

## Report: Canada Can Reliably Integrate Large Amounts of Wind Energy



Canada can get more than one-third of its electricity from wind energy without compromising grid reliability — and at the same time realize economic and environmental benefits, according to a wind-integration study issued by the Canadian Wind Energy Association (CanWEA).

The *Pan-Canadian Wind Integration Study* (PCWIS) is the first to take a detailed national, system-level look at the production costs and benefits of high wind-energy penetration in Canada and helps identify potential operational challenges and the most efficient solutions.

The study presents utilities, system operators, and policymakers with data they've never had access to before. It provides a technical platform that can be used to inform the development of provincial, regional, and North American energy policies that are realistically achievable and technically sound. The study serves as a solid foundation for further research and analysis in this area.

“Understanding the implications of integrating a greater amount of wind energy into Canada’s electrical system contributes to our goal of developing clean-energy resources and moving our country towards a low-carbon economy,” said Jim Carr, Canada’s minister of Natural Resources. “The Government of Canada supports clean energy technologies that encourage energy efficiency, bring cleaner renewable energy onto a smarter electricity grid, and promote sustainable economic growth and competitiveness.”

The study is timely, given Canada’s commitment to shift to a low-carbon economy. It considers four pan-Canadian scenarios with wind energy supplying between 5 percent and 35 percent of the country’s forecast system load in 2025, including power flows across the border. The analysis concludes that 20-percent and 35-percent wind penetrations can be achieved in a reliable and efficient manner.

“Affordable, reliable, zero-emission electricity generation, like wind energy, will reduce greenhouse gas emissions by helping to clean the electricity grid so that clean electricity can be used to power vehicles, buildings, and industry, and generate export opportunities,” said CanWEA President Robert Hornung. “This technical study contributes to our understanding of how we can make the most effective use of a valuable, but underutilized, clean-energy resource to make the kinds of deep emissions cuts ultimately needed to address climate change.”

### RECOVERING THE COSTS

The findings speak to the costs of integrating higher penetrations of wind energy. With respect to the estimated cost of new transmission tie-lines between provinces and between Canada and the U.S. needed to accommodate high penetrations of wind, it shows costs would be recovered within a few years. As well, the additional backup generation required to balance wind energy’s variability is shown to be modest, amounting to a small fraction of total wind-generating capacity.

At the installation levels studied, wind production displaces output from the most expensive and least efficient power plants, which the scenarios show to be mostly natural gas- and coal-fired generation. As fossil fuels are displaced with zero-carbon wind energy, greenhouse gas emissions are reduced.

The economic benefits of the wind resources in the study scenarios have

two components: Firstly, there is a reduction in production costs in Canada as a result of displacing thermal generation, which has fuel costs to consider, with wind energy that has no fuel costs. Secondly, there are revenues from increased exports to the U.S. The study did not quantify investment costs of new generation or its interconnection.

“While the benefits of wind energy are widely known, this nearly three-year-long project helps provide decision makers with insights into how those benefits can be most efficiently realized as Canada takes steps to make use of this vast renewable resource,” said Bahman Daryanian of GE Energy Consulting Group, who was the study’s technical director and project manager.

“The project confirms Canada has high-quality wind resources in all provinces, and makes laudable contributions to the study and understanding of wind-integration issues,” said Charlie Smith, executive director for the Utility Variable-Generation Integration Group (UVIG) and an active member of the study’s Technical Advisory Committee. “A notable example is its examination of what changes can be made in the operations and forecasting of existing thermal and hydroelectric generation to take advantage of available wind energy in a cost-effective way.”

### PARTNERSHIP PROJECT

“The project team included among their efforts a number of sensitivity analyses to confirm the PCWIS results

are robust and dependable; the Canadian wind resource is outstanding and matches the load over the course of a year remarkably well,” said DNV GL’s Dariush Faghani, the project adviser to CanWEA.

GE executed the project in partnership with Vaisala, Electranix, EnerNex, and Knight Piésold. Guidance was provided by CanWEA, DNV GL, and a Technical Advisory Committee that included representatives from: Alberta Electric System Operator (AESO), BC Hydro, Hydro-Québec, Independent Electricity System Operator (IESO), ISO-New England (ISO-NE), Manitoba Hydro, Midcontinent Independent System Operator (MISO), National Renewable Energy Laboratory (NREL), New York Independent System Operator (NYISO), SaskPower, Utility Variable-Generation Integration Group (UVIG), and Western Electricity Coordinating Council (WECC).

The PCWIS was co-funded by CanWEA and Natural Resources Canada (NRCan), through the ecoEnergy Innovation Initiative. Environment and Climate Change Canada provided data and modeling input. The contents of the study do not necessarily reflect the opinions of the Government of Canada nor those of the Technical Advisory Committee members or the organizations they represent. ↘

Source CanWEA

For more information, go to [www.canwea.ca](http://www.canwea.ca)

## Wind Investment Grows During the Second Quarter

U.S. wind-industry activity approached record levels in the second quarter as utilities and other purchasers locked in record-low wind costs.

More than 18,200 MW of wind-power capacity are now under construction or in advanced stages of development, according to the American Wind Energy Associa-

tion’s (AWEA) *U.S. Wind Industry Second Quarter 2016 Market Report*.

Recognizing the value of low-cost, reliable, stably-priced, and zero-emission wind energy, major utilities announced plans during the second quarter of 2016 to develop and own up to 2,600 MW of new wind-energy generating capacity.

“There’s never been a better time to buy American wind energy,” said Tom Kiernan, CEO of AWEA. “Smart utilities and other customers are locking in prices at record lows by starting construction this year to qualify for the full-value PTC. The industry is thriving thanks to policy stability, and we appreciate support

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from champions in Congress for a multi-year extension of the PTC. Wind power supports 88,000 well-paying jobs, and the wind-turbine technician is the fastest growing profession in the U.S. This is what an efficient, performance-driven policy delivers — more low-cost clean energy and the American jobs that make it happen.”

## EARLY WIND INVESTMENT

Congress passed a multi-year extension of the performance-based wind-energy Production Tax Credit (PTC) with a bipartisan vote late last year. The multi-year PTC extension encourages utilities to invest in wind early, so they can scale-up clean energy while making the most of the full-value PTC. The 2.3 cents per kilowatt hour PTC is scheduled to decrease to 80 percent of that value for projects that start construction in 2017, 60 percent in 2018, and 40 percent in 2019.

After emerging from several years of policy uncertainty that placed American jobs at risk, wind energy is on track to grow from supplying about 5 percent of U.S. electricity today to 10 percent by 2020, and 20 percent by 2030.

The 18,200 MW of current activity includes more than 12,450 MW of wind projects now under construction, with 3,000 MW in new construction announcements during the second quarter, an increase of 23 percent over the first quarter of 2016. Kansas led the nation this quarter in new construction announcements at 778 MW, followed by Iowa at 551 MW and North Dakota at 400 MW.

Enel Green Power North America Inc.'s (EGP-NA) 400 MW Cimarron Bend wind farm in Kansas is among the projects that started construction this quarter to meet demand for wind energy from utilities and emerging corporate buyers.

Cimarron Bend will supply half of its power to the Kansas City Board of Public Utilities, and half will go to Google, once completed.

“For EGP-NA, the first half of 2016 has been marked with rapid growth, including the announcement of more than 720 MW of new wind capacity under construction,” said Jack Thirolf, senior director of regulatory affairs for Enel Green Power North America. “Not only are we seeing capacity growth, but also diversification of power purchasers as more commercial and industrial customers

are attracted to the competitive pricing and long-term stability that clean wind energy can deliver.”

Even larger projects are on the way. Utilities announced large scale wind-power investments during the second quarter, including the up to 2,000 MW Wind XI project by MidAmerican Energy in Iowa, as well as the 600 MW Rush Creek project by Xcel Energy in Colorado.

## UTILITIES AND PPAS

Utilities also disclosed more than 1,800 MW of wind Power Purchase Agreements (PPAs), the second highest volume of announcements in a single quarter since the beginning of 2014. Other utilities released requests for proposals and requests for information for thousands of megawatts of new renewable capacity, which are likely to lead to new wind purchases in the near future. These an-



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nouncements illustrate growing utility appetite for wind energy to help keep costs low for ratepayers while also meeting clean energy targets.

Utilities are vocal in their support of wind power for its consumer benefits:

- Iowa Economic Development Authority on Mid-American Energy announcement to invest \$3.6 billion in Wind XI Project, April 14: “Investments of this scale are viable because federal production tax credits are at their highest level. It makes sense to leverage that benefit to solidify Iowa’s leadership in wind energy. (The) announcement continues to build Iowa’s legacy in the renewable energy space — and in a very real way, provides economic benefits to all Iowans.”
- Xcel Energy, May 31: “The addition of cost-effective renewables that take advantage of the recently extended PTC and ITC can still provide significant savings in power-supply costs for customers.”
- Kansas City Power & Light on 500 MW PPA announcement with Osborn and Rock Creek wind projects in Missouri, April 7: “Both of these projects qualify for the federal PTC. This tax credit allows KCP&L to pass savings along to customers, keeping rates lower than would otherwise be possible.”

### BIPARTISAN SUPPORT

The industry installed 169 wind turbines across four states during the second quarter, representing 310 MW of capacity. Texas led the country with 200 MW of wind capacity installed, followed by Kansas (72 MW), Nebraska (36 MW), and a single turbine installation in Iowa. Across the U.S., cumulative year-to-date installations total 830 MW. The U.S. now has an installed wind-power capacity of 74,821 MW.

American wind power is growing, as is its popularity. Wind power has bipartisan support from governors, members of Congress, and elected officials at all levels.

In a divisive election year, several new polls signal wind power’s broad support among the American public:

- A March Gallup poll found 73 percent of adults say the U.S. government should “emphasize the development of alternative energy such as wind and solar power” (up from 66 percent in 2011).
- Lazard’s Alternative Energy Poll 2016, release in March, shows 90 percent of likely voters favor “expanding wind power” (up 12 points from 78 percent in 2012)
- The same 2016 Lazard poll found 81 percent of self-described conservatives favor “expanding wind power” (up 34 points from 57 percent in 2012).

Federal support in the form of the PTC is important to level the playing field and to keep growing wind power, but state and local policies and adequate access to transmission remain critical to scaling up and delivering low-cost wind energy to more Americans.

A number of states have shown leadership by expanding their Renewable Portfolio Standards (RPS). At present, California, Oregon, Hawaii, Vermont, and the District of Columbia have all increased their target standards to 50 percent renewable energy and beyond. Other states, such as Maryland, Massachusetts, New York, and Rhode Island have passed or are actively considering other big increases to their standards.

Strengthening the electric grid provides a number of benefits by providing consumers with lower-cost and more reliable power and greater access to renewable energy. Investing in more transmission capacity makes the grid more resilient and increases access to wind resources in low-cost areas. ↴

*Source AWEA*

For more information, go to [www.awea.org](http://www.awea.org)

### New York Gets Historic Clean-Energy Standard

The New York Public Service Commission recently issued an order requiring 50 percent of New York’s electricity come from renewable, clean energy resources such as wind and solar power by 2030.

A separate section of the Clean Energy Standard order establishes an incentive program to keep upstate nuclear power plants operating through 2030. The nuclear incentive level was established only for the next two years and can be adjusted up or down after 2018 based on market conditions. Output from the nuclear plants will not count toward the 50 percent renewables mandate.

New York, with the country’s third-largest population, joins California, America’s most populous state, in having set a “50 by ’30” renewable electricity benchmark. This also means that a total of five states (New York, California, Vermont, Hawaii, and Oregon) and the District of Columbia have established a requirement to reach 50 percent renewable energy levels or higher. ↴

*Source Natural Resources Defense Council*

For more information, go to [www.nrdc.org](http://www.nrdc.org)