Assessing Policies for Reducing Greenhouse Gas Emissions from Cars and Trucks

By Jillian Mallory

We continually hear of promising new technologies that could reduce our greenhouse gas emissions while allowing us to maintain our current standard of living. For instance, a car or truck that emits zero or near-zero greenhouse gas emissions would meet our seemingly insatiable desire for personal mobility while significantly reducing emissions. However, zero-emission vehicle (ZEV) technologies (like hydrogen fuel cell vehicles and plug-in electric vehicles) are more expensive than conventional cars and trucks. Also, ZEVs have other potential drawbacks, known as intangible costs, which make them uncompetitive, such as performance differences and increases in real or perceived risk. Given these high initial costs, our adopting ZEVs is unlikely to happen without some form of policy intervention.

However, debate exists about what kinds of policies are likely to generate innovative, low-cost solutions to reduce GHG emissions, particularly when the impact of two market tendencies are considered: learning-by-doing and the neighbour effect.

Learning-by-doing describes the phenomenon in which the financial costs of a new technology are observed to decrease with gains in experience with the technology, often due to production efficiencies. There is also some evidence to suggest that as the market share of a technology increases, its intangible costs decline. This so-called neighbour effect can be attributed to factors such as consumers’ increased perceptions of a technology’s reliability and learning from other consumers’ experiences with the new technology. Learning-by-doing and the neighbour effect could improve the competitiveness of ZEVs in the long-run.

Using a model based on the CIMS transportation sector, my research assessed various policies for increasing the market penetration of ZEVs. The model allowed costs of new vehicle technologies to decline with cumulative experience to capture learning-by-doing. Additionally, using intangible cost estimates for various vehicle technologies from recent EMRG preference research, intangible costs were modeled to decrease as a function of increased market share to capture the neighbour effect.

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Policies evaluated included a tax on greenhouse gas emissions, a standard mandating ZEV market shares, a purchase subsidy for ZEVs and a standard policy followed by a tax.

The policy of a standard followed by a tax was found to be the most cost-effective policy option for two reasons. First, this policy forces market concentration in ZEV technology early on, resulting in declining ZEV financial and intangible costs. Second, by implementing a tax when the standard is removed, a signal is sent for consumers to lower their demand for vehicle use tempering any increases in demand from the increased fuel-efficiency of the vehicle fleet (rebound effect). A standard or a tax, implemented on its own, provides a portion of these benefits but not all of them, resulting in higher costs relative to the combination of a standard then tax.

Economists typically argue that taxes which put a price on emissions are the most economically efficient tool to meet environmental objectives. However, the results of my research suggest that under certain conditions, particularly when costs of new technologies are expected to decline with cumulative experience and market share, implementing a standard may result in minimal to no cost-penalty relative to a tax. This finding is particularly relevant given the current political unpopularity of taxes.

**Hot Air**

By Nic Rivers

Ever wonder why, despite years of seemingly sincere politicians vowing to tackle the climate change issue, Canada’s greenhouse gas emissions continue to rise as fast as ever? Why the commitments Canada made during the Kyoto Protocol negotiations ended up being the toughest of any country? Or how to tell if a politician is pulling the wool over our eyes with lofty climate change commitments never intended to be met?

EMRG researchers Mark Jaccard and Nic Rivers, along with Globe and Mail columnist Jeffrey Simpson, delve into Canada’s climate change closet of skeletons to try to answer these and many other questions in their new book *Hot Air: Meeting Canada’s Climate Change Challenge*, published by McClelland and Stewart.

The book begins with a walk through 20 years of domestic and international climate change policy history, and one is struck by how little domestic policies have changed despite increasingly urgent calls for dramatic reductions in emissions from the world’s scientists.

From this legacy of failure, the authors set their sights forward to consider the types of policies that might actually help to lower emissions in Canada in coming years. They survey the types of policy instruments at the disposal of government for curbing emissions growth in Canada, finding that subsidy instruments and voluntary approaches, long the mainstay of the Canadian approach to dealing with climate change, are the least likely to produce substantive changes in behaviour. In fact, the authors doom to eventual failure any policy that does not put either a regulatory or financial cap on emissions from firms and individuals, arguing that without a direct penalty there is no incentive to reduce emissions.

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Following this logic, the authors strongly recommend a carbon tax as the most effective policy for addressing climate change in Canada. Recognizing the difficulty that politicians face in adopting a carbon tax, Simpson, Jac- card, and Rivers propose several alternative schemes that would be likely to reduce emissions much more, and more cost effectively, than the voluntary and subsidy approach that has dominated Canadian climate change poli- tics for the past 2 decades. These alternative schemes include the popular cap-and-trade ap- proaches for large firms, as well as other mar- ket-based instruments governing emissions from vehicles, electricity generation, houses, and other emissions sources.

Throughout the book, the authors critique governments for continually setting ambitious tar- gets without proposing detailed and realistic plans for how to achieve the targets. The setting of targets is lauded by both the media, who appreciate the easy sound bites that target- setting provides, and by environmentalists, who often push for Canada’s climate change targets to match leading countries’ targets. Targets can be useful, the authors argue, but are completely meaningless without a suite of realistic policies with which to achieve them. Without policies, the setting of targets distracts the public into believing that governments are taking actions when in fact none are being taken.

Through twenty years of policy failures, we’ve seen many broken promises on the climate change front made by politicians attempting to convince the public of substantive action when none is being taken. To avoid this in the fu- ture, the authors provide a “smell test” to de- termine whether sincere action is being taken by politicians or whether a promise is just more spin that will have little effect on emis- sions:

1. If targets are proposed, but the politicians setting them do not detail how they will be reached, assume failure.
2. If, after advancing a target, politicians pro- pose policies that lack a regulatory or fi- nancial constraint on greenhouse gas emissions, assume failure.
3. If politicians insist that behavioural change by individuals alone will solve the climate- change problem, assume failure.
4. If politicians talk only about exciting, en- ticing actions - renewable energy, energy efficiency, carbon capture and storage - but say nothing about economic policies to force these actions, assume failure.
5. If politicians complain about jurisdic- tional constraints, assume failure.
6. If politicians crisscross the country or their province handing out subsidies and offering photo opportunities of themselves in front of wind turbines, research laborato- ries, or corn fields, assume failure.
7. If politicians make a big deal for ideological or other reasons about ruling out all forms of greenhouse-gas taxes, and don't substitute for those tax policies ones that rely on market-oriented regulations such as emissions caps with tradable permits, assume failure.
8. If politicians insist that Canada can meet its Kyoto commitment, offer the benefit of the doubt that they are not lying, just being dis- ingenuous.

JEFFREY SIMPSON
MARK JACCARD
NIC RIVERS

HOT AIR
MEETING CANADA’S CLIMATE CHANGE CHALLENGE
New EMRG Students

EMRG welcomes two new master’s students this fall.

**Caroline Lee** was born and raised in Fredericton, New Brunswick and is a newcomer to Vancouver. She has also lived in Ottawa and Hong Kong, and completed her undergraduate degree in Environmental Sciences at the University of Guelph. Caroline has always had a passion for the environment and has recently become very interested in energy and climate change issues. She is excited to be a new addition to the EMRG research group and is looking forward to delving further into these issues. Outside of school, she enjoys traveling and has done most of this in east and southeast Asia. Other interests include being outdoors and eating delicious food.

**Jodie Capling** grew up in a small town in the Cariboo-Chilcotin region of British Columbia. This set her up for some culture shock (and made her really miss forests and lakes) when she moved to Montreal, where she obtained an undergraduate degree in chemistry at McGill University. She has worked for short periods of time in various labs researching shellfish biotoxins and fuel cell catalysts, as well as a brief stint in occupational health and safety/indoor environmental consulting. She is excited about joining the EMRG team and is always looking for people who want to play tennis.

Further Research...

After several years of consulting in the energy analysis field, **Nic Rivers** is returning to SFU to pursue a PhD in Resource and Environmental Management. Nic has a mechanical engineering degree and a Master's degree in REM. Most of his work has focused on quantitative analysis of policies aimed at reducing energy consumption and greenhouse gas emissions. He has published papers in several top energy and economics journals, with independent think tanks, and recently co-authored *Hot Air* with Mark Jaccard and Jeffrey Simpson. His PhD research will focus on program evaluation using econometric methods.

Grand Opening

In previous editions of this newsletter, we noted that EMRG had moved its offices to the new Technology and Science Complex 2 building. On April 30, 2007, EMRG participated in the grand opening of TASC2. The University President, Dr. Michael Stevenson, and an entourage of special guests from funding agencies, the provincial government and other SFU faculties visited the building and our office where EMRG and CIEEDAC directors made a brief presentation on activities in the areas of data analysis, energy and climate change research.

Congratulations!

To Jillian Mallory for successfully defending her 699 research project this September. See page 1 for a summary of her work.

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EMRG News

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