



Energy in Canada @150 and Beyond **Wind Energy's Coming of Age**

By Robert Hornung, President, Canadian Wind Energy Association

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: Robert Hornung sees the world resolutely moving towards a low-carbon future. Canada, with its huge quantity of high-quality clean energy reserves, has a unique opportunity to lead the transition. After briefly pointing out highlights of wind energy developments in Canada and rapidly-growing global investments in wind energy, he indicates that a recent study found no operational barriers to the integration of 35% wind energy generation into the grid provided a number of cost-effective transmission investments were made.

Latest Spin on a Long Tradition

The thousands of wind turbines delivering clean electricity to millions of homes across the country may be a marvel of modern engineering and innovation, but they are also just the latest spin on harnessing an energy resource that has been powering Canadian lives, in one way or another, since before there was a Canada.

Before oil was discovered in Alberta, before Quebec built its first hydro dam, and before the first uranium was extracted from deposits in northern Saskatchewan, early settlers were building windmills to grind grain and pump water. By the 1920s, small-scale wind generating systems were starting to dot the Prairie

landscape, providing electricity to power lights and charge batteries.

As the electricity grid was extended into rural areas, the use of on-site windmills declined. The desire to capture and use the renewable power of the wind, however, never disappeared. The oil crises of the 1970s sparked new interest in wind energy production, but this time at a larger scale. In Canada, this modern era is considered to have begun at Cowley Ridge in southern Alberta, where 52 Kenetech 375 kW wind turbines were installed in 1993 and 1994.

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The Cowley Ridge project was decommissioned last year after 23 years of service, long eclipsed by the technical sophistication of newer wind turbine models and the rapid expansion of the industry across Canada. By the end of 2016, there were 6,288 wind turbines – some nearly 10 times more powerful than those early Kenetech machines – operating at 285 project sites in all 10 provinces, Yukon and the Northwest Territories. Installed wind capacity has grown by an average of 18 per cent – or 1,327 MW – a year for the past five years,



making Canada the eighth largest wind energy producer in the world. The sector now supplies six per cent of Canada's electricity needs, and has been the country's largest source of new electricity generating capacity over the past decade.

Revolutionary in Scope

The industry's growth in Canada is part of a renewable energy revolution underway across the globe. Clean energy is now big business, with worldwide investment totaling \$348 billion last year. The year before that, a record-setting \$468 billion flowed into the sector, the first time more money was invested in renewable energy than in power from natural gas, coal, and oil combined. And even though overall investment in clean energy was down in 2016, the total capacity installed was virtually the same, thanks to falling technology costs.

The global wind industry installed 56.5 GW of new generating capacity in 2016, its second-best year ever. More and more wind farms are being built at prices that rival, and often undercut, their competitors. According to the U.S. financial advisory firm Lazard, the levelized cost of wind energy has plummeted 66 per cent since 2009, and looking forward, the International Energy Agency forecasts it will drop another 26 per cent by 2025. Wind is already Canada's most cost-competitive source of new electricity generation alongside natural gas. And unlike natural gas, it is not impacted by carbon prices or commodity price fluctuations, and so will only become more affordable over time.

Is it any wonder then, that wind energy can be found at the centre of any credible strategy to

combat climate change and capture clean growth opportunities?

We see it around us. Alberta and Saskatchewan are moving forward with plans to install as much as 7,000 MW of new renewable energy capacity on their grids by 2030 to replace retiring coal and reduce electricity sector greenhouse gas emissions, with most of it expected to be wind. The release of Quebec's new 2030 energy policy in late 2016 set the stage for wind to play a major role in the province's efforts to decrease fossil fuel use and accelerate the transition to a low-carbon economy. The federal government has promised to phase out coal-fired generation by 2030 and has set a target of generating 90 per cent of Canada's electricity from non-emitting sources by 2030, up from 83 per cent today.

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Even as U.S. President Donald Trump reverses some of the climate change actions of his predecessor, he will not be able to roll back renewable energy. States in the U.S. northeast have independently made strong greenhouse gas emission reduction commitments and are in the market for significant amounts of new clean energy supply. Hydro and wind energy producers in Canada are responding, forming partnerships with transmission developers to help fill that demand.

These trends are only going to accelerate over time. They have to. Canada has made a commitment to reduce carbon emissions 30 per cent below 2005 levels by 2030. Some provinces have gone further, adopting targets consistent with the Paris Agreement's objective of limiting



global temperature rise this century to less than 2°C and seeking emissions reductions in the order of 80 per cent by 2050. The only way to meet this objective is to fundamentally transform the way we produce and use energy.

It will mean powering more and more of our activities and industries with clean, non-emitting electricity. We'll be driving electric vehicles, using electricity more often to meet heating and cooling needs in significantly more energy efficient buildings, and employing innovative processes that integrate energy efficiency and clean generation technologies to drive both costs and emissions down in some industrial sectors.

The commercial and industrial sector has become one of the fastest-growing customers for wind energy

We are already starting down this path. Bloomberg New Energy Finance released a study last year predicting that electric vehicles will make up 35 per cent of new car sales by 2040. Wind turbines are powering remote mines in the Northwest Territories and Northern Quebec right now, and are doing the same in Chile, Argentina, Australia and other places around the globe. Over the last couple of years, the commercial and industrial sector has become one of the fastest-growing customers for wind energy. More than one third of new wind power purchase contracts in the U.S. are being signed by non-utility customers, and the market is expanding to include countries like Germany, South Africa, Mexico, Chile, Brazil and the U.K. IKEA owns two wind farms in Alberta, part of its global strategy to produce more renewable energy than it uses by 2020.

Unexploited Opportunity

In a world increasingly demanding clean energy solutions, Canada's vast and diverse renewable resources are a strategic advantage. And when it comes to wind energy in particular, it's an opportunity we have barely begun to exploit. That became very clear last year, when the Canadian Wind Energy Association released the results of a ground-breaking study that found Canada can reliably and cost-effectively get more than a third of its electricity from wind energy.

The *Pan-Canadian Wind Integration Study* (PCWIS) found no operational barriers to achieving 35 per cent wind penetration. Reaching that mark would require new transmission interconnections to allow the free flow of wind-generated electricity between markets, but with wind displacing more expensive coal- and gas-fired generation in both the U.S. and Canada, the fuel cost savings would pay for that infrastructure in just three or four years, while at the same time racking up billions of dollars a year in new clean energy export revenue and reducing emissions on both sides of the border by tens of millions of tonnes.

It sounds like a big leap from where we are today, and it is. But it is also in step with what jurisdictions around the world are already doing. Iowa got nearly 37 per cent of its electricity from wind last year, South Dakota got more than 30 per cent and three other U.S. states surpassed 20 per cent. Denmark meets 40 per cent of its electricity demand with wind, Portugal is at 30 per cent and Ireland is within striking distance of that mark. In our own country, P.E.I. is already at 25 per cent and has



plans to increase its installed wind capacity by a third.

Bridging the Gap

So how does Canada bridge the gap and get to where we know we need to be? We have the resources and we have the technology. What we need now are policies that drive investment in the right direction. Pricing carbon is a good first step, but it will only get us so far. We also need smart limits on emissions from natural gas-fired generation that allow it to play a transition role as an enabler for more renewable energy while not becoming a long-term barrier to it, strategic transmission investments that connect wind-rich regions with those in need of clean electricity, and electricity market designs and rules that recognize and reward the value wind energy brings to the grid.

The world is resolutely moving towards a low-carbon future, and Canada, with its huge quantity of high-quality clean energy reserves, has a unique opportunity to lead the transition. If we seize it, Canada will not just compete, but thrive, in the next century of clean growth.

Robert Hornung has been president of the Canadian Wind Energy Association (CanWEA) since August 2003. He represents the interests of Canada's wind energy industry, including wind farm owners, operators, project developers, consultants, manufacturers and service providers. Robert is also a Board Member of the Global Wind Energy Council and was named a Fellow of the Royal Canadian Geographical Society in 2009.