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Commentary on the Government of Canada's "Climate Change Plan for Canada"

by Ralph Torrie, December 2002

The Government of Canada released its "Climate Change Plan for Canada" on November 21, 2002, just prior to the House of Commons ratification vote on the Kyoto Protocol.[1] Although the Plan carries the subtitle "Achieving Our Commitments Together", the emission reduction measures described in the Plan fall far short of what would be required for Canada to meet its commitments under the Kyoto Protocol.

In September 2002, we completed a scenario analysis for the David Suzuki Foundation and the Climate Action Network of how Canada could reduce its emissions to half their current levels by 2030, surpassing the Kyoto target along the way.[2] It remains the only published strategy for meeting Canada's commitments under the Kyoto Protocol.

We have taken a preliminary look at the difference between the numbers in the government's Climate Change Plan for Canada (referred to as GP throughout this letter) and our "Kyoto and Beyond" report (referred to as KB throughout). This is only a cursory comparison, and the Government Plan continues to evolve, but the differences between the two approaches and the results they achieve are so great that the comparison is nevertheless instructive.

Caveats

1. While a detailed comparison could and should be done, the different methods and the extent of double counting and vague explanations in the government's plan complicate matters. Essentially, we started out with an end use representation of Canadian emissions in 2004 (end use activity X energy per unit of activity X emissions per unit of energy, by fuel). We then proceeded to construct a bottom-up profile of emissions in 2012 (and in 2030) by escalating the end use activity levels with multipliers that are essentially the ones used in the government's

[1] Government of Canada, "Climate Change Plan for Canada", Ottawa, 2002. The document itself is undated but was released on November 21, 2002. It is available from www.climatechange.gc.ca.
[2] Ralph Torrie, Richard Parfett and Paul Steenhof, "Kyoto and Beyond: The Low-Emission Path to Innovation and Efficiency", prepared for the David Suzuki Foundation and the Canadian Climate Action Network Canada, Ottawa September 2002. Available from www.torriesmith.com.

energy forecasts, and then building up a profile of energy efficiencies and fuel shares in 2012. So while this method implies a "business-as-usual" level of emissions in 2012 that could be compared to the government's 810 Megatonnes figure for 2010, we did not do a full scale business-as-usual projection of emissions in 2012. In a nutshell, our approach was to quantify emissions in 2012 whereas the government's approach is to quantify emission reductions relative to a notional future level of emissions. It may sound like a subtle difference, but it makes the job of comparing the two sets of numbers difficult.

2. Secondly, our approach forces a certain rigor into the numbers that is not necessarily present in the type of "gap analysis" done by the government. The one tonne per Canadian target, for example, overlaps with other items in the government plan in ways that are not specified. The one tonne target is quite modest if it can include anything and everything that an "average Canadian" can do to reduce emissions in their home and vehicle energy use and in their waste generation and recycling activities. If, on the other hand, the one tonne target excludes other emission reductions in vehicles and home energy use that are in other parts of the plan, and must therefore be achieved strictly through behavioral changes, it is more ambitious (especially if the one tonne must be saved AFTER the efficiency measures elsewhere in the report are implemented. It's a lot easier to reduce a tonne of emissions from a gas guzzler than it is to reduce emissions from a more fuel efficient vehicle).

3. Third, in many areas of the government plan there is such a dearth of specifics that it is difficult to tell whether they have omitted an option altogether or just drastically underestimated it. The most glaring example of this is electricity cogeneration. In our estimation and this is a universal finding in low emission analyses, increased cogeneration is one of the largest contributors to emission reductions. We think it is at least twice as important as all new and renewable energy sources added together, and can make a contribution that is about half what is available from energy efficiency improvement. And yet, it is mentioned only in passing in the government plan. One might suppose that it is included somewhere in the targets for industry, but the aggregate numbers do not indicate it is there. Furthermore, cogeneration does not necessarily lead to dramatic emission reductions in the industrial sector that is making the electricity (or in the commercial or institutional or residential sector in the case of microcogeneration) – its real impact is in reducing the need for what we called "grid electricity" in our report, the electricity that utilities must provide. The more non-utility cogeneration that exists, whether grid connected or not, the lower will be the demand for grid electricity, and it is the lower demand for grid electricity that allows the phasing out of the high emitting central coal and oil plants, as well as the nuclear plants.

4. This leads to another omission in the federal plan – the impacts on the electricity supply side of a concerted effort to improve the efficiency of electricity use, reduce its use as a space heating fuel, and accelerate the development of cogeneration, not only in the traditional industrial sectors, but in commercial and institutional buildings and eventually even at the household level. It would appear that either the federal plan has simply not considered this phenomenon, or that their electricity efficiency improvements are so modest that they didn't think it was worth investigating. In any event, if the electricity efficiency and cogeneration resources are developed to the extent they would be in a rational plan for emission reductions, the upstream impact on the need for central grid power is very large. This phenomenon appears to be omitted from the GP.

5. The fact that we do include the impact on electricity supply of the effects of demand side programs is another reason why the GP and KB are difficult to compare. In KB, after we had built up a profile of electricity demand in 2012 by applying all the efficient technologies, and by adding in the cogeneration, and by backing electricity out of space and water heating (a process still underway in 2012), we then went back and looked at the effect this lower demand could have on the mix of utility power plants and therefore on the emissions per kilowatt-hour associated with the electricity demand itself. In KB, the lower demand for grid electricity allows for, principally, a significant reduction in the number of coal-fired generating stations needed in the country. This provides a good illustration of how our method differs from the "gap analysis" performed in the GP. Presumably, in the GP electricity savings are multiplied by an emissions intensity of electricity higher than ours, because they do not take into account the effects of demand management, fuel switching and cogeneration on the greenhouse gas intensity of electricity. The result is an undervaluation of the impact of demand management initiatives on greenhouse gas emissions.

6. All this illustrates how the conventional approach to energy and emissions analysis can miss critically important elements when it comes to quantifying the full impact of demand side savings. In spite of 30 years of dramatic improvements in energy/output ratios, most energy analysts still don't see the demand side as real or believable or dependable enough to obviate the need to build more power plants.

Some Big Picture Comparisons

7. Our general conclusion is that the emission reductions in the GP, if we exclude sinks and international trading (30 + 12 = 42 Mt), come out to about 140 Mt, and the roughly comparable figure from KB would be about 290 Mt. The GP significantly underestimates the potential for those initiatives that it does include, and appears to omit consideration of three of the largest options available, namely: cogeneration, the electricity supply side bonus from DSM, and the reduction in emissions from oil production that results from a decline in the domestic demand.

8. We constructed a facsimile of a "business as usual" scenario to support the comparisons of our numbers with the GP, but it is important to realize that while our business-as-usual total emissions in 2012 of 819 Mt is not too far off the GP figure of 810 Mt, there are large but difficult-to-specify differences in the composition of the two numbers.

9. The attached table – "Greenhouse Gas Emissions in "Kyoto and Beyond", Reductions from the Base Year (2004) and Reductions Relative to a Rough Estimate of Business-As-Usual in 2012" – summarizes this exercise. The first six columns of numbers show the total emissions in the KB base year of 2004, the KB scenario for 2012, and the reduction in emissions in the KB 2012 scenario as compared with 2004. The last three columns show the total emissions in 2012 from the rough "business-as-usual" estimate we constructed, and then the emission reductions in the KB 2012 scenario relative to this "business-as-usual" reference.

10. KB has a much greater emphasis on the buildings and vehicles relative to industry. We run right up against the double counting, "shell game" that permeates the GP, but their overall number for residential and commercial buildings is a very small 8 Mt. This figure does not

include electricity-related emissions, which appear to be included under Industrial Emitters in the GP, but it is still small compared to KB. KB has a total of 68 Mt reductions here (as compared with our notional BU scenario) but our number is dominated by the reductions from electricity savings AND the electricity supply side bonus. If we take those out, KB still has some 15 Mt of reductions, over twice the GP number. Perhaps more important, given that the GP rolls electricity related savings into the "Industrial Emitters" category, and that total emission reductions from that category, including the entire power sector plus the oil and gas industry and the big industry and SME's, and that total still only reaches 96 Mt, it is clear that they must have very small numbers indeed for the emission reduction impacts of DSM in the residential and commercial building sectors.

11. Regarding transportation, GP has a grand total of 21 Mt of emission reductions for all personal and freight transportation, comparable to our 92 Mt, of which 65 Mt is from personal vehicles and 27 Mt is from trucks and other freight modes. This is probably the most straightforward sector-level comparison between the two reports, and is indicative of the large differences in methods and assumptions between the two reports.

12. The GP has 96 Mt of reductions from industrial emitters, including the power sector. Everything but the kitchen sink is in this number, but a roughly comparable number form KB would be about 150 Mt, which includes the KB oil and gas industry, industry sector, the part of the residential and commercial sector savings related to electricity, and the industrial process emissions in the KB non-energy category. It bears emphasizing here that most of the emission reductions in KB for the oil and gas sector are due to decreased demand for oil from the domestic market, and not because we assumed technological improvements in oil production, which we did not. What reductions in emissions intensity of oil and gas production that do take place in the KB scenario are largely due to the lower emission intensity electricity available thanks to the electricity efficiency measures being implemented in the commercial, residential and general manufacturing sectors. This same point applied to a somewhat lesser extent for industry in general.

13. The GP attributes 38 Mt of emission reductions to "agriculture, forestry and landfill gas", but this includes 30 Mt for forestry sinks, which we excluded from KB. The balance of 8 Mt roughly compares to the 29 Mt from waste and agriculture in the KB non-energy sector.

Additional Observations and Comparisons

14. ***Transportation – Ethanol Blends***. KB assumes that 55% of all gasoline sold in the country will be ethanol blend by 2012; GP assumes 25%. By 2005, the biofuels industry expects total production of ethanol to be about 1 billion litres per year. Our scenario assumes the production and use of 1.3 billion litres of ethanol. Their scenario appears to assume less ethanol is used by 2010 than will already be being produced by 2005.

15. ***Transportation – Biodiesel***. The GP is "considering" 500 million litres of biodiesel; KB includes 420 million litres by 2012.

16. ***Transportation – Fleet Fuel Economy.*** The GP assumes a minimum 25% improvement in *new car* fuel economy by 2010, looking to "intensify" negotiations. KB assumes an *overall fleet*

average improvement in fuel economy of 15%. They should expect an overall improvement in new car fuel efficiency of at least 30%. There will need to be a ramp-in schedule, with a 15% improvement being achieved by 2006. As the previous discussion highlighted, we need to move on vehicle fuel economy aggressively and soon if we are going to meet Kyoto targets.

17. ***Transportation -- Fuel Cells***. The GP does not appear to be assuming any penetration of fuel cell vehicles by 2010. KB assumes that 2.6% of total transportation energy consumption will be met from fuel cells by 2012, mostly in heavier vehicles; cars come on later.

18. ***Transportation – Use of Public Transit.*** The BP has assumed a 7 Mt reduction as a result of increased use of public transit and better urban planning. KB assumes 5 Mt, but we have also assumed that more people cycle and walk, which yields another 3 Mt.

19. ***Freight Transportation – Intermodal Opportunities***. The GP assumes approximately 1 Mt savings from improving intermodal freight opportunities; KB has about the same number for moving more freight onto rail and away from trucks.

20. ***New Housing.*** The GP includes "considering" a target of all new houses being built to the R-2000 standard or equivalent by 2010. KB assumes R-2000 becomes the minimum EE standard by 2004. It is unclear whether they are suggesting R-2000 as a minimum efficiency standard or are simply assuming that they can cajole Canadians into choosing R-2000. A more aggressive strategy would set R-2000 as a minimum energy efficiency standard in new homes, starting in 2004. Builders across the country are already familiar with and have built to R2000 standards. The cost could be reduced by not requiring a blower door test on every house.

21. ***New Commercial Buildings.*** The GP suggests all new buildings be built to a standard of 25% better than the model national energy code by 2010, but it seems fairly clear that they want to reward building owners for building to this standard (e.g. it's not a minimum energy efficiency standard, but a target for which owners are rewarded if they achieve it). KB assumes that we go at least 50% below the energy consumption of a building built to the model code, starting in 2004. We know from the results of the CBIP program that 40-50% improvement in energy efficiency over the model national energy code can be achieved with virtually no increase in building capital cost. Perhaps the GP target of 25% better than the Model Building Code would be defensible as a minimum standard, but not as a target to be rewarded as if it represented exceptional practice -- it does not. The government's own case studies from the CBIP program are turning in performances that do much better, with the Alice Turner Library in Saskatoon, the Crestwood Corporate Centre in Surrey, the Autovalue Central Auto Parts outlet in Calgary, and the Green on the Grand office building in Kitchener-Waterloo achieving energy use levels that are, respectively, 65%, 60%, 50% and 72% below the energy use of building built to the model code.

22. ***Existing Residential Housing.*** KB includes the retrofitting of most of the country's housing stock that is technically eligible for retrofitting, with a program that ramps up gradually, reaching a cumulative total of 5% of eligible stock by 2012 or about 350,000 houses. The GP includes "consideration" of a target of 20% of all homes to receive EE retrofits by 2010. We have assumed 5% by 2012 (20% of all homes is about 1.4 million homes), so the GP plan is quite ambitious in terms of the number of houses that would be done by 2010). Their emissions

savings suggest measures very similar to ours, namely the retrofits made would be air sealing, upgraded attic insulation and the installation of energy efficient doors, which is the really simple and cost-effective stuff. Although we have basically the same savings per retrofit house, we have fewer houses retrofit by 2012 than in the GP (350,000 vs. 1.4 million). Because we used NRCan's Hot 2XP model, our results per house are very close to the GP. Their 1.4 million homes by 2012 target could be done, but one wonders whether they have thought through all the organizational and manpower implications of that level of mobilization on that time scale. When we thought about it, we thought it would be better to build it up gradually, with the job taking until about 2020 to complete.

23. ***Existing Commercial Buildings***. The GP includes consideration of a target of 20% of all buildings to receive EE retrofits by 2010 but have assumed the net GHG emissions reduction from this is only 1.2 MT. This seems very low. For example, an average 30% improvement in overall energy efficiency in 20% of existing buildings would yield an approximate reduction in GHG emissions of about 3.7 MT. Thirty-percent is not hard to achieve. A 1.2 MT reduction in emissions therefore assumes these buildings are getting a 10% or less improvement in their energy efficiency after the retrofits. GP numbers seem very low here.

24. ***Equipment and Appliances***. The GP suggests "improved standards for equipment and appliances already under way". What will they be? They should be spelled out and they should be implementing measures such as making high efficiency furnaces the only furnaces on the market, eliminating the least efficient appliances, adding some sort of incentive for the purchase of Energy Star appliances, or possibly outlawing everything but Energy Star appliances. Minimum efficiency standards are very important and they should be moving aggressively on this as soon as possible. They have assumed a 3 MT reduction from this, but the KB analysis comes in at 4.5 MT.

25. ***Electricity – New and Renewable***. The GP suggests that 10% of all new electricity generation be renewable energy. KB assumes, first of all, that demand for electricity declines by 2012. It appears that the GP does not account for the impact of energy efficiency on the demand for electricity. It would appear that electricity intensity in the GP is about the same in 2010 as today, although in the text there is acknowledgement that new renewable electricity will have a significant impact on the emissions intensity of electricity. In KB, there is a double hit from electricity efficiency improvements and non-utility generators, with the lower demand from DSM allowing the phasing out of central power plants, thus lowering the emissions intensity of the residual demand for central, grid electricity. There will be significant turnover in electricity using equipment between now and 2012, so if standards are in place by 2004 (that was our assumption) significant progress can be made by 2012.

26. ***Cogeneration.*** This option is mentioned in passing under SME and under Electricity, but nothing that reflects the huge importance of this technology. This is a critical part of our scenario, with 4,000 MW of new industrial cogeneration in place by 2012, and smaller scale cogeneration also beginning to make inroads by then in commercial and institutional buildings. Since completing the study we have seen additional assessments that indicate our numbers are extremely conservative, but one has to be careful on this. Cogeneration advocates will sometimes quantify the potential for cogeneration on the basis of a business-as-usual level of energy efficiency, whereas we looked at its potential only AFTER improving the efficiency of

both electricity and heat consumption in the industrial sector. Also, because demand side measures in the KB scenario wipe out the need for ANY new electricity in B.C., Quebec, Manitoba, Newfoundland and Labrador, we did not pursue cogeneration in those provinces' industrial sectors, but it will happen nonetheless, thereby making our estimate even more conservative. The omission of significant attention to cogeneration in the GP is one of the largest omissions relative to KB. Every serious look at low emission futures (UK, Australia, Tellus in US etc) have come to the same conclusion -- cogeneration of electricity is second only to energy efficiency improvements in reducing emissions. Interestingly, when we look at where the emission reductions come from in our study, we find that energy efficiency improvements yield twice as much as cogeneration and cogeneration yields twice as much as new and renewable sources.

Greenhouse Gas Emissions in "Kyoto and Beyond", Reductions from the Base Year (2004) and Reductions Relative to a Rough Estimate of Business-As-Usual in 2012										
		K&B Emissions				Emission Reductions by 2012 in K&B		Rough Estimate Business as Usual Mt eCO2 in 2012	Reduction from BU	
		Mt in 2004	% of total	Mt in 2012	% of total	Mt eCO2	% of total		Mt eCO2	% of Total
GRAND TOTALS	**All Sectors**	**727**	**100%**	**529**	**100%**	**199**	**100%**	**819**	**290**	**100%**
	Residential	72	10%	52	10%	20	10%	75	23	8%
	Commercial	68	9%	30	6%	38	19%	76	46	16%
	Personal Transportation	119	16%	73	14%	46	23%	138	65	23%
	Freight Transportation	60	8%	48	9%	12	6%	75	27	9%
	Industry excl oil and gas	146	20%	118	22%	29	14%	173	55	19%
	Oil and gas industry	126	17%	116	22%	11	5%	138	22	8%
	Non energy Sources	136	19%	92	17%	44	22%	144	52	18%
DISAGGREGATED NUMBERS:										
Residential	Existing residential	72	10%	50	9%	22	11%	72	22	8%
	New residential	0	0%	2	0%	-2	-1%	3	0	0%
Commercial	Existing commercial	68	9%	25	5%	43	22%	68	43	15%
	New commercial	0	0%	5	1%	-5	-3%	8	3	1%
Personal Transportation	Personal Vehicles	107	15%	60	11%	47	23%	124	63	22%
	Transit	2	0%	3	1%	-1	-1%	2	-1	0%
	Personal Air Travel	10	1%	9	2%	1	0%	12	3	1%

Greenhouse Gas Emissions in "Kyoto and Beyond", Reductions from the Base Year (2004) and Reductions Relative to a Rough Estimate of Business-As-Usual in 2012

		K&B Emissions				Emission Reductions by 2012 in K&B		Rough Estimate Business as Usual Mt eCO2 in 2012	Reduction from BU	
		Mt in 2004	% of total	Mt in 2012	% of total	Mt eCO2	% of total		Mt eCO2	% of Total
Freight Transportation	Light and medium trucks	21	3%	16	3%	4	2%	26	10	3%
	Heavy Trucks	23	3%	17	3%	6	3%	28	11	4%
	Air Freight	4	1%	4	1%	0	0%	5	1	0%
	Rail Freight	6	1%	5	1%	1	1%	8	3	1%
	Marine Freight	6	1%	6	1%	0	0%	8	2	1%
Industry	Agriculture	17	2%	16	3%	1	0%	20	4	1%
	Mining	16	2%	9	2%	7	4%	19	10	4%
	Pulp and Paper	21	3%	14	3%	7	3%	25	11	4%
	Metals and Steel	25	3%	22	4%	3	1%	29	7	2%
	Industrial Chemicals	24	3%	21	4%	3	2%	29	8	3%
	Cement, Glass, Non-metallics	7	1%	6	1%	1	1%	8	3	1%
	Food and Beverage	6	1%	5	1%	1	1%	8	2	1%
	Auto Industry	4	1%	3	1%	1	1%	5	2	1%
	Other Industry	25	3%	21	4%	4	2%	30	9	3%
Oil and Gas Industry	For Domestic Markets	59	8%	46	9%	13	6%	65	19	6%
	For Export Market	67	9%	69	13%	-2	-1%	73	4	1%

Greenhouse Gas Emissions in "Kyoto and Beyond", Reductions from the Base Year (2004) and Reductions Relative to a Rough Estimate of Business-As-Usual in 2012

		K&B Emissions				Emission Reductions by 2012 in K&B		Rough Estimate Business as Usual Mt eCO2 in 2012	Reduction from BU	
		Mt in 2004	% of total	Mt in 2012	% of total	Mt eCO2	% of total		Mt eCO2	% of Total
Non-energy Sources	Non-Metallic Minerals (Cement, Lime)	9	1%	8	1%	2	1%	9	2	1%
	Ammonia, Adipic and Nitric Acid	7	1%	0	0%	7	3%	7	7	2%
	Ferrous Metal Production	9	1%	6	1%	3	1%	9	3	1%
	Aluminum and Magnesium Production	12	2%	8	2%	4	2%	12	4	1%
	Misc. Industrial Processes	14	2%	10	2%	4	2%	17	7	2%
	Solvents and Other Product Use	1	0%	1	0%	0	0%	1	0	0%
	Agricultural Sources	61	8%	50	9%	11	6%	64	14	5%
	Waste (Landfills, Wastewater)	24	3%	10	2%	14	7%	25	15	5%