

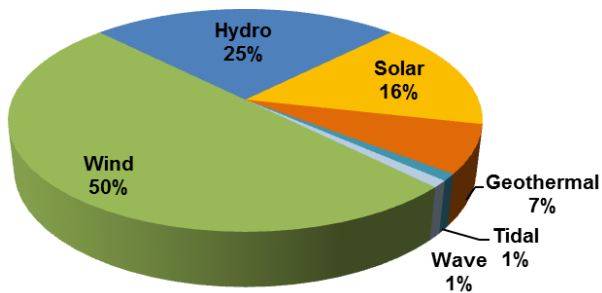
# A path to sustainable energy in Canada

Matthew McCarville

On March 2<sup>nd</sup>, I testified to the Parliament of Canada Senate Committee on Energy, the Environment and Natural Resources with a plan to power Canada with 100% renewables by 2050. I motivated this asking what's the problem? Why care? Why act quickly; not in 100 years?

Aside from 2.5-3 million air pollution deaths a year, hidden medical and insurance costs, etc., temperatures are rising. In Atlantic Canada from September to December in 2010, 89 new temperature records were set; 3 new lows and 86 new highs. In the 2000's arctic sea ice decreased 15% and we had 9 of the 10 hottest years in recorded history. As sea ice disappears it's more difficult for it to recover. Once gone, the climate can warm even more rapidly. So this is important as we can't rely on solutions that might become available. We have huge populations to support, we have infrastructure and want to be sustainable for a while, so we must rely on the best technologies existing today to solve this.

## Canada Energy Supply, 2050



I estimate that approximately 55,000 5 megawatt (MW) wind turbines, 500 300 MW concentrated solar plants, 500 300 MW solar PV power plants, 3 million 3 kilowatt (kW) rooftop PV or small wind systems, 150 100 MW geothermal power plants, 5000 0.75 MW wave devices, 5000 1 MW tidal turbines, 10 new 1300 MW hydroelectric power plants and 70,000 MW of existing hydroelectric power plant capacity, can power Canada with electricity and electrolytic hydrogen for all purposes within 40 years at costs similar to today.

Vehicles, ships and trains would be powered by electricity and hydrogen fuel cells. Aircraft would run on liquid hydrogen. If Canada converts all personal vehicles to battery electric vehicles powered by wind, towers on the ground require less than 0.2 km<sup>2</sup> – twice the area of Parliament Hill. Land for turbine spacing can still be used for agriculture.



Wind power is the greenest energy supply option and it's about twice as powerful in the coldest month compared to the warmest. Space heating is 63% of end-use energy in Canada's residential sector. So homes would be warmed with excess winter winds using electric thermal storage heaters – no need for coal, oil, natural gas, nuclear or biofuels – and water would be preheated by the sun.

Aside from cryogenic hydrogen for aircraft, which you have to combust, along with some high temperature processes that would replace steel production, there would be no need for any combustion except in very remote circumstances. In sum, this path to sustainable energy in Canada achieves about 90% reductions in GHGs from energy use by 2050. Barriers to the plan are primarily social and political, not technological or economic.

*Matthew McCarville is currently a researcher for a Marine Renewable Energy Infrastructure Assessment being carried out for the Government of Nova Scotia Department of Energy. From 2007-2010 he was Coordinator for the ECOPEI Energy Project.*