BEYOND THE 2020 PLAN: A REVIEW OF THE MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN

Harvard Law School
Emmett Environmental Law & Policy Clinic

August 2013

BEYOND THE 2020 PLAN: A REVIEW OF THE MASSACHUSETTS CLEAN ENERGY AND CLIMATE PLAN

Harvard Law School
Emmett Environmental Law & Policy Clinic

August 2013

Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett Street, Suite 4119
Cambridge, MA 02138
Phone +1-617-496-2058
Fax +1-617-384-7633
Website http://blogs.law.harvard.edu/environmentallawprogram/clinic/

Citation
This paper may be cited as: *Beyond the 2020 Plan: A Review of the Massachusetts Clean Energy and Climate Plan*, Emmett Environmental Law & Policy Clinic, Harvard Law School, Cambridge, Mass.: August 2013.

Comments are welcome and may be directed to Wendy B. Jacobs at wjacobs@law.harvard.edu.

Acknowledgements
The Clinic thanks the following individuals, who contributed their input to this report: Wendy B. Jacobs, Clinical Professor and Director; Shaun A. Goho, Senior Clinical Instructor and Staff Attorney; David Turner, Clinic student, LLM '13; Felix Zaharia, Clinic student, LLM '13; Mary Schnoor, Research Assistant, JD '16.

The Emmett Environmental Law and Policy Clinic at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, water protection, and smart growth.

Cover Image: Fountain Pond State Park, Great Barrington, MA, available at Massachusetts Energy & Environmental Affairs photostream, http://www.flickr.com/photos/masseea/6309764882/in/set-72157627920272531.

TABLE OF CONTENTS

Executive Summary *5*

Introduction *8*

A. Challenges and Advantages Specific to Massachusetts *8*

B. The Need to Do More, Faster *8*

C. The Need for Engagement *9*

D. Acting on a Regional Basis *12*

E. Co-Benefits *12*

F. The Need for Ongoing Monitoring and Reporting *13*

Beyond the 2020 Plan *14*

A. Top Priorities *14*

B. Challenging but Worthwhile Options *27*

C. Revenue-Positive Actions *33*

Conclusions *38*

EXECUTIVE SUMMARY

In 2010, acting pursuant to the Global Warming Solutions Act (GWSA), the Executive Office of Energy and Environmental Affairs (EOEEA) released the Massachusetts Clean Energy and Climate Plan for 2020 (the 2020 Plan). The 2020 Plan set forth a package of policies intended to guide the Commonwealth toward achieving a 25 percent reduction in greenhouse gas (GHG) emissions by 2020 from 1990 levels.

While the 2020 Plan is an impressive roadmap, more can and should be done to reduce GHG emissions in the Commonwealth.[1] For one thing, it is not certain that the 2020 Plan will achieve the aimed-for 25 percent emissions reduction. Elements of the plan might not be fully implemented, the emissions reductions resulting from those elements might prove to be less than projected, or other sources of emissions might increase in unanticipated ways. In addition, the 2020 emissions reduction goal is only the first step toward the statutory mandate of reducing GHG emissions by 80% by 2050. To keep on track toward achieving that long-term goal, the state needs to start planning for the next steps today and integrating them with the implementation of the 2020 plan.

Our research identifies a variety of potentially effective options for reducing GHG emissions which the Commonwealth has not yet considered or adopted. This report aims to highlight some of those options and make a case for their serious consideration by the Commonwealth. Some of the ideas build upon ideas already contained in the 2020 Plan, while others are new. None, however, is intended to replace anything contained in the Plan; the Commonwealth will need to carry out all elements of the Plan and many others to reach its 2050 goal.

The suggested measures fall into three categories:

A) **Top Priorities:** These options include reducing methane emissions from natural gas pipelines, promoting electric vehicle usage, accelerating the adoption of LED (light-emitting diodes) street lighting, improving enforcement of existing traffic laws, ensuring that municipal utilities offer net metering, and promoting carbon offsets for forest protection. Although these options address different sectors of the economy and will achieve varying levels of GHG emissions reductions, they share certain features: none requires legislative action and none faces overwhelming political or financial hurdles. The Commonwealth should move forward on these items now.

1 The focus of this paper is on concrete measures that the Commonwealth can and should take to achieve the emissions reductions goals of the GWSA. While the GWSA plainly directs the Department of Environmental Protection (DEP) to promulgate regulations to establish "a desired level of declining annual aggregate emission limits for sources or categories of sources that emit greenhouse gas emissions," M.G.L. c. 21N, § 3(d), that duty is not the focus of this white paper.

B) **Challenging but Worthwhile Options:** This set of options includes promoting bus rapid transit and electrification in areas where light rail is not feasible, encouraging some replacement of home heating oil by natural gas, and engaging in smart urban planning. Financial, logistical, or legislative barriers present difficulties for implementation, but taking these actions will benefit Massachusetts in the long run.

C) **Revenue-Positive Actions:** The final set of actions we recommend pursuing includes raising vehicle registration fees and excise tax rates and/or tying these fees and rates to vehicle fuel economy; and, increasing and diversifying road tolls, including congestion charges. In addition to promoting emissions reductions, these actions will generate much-needed funds that can be used to increase the impact of other measures.

Measure	Legal Action	Estimated GHG Impact (million tons CO_2 per year)	Time Needed for Implementation	Cost to State	Comments	Additional Non-GHG Benefits
TOP PRIORITIES						
Reduce gas pipeline leaks	New regulations	0.7-3.6	1 year	Low	DPU to implement regulation	Public safety; public health
Electric Vehicle Incentives/ Investment	Existing authority and new regulations	4.5	5-10 years	Low – Intermediate	Will benefit from regional cooperation	Long term cost savings to EV car owners; public health
LED Street Lighting	Legislation (to establish a loan fund)	0.18	5 years	Intermediate	May benefit from (revolving) loan fund	Long-term cost savings to municipalities & state
Enforce Traffic Laws	Existing authority	1-2	1 year	Low	Need public/police force education	Public safety; public health
Municipal Utility Net Metering	New legislation	0.2	1 year	Low	Need legislation or cooperation of municipal utilities	
Carbon Offsets to Protect Forests	Existing authority	*	5 years	Low	Need action from private land-owners	Woodland conservation
CHALLENGING BUT WORTHWHILE OPTIONS						
Bus Rapid Transit & Electrification	New regulations; legislation	*	1-5 years	Low – High	Cost barrier for some measures; changing road rules	Improved reliability of public transit system
Encourage replacement of heating oil	Existing authority	*	1 year	Low	Need action from home-owners	Public health
Smart Planning	New regulations; legislation	*	10 years	Intermediate	Cost barrier for some measures; need cooperation of municipalities	Public welfare; public health
REVENUE-POSITIVE ACTIONS						
Increase Vehicle Registration Fees & Excise Taxation	New regulations / new legislation	*	1 year	Revenue-Positive	Need excise tax increase to pass legislature	Revenue-positive
Increase and Diversify Road Tolls	New regulation / new legislation	*	2 years	Revenue-Positive	Implementation of open-road tolling	Once implemented, revenue-positive
Further Increase the Gas Tax	New Legislation	*	1 year	Revenue-Positive	Need tax increase to pass legislature**	Revenue-positive

* indicates that the GHG impact could vary greatly and is difficult to estimate

**Not likely in the near term, given the July 2013 legislative override of the Governor's proposal to raise the gas tax in 2017

INTRODUCTION

A. Challenges and Advantages Specific to Massachusetts.

Massachusetts is well-placed to take a leading role in climate change mitigation. The Commonwealth has a service-focused economy (with fewer manufacturing emissions than many other states), significant wind power resources, and a citizenry that is conscious of and committed to addressing climate change. As the 2020 Plan emphasizes, the Commonwealth has an opportunity to position itself to benefit politically and economically from the world's increasing focus on climate change issues, by establishing itself as a national and global center for climate change technology and ideas—the Massachusetts Clean Energy Center's Wind Technology Testing Center is an excellent example of the economic potential in this area. A transition to a local clean energy economy could yield huge economic dividends for the Commonwealth.

By taking significant unilateral steps to reduce its own emissions, Massachusetts can be a leader and encourage other states to follow. Recognizing that the financial resources at the disposal of the Commonwealth are limited and the state government faces many challenges and demands on its resources in addition to climate change mitigation. We have therefore prioritized proposals that are inexpensive or net revenue-positive.

B. The Need to Do More, Faster.

The fact that Massachusetts has opted for the most ambitious target of a 25% emissions reduction below 1990 levels by 2020 is admirable. But the 25% target does not have to act as a cap on reductions in the next several years. This is especially so given that a 19% reduction in emissions is anticipated to occur simply under the business as usual (BAU) model. The 2020 Plan itself suggests that with a low BAU impact and high policy impact, a 33% reduction by 2020 is possible.[2]

Moreover, to achieve the statutory goal of 80% emissions reduction over 1990 levels by 2050, more must be done now towards achieving that longer-term goal. A 25% reduction by 2020 means that a much more considerable 55% reduction will need to be achieved in the following 30 years. Even accounting for anticipated technological developments between now and 2050, achieving this 55% reduction may prove significantly more difficult than the 25% by 2020, given that much of the "low-hanging fruit" policy options will already have been put into effect.

2 See Executive Office of Energy and Environmental Affairs, Massachusetts Clean Energy and Climate Plan for 2020, at ES-5 (2010) [hereinafter 2020 Plan], *available at* http://www.mass.gov/eea/docs/eea/energy/2020-clean-energy-plan.pdf.

Achieving an 80% reduction by 2050 will require serious, long-term infrastructure investment, research and development (R&D) advancements, behavioral change, and more generally a paradigm shift in the way that development, growth and human activity are carried out. Such systemic changes require long-term planning and investment. This is particularly true when it comes to changes to the way that urban and suburban environments in the Commonwealth are designed, to change behavioral patterns of transport use and energy consumption, as well as management of forests.

Moreover, because so many of the decisions that affect greenhouse gas emissions involve buildings, equipment, and infrastructure that will be in use for years or even decades, if the wrong decisions are made now, they will make it harder to achieve not just the 2020 goal, but the 2050 goal as well. This is particularly true in the area of urban and suburban planning and infrastructure, where making the wrong planning decisions now can lock in patterns of behavior and energy consumption for decades. Reversing patterns of development sprawl and private vehicle usage will become substantially more difficult.

C. The Need for Engagement.

A real, wide-reaching turnaround in emissions patterns requires engagement and input from all citizens. There are several reasons for this. First, the patterns of behavior and consumption that have developed since the industrial revolution, and particularly over the course of the 20th century, are unsustainable. Truly significant emissions reductions can be achieved only by reducing our collective consumption of fossil fuels, electricity, water, plastic goods, and other GHG-emitting goods and services. Second, without widespread citizen engagement, emissions reductions in one area may be undermined by increases in another. For example, without a popular appreciation for the importance of changing driving behavior to reduce vehicle miles travelled (VMT), greater vehicle fuel efficiency may not result in emissions reductions if consumers respond to lower fuel costs by driving more—a phenomenon known as the rebound effect.[3] Third, an actively engaged and coordinated citizenry can help foster the kind of political climate that is necessary to bring about some of the long-term, ambitious projects that we have identified below as necessary for Massachusetts's long-term emissions reduction strategy. For example, absent citizen education, engagement and support, a gasoline tax will likely neither be proposed nor passed.

In addition to generally acting to promote public awareness of and support for significant reductions in GHG emissions, the Commonwealth should focus on engaging with (1) schools and universities and (2) the insurance industry as suggested below.

3 *See generally* David Owen, The Conundrum: How Scientific Innovation, Increased Efficiency, and Good Intentions Can Make Our Energy and Climate Problems Worse (2011).

1. Schools and Universities.

Engage with educational institutions throughout the Commonwealth—from elementary schools to universities—to focus their energy on the challenges of climate change, generate new ideas from our leading universities, and foster a culture of climate consciousness. Create a competition with prizes for the students who develop the best ideas to reduce emissions cheaply.

Massachusetts has an inbuilt advantage in that it already hosts a vibrant array of higher education institutions within its borders. Positioning itself as a leader on climate change and in the shift to an innovative clean energy economy, the Commonwealth can directly engage with universities so that they serve as ideas factories and logistical supporters of the climate change strategy.

One method of leveraging the intellectual capital in the state's universities would be to create a competition for students to develop cost-effective strategies for reducing GHG emissions. The use of prizes and bounties to promote innovation has received significant attention in recent years, with a prominent, and successful, example being the Ansari X prize for creating a reusable manned spacecraft.[4] In the climate context, Richard Branson launched the Virgin Earth Challenge, which offers $25 million for the development of a commercially-viable technology for the permanent removal of GHG from the atmosphere.[5] For a relatively small amount of money, the Commonwealth could harness the creativity and energy of its many university students to generate new strategies to help it achieve its 2020 and 2050 emissions reductions goals.

4 X PRIZE Foundation, *Ansari X PRIZE*, *available at* http://space.xprize.org/ansari-x-prize (last visited June 26, 2013).

5 Virgin Earth Challenge, *Removing Greenhouse Gases from the Atmosphere*, *available at* http://www.virginearth.com/ (last visited June 26, 2013). More generally, Professor Jonathan Adler of Case Western Reserve University has suggested that:

> Prizes are particularly well-suited for the climate policy challenge because the threat of global warming cannot be reduced by any meaningful degree without dramatic technological breakthroughs that enable reductions in atmospheric concentrations of GHGs, and traditional innovation tools are inadequate. Patent protection provides ample incentive to innovate in many areas, but not where, as here, there is no direct economic benefit to be derived from relevant inventions. . . . Prizes can fill the gap by providing the promise of supercompetitive returns for the development of climate-protecting innovations.

Jonathan H. Adler, *Eyes on a Climate Prize: Rewarding Energy Innovation to Achieve Climate Stabilization*, 35 Harv. Envtl. L. Rev. 1, 4 (2011); *see also* Thomas Kalil, The Brookings Institution, *Prizes for Technological Innovation* 13-14 (2006) (suggesting climate-related prizes for advances in zero-energy buildings, fuel-efficient cars, power storage, solar cells, and net zero energy consumption appliances).

The Commonwealth should also engage with educators and students in elementary and high schools to ensure that serious education about climate change and its effects, as well as learning to think innovatively about solutions to climate change, form a part of the school curriculum. This could include providing materials, speakers, sponsoring field trips to sites of climate change relevance, sponsoring science fairs or competitions focused on climate change mitigation, and hosting seminars, conferences and other opportunities for teachers to engage with officials, scientists and university faculty to increase their own knowledge of climate change issues.

2. The Insurance Industry.

Engage the insurance industry to help fight climate change.

The insurance industry is well-positioned to help develop creative solutions for reducing greenhouse gas emissions. It already understands the risks posed by climate change and some insurance companies have already started to act to address them. The industry also has significant risk management expertise. Finally, the insurance industry has a history of being able to generate large behavioral shifts by incentivizing risk-reducing behavior.[6] Because of the industry's strengths in these areas, the Commonwealth should partner with insurers to develop new strategies to reduce GHG emissions.

The insurance industry has already developed policies that create incentives for actions that reduce GHG emissions. For example, "Pay-As-You-Drive" (PAYD) automobile insurance is based on the principle that risk increases with vehicle miles traveled. Under a PAYD policy, the premium is calculated on a cents-per-mile basis for the distance actually driven. Studies have shown that drivers who acquire PAYD policies on average reduce the miles they drive. For example, a 2010 paper estimated that if all drivers in Massachusetts switched to a PAYD policy, the result would be a 9.5% reduction in VMT and a corresponding reduction of 1.8 million metric tons of CO_2 emissions.[7] The Brookings Institution has estimated that driving would decline about 8% nationwide if all drivers adopted PAYD, and that two—thirds of households would have lower insurance premiums.[8] PAYD was identified in the 2020 Plan as an avenue for exploration, and a pilot is set for launch in 2013 as a joint venture between CLF Ventures (in partnership with Plymouth Rock Insurance) and MIT Professor Joseph Ferreira which will

6 Richard Lou, et al., Emmett Environmental Law & Policy Clinic, *Municipal Climate Change Adaptation and the Insurance Industry* 5 (2012), *available at* http://blogs.law.harvard.edu/environmentallawprogram/files/2013/01/municipal-cc-adaptation-and-insurance-industry_final.pdf.

7 Joseph Ferreira, Jr. & Eric Minkel, *Pay-As-You-Drive Auto Insurance in Massachusetts: A Risk Assessment Report on Consumer, Industry and Environmental Benefits* 41 (2010), *available at* http://www.clf.org/wp-content/uploads/2010/12/CLF-PAYD-Study_November-2010.pdf.

8 Jason E. Bordoff & Pascal J. Noel, Brookings Institution, *Pay-As-You-Drive Auto Insurance: A Simple Way to Reduce Driving-Related Harms and Increase Equity* 5 (2008), *available at* http://www.brookings.edu/~/media/research/files/papers/2008/7/payd%20bordoffnoel/07_payd_bordoffnoel.pdf.

reportedly begin enrolling participants soon.[9] Similarly, "customers with a tendency to reduce climate vulnerabilities, e.g., drivers of hybrid cars, are being seen by companies like Farmers, Sompo Japan, and Travelers as 'good risks,' and rewarded accordingly through premium discounts."[10]

Insurance products that reward GHG emission-reducing behaviors are not limited to the auto insurance market. For example, Fireman's Fund Insurance Company offers lower property insurance premiums for buildings that meet LEED standards. LEED-certified buildings tend to be more energy-efficient than other buildings.[11] As a result, if this kind of insurance discount encourages more building owners to upgrade their buildings to LEED standards, then building-sector GHG emissions will be reduced.

The Commonwealth could work with local insurers to promote these kinds of insurance policies and others like them, as well as to benefit from the insurance industry's expertise.

D. Acting on a Regional Basis.

Massachusetts can and must act without regard to whether other states in the region take similar action. The state is and should remain a leader on these issues. Nevertheless, there are advantages to working in partnership with neighboring states, particularly in reducing the risk of "leakage," in which businesses move their operations to nearby states with less restrictive regulatory approaches, thereby undermining emissions reductions gains. The Commonwealth should therefore strive where possible to take action in coordination with other states, including the Regional Greenhouse Gas Initiative (RGGI) states. The significant amendments to RGGI itself that are currently being implemented, including lowering the emissions cap, are a good example of regional action. Other regional actions could include the development of a region-wide electric vehicle charging network and the expansion of RGGI into new sectors of the economy.

E. Co-Benefits.

One feature of the options proposed in this report is that they do not solely improve the climate and emissions profile of Massachusetts. Many of the proposed solutions also offer other types of significant benefits for public health and the economy. If the Commonwealth takes a leading role in the clean energy and clean technology industries, these changes have the potential to generate significant economic benefits. Reductions in GHG emissions will bring accompanying reductions in the emissions

9 Conservation Law Foundation, *Pay As You Drive Insurance (PAYD)*, http://www.clf.org/our-work/healthy-communities/modernizing-transportation/pay-as-you-drive-auto-insurance-payd (last visited May 21, 2013).

10 Evan Mills, From Risk to Opportunity: An Insurer Responses to Climate Change 24 (2009), *available at* https://www.ceres.org/resources/reports/insurer-responses-to-climate-change-2009.

11 Lou, et al., *supra* note 6, at 8.

of other pollutants, such as nitrous oxides and sulfur dioxide, and thereby lead to other health and environmental benefits. Moreover, changing behavioral patterns to increase the use of public transit and travel on foot or by bicycle can have significant benefits to overall public health and wellbeing. The preservation of forests, ecosystems, wetlands, and public parks all have a positive impact on wildlife rejuvenation, biodiversity preservation, air and water quality, and public and environmental health generally. Smart urban planning to reduce travel times, congestion, and wasted hours spent idling in traffic will improve economic productivity.

F. The Need for Ongoing Monitoring and Reporting.

Under the GWSA, the 2020 Plan must be updated every five years.[12] This requirement is important, to ensure that progress continues to be made, not only toward the 2020 goal but toward the ultimate 80% reduction goal in 2050. Such revisions will only be effective, however, if there are mechanisms in place to monitor the effectiveness of the implementation of the plan and to identify—as this report aims to do—whether there are additional or new measures that might also be adopted to enhance the Commonwealth's climate change strategy. The public should be kept informed about whether Massachusetts is on track to achieve its goals under the 2020 Plan and about problems encountered in meeting the objectives.

One mechanism for ensuring that regular monitoring and reporting occurs is to institute a formal carbon budget, analogous to the Commonwealth's annual financial budget, in order to have a gauge against which to measure and report progress. The United Kingdom uses this approach and produces annual carbon budgets under its 2008 Climate Change Act. The Committee on Climate Change, an independent body created to advise the British government on its greenhouse gas emissions reductions strategies, explains the rationale for carbon budgets: "By providing benchmarks towards the 2050 target, the carbon budgets ensure regular progress is being made and provide a level of predictability for UK firms and households to plan and invest for a low-carbon economy."[13] Carbon budgets could play a similar role in guiding, monitoring, and publicizing the Commonwealth's progress toward its 2020 goal, and beyond.

12 M.G.L. c. 21N. § 4(h).

13 U.K. Committee on Climate Change, *Carbon Budgets and Targets*, http://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets (last visited May 21, 2013).

BEYOND THE 2020 PLAN

A. Top Priorities.

Below, we identify a set of strategies that should produce significant greenhouse gas emissions reductions while still being relatively inexpensive and unlikely to provoke major political opposition. These measures can and should be implemented immediately.

1. Reduce Gas Pipeline Leaks.

Take immediate action to reduce the leakage of natural gas from pipelines in Massachusetts by establishing a regulatory leak classification scheme with associated repair timelines.

Natural gas, when burned, produces lower GHG emissions per unit of energy produced than other types of fossil fuels. When unburned natural gas (methane) leaks into the atmosphere, however, it is a powerful greenhouse gas, with a 20-year global warming potential (GWP) which is many times greater than that of carbon dioxide.[14]

Methane leaks can occur at any point along the pathway that natural gas takes from the wellhead to the large interstate transmission pipelines to the smaller pipelines that distribute gas to individual buildings for heating. In the distribution network, older gas mains made from cast iron or unprotected steel are particularly prone to leaks. A survey of all 785 road miles in Boston led by Professor Nathan Phillips of Boston University identified 3,356 separate gas leaks.[15]

These leaks are potent sources of greenhouse gas emissions. Fugitive emissions of natural gas from distribution pipelines in Massachusetts amounted to between 700,000 tons and 3.6 million tons of carbon dioxide equivalent in 2010—between 0.8% and 4.2% of all greenhouse gas emissions in the state.[16]

14 The standard figure used when comparing methane to carbon dioxide is a GWP of 21, meaning that each unit of methane has 21 times as great an impact as an equivalent unit of carbon dioxide over the next 100 years. This number was included in the 1995 assessment report of the Intergovernmental Panel on Climate Change, and was an estimate of the comparative impact of methane and carbon dioxide over 100 years. Other, more recent, sources have used different numbers, both because estimates of the 100-year potential of methane have gone up, and because some authors prefer to use a 20-year comparison because methane remains in the atmosphere on average only for about 12 years, compared to 100 years for carbon dioxide on average. *See* Shanna Cleveland, Conservation Law Foundation, *Into Thin Air: How Leaking Natural Gas Infrastructure is Harming our Environment and Wasting a Valuable Resource* 12 (2012).

15 Nathan G. Phillips, et al., *Mapping Urban Pipeline Leaks: Methane Leaks Across Boston*, 173 Envtl. Pollution 1 (2013).

16 Cleveland, *supra* note 14, at 13.

Methane leaks are not only a climate change problem. As demonstrated by the 2010 gas pipeline explosion in San Bruno, California, that killed eight people and destroyed 38 homes, pipeline leaks also pose a significant public safety hazard. In the past few years in Massachusetts alone, explosions have occurred in Gloucester in 2009 and in Springfield in 2012—the latter destroying a building and damaging an entire city block.[17] Natural gas leaks also interact with nitrogen oxides to produce ground-level ozone—also known as smog—which contributes to significant health problems including heart and lung disease.[18] Finally, these leaks cost money: the lost natural gas costs ratepayers an estimated $38.8 million per year.[19] Taking measures now to reduce the leakage of gas through Massachusetts's aging pipeline infrastructure presents an opportunity to make significant progress toward the state's 2020 goal as well as address these associated harms.

The key problems under existing state law are that (1) there is no regulatory methodology for accurately accounting for leaks or the emissions they represent[20] and (2) utilities have no incentive to identify or repair these leaks—in fact, they have the opposite financial incentive. Utilities are currently required to replace or retire cast iron/unprotected steel pipes only when they reach a level of "hazardous" risk—a characterization that aims to protect public safety, but does not address fugitive emissions contributing to climate change.[21] Moreover, because utilities are permitted to pass the cost of lost and unaccounted-for gas to consumers, they have a financial incentive not to repair leaks until they reach the level of "hazardous."[22]

To address the first problem, the Department of Public Utilities (DPU) could—and should—establish a binding leak grading system and timelines for leak repairs. Legislation to establish such a system has passed the House of Representatives and is currently under review in the Senate.[23] The legislature

17 *See* Mass. DPU, Pipeline Engineering & Safety Div., *Incident Report: 76 Eastern Ave., Gloucester, Mass., Jan. 25, 2009* (2010), *available at* http://www.mass.gov/eea/docs/dpu/pipeline/incident-reports/1-25-09-gloucester.pdf; Derek Anderson, Colin A. Young & Zachary T. Sampson, *Gas Explosion Levels Springfield Strip Club: At Least 18 Injured; Area was Evacuated Just an Hour Before*, Boston Globe, Nov. 24, 2012, *available at* http://www.bostonglobe.com/metro/2012/11/24/springfield-explosion-injures-least-levels-strip-club/SX7MmBHvdfePUBk-pyCgG6L/story.html.

18 Phillips et al., *supra* note 15, at 3.

19 Cleveland, *supra* note 14, at 13.

20 There is an industry-developed leak grading system, which classifies leaks as Grade 1, Grade 2, or Grade 3. All three levels, however, relate only to the potential hazardousness of the leaks. *See* In re New England Gas Co., D.P.U. 10-114, 2011 WL 1343005, at *114 n.160 (Mass.D.P.U. Mar. 31, 2011). In addition, these classifications are not binding and do not impose any duty on the utility to repair the leaks on any particular timeline, beyond the basic duty to repair hazardous leaks.

21 Cleveland, *supra* note 14, at 10; *see* 49 C.F.R. § 192.703(c) ("Hazardous leaks must be repaired promptly.").

22 Cleveland, *supra* note 14, at 11–12.

23 S.1580, 188th Gen. Ct. (Mass. 2013), *available at* https://malegislature.gov/Bills/188/Senate/S1580.

should enact this bill. Even if it does not, however, DPU already has the legal authority to establish its own set of leak classifications and associated repair timelines.[24] At least thirteen states, including Maine, New York, and New Hampshire, have already done so, providing models that DPU could reference or adopt.[25]

DPU could also limit utilities' ability to recover the cost of lost and unaccounted-for gas.[26] There is also a model for this action, as the New York Public Service Commission has established benchmarks for lost and unaccounted-for gas during a utility's rate case and penalized utilities for gas lost in excess of the benchmark.[27]

Because the potential for greenhouse gas reductions and the additional public health, safety, and pollution implications of failure to take action are significant, this is an option meriting prompt attention. DPU should start a rulemaking to establish leak classifications and repair timelines and begin gathering the data necessary to establish benchmarks for lost and unaccounted-for gas.

2. Electric Vehicle Investment/Incentives.

Support the expansion of the electric vehicle market and infrastructure in the Commonwealth through the Electric Vehicle Incentive Program (MassEVIP), clarification of regulations applicable to electric vehicle service providers, consumer incentives, and a public education campaign.

The annual greenhouse gas emissions from an all-electric vehicle such as the Nissan Leaf can be 64% lower than those from a comparable gasoline-powered, medium-sized sedan.[28] Widespread adoption of electric vehicles (EVs) will therefore significantly reduce transportation sector carbon dioxide emissions.[29] To its credit, the Massachusetts Executive Office of Energy and Environmental Affairs

24 49 U.S.C. § 60104; M.G.L. c. 164, § 75E, 76C.

25 Cleveland, *supra* note 14, at 15.

26 These actions are two of the five policy options to address this issue identified by CLF in a recent white paper. Cleveland, *supra* note 14 at 15. The full list is: (1) establishing leak classification and repair timelines; (2) limiting supplier cost recovery for lost and unaccounted-for gas; (3) expanding targeted infrastructure replacement programs; (4) incorporating leak reduction into service quality standards; and (5) enhancing monitoring and reporting.

27 See *In the Matter of the Filing of Annual Reconciliations of Gas Expenses and Gas Cost Recoveries, filed in C 21656*, Case 04-G-1278, at 9 (N.Y. P.S.C. 2005).

28 Emily Norton, Environment Northeast & Jenny Rushlow, CLF, *Deploying Electric Vehicles in MA: A Policy Overview* 5 (2013), *available at* http://www.mass.gov/eea/docs/doer/clean-cities/ma-ev-roundtable-environment-northeast.pdf.

29 According to an Environment Northeast analysis, if 20% of vehicles in the ISO-New England region were electric vehicles, annual transportation-related carbon dioxide emissions in the region would decline from approximately 71 million metric tons to 62 million metric tons. *Id.* at 6.

(EOEEA) has recognized the importance of EVs in meeting the Commonwealth's GHG emission goals,[30] but further action is needed to support and advance the burgeoning EV industry. Electric vehicles have begun to appear on the streets of Massachusetts, but uptake remains relatively slow. There are an estimated 1,000 EVs now in Massachusetts, compared with 20,000 in California (Massachusetts would need at least 3,500 to match California's per capita EV ownership).[31]

The Commonwealth can do at least three things to increase electric vehicle usage in Massachusetts. First, it can provide direct funding or subsidies for the development of the charging infrastructure. As a good first step in this direction, DEP recently introduced MassEVIP, a $2.5 million program that subsidizes the purchase of EVs and charging stations by Massachusetts municipalities.[32] Public spending should be focused on areas where infrastructure development is likely to have the greatest impact, including neighborhoods with high concentrations of multi-unit housing and destinations such as parks, museums, shopping malls, and stadiums.[33] Ongoing technological developments in wireless charging,[34] solar charging,[35] and wind charging[36] should also be considered as ways to further increase convenience and emissions reduction benefits.

To expand MassEVIP, the Commonwealth could work together with neighboring states to establish a multi-state funding mechanism, in combination with the development of a regional charging network.

30 Testimony from Global Warming Solutions Act of 2008 Hearing, Senate Committee on Global Warming & Climate Change, April 22, 2013, *available at* http://www.mass.gov/eea/docs/eea/gwsa/gwsa-oversight-hearing-4-22-13.pdf.

31 *See* Norton and Rushlow, *supra* note 28, at 21.

32 Executive Office of Energy and Environmental Affairs, *Massachusetts Electric Vehicle Incentive Program (MassEVIP),* http://www.mass.gov/eea/agencies/massdep/air/grants/massevip.html (last visited June 24, 2013). The state has funded Massachusetts municipalities to install 140 charging stations; the total state-wide is over 390 public charging points. A Level 2 charging station (full charge time of 3-8 hours) costs approximately $1,000-$7,000 and a DC fast-charging station (full charge time of 15-30 minutes) costs $20,000-$50,000 (because of the additional hardware requirements associated with high-power operation). *See* U.S. Department of Energy, *Plug-In Electric Vehicle Handbook for Public Charging Station Hosts* (2012), *available at* http://www.afdc.energy.gov/pdfs/51227.pdf.

33 *See* Charles Zhu & Nick Nigro, Center for Climate and Energy Solutions, Plug-in Electric Vehicle Deployment in the Northeast: A Market Overview and Literature Review 27 (2012), *available at* http://www.georgetownclimate.org/sites/default/files/TCI-EV-Lit-Review-1.pdf.

34 Jim Motavalli, *Hertz to Test Plugless Power on Nissan Leaf*, The New York Times Wheels Blog (Feb. 8, 2012, 2:56 PM), http://wheels.blogs.nytimes.com/2012/02/08/hertz-to-test-plugless-power-on-nissan-leaf.

35 University of Iowa Facilities Mgmt., *Renewable Energy: Exploring New Energy Sources: Solar Electric Vehicle Charging Station*, http://facilities.uiowa.edu/uem/renewable-energy/solar-energy.html (last visited June 24, 2013).

36 Nikki Gordon-Bloomfield, *GE "Skypump" Charges Electric Cars with Wind Power*, Christian Science Monitor, Aug. 16, 2012, http://www.csmonitor.com/Business/In-Gear/2012/0816/GE-Skypump-charges-electric-cars-with-wind-power.

EOEEA has already started to pursue a regional partnership through the Transportation and Climate Initiative (TCI), which will help to guide EV infrastructure development in the New England and Mid-Atlantic region.[37] Regional deployment of EV infrastructure will enable Massachusetts EV drivers to travel to destinations outside the Commonwealth.

Second, because public funds for EV infrastructure are likely to be limited, the state should ensure that its regulation of charging stations does not erect any unnecessary barriers to private investment. At least two types of entities are developing private charging stations: electric vehicle service providers (EVSPs) and utilities. EVSPs provide charging stations as a service, much like gasoline service stations. Because EVSPs provide electricity to their customers, the possibility exists that regulations intended for electric utilities would apply to them, which could unnecessarily impede this new industry.[38] Several states, such as California, have declared unequivocally that a supplier of electricity for electric vehicles is not defined as a public utility.[39] DPU has not undertaken any effort to regulate EVSPs, but a lack of certainty on this issue could deter private investment in charging infrastructure. The legislature or DPU should clarify that EVSPs will not be regulated as utilities.

At the same time, however, the state should not discourage utilities from deploying their own charging infrastructure. Currently, utilities may open their own charging stations; Western Massachusetts Electric Company has installed several.[40] Utilities have a significant incentive to promote electric vehicle charging on their grid, because, with the use of smart grid technology, EVs can be used as demand response resources and as storage during off-peak times.[41] At the same time, however, the terms under which utilities can develop the charging infrastructure should be clearly defined; because utilities have the possibility of subsidizing their operations with ratepayer funds, EVSP companies fear that they will be competing on an uneven playing field.[42]

37 *See* Testimony from the Global Warming Solutions Act of 2008 Hearing, *supra* note 30.

38 Alana Chavez-Langdon & Maureen Howell, The EV Project, *Lessons Learned—Regulatory Issues and Utility EV Rates* 2 (2013), *available at* http://www.theevproject.com/cms-assets/documents/103425-835189.ri-2.pdf.

39 Cal. Pub. Util. Code § 216(i). In New York, Governor Cuomo recently directed the state Public Service Commission "to review existing policies to ensure that regulations promote the evolution of the electric vehicle market in New York." Press Release, Andrew M. Cuomo, Governor of New York, Governor Cuomo Calls for Regulatory Reform to Expand the Number of Statewide Electric Vehicle Charging Stations (May 24, 2013), *available at* http://www.governor.ny.gov/press/05242013-regulatory-reform-to-expand-number-of-electric-vehicle-charging-stations.

40 Press Release, Western Massachusetts Electric Co., *WMECo Adds Electric Vehicle Charging Stations in Western Mass* (May 3, 2011), *available at* http://nuwnotes1.nu.com/apps/wmeco/webcontent.nsf/0/2F337C0F58E2454B85257885007304FB?opendocument.

41 *See, e.g.*, David Biello, *Will You or the Grid Control Your Electric Car?*, Scientific American (June 18, 2013), http://www.scientificamerican.com/article.cfm?id=remote-control-of-electric-cars.

42 Chavez-Langdon & Howell, *supra* note 38, at 3.

Third, the Commonwealth should make ownership of an EV as convenient and cost-efficient as possible. Incentives such as HOV lane access for electric vehicles, preferential parking (the City of New Haven, for example, provides free parking for electric vehicles),[43] and lower excise tax should all be considered. Most EV owners will charge their vehicles primarily at home. The Commonwealth should therefore also streamline the permitting and inspection process for the installation of AC Level 2 chargers, which can substantially reduce charging times.[44] Because a significant proportion of Massachusetts residents live in multi-family homes, the Commonwealth should also encourage property developers to include charging stations in their developments through credits or subsidies and a streamlined permitting process.

Massachusetts could also consider a state-level subsidy for EVs, such as a sales tax exemption. Although the federal government offers a tax credit of up to $7,500 for EV purchases, EVs still cost substantially more than comparable gasoline-powered cars. California, for example, offers rebates of up to $2,500 on the purchase of an all-electric of plug-in hybrid vehicle.[45] New Jersey[46] and Washington State[47] exempt electric vehicle sales from sales tax, South Carolina[48], Colorado,[49] and Georgia[50] provide income tax credits for electric vehicle purchase, and California has provided a bundled contract on discounted electricity from some utilities with vehicle purchases.[51] Such an approach might not be the most cost-effective or equitable way to increase electric vehicle usage, however, because early individual purchasers of EVs are likely to be affluent and therefore potentially less influenced by a tax credit than by the convenience incentives mentioned above.[52]

43 City of New Haven, *Transportation, Traffic & Parking: Hybrid Parking Permits*, http://www.cityofnewhaven.com/TrafficParking/hybridparking.asp (last visited June 24, 2013).

44 *See* Zhu & Nigro, *supra* note 33, at 53.

45 Cal. Ctr. for Sustainable Energy, *Clean Vehicle Rebate Project,* http://energycenter.org/index.php/incentive-programs/clean-vehicle-rebate-project (last visited June 24, 2013).

46 N.J. Stat. Ann. § 54:32B-8.55.

47 Wash. Rev. Code §§ 82.08.809, 82.12.809.

48 S.C. Dep't of Revenue, SC Information Letter #06-23: New Energy Conservation Tax Incentives for Individuals (2006), *available at* http://www.sctax.org/NR/rdonlyres/0D5CBB97-1A9F-466E-99F2-3FBC9B09E219/0/IL0623.pdf.

49 Colorado Dep't of Revenue, *FYI Income 67: Innovative Motor Vehicle and Alternative Fuel Vehicle Credits* (2012), *available at* http://www.colorado.gov/cms/forms/dor-tax/Income67.pdf.

50 Georgia Dep't of Natural Resources, *LEV/ZEV and Electric Vehicle Charger Tax Credit Fact Sheet* (2013), *available at* http://www.gaepd.org/Files_PDF/forms/apb/apb_levzevfs.pdf.

51 Pacific Gas & Electric Co., *Rate Options,* http://www.pge.com/myhome/environment/whatyoucando/electricdrivevehicles/rateoptions/ (last visited June 18, 2013).

52 Russell Hensley, Stefan Knupfer & Axel Krieger, *The Fast Lane to the Adoption of Electric Cars,* McKinsey Quarterly (Feb. 2011), *available at* http://www.mckinsey.com/insights/manufacturing/the_fast_lane_to_the_adop-

Finally, a significant barrier to the adoption of EVs is a lack of consumer understanding of the benefits of EVs, along with concern about how far the cars can travel on a charge—so-called "range anxiety."[53] A state-sponsored public information campaign, coordinated with and supported by EV manufacturers and dealers, could educate consumers about the significantly lower usage cost of EVs (approximately $0.02/mile versus $0.14/mile for gasoline-powered cars) and the availability and location of charging stations. Such a campaign would reduce consumer concerns and accelerate the public acceptance of EVs as a realistic alternative to gasoline-fueled vehicles. Strategies for the public information campaign could be taken from ideas generated by the Massachusetts Electric Vehicle Initiative (MEVI), which grew out of a roundtable meeting hosted by EOEEA and the Conservation Law Foundation in March 2013.[54]

3. Enable the Transition to LED Public Lighting.

Establish a revolving loan fund to help municipalities invest in LED street lights and install LEDs on street lights owned by state agencies. Additional emissions reductions can be achieved by adopting smart control technologies.

Light-emitting diode (LED) street lights are significantly more efficient than conventional street lights, using at least 50% less electricity for equivalent or better results.[55] The widespread conversion of public lighting to LED lights therefore presents an opportunity for substantial reductions in lighting-related energy use and consequently in greenhouse gas emissions. The Commonwealth should follow through on its plans to convert state-owned public lighting to LED lights and assist municipalities in making the transition.

In the long run, switching to LED lights can save money, both through lower electricity bills and reduced maintenance and replacement costs. For example, the City of Boston, which started replacing its public lighting and traffic[56] signals with LED lights in the fall of 2010, expects the payback period

---

tion_of_electric_cars.

53 Zhu & Nigro, *supra* note 33, at 25, 35-37.

54 Mass. Executive Office of Energy & Envtl. Affairs, *Massachusetts Electric Vehicle Initiative*, http://www.mass.gov/eea/energy-utilities-clean-tech/alternative-transportation/mevi-home-page.html (last visited June 19, 2013).

55 Remaking Cities Institute, Carnegie Mellon University, *LED Street Light Research Project* (2011), *available at* http://www.cmu.edu/rci/images/projects/led-updated-web-report.pdf; *see generally Everlasting Light*, The Economist, June 1, 2013.

56 Because LED lights are so efficient, they do not release as much heat as conventional traffic lights. One downside to this efficiency is that they do not produce enough heat to melt snow that accumulates on the lights. *See* Susan Saulny, *LED Signals Seen as Potential Hazard*, N.Y. Times, Jan. 2, 2010, at A12. Several solutions have been proposed for this problem, however, including improved visors and wire defrosters. *See Cheap CDOT Device Clears Snow-Clogged Traffic Signals*, TheDenverChannel.com, Dec. 23, 2009, http://www.thedenverchan-

for its Phase I installation of LED street lighting to be 2-3 years.[57] The initial cost of switching to LED lighting is high, however, and this cost can present a barrier to local governments that want to make the transition.

The Commonwealth should therefore encourage municipalities to switch to LED street lighting by establishing a revolving loan fund to which cities and towns in Massachusetts could apply. With the assistance of a loan, more municipalities would be able to install LED street lighting, and the proposal process could help to ensure competitive bidding for installation contracts. RGGI proceeds could be used to establish the fund.[58]

This incentive should be made available to towns and cities without delay because nearly 80 percent of streetlights in the U.S. have reached the end of their useful life and will need to be replaced in the next few years.[59] Municipalities will likely be eager to participate; according to the United States Conference of Mayors, "street lighting expenses represent a major part of on-going operating costs for cities across the US, for many cities it is the single largest power utility bill received, and in some cases the single largest recurring cost to the city's general fund."[60] Prompt action will efficiently replace outdated mercury vapor or high pressure sodium street lighting with LED lighting.

The Commonwealth should also undertake the conversion of lighting owned by the Department of Transportation (DOT), Department of Conservation and Recreation (DCR), and other state agencies. In its GreenDOT plan, DOT has set a goal of replacing all traffic lights with LEDs by 2015 and all other lights by 2020, resulting in a 50% reduction in electricity use for lighting.[61] As of 2012, DCR has only 168 LED street lights, out of the over 12,500 street lights it maintains, and is in the process of

---

nel.com/news/cheap-cdot-device-clears-snow-clogged-traffic-signals; Press Release, University of Michigan, *Engineering Team Develops Device to Aid LED Traffic Signals in Inclement Weather & Places Overall in Campus's Senior Design Competition* (June 22, 2011), *available at* http://sustainability.umich.edu/news/engineering-team-develops-device-aid-led-traffic-signals-inclement-weather-places-overall-campu.

57 City of Boston, *LED Street Lighting*, http://www.cityofboston.gov/publicworks/lighting/led.asp (last visited June 14, 2013).

58 Other innovative financing structures to promote the transition to LED public lighting, including leasing arrangements and public-private partnerships, may also be worth investigating. *See* The Climate Group, Lighting the Clean Revolution: The Rise of LEDs and What it Means for Cities 36-39 (2012), *available at* http://thecleanrevolution.org/_assets/files/LED_report_web1%283%29.pdf.

59 U.S. Conference of Mayors, *Resolution to Promote the Use of Energy Efficient Solid-State LED Street Lighting* (2012), *available at* http://usmayors.org/resolutions/80th_Conference/energy11.asp.

60 *Id.*

61 Mass. Dept. of Transportation, GreenDOT Implementation Policy 23 (2012), *available at* http://www.massdot.state.ma.us/Portals/0/docs/GreenDOT/finalImplementation/FinalGreenDOTImplementationPlan12.12.12.pdf.

studying how to upgrade this lighting.[62] The Commonwealth should ensure that these agencies have adequate funding and logistical support to set and achieve their targets in this area and, if feasible, accelerate the replacement of street lighting.

Not only do LED lights use less electricity than conventional public lighting, but they are also more easily managed through "smart street lighting" mechanisms and sensor technology that can provide further reductions in electricity use. Smart street lighting connects street lamps to a network and provides lighting data to a central administrator, who can also remotely control and adjust street lighting.[63] Monitoring and controlling lighting and energy use in this way can yield further efficiency improvements. Some cities, including Oslo, Amsterdam, Birmingham, England, and the borough of Westminster in London, have already introduced smart lighting programs and are predicting that these programs will lead to significant savings and emissions reductions.[64] Direct sensor technology, such as ambient light or motion detectors, can also dim or shut off LED street lights when they are not needed. The cost of these additional technologies would vary, and expected electricity savings (and therefore GHG emissions reductions) must be balanced against the price of installation and maintenance.

62 Mass. Dep't of Conservation and Recreation, *Outdoor Lighting,* http://www.mass.gov/dcr/pe/architecture/recent.htm (last visited June 14, 2013).

63 *See* Stuart Nathan, *Brilliant Design: Intelligent Lighting and Sensors in Smart Cities,* The Engineer, May 13, 2013, http://www.theengineer.co.uk/energy-and-environment/in-depth/brilliant-design-intelligent-lighting-and-sensors-in-smart-cities/1016279.article. An article in the European Energy Review summarized the benefits of smart lighting systems:

> A dynamic street light is a system that tells you exactly how much energy each single luminary is using and when its lamp needs to be replaced. It adapts the light intensity automatically to external factors such as the amount of daylight, weather conditions, road constructions or traffic density. Such adaptation (dimming) does not only prolong the lifetime of the lamp, it also saves energy. As each luminary is connected to a central database, it is possible to organize maintenance much more efficiently. The system shows when a lamp needs to be replaced. Replacing lamps in time saves a considerable amount of energy, since their efficiency decreases towards the end of their economic life. In addition timely replacement extends the lifetime of other street light components.

Annemiek Planting, *A New Light on Saving Energy*, European Energy Review, Mar.-Apr. 2009, at 68, 68.

64 *See* The Climate Group, *supra* note 58, at 30-31; Planting, *supra* note 62; Press Release, City of Westminster, Westminster to Introduce 12,000 "Smart Lights" to Save Millions (July 21, 2011), *available at* http://www.westminster.gov.uk/press-releases/2011-07/westminster-to-introduce-12000-smart-lights-to-sav/.

4. Improve Enforcement of Existing Traffic Regulations.

Increase enforcement of current speed limits and vehicle idling laws to reduce vehicle emissions.

A potentially highly effective means of bringing about a reduction in GHG emissions is to better enforce existing speed limits. Following an analysis by the Conservation Law Foundation, if one assumes that highway traffic now travels at an average of 75 mph, then if the Commonwealth were to ensure that half of highway traffic in Massachusetts travelled instead at 65 mph, it would result in an emissions reduction of nearly 0.9 million tons of CO_2/year[65]—about 3.5% of the total statewide reduction in GHG emissions needed to achieve the 2020 goal. If, going even further, 50% of traffic traveled at 55 mph and 50% at 65 mph, there would be a reduction of 2.3 million tons of CO_2/year.[66]

This action would require no new legislation or regulations, or even any changes in posted speed limits.[67] Instead, it could be accomplished by better enforcing existing speed limits and educating drivers about the environmental (and public safety) significance of driving at or below existing speed limits. Measures for enforcing the existing speed limits could include increased police monitoring and deployment of speeding cameras.

Another way to decrease vehicle emissions by increasing enforcement of existing traffic regulations is to take a harsher stance on vehicle idling. The Massachusetts anti-idling law, M.G.L. c. 90, § 16A, was designed to reduce localized air pollution,[68] but the effects on CO_2 emissions could also be significant. The law requires that no person "cause, suffer, allow or permit the unnecessary operation of the engine of a motor vehicle while said vehicle is stopped" for more than five minutes (with limited exceptions for delivery vehicles and vehicles under repair or providing engine power for an associated power need). A concerted campaign to raise awareness among drivers and police about these laws and their significance for GHG emissions, coupled with a push to better enforce the law, could again yield emissions savings and help increase understanding of the environmental impacts of driving behavior.

65 Conservation Law Foundation, *Public Comments on Global Warming Solutions Act Implementation Plan* 173 (2010), *available at* http://www.mass.gov/eea/docs/dep/air/climate/gwsapc.pdf.

66 *Id.*

67 Highway speed limits in Massachusetts are never higher than 65 mph and in many cases are 55 mph. *See* Mass. Registry of Motor Vehicles, Driver's Manual: Passenger Vehicles 80 (Revised 05/2013), *available at* http://www.massrmv.com/rmv/dmanual/Drivers_Manual.pdf. By statute, the speed limits on portions of the Massachusetts Turnpike, Interstate 91, and Interstate 95, must be 65 miles per hour. M.G.L. c. 90, § 17A. Changes to these speed limits would therefore require legislative action.

68 Mass. Dept. of Envtl. Prot., *Idling Reduction Toolkit* (2007), *available at* http://www.mass.gov/dep/air/community/depirkit.pdf.

5. Promote the Adoption of Net Metering by Municipal Utilities.

Net metering, in which a utility's customers sell electricity they generate back to the grid, is an effective tool for encouraging the installation of renewable, distributed generation such as solar photovoltaic arrays. Under existing law, investor-owned utilities must provide net metering, but municipally-owned utilities do not need to.

Under net metering, a utility allows a retail electricity customer to sell back to the grid any energy generated on the customer's property at the retail price. The electricity that the customer generates is "netted" against its electricity usage on its electricity bill. The availability of net metering is an important incentive for the installation of distributed generation, such as rooftop solar photovoltaics.

As a matter of state law, the Commonwealth's investor-owned utilities must offer net metering to the general public.[69] By contrast, municipal utilities may offer net metering, but are not required to do so.[70] Accordingly, whether local municipal utilities in Massachusetts offer net metering to their customers is entirely a matter of municipal discretion. There are currently 41 municipal electric utilities in Massachusetts,[71] and their practices regarding net metering vary. Some municipal utilities do not offer it at all, and those that do sometimes do so on different terms from those mandated on all investor-owned utilities.[72]

Several other states, including Arkansas, California, Colorado, and Louisiana, mandate that at least some municipal utilities offer net metering, and the approaches adopted in these states could serve as models for the Commonwealth.[73] In particular, some states have taken into account the generally smaller size of municipal utilities, compared to investor-owned utilities, by exempting the smallest municipal utilities and imposing a maximum size limit on the facilities for which municipal utilities

69 220 CMR 18.03.

70 Mass. Executive Office of Energy & Envtl. Affairs, *Net Metering: Frequently Asked Questions and Answers,* http://www.mass.gov/eea/grants-and-tech-assistance/guidance-technical-assistance/agencies-and-divisions/dpu/net-metering-faqs.html (last visited June 19, 2013).

71 Sacha Pfeiffer & Lynn Jolicoeur, *Why Local Power Utilities Often Outperform Regional Ones*, WBUR, Nov. 4, 2011, http://www.wbur.org/2011/11/04/municipal-power (last visited June 25, 2013).

72 *See, e.g.,* New England Breeze, LLC, *Net Metering and Municipal Utilities,* The Energy Mizer #29, July 26, 2009, *available at* http://newenglandcleanenergy.com/newsletters/29-net-metering-explained_2009_07.htm.

73 Ark. Code Ann. § 23-18-604 (requiring that all electric utilities offer net metering); *id.* § 23-18-603(2) (defining "electric utility" to include municipal utilities); Colo. Rev. Stat. § 40-2-124(7); La. Rev. Stat. Ann. § 51:3063(A) ("An electric utility that offers residential or commercial electrical service, or both, shall allow net energy metering facilities to be interconnected using a meter capable of registering the flow of electricity in two directions"); *id.* § 51:3062(2) (defining "electric utility" to include municipal utilities); Assem. Bill 2165, Reg. Sess., 2012 Cal. Stat. (requiring that every electrical company offer net metering).

must allow net metering. For example, Colorado exempts municipal utilities with fewer than 5,000 customers and requires that municipal utilities allow net metering only for up to 10 kW from residential customers and 25 kW from commercial and industrial customers.[74] Even though this approach still limits net metering by municipal utilities to some extent, it has the advantages of providing certainty and uniformity across the state.

Massachusetts should encourage municipal utilities to adopt net metering. DPU can provide technical support to utilities that want to develop net metering programs. If most municipal utilities still do not adopt net metering, the legislature should consider mandating that municipal utilities offer net metering. To account for the greater challenge posed by net metering to smaller utilities, the legislature could include limits on the mandate along the lines of Colorado's. In this way, the state could further encourage the installation of distributed renewable energy generation capacity while minimizing the challenges for municipal utilities.

6. Promote the Use of Carbon Offsets to Protect Forests.

Adopt the proposed revisions to the RGGI Forestry Protocol and promote the use of carbon offsets for land conservation and carbon sequestration by forest landowners.

The forests of Massachusetts are an important reservoir of carbon dioxide and their preservation is a potentially significant climate change mitigation tool. From the colonial era to the middle of the nineteenth century, the percentage of the Commonwealth covered by forests declined from more than 90% to less than 50% as land was cleared for agriculture. In the century and a half since then, however, Massachusetts forests have staged a remarkable comeback, and approximately 80% of the state is forested today.[75] These forests function as large sinks of carbon dioxide; one study estimated that Massachusetts forests sequestered an average of 955,064 metric tons of carbon dioxide per year between 1998 and 2005.[76]

74 Colo. Rev. Stat. § 40-2-124(7).

75 David R. Foster & John D. Aber, *Background and Framework for Long-term Ecological Research*, *in* Forests in Time: The Environmental Consequences of 1,000 Years of Change in New England 3, 10 (David R. Foster & John D. Aber eds., 2006). A different, more recent survey estimated the percentage of forest cover as only 63%, however. USDA Forest Service, *An Assessment of the Forest Resources of Massachusetts* (2010), *available at* http://www.mass.gov/dcr/stewardship/forestry/docs/Assessment_of_Forest_Resources.pdf.

76 Minda Berbeco & Colin Orians, *Carbon Sequestration in Massachusetts Forests as an Offset for Energy Sector Carbon Dioxide Emissions* 7 (2009), Paper Presented at NARUC/NCEP Climate Conference: The Utility of the Future in a Carbon Constrained World, *available at* http://www.naruc.org/publications/BERBECO-%20Panel%205.pdf. The Congressional Budget office has estimated that U.S. forests have the potential, with appropriate policies, to remove between 40 and 60 billion metric tons of carbon dioxide from the atmosphere over the next 50 years. Congressional Budget Office, *The Potential for Carbon Sequestration in the United States* 2 (2007), *available at* http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/86xx/doc8624/09-12-carbonsequestration.

The current level of forest cover nevertheless represents a decline from a peak of over 85% in 1950 and various threats have placed the forests of Massachusetts and of New England more generally back on a downward trajectory.[77] Massachusetts should take advantage of carbon markets to promote the preservation of forestland. In particular, Massachusetts should (1) work to ensure that the revised RGGI forestry protocol is adopted and (2) work with stakeholders to educate landowners about the benefits of selling forest conservation offsets in both the RGGI and California markets.

At the moment, RGGI allows offsets to be issued only for afforestation—tree planting—projects. In February 2013, however, RGGI released an updated forest offsets protocol as part of its revisions to the RGGI model rule.[78] The revised protocol will allow the issuance of offsets for actively managed forests which are subjected to management protocols that ensure that more carbon is sequestered and for forests that would otherwise have been converted to non-forest uses.[79] Under the latter, "avoided conversion," type of project, the landowner must commit to protect the land from forest clearance for at least 100 years. The revised protocol should allow many more landowners to participate in the RGGI offset market because lands with existing forests are now eligible for offsets. As a result, it will allow offsets to be used as a tool for protecting the state's existing forests. DEP should revise its regulations to allow Massachusetts landowners to take advantage of the revised protocol.

In addition, Massachusetts should work with educational institutions, carbon market professionals, and other stakeholders to educate forest landowners about the benefits of participating in carbon markets. The private landowners who own 78% of the Massachusetts forest base[80] should be a primary target for this educational campaign. This educational campaign should focus not only on the revised RGGI forestry protocol, but also on the ability of Massachusetts forest landowners to sell offsets into the California cap-and-trade market. Offsets are currently trading at a significantly higher price in the California market than in RGGI and California also has a higher cap for the number of offsets that can be sold into its market.[81] The California market therefore may provide an even stronger financial

---

pdf.

77 David R. Foster, et al., Wildlands & Woodlands: A Vision for the New England Landscape 9-11 (2010).

78 *See* RGGI, *Offset Protocol, U.S. Forest Projects* (2013), *available at* http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Forest_Protocol_FINAL.pdf; RGGI, *Summary of RGGI Model Rule Changes: February 2013* (2013), *available at* http://www.rggi.org/docs/ProgramReview/_FinalProgramReviewMaterials/Model_Rule_Summary.pdf.

79 RGGI, *Offset Protocol*, *supra* note 78, at 9.

80 Family Forest Research Center, *The Potential for Carbon Sequestration on Family Forestland*, http://www.familyforestresearchcenter.org/projects/carbon.html (last visited June 25, 2013).

81 California allowances sold for $14.00 at its most recent auction in May 2013. Cal. Air Resources Bd., *Quarterly Auction 3, May 2013: Summary Results Report* 1 (2013), *available at* http://www.arb.ca.gov/cc/capandtrade/

incentive than RGGI for forest landowners to increase carbon sequestration on their land.

In assessing the role of forest carbon offsets in meeting the Commonwealth's progress toward its 2020 and 2050 goals, EOEEA will need to determine the appropriate accounting mechanisms. For example, when these offsets are sold into the RGGI market, EOEEA should ensure that the emissions reductions are not in effect double-counted.

B. Challenging but Worthwhile Options.

This section discusses a number of approaches that could have significant climate change mitigation benefits, but that face hurdles to implementation. These hurdles vary: some options are expensive, others appear politically challenging, and some require longer periods of time to execute. Nevertheless, their benefits justify the costs, and we recommend that the Commonwealth include them in revisions to the 2020 Plan.

7. Bus Rapid Transit and Increased Bus Electrification.

Investigate the possibility of converting more lines to bus rapid transit and replacing diesel buses with electric trolley buses.

Public transportation results in GHG emissions considerably lower than individual travel by automobile. To generate the substantial emissions reductions associated with shifting commuters from automobiles to public transportation while minimizing capital costs, the Commonwealth should focus on increasing the speed and convenience of travel by bus. Further emissions reductions can be achieved by expanding electrification of the bus fleet. The following three measures are presented in order of increasing cost and complexity of implementation.

First, a near-term, inexpensive approach is to target high-use bus lines and implement temporary bus lanes during rush hours.[82] This result could be achieved simply by prohibiting parking in the curb lane and dedicating this lane to buses and right-turning vehicles during the morning and evening

auction/may-2013/results.pdf. By contrast, RGGI allowances sold for $3.21 at its June 5, 2013 auction. Press Release, RGGI, 38.7 Million CO_2 Allowances Sold at 20th RGGI Auction (June 7, 2013), *available at* http://www.rggi.org/docs/Auctions/20/PR060713_Auction20.pdf. In California, offsets are limited to 8% of an entity's total compliance obligation, while RGGI sets this limit at 3.3%. *See* Cal. Code Regs., tit. 17, §95854 (2013); RGGI, *CO2 Offsets*, *available at* http://www.rggi.org/market/offsets. (last visited June 20, 2013)

82 We recognize and applaud the steps that the MBTA is taking to improve the speed and reliability of many of its bus routes through the Key Bus Route Improvement Program. *See* MBTA, *Key Bus Route Improvement Program*, http://www.mbta.com/about_the_mbta/t_projects/default.asp?id=19047 (last visited June 25, 2013). These improvements include bus stop location improvements, transit signal priority, and queue jump lanes. Our proposals are intended to build upon these initial steps.

rush hours. This approach has already been adopted in some cities, including San Francisco and Chicago.[83]

Second, the Commonwealth should examine the introduction of more bus rapid transit (BRT) routes. Key features of BRT include:[84]

- Dedicated busways, bus lanes and rights of way;
- Use of intelligent transportation systems (ITS) to coordinate buses;
- High-frequency services;
- Enclosed bus stations;
- High-capacity buses; and
- Integration into existing transit infrastructure and ticketing.

Coordinated infrastructure and use of advanced communications technology enables BRT buses to travel much faster and more efficiently than regular buses—typically from 17 to 30 mph, an improvement of 15-25% over regular buses[85]—and integrated or smart ticketing significantly reduces bus loading times. Well-developed bus stations, ticketing, provision of real-time information and branding/identity enhancement provide incentives for customers to use BRT over traditional bus systems—resulting, generally, in ridership gains of between 5% and 25%.[86] The increase in passengers per bus further reduces VMT and associated CO_2 emissions.

Compared to other public transit options, such as subways, streetcars, and light rail, BRT typically involves a low capital cost per mile investment.[87] Because of the density of development in many urban areas in the Commonwealth and limited public funds, BRT is therefore the form of high-speed public transportation most likely to be implemented in many areas. While BRT is easier to implement than light rail, BRT is not as fast or reliable as light rail. For environmental justice communities, long

83 San Francisco Municipal Transportation Agency (SFMTA) has a pilot project of transit-only lanes, which are painted red for clear indication. *See* SFMTA, *Church Street Transit-Only Lane Pilot*, http://www.sfmta.com/projects-planning/projects/church-street-transit-only-lane-pilot (last visited June 25, 2013). Chicago Transit Authority has a new bus service that features dedicated bus lanes during rush hour. *See* CTA, *Jump: Reliable, Easy, Fast*, http://www.transitchicago.com/jump/ (last visited June 25, 2013).

84 *See* Federal Transit Admin., Characteristics of Bus Rapid Transit for Decision-Making, at 2-1 (2004), *available at* http://www.nbrti.org/docs/pdf/Characteristics_BRT_Decision-Making.pdf.

85 *Id.* at ES-5, ES-7 (2004).

86 *See id.* at ES-1, ES-6.

87 *Id.* at ES-6.

underserved by efficient public transit, BRT may not be the preferred option.

In Massachusetts, a first step toward BRT has already been established: the Silver Line Phase II. The Silver Line also indicates how BRT could be combined with bus electrification, for further emissions savings. An assessment by the Institute for Transportation and Development Policy, however, did not classify the Silver Line as "true" BRT, noting that for much of its length the line has no dedicated right-of-way and in some cases has proven slower than the bus line it replaced.[88] New BRT development should guard against the gradual stripping away of BRT features in the implementation process—a phenomenon known as "BRT creep." A significant part of this BRT expansion could occur through the Boston Urban Ring project (see below).

Third, the Commonwealth could upgrade the public transportation vehicle fleet to include more efficient vehicles. Among the MBTA's fleet of buses, the diversity of fuel sources used means that some buses are much more energy-efficient than others. Of the 1052 active MBTA buses, approximately 34 use compressed natural gas (CNG) and 6% use electricity (half of these, dual-mode buses on the Silver Line, can use either diesel or electricity)[89] The remainder use diesel, mostly Emissions-Controlled Diesel (ECD), which emit lower levels of nitrogen oxides (NOx), particulate matter, and sulfur dioxide than conventional diesel engines.[90] The approximately 25 electric buses are confined to routes equipped with overhead lines—former streetcar lines known as "trolley bus" lines.

CNG buses have lower tailpipe GHG emissions than diesel buses, but a comparison of lifecycle emissions is complicated because of uncertainties about the rate of methane leakage associated with natural gas extraction, transmission, and distribution.[91] Fully electric trolley buses, however, have lower lifecycle GHG emission rates than both CNG and diesel.[92] As Massachusetts increasingly generates its electricity from renewable or low-carbon sources, this advantage will only increase.

88 Annie Weinstock, et al., Institute for Transportation and Development Policy, *Recapturing Global Leadership in Bus Rapid Transit: A Survey of Select U.S. Cities* 46 (2011), *available at* http://www.itdp.org/documents/20110526ITDP_USBRT_Report-HR.pdf.

89 Boston Transit eMuseum, *The MBTA Vehicle Inventory Page*, http://www.transithistory.org/roster (last visited June 25, 2013); Kavanagh Transit Systems, *Boston Transit: Trolley Buses/Silver Line*, http://www.ktransit.com/transit/NAmerica/useast/boston/boston-etb.htm (last visited June 25, 2013).

90 MBTA, *MBTA Scorecard 2* (Nov. 2009), *available at* http://www.mbta.com/uploadedfiles/About_the_T/Score_Card/ScoreCard-2009-11.pdf.

91 Alternative Fuels Data Center, U.S. Dep't of Energy. *Natural Gas Vehicle Emissions*, http://www.afdc.energy.gov/vehicles/natural_gas_emissions.html (last visited June 25, 2013).

92 *See* for example, King County Metro's evaluation of electrified trolleys in the greater Seattle area. King County Metro, *King County Trolley Bus Evaluation*, 1-5 (2011), *available at* http://metro.kingcounty.gov/up/projects/pdf/Metro_TB_20110527_Final_LowRes.pdf.

Trolley buses are not, of course, without disadvantages—they are relatively inflexible in that they rely on overhead wires and thus cannot be easily re-routed, and they can be stranded if dewirement occurs. However, recent developments in hybrid designs have allowed trolleys equipped with batteries or diesel engines to move fairly long distances away from the wires. Such hybrid systems have been deployed on a wide scale in cities such as San Francisco[93] and Vancouver.[94] The MBTA itself uses a small number of dual-mode buses on the Silver Line Phase II.

The MBTA should research the feasibility of converting more bus routes into electric-powered trolley buses. If research suggests it is feasible, the Commonwealth could provide for the electrification of bus routes in other transit authorities throughout Massachusetts.

8. Providing Incentives to Phase Out Home Heating Oil Use

Encourage the adoption of renewable fuel sources, and phase out the dirtiest-burning grades of heating oil.

Massachusetts is one of a small number of states in which a significant percentage of buildings still use oil as the fuel for heating. 31.8% of Massachusetts homes currently use heating oil, compared to 6.5% nationwide.[95] Heating oil produces significantly greater GHG emissions per unit of heat produced than do renewable fuels or even natural gas.[96] Heating oil, especially the dirtier No. 4 and No. 6 grades, also produces significantly more local air pollution, especially particulate matter (soot), with consequences for public health.[97]

The Commonwealth should examine strategies to reduce the number of buildings using heating oil. The City of New York took an initial step in this direction in 2011, when it adopted a regulation

93 *See* San Francisco Municipal Transit Authority, *Trolley Buses*, http://www.sfmta.com/cms/mfleet/trolley.htm (last visited June 18, 2013).

94 Christopher Reynolds, *TransLink Signs Deal for 25 New Hybrid Buses*, Vancouver Sun, July 20, 2012.

95 U.S. Energy Info. Admin., *Massachusetts State Energy Profile*, http://www.eia.gov/state/print.cfm?sid=MA (last visited June 25, 2013) (2011 data). Massachusetts is the second-largest consumer of residential heating oil, after New York. U.S. Energy Info. Admin., *Distillate Fuel Oil Consumption Estimates, 2011*, http://www.eia.gov/state/seds/data.cfm?incfile=/state/seds/sep_fuel/html/fuel_use_df.html (last visited June 25, 2013).

96 Heating oil emits 161.3 lb CO_2/million Btu energy, compared to 117.0 lb CO_2/million Btu energy for natural gas. *See* EIA, *Carbon Dioxide Emission Coefficients*, http://www.eia.gov/environment/emissions/co2_vol_mass.cfm (last visited June 25, 2013).

97 *See* Mireya Navarro, *City Issues Rule to Ban Dirtiest Oils at Buildings*, N.Y. Times, Apr. 21, 2011, *available at* http://www.nytimes.com/2011/04/22/nyregion/new-york-city-bans-dirtiest-heating-oils-at-buildings.html. For example, in New York City, the 1% of buildings burning No. 4 and No.6 heating oil are responsible for 85% of all building-produced soot. *Id.*

requiring the phase-out of No. 4 and No. 6 heating oils by 2030.[98] DEP, using its statutory authority over ensuring air quality, could promulgate regulations similar to those in New York City, requiring No. 4 and No. 6 heating oils to be replaced with renewable sources of energy, natural gas or the cleaner No. 2 oil.

The best outcome would be if oil was replaced by renewable sources of energy. Where that is not feasible, and where pipelines already exist, it may be appropriate to encourage the switch from oil to natural gas. In recent years, the lower cost of natural gas and utility incentives have encouraged some homeowners to make the switch.[99] The high up-front conversion costs can nevertheless be a significant impediment, particularly for lower-income households or for larger buildings.[100] Rather than instituting a regulatory mandate, therefore, the state should look at developing incentives and assistance programs, perhaps funded in part through RGGI proceeds.

9. Smart Planning Coordination and the Urban Ring Project.

Provide more coordinated support for smart growth and planning in towns and cities through an initiative modeled after the Green Communities Division. Consider moving forward with the Urban Ring Project.

In the long run, patterns of urban and suburban development and design have an important impact on energy use and consumption. Choices and investments made now will effectively lock in patterns of growth and lifestyle behavior for many years to come. The general thinking about how to plan cities and towns smartly – increased density, mass transit networks as development hubs, "complete streets" planning, creating green spaces, and the like—is well known and accepted, and is recognized in the 2020 Plan. But smart planning and development is challenging for the state to promote, because many of the legal changes involved are zoning issues, which are primarily a matter of local authority.

The Commonwealth should therefore continue to work with local governments through its existing

98 *See id.*; New York, N.Y., R.C.N.Y. tit. 15, ch. 2 (2011), *available at* http://www.nyc.gov/html/dep/pdf/air/heating_oil_rule.pdf.

99 *See* Diane Cardwell & Clifford Krauss, *As Price of Oil Soars, Users Shiver and Cross Their Fingers,* N.Y. Times, Jan. 21, 2012, *available at* http://www.nytimes.com/2012/01/22/business/heating-oil-costs-surge-and-many-in-northeast-cant-switch.html?pagewanted=all; Steve Adams, *Massachusetts Homeowners Switching from Oil Heat to Gas,* The Patriot Ledger (Quincy, Ma.), June 3, 2012 ("More than 2,000 homeowners in NStar's territory of 50 Massachusetts communities converted to natural gas in 2011, compared with an average of 713 in each of the previous eight years."), *available at* http://www.patriotledger.com/topstories/x1982680168/Massachusetts-homeowners-switching-from-oil-heat-to-gas.

100 *See* Cardwell & Krauss, *supra* note 99; Adams, *supra* note 99 ("Installation costs can run as high as $12,000, depending upon whether a line needs to be run to the street.").

policies (such as the Compact Neighborhoods Policy and Chapter 40R) that incentivize dense growth and mixed-use zoning.[101] Going a step further, the state government could implement a more coordinated Smart Growth Initiative, along the lines of the Green Communities Division.[102] Obtaining a commitment from local governments to implement "best practice" standards for zoning and planning would encourage a higher degree of uniformity and coordination in smart growth planning. Projects spanning multiple towns could also be made possible by funding from this Initiative.

One concrete, but stalled, effort at smart planning is the DOT's Urban Ring Project. The Urban Ring would help overcome the limitations of the current "hub and spoke" public transit model, which for many Boston-area travelers requires inefficient, indirect mass transit travel to reach their destinations. Providing vital "circumferential mobility" in the Greater Boston area, the Urban Ring would create a circular mass transit corridor to provide faster and more direct high-volume transport between established areas of urban density, growth areas and important facilities/activity centers in Boston, Brookline, Cambridge, Chelsea, Everett, Medford and Somerville.[103]

The growth of new residential, commercial and institutional development in the Urban Ring zone in recent years has intensified the need for faster and more efficient public transport.[104] Improving mass transit between areas on the Urban Ring could significantly lower VMT.[105] The Urban Ring development would also have significant quality of life and productivity impacts by improving efficiency and interconnection of services, decreasing overcrowding and congestion on existing services in central Boston, cutting transit times for commuters and other travelers, improving air quality, and sparking economic development in the areas served by the new system.[106]

Although the project involves significant infrastructure development and cost (estimated in 2008 at $2.4 billion), this type of integrated planning, involving or complementing several elements proposed elsewhere in this paper (such as smart growth planning, bus rapid transit, and congestion charges), will

101 M.G.L. c. 40R, §§ 1-14; Mass. Dep't of Housing & Econ. Dev., *Compact Neighborhoods Policy* (2012), *available at* http://www.mass.gov/hed/docs/dhcd/cd/ch40r/compact-neighborhoodspolicy.pdf.

102 EOEEA, *Green Communities*, http://www.mass.gov/eea/energy-utilities-clean-tech/green-communities/ (last visited June 25, 2013).

103 Massachusetts Dep't of Transp., *Circumferential Transportation Improvements in the Urban Ring Corridor: Revised Draft Environmental Impact Report* ES-1 – ES-7 (2008), *available at* http://www.massdot.state.ma.us/theurbanring/downloads/RDEIR_ExecutiveSummary.pdf.

104 *Id.* at ES-4 – ES-5.

105 The 2008 Draft Environmental Impact Report on the Urban Ring projected that the project would lead to an estimated reduction of 189,400 VMT *every day*. *Id.* at ES-21.

106 *Id.* at ES 4 – ES-5; ES-15.

likely be necessary to achieve the Commonwealth's longer-term goals for emissions reductions by 2050. The Commonwealth should therefore reopen consideration of the Urban Ring project.

C. Revenue-Positive Actions.

Several of the items described above involve significant expenditures. We have therefore also examined options that combine GHG emissions reductions with the generation of revenue for the state or local governments.

10. Increasing Vehicle Registration Fees and Excise Taxation.

Increase the vehicle registration fee and excise taxation of motor vehicles.

Massachusetts residents currently pay a variety of fees (vehicle registration, driver's license, and annual inspection) to be able to drive a motor vehicle in the Commonwealth. Vehicle owners must also pay an annual Motor Vehicle Excise Tax, a type of personal property tax whose revenues go to the municipality in which the owner resides.[107] The Excise Tax rate has not been increased in thirty years.[108] By increasing these fees and/or the tax, the state can increase the cost of car ownership, thereby reducing automobile use and also raising funds that can be used for developing the public transportation and/or electric vehicle infrastructure. In addition, these fees and tax can be modified to favor more fuel-efficient vehicles.

In January 2013, the Massachusetts Department of Transportation (DOT) released a report suggesting that, if the tax increases proposed by the Governor in his FY2014 budget do not occur, the DOT will raise revenue by increasing vehicle registration fees by $53, drivers license fees by $86, and annual vehicle inspection fees by $19.[109] We support this move to increase the costs associated with having a car. In addition, DOT should consider providing exemptions from the fee increase for electric vehicles (EVs), to incentivize EV ownership, and for low-income car owners, to reduce equity concerns. Furthermore, ownership of multiple cars could be discouraged by implementing an additional registration fee increase for any car beyond the first one registered at an address.

Currently, the excise tax is $25 per thousand dollars of assessed value.[110] This tax has not been in-

107 M.G.L. c. 60A, § 1.

108 Mass. Secretary of State, *Motor Vehicle Excise Information*, http://www.sec.state.ma.us/cis/cisexc/excidx.htm (last visited June 19, 2013).

109 Massachusetts Dep't of Transp., *The Way Forward: A 21st Century Transportation Plan* (2013), *available at* http://www.mass.gov/governor/docs/way-forward-21-century-transportation-plan.pdf.

110 The tax is assessed according to a schedule under which the assessed value is a percentage of the list price of the vehicle: 90% in the year of manufacture, 60% in the second year, 40% in the third year, 25% in the fourth year,

creased since 1981, so an adjustment now, thirty years later, could be politically feasible.[111] With over 5.4 million private vehicles registered in Massachusetts, even a slight increase in the tax per thousand dollars of assessed value would gain significant revenue for municipalities.[112] The additional revenue could be spent on GHG emissions reduction strategies, such as municipal EV fleets and infrastructure, bike lanes, or sidewalk improvements.

11. Increasing and Diversifying Road Tolls.

Impose new tolls, increase existing tolls, and consider imposing a general congestion charge on Boston's central business district or within the 128 perimeter.

Road tolls can reduce driving-related emissions by increasing the cost of driving and therefore encouraging commuters to take public transportation, carpool, telecommute, or move to a home closer to their workplace. Tolls can also be a significant source of revenue that can be used to fund the additional public transportation infrastructure that will be needed if commuters are diverted from driving in large numbers.[113]

Massachusetts currently charges road tolls for use of the Massachusetts Turnpike, two of the Boston Harbor tunnels (the Sumner and Ted Williams tunnels), and the Tobin Memorial Bridge.[114] This system has been criticized as inequitable, as commuters from some areas must pay tolls when they drive while others do not.[115]

Therefore, a first option is to increase the number of roads on which tolls are charged, possibly in combination with increasing the toll amount. This approach would distribute the costs of tolls more equitably, generate more revenue in the short term, and discourage more people from driving in the long term.

Because it would be both expensive and inconvenient to build toll booths on other roads, this expansion

---

and 10% in the fifth year and subsequent years. M.G.L. c. 60A, § 1. For a vehicle with a list price of $25,000, therefore, the first-year excise tax is $562.50.

111 Mass. Secretary of State, *Motor Vehicle Excise Information*, http://www.sec.state.ma.us/cis/cisexc/excidx.htm (last visited June 19, 2013).

112 Federal Highway Admin., *Highway Statistics 2011*, http://www.fhwa.dot.gov/policyinformation/statistics/2011/mv1.cfm (last visited May 16, 2013).

113 These two benefits of road tolls are obviously in tension with each other: the more that tolls deter people from driving, the less revenue they will generate. But because tolls will not stop all people from driving, they can both reduce driving to some degree and generate some revenue.

114 Mass. Dep't of Transp., *Toll Calculator*, http://www.massdot.state.ma.us/highway/TollCalculator.aspx (last visited June 19, 2013).

115 *See, e.g.*, Editorial, *Our View: Fight to Fix Toll Inequity Isn't Over Yet*, Salem News, Aug. 20, 2009.

should be combined with "open road tolling." Under this approach, the road has no cash collection booths; instead, holders of E-ZPasses have their toll automatically deducted from their accounts, while others receive bills periodically sent to the address at which a vehicle is registered.[116] DOT has already planned a pilot of open-road tolling on the Tobin Bridge later this year,[117] and hopes to transition fully to open-road tolling by mid-2015.[118]

Another option would be to impose a congestion charge on central Boston. This approach involves charging a fee for access to a particular geographic area, rather than for use of a specific road, as with conventional tolls. A congestion charge could be particularly effective given alternative modes of transportation are already available in the Boston Central Business District and the surrounding suburbs/cities through the MBTA and the Hubway bike share program, thereby offering alternatives for people who are discouraged from driving by the charge.

Congestion charges have been adopted elsewhere in the world and in some cases have had considerable success in reducing traffic and automobile usage.[119] Singapore was the first country to adopt such a daily charge scheme in 1975.[120] London is perhaps the best-known example of congestion charging—since 2003, drivers have had to pay a daily charge to enter a 22-square-kilometer area in the center of London between 7:00 am and 6:30 pm on weekdays.[121] In London, the congestion charge system has reduced inner-city traffic by 12%, of which 50-60% of travelers shifted to public transport, and total vehicle miles travelled declined by 147 million miles (237 million kilometers) per year, resulting in emissions reductions of 132,000 tons of CO_2/year.[122] Various studies have predicted similar benefits if congestion charges were introduced in other metropolitan areas. For example, a 2007 study estimated that CO_2 emissions in Copenhagen could be reduced by 0.013-1.5 million tons CO_2/year by imposing a congestion charge.[123] Congestion charges have significant benefits in addition to reducing GHG emissions: they reduce traffic congestion, conventional air pollution, and traffic noise. Similar results could be achieved

116 Martine Powers, *Electronic Toll Collection Soon Coming to Tobin Bridge*, Boston Globe, Mar. 3, 2013.

117 *Id.*

118 *Davey: Open-Road Tolling Installed by Mid-2015*, CBS Boston, May 7, 2013, http://boston.cbslocal.com/2013/05/07/davey-open-road-tolling-installed-by-mid-2015.

119 Govindra R. Timilsina & Hari B. Dulal, World Bank Development Research Group, Fiscal Policy Instruments for Reducing Congestion and Atmospheric Emissions in the Transport Sector (2008), *available at* https://openknowledge.worldbank.org/bitstream/handle/10986/6872/wps4652.pdf?sequence=1.

120 *Id.* at 5-6.

121 *Id.* at 6.

122 Reg Evans, *Central London Congestion Charging Scheme: Ex-post Evaluation of the Quantified Impacts of the Original Scheme* 17 (2007), *available at* http://www.tfl.gov.uk/assets/downloads/Ex-post-evaluation-of-quantified-impacts-of-original-scheme-07-June.pdf.

123 *See* Timilsina & Dulal, *supra* note 119, at 9.

by imposing a congestion charge on ingress routes around the Boston Central Business District and perhaps inside the Route 128 perimeter.

12. Establishing a Larger Increase in the State Gasoline Tax.

Increase the gas tax levied by the state for every gallon of gasoline (and diesel) purchased.

Increasing the state gas tax would influence consumer behavior and travel choices, including incentivizing a switch to mass transit. Based on evidence from California, the Congressional Budget Office (CBO) has confirmed the conventional wisdom that motorists adjust to higher gas prices by making fewer trips, driving more slowly, and buying more fuel-efficient vehicles.[124] On weekdays during the CBO study period, for every 50-cent increase in the price of gasoline the number of freeway trips declined by about 0.7% in areas where rail transit was a nearby substitute for driving. From 2003-2007, higher gas prices led to a decline in gas consumption in 8 of 10 quarters.[125] It should be noted, however, that increases in fuel efficiency can reduce drivers' sensitivity/elasticity to price.[126]

Gas prices around the world are, in general, significantly higher than in Massachusetts and the United States. Among the countries of the Organization for Economic Co-operation and Development (OECD), only Mexico has lower gasoline taxes than the United States.[127] In many European countries, in fact, the tax on gasoline is greater than the total price of gasoline in the United States.[128]

In Massachusetts, the state gas tax was recently raised by three cents,[129] after remaining at $0.21 per gallon for over twenty years.[130] Although this increase is a welcome start, it is still an exceedingly modest one. A larger increase in the tax would both have a more significant impact on residents' travel choices and also bring in significant revenue for the Commonwealth. Given the July 2013

124 Congressional Budget Office, *Effects of Gasoline Prices on Driving Behavior and Vehicle Markets* IX-XIII (2008), *available at* http://www.cbo.gov/sites/default/files/cbofiles/ftpdocs/88xx/doc8893/01-14-gasolineprices.pdf.; *see also* Kenneth Gillingham, *Identifying the Elasticity of Driving: Evidence from a Gasoline Price Shock in California* (2013), *available at* http://www.yale.edu/gillingham/Gillingham_IdentifyingElasticityDriving.pdf.

125 Congressional Budget Office, *supra* note 124, at XII.

126 *Id.* at X-XI.

127 DOE Alternative Fuels Data Center, *Maps & Data: Fuel Taxes by Country*, http://www.afdc.energy.gov/data/tab/all/data_set/10327 (last visited May 22, 2013).

128 Derek Thompson, *Gas Prices Around the World: Cheaper than Water* and *$10 a Gallon*, The Atlantic, May 3, 2011, http://www.theatlantic.com/business/archive/2011/05/gas-prices-around-the-world-cheaper-than-water-i-and-i-10-a-gallon/238226.

129 Mass. Acts 2013, c. 46, § 43 (amending M.G.L. c. 64A, § 1).

130 American Petroleum Institute, *State Motor Fuel Taxes 2013*, at 22, *available at* http://www.api.org/oil-and-natural-gas-overview/industry-economics/~/media/Files/Statistics/StateMotorFuel_OnePagers.pdf. Similarly, the federal gas tax of $0.184 per gallon was last raised in the Omnibus Budget Reconciliation Act of 1993.

legislative override of the Governor's proposal to further raise the gas taxes, we recognize this is not likely to happen in the near term. According to the US Energy Information Administration, 66.2 million barrels of gasoline are currently consumed in Massachusetts each year.[131] According to an analysis by the Conservation Law Foundation, simply indexing the gas tax to the consumer price index would bring in an estimated $1.3 billion in cumulative additional revenue through 2020.[132] Larger increases to the gas tax would bring in even more money: a $0.20 per gallon increase would raise an additional $600 million each year, $0.30 per gallon $900 million, and $0.50 per gallon $1.5 billion.[133] Because, according to its law, Massachusetts, like many other states, must spend revenue from the gas tax for "transportation-related purposes",[134] these revenues could be invested in public transportation upgrades, including commuter rail transport and the Urban Ring.

There are challenges associated with increasing the gas tax. Most significantly, it is politically unpopular to increase any tax, including the gas tax. While recognizing that a gas tax increase might not be feasible in the short-term, a bill proposing an increase in the tax is more likely to be successful if it addresses the criticisms listed below. It can also be promoted as a market-based mechanism to address motor vehicle emissions.

Increasing the gas tax will not shift travelers to public transportation unless they have an adequate public transportation option available to them. It is therefore essential that some of the revenues from an increased gasoline tax be directed to maintaining and expanding the public transportation system.

The gas tax is also subject to criticism as a regressive tax, hitting residents who cannot afford to live close to work or buy fuel-efficient vehicles the hardest. Any increase should therefore be offset by tax credits for low-income households or a similar mechanism to minimize its adverse distributional effects.

As vehicle efficiency increases and VMT declines, the revenue from the gas tax will also decrease. This is ultimately a positive outcome, however, and also does not detract from the significant revenue that could be raised in the near term.

131 *See* US Energy Information Administration, *Massachusetts State Energy Profile*, http://www.eia.gov/state/print.cfm?sid=MA (last visited May 22, 2013). The state brought in $688 million from all motor vehicle fuel taxes last year. *See* Massachusetts FY 2012 Budget, *available at* http://www.malegislature.gov/Budget/PriorBudget/2012.

132 Conservation Law Foundation, *supra* note 65, at 170.

133 *Id.* The calculation does not account for the expected reduction in driving resulting from the increased price.

134 M.G.L. c. 64E, § 13.

CONCLUSION

The Commonwealth has already taken significant steps towards meeting its goal of reducing GHG emissions by 25 percent by 2020. To ensure that this target is not missed and to make progress on the significantly greater cuts needed by 2050, however, more can and should be done. This report highlights several concrete steps that the Patrick administration and the legislature can take to build on the 2020 Plan. By adopting these recommendations, the Commonwealth can maintain its leadership role in combating climate change and transitioning to a clean energy economy.

Emmett Environmental Law & Policy Clinic
Harvard Law School
6 Everett Street, Suite 4119
Cambridge, MA 02138
Phone +1-617-496-2058
Fax +1-617-384-7633

The Emmett Environmental Law & Policy Clinic at Harvard Law School is directed by Wendy B. Jacobs and is dedicated to addressing major environmental issues in the United States and abroad and to providing its students an opportunity to do meaningful, hands-on environmental legal and policy work. Students and clinic staff work on issues such as climate change, pollution reduction, water protection and smart growth.