and beyond. The three-year Plan adopted by the EEAC for 2013-2015 is lower than this, reaching 2.6% in 2015. Given the inability of the current programs to reach their targets in the first three-year plan from 2010-2012, it seems realistic to assume that, in the absence of more strenuous efforts, the PAs will not be able to go beyond the 2015 annual target in succeeding years. We therefore estimate that the three-year plans to be adopted by the EEAC for 2016-2018 and 2019-2021 will project saving a constant 2.6% a year from 2016 through 2020, significantly below the forecast in the 2020 Plan. For the state to reach its overall 25% GHG reduction goal in 2020, it will be important for the electric efficiency programs to save more than 2.6% annually. But for this to occur, changes in state policies and/or PA administration of the programs will likely be necessary, and at present we cannot assume that such changes will take place.

Second, as noted above, the electric programs fell substantially short of their GHG goals for 2010-2012, attaining only 83% over the three years, according to the state’s Five Year GWSA Progress Report. Assuming that the PA’s and the EEAC gain experience over time, we project somewhat better performance in the future, with the utility programs attaining an average of 90% of the targets set in the three-year plans, beginning with the current one.

Third, the GHG reductions due to electric efficiency are based on the marginal CO\textsubscript{2} emissions per kilowatt-hour of electricity generation on the New England grid. These emissions will turn out to be significantly lower than the estimates used in the 2020 Plan because most or all of the coal plants in Massachusetts, most importantly Brayton Point, are now expected to close well before 2020. While these closures are a great boon to meeting the 25% GHG reduction in 2020, they actually reduce the CO\textsubscript{2} savings that result from the efficiency measures operating in 2020.

One means by which the utilities could raise their electricity savings is to spend all the funds they have allocated to efficiency programs. At present, some of the utilities leave as much as 20% of their efficiency program funds unspent annually. One could hypothesize a variety of reasons for this, but in any case correcting it would likely lead to greater electricity savings. Ongoing efforts to penetrate more deeply the hard-to-reach and hard-to-serve residential community, including low/moderate income communities of color with older housing stock, high percentages of non-English speaking populations, and high concentrations of renters, will be necessary to ensure that all communities are able to participate in – and benefit from – these programs as well.

**Policy: Natural gas, heating oil, and propane efficiency**

(2020 Plan: 2.1% of overall GHG emissions; 2014 Scorecard: 1.3%)

**Background**

The Green Communities Act requires both the electric and gas utilities to provide funding for all cost-effective efficiency opportunities. Historically, funding from the electric utilities has been far higher than that from the gas utilities, but due to the Act the latter have been ramping up their funding rapidly. Because heating oil and propane used to heat homes and businesses are not provided by regulated utilities, the sellers of these fuels have not been required to provide funding for efficiency. However, due to long-established legislation that requires the electric utilities to provide fuel-neutral efficiency services to residential customers, the electric PA’s do
fund efficiency for homeowners with oil heat, if they are also electricity customers.

**Progress**
The efficiency savings that resulted from measures installed to conserve heating fuels were far below the projections for the first three-year plan, at only 60% of goal (the percentage refers only to savings above 2008 levels. If the pre-2008 savings level is included the PAs report that they achieved 88% of their gas savings goal). While this significant decline is likely associated in part with a sharp drop in natural gas prices, at this point – absent meaningful new approaches taken to bridge the gap between actual and projected thermal efficiency targets – we have to expect that future gas savings will continue to be well below the numbers used in the 2020 Plan.

For the 2013-2015 Three-Year Plan, the PA’s project very small annual increases, with savings rising from 1.10% of sales in 2013 to 1.15% in 2015. Based on this, we project similarly small future increases of 0.03% annually through 2020, ending at 1.30% per year. This is substantially lower than the 0.15% annual increases assumed in the 2020 Plan, with savings rising to 1.9% of sales/year in 2017, then staying at that level through 2020. Cumulatively over the years 2010 through 2020, the actual PA plans for 2010 through 2015 plus our projected PA plans through 2020 yield a total of 12.2% in savings through 2020; versus 15.6% cumulative savings in the 2020 Plan, this is a significant shortfall.

However, we project that, based on having greater experience, the PAs will achieve 80% of their targets in 2013 through 2020, versus only 60% in 2010 through 2012. This is a substantial improvement over 2010-2012, but still well below the numbers needed to meet an overall 25% GHG cut by 2020. As with the electric programs, improving on our “conservative” forecast will be important to reaching the state’s overall GHG reduction mandate.

**Policy: Advanced building energy codes**
*2020 Plan: 1.6% of overall GHG emissions; 2014 Scorecard: 1.2%*

**Background**
The Green Communities Act requires that the state adopt the national model energy code (the IECC, or International Energy Conservation Code) within one year of each new version being released, which is normally on a three-year cycle. Secondly, the state is also expected to adopt a new “stretch code” each time that the IECC is approved. The Stretch Code is a local-option energy code that offers improved energy efficiency provisions above the standard Building Code. As a performance-based code, the Stretch Code requires specific reductions in energy usage, allowing flexibility in how the reductions are achieved. Municipalities across the state can opt to adopt the code, and many – especially those communities that have chosen to participate in the Massachusetts Green Communities program – have already done so.

**Progress**
The projections used in the 2020 Plan are based primarily on the requirement that the state adopt the national model energy code within one year of each new version being released. At present, the state is two years behind schedule in putting the latest model code into effect and in fulfilling the accompanying expectation of issuing a new Stretch Code. In addition, as the state's Five-Year Progress Report acknowledges, the rate of new construction in Massachusetts...
has been slow in recent years, which means that fewer buildings are being built to higher-efficiency standards. We don’t know whether these policy decisions and economic trends will continue, but due to them we forecast that by 2020 we will have achieved only 75% of the savings anticipated in the 2020 Plan.

**Policy: Federal appliance and product standards**  
*(2020 Plan: 0.6% of overall GHG emissions; 2014 Scorecard: 0.4%)*

**Background**
The federal government acts as the regulatory body for efficiency standards for appliances, electronics and other products. The Obama administration planned to issue new, stricter energy efficiency standards on an accelerated schedule.

**Progress**
The Obama administration is well behind schedule in publishing new efficiency standards for a variety of appliances and electrical products, as the Five-Year review acknowledges. Given that we are now only six years from 2020, each year of delay is important. As a result, we are estimating that by 2020 these standards will have achieved only two-thirds (67%) of the savings anticipated in the 2020 Plan.

**Policy: Massachusetts Environmental Policy Act GHG Policy and Protocol**  
*(2020 Plan: 0.0% of overall GHG emissions; 2014 Scorecard: 0.0%)*

**Background**
In order to help ensure that new housing, commercial and other developments don’t contribute unnecessarily to Massachusetts’ GHG emissions, the Massachusetts Environmental Policy Act (MEPA) Greenhouse Gas Emissions policy and protocol requires the examination of the GHG emissions of certain proposed developments early in the planning process, including examination of lower emission alternatives and mitigation measures. By conducting this early-stage impacts and alternatives analysis, project proponents can integrate sustainable design considerations directly into project planning, which will allow the project to achieve GHG reductions in the most cost-effective manner.

**Progress**
In 2007, the MEPA unit established a Greenhouse Gas Emissions Policy and Protocol applicable to all projects requiring an Environmental Impact Report. Revised in 2013, new greenhouse gas emissions thresholds were incorporated into the MEPA regulations. It is not yet clear what impact these requirements are having. But they are probably yielding a modestly positive impact, by increasing transparency and in allowing energy use considerations to be reviewed by state agencies making decisions on permitting and financial assistance. The slow economic climate has meant that in recent years far fewer developments have come through the MEPA process, but that slowdown is now over and the office is receiving many new proposals. The 2020 Plan included MEPA in its policies but did not attribute any GHG savings to it, and we take the same position here.

One significant area for improvement is the need for MEPA review to take into account GHG emissions – and potential alternatives and/or mitigation measures that reduce GHG emissions
over the full anticipated lifespan of projects that are expected to endure for decades to come. The lifetime GHG emissions of such projects obviously have implications for the Commonwealth’s ability to meet its 2030, 2040 and 2050 reduction requirements, and MEPA review is one avenue for evaluating and beginning to reduce those longer-term GHG impacts.

**Policy: “Deep” energy efficiency improvements for buildings**  
**(2020 Plan: 0.2% of overall GHG emissions; 2014 Scorecard: 0.0%)**

**Background**

Despite the successes of the existing energy efficiency programs, to meet our long term goals Massachusetts will need to engage in “deep energy efficiency” -- retrofitting existing buildings with more insulation, better windows, and lower air leakage than is currently achieved in typical retrofits. The resulting savings in electricity and heating fuels will bring significant decreases in emissions in the long term.

**Progress**

According to the GWSA 5-Year Progress Report, “deep energy retrofit” efficiency improvements have been absorbed into the larger energy efficiency programs, and are no longer tracked as an independent policy. This complicates assessment of this effort. Massachusetts’ gas and electric utilities are sponsoring a limited Deep Energy Retrofit (DER) program to support customers as they are remodeling their homes and are seeking to reduce energy use. Benefits such as building durability, comfort, and good indoor air quality are part of the design, and the project may also increase the usable space of a building. For example, upgrading an attic or basement may create new usable living area while using less energy to heat or cool the space and reducing energy waste in the building overall. Originally a separate program, this work has been piloted by National Grid, but at present all the utilities in the state appear to be relegating it to the back burner, in part because of the high costs per building. As a result, we are not including any savings from this program for the year 2020. We do, however, see this as a significant problem – to reach the 2050 mandate of an 80% reduction, most existing buildings will need to undergo deep retrofits, and this program should receive a higher priority than the utilities are currently giving it.

**Policy: Expanding energy efficiency programs to commercial/industrial use of heating oil**  
**(2020 Plan: 0.1% of overall GHG emissions; 2014 Scorecard: 0.0%)**

**Background**

At present, commercial and industrial oil heat users are not eligible to take part in the utility-based energy efficiency programs. In the residential sector, oil-heat customers have been eligible for efficiency programs if they are also electricity customers. However, commercial and industrial oil customers have not been permitted to access the programs. These customers offer a real potential source of emissions reductions if regulatory changes are made to grant them the same access as residential customers.

**Progress**

At present the Patrick administration has not proposed either legislation or changes in
regulations that would lead the utilities to begin serving this market, nor is there any indication that this will change in the near future. We therefore estimate that this policy will not yield any GHG savings in 2020.

**Policy: Developing a mature market for solar thermal water/space heating (now expanded to all forms of renewable thermal)**

*(2020 Plan: 0.1% of overall GHG emissions; 2014 Scorecard: 0.7%)*

**Background**

Solar thermal energy technology harnesses the thermal energy of the sun for heating water or air. Heating water uses roughly 20% of all home energy consumption, and installing a solar water heater can save between 50% and 75% of those fuel costs, reducing the need for traditional fossil fuel sources of energy. The 2020 Plan projected minimal savings from such installations by 2020, of 0.1 million metric tons or 0.1% of statewide GHG emissions. However, the Plan also noted that a broader, more aggressive effort to promote all renewable thermal technologies, not only solar, and focusing on those homes with the highest-energy cost energy sources at present (fuel oil, propane, and electricity), had the potential to reduce emissions by 2 million tons, or about 2% of overall emissions, in 2020.\textsuperscript{11}

**Progress**

The Massachusetts Clean Energy Center (MassCEC) provides financial incentives to help with the installation costs of a solar hot water system at a home or business through its Commonwealth Solar Hot Water Pilot Program, launched in February 2011 with a budget of $10 million. This program offers rebates on a first-come, first-served basis to residential and commercial property-owners who install solar panels to supply water and space heating in their homes or businesses. In October 2013 the Patrick administration announced that $32 million in funding will be provided over the next few years for clean energy heating and cooling projects, including solar, low-emissions biomass, and high-efficiency heat pumps.\textsuperscript{12} Whether further funding will be available in the future is not known.

In January 2013 the state’s Department of Energy Resources issued a consultants’ study titled “Commonwealth Accelerated Renewable Thermal Strategy.”\textsuperscript{13} The study found that a “High State Support” scenario could achieve an annual reduction of 2% in statewide emissions by 2020.\textsuperscript{14} However, this would require state spending of $52 million in 2015, rising to $341 million in 2020, far above the levels now being provided.\textsuperscript{15} The consultants predicted that on top of existing state incentives, an additional rebate of 25% of the installed cost would be needed to achieve accelerated installation levels for solar thermal. This also assumes that existing federal tax incentives are extended beyond 2020. The consultants also presented a “business as usual” (BAU) scenario where the state continues to provide current incentives, and they forecast that this will yield GHG reductions of 0.65 million tons, or 0.7% of the statewide total, in 2020.\textsuperscript{16}

Efforts are underway to increase funding for renewable thermal, including through use of Alternative Compliance Payments (ACP), inclusion of renewable thermal in the MassSave energy efficiency programs, or legislation to make renewable thermal part of the Alternative Portfolio Standard.\textsuperscript{17} However, at present it does not appear that annual funding anywhere close to the $341 million cited above will be available in the next few years - the $32 million
recently announced being only one-tenth of that amount. Given these circumstances, we will increase the expectation of GHG savings due to solar thermal from 0.1% in the 2020 Plan to the 0.7% in the consultants’ “business as usual” case. But that is still only one-third of what the state and its consultants have estimated is possible with sufficient funding.

**Policy: Tree retention and planting to reduce heating and cooling loads**  
(2020 Plan: 0.1% of overall GHG emissions; 2014 Scorecard: 0.1%)

**Background**
Planting or retaining trees around buildings reduces the amount of energy required to heat and cool structures. An incentive program to plant new trees and retain existing trees would reduce the heating and cooling load, lowering emissions. Based on forecasts of number of trees that could be planted and time needed for them to grow from saplings, the 2020 Plan estimated savings of 0.1 million tons of GHG in 2020, with savings rising in later years as trees reach their full shade potential.

**Progress**
According to the Five Year Progress Report, a successful $5 million initial investment in this program will result in an expected 15,000 trees planted, and a reduction of 1.8 MMTCO$_{2e}$ over the life of the trees - which goes far beyond 2020. At present, we will retain the forecast of 0.1 million GHG tons saved in 2020.

**ELECTRICITY SUPPLY**

Power plants are responsible for about one quarter of GHG emissions in Massachusetts, and – due to a variety of factors both within and beyond the control of the Commonwealth – the state is making great strides in reducing emissions from this sector. Currently, the GHG emissions from the use of electricity in Massachusetts have decreased significantly since 1990. This decrease is largely attributable to the decline of coal-fired power plants in Massachusetts; two coal-fired plants have already shut down some or all of their generating capacity. Additional GHG reductions from the closure of the remaining coal-fired plants—Salem Harbor Station, Brayton Point and possibly Mount Tom —are likely in the next few years. This trend is the result of many things, including the price of natural gas as compared to coal, the recent slowdown in the economy, and regulations adopted in 2001 that began mandatory reductions of sulfur, nitrogen oxides and mercury from the state’s oldest and dirtiest power plants. Massachusetts also led the way in securing an historic commitment by the nine Regional Greenhouse Gas Initiative (RGGI) states to lower the regional cap on power plant emissions from 165 million short tons per year to 91 million short tons per year in 2014, with an annual regional reduction of 2.5 percent each year through 2020.
Policy: Expanded renewable portfolio standard
(2020 Plan: 1.2% of overall GHG emissions; 2014 Scorecard: 1.2%)

Background
The Renewable Portfolio Standard (RPS) requires Massachusetts electric suppliers to provide an annually increasing share of electricity to their customers from new clean, renewable sources. The RPS, in place since 1998, was strengthened by the Green Communities Act of 2008. Within the RPS, a solar carve-out was created in order to encourage the development of distributed solar photovoltaics (PV), with the original goal of reaching 400 MW of generation statewide. This program has been very successful as solar installation and generation has exceeded targets. The policy development for a “post-400 MW” solar carve-out is ongoing, and Governor Patrick has quadrupled the goal to 1,600 MW by 2020.

Progress
The RPS Class 1 (meaning “new” renewables, those built since 1997) rises one percent each year, reaching 15 percent of electricity sales by electric suppliers in 2020 (the state's municipally-owned electric utilities are exempt). At last report, the utilities were meeting 100 percent of their Class I requirements through actual purchase of Renewable Energy Certificates (RECs), without the need to make Alternative Compliance Payments (ACP) associated with shortfalls. For purposes of this scorecard, we have assumed that RPS Class 1 requirements will be fulfilled through purchases of RECs, without significant reliance on ACP payments, through 2020.

Policy: More stringent EPA power plant rules cause shutdown of inefficient coal-fired generating plants
(2020 Plan: 1.2% of overall GHG emissions; 2014 Scorecard: 1.2%)

Background
Prior to release of the 2020 Plan it was expected that new EPA regulations on air pollutants (ones affecting public health but not climate change) and on the amount of heat discharged to surface water would result in coal-fired power plants having to internalize significant costs that, until recently, have been borne by the public. As a result, those plants that were relatively inefficient, and so on the edge financially, would be more likely to shut down.

Progress
As expected, the Somerset plant has stopped operations, and the Salem plant is subject to a legally binding consent decree requiring that it be shut down by mid-2014. (See “Remaining coal plants shut down” below for discussion of the other two plants still operating in Massachusetts.) Changing market conditions also have played a significant role as the remaining coal plants have become uneconomic to operate throughout most of the year and, accordingly, have substantially curtailed their operations and associated GHG emissions.
**Policy: Clean energy imports**  
(2020 Plan: 5.4% of overall GHG emissions; 2014 Scorecard: 0.3%)

**Background**
The 2020 Plan anticipated that Massachusetts would increase its imports of electricity from Canada significantly, primarily from large-scale hydropower. This effort constitutes the single largest new policy in the 2020 Plan, accounting for 5.4 percentage points of the overall reductions in the 2020 Plan.\(^{20}\) The 2020 Plan assumed that Mass. would be able to reduce CO\(_2\) emissions by 5.1 million tons, or 5.4% of total 1990 emissions, due to either:

- Getting 100% of the power transmitted by a 1,500 MW Northern Pass line.
- Getting 50% of Northern Pass plus a second line being built

**Progress**
Because existing transmission lines from Canada are near capacity, new transmission lines would need to be built to make significantly greater imports possible. Several major transmission projects have been proposed to deliver power from Canada to various locations in New England. The Northern Pass Project, the option that was specifically identified in the 2020 Plan, continues to face significant challenges, and the Patrick Administration’s Five Year Review reflects an updated approach that is no longer tied to that specific project. At present, it is not clear which projects are most likely to go forward. Even if a new line is able to overcome all the necessary political, regulatory and financial hurdles within the next couple of years, at this point it appears unlikely that a line could be completed and in operation by 2020 along with zero carbon resources that would feed the line. It is possible that other sources of low- or zero-carbon power could become available in time, such as wind power from northern Maine or other hydropower from eastern Canada (Newfoundland and Labrador, for example), but the state’s Five Year Review does not present evidence of their likelihood.

The 5-Year Progress Report includes clean imports in the “highly likely” category.\(^{21}\) We think, however, that the probability of such imports by 2020 is small, and that if completed the amount of power obtained by Massachusetts is well less than that shown in the 2020 Plan, for the following reasons:

1) The Northern Pass project, if it is built, is rated to be a 1,200 MW rather than a 1,500 MW line.
2) While no hard data is available, it seems likely that the Commonwealth would get less than 100% of the transmitted power, with some percentage going to at least Northeast Utilities’ subsidiary in Connecticut. For purposes of this Scorecard, we assume that two-thirds of the power goes to Massachusetts.
3) NESCOE commissioned Black & Veatch to conduct an *Analysis of Hydroelectric Power Imports* to study various incremental levels of imports and provide an associated cost-benefit analysis. Materials related to this and two other related studies are available at [www.nescoe.com](http://www.nescoe.com). The White Paper\(^{22}\) re-analyzes many options at a fairly general level and offers a number of possibilities, but does not indicate that any option is likely to succeed in the next few years. The Request for Proposal for renewable power that the states have issued jointly is a potentially hopeful sign, but it remains unclear whether the generation and the transmission needed to get it to Massachusetts could be up and
running by 2020. It seems likely that one or more projects will happen – but far less likely that they can be completed by 2020, and we have assigned a 10% probability to a 1,200 MW line becoming operational in that year.

4) It seems unlikely that not only will one new transmission line be completed by 2020, but that a second line will be available in addition.

Were a 1,200 MW line to be completed and two-thirds of the power to come to Massachusetts (all of which was zero-carbon power), it would yield approximately a 3.0% cut in overall GHG emissions in 2020. However, given our estimated 10% probability, we have included only a 0.3% cut in the state’s emissions in 2020, rather than the 5.4% forecast in the 2020 Plan.

**Emissions from newly flooded hydropower reservoirs:** Even if one or more new transmission lines delivering imported power were to become operational, the assumption of the delivery of zero-carbon power needs reassessment. When a new hydroelectric dam is constructed, there is an initial “pulse” of GHG emissions from the organic matter that is submerged and then decomposes. Due to this, large dams probably do not yield net GHG reductions until some years after construction. Further, hydroelectric facilities that inundate new areas of vegetated landscapes (Canadian boreal forest, for example) result in permanently taking those forests out of commission as carbon “sinks”; in other words, the submerged forests no longer absorb GHG emissions from the atmosphere, and this lost GHG reduction capacity must be taken into account.

We have not been able to evaluate what fraction of Canadian imports is likely to come from already-existing hydroelectric facilities and what fraction would require new dams and flooding. To the extent that additional land is flooded in order to provide for Massachusetts’ power needs, the GHG increases from the flooding should be added to our state’s overall emissions (in other words, these emissions should be subtracted from the emissions savings due to power imports from Canada).

**Policy: Brayton Point Power Plant shuts down**  
(*2020 Plan: not included; 2014 Scorecard: 3.7% of overall GHG emissions*)

**Background**

When the 2020 Plan was released in December 2010, Massachusetts’ fleet of coal-fired power plants already was in decline. Since then natural gas prices dropped sharply and the EPA announced its intention to begin regulating GHG emissions from existing power plants. The availability of cheaper natural gas has played a substantial role in making aging coal plants increasingly uneconomic to run, which has recently caused the state’s coal plants to operate much less of the time. In addition, the likelihood of future EPA regulations further signals that the days are numbered for coal-fired power plants to continue passing off the costs of their impacts to the public.

**Progress**

The owners of Brayton Point, the state’s largest power plant and the largest source of GHG emissions in New England, have stated their intention to permanently close the plant by the end of 2017. The owners of the Mount Tom plant in Holyoke, Massachusetts have stated that the plant will be idled for all of 2016, and it is possible that this will lead to a permanent
shutdown. Assuming that Brayton Point’s coal-fired power is replaced with gas-fired generation or with renewable energy sources, this will cause a large drop in emissions from the electricity sector, which the state has estimated will yield a 3.7% drop in the state’s overall GHG emissions in 2020 – a large improvement that was not anticipated when the 2020 Plan was published.

TRANSPORTATION

Policy: Federal and California vehicle efficiency and GHG standards
(2020 Plan: 2.6% of overall GHG emissions; 2014 Scorecard: 2.6%)

Background
The fuel efficiency standards for light-, medium-, and heavy-duty vehicles are the measures with the greatest near-term emissions reductions potential in the transportation sector. These regulations begin in Model Year 2012 and run through 2016. In addition, as it has in earlier years, Massachusetts adopted California’s “Advanced Clean Cars Program” and its deeper vehicle efficiency standards from 2017 through 2025. The 2020 Plan assumed that these strategies will deliver sizeable GHG reductions of 2.4 MMTCO$_2$e by 2020 (or 2.6 percent below 1990 levels).

Progress
We fully expect that these regulations are working well and will account for 2.6% of the economy-wide GHG cuts in Massachusetts in 2020.

Policy: Federal emissions and fuel efficiency standards for medium and heavy duty vehicles
(2020 Plan: 0.3% of overall GHG emissions; 2014 Scorecard: 0.3%)

Background
The EPA and US DOT’s National Highway Traffic Safety Administration have jointly established new national GHG emissions standards and fuel consumption requirements for trucks from semis to the largest pickup trucks and vans, as well as all types and sizes of work trucks and buses. Known as the Heavy Duty National Program, this rule covers the vehicles that produce nearly 6% of all U.S. GHG emissions and 20% of transportation GHG emissions. The program sets standards for:

- Combination tractors – commonly known as big rigs or semi trucks – to achieve an approximate 20% reduction in fuel consumption and greenhouse gas emissions by model year 2018.
- For heavy-duty pickup trucks and vans, separate standards are required for gasoline-powered and diesel trucks that will use about 15% less fuel and emit about 15% less greenhouse gas by Model Year 2018.
- Special use vehicles – including delivery trucks, buses, and garbage trucks – will be required to reduce fuel consumption and greenhouse gas emissions by approximately 10% by Model Year 2018.
Progress
The new standards for trucks are in place for vehicles sold in Model Years 2014-2018 and are starting to produce significant savings and benefits over the lifetime of vehicles. Serious and achievable fuel efficiency improvement goals are charted for each year and for each vehicle category and type. Although fleet turnover in these large vehicles is slow, we expect to begin seeing reductions by 2020 that are consistent with the state’s original forecasts. Since heavy-duty trucks are among the fastest-growing contributors to greenhouse gas emissions within the transportation sector, this is important.

Policy: Federal Renewable Fuel Standard and Regional Clean Fuel Standard
(2020 Plan: 1.6% of overall GHG emissions; 2014 Scorecard: 0.5%)

Background
The national Renewable Fuel Standard (RFS) was developed to increase the volume of renewable fuel blended into transportation fuels and requires increasing amounts of such fuel to be used each year. Each renewable fuel category in the RFS program must emit lower levels of greenhouse gas emissions on a lifecycle basis relative to the petroleum fuel it replaces. The program requires that some of the transportation fuel must contain cellulosic biofuel, biomass-based diesel, and advanced biofuel. The cellulosic biofuel must achieve a 60% reduction in GHG emissions and the biomass-based diesel a 50% GHG emissions reduction. Although this is a long term program, the U.S. EPA has just relaxed its mandated targets for U.S. biofuel production by lowering the proposed levels of ethanol use outlined in its RFS, now requiring just under 10 percent of motor-fuel consumption (16 percent less than targets established by Congress in 2007). This change was due to: 1) advances in vehicle fuel economy and the slower economy reduced need for fuel overall and 2) the price of corn ethanol has risen and the promise of cellulosic ethanol and biodiesel has not yet materialized in the marketplace. Nearly all gasoline sold in the U.S. now includes up to 10 percent ethanol, which is the maximum percentage that auto manufacturers recommend.

The proposed Clean Fuel Standard (CFS) is an effort to reduce the lifecycle carbon intensity of transportation fuels by reducing the fuel’s GHG emissions per unit of energy delivered. The implementation mechanism would come in a credit trading approach where fuel blenders and refiners would earn credits in providing fuels that lower average carbon intensity as compared to the carbon intensity of the baseline fuel supply.

Progress
Although Massachusetts played a strong leadership role in the launch of a Northeast/Mid-Atlantic regional LCFS program and the subsequent development of a similar program known as a regional Clean Fuel Standard (CFS), the regional program is not currently ready to launch. The states region-wide have not yet agreed to a regulatory framework. The Patrick Administration’s 5-Year GWSA Progress Report gives a “low” probability that the RFS and CFS will attain their goals in 2020. As a result, we project the combined impact of the RFS and CFS in 2020 to be only one-third of the 1.6% of economy-wide emissions that was included in the 2020 Plan. This assessment notably does not take into account recent analysis indicating an imminent risk of substantial market penetration by very high carbon fuels derived from tar
sands. Absent action to adopt policies that prevent backsliding and/or advance a CFS program to reduce the carbon-intensity of transportation fuels, the state will be at serious risk of seeing significant increases, rather than decreases, in GHG emissions from the transportation sector.

**Policy: Mileage Reduction Pilot Program (replacing Pay-As-You-Drive auto insurance program that was part of the 2020 Plan)**

*(2020 Plan: 1.1% of overall GHG emissions; 2014 Scorecard: 0.3%)*

**Background**
Several studies and analysis conducted in the United States and Europe have forecast that charging for auto insurance on a per-mile basis, or providing incentives to drive less, would cause significant drops in miles driven and accident damages.

**Progress**
The 2020 Plan includes PAYD as a pilot program, to be expanded if the pilot shows promising results. MassDOT designed a pilot, applied to the Federal Highway Administration for funding, was awarded funding, and then signed a contract with a private bidder to conduct the pilot program. Unfortunately, administrative difficulties appear to have caused long delays in implementing the pilot, and a modified “mileage reduction” pilot program has not yet been launched, although MassDOT indicates that it may begin soon. The 1.1% of economy-wide savings from this policy included in the 2020 Plan was based on the program expanding from a pilot to a widely-available insurance option by 2020.

The 5-Year Progress Report acknowledges that the probability of achieving the formerly expected goal by 2020 is low.\[^{[1]}\] As a result, we have cut by 75% the estimated 1.1% of economy-wide GHG emissions that the 2020 Plan forecasted to be obtained from this policy in 2020. Even to achieve this revised and much more modest target, the value pricing pilot program must be unleashed without further delay.

**Policy: Clean Car Consumer Incentives**

*(2020 Plan: 0.5% of overall GHG emissions; 2014 Scorecard: 0.0%)*

**Background**
A new policy included in the 2020 Plan is to vary taxes on motor vehicles based on their fuel efficiency. Most effective would be varying sales taxes on new cars, but other possibilities include annual auto excise (property) taxes and registration fees. All changes in tax rates require legislative approval.

**Progress**
The Patrick administration has chosen not to propose such legislation, and therefore we have removed the savings that were projected in the 2020 Plan. The 5-Year Progress Report indicates that while these incentives will not occur, the administration is making efforts to promote the use of electric vehicles in the state, but has not provided an estimate of what GHG savings such vehicles might provide by 2020, nor evidence that they will achieve a significant market share.\[^{[26]}\] As a result, we include no savings from electric vehicles in this Scorecard.
Policy: Electric Vehicles
(2020 Plan: not included; 2014 Scorecard: 0.1%)

Background
This measure increases the use of electric vehicles (EVs) in the Commonwealth through actions including financial incentives, convenience incentives, education and outreach, creating public infrastructure for recharging and changes to the pricing of electricity to recharge cars, including using the state’s regulatory oversight in ratemaking cases. The state has set a goal of there being 300,000 electric vehicles in Massachusetts by 2025.27

Progress
Many of the programs that were originally proposed, especially EV rebates, have not been implemented. Progress has been very modest as a result and needs to be strengthened.

There have been a few efforts that are bearing fruit, including:

The Massachusetts Electric Vehicle Task Force has met with Green Communities representatives, state agencies, auto and charging station manufacturers and non-profit groups to assist the Commonwealth in its goal to increase electric vehicle sales. The only program launched to date is the Massachusetts Electric Vehicle Incentive Program (MassEVIP) to help Massachusetts cities and towns, public universities & colleges, car share companies, and the state government’s fleet of vehicles to acquire Plug-In Hybrid Vehicles and Battery Electric Vehicles as well as Level 2 charging stations. This program is in the second round and has been well received. However, it only amounts to a fairly small number of vehicles in total.

In addition, a Massachusetts staffer co-leads the Clean Vehicle and Fuel Workgroup of the Transportation and Climate Initiative (TCI), leading states from Maine to Maryland to launch a Northeast Electric Vehicle Network. With a grant from the U.S. Department of Energy, useful materials were developed including: An EV Information Guide for Employers, one for local governments, EV handbooks for Multi-Unit Housing Owners and one for Utilities, an assessment of Current EV Supply Equipment, a menu of plug-in EV incentives, EV Siting and Design Guidelines, EV-Ready Codes for the Built Environment, and a Guide to Planning and Policy Tools for EV Deployment. This work is available to all Massachusetts communities.

Based on the state’s goal of 300,000 EV’s by 2025 and the limited progress to date, we will estimate that 50,000 EV’s are on the state’s roads by 2020, which results in approximately a 0.1% reduction in the state’s overall GHG emissions.

Policy: GreenDOT (includes the next four items)
(2020 Plan: 1.2% of overall GHG emissions; 2014 Scorecard: 0.5%)

Background
In June 2010, MassDOT launched GreenDOT, a comprehensive environmental responsibility and sustainability initiative with an intention of making MassDOT a national leader in "greening" the state transportation system. GreenDOT’s three primary goals are: (1) reduce greenhouse gas emissions; (2) promote the healthy transportation options of walking, biking and public transit; and (3) support smart growth development. GreenDOT calls for MassDOT to
incorporate sustainability into all of its activities, from strategic planning to project design and construction to system operation.

MassDOT published a GreenDOT plan in December 2012 that details actions to meet 16 sustainability goals related to air, energy, land, materials, waste, water and design. A strong effort, the Plan is primarily internally focused on MassDOT operations and planning and details the action needed to meet GreenDOT goals. Additional work across the MassDOT agencies offers more sustainable practices that are feasible, including using low emission transit vehicles and hybrid cars, retrofitting tunnel and traffic signal lights with energy efficient LED bulbs, use of native plants in station plantings, use of recycled materials, retrofitting plumbing systems to reduce water use, and single stream recycling at all facilities. While a good start, GreenDOT’s real potential for significant reductions over the long term lies with setting goals for the transportation system at large, including the degree to which transportation funding is allocated on the basis of how the resulting projects will impact GHG emissions.

The state is participating in the Transportation and Climate Initiative, a regional effort to improve the energy efficiency and operations of the transportation sector, which is a useful place to work on the issues of increasing funding for a transition to lower carbon transportation alternatives and setting new metrics for measuring the energy use of proposed projects.

**Progress**

The 5-Year Progress Report gives a “medium” probability that GreenDOT will achieve the 1.2% reduction in economy-wide GHG savings forecast in the 2020 Plan. In our estimation, the aspects of GreenDOT that appear to be receiving priority treatment within MassDOT are mainly those which fall along the lines of MassDOT’s traditional responsibilities and are mainly about internal operations. The single largest new effort, providing renewed support for bicycling, pedestrians, and mass transit, is designed to encourage “mode shift” from auto travel and is the main way of getting significant reductions over time. To support that work, MassDOT made efforts along with the Governor to improve the funding conditions for our transit system to allow for modernization of our aging infrastructure, new and enhanced transit services and lower fare hikes. They have partially succeeded and this will help in reducing backsliding in the overall emissions benefits of the transportation system, but it will not be sufficient to make the deep cuts that we need across the transportation sector.

Some of the measures that could have the most impact on reducing GHG emissions do not appear to be on the agenda, including promoting “smart driving” for the general public, in order to improve the fuel efficiency of existing vehicles on Massachusetts’ roadways; more of an emphasis on land use and community planning including incentives programs; and assessing energy use in the transportation system.

Overall, we estimate that GreenDOT will achieve half of the 1.2% of economy-wide emissions that was forecasted in the 2020 Plan. It holds great promise but more needs to be done to make it achieve its full potential.
**GreenDOT Policy Set: bike, pedestrian, transit investments**

**Background**
In October 2012, MassDOT announced a commendable “mode shift” goal to triple the share of travel in Massachusetts being done by bicycling, transit and walking by 2030. By having more trips made by these modes, MassDOT hopes to alleviate congestion on our roads and provide healthier transportation options at a time when we are seeing record rates of obesity. Promoting intermodal access to the maximum extent feasible will help the agency meet this goal.

In addition, the establishment of a Healthy Transportation Policy and the Directive for its implementation are very positive steps in establishing a leadership position for changing how transportation projects are reviewed and selected with the limited funds available. In general, this policy will encourage climate-friendly projects because it states that all MassDOT funded and/or designed projects shall seek to increase and encourage more pedestrian, bicycle and transit trips. In other words, the Policy and Directive explicitly seek to encourage lower carbon modes of transportation.

**Progress**
The project reviews were scheduled to be completed by January 1, 2014 and submitted to the Secretary and CEO. The policy is that projects should not advance in the design process until they have undertaken this review. Importantly, any proposal for a MassDOT-funded and/or designed project that fails to provide facilities for healthy transportation modes, as identified by the reviews, now requires signoff by the Secretary and CEO of Transportation prior to advancing additional design work. This effort will be watched closely as to its implementation.

**GreenDOT Policy Set: operations efficiency, development project mitigation, commuter choice**

**Background**
The goal of this set of activities is to have the state provide the leadership and resources necessary to help create a transportation system that connects activity centers and attempts to reflect the diversity of transportation needs across the state: what works in dense urban areas will be different than what is effective in low-density suburban or rural areas.

In addition, in this cluster of activities, working with developers to ensure that they have considered the full suite of ridesharing and trip reduction strategies allows them to reduce future vehicle trips to their sites and to build in measures that promote access by transportation modes that entail fewer GHG emissions.

The term Commuter Choice refers to a broad spectrum of travel choices, supporting programs and organizational resources including tax incentives available to employers and commuters as well as the public at large. Communities can turn their travel challenges into significant opportunities where employers can attract and retain employees and reduce employees’ commuting stress, and communities can see less congestion, more community cohesion and environment benefits as well.
Progress
As noted above, MassDOT has been putting significant effort into the energy efficiency of its own operations including agency-by-agency reviews. Some of the agencies, such as the MBTA, have taken on ambitious energy efficiency investment targets and are doing a commendable job in implementing their energy reduction goals. However, compared to the emissions from the transportation sector overall and the reductions needed, the potential gains from energy efficiency at the agencies are still small. This internal energy efficiency work is worthy and should continue, but much larger gains are possible from mitigating greater vehicle travel from new development projects and, most importantly, from providing commuters more convenient transportation choices apart from single-occupancy car travel. While Massachusetts used to be a leader in this type of creative programmatic thinking, we are concerned that this set of measures isn’t being fully mined for emission reductions nor for community benefits, and believe that it is unlikely to reach its potential as a reduction strategy for 2020. We are therefore reducing its expected impacts to 60% of those projected by MassDOT, which yields a 0.3% GHG reduction in relation to the state’s total emissions in 2020, rather than 0.5%.

GreenDOT Policy Set: smart-driving education for light-duty vehicle drivers

Background
“Smart Driving” means employing a set of strategies and techniques that maximize fuel efficiency by improving driving habits and vehicle maintenance. These actions are some of the most rapid things we can do reduce GHG emissions from our cars, improve gas mileage, reduce fuel costs, increase safety and lessen stress. Most smart driving programs generally raise the awareness of drivers on issues such as how to drive as smoothly as possible and avoid accelerating harder than required, trying to maintain a fairly steady safe speed, staying at the speed limit or below, using cruise control whenever possible, avoiding prolonged engine idling, avoiding peak driving times when possible, scheduling travel times and routes to avoid congestion when possible, using car air conditioners sparingly, etc. The experience of places that have encouraged these driving techniques is that they do help reduce fuel use, wear and tear on car brakes, tires and the other mechanical parts, and air emissions over time as well.

Progress
The potential gains in fuel efficiency are large here. But, three years after release of the 2020 Plan, MassDOT is only now expecting to begin a pilot training program for some of its own employees, with the possibility of expanding later to other state fleets. Any educational efforts directed toward the general public, which owns the vast majority of motor vehicles in the state, do not appear to be on the drawing board. As a result, we include no GHG savings from Smart Driving in 2020.

GreenDOT Policy Set: smart-driving education for heavy-duty vehicle drivers

Background
Smart Driving or Eco-Driving is of even more interest for heavy-duty vehicles because of their greater fuel use per mile driven. Some of the use of Eco-Driving systems may be generated by the market, as trucking companies look to reduce their costs and boost profits. But the state
can offer incentives and institute requirements as well.

Several pilots have been implemented by large trucking companies and the results are promising. For example, in one pilot done by Volvo, a dashboard screen is being used to educate truck drivers about the consequences of their driving style, giving feedback if the driver was accelerating too hard or if the vehicle was in the wrong gear. Incorporating both Google maps and GPS data, drivers are also given advance information about what's coming up, including things like hills, rotaries and speed limits. The dashboard screen informs drivers when it's time to ease off the accelerator or apply brakes. All this is especially important when driving a heavy-duty truck, which needs a lot more distance than a car to slow down or stop. Testing has been performed by professional drivers on the road and through a simulator, and the findings are that fuel consumption can be lowered 10 to 15 percent. Similarly, the European Eco-move\(^2\) program has reduced emissions and fuel use by up to 20% with their coaching and follow up approach. Smart-driving in general may take some novel partnerships to employ and some new incentives and requirements to engage. For example, requiring that all state procurements give preferences to delivery trucks using eco-driving screens would be a start. Also, introducing an eco-driving knowledge section in the Massachusetts drivers test for truckers would be a good start, and is well within the ability of the Registry to implement.

**Progress**

As with light-duty vehicles, no significant educational efforts are being made for the owners and operators of heavy-duty vehicles, so we attribute no GHG savings in 2020 to this policy.

**Policy: Smart Growth Policy Package**

*(2020 Plan: 0.5% of overall GHG emissions; 2014 Scorecard: 0.3%)*

**Background**

Encouraging compact, mixed-use development leads to significant decreases in Vehicle Miles Traveled (VMT) - fewer, shorter trips and the resultant decreases in emissions. Policy initiatives aimed at infrastructure investment and influencing local planning processes can encourage this desirable type of development.

**Progress**

The 5-Year Progress Report rates as “low/medium” the probability that the Smart Growth Policy Package (including the Sustainable Development Principles) will achieve the 0.5% of economy-wide savings forecast in the 2020 Plan. However, some excellent progress in this area has been made through MassWorks, regional planning with identification of priority development and priority preservation areas, and the Executive Order that the Governor put in place on the South Coast Rail to align state investments with the corridor plan. These are programs that are creating positive change and could be expanded and continued.

Although one vital effort, the local zoning reform legislation, has not yet passed, we adopt the same expectation as the Progress Report, reducing the expected savings to 0.3%. \(^3\)

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\(^2\) [http://www.ecomove-project.eu/about-ecomove/subprojects/sp3/](http://www.ecomove-project.eu/about-ecomove/subprojects/sp3/)

\(^3\) The 0.5% includes both the Smart Growth Policy Package and Sustainable Development Principles, on pages 64 and 67 of the 2020 Plan.
NON-ENERGY EMISSIONS

The emissions options in this sector consist of sources that emit GHGs that have hundreds to thousands of times the climate impact per pound as does CO$_2$. High global warming potential substances are largely used as refrigerants in stationary and mobile source air conditioning and refrigeration, as coolants in utility transmission systems, as fire suppressants, and in various consumer products.

Policy: Reducing GHG emissions from motor vehicle air conditioning
(2020 Plan: 0.3% of overall GHG emissions; 2014 Scorecard: 0.3%)

Background
Massachusetts state law mandates the adoption of new vehicle emissions standards issued by the California Air Resources Board (CARB) if they are more stringent than federal standards. CARB developed regulations aimed at reducing emissions from motor vehicle air conditioning fluids for new light duty vehicles.

Progress
Based on the State’s adoption of the stricter CARB standards, we anticipate these emission reductions will be achieved as expected by 2020.

Policy: Stationary equipment refrigeration management
(2020 Plan: 1.2% of overall GHG emissions; 2014 Scorecard: 0.6%)

Background
By far the largest component of non-energy GHG emissions that the state has analyzed comes from the leakage of high-GHG impact chemicals from refrigeration equipment, mainly hydrofluorocarbons (HFCs). In December 2013, a group of Congressmen and Senators led by Massachusetts Senator Ed Markey urged EPA Administrator, Gina McCarthy, to enact policies that accelerate the phase-out of hydrofluorocarbons (HFCs) when refrigeration systems are replaced. Until and before that is done, Massachusetts could act to lead the way.

Progress
MassDEP is working on legislation and regulations regarding leak detection and repair. However, the 5-Year Progress Report does not indicate that the Patrick administration intends to push for legislation or implement regulations before leaving office. We therefore do not yet have confidence that HFC controls will come into place within the next couple of years. As a result, we have reduced the forecasted emissions reductions from HFCs from the 1.2% in the 2020 Plan to half that amount.

Policy: Reducing SF$_6$ Emissions from Gas-Insulated Switchgear
(2020 Plan: 0.2% of overall GHG emissions; 2014 Scorecard: 0.2%)

Background
Sulfur hexafluoride (SF$_6$) is a potent greenhouse gas, with a global warming potential (GWP) of 23,900 (compared to 1 for CO$_2$), the highest GWP identified by the Intergovernmental Panel on

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Climate Change. It has historically been widely used in high-voltage electrical transmission, especially inside circuit breakers to extinguish the electrical arc when the contacts inside the circuit breaker are pulled apart, thus enabling the electrical circuit to be broken. The gas is also a very good insulator and can withstand dielectric stress. It has become the industry’s standard over the past 30 years as it allows equipment to be much smaller and more efficient.

It is also chemically inert, non-toxic and non-flammable, making it the most suitable gas for circuit-breaker applications. However, there is just one problem -- it is a highly potent greenhouse gas.

**Progress**

Today the main method of reducing SF₆’s impacts is to require zero leakage when commissioning or performing maintenance on transmission equipment. At the end of life, the used SF₆ gas is either recycled, if still usable, or it is disposed of by burning, which prevents the used gas from being released to the atmosphere.

That said, in 2007, California imposed sulfur hexafluoride regulations for utility applications and Massachusetts has the ability to adopt regulations requiring these same changes in order to gain additional reductions. MassDEP is finalizing a regulation to require large electric utilities to reduce leakage of SF₆ from their equipment, both new and existing. Existing facilities would be subject to a declining emissions standard. DEP has not provided an estimate of how large a reduction this measure will achieve. The original estimate for the regulation is that it would reduce emissions by 0.2% of economy-wide emissions in the 2020 Plan. In the absence of further information, we have not changed this forecast.

**Policy: Reduce GHG emissions from plastics (through greater recycling)**

(*2020 Plan: 0.3% of overall GHG emissions; 2014 Scorecard: 0.3%*)

**Background**

This policy aims to increase recycling of plastics, leading to less plastic in the waste stream and lower carbon emissions from combustion at municipal waste to energy facilities. While plastics recycling has long been a priority in the state, further measures to divert additional plastics could include increasing assistance to cities and towns, increasing producer responsibility, and building markets for recycled materials.³⁰

**Progress**

The 2013 Solid Waste Master Plan³¹ (SWMP) describes the benefit of waste reduction as having significant greenhouse gas reduction benefits. It acknowledges that a policy to reduce greenhouse gas emissions from municipal waste combustors by reducing the disposal of plastic is part of the Clean Energy and Climate Plan and says that based on waste characterization studies conducted in Massachusetts in 2010, typical composition of municipal solid waste includes 14% plastics.

The Plan sets a 33% reduction goal in the distribution of paper and plastic disposable grocery bags, proposes to boost plastic packaging recycling programs at participating supermarkets and grocery stores and talks about other methods of reducing plastic bag use.
Much more importantly, the plan discusses a 2050 waste reduction goal that it says aligns with the GWSA by seeking an 80% reduction in waste by that year. The SWMP states that while these waste reduction strategies are relatively small contributors to reducing greenhouse gas emissions from Massachusetts’ sources covered by the GWSA, the broader lifecycle GHG reductions of achieving the SWMP goals for 2020 could exceed 4 million tons of carbon dioxide annually, which is very significant. Boosting the recycling rate and managing organics as proposed in the plan could augment the emission reductions from plastics recycling, but clearly this policy is not yet being implemented at the scale needed to make a major difference. Revising the previous moratorium on waste incineration also opens the door to new disincentives to recycling, risking diversion of recyclable plastics to expanded incineration capacity. Further information on the administration’s plans for plastics recycling is needed, but for the present Scorecard we have not changed the expectation of a 0.3% emissions reduction due to this policy.
GWSA Background and the GWSP Scorecard

In 2008, the Massachusetts legislature passed (and Governor Deval Patrick signed) the MA Global Warming Solutions Act (GWSA, or the Act), and in doing so, declared its intent and commitment to take on the issue of climate change in a meaningful way. The Act’s requirements established a pathway to setting the most aggressive greenhouse gas (GHG) emissions reduction targets in the nation, declaring a binding target of reducing GHG emissions at least 80% by 2050 and requiring the administration to set an interim 2020 emissions limit between 10% and 25% below the 1990 level. As required by the Act, the Secretary of Energy and Environmental Affairs issued a determination in December 2010 that took a leadership stance in setting the 2020 emissions limit at 25% below the 1990 level. At the same time, and also as required by the Act, the state released a Clean Energy and Climate Plan for 2020 (the 2020 Plan). The 2020 Plan identified existing and new policies and programs to meet the requirements. Since then, the Patrick Administration has been working hard to meet the 25% binding emissions reduction requirement by 2020. Along with other actions by the Administration and the Legislature, the Act and the 2020 Plan in many respects form the basis of a national model of state-based climate protection.

The 2020 Plan identifies policies and programs that are intended to reduce heat-trapping emissions to levels that scientists believe give us a reasonable chance of avoiding the worst effects of climate change – effects that Massachusetts already is experiencing but that are expected to become much worse in the absence of sufficient action to confront the causes. The Plan contemplates reductions from all sectors of the economy to reach the 25% mandate. Through the implementation of measures identified in the Plan and other factors (such as changing economics of carbon-intensive fuels such as coal and oil), Massachusetts is moving toward a clean energy economy using policies that reduce emissions and greenhouse gases. It is gaining greater energy efficiency, more clean renewable energy, and a more energy efficient transportation sector.

In this first edition of the Scorecard, we assessed the state’s efforts at designing, planning and implementing policies and programs. We used three screens for assessing each of the 28 areas of action that make up the 2020 Plan: 1) is the state working on the policy at all, even if the work is just in the planning stages? 2) Is the program or policy being implemented well, with sufficient staff attention, funds and leadership, and with regulations or legislation proposed where necessary? And, most importantly, 3) is the policy or program making the reductions in energy use and emissions expected in the 2020 Plan?

While the day-to-day work of the Clean Energy and Climate Plan involves the management of many programs and policies, the Scorecard is intended above all to focus on the results, scoring the state’s likelihood of meeting the legal requirement it has set and making the reductions that the people of Massachusetts need.

This Scorecard is an independent assessment of progress toward meeting clean energy and climate change objectives since the enactment of the precedent-setting Massachusetts Global Warming Solutions Act of 2008 (GWSA). Developed by members of the Global Warming Solutions Project (GWSP), the scorecard evaluates the state’s progress in meeting its own
targets for reducing the pollution that is warming the climate, and suggests additional steps to improve this urgent work. It is important to note that the degree of progress results not only from the state government’s own actions, but also from actions by the federal government, other state governments in the region, and from independent factors such as changes in fossil fuel prices.

The Scorecard provides a broad assessment of policies and programs identified in the 2020 Plan that are intended to improve energy efficiency in our homes, businesses, and transportation systems, increase the use of renewable energy, and reduce the non-carbon chemicals that cause climate change. In particular, the Scorecard examines the policy areas that the state has committed to improving: Buildings and Energy Efficiency, Electricity Generation and Distribution, Transportation and Land Use, and Non-Energy Emissions.

We contacted state officials and interviewed the state’s team leaders to get their views on the current status of each policy in the 2020 Plan, and additional GHG-reduction measures that the state has decided to pursue. Further, we have given the state the opportunity to present their performance management system to the GWSP members and to review and provide updates on the information scored.

The active members of the Global Warming Solutions Project have been invaluable in evaluating progress and considering the issues of highest importance to them and to the successful accomplishment of the GWSA’s goals. Many of the GWSP members are also on the State’s Implementation Advisory Committee (IAC) for the GWSA, and ideas that they have presented to the IAC are incorporated here as well.

This Scorecard is not intended to criticize the Commonwealth or the Governor. Massachusetts been bold and focused in seeking to transform the energy system to provide clean energy and to tackle climate change. Through this Scorecard, we seek to encourage continued strengthening of the state’s commitment to climate protection and the Governor’s vision of this work as an effective strategy for promoting economic growth, securing important environmental benefits, and increasing our local resilience in the face of the uncertain costs and supplies of the energy resources on which we all depend.

About the GWSP
The Global Warming Solutions Project (GWSP) is a multi-year initiative supporting a network of diverse stakeholders, each of whom wants to help the Commonwealth honor its climate commitments by meeting the GHG reductions mandated by the GWSA. The network is coordinated by ELM and comprised of stakeholders from business, labor, academia, and environmental, public health, planning, and environmental justice organizations. The network members engage in joint action and advocacy on shared priorities. The members strengthen connections between each other and their constituencies, as well as across coalitions and networks. The network independently assesses the state’s progress on achieving its GHG emissions reductions targets: 20% below 1990 levels by 2020, at least 80% below 1990 levels by 2050.

The network worked cooperatively with the state to produce the preliminary GWSDA Dashboard, released on Earth Day 2013. The Dashboard provides a visual snapshot of data
concerning the state’s energy, transportation, and economic systems. It highlights that Massachusetts’ emissions fell 11% between 1990 and 2010. This 11% reduction is a major accomplishment. It is the result of the Commonwealth’s national leadership in energy efficiency and power plant regulations along with exogenous factors such as the low price of natural gas and the international economic slowdown.

Uniting to work on big-picture objectives, the GWSP has supported and evaluated Massachusetts’ leadership on clean energy and climate change solutions. We hope to see the important objectives of the Act achieved and to see Massachusetts benefit. By doing this, the network intends to help Massachusetts continue as a national leader on climate protection and innovation.

The members of the Global Warming Solutions Project’s network include Clean Water Action, Conservation Law Foundation, Environment Northeast, Health Care Without Harm, Massachusetts Climate Action Network, Metropolitan Area Planning Council, National Consumer Law Center, Northeast Energy Efficiency Partnerships, representatives from the state legislature and municipal government, labor, business and more.

**Scorecard Methodology**

For each policy in the 2020 Plan, we provide:

1. The percentage reduction in 1990 emissions that the 2020 Plan forecasted this policy would achieve in 2020.
2. The percentage reduction in emissions that we now estimate this policy will achieve in 2020. Where our current estimate is lower than that in the 2020 Plan, concerted action by the state government could raise the 2020 impacts.
3. Item (2) minus Item (1) – which shows the degree to which our current forecast of GHG reductions is higher (positive number) or lower (negative number) than was included in the 2020 Plan.
4. For each sector of the economy, the percentage of the GHG reductions in the 2020 Plan that we now expect the combination of all policies in this sector to achieve by 2020.

Where our current impact estimate is lower than that in the 2020 Plan, we have reduced the estimate for one or more reasons:

- First, the particular policy may not have been implemented yet, and it is unclear whether it will be implemented by some year before 2020 or in 2020. In such cases we have assigned a probability to whether the policy will be in effect in 2020, and the impacts shown reflect that probability.
- Second, some policies are delayed. Depending on the policy, the number of years prior to 2020 that it is in effect may change its actual impact in 2020.
- Third, for policies that are in operation today, they may not be achieving as much GHG reduction as was expected.

Where we have reduced the expected emissions reductions in 2020, it is based on the evidence currently available to us. Since no definitive data exists concerning how effective the State’s policies will turn out to be in the next six years, our judgments necessarily have some degree of subjectivity. Documentation for our estimates is provided in the description of each policy.
Acknowledgments

First, we would like to thank our many contacts at state environment, energy and transportation agencies that have provided valuable data and information on policies and programs being considered and being implemented by the state. Of great importance, we extend further thanks to the Barr Foundation for supporting this project and the GWSP, and also for assisting the state in enhancing its own capacity to collect and track data and performance, all of which made this project possible. *The Massachusetts Clean Energy and Climate Scorecard* would not have been possible without a significant commitment of time and expertise from many people, including peer reviewers and several network members, including Clean Water Action, Conservation Law Foundation, Environment Northeast, Environmental Entrepreneurs, Health Care Without Harm, Mass Climate Action Network, Mass Energy Consumers Alliance, Metropolitan Area Planning Council, Northeast Energy Efficiency Partnerships, and the New Directions Collaborative. Finally, we wish to thank our consultants, Sonia Hamel and Marc Breslow, for leading the analysis of the state’s policy implementation and the drafting of this report.
Notes

4 GWSA 5-Year Progress Report, Commonwealth of Massachusetts, page 34. Also see Footnote 7 on that page, which explains the discrepancy between the attainment percentages given in the 2012 Annual Report of the Energy Efficiency Advisory Council (page 3) and those in the 5-Year Progress Report, for both electricity and natural gas. The EEAC reports include all efficiency savings, while the Clean Energy and Climate Plan for 2020 only includes efficiency savings above the levels that existed in 2008 before passage of the Green Communities Act. This difference exists because the “business as usual” electricity sales projections used for the 2020 Plan already assumed the levels of spending on efficiency programs, and consequent energy savings, that existed in 2008 and earlier years. If we include the pre-2008 savings in the calculation, the electric and gas programs combined reached 87% of their GHG reduction goals for the 2010-2012 Three-Year Plan.
5 GWSA 5-Year Progress Report, page 34. Savings for oil-heated homes were closer to target than those for gas-heated homes, but the oil savings were only a small fraction of the overall total.
8 GWSA 5-Year Progress Report, page 32.
9 GWSA 5-Year Progress Report, page 33.
14 Navigant and Meister, page 31.
16 Navigant and Meister, page 70.
Somerset Station shut down completely in 2010. Salem Harbor shut down two units in 2011; two remaining units are scheduled to shut down by June 2014. Owners of the Brayton Point coal-fired power plant recently announced the closure of that plant, expected in 2017.

2020 Plan page ES-6. The 2020 Plan includes middle, lower, and upper projections, with 27% as the middle, and the lower to upper bounds going from 18% to 33%.


GWSA 5-Year Progress Report, page 12.


Somerset Station shut down completely in 2010. Salem Harbor shut down two units in 2011; two remaining units are scheduled to shut down by June 2014. Owners of the Brayton Point coal-fired power plant recently announced the closure of that plant, expected in 2017.

“Mount Tom power plant to leave regional electrical grid for one year, but critics of coal-burning plant hope to make shut down permanent,” MassLive (Springfield Republican), March 6, 2013.


GWSA 5-Year Progress Report, pages 15, 49.


GWSA 5-Year Progress Report, page 59.

Massachusetts Clean Energy and Climate Plan for 2020, Page 72.

http://www.mass.gov/eea/docs/dep/recycle/priorities/swmp13f.pdf

http://www.mass.gov/eea/docs/dep/recycle/priorities/swmp13f.pdf, page vi