



Energy in Canada @150 and Beyond Canada's Future is Electric

Submitted by Canadian Council on Renewable Electricity

One in a series of papers prepared by Canadian energy sector leaders – at the invitation of the Energy Council of Canada – exploring key aspects of our ongoing national energy story on the occasion of the 150th anniversary of Confederation.

Summary: The Canadian Council on Renewable Electricity overviews Canada's uniquely strong and still expanding position in renewable energy generation, and the foundation this provides for deeper electrification and decarbonisation across the building, transportation and industrial sectors. With the right policy support and a clear roadmap, a doubling of this country's renewable electricity output is within reach.

Though they haven't received nearly as much attention in recent years as our fossil-energy deposits, Canada is awash in renewable-electricity resources. For decades, Canadian utilities and developers have responsibly tapped into them to power our homes and industries.

The result?

Canada is a global leader in renewable electricity, which accounts for more than 65 per cent of Canada's electrons, the highest such proportion amongst G7 nations. That's something to be proud of. But it's also just a taste of what's to come; because Canada has many renewable resources yet to harness—and very good reason to do so.

Around the world, governments and utilities are turning their attention to renewable sources of electricity – from the sun, wind and water – to provide clean, reliable and affordable power for homes and businesses. Supportive policy coupled with falling technology costs have made renewable sources of power the preferred choice for both meeting new electricity demand, and for cleaning up grids dominated by fossil fuels.

Here in Canada, the role of renewable sources of energy will continue to grow in our electricity system, as coal-fired power is phased out by 2030 and natural-gas fired power is more stringently regulated. Indeed, the federal government is seeking to meet a target of 90 per cent non-emitting electricity by 2030.

Canada has the highest proportion of renewable electricity in the G7.

But that isn't where the opportunity for renewable electricity in Canada ends.

As a signatory to the Paris Agreement, Canada has committed to reducing its greenhouse gas (GHG) emissions by 30 per cent below 2005



levels by 2030. While many developed countries, such as the United States, will be able to achieve a significant proportion of their reductions by reducing reliance on coal-fired power within their electricity systems, Canada's already relatively clean grid means that a majority of reductions will have to be found in other sectors.

While this may appear a significant challenge at first glance, a deeper look reveals the opportunity presented by our abundant supply of renewable sources of electricity.

How? Through the increased electrification of sectors – buildings, transportation, and industry – currently reliant upon fossil fuels.

Changing the Primary Energy Mix

As illustrated in our report, [Powering Climate Prosperity: Canada's Renewable Electricity Advantage](#), renewable electricity must meet a growing proportion of our primary energy needs in the decades ahead if we are to achieve our climate change targets. Carbon-based fuels provided Canada with 70 per cent of its primary energy needs in 2010 – the most recent year for which reliable data exists.

We still have a very long way to go to reduce our coal, gas, and oil consumption and slash our carbon emissions, but analysis after analysis concludes that this is the pathway Canada must follow to achieve deep decarbonization:

- *“Fuel switching to decarbonized electricity is the single most significant pathway toward achieving deep emissions reduction globally. It allows demand sectors to reduce their*

end-use emissions by switching from refined petroleum products, natural gas and other fossil fuels to clean electricity. This abatement is only made possible through both decarbonization of existing electricity generation as well as a large expansion of new zero emissions electricity sources.” – Pathways to Deep Decarbonization, Canada Report

- *“Low-emission electricity is the foundation for economy-wide emission reductions in transportation, buildings, and industry. While Canada already benefits from relatively low-emission power generation, remaining high-emission generation facilities will need to be replaced, and all provinces will need to expand low-emission electricity generation capacity to meet growing demand and enable further reductions.” – Council of Canadian Academies*

Renewable electricity must meet a growing proportion of our primary energy needs in the decades ahead.

- *“Electricity as an energy carrier has a pivotal role in achieving economy-wide deeper emissions reductions. It is a highly versatile form of energy and converting electricity into end-use energy services can be done at high efficiencies. As such, an economy-wide transition from current energy end-use fuel mix to one dominated by electricity is an option to satisfy future energy demands, while achieving deep GHG gas emissions reductions.” – Canadian Energy Research Institute*
- *“Electrification has been identified as an essential step in all deep GHG mitigation analyses. The electrification of end use*



applications that are currently using fossil fuels is fundamental, for example, using electricity to power certain cars, trucks, building appliances and heating systems, and energy requirements for some industries.” – Canada’s Mid-Century Long-term Low-Greenhouse Gas Development Strategy

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Renewable Electricity in End-Use Applications

Around 70 per cent of the energy used in commercial and residential buildings is used for heating, generating substantial emissions. Better insulation has already led to a substantial decrease in heat intensity for new buildings, with approximately a 40 per cent reduction for residential heat intensity between 1990 and 2012. This reduction is expected to continue although at a slower pace. With these low heating loads, electric (and solar) heating, potentially in combination with heat pumps, is becoming a very economic option and will allow buildings to reach close to zero emissions by 2050, with all energy needs in residential and commercial buildings powered by electricity.

EV Viability

By 2050, transport will be the largest GHG emitter in Canada under the *Deep Decarbonization Pathways* project reference-case scenario, almost three times the total carbon budget for all sectors. Fortunately, recent technological improvements – mostly in battery technology – have made the full electric car a viable alternative to internal combustion

engine cars. Full electric cars may have lower GHG emissions than gasoline-powered cars even in areas with relatively dirty electricity supply. For example, an average car driver will reduce lifecycle GHG emissions when switching to a similar battery electric car in all states of the United States. In Canada, with relatively low emissions in its GHG profile, the switch from gasoline to electric cars will see even larger potential GHG reductions.

At present, fully electric cars still only represent less than one per cent of new vehicle sales, but this modest showing is about to change. Battery costs have already come down 60 per cent over the last five years and will continue to decline, further making full electric cars increasingly competitive. Bloomberg predicts that by 2022 the total cost of ownership for a battery electric vehicle will be lower than a traditional car (at \$70 oil) at which point electric vehicle sales will really start to take off. Major car manufacturers are already preparing for these changes with almost all major manufacturers introducing electric car models.

As cars electrify, it’s important to ask if Canada has enough clean and renewable electricity to fuel them. Fortunately, Canada has tremendous untapped renewable energy potential of all types. In fact, if all current light duty vehicles in Canada were plug-in electrics, just half of Canada’s undeveloped hydropower potential alone could power the entire Canadian fleet plus twenty-five per cent of the U.S. light duty vehicle fleet as well. Apply Canada's marine, solar and wind power potential to the challenge and Canadian renewables offer a North American-scale solution for electrifying transportation.

Industrial Sectors



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Many industrial processes use heat and factories typically burn fossil fuels to generate it – the source of most industry-related emissions.

In principle, these emissions can be reduced dramatically by a combination of energy efficiency measures, biomass, electrification, CCS and a number of smaller measures. Electrification via the use of heat pumps and electric boilers will certainly be one of the most substantial GHG reduction measures especially in light industries. The *Deep Decarbonization Pathways* project estimates the market share of electric boilers in industrial heat generation to increase from seven per cent in the reference case to 40 per cent in 2050, which would under this scenario be responsible for over 50 per cent of the total non-oil & gas GHG abatement.

The more we electrify our economy – from buildings, to transportation, to industry – with renewable resources, the faster and deeper we can cut greenhouse gas pollution and ensure Canada stands out as a climate change leader.

Leadership at the Next Level

This, then is the opportunity: Canada can become a global climate leader by taking our renewable-electricity leadership to the next level. Doing so would mean not only cleaning up our grids, but also roughly *doubling* our output of renewable electricity to increase the role of renewables in Canada's primary energy mix. That is no small challenge, but also a huge opportunity.

Across the country renewables are now a cost-competitive option for new electricity owing largely to the fact that there is no cost for wind, water or sunshine. While we already produce a

significant amount of renewable electricity, we've barely scratched the surface of our renewable-energy potential – recent assessments suggest that renewable electricity resources could readily supply one and a half times the nation's energy needs. We have resources available from coast to coast to coast, and the diversity of sources – from hydro, to wind, to solar to marine – offer different characteristics that complement each other to ensure we can increase the overall supply of clean, affordable, reliable electricity across Canada.

With the right policy support from provinces and the federal government, we could repower our factories, buildings, trains, vehicles, and more with clean electrons and accelerate our shift to the low carbon economy. This is how we will power prosperity into the coming decades as the world shifts to lower carbon energy sources.

To do this in a comprehensive, efficient and effective way, we –along with numerous other stakeholders who signed on to [*A Canadian Opportunity: Tackling Climate Change by Switching to Clean Power*](#) – believe that Canada needs a national roadmap or action plan for electrification. As a relatively new policy area, it faces some significant barriers. A roadmap for electrification would help fill information gaps that exist today, and lay out a national vision aligned with the pan-Canadian effort to tackle climate change and the Council of the Federation's *Canadian Energy Strategy*.

Canada has the opportunity to leverage our competitive advantage in renewable electricity to power our future climate prosperity.

It is an advantage we must seize.



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The Canadian Council on Renewable Electricity educates and engages Canadians about the opportunity to expand the production and use of renewable electricity across the country. The founding members of the Council are the Canadian Hydropower Association, Canadian Solar Industries Association, Canadian Wind Energy Association, and Marine Renewables Canada.