Canadian Priorities Agenda

Focus on actions, not instruments

DRAFT COMMENTARY

Comments on "Canadian policies for deep greenhouse gas reductions" by Mark Jaccard and Nic Rivers

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Prepared for the Canadian Priorities Agenda Project

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IRPP

The IRPP's *Canadian Priorities Agenda* project is designed to initiate a broad-based and informed public debate on policy choices and priorities for Canada over the medium term. Research papers on the following eight broad policy challenges have been undertaken to examine the most effective ways to address them:

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- Climate change
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Six judges will each craft a policy package from the specific recommendations put forth in the eight papers that in his or her view will best enhance the economic and social well-being of Canadians.

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Setting

Climate change is an important, long-term, issue of public policy—arguably a dominating and defining one for the twenty-first century. Given what we are learning from the science of climate change, one can anticipate that the issue will be of both increasing public concern and a persistent thorn in the side of Canadian public policy. Presently, all five (including the Green) federal parties have put climate change high on their political agendas.

Unfortunately, Canadian public policy has failed to come to terms with the fact that stabilizing climate is a truly daunting, long term, *energy technology* problem. Instead, the previous government's blind adherence to Kyoto targets, which were both unachievable and, in climate change terms, essentially meaningless, has continued to infect climate change debate.

These opening remarks reflect what I bring to an assessment of the Jaccard and Rivers (J-R) paper. I will argue that the package of proposals vetted by J-R, while not without some faults, is one of the more sensible, and in some respects the most novel, suggested in a Canadian context. But I will also argue that it is important not to overstate what these proposals can actually do to reduce emissions from *current* levels—although they undoubtedly would make a huge dent in emissions from a *correctly specified* emission baseline.

Criteria and instruments

After a brief introduction to the climate change issue, J-R set out criteria for choosing among climate change policies and several possible instruments for implementing policy actions. The criteria include the usual suspects: effectiveness, efficiency, acceptability and administrative feasibility. But J-R wisely warn that other considerations must not be overlooked, including Canada's multiple jurisdictions over the environment and the need to account for decision-making under uncertainty.

With regard to instruments of policy, the J-R list includes the regular litany: command and control regulation; emission cap and permit trading; GHG taxes; subsidies; and voluntarism. For all the right reasons, J-R rule out subsidies (a costly method of accomplishing very little or doing the wrong thing) and voluntarism (we've tried that, and it doesn't work). As J-R make clear, we need a positive price for carbon, not a neutral (voluntarism) or negative (subsidies) one. However, I would have liked J-R to have also made

clear that their discussion of subsidies really applies to production subsidies. The emphasis on these types of subsidies (one thinks of subsidies to wind power and ethanol production) is as opportunistic (and scandalous) as they are popular. In contrast, subsidies to basic R&D for new energy technologies and sources; to the development of enabling technologies such as storage for intermittent wind and solar energies and "smart grids" to handle variable supplies as well as demands for electricity; and even some capital subsidies are/may be justified (as well as needed) on traditional public good or externality grounds.

One novel inclusion in the J-R list of instruments is a system of obligation and certificate trading (OCT). Although superficially similar to emission cap and tradable permits (ECTP), the two are quite different. As described by J-R, where ECTP "regulates a maximum amount of an undesirable product (emissions)", an OCT system "requires a minimum amount of a desirable product or process" (presumably emission reduction). Instead of the highly contested (and inevitably political) issue of how to allocate permits to produce a "bad" (emissions), OCT generates certificates when firms produce a "good". But OCT does not wholly avoid the potentially high costs of administering, monitoring, and enforcing a system of ECTP. This cost would increase as the number of units with obligations (permits) rises. The issue is not an idle one, as J-R propose to employ OCT as an integral part of two of their emission-reducing initiatives. In my view, an initially low, gradually escalating carbon tax, combined with an R&D energy technology policy, dominate by a wide margin either ECTP or OCT.

Policy actions

J-R propose three policies to reduce GHG emissions over the period up to 2050. These are:

1. A carbon management standard for fossil fuel producers and importers
2. A vehicle emission standard
3. Appliance and building regulations

Before discussing these, I would like to register my support for the approach taken by J-R. By focusing on important potential undertakings, their approach stands in contrast to Canadian climate policy through 2005. That focus was on hard, near-term, quantitative emission reduction targets, a legacy of our obsession with Kyoto. The obsession with targets led to commitments that are generally *not "credible"* (Schelling 1992, 2005), while at the same time ruling out, for all intents and purposes price-based (e.g. carbon taxes) as opposed to quantity-based (e.g. emission permits--tradable or not) instruments. J-R, in contrast suggest policy actions, commitments that may be credible in Schelling terms and that could have important emission reducing impacts over time (although they would not likely meet hard, near-term targets).

(a) Carbon management standard

J-R would require that fossil fuel producers and importers "ensure that a growing fraction of the carbon they extract from the earth's crust does not reach the atmosphere" (p.14). To achieve this goal, J-R would employ an OCT system. Instead of allocating permits to firms, government would collect certificates from firms that match their emission reduction obligation. Those obligations would be measured in terms of a percentage of carbon fuels, rather than in absolute terms, thus relaxing the emission constraint somewhat if the consumption of fossil fuels grows (as it will). Firms that fail to comply would be subject to stiff penalties, but a "safety valve" would be added in the form of a sale of government-issued certificates at a pre-

determined price if the fossil-fuel growth rate is faster than anticipated or if abatement cost is significantly higher than expected (p.15).

The J-R approach to implementing a carbon management standard is novel, and would seem to be a workable means of inducing carbon capture and storage (CCS) from electricity generating plants and from fossil fuel production sites such as the tar-sands. But it is less easy to discern how it could apply to fossil fuel producers who sell (mainly oil and natural gas) downstream to final energy users such as homes, buildings and factories that use these energy sources for heating, transportation and various industrial usages. One may reasonably ask how upstream producers and importers can be held responsible for the downstream use of their fuels. To be sure, J-R appear to be thinking mainly about CCS from power plants and plants in energy-intensive industries, and of capture of fugitive emissions from coal mines, oil and gas wells, and natural gas pipelines. But then why are "importers" included, and why limit certification to fossil fuel producers, other than those whose activities directly generate fossil fuel emissions? Instead, in some cases it would make more sense to move certification responsibility a notch downstream to the power plant and pipeline levels.

(b) Zero-emission vehicle standard for vehicle manufacturers

The second initiative suggested by J-R is a vehicle emission standard (VES) that "requires vehicle manufacturers and importers to sell a minimum number of *zero emission vehicles* by a target date as a percentage of total vehicle sales" (p.17, emphasis added). Again, the instrument of choice is obligation and certificate trading (OCT). The minimum market share of zero emission vehicles (ZEV) would rise over time. J-R argue that the VES "accelerates the process of developing, commercializing, and disseminating low emission vehicles" (p.17). J-R cite the VES policies of California as an apparent model for what they have in mind.

J-R make a strong case that the transportation vehicle sector needs to be tackled if there are to be significant reductions in emissions by 2050. Nevertheless, I have some reservations about their approach. The most important of these is that the ZEV concept is a misnomer, once one thinks in "life-cycle" or "well-to-wheels" power cycle terms. Electric cars or plug-in hybrids require recharging, which would increase emissions if the electric power is generated by fossil fuel-fired plants. If J-R are assuming that the generating plant emissions would be subject to CCS then they should make clear that their ZEV proposal depends heavily on the viability of their proposed "carbon management" system and its capability of scale-up essentially without limit.

Moreover, if ZEV is based on ethanol and other bio-fuel usage, or on hydrogen, then life-cycle analysis takes on added importance. In the case of bio-fuels, a great deal of energy is needed to produce the inputs that go into ethanol and bio-diesel, and then to convert these inputs into liquid fuels. Some evidence suggests that the energy required to produce ethanol (including the energy used in production of the input, corn) actually exceeds the energy content of ethanol, resulting in negative net energy (Pimentel and Patzek, 2005), while others have found slightly positive net energy (Farrell, et al., 2006; Tilman, et al., 2006). In any case, if fossil fuels are used in the life-cycle bio-fuel production process, then the resulting emissions must be considered, unless somehow captured. If the fuel of choice is hydrogen, it is important to consider how the hydrogen is produced. If it is produced by "reforming" natural gas or in a process that gasifies coal then emissions are produced unless the CO2 is captured. Thus, ZEV is much better described as a (hopefully) "low-, or lower, emission vehicle".

Frankly, I would give greater emphasis to enhanced vehicle fuel efficiency standards. Presumably, J-R have, like almost all economists, rejected fuel-efficiency standards because they (a) do not focus on emission reductions, and (b) are subject to a "rebound" effect (by increasing fuel efficiency they would lower the cost of vehicle use, increase kilometres driven, and thus cut into the emission reduction effect). That is true on both counts. But a fuel efficiency standard (such as the US corporate average fuel efficiency, or CAFE, standards) has "legs": (i) it is more easily administered and enforced than a VES (assuming the "light truck" loophole in CAFE is filled); and (ii) can largely avoid the "rebound" effect if accompanied by a low, but increasing, carbon tax.

(c) Building and appliance standards

The third set of policies that J-R propose are residential and commercial building codes and appliance and equipment standards. J-R argue that the "most cost-effective way to lower GHG emissions in the building stock (through energy efficiency and fuel choice) is in design and construction" (p.18). The assumption is that design and construction influence the amount of energy used in heat and air-conditioning, lighting, water-heating and the like. I believe they are right, and a corollary (not mentioned by J-R) is that it is much more cost-effective (and probably energy-effective too) to apply building standards when constructing *new* buildings, just as setting standards for *new* appliances and equipment is much more cost effective, than retrofitting existing ones.

As my final comment regarding the VES proposal suggests, I support the use of efficiency standards including those for new building and appliances. J-R note that although "Canada has relatively strong efficiency standards for some equipment" (p.19), there is still great room for improvement. Let me highlight two initiatives (neither mentioned in the J-R paper). One involves washing machines. Currently, most washing machines are "top-loaders", although a growing number are "front-loaders". Front-loading washing machines are more energy efficient, because they use 30-40% less (hot) water. If Canada simply legislated that after, say, 2009, no top-loading washers could be sold in Canada, a small, but important, contribution could be made toward improving energy efficiency in household appliance use.

Another initiative could require that at the time of constructing new buildings, pipes must be sunk into the ground in order to facilitate geothermal means of contributing to building climate control (heating in winter, cooling in summer). Of course, neither initiative allows one to predict emission-reductions for the short term, which is one reason why such obvious contributors to long-term emission reduction get short shrift when the pressure is to achieve Kyoto-type targets.

Results

In the final pages, J-R project the impact of their proposed policies. Their results, produced for energy-related emissions only, are detailed in Table 5, and summarized in Figure 3. In each, comparisons are made for both "business as usual" (BAU) and policy-related GHG emissions for 2050, using 2010 as a base year. The projected reductions are large, regardless of base or baseline. Table 5, indicates that J-R believe that especially large reductions in emissions can be made in the electricity generation, oil and gas production, energy-intensive industry, and transportation sectors. The amount of the estimated reductions is sufficiently large as to suggest the possibility of overstatement. Setting these concerns aside, I nevertheless have reservations about the way in which J-R calculated the BAU 2050 emission level in their policy scenario.

According to J-R, emissions in 2010 will be 713 Mt of CO2 equivalent. That implies an average annual growth rate in energy-related emissions of 2.0 percent from 1990 to 2010. J-R estimate that BAU emissions will be 1,157 Mt in 2050. That implies a 1.2% average annual rate of GHG emissions growth from 2010 to 2050 (using the J-R base of 713 Mt in 2010). What is not clear is why the "no-policy" rate of growth of energy related GHG emissions is so much lower for 2010-2050 than the 2.0% rate for 1990-2010, a rate that would have raised energy-related emissions to around 1574 Mt in 2050 as compared to their 1157 Mt.

J-R imply that their policies can reduce GHG emissions in Canada to 357 Mt by 2050, that is, by 356 Mt from their 2010 base of 713 Mt, and by 800 Mt from their 2050 BAU baseline of 1157 Mt. Even assuming that the J-R policy actions are capable of reducing GHG emissions by 800 Mt from baseline in 2050, the analysis above suggests there is plenty of room for doubt that energy-related emissions will be reduced to 357 Mt by that time.

Since J-R are attempting to estimate the emission reductions that flow directly or indirectly from energy technology changes, they would have done better to employ a "frozen technology" baseline Edmonds and Smith, 2006)—that is, a baseline that indicates emissions in the absence of energy technology change. A "frozen technology" BAU emission baseline for 2050 also avoids inadvertent double-counting of technologies (once in the baseline and once in the policy emission scenario). Using such a baseline, emissions would grow roughly at the rate of GDP. (I say "roughly", because changes in industry structure can alter somewhat the energy intensity of the economy. Calculations suggest that, on a trend basis, the structural factor comprises 10-30 % of trend energy intensity decline.) If the trend rate of GDP for the period 2010-2050 were 2.5%, and "frozen technology" emissions grew at 2.0 % (allowing for structural factors to contribute a 20% of the differential between GDP and GHG emissions growth), BAU emissions in 2050 would be 1567 Mt. A 800 Mt reduction (if achievable) from a 1567 Mt baseline would imply energy-related emissions in 2050 of 767 Mt, or almost 24% higher than the 2004 level of 620 Mt, and more than double the 357 Mt level that J-R say their policies can achieve.

Conclusion

J-R have provided us with a useful set of policies with which to tackle a very important long-term problem. I also think that their approach of focusing on appropriate policy actions rather than "targets" is a breath of fresh air. While I have raised some concerns with aspects of two of their policy actions, I think their choice of where Canada can make important contributions to GHG reduction are good ones. As important as these are, I think that their "projections" of where GHG emissions will be in 2050 may be rather optimistic. Be that as it may, climate change deserves high rank in the Canadian Priorities Agenda, and the J-R policy actions, with perhaps some modifications at the margin, could put us on a path to GHG emission reduction.

References

Edmonds, J.A**.** and Smith, S.J. (2006), "The Technology of Two Degrees", In *Avoiding Dangerous Climate Change*, Eds. H.J Schnellhuber, et al., Cambridge University Press, Cambridge, UK, pp.385-392.

Farrell, A.E., et al (2006) "Ethanol can Contribute to Energy and Environmental Goals", *Science*, **311**:506-508.

Pimentel, D. and Patzek, T.W. (2005) "E thanol Production Using Corn, Switchgrass, and Wood; Biodiesel Production Using Soybean and Sunflower", *Natural Resource Research* , **14**: 65-76.

Schelling, T.C. (1992) "Some Economics of Climate Change", *American Economic Review*, **82** (March) 1-14.

Schelling, T.C. (2005) "What Makes Greenhouse Sense?", *Indiana Law Review*, **38**:581-593.

Tillman, D., Hill, J., and Lehman, C., (2006) "Carbon-negative Biofuels from Low-input, High-diversity Grassland Biomass", *Science,* **314**:1598-1600.