

# **Analysis of Carbon Pricing as a Mechanism to Reduce GHG Emissions in Massachusetts<sup>1</sup>**

## **Summary**

July 2015, Marc Breslow, Ph.D.

### **I. Overview and Policy Context**

In 2014 the Massachusetts Department of Energy Resources (DOER) commissioned a study to analyze how a revenue-neutral carbon fee (or tax) could be implemented in the Commonwealth. The present document summarizes that study.

A carbon fee/tax creates a price for emitting carbon dioxide to the atmosphere, providing a disincentive to burning fossil fuels. Such a carbon charge would contribute to meeting the mandates of the Global Warming Solutions Act (GWSA) of 2008 and the roadmap set by the Massachusetts Clean Energy and Climate Plan for 2020. These documents require the state to reduce its greenhouse gas (GHG) emissions to 25% below the 1990 level by 2020 and to at least 80% below 1990 by 2050.

DOER requested the carbon price to be revenue-neutral, so that the residents, companies, and other institutions of the Commonwealth would receive back via tax cuts or rebates as much money as they are paying in carbon taxes. Our modeling is designed on this basis, and estimates the net impacts from the combination of a fee/tax along with returning all the funds to the public.

British Columbia (BC) provides a precedent for Massachusetts, having instituted a revenue-neutral carbon tax in 2008 that is now \$30/ton. Since 2008, BC cut its GHG emissions substantially compared to the rest of Canada, while experiencing economic growth slightly higher than the rest of its nation.

### **II. Design Issues in Applying the Fee/Tax**

We were guided by the following key principles in designing the tax and methods of returning the revenue to the public:

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<sup>1</sup> Based on “Analysis of a Carbon Fee or Tax as a Mechanism to Reduce GHG Emissions in Massachusetts,” Marc Breslow, Ph.D., Hamel Environmental Consulting, Sonia Hamel, Hamel Environmental Consulting, Patrick Luckow, Synapse Energy Economics, and Scott Nystrom, Regional Economic Models, Inc., prepared for the Massachusetts Department of Energy Resources, December 2014.

- **High potential to reduce GHG emissions** –a carbon tax should make a major contribution to achieving the state’s GHG reduction mandate for 2050.
- **Economy-wide** - cover all major sources of greenhouse gas (GHG) emissions; beginning with fossil fuels and the electricity generated by such fuels.
- **Revenue-neutral** – the DOER specified that this study should assume that all revenues from the tax would be returned to the public.
- **Gradual phase-in** - the tax should be phased-in over time so that households and businesses would have time to consider their options for reducing their costs and for adjusting their energy (carbon) use.
- **Protect vulnerable households** - this study proposes a method for rebating the carbon fee that, on average, will cover the increased costs experienced by low- and moderate-income households. It also proposes additional assistance to certain households with relatively high carbon emissions – those who live in areas where it is necessary to drive substantially more than average and those who use heating oil in their homes.
- **Protect business** – provide additional assistance to manufacturing industries that are energy-intensive and face competition from firms in untaxed jurisdictions

**Fee rate:** We modeled three price trajectories. In all three, the price begins at \$10/metric ton and rises \$5/year to reach \$30 in the fifth year. After that, we model low, medium, and high annual rate increases that result in the tax reaching \$50, \$75, or \$100 per ton in 2040.

**Where should the carbon fee be levied?** We have assumed that the tax would be imposed only on the major sources of fossil fuel combustion (oil, natural gas, gasoline, and coal) and on emissions from electricity generation. Due to the small contribution that electricity makes to reducing CO<sub>2</sub> emissions when the carbon tax is applied, exclusion of it from the fee/tax system should be considered. For each fossil fuel, we propose placing the fee at the point of first sale in Massachusetts, or on out-of-state suppliers where appropriate.

**Electricity generation and interactions with the Regional Greenhouse Gas Initiative (RGGI):** Implementing the tax on electricity involves complications due both to RGGI and to the regional nature of electricity supply. Given these difficulties, we conclude that if the carbon fee is imposed on electricity it should be applied directly to consumers at the retail level, based on average emissions in the New England region.

### III. How to Rebate the Carbon Fee Revenues

Key to the equity of the fee and its impact on the economy is how the revenues are returned to the public.

**How to return revenues to households:** We assume that the household sector as a whole receives as much money back as it pays in for the carbon tax. Households are “ranked” by their income levels, and divided into 5ths, with the lowest-income 5<sup>th</sup> called Quintile 1 and the highest income Quintile 5. We determined that reducing the rates of any of the major state and local taxes paid by

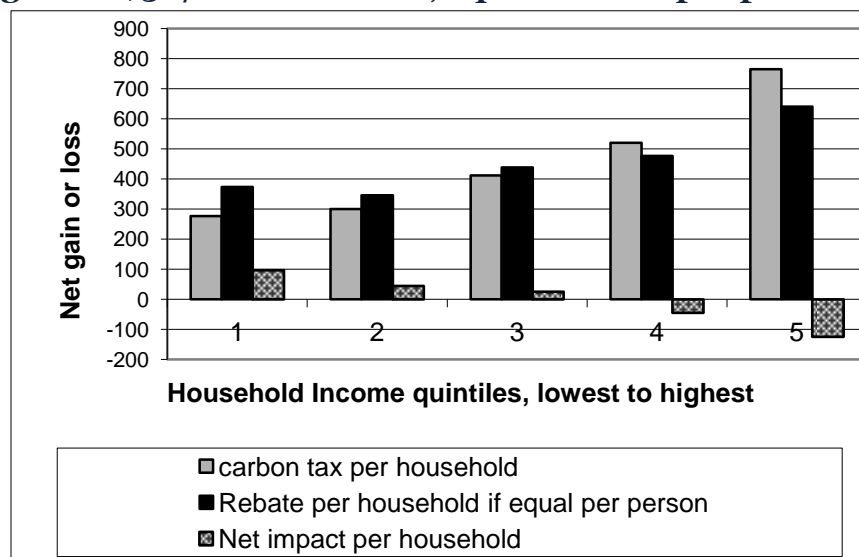
households – income, sales, or local property taxes – will not sufficiently protect lower-income households. Instead, we analyzed two scenarios for how to distribute the funds:

- 1) equal rebate payments per household
- 2) equal rebate payments per resident of the state

Under either rebate scenario, because energy use rises with income, on average households in the bottom two quintiles will have a net gain from the combination of tax and rebate, while quintile three will come out about even, quintile four will have a small loss, and quintile five (those households with the highest incomes) will have a net loss averaging about \$120 (in the 5<sup>th</sup> year, when the fee rate is \$30/metric ton). We conclude that the fairest system is to provide equal rebates per person; or to use a “mixed” system, such as equal rebates for the first member of a household and half as large a rebate for each additional member.

For the 91% of Massachusetts residents who live in households that pay state income taxes, the rebate could be provided either through a carbon tax credit or through a rebate outside the tax system. For the 9% of residents who do not pay state income taxes, rebates could be provided by either the Dept. of Revenue or through one of the existing programs that serve low-income households.

**Figure 1: \$30/metric ton tax, equal rebates per person**



**How to return funds to businesses and institutions:** We considered returning the funds according to an entity’s share of either total state employment or payroll. Using employment, we find that the net impact of the carbon tax combined with such rebates would be quite small impacts on most sectors of the economy, with the state’s dominant sectors, such as professional services, having small gains. A few sectors, such as construction and several manufacturing industries, would have noticeable net losses ranging from 0.1% to 0.4% of their total annual operating costs. The state’s largest manufacturing industry, computer and electronic products, would have a small net gain.

**Energy-intensive manufacturing:** The standard rebates related to employment or payroll will yield reasonable net impacts on most manufacturing industries. However, we recommend that the

state consider targeted rebates for particular manufacturing industries that have substantially higher than average carbon tax costs and face tight competition from firms in other states and nations.

#### IV. Macroeconomic Impacts

Overall, the carbon fee/tax has small but positive impacts on the Massachusetts economy. These include:

- **Jobs:** 2,000 to 4,000 additional jobs by 2020 and 6,000 to 15,000 by 2040; additional jobs and output would be concentrated in the service and technology sectors that already form the backbone of the Massachusetts state economy
- **Personal income:** greater real personal income in most of the scenarios tested, even adjusting for a slightly higher cost of living

Massachusetts performs well with a carbon fee and rebate primarily because the state imports nearly all of its fossil energy resources, draining billions from the state’s economy. Reducing fossil fuel use means those dollars will stay in the Massachusetts economy, leading to increased spending on other industries where much more of the money pays for in-state labor, services, and other costs.

#### V. Carbon Dioxide Emissions Impact

The effects on carbon dioxide emissions are greater than those on the state economy. The price incentive provided by the carbon tax would reduce state GHG emissions to a larger degree than almost every other Massachusetts program that currently serves this purpose. Emissions would fall by 5% to 10% compared to the base case, making a major contribution to reaching the state’s legal mandates.

**Figure 2: change in carbon dioxide emissions from 2013, with fee rates rising to \$50 (low), \$75 (medium), or \$100/ton (high) by 2040**

