A similar analysis by the US Department of Energy's Lawrence Berkeley National Laboratory found that proximity to wind energy facilities does not have a pervasive or widespread adverse effect on the value of nearby homes. Researchers examined 7,500 single-family property sales between 1996 and 2007, covering a time span from before the wind farms were announced to well after construction and operation. [2]

A 2010 study looking at property values near the 396 MW Twin Groves Wind Farm in Illinois found prices were negatively affected ***before*** the wind farm was built, but rebounded ***after*** it was in place.[3]

WHAT DO THE EXPERTS SAY?

"Based on the data sample and analysis presented here, no evidence is found that home prices surrounding wind facilities are consistently, measurably, and significantly affected by either the view of wind facilities or the distance of the home to those facilities."

The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonistic Analysis

"In the study area, where wind farms were clearly visible, there was no empirical evidence to indicate that rural residential properties realized lower sales prices than similar residential properties within the same area that were outside the viewshed of a wind turbine."

Wind Energy Study – Effect on Real Estate Values in the Municipality of Chatham-Kent

"During the operational stage of the wind farm project, when property owners living close to the wind turbines actually had a chance to see if any of their concerns materialized, property values rebounded."

Wind Farm Proximity and Property Values: A Pooled Hedonistic Regression Analysis of Property Values in Central Illinois

Sources:

1. Wind Energy Study - Effect on Real Estate Values in the Municipality of Chatham-Kent (Canning Consultants Inc. and John Simmons Realty Services Ltd., February 2010)

2. The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonistic Analysis (Ben Hoen, Ryan Wiser, Peter Cappers, Mark Thayer, and Gautam Sethi, December 2009)

3. Wind Farm Proximity and Property Values: A Pooled Hedonistic Regression Analysis of Property Values in Central Illinois (Jennifer L. Hinman, May 2010)

The Economic Impacts of the Wind Energy Sector in Ontario 2011-2018

May 27, 2011

Prepared by ClearSky Advisors Inc.

ClearSky ADVISORS

Disclaimer

The materials ClearSky Advisors Inc. (ClearSky Advisors) provides will reflect ClearSky Advisors' judgment based upon the information available to ClearSky Advisors. ClearSky Advisors disclaims any other representations or warranties, express or implied, including without limitation any implied warranties of merchantability, fitness for a particular purpose or non-infringement. This report is based on sources believed to be reliable, but no independent verification has been made nor is its accuracy or completeness guaranteed. ClearSky Advisors is an independent research firm that does and seeks to do business with all stakeholders within the industries covered in ClearSky Advisors research. Investors and decision-makers should consider ClearSky Advisors research as only a single factor in making their key decisions.

Table of Contents

1 Executive Summary

1.1 Key Highlights

The wind energy sector in Ontario will generate a significant amount of both electricity and economic activity over the course of 2011 through 2018. Specifically, during this timeframe, the sector is expected to:

- Install over 5.6 GW of wind energy capacity, bringing Ontario's total wind energy capacity to 7.1 GW by 2018;
- Create 80,328 job years (Person-Years of Employment or PYE);
- Attract $16.4billion of private investments of which $8.5billion will be invested locally in Ontario; this investment is entirely private investment, and is only to be paid back upon the production of power over the lifespan of the turbines; and
- Contribute more than $1.1billion of revenue to local Ontario municipalities and landowners in the form of taxes and lease payments over the 20-year lifespan of projects installed in 2011 - 2018.

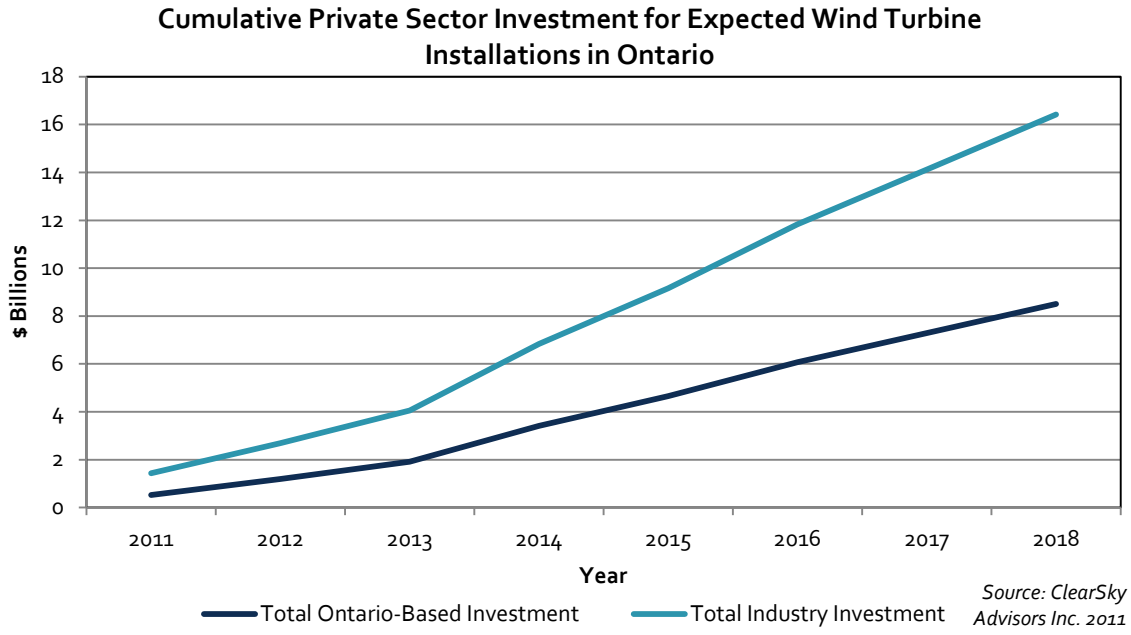


Figure 1.1: Cumulative Private Sector Investment for Wind Turbine Installations in Ontario, Expected Scenario 2011-2018

Of the over 5.6 GW of wind energy capacity installed from 2011 to 2018:

- On average 709 MW will be installed per year; and
- The market will have a capacity for up to 900 – 1,000 MW of installations per year.

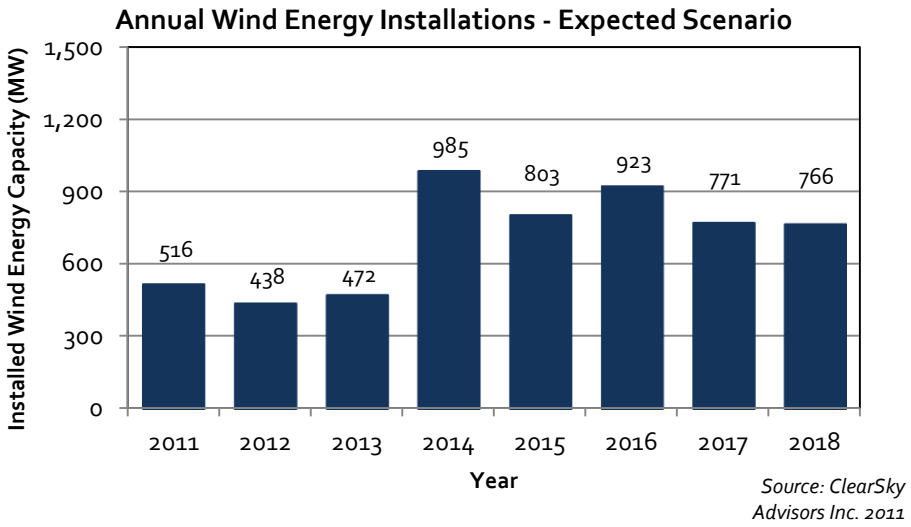


Figure 1.2: Annual Wind Energy Installations in Ontario (in MW), Expected Scenario (2011-2018)

The $1.1billion of revenue to local Ontario municipalities will be paid out over the 20-year lifespan of projects and will consist of:

- Over $1billion in lease payments paid to landowners
- Over $145million in taxation paid to local municipalities

The 80,328 PYE corresponds to 14.1 PYE per MW of nameplate capacity, split between:

- 10.5 PYE per MW in the construction phase; and
- 3.6 PYE per MW for ongoing operations and maintenance.

Note: These figures are ONLY for the projects forecast for installation in 2011 through 2018. The actual number of jobs is likely to be higher because no jobs are included for export, pre-contract development, or any ongoing installations after 2018. Furthermore, we have only considered direct and indirect jobs and not induced jobs. Therefore, these numbers are conservative for all years. The drop-off in employment after 2017 would only occur if exports and continued project awards beyond 2018 did not materialize.

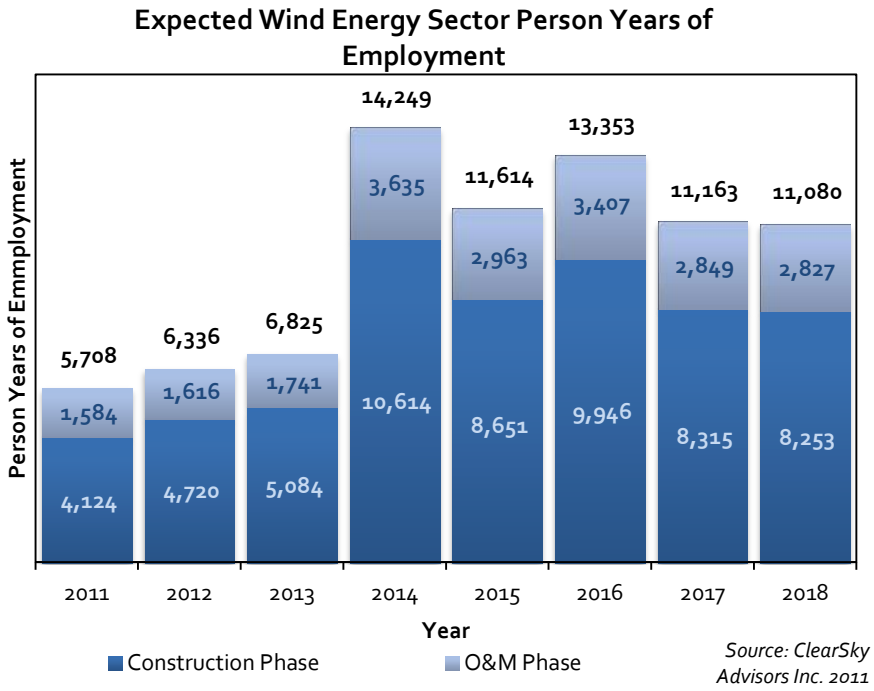


Figure 1.3: Person Years of Employment Created by the Wind Energy Sector in Ontario, Expected Scenario 2011-2018

To illustrate, for a sample 100 MW nameplate capacity wind energy generation project installed in Ontario:

Table 1.1: Summary of 100 MW Project Sample Costs, Benefits, and Employment

100 MW Project Sample Costs, Benefits, and Employment		
Expected Cost	*Total Lifetime Cost (in 2011 $)*	$337,530,679
	Total 20 Year O&M Cost	$68,501,669
	Total Expected Installation Cost	$269,029,010
20 Year Economic Benefits to Landowners and Municipalities	*Total 20 Year Economic Benefits*	$41,271,945
	20 Year Lease Payments	$38,668,407
	20 Year Tax Payments	$2,603,538
Expected PYE	*Total*	1,416
	Construction Phase	1,052
	O&M Phase	363

Source: ClearSky Advisors 2011

1.2 Methodology for Data Collection and Analysis

Primary data was collected through interviews with a wide range of industry stakeholders. In total, ClearSky Advisors conducted 43in-depth interviews to develop a comprehensive understanding of the economics of the wind energy sector in Ontario. Occasionally, the in-depth interviews would be complemented by emails to ensure that all necessary details were obtained from the interviewees. Overall, we interviewed:

- Large and small project developers, representing over 92% of the MW volume of connected projects and contracts offered to date;
- Leading independent engineering, construction, and consulting firms; and
- Manufacturers (both at the OEM and Tier 1 level), representing over 99% of the installed wind capacity in the province of Ontario.

The high rate of participation by interviewees in this study means that we are very comfortable that the data collected is representative of the current wind industry in Ontario.

In conjunction with the in-depth interviews, research from secondary resources was conducted to further inform interviews, cross-check interview findings, compare Ontario-based findings in a global perspective, and generally to enhance the understanding of the intricacies of the economics of the Ontario wind energy sector. Notable examples of secondary sources include:

- Publications by the Ontario Power Authority (OPA) including Ontario's Long-Term Energy Plan (LTEP), Integrated Power System Plan (IPSP) and quarterly updates;
- Peer-reviewed studies from academic sources and publications; and
- Statements and plans by the Ministry of Energy, IESO, and OPG.

Forecasts for job creation and ratepayer impact were generated through a ClearSky Advisors model that incorporates established and recognized 3rd party tools (Jobs and Economic Development Impact Model-W1.10.2)[1] with in-house modelling. Inputs for the model were taken from ClearSky Advisors' market modeling as well as trusted 3rd party sources. In particular, economic multipliers specific to Ontario were obtained from Statistics Canada, job creation data was taken from peer reviewed publications, and price data was taken from sources such as the Ontario Power Authority, Ontario's Ministry of Energy and Moody`s Investment Service. Cost data for fossil fuels includes environmental and health externalities where they have been quantified by either peer reviewed publications or government data. Given the controversy around including externalities, we have used conservative and verifiable estimates and identified where we have used them wherever possible. Additional costs for nuclear (including waste management and insurance) are not included.

Job creation outcomes are tailored to reflect domestic content requirements in the province and other characteristics of Ontario's Feed-in Tariff program. Person-years of employment (PYE) include only direct and indirect jobs (induced jobs would be additional to figures reported here).

[1] National Renewable Energy Laboratory (NREL), Jobs and Economic Development Impact (JEDI) Model.

2 Introduction

2.1 Background

The purpose of this study is to provide an understanding of the economic impact of Ontario's wind energy industry for the period 2011 – 2018. Specifically, the report considers the wind industry within the context of and parameters laid out by the Ontario Government in the Long Term Energy Plan (LTEP) that was released in November 2010. In the LTEP, the Ontario Government covers both demand for and supply of energy for the period 2011 to 2030, including the supply mix, conservation plans and the transmission system.

Based on the targets laid out in the LTEP, the wind energy industry is entering a period of strong growth. By 2018, the Ontario Government is targeting a wind energy generation capacity of 7.1 GW, a number that amounts to an almost five-fold increase from the capacity of 1,428 MW which was in-service at the end of 2010[2].

This study is concerned with quantifying the economic impacts of this growth from 2011 to 2018 on the Ontario economy and for a range of different stakeholders including:

- Wind energy project developers;
- Wind energy equipment design, supply and manufacturing firms;
- Construction and transportation firms;
- Job seekers;
- Municipalities and landowners that host wind farms; and
- Equity and debt providers.

The study was commissioned by the Canadian Wind Energy Association (CanWEA) and has been conducted by ClearSky Advisors on an independent basis. Our mandate has been to produce facts, analysis, and forecasts but not to offer any recommendations.

2.2 Scope

There are three primary areas of focus for this report:

1. Ontario wind energy market economics from 2011-2018
2. Ontario wind energy market labour forecast from 2011-2018
3. Job multipliers for both the construction and operations phases of wind energy projects in Ontario

Specifically, this report examines the following:

1. Ontario wind energy generation market economics from 2011-2018
    - Annual and total forecast (in MWh) for the Ontario electricity market;
    - Annual and total forecast (both in MW and dollar value) for the wind energy market in Ontario, including both the construction and operations phases;

[2] Ontario Power Authority. (2010). Progress Report on Electricity Supply, 4th Quarter 2010.

- Analysis of the market opportunity for each major service and supply segment during the construction phase as identified in the Ontario Power Authority's domestic content grid;
- Forecast for the annual and total value of the operations and maintenance market to support wind energy generation during the operations phase;
- Forecast for the share of the market to be captured by the Ontario supply and value chain; and
- Forecast for the dollar value of benefits to landowners and communities in Ontario.

2. Ontario wind energy generation market labour forecast from 2011-2018:
    - Annual direct and indirect employment during both the construction and operations phases; and
    - Employment breakdown by supply and value chain segments.
3. Job multipliers for the construction and operations phases of wind energy generation in Ontario

3 Market Forecast

The wind energy sector in Ontario is expected to grow significantly from 2011-2018. Specifically, the market is expected to:

- Install an additional 5.6 GW of wind energy capacity by 2018, bringing Ontario's total wind energy capacity to 7.1 GW by 2018.
- Provide 3.11% of the required electricity in Ontario in 2011, increasing to 10.99% by 2018.

While the past decade has seen growth for the wind industry in Ontario, the LTEP targets continued capacity growth through 2018, as shown in Figure 3.1.

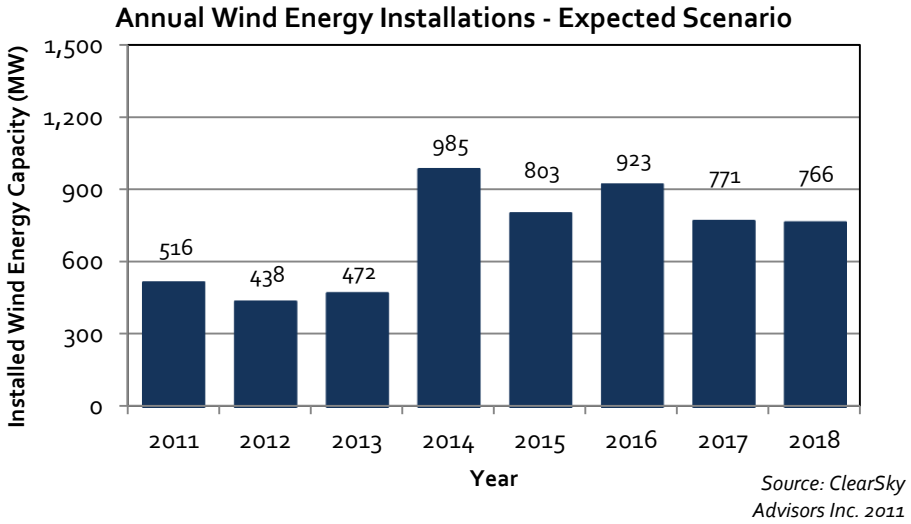


Figure 3.1: Expected Ontario Annual Wind Energy Installations Forecast From 2011-2018 (in MW)

Ontario's energy market is driven by the province's energy procurement policy, as implemented by the Ontario Power Authority (OPA). For wind energy specifically, the procurement policy has been implemented through a series of programs since 2003, beginning with Renewable Energy Supply (RES) I-III, followed by the Renewable Energy Standard Offer Program (RESOP) and finally the current Feed-In Tariff Program (FIT) which was launched in October 2009.

3.1 Market Overview

3.1.1 Ontario Electricity Market Forecast

Ontario's Long-Term Energy Plan (LTEP) clearly outlines that the years 2011 through 2018 will be a period of change in the energy supply mix in Ontario.

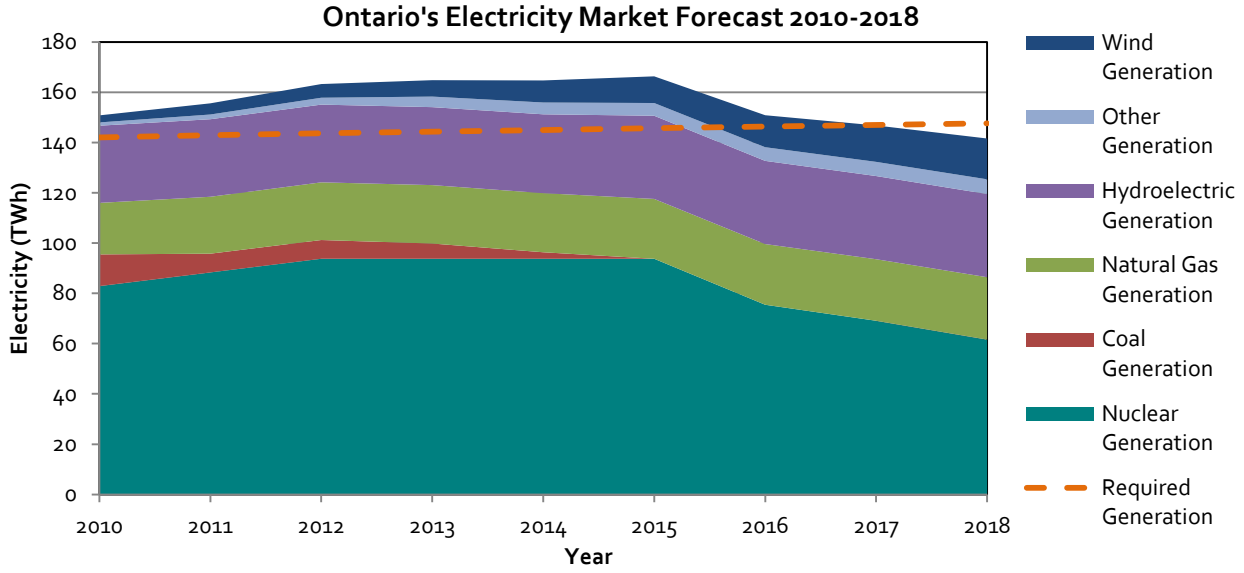
- There is significant investment planned into transmission and energy conservation in Ontario.
- Electricity demand is anticipated to grow at a CAGR of 0.46%[3] from 2010 through 2018.

[3] Ontario Power Authority. (2010). Ontario's Long Term Energy Plan 2010-2030; Independent Electricity System Operator (IESO). 2010. 18 Month Outlook From December 2010 to May 2012 http://www.ieso.ca/imoweb/pubs/marketReports/18Month_ODF_2010dec.pdf; and Ontario Power Authority. (2011). IPSP Planning and Consultation Overview.

- Coal-fired generation will be phased out in the province by 2014.
- By 2025, 10,000 MW of existing nuclear generation capacity will be refurbished.

From 2011 to 2018, it is anticipated that total electricity demand in Ontario will increase from 142.4 TWh to 147.6 TWh, though by 2018, with an additional 17.8 TWh offset by energy conservation in Ontario.

As the province aims to phase out coal by 2014, wind energy generation will increasingly become an important part of the energy supply mix. In 2011, wind is anticipated to provide 3% of the required electricity in Ontario, increasing to just under 11% by 2018[4].



Sources: ClearSky Advisors Inc. 2011; OPA, IPSP Planning and Consultation Overview 2011; OPA, Ontario's Long Term Energy Plan 2010; IESO, 18 Month Outlook December 2010

Figure 3.2: Ontario's Electricity Market Forecast

3.1.2 Implications of Long Term Energy Plan for Renewable Energy Capacity and Generation

Ontario's LTEP outlines that 10,700 MW of renewable energy generation capacity (including wind, solar, and biomass) is to come online by 2018 in the province of Ontario. This capacity is expected to yield an annual electricity generation of 24.96 TWh, where:

- 78% is anticipated to come from wind energy;
- 12% is anticipated to come from solar PV; and
- 10% is anticipated to come from biomass sources.

[4] Generation is calculated as the difference between gross demand and energy conservation.

3.1.3 Wind Energy Capacity in Ontario: Existing, Contracted, and Targeted

By 2018, the LTEP targets over 7 GW of installed wind energy generation capacity in Ontario. Table 3.1 illustrates that while the pace of development has been significant in the past, the next several years will require a high pace of project awards if the province is to meet the LTEP target.

Table 3.1: Wind Energy Generation Contracts in Ontario: Existing, Contracted, and Targeted

Wind Energy Capacity in Ontario: Existing, Contracted, and Targeted							
	RES Program	RESOP Program	On-Shore FIT Program	Samsung & KEPCO	Total	Target	Additional Required
Existing installed capacity (MW)*	1,233.1	193.8	0.8	-	1,427.7	N/A	N/A
Contracts under development (MW)*	276.3	131.5	1,228.8	2,000	3,636.6	N/A	N/A
Total (MW)	1,509.4	325.3	1,229.6	2,000	5,064.3	7,101.2	2,036.9

** As of December 31st, 2010[5].*

Sources: ClearSky Advisors 2011; OPA, Progress Report on Electricity Supply, 4th Quarter 2010

Table 3.2: Expected Wind Energy Generation Capacity Installations in Ontario by Program Type, 2011-2018

Expected Wind Energy Generation Capacity Installations in Ontario by Program Type, 2011-2018									
	2011	2012	2013	2014	2015	2016	2017	2018	Total
RES	132	-	-	-	-	-	-	-	132
RESOP	276	-	-	-	-	-	-	-	276
On-Shore FIT	109	38	72	585	403	523	771	766	3,266
Samsung & KEPCO	-	400	400	400	400	400	-	-	2,000

Sources: ClearSky Advisors 2011; OPA, Progress Report on Electricity Supply, 4th Quarter 2010

3.1.3.1 Wind Energy in Ontario: Pre-contract Development

Currently, there are more than enough FIT applications for wind energy projects awaiting approval by the OPA to satisfy the targets of the LTEP.

- The LTEP calls for 7.1 GW of installed wind energy capacity;
- As of Dec 31st, 2010, 1,428 MW of wind energy capacity are installed in the province; and
- This leaves a requirement of 5.6 GW of additional capacity to be installed.

[5] Ontario Power Authority. (2010). Progress Report on Electricity Supply, 4th Quarter 2010.

Consider the above facts in light of the wind pipeline in the on-shore FIT program and Samsung and Korea Electric Power Corporation (KEPCO) agreement as of Q4, 2010:

- 0.8 MW of FIT projects already connected in the province;
- 1,229 MW of FIT projects with contracts awarded and were under development;
- 2,000 MW of projects under development by the Samsung and KEPCO; and
- 5,153 MW of FIT project applications awaiting the economic connection test (ECT).
- In total, the above numbers represent over 8.3 GW of potential wind energy capacity, from just the FIT program and the Samsung & KEPCO agreements– far surpassing the 5.6 GW of additional capacity required to meet the LTEP targets for wind energy.

It is not impossible for new project applications to be submitted, accepted, constructed, and connected during the forecast period. After all, it is highly unlikely that all of the contracted and applied-for projects will come to fruition for a variety of reasons. For example, some projects will not find financing, while others are not located where there is likely to be an economic connection to the grid. However, the chances of new project applications making it through to construction at this point are much lower than just two years ago. As such, developers we interviewed have confirmed that their pre-contract development activity will be greatly reduced over the near term.

3.2 Supply of Wind Energy Equipment

Compared to other renewable energy sources, the wind industry enjoys a relatively mature supply chain at the global level. However, as part of the province's FIT program, an increasing amount of the equipment must be made in Ontario. For FIT projects with a commercial operation date (COD) before December 31, 2011, the level of domestic content as defined by the OPA is 25% while for FIT projects with a later COD, the level of domestic content is 50%. Projects under development by Samsung must adhere to domestic content requirements similar to those under the FIT program. In short, this increase in domestic content requirements means that a wind supply chain will need to be significantly augmented in Ontario.

For this report, the supply chain for the wind energy sector is broken down into the construction phase and the operations and maintenance phase. The construction phase is further divided into equipment and balance of plant.

Table 3.3: Breakdown of Total Installed System Cost for a Wind Turbine in Ontario (by Percent)

Breakdown of Total Installed System Cost for Wind Turbines in Ontario[6]	
Component	**Percent of Total Installed System Cost**
Nacelle	40%
Blades	9%
Towers	12%
Transportation	10%
Balance of Plant (BOP)	29%*
General Materials	52% of BOP
Labour	33% of BOP
Development	15% of BOP

* *In Ontario, the BOP for wind turbine installations can range between 20-40%.*

Source: ClearSky Advisors 2011

The equipment portion of the construction phase is broken down into 4 components; nacelle, blades, towers, and balance of plant.

3.2.1 Nacelle

For wind turbines installed in Ontario, on average, the nacelle accounts for 40% of the total installed system cost. For this report, the nacelle is defined as including (where applicable):

- Nacelle frame and shell;
- Pitch system;
- Yaw system;
- Hub (and hub casing);
- Gearbox;

[6] From the interviews we conducted the average wind turbine in Ontario ranged from 2-2.3 MW.

- Generator and brake;
- Heat exchanger;
- Drive shaft; and
- Power converter.

3.2.2 Blades

Blades installed on wind turbines in Ontario account on average for 9% of the total installed system cost. For the purpose of this report, blades are defined as cast/moulded wind turbine blades.

3.2.3 Towers

On average, wind turbine towers installed in Ontario account for 12% of the total installed system cost. For the purpose of this report, towers are defined as (where applicable):

- Materials for wind turbine towers (typically either steel or concrete); and
- Manufacturing/forming of materials into wind turbine towers.

3.2.4 Transportation

Transportation of the nacelle, towers, and blades from manufacturers to the installation site accounts for 10% of the total installed system cost for wind turbines built in Ontario.

3.2.5 Balance of Plant

Balance of plant (BOP) accounts for an average of 29% of total installed system cost for wind turbines installed in Ontario. For the purpose of this report, the balance of plant is defined as:

- General materials and equipment (52% of the BOP cost), including:
    - Construction (roads, bulldozers, cranes, etc.);
    - Transformers;
    - Control panels and electronics (such as cables and wiring); and
    - HV electrical systems.
- Labour (33% of the BOP cost), including:
    - Foundation;
    - Tower erection;
    - Electrical; and
    - Management/supervision.
- Development (15% of the BOP cost), including:
    - Interconnection;
    - Legal consulting; and
    - Engineering.

Table A.2 in the appendix shows how the supply chain classifications match the OPA's domestic content grid.

3.3 Pricing

Though relatively new in North America, particularly in Ontario, electricity generation from wind turbines is a mature technology with well-established global manufacturers and developers. For the purposes of this report, we have assumed that the rate of innovation and cost-reduction will only slightly outpace inflation, thus leaving equipment costs essentially flat over the forecast period.

The installation cost of wind turbines has been fairly well insulated against inflation. Variation in total system price and O&M cost of wind turbines in Ontario depends primarily on the following factors:

- Wind regime conditions;
- Choice of turbine technology;
- Project specific geography (Crown land, location of interconnection, road access, etc.);
- Topology/geo-morphology (type of soil/rock on which the project is built, the slope/grade of the land on which the project is built, etc.);
- Project implementation schedule; and
- First Nations agreements.

Table 3.4: Wind Turbine Installation and Service Pricing in Ontario

Wind Turbine Installation and Service Pricing in Ontario (in Real 2011 $CAD)				
		Average Price ($/MW)	**High Price ($/MW)***	**Low Price ($/MW)**
Total All-In Installed Cost	*Pre-50% Domestic Content Requirements (2011)*	$2,630,000	$3,430,000	$2,110,000
	Post-50% Domestic Content Requirements (2012-2018)	$2,690,000	$3,500,000	$2,110,000
Annual Operations & Maintenance Cost		$34,300	$40,600	$20,800

* *Projects at the high end of the price range would only be financially viable in very unique circumstances.*

Source: ClearSky Advisors 2011

ClearSky Advisors has reported an average value, high-price, and low-price for total installation and O&M wind turbine system costs for pre- and post-50% domestic content requirements to reflect the variability of these factors. This is shown above in Table 3.4. Turbine prices are expected to increase due to domestic content requirements. Our research has found, however, that the reported ranges for all-in system costs and O&M costs have more to do with the variable nature of balance of plant costs (20-40% of the total installed cost) and the aforementioned project-specific location characteristics in Ontario and less to do with impact of changing domestic content requirements on turbine costs. Projects at the high end of the price range would only be financially viable in very unique circumstances.

As the OPA's mandated 50% domestic content requirement for wind turbines installed in Ontario comes into effect after January 1st, 2012, we expect an increase of just over 2% to the all-in installed system cost. In terms of O&M costs, the accumulated 20-year costs are anticipated to stay around 20% of the total lifetime cost (all-in installed price plus 20-year O&M costs), irrespective of the domestic content requirements.

3.4 Wind Energy Sector Installed Capacity Forecast Scenarios

The potential market outcomes for the wind energy sector over the next few years are based on three pairs of wind energy demand and supply scenarios, with the assumptions for each outlined in Table 3.5.

Table 3.5: Wind Energy Sector in Ontario Scenario Assumptions

Wind Energy Sector in Ontario Installed Capacity Forecast Scenario Assumptions			
Assumption	**High Market Forecast**	**Expected Market Forecast**	**Low Market Forecast**
Political Support	High	Steady	Low
Transmission Capacity	Aggressive Additions	Steady Additions	Minor Additions
Project Delays*	Few	Some	Significant
Project Cancellations	Few	Some	Significant

These delays include the February, 2011 offer from the OPA for a 1-year extension on commercial operation date (COD) for FIT contract holders.

Source: ClearSky Advisors 2011

Factors that were considered to contribute positively or negatively to the assumptions listed above include:

- Environmental benefits;
- Environmental concerns;
- Increased awareness of the cost of traditional energy sources;
- Perceived causes of the increase in the cost of electricity to ratepayers;
- Community support;
- Community opposition; and
- Contracting and permitting processes.

1. Expected Market Forecast – The Expected Scenario reflects a situation where government policy supports the targets laid out in the LTEP. The Expected Scenario is mostly based on information garnered from the interviews with developers of wind generation projects in the province as well as related research and analysis of the targets set out in the LTEP in conjunction with planned transmission expansions and upgrades.
2. High Market Forecast – The High Scenario is based upon expedited transmission expansions and increases in either a) the target itself, or b) the relative proportion of wind included in the LTEP target of 10,700 MW of renewable energy generation to be installed in Ontario by 2018.
3. Low Market Forecast –The Low Scenario is predominantly based upon assumptions around delays to the current transmission expansion plans, coupled with a loss of political will to continue with the growth of the wind energy generation sector in Ontario.

Table 3.6: Installed Wind Capacity to be Built in Ontario, 2011-2018

Annual Installed Wind Capacity in Ontario (MW)										
	2011	2012	2013	2014	2015	2016	2017	2018	Installed Capacity From 2011-2018	Total Installed Capacity by 2018
Expected Scenario	516	438	472	985	803	923	771	766	5,673	7,101
High Scenario	653	456	660	1,111	976	1,015	1,059	1,010	6,939	8,366
Low Scenario	386	384	283	516	248	311	152	-	2,280	3,708

Source: ClearSky Advisors 2011

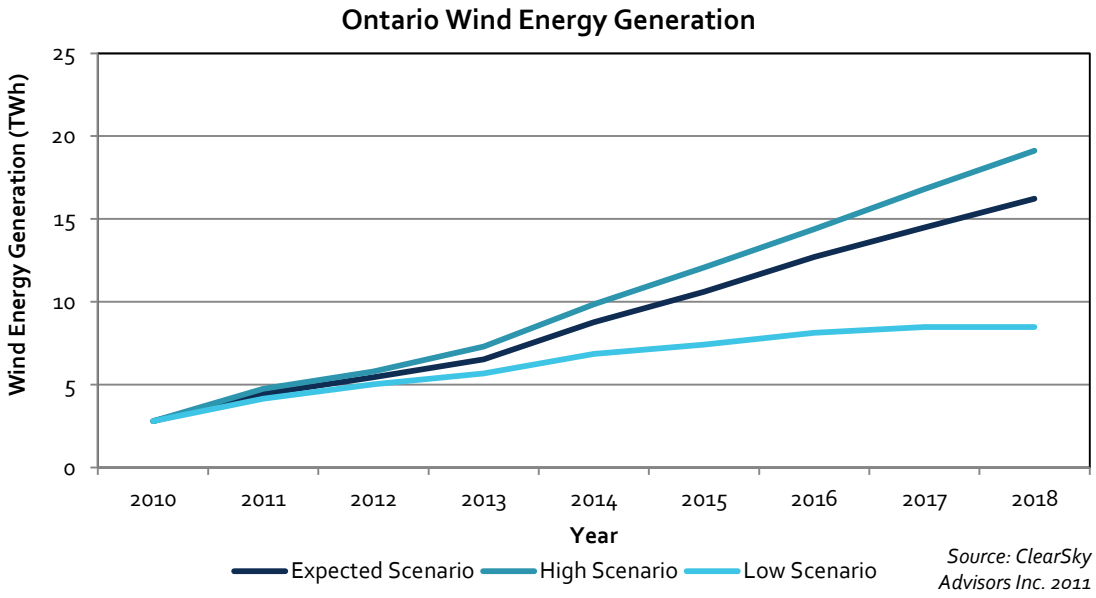


Figure 3.3: Ontario Wind Energy Generation (in TWh)

It is important to note that the Expected Case and High Case only slightly differ between the present and 2014. This reflects the assumption that wind energy capacity is currently being added to the grid essentially as fast as the grid can allow for. It also reflects the fact that wind energy takes approximately 3 to 4 years to develop from inception to connection. The remaining time is spent on activities such as development, contracting, permitting, etc.

As was outlined above, we considered many factors in developing our three market scenarios. However, as a result of the interviews we conducted it was apparent that political support and the availability of transmission were the two factors that had the biggest impact on the wind energy sector in Ontario.

3.4.1 High Scenario Overview:

Assumptions used in the creation of the high scenario include:

- Strong political support for continued procurement of wind energy generation capacity.
- Aggressive transmission additions will facilitate an increase in project awards and installations.
- Potential interruptions to original project schedules:
  - Permitting – few;
  - Construction – few (chiefly due to winter weather);
  - OPA's 1 year extension on COD – some; and
  - Project cancellations – few.

3.4.1.1 Installation Rate in Ontario

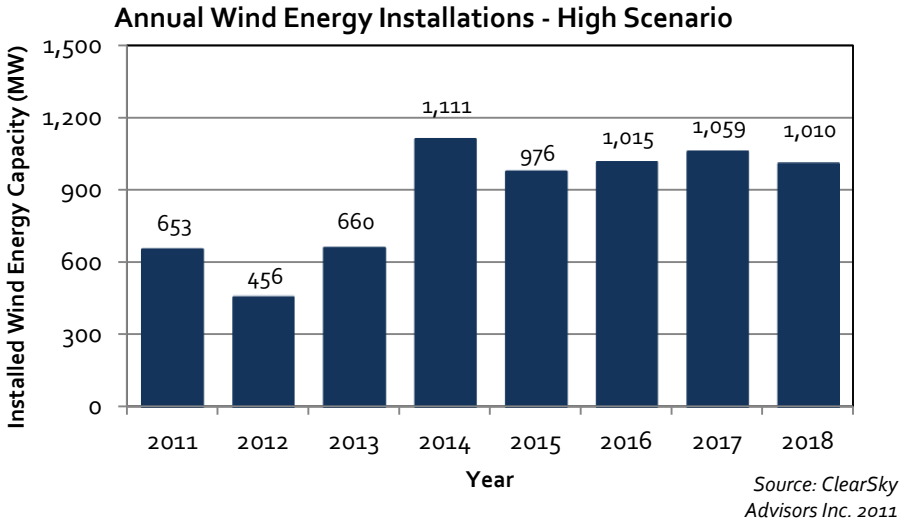


Figure 3.4: Annual Wind Energy Installations in Ontario (in MW), High Scenario (2011-2018)

- Total 2011-2018 installations: 6,939 MW - total cumulative installations by 2018: 8,366 MW.
- Average annual installations: 867 MW - ranging from 456 MW (2012) to 1,111 MW (2014).

3.4.1.2 Trends

- Annual installations will peak in 2014 and maintain a high level through 2018 due to:
  1. The Bruce to Milton transmission expansion project
  2. East-West tie transmission upgrades
  3. Substantial transmission upgrades in south-western Ontario (2017)
- Market supply capacity for wind turbine installations of 1,100 - 1,200 MW per year:
  - The market may experience potential domestic content supply constraints in 2014-2018 as there will be a near doubling of market volume from 2013 to 2014 and 5 consecutive years approaching market capacity.
  - Most parts of the value and supply chains can stretch beyond 1,200 MW per year, but depending on future market conditions, the supply of domestic-content compliant steel and the availability of skilled labour (especially for electrical and tower erection) could be constraining factors that could cause delays and/or price increases.