Wind Energy Development in Nova Scotia

What is the history of wind energy in Nova Scotia?

Since the early 1900s, privately-owned wind turbines have been used to generate electricity in Nova Scotia; on farms, they provided power for lighting and heating. More recently, they have been used to power equipment and irrigation systems.

In 2002, the first modern large-scale wind turbines were erected in Grand Etang, Inverness County and Little Brook, Digby County. These single turbines have outputs of 0.7 MW and 0.6 MW respectively, each producing enough electricity for about 450 homes.

In 2006, a private developer built the first wind farm in Nova Scotia on Pubnico Point in the Municipality of the District of Argyle. Seventeen turbines were connected to the electrical grid, each with an output of 1.8 MW and together powering about 10,000 homes. This project sells fixed-cost electricity to Nova Scotia Power under a 20-year power purchase agreement and pays the Municipality about $200,000 per year in taxes.

Since 2006, there have been major advances in wind technology and expertise, and many large- and small-scale turbines have been constructed in Nova Scotia. Like any innovative technology, wind turbines present both opportunities and challenges. Wind energy has already made an important contribution to electricity generation and, with insightful planning, will continue to do so, providing significant environmental, social and economic benefits for municipalities.

Above Photo: Higgins Mountain, Nova Scotia
SOURCE: COMMUNICATIONS NS

Where are the wind turbines operating or planned in the Province?

From Cape Breton to Yarmouth, over 200 turbines dot the Province as of March 2015. More than half are independently-owned; the remainder are owned by Nova Scotia Power. At this time, the 200 turbines supply approximately 10% of Nova Scotia's overall electricity needs. This percentage will increase with installation of more large and small wind turbines, including a large-scale wind energy project with 34 turbines expected to start generating electricity by mid-2015.

In 2010, the Nova Scotia Department of Energy released its Renewable Electricity Plan[1] to promote renewable energy, including wind. Since then, new wind energy projects have helped meet the regulated target of generating 18.5% of our electricity from renewable energy in 2013. Renewable Electricity Regulations mandate targets of 25% by 2015 and 40% by 2020.[2] By 2020, over 500,000 homes will be running on renewable electricity, more than enough energy for every residential customer in Nova Scotia.

Table of Existing and Approved Turbines in Nova Scotia as of March 2015

#	LOCATION	MW	TURBINES
1	Higgins Mountain	3.6	3
2	Springhill	2.1	2
3	Amherst	31.5	15
4	Nuttby Mountain	50.6	22
5	Tatamagouche	0.8	1
6	Spiddle Hill	1.7	4
7	Fitzpatrick Mountain	1.6	2
8	Glen Dhu	62.1	27
9	Maryvale	6	4
10	Irish Mountain	2	1
11	Fairmont	4.6	2
12	Creignish Rear	2	1
13	South Cape Mabou	2	1
14	Grand Étang	0.7	1
15	Lingan	15.6	7
16	Glace Bay	0.8	1

#	LOCATION (CONT)	MW	TURBINES
17	Donkin	0.8	1
18	Tiverton	0.9	1
19	Digby Neck	30	20
20	Digby	0.8	1
21	Granville Ferry	2	1
22	Little Brook	0.6	1
23	South Canoe	102	34
24	Goodwood	0.6	1
25	Brookfield	0.6	1
26	Dalhousie Mountain	51	34
27	Sheet Harbour	1.5	1
28	Point Tupper	0.8	1
29	Point Tupper	22.6	11
30	Sable Wind	13.8	5
31	Pubnico Point	30.6	17
32	Kaizer Meadow	2.0	1

Please Note: Information contained in the table above and on the following map is taken from the Nova Scotia Power Wind Farm Map.[3] Please check this live link for up-to-date information, as it will change over time.

1 *http://energy.novascotia.ca/sites/default/files/renewable-electricity-plan.pdf*

2 *www.novascotia.ca/just/regulations/regs/elecrenew.htm*

3 *www.nspower.ca/en/home/about-us/how-we-make-electricity/renewable-electricity/wind-farm-map.aspx*

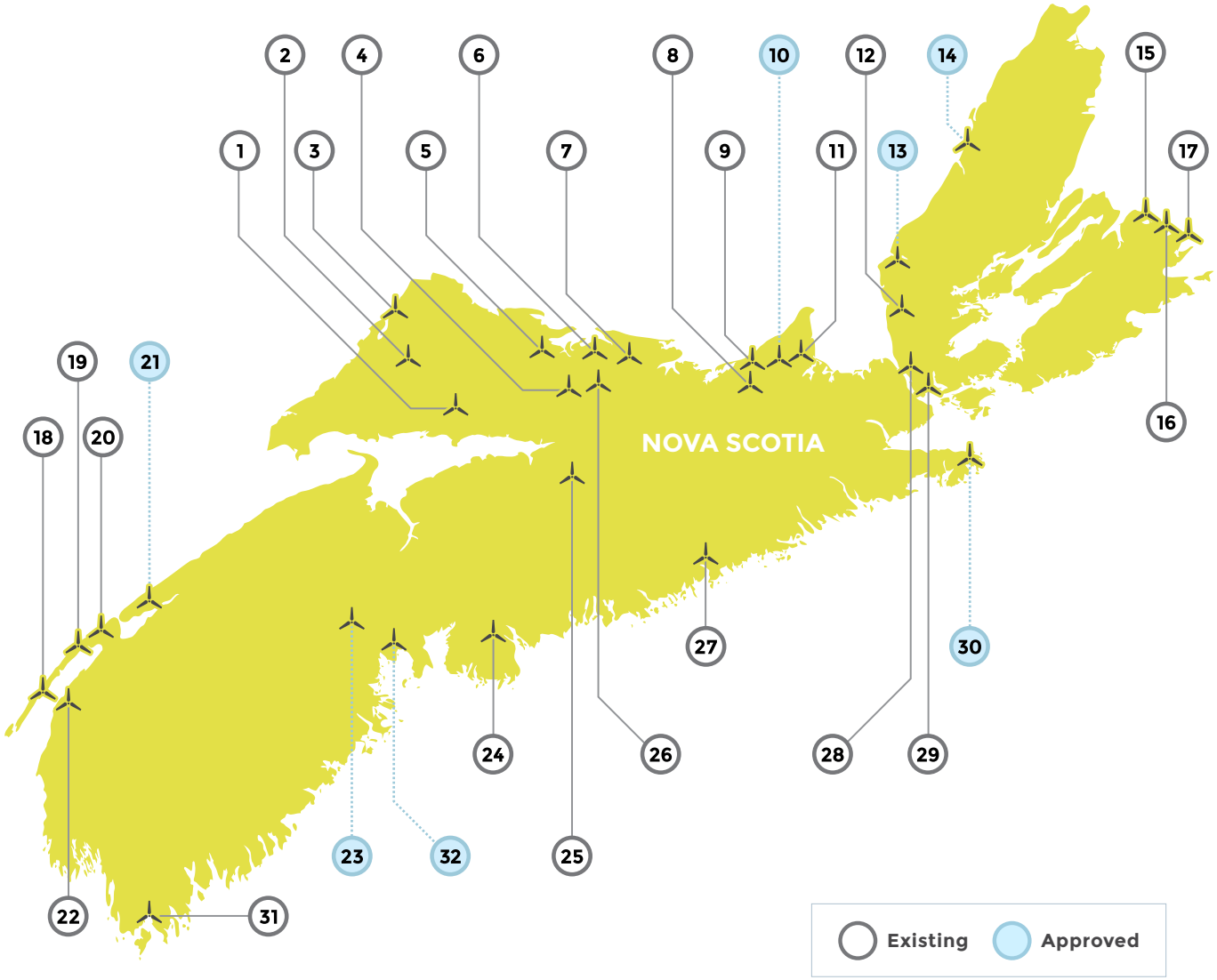
SOURCE: COMMUNICATIONS NS

Dalhousie Mountain, Nova Scotia

SOURCE: COMMUNICATIONS NS

Lingan, Nova Scotia

Map of Existing and Approved Turbines in Nova Scotia as of March 2015



Get to Know Wind Energy

Watts (W):
Used to describe the rate of electricity use; for example, a 50 watt bulb uses 50 watts of power.

Prefixes are often used to describe large amounts of electricity:

1 Kilowatt (kW) = 1000 watts – used to describe the power used by a typical home.

1 Megawatt (MW) = 1000 kW – used to describe the power production of a large-scale wind turbine.

1 Gigawatt (GW) = 1000 MW – used to describe the power used on scale of an electrical grid.

Watt-hours (Wh):
used to describe the amount of energy. For example, a 50 watt bulb turned on for 2 hours would use 100 Wh of energy (50W x 2h =100Wh).

1 gigawatt-hour (GWh) = 1 million kilowatt-hours – used to describe the amount of energy used by regions over time.

What contribution has wind energy made to Nova Scotia?

Already a significant renewable source, wind energy promises to continue to make a major contribution to Nova Scotia's electricity future. Small-scale wind turbines (typically defined as 50 kW or less) generate electricity that can be used on-site or sold to Nova Scotia Power. Large-scale wind turbines can be developed by Independent Power Producers[4] or community-based groups, including municipalities, under the Community Feed-in-Tariff (COMFIT) Program[5]. Wind turbines can also produce electricity for private owners: in some cases, excess electricity can be sold to Nova Scotia Power under the Enhanced Net Metering Program.[6]

Under the Nova Scotia Department of Energy's 2010 Renewable Electricity Plan, these programs enable municipalities, the private sector, First Nations, co-operatives and non-profit groups to participate in developing wind energy. This brings local investment, short- and long-term employment, and tax revenue to the municipality.

Here are a few general statistics on wind energy in Nova Scotia as of March 2015:

» Total number of turbines in Nova Scotia: 200
» Installed wind power in Nova Scotia: 350 MW
» Equivalent homes powered by wind: 120,000
» Tonnes of greenhouse gas emissions reduced: 800,000 tonnes per year
» Capital investment in wind energy: approaching $1 billion
» Tax base for municipalities: about $2 million per year
» Long-term employment: over 60 full-time positions in turbine operation and maintenance

At this time, Nova Scotia consumes about 10,500 GWh of electricity per year. Wind energy now satisfies about 10% of our overall electricity requirements. Additional large and small wind energy projects are expected online later in 2015. Wind energy's proportional contribution will increase as new turbines – both large and small – are installed in Nova Scotia.

4 *http://energy.novascotia.ca/renewables/programs-and-projects/commercial-renewables*
5 *http://energy.novascotia.ca/renewables/programs-and-projects/comfit*
6 *http://energy.novascotia.ca/renewables/programs-and-projects/enhanced-net-metering*

SOURCE: RENEWABLE ENERGY SERVICES LTD.

Digby, Nova Scotia

SOURCE: RENEWABLE ENERGY SERVICES LTD.

Digby, Nova Scotia

Case Study: DIGBY RENEWABLE ENERGY HUB

Like many Nova Scotia municipalities, the Municipality of the District of Digby and the Town of Digby have diverse end users of energy, resources, and infrastructure, including harbours, islands, hybrid ferries, wind turbines, tidal resources, fishing fleets, highways, and distinct communities. There are many options for renewable energy: tidal, wind, biogas (using mink waste as feedstock) and co-generation energy, as well as the introduction of electric vehicles, which will all play major roles in the region in the near future. Five wind energy projects, ranging from a single large-scale turbine (0.6 MW) to a wind farm with twenty large-scale turbines (30 MW) are in operation. Tidal energy technology, from project development to evaluation of infrastructure at the Port of Digby, is underway.

Both the Municipality of the District of Digby and the Town of Digby stand to gain from becoming a regional renewable energy hub because sustainable domestic energy production will produce direct and indirect economic benefits in their area – all in the effort to become the "Greenest County in Nova Scotia".[7]

[7] *http://www.digbydistrict.ca/renewable-energy.html*

Case Study Basic Stats

Location:

Within the Municipality of the District of Digby

Output:

34.3 MW

No. of Turbines:

24 (5 projects)

SOURCE: CRAIG NORRIS

Amherst, Nova Scotia

What is a municipality's role in a wind energy project?

Municipalities play important roles in wind energy development. Municipal staff and elected officials can do much to encourage and facilitate projects appropriate to their unique municipality:

» As educators, municipalities can provide residents with balanced wind energy information.

» As land-use planners, they can develop fair and technically accurate approaches to regulate future projects.

» As consumers of electricity, municipalities can generate part of what they need for their facilities with wind turbines.

» As owners of wind energy facilities, municipalities can generate revenue by investing in well-planned and executed projects.

How can a municipality profit from wind energy?

The direct benefits are primarily financial, including tax paid to the municipality by the project owner, and possibly net profits from municipal ownership of a wind energy facility.

» In terms of municipal revenue, wind turbines that produce electricity are exempt from regular municipal taxes; instead, tax is based on capacity of the wind turbines. However, all associated land and buildings remain taxable at the regular rate. The specific taxation rate is defined in the Wind Turbine Facilities Municipal Taxation Act[8]; it is currently $5500 per megwatt (MW), plus increases based on the Canadian Consumer Price Index at the end of the 2005 calendar year.

» In terms of ownership, profits depend on percentage of ownership, cost to develop the project (including debt servicing), and energy production; a project's economic viability varies accordingly. There are now several municipally-owned wind energy facilities in Nova Scotia, some of which are featured in the fact sheets that follow.

8 *http://nslegislature.ca/legc/statutes/windturb.htm*

What are the indirect benefits of hosting a wind energy project?

Some of wind energy's many indirect benefits to a municipality are highlighted below; each is examined more fully in a separate fact sheet.

Environmental

» Offsets use of fossil fuels with clean renewable wind energy

» Reduces greenhouse gas emissions and other air pollutants

» Improves electrical grid efficiency where energy is used locally

Social

» Empowers communities and develops local partnerships

» Provides options for socially responsible investing

» Utilizes and develops community-based expertise

Economic

» Provides more local benefits than imported energy sources; it is estimated that every dollar invested in wind energy is multiplied three-fold within the community

» Geographic distribution of projects across the province will promote local economies and provide jobs

» Reliance on unpredictable imported energy sources from worldwide markets is reduced

A well-planned project can maximize these benefits, as well as reduce any negative impacts.

The following nine fact sheets provide additional information. Fact Sheets 2, 3 and 4 focus on the basics of electricity generation, wind energy, and phases of project development. Fact Sheet 5 provides an overview of approaches to siting wind turbines. Fact Sheets 6, 7 and 8 take a more detailed look at possible ecological, social and financial implications. Fact Sheets 9 and 10 present best practices in community engagement and policy and planning considerations. The Fact Sheets close with a list of hyperlinked references for more reading and exploration in wind energy.

My Ideas and Notes

SOURCE: MUNICIPALITY OF THE DISTRICT OF CHESTER

Chester, Nova Scotia

SOURCE: MUNICIPALITY OF THE DISTRICT OF CHESTER

Chester, Nova Scotia

Case Study Basic Stats

Location:

Municipality of the District of Chester

Output:

2.0 MW

No. of Turbines:

1

Case Study: KAIZER MEADOW WIND PROJECT

After five years of planning, testing and permitting by the Municipality of the District of Chester, a 2 MW wind turbine 25 km north of the Village of Chester began generating power in January 2014. Preliminary work included testing wind at the site to verify that the project made financial sense; Council decided to proceed with the COMFIT program in 2011. Following study and consultation, an environmental assessment was approved by Nova Scotia Environment in late 2012.

The wind turbine is owned by the Municipality and is located near the Kaizer Meadow Environmental Management Centre. The power generated is fed into the local power grid with fixed rates paid to the Municipality (13.1¢ per kWh for wind power over 50 kW for a 20-year period, per the COMFIT program). Profits from this $5.5 million project were expected to be about $150,000 in the first year. As the 15-year mortgage declines, profits increase; in the final years of the 20-year project, the Municipality will realize about $330,000 in revenue annually.[9]

[9] *www.chester.ca/inform/metrics/kaizer-meadow-wind-turbine*