

Federal Budgetary Implications of Coalition Recommendations

Detailed Version - October 15, 2004

EXECUTIVE SUMMARY

This paper estimates the cost of the Clean Air Renewable Energy Coalition recommendations listed in its "Vision for a Low-Impact Renewable Energy Future for Canada", during the period of 2005 to 2020. To implement all measures, a budget of \$131 million per year would be required between now and 2020. This funding would provide for a larger Wind Power Production Incentive (target increased to 4,000 MW from currently 1,000 MW), the creation of a similar incentive for other low-impact renewable energy technologies (Green Power Production Incentive), an extension of the Market Incentive Program to 2012 at an increased budget, increased federal green power procurement, a national solar PV buy-down program, resource assessments for various technologies, and increased research funding specific to renewable energy.

This level of funding is in line with current government support for other types of energy, such as nuclear or bio-ethanol. Compared to the overall target of the Clean Air Renewable Energy Coalition for 2020 (15% of total Canadian electricity generation to be provided by low-impact renewable electricity sources), the recommended incentives would only support about a quarter of the facilities to be installed. However, a combination of provincial measures, such as renewable portfolio standards, and the suggested federal measures could bring Canada back onto the international renewable energy map by providing research moneys and incentives similar to what has been in place in other OECD countries for several years. In order not to lose significant market opportunities and to actively engage in a sustainable energy future for Canada, low-impact renewables should become a primary target of federal efforts to influence Canada's energy future.

BACKGROUND

The following sections describe the specific budgets and assumptions for each of the Coalition's recommended measures. The budget for each measure is shown in 2004 dollars, adjusted with a 2% annual inflation rate.

1a. Expand the Wind Power Production Incentive (WPPI) to 4,000 MW

The federal Wind Power Production Incentive (WPPI) has a target of 1,000 MW of new wind turbine capacity to be installed between April 1, 2002 and March 31, 2007. According to the WPPI website (October 8, 2004), \$115,757,514 out of a total of \$254,415,000 are already committed. It is therefore possible that the budget will be depleted before the incentive drops to a level of 0.8 ¢/kWh in 2006. The Coalition recommends that an extended WPPI, supporting an incremental 3,000 MW of new capacity should be provided at 1.0 ¢/kWh as a lower level does not fulfill industry needs and would be ineffective. WPPI is paid out to a company over ten years; the assumed capacity factor for wind turbines is 27%.

Table 1 Evolution of WPPI Payments over Time (CANMET website)

Commissioning Date	Amount of Financial Incentive for the ten-year period
April 1, 2002 to March 31, 2003 inclusive	1.2 ¢/kWh
After March 31, 2003 and on or before March 31, 2006	1.0 ¢/kWh
After March 31, 2006 and on or before March 31, 2007	0.8 ¢/kWh

Table 2 Cost of WPPI and WPPI Expansion

	Cost
WPPI (old) – 1,000 MW	\$254,415,000
WPPI (exp.) – 3,000 MW @ 1¢/kWh	\$709,560,000
TOTAL (nominal)	\$963,975,000
TOTAL (2004 dollars, 2003-2020)	\$803,187,485
After tax (33%)*	\$535,458,323

* Private investors in renewable energy will only receive about 67% of WPPI as they are subject to corporate taxation, which will reduce the net cost to the federal government by about one-third.

The total budget in 2004 dollars required between now and 2020 would be \$800 million, or about \$50 million a year between 2005 and 2020 (before tax).

1b. Create a Green Power Production Incentive

As there are significant opportunities and benefits of developing other forms of renewable energy, such as small hydro, biomass, and ocean energy facilities, the Coalition recommends that the government broaden its support to all green power technologies through the creation of a *Green Power Production Incentive* (GPPI), at the same level as WPPI (1¢ per kWh). In assessing the overall cost of such a measure, the 2020 generation mix used for the assessment of employment impacts¹ is also used here (see Figure 1). The generation mix shows that close to half of the expected generation will come from onshore and offshore wind, about a quarter from small hydro, and another quarter from biomass. Geothermal, ocean energy and solar PV will generate about 5% of the total.

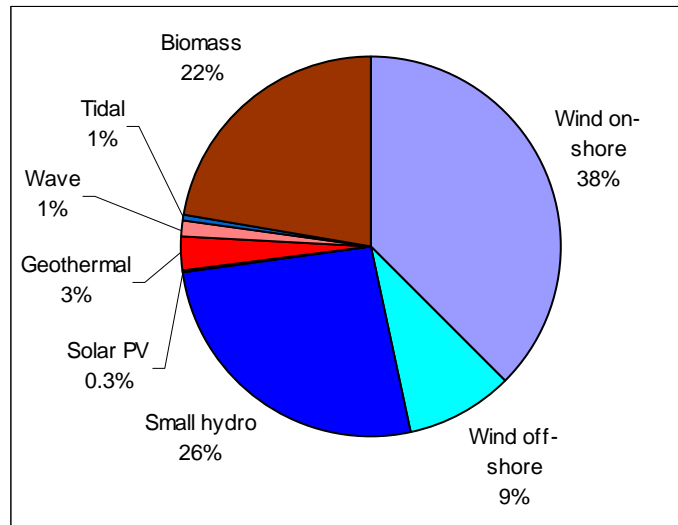


Figure 1 Expected Split between Different Technologies for 2020; Power Generation Based on Coalition Target of 15% of Total

¹ Horne, Matt: Canadian Renewable Electricity Development: Employment Impacts. The Pembina Institute, 2004

Table 3 Cost of Expanding WPPI and Applying GPPI to All Technologies

Technology	Generation Share in 2020	Total MW expected by 2020 (15% of total generation)	MW financed	Capacity Factors	% financed through expanded WPPI	Cost in C\$ @ 1 ¢/kWh
Onshore Wind	38%	19,265	4,000	27%	20.76	946,080,000
Offshore Wind	9%	3,600	711	36%	19.74	224,071,579
Small Hydro	26%	7,250	1,478	50%	20.38	647,317,895
Geothermal	3%	400	90	95%	22.44	74,690,526
Wave & Tidal	2%	886	189	30%	21.39	49,793,684
Biomass	22%	3,849	782	80%	20.31	547,730,526
TOTAL	100%	35,250	7,249		20.57	2,489,684,211
<i>Total (2004 dollars, 2005-2020 only)</i>						967,006,624
<i>After tax (33%)</i>						644,671,086

Note: Solar PV is to be supported by other measures than a WPPI expansion

Table 3 shows that, at 1 ¢/kWh, an incentive that supports all technologies at the same level as the current 4,000 MW target for on-shore wind would require a budget of \$2.5 billion during the period of 2005-2030. Adjusting for inflation, and limiting the period to look at to 2005 – 2020, the cost would be less than \$1 billion (the cost for the existing WPPI program for 1,000 MW was subtracted to derive the incremental cost only). For the WPPI expansion to 4,000 MW, this would represent an average cost of \$37.4 million per year, over 16 years. The extra incentive for other low-impact renewable energy technologies (GPPI) would cost another \$23 million per year.

Each technology gets the same amount of support in relation to its expected 2020 generation share. Note that a large part of this money would only be paid out after 2020, as all generation coming on-line after 2010 would receive part of the incentive between 2020 and 2030. About 20% of the Coalition target for 2020 could be financed through such an incentive. Given that existing generation from non-large hydro renewables is about 17 TWh, this budget would support nearly 25% of all new generation between now and 2020 that would come on-line to reach the proposed Coalition target of 15% of total Canadian generation by 2020. In order to support 100% of new generation required to reach this 15% target, the incentive would have to be quadrupled. It is, however, likely that the cost of renewable energy will come down so that many generators will only require a smaller incentive than that assumed (WPPI is designed so it does not incent projects more than is required to be financially viable).

2. Extending the Market Incentive Program to 2012

The Market Incentive Program (MIP) was announced in the Fall of 2002. It is funded with \$25 million and will run until March 31, 2006. The average annual cost is \$7.14 million. In order to make a more significant impact, the Coalition recommends that the MIP be increased to a value of \$30 million per year and extended through to 2012.

Table 4 Increase Funding for MIP

2005 and 2006	2007 to 2012	Total (nominal)	Total (2004 dollars)
\$22.9 million per year	\$30 million per year	\$225.8 million	\$206.0 million

For the period from April 1, 2004 to March 31, 2006, the incremental costs of the Coalition's proposal to the federal budget is \$22.86 million per year (nominal dollars). From April 1, 2006 to March 31, 2012, the additional costs would be \$30 million per year.

3. Increased Federal Green Power Procurement

Currently, the federal government's green power procurement target is 20% for 2006. The Coalition recommends increasing this to 30% by 2010 and to 80% by 2020.

The federal government pays between 2 and 3 cents/kWh as a premium for green power. 50 GWh are being purchased at the moment, and another 400 GWh would be required to fulfill the 20% procurement target across the nation. Assessing the cost of this measure is non-trivial, as for example in Alberta, Environment Canada buys green power through a contract for differences, and actually gained money due to significant increases in the market price of conventional energy. It is also expected that the price premium may fall in the future as the cost of renewable energy technologies declines.

For this paper, an average price premium of 2.0 cents/kWh for 2006, decreasing to 1.0 cent/kWh by 2020 is assumed. The 20% target is to be reached by March 31, 2006. Only the additional cost of the increased targets based on the Coalition recommendation is accounted for here. Assuming that 450 GWh represents a 20% procurement target, an additional 225 GWh would be required to meet a 30% target by 2010 and an additional 1,250 GWh to reach the 2020 target of 80%. It is assumed that there are incremental increases in green power procurement over the years. It may well be possible that by 2020, green power is cost-competitive with conventional energy, or even cheaper. Table 5 shows that in 2020, the overall cost drops as the cost premium decreases faster than purchases increase.

Table 5 Cost of Increasing the Federal Green Power Procurement (2004 dollars)

Year	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
GWh	40	85	130	175	225	325	425	525	625	725	830	935	1,040	1,145	1,250
Price, ¢/kWh	2	2	1.9	1.9	1.8	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.2	1.1	1.0
Cost \$MM	0.8	1.6	2.3	3.0	3.6	4.8	5.8	7.0	7.7	8.2	8.5	8.7	9.5	9.4	9.1
Percentage	20%				30%										80%

4. Creating a 100,000 Roofs Program for Solar PV

Solar PV needs different incentives than other renewables, and an inclusion under an expanded WPPI scheme would not be appropriate. The Coalition recommends implementation of a Solar Roofs program supported by a government-funded buy-down program, similar to those in place in several US states.

For a Canadian 100,000 solar roofs program, a 2,000 Watt system size is assumed, **and government is expected to introduce a buy-down program that restores 30% of purchasing costs.** At the moment, the cost for solar panels panel is about US\$4² per Watt. This cost is assumed to decrease to US\$3 by 2010 and to US\$2 per Watt by 2020. The 100,000 roofs program would deliver 200 MW of solar generation capacity – two-thirds of the 344 MW expected under the Coalition target for 2020. It is therefore assumed that the 200 MW target will be achieved 11 years after implementing the program, starting in 2005. Installations would continue after that, as solar PV is then expected to be cost competitive with grid electricity (at the consumer site, assuming net billing). A 20% overhead to administer the program is included in the cost displayed.

Table 6 Cost of a Federal 100,000 Roofs Solar PV Program in Canada (2004 dollars)

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
MW installed, by year	2	5	10	15	18	20	20	25	25	30	30	200
Price per W, US\$	4	3.8	3.6	3.4	3.2	3	2.9	2.8	2.7	2.6	2.5	-
Cost in C\$MM (30%)	3.9	9.1	17.0	23.6	26.1	26.6	25.2	29.9	28.2	32.0	30.2	252

² The exchange rate used in this paper is 0.72 cents US for one Canadian dollar.

5. Renewable Energy Resource Assessments

To define targets and government programs, it is necessary to know what the available technical resource potential for emerging renewables is. British Columbia has completed resource assessments for most low-impact renewable resources, but other provinces still need to follow suit.

BC Hydro paid \$100,000 for its wind resource assessment, and about \$30,000 for other technologies - covering geothermal, small hydro, biomass, and tidal energy. Only 50% of the costs for these assessments should be covered by the federal government. The other half would have to be financed by the provinces, utilities and/or the private sector. It is assumed that offshore wind could be assessed on a per-case basis, and that no specific assessment is required for solar PV. Table 7 summarises the overall resource assessment costs (with BC already having completed several of them), which come to a total of \$1.4 million. Assuming similar costs for each province and a 50% cost sharing by the Federal Government, these assessments would cost the Federal Government \$0.7 million.

Table 7 Cost of Canada-Wide Resource Assessments

Province	Resource Assessment Costs in \$								
	BC	AB	SK	MB	ON	QC	NB	NF	NS
Onshore wind	0	100,000	100,000	100,000	100,000	100,000	50,000	50,000	50,000
Small Hydro	0	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Wave	30,000	n/a	n/a	n/a	n/a	n/a	n/a	30,000	30,000
Tidal	50,000	n/a	n/a	n/a	n/a	n/a	n/a	50,000	50,000
Biomass	0	30,000	30,000	30,000	30,000	30,000	30,000	30,000	30,000
Geothermal	0	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total	80,000	160,000	160,000	160,000	160,000	160,000	110,000	190,000	190,000

For geothermal energy, the U.S. government shares 80% of the costs for test drillings. According to Western Geopower in BC, a 3.5 inch test well costs C\$3.5 million, and two of these are usually required to safely assess a geothermal resource. The Meager Creek site has already gone beyond this stage, but the two other sites under exploration would still require this incentive. Similar incentives could be given for other technologies to support feasibility studies and local resource assessments. Such incentives have not been included here, and the above costs only cover global resource assessments, which need to be refined by site-specific assessments in order to allow project developments.

6. Renewable Energy-Specific Research and Development Program

European countries are providing substantial R&D support to their renewable energy industries³. For example, Germany invests about C\$92 million per year in R&D, and the U.K. provides some C\$415 million in R&D moneys for a mix of technologies, over three years.⁴ Taking the UK's annual investment and applying it to Canada based on population, this would equal about C\$70 million per year. Germany's R&D investment would be at least C\$35 million. The U.S. Department of Energy had a budget of C\$583 million for renewable energy research in 2001. These figures suggest that an annual R&D investment of about \$50 million would be appropriate for Canada in order to fund research at the same level as other countries. CANMET's Renewable Energy Technologies Program is funded with only \$5 million per year.

³ See Pollution Probe, *Promoting Green Power in Canada* (2002), for more detail

⁴ Another £50 million program for ocean energy resources was announced in August 2004

CONCLUSION

Figure 2 shows the combined annual costs of all recommendations for the federal government, corrected for 2% inflation. The existing WPPI with a budget of \$260 million is meant to create 1,000 MW of wind turbines, and is included in the estimate for a WPPI expansion. This amount was also depreciated over time (\$205 million in 2004 dollars, assuming that an expanded WPPI will conclude its last contracts in 2016) and subtracted from the total cost for WPPI expansion in order to obtain the incremental costs for the additional 3,000 MW of wind from a WPPI expansion (it was not possible to show this effect in Figure 2). Table 8 shows the aggregated costs for all measures between now and 2020 (additional over existing programs), which adds up to 2.1 billion dollars. Per year, this would be about \$131 million, which is very much in line with current subsidies given to Canada's nuclear industry (\$211 million per year⁵) and the ethanol production sector (\$100 million from the 2003 budget⁶).

Table 8 Aggregated Cost of Coalition Recommendations through 2020

Program	Costs of Recommended Measures from 2005 to 2020 (\$MM, 2004 dollars)
WPPI Expansion to 4,000 MW	803 – 205 (existing WPPI) = 598
Create GPPI	369
100,000 Solar Roofs Program	252
Green Power Procurement	90
Resource Assessments	0.7
Expanding the MIP through 2012	206
Canadian R&D Program	611
TOTAL	2,127

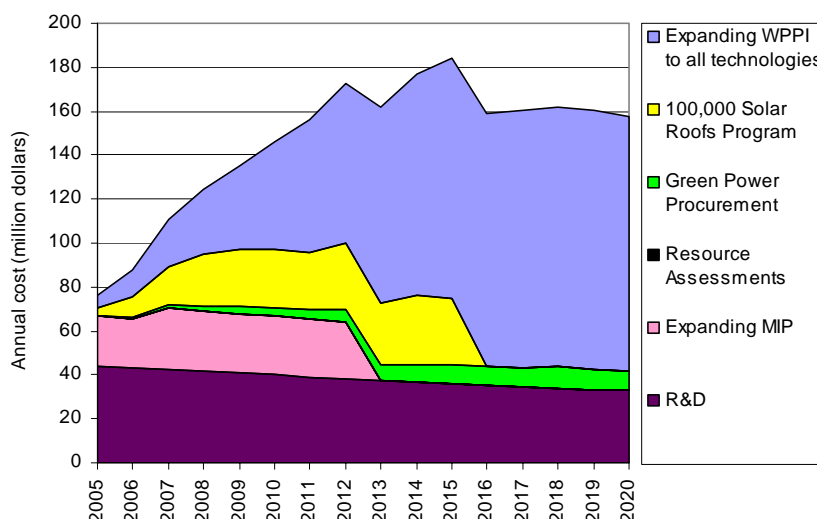


Figure 2 Combined Cost of All Coalition Recommendations (corrected for inflation)

Other countries, like the USA, Great Britain, Germany or Spain have provided strong incentives to low-impact renewable energy technologies for many years, and have created viable industries that are now exporting equipment to Canada and other countries in the world. If Canada decides to create an investment climate that shows a clear preference for low-impact renewable energy, it can attract investment and further the domestic development of this sector, creating both environmental benefits and export opportunities. These opportunities will be lost unless strong political guidance is provided by the federal government, both in terms of target-setting for low-impact renewables, as well as providing clear and effective incentive programs.

⁵ see <http://www.cnp.ca/resources/nuc-subsidies-at-50-ex-sum.html>

⁶ see http://www.nrcan-rncan.gc.ca/media/newsreleases/2004/200402a_e.htm