



**MaRS** Market Insights

## Feed-in tariffs

Accelerating renewable  
energy project  
development in Ontario

**MaRS**

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# Table of Contents

---

**Introduction** / 01

---

**Renewable energy projects in Ontario** / 01

The role of the renewable energy project developer / 01

---

**A brief introduction to Ontario's feed-in tariff program** / 01

The purpose of feed-in tariffs / 01

How the FIT program works / 01

Key design features of the Ontario FIT program / 06

---

**Building a renewable energy capacity in Ontario:**

**Implications of the domestic content rule** / 07

Why is domestic content a key issue for renewable energy project developers? / 07

The importance of R&D in Ontario's feed-in tariff scheme / 07

Renewable energy equipment manufacturing in Ontario / 08

---

**Financing renewable energy projects in Ontario** / 11

Financing microFIT projects / 11

Financing for community and Aboriginal projects / 12

Financing FIT projects / 14

Managing financial risk in renewable energy / 15

---

**Key actions and considerations for connecting a microFIT project to the grid** / 15

Tax implications for microFIT projects / 15

Project timelines / 18

---

**Key actions and considerations for connecting a FIT project to the grid** / 18

Summary chart of key requirements for FIT projects / 18

Milestones for project developers who have been awarded a FIT contract / 18

Licenses and approvals / 18

FIT project timelines / 23

Facilitating the development and use of renewable energy / 23

An overview of the Ontario electricity transmission system / 23

Working with the Electrical Safety Authority / 24

Working with the Ministry of the Environment / 25

Working with municipalities / 25

Working with the Ontario Energy Board / 26

---

**Recent developments in the FIT program** / 26

The Economic Connection Test / 27

Upgrades to Ontario's transmission system / 27

Metering / 27

---

**Looking ahead** / 28

---

**Renewable energy policy analysis** / 29

Targets and policies to increase renewable capacity / 29

Analyzing feed-in tariffs as a policy tool / 30

Policy-level barriers that could impact the deployment of renewable energy in Ontario / 30

---

**Community engagement** / 30

---

**Conclusion** / 31

---

**Appendix A – Definition of “community” and “Aboriginal” in the context of the FIT program** / 31

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## Introduction

The electricity generation industry in Ontario is in the midst of a green transformation, aided by the recent implementation of the *Ontario Green Energy and Green Economy Act*. The *Act* spells out specific incentives offered to electricity generators who exploit renewable energy sources, namely wind, solar, hydro, biogas and biomass. The *Act* is designed to “*facilitate the development of a sustainable energy economy that protects the environment while streamlining the approvals process, mitigating climate change, engaging communities and building a world-class green industrial sector.*”<sup>vi</sup> One of the most important incentive mechanisms in the *Act* is the introduction of an advanced feed-in tariff (FIT) program for renewable energy generators in Ontario.

The renewable energy industry connects a complex web of stakeholders from landowners to equipment manufacturers to those with energy transmission and distribution interests to consumers and businesses. The central players in this network are the renewable energy project developers who act as the mainstays for all renewable energy generation in the province. Figure 1 illustrates this web.

The purpose of this report is twofold. First we discuss key issues affecting renewable energy project developers in the context of Ontario’s new feed-in tariff program. These issues include domestic content regulations, financing models, transmission and distribution capacity, and complementary government programs that support renewable energy. Next, we highlight gaps in Ontario’s renewable energy value chain that represent opportunities for the introduction of new renewable energy products and services in Ontario. To this end, we provide insight into the role of project developers, the Ontario Power Authority, entrepreneurs, R&D institutions, manufacturers, financial institutions, electricity transmission and distribution infrastructure, and government policy.

The information in this report was obtained largely through primary research. Interviews were conducted with over 31 stakeholders representing all stations in the renewable energy value chain.

## Renewable energy projects in Ontario

### The role of the renewable energy project developer

Renewable energy project developers coordinate all aspects of a renewable energy project from land surveys and environmental assessments to construction to ongoing operation. Renewable energy project developers make use of an array of business models, depending on their expertise and financial resources. Some project developers design, manage and finance their own projects while others participate only as project coordinators. Above all, it is the responsibility of renewable energy project developers to manage risk. There are a multitude of operational and financial risks inherent in renewable energy projects, and without prudent risk management, banks and other sources of project financing could not be induced to invest in the sector.

Figure 2 provides a summary of activities typically managed by renewable energy project developers, together with some common risks and risk-mitigation strategies.

## A brief introduction to Ontario’s feed-in tariff program

Ontario’s feed-in tariff (FIT) program is the first program of its kind in North America and represents the largest green energy investment of its kind in Canadian history.<sup>vi</sup> It provides a comprehensive, guaranteed pricing structure for electricity production from renewable sources. The FIT program includes standardized program rules, prices and contracts in order to undertake a renewable energy project. The program is administered by the Ontario Power Authority (OPA). FIT prices are designed to help developers cover renewable energy project costs and provide a reasonable return on investment over the term of each contract.

Renewable energy sources qualifying for FIT funding include:

- bioenergy—biogas, biomass, landfill gas
- solar photovoltaic (PV)
- water power
- wind

The program is divided into two streams—FIT and microFIT. The FIT program is for renewable energy projects that are able to generate more than 10 kilowatts (kW) of electricity. Very small projects, such as residential installations, that generate 10 kW or less are eligible for the microFIT program.

### The purpose of feed-in tariffs

The planning, organization, development, ownership and operation of electricity-generating facilities in most countries have traditionally been financed with public dollars. In recent years, many countries have begun the slow transformation of their energy infrastructure from fossil fuels to renewable energies, and from being publicly financed, owned and operated to being privately financed, owned and operated.

Unlike public energy utilities, the cost of renewable energy generation is most commonly paid for by electricity consumers, or “ratepayers.” As such, feed-in tariff schemes help to unlock private cash flows for energy infrastructure. Many predict that in future only energy distribution will remain the responsibility of public entities.

One study, conducted by the Cleantech Group LLC, sets the price of transitioning the world’s energy-generation infrastructure to 100% renewable sources at \$9 trillion.<sup>vii</sup> While this sum would be crippling to government budgets, it is not unrealistic to imagine that FIT programs will play a role in this privately-managed renewable energy future, lessening the taxpayer burden and accelerating the transition.

Over time, as FIT programs gain momentum in their jurisdictions, FIT tariff rates will be adjusted downward to reflect demand and the declining cost of technology as it is manufactured in greater volumes. For renewable energy project developers, the only defence against falling FIT rates is to enter into a FIT contract as soon as possible. Once renewable energy producers are under FIT contract, their rates are guaranteed for the duration of the project’s life.

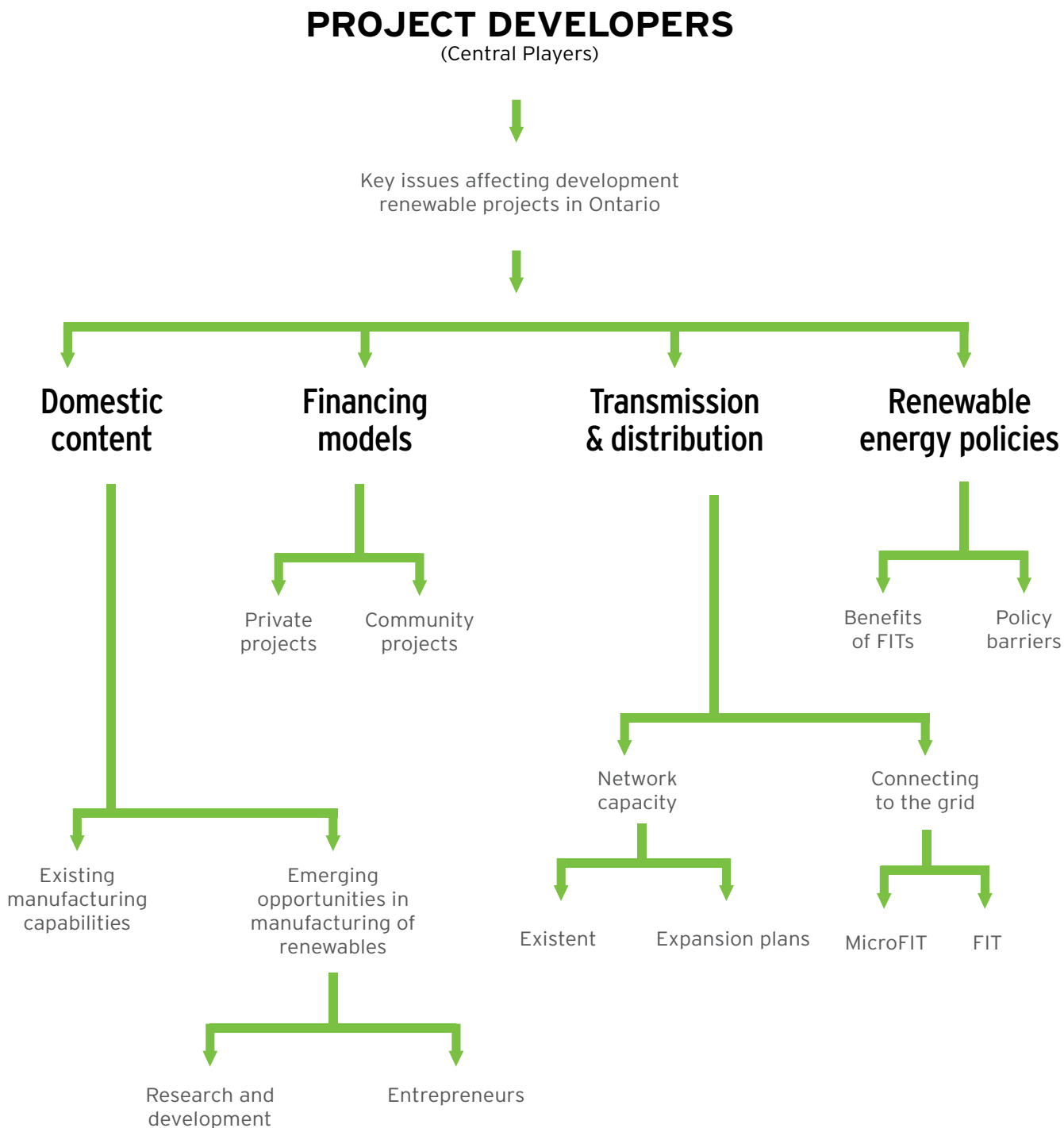
### How the FIT program works

Parties interested in establishing a qualifying renewable energy generating system must enter into a contract agreement with the OPA. Under this FIT agreement, the OPA agrees to pay the renewable energy generator a fixed rate per kilowatt-hour of energy produced. The renewable energy generator connects their energy

generation system to the grid, and the OPA pays the generator the agreed-upon rate for the duration of the contract. Contracts are long-term and designed to effectively guarantee a particular rate of return to the provider of renewable energy. For France, Germany and Spain, investor internal rates of return (IRRs) tend to be in the

7% to 10% range. Ontario's policy estimates a target return on equity of 11% based on a debt/equity ratio of 30/70.<sup>viii</sup> The FIT program is attracting local and foreign renewable energy project developers to the Ontario electricity generation market.

**Figure 1** Renewable energy project developers and the stakeholders involved in renewable energy projects.



## PROJECT STEPS

### Site selection – Assessing the renewable energy resource

#### Description

When launching a renewable energy project, the first and most important step is to determine whether a viable opportunity exists for electricity generation at a given site. Renewable energy resources (e.g., sun, wind, flowing water) vary in intensity from site to site, even within a known region. Additionally, resource intensity can also vary by season, month, and time of day.

According to one project developer, “Generally we will take 30 years of local weather data, and we’ll do an analysis on that weather data to determine how many days are sunny each year. So, we’ll look at every hour for the last 30 years, we’ll come up with some averages and we will say here is what the solar radiation on a day to day basis should be in these areas.”

Notes another project developer, “when selecting a site, one has to look at the size of the site, the topography where the site is located in context of transmission lines, site access, and public transportation, as in roads or highways, because you have to bring equipment to the site. And the other thing that we look at is the site’s proximity to potential residences or other areas which we may interfere with as we are building...we are very sensitive to the neighbourhoods we go to. And we try to work very closely with the municipality and if there is a First Nations or Métis community, we take that as a consideration as well. So, we go through a proprietary process internally of selecting sites. It’s a very unique process that goes through multiple reviews and quality checks before we actually select the site.”

#### Risk Factors

Locating in an area with insufficient renewable resource intensity for profitable electricity generation

#### Mitigation Strategies

A higher-quality and longer-term resource assessment period mitigates the risk of inadequate energy production. However, more robust resource studies require a larger upfront investment that may not be recouped. To balance this risk, project developers often supplement the data from their own instruments over shorter observation periods with data from nearby weather stations or airports to validate and their production expectations.

### Site selection – Engaging with local electricity utility

#### Description

Early in the project development process, renewable energy project developers engage with the local electricity utility to assess receptivity to a renewable energy electricity generation project and to examine grid interconnection opportunities. It is the responsibility of the renewable energy producer to pay for the cost of establishing a grid connection for their project. At this phase, renewable energy project developers must determine how a connection can be made from their site, and also the likely cost of establishing a connection.

#### Risk Factors

Transmission capacity and connection to the grid

#### Mitigation Strategies

Grid interconnection and transmission capacity can be a major roadblock to establishing a renewable energy generation project. Early consultations with local utilities can help to establish whether transmission capacity exists or is planned in the relevant area, and whether establishing a grid interconnection will represent a significant cost to the developer.

### Acquiring a land lease, land use permits, and environmental permits

#### Description

Once it has been established that a given site is a viable location for electricity generation using renewable assets, project developers must secure a lease agreement from the landowners as well as the requisite permits for the construction and operation of an electricity generation facility. These may include, but are not limited to, a Renewable Energy Approval from the Ministry of the Environment, or permits from Environment Canada, the Ministry of Natural Resources, and/or from the Ministry of Transportation, the Ontario Conservation Authority, and the Niagara Escarpment Commission. A comprehensive guide to the global permitting process for Ontario renewable energy project developers is available here: [http://www.ene.gov.on.ca/en/business/green-energy/docs/REP\\_Guide.pdf](http://www.ene.gov.on.ca/en/business/green-energy/docs/REP_Guide.pdf).

#### Risk Factors

- Environmental concerns
- Contractual concerns with landowner

### Mitigation Strategies

Early in the project development process, it is important to examine the availability of transmission capacity required to meet the needs of a planned renewable energy project. The Ontario Power Authority (OPA) publishes construction schedules and also conducts regular assessments to determine when and where new capacity should be added. Unfortunately this is an extremely slow-moving process. The best strategy is to make the current or planned availability of transmission capacity a part of the site selection process.

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## Community, municipal and Aboriginal consultations

### Description

A set of formal consultations with the community, municipal bodies (e.g., to discuss site access rights, emergency services, remediation measures), and with Aboriginal groups (regarding treaty rights, for example) must be undertaken for most utility-scale renewable energy projects.

### Risk Factors

Public appearance

### Mitigation Strategies

Renewable energy project developers communicate with community members and other stakeholders early in the project development process. This way project developers are able to learn what opposition they may face and the open communication may help to alleviate the public acceptance challenge.

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## Completing a FIT application

### Description

Renewable energy project developers must register with the OPA to begin the process of obtaining a FIT contract. A detailed discussion of the FIT application process is included later in this report. During the application process, and subject to information provided by the project developer, the OPA may require that an economic connection test be performed to assess the cost of constructing additional transmission infrastructure required to extend the electricity grid to meet renewable energy production sites. These economic connection tests are conducted periodically, and FIT applications are subject to this schedule.

### Risk Factors

Project delays due to lack of transmission capacity

### Mitigation Strategies

Early in the project development process, it is important to examine the availability of transmission capacity required to meet the needs of a planned renewable energy project. The OPA publishes construction schedules and also conducts regular assessments to determine when and where new capacity should be added. Unfortunately this is an extremely slow-moving process. The best strategy is to make the current or planned availability of transmission capacity a part of the site-selection process.

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## Financing

### Description

Developers of renewable energy projects use approved FIT contracts as a basis for raising debt and equity financing to fund the construction and initial operation of their projects.

### Risk Factors

Economic downturns, perceived technology risk of FIT projects and timing of financing

### Mitigation Strategies

Renewable energy projects require financing in the order of tens and even hundreds of millions of dollars. In a risk-averse economic environment, or in the case that FIT-supported renewable energy projects do not provide sufficient income assurance, renewable energy project developers may not be able to raise sufficient funds for their projects.

Additionally, banks are highly averse to perceived technology risk associated with FIT projects. Banks will only provide financing for renewable energy equipment that has a long track record of successful operation. Careful selection of technology suppliers, in consultation with the banks themselves, will help to reassure financiers about the performance of the chosen technologies.

Renewable energy project developers are exposed to an additional dimension of financial risk related to issues of timing. Frequently, renewable energy project developers are offered financing on a term that is much shorter than the expected life of the FIT contract. This exposes project developers to the risk of having to refinance their projects partway through their productive lives. Banks are increasingly aware of

this issue and are gradually becoming more open to matching financing timelines with FIT project timelines. Being aware of this challenge from the start can help to guard against the risk of failing to secure the appropriate refinancing agreement later on.

Approaching banks with experience in renewable energy project financing, and working with legislators for the transparent and consistent long-term management of the FIT program can help to increase the comfort level of all financial contributors to a renewable energy project.

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## Construction

### Description

Renewable energy project construction is subject to budget and time constraints. The construction process may include site preparation, grading, road construction, foundation construction, equipment transportation and installation, interconnection and inspection.

### Risk Factors

Construction delays

### Mitigation Strategies

Complicating factors during the construction process include the need for heavy equipment, weather conditions, and the lack of local contractors with expertise in the relevant project type. Equipment vendors may be able to provide turn-key options which are more expensive, but a good alternative when local expertise is not available. Other mitigating strategies for construction delays include entering into a construction contract with a contractor that includes clear construction milestone completion dates and penalties.

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## Operation and maintenance

### Description

Once a renewable energy generation project is operational, it must be maintained throughout its lifespan. Project developers generally enter into an operation and maintenance contract with the equipment manufacturer or other qualified firm. Equipment warranties and insurance contracts are also managed throughout the project lifespan.

One industry participant notes that *“you have to take into account the fact that equipment will sometimes fail, and so you want to look first of all for a very reliable supply of equipment. You want to make sure that you buy high-reliability equipment, and you want to make sure that as an operator of that equipment, you have people remotely monitoring that system and watching for failures—so you can dispatch and repair things as necessary. You have to make sure you have a good maintenance and operations plan for that equipment.”*

### Risk Factors

Adverse weather events, equipment failure

### Mitigation Strategies

Fully insuring the project mitigates the potential for financial losses due to acts of nature such as tornadoes. Warranties will generally cover equipment, while performance guarantees may be available to ensure ongoing system performance. While equipment (namely wind and solar energy generation equipment) is typically designed for a 20-year lifespan, performance guarantees and warranty periods may not match this timeframe. Guarantees may also be conditional upon set maintenance schedules or other operational requirements. Careful siting and gathering of extensive resource data pre-construction, as well as maintaining a pool of reserve funds and having an experienced site manager may help to mitigate these risks.

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## Decommissioning /repowering

### Description

Environmental permitting bodies commonly require assurances from project developers that funding will be available for decommissioning a renewable energy project site at the end of its planned productive life, or for repowering the site with modern equipment.

### Risk Factors

Insufficient funds available at the end of the project life

### Mitigation Strategies

If insufficient funding is reserved for decommissioning at the end of the project life, it is the project owner who will be responsible for assuming the cost overrun. In order to guard against this outcome, appropriate guarantees should be incorporated into the original contracts to ensure that unforeseen cost overruns related to decommissioning are not an issue.

Figure 3 lists contract rates for renewable energy projects of varying sizes.

### Key design features of the Ontario FIT program

The success of a FIT program weighs heavily on the strength of its design. The following are key design elements of Ontario's FIT program.

**Figure 3** Feed-in tariff rates for renewable energy in Ontario.

Technology	Capacity	Contract price ¢/kWh
<b>Biomass</b>		
	≤ 10 MW	13.8
	> 10 MW	13.0
<b>Biogas</b>		
On-farm	≤ 100 kW	19.5
On-farm	> 100kW ≤ 250kW	18.5
Biogas	≤ 500 kW	16.0
Biogas	> 500 kW ≤ 10MW	14.7
Biogas	> 10 MW	10.4
<b>Waterpower</b>		
	≤ 10 MW	13.1
	> 10 MW ≤ 50MW	12.2
<b>Wind</b>		
On-shore	Any size	13.5
Off-shore	Any size	19.0
<b>Solar PV</b>		
Any type	≤ 10 kW	80.2
Rooftop	> 10kW ≤ 250 kW	71.3
Rooftop	> 250 kW ≤ 500kW	63.5
Rooftop	> 500 kW	53.9
Ground-mounted	> 10 kW ≤ 10 MW	44.3
Ground-mounted	≤ 10 kW	64.2
<b>Landfill Gas</b>		
	≤ 10 MW	11.1
	> 10 MW	10.3

**Source** Reproduced from Ontario Power Authority, *FIT Price Schedule*, updated July 2, 2010

[www.fit.powerauthority.on.ca/Page.asp?PageID=924&ContentID=10543](http://www.fit.powerauthority.on.ca/Page.asp?PageID=924&ContentID=10543)

### Must-take regulations

Ontario's FIT program regulates that the purchase of energy from renewable sources by grid operators must take priority over carbon-based fuel sources. This effectively guarantees that 100% of the energy produced from renewable sources will be bought.<sup>ix</sup>

### Mandatory interconnection

Subject to capacity availability, renewable projects in Ontario are guaranteed access to the grid ahead of traditional electricity generators.<sup>x</sup>

### Guaranteed payments

Payment of the FIT rates for an agreed-upon time period is contractually assured in Ontario, increasing the confidence of long-term lenders and facilitating financing agreements for renewable energy projects.

### Setting the price based on generation cost plus a profit

In Ontario, FIT pricing for renewable energy is established through a formula that utilizes the cost of generating energy plus a sufficient profit margin for a reasonable return. Many FIT programs target specific rates of return based on common project debt/equity ratios.<sup>xi</sup> FIT rates are re-evaluated at regular intervals to adjust for the changes in project and equipment costs that renewable energy producers face. As equipment prices fall, FIT prices are adjusted downward to maintain consistent profit margins.

### Streamlined application process

Energy agencies in Ontario have gone to significant lengths to enhance transparency and reduce the administrative costs for government and investors seeking to participate in renewable energy projects. Ontario recently introduced a Renewable Energy Facilitation Office designed specifically to assist in launching new renewable energy projects.<sup>xii</sup>

### Grid parity

While FIT programs are designed to compensate energy generators for the additional cost of renewable energy projects (over coal-based energy), the ultimate goal is for energy that is generated from renewable sources to become cost-competitive with conventional fossil fuels (i.e., to reach "grid parity"). To this end, FIT rates in Ontario for new renewable energy projects are reviewed on a periodic basis. Where appropriate, these rates are adjusted downward to reflect scale advantages achieved by equipment manufacturers over time.<sup>xiii</sup>

Grid parity prices can be interpreted and calculated in a number of ways. Comparing against the retail price of electricity for consumers is one straightforward approach. However, grid parity can also be taken to mean the retail price of electricity for industrial users. Another method for evaluating grid parity prices uses the production cost of electricity from competing fuel sources, plus the implied price of the associated carbon emissions. Lastly, grid parity prices can include the capital costs for additional transmission capacity that are *avoided* by producing electricity closer to the point at which it is consumed. Achieving grid parity for electricity from renewable sources is essentially the pursuit of a moving target. As the methods for calculating grid parity prices gain accuracy and acceptance, pricing will become an increasingly important issue for project developers.

### Domestic content

To qualify for a FIT agreement in Ontario, wind and solar energy

producers must fulfill a “domestic content requirement.” The domestic content requirement indicates that a certain percentage of the proposed project content (activities, not financial value) must come from Ontario sources. Figure 4 highlights domestic content requirements for certain system types.

For microFIT projects, domestic content requirements are in force for solar power only. No other fuel types must fulfill a domestic content requirement. For a complete description of required domestic content for microFIT solar projects, refer to the Ontario Power Authority’s microFIT publication, “Domestic Content Grid” at [www.microfit.powerauthority.on.ca/pdf/microFIT-Domestic-Content.pdf](http://www.microfit.powerauthority.on.ca/pdf/microFIT-Domestic-Content.pdf).

For FIT projects, wind-power generation facilities with a production capacity greater than 10kW, and all solar power generation projects, domestic content requirements must be met. A detailed list of these requirements can be found in Exhibit D of standard FIT contracts on the Ontario Power Authority website: [www.fit.powerauthority.on.ca/Storage/99/10810\\_FIT\\_Contract\\_Version\\_1.2\\_Exhibit\\_D\\_Domestic\\_Content.pdf](http://www.fit.powerauthority.on.ca/Storage/99/10810_FIT_Contract_Version_1.2_Exhibit_D_Domestic_Content.pdf)

Note that the Ontario Ministry of Energy and Infrastructure and the OPA are seeking comments from stakeholders on a proposed change to the domestic content requirements for wind projects greater than 10kW. These changes will provide additional flexibility for wind project developers to meet the 50% domestic content requirement. A detailed description of these changes can be found here: [www.fit.powerauthority.on.ca](http://www.fit.powerauthority.on.ca)

## Building renewable energy capacity in Ontario: Implications of the domestic content rule

The domestic content requirement provides a guaranteed customer base for national and international corporations that elect to establish a location in Ontario and integrate into the renewable energy value chain to meet gaps in areas that may not be currently met by Ontario manufacturers. To this end, Ontario supports an array of innovative research centres as well as a variety of funding

programs and tax incentives for the development and manufacture of innovative green technologies in Ontario.

### Why is domestic content a key issue for renewable energy project developers?

Renewable energy project developers must be well versed in the domestic content rules as applicable to their own project development plans and timelines. These rules add significant supplier risk to the renewable energy project development equation, and project developers must invest a great deal of time and energy in the evaluation of alternate component and equipment suppliers in order to fulfill local content requirements for their projects. Many project developers are challenged to source the regulated mix of content locally. This is because the local market for renewable energy equipment, components and expertise is still developing, and timely delivery is often impossible. Without evidence that these projects will meet the stipulated local content requirements, they will be refused a FIT contract by the OPA. Local content requirements therefore have the potential to derail renewable energy projects in Ontario due to a lack of local production capacity and expertise. Please refer to page 23, “FIT project timelines,” of this report for more information on Domestic Content Plans.<sup>1</sup>

### The importance of R&D in Ontario's feed-in tariff scheme

While R&D and the development of next-generation renewable energy technology is important for ensuring Ontario’s continued participation in the renewable energy technology market, project developers rely mostly on “tried and true” energy generation equipment. Although new technologies often offer superior energy yields, they may not be viable from a financing standpoint. Institutional lenders are extremely sensitive to the perceived technology risk inherent in new technologies. Until these have established a substantial track record of successful operation, new technologies will be used in only an extremely small portion of renewable energy projects. Nevertheless, establishing Ontario’s position on the forefront of renewable energy technology innovation secures a leading role for the province in the global transition away from carbon-centric energies in the years and decades to come.

Ontario companies and corporations with R&D operations in the province have become world leaders in specialized areas of clean technology innovation. Ontario is home to a host of marquee

**Figure 4** An overview of domestic content requirements for renewable energy projects in Ontario.

System Type/Size	From 10/01/2009	From 01/02/2011	From 01/02/2012
<b>FIT program (&gt; 1 OkW)</b>			
Wind	25%	25%	50%
Solar	50%	60%	60%
<b>MicroFIT program (&lt; or = &gt;10kW)</b>			
Wind	not applicable	not applicable	not applicable
Solar	40%	60%	60%

**Source:** Ontario Power Authority, FIT Program FAQ2008, Page 1

<sup>1</sup> Also note that the OPA permits renewable energy project developers to submit Domestic Content Plans prior to the Notice to Proceed phase of the process. It may be wise to do so in order to incorporate any feedback prior to the submission deadline.

scientific minds. The province also attracts top-calibre researchers from around the world who are drawn by Ontario's collaborative atmosphere and generous funding environment.<sup>xiv</sup> Twelve world-class research centres with a focus on renewable energy technology are located in Ontario, working in close collaboration with industry to bring the province's cleantech innovations to the world market. Cleantech innovation in Ontario is also supported by a generous system of tax credits for research and development.<sup>xv</sup>

#### Selected funding programs for cleantech R&D

Part of what makes Ontario an attractive venue for cleantech R&D is the availability of funding programs to support it. Figure 5 details a selection of funding programs aimed at encouraging cleantech R&D in Ontario.

In addition to these grant-based programs, Canada's Scientific Research and Experimental Development (SR&ED) tax incentive is widely held to be among the most generous in the world. In Ontario, the SR&ED program is available with further support from the Ontario Business Research Institute tax credit and the Ontario Innovation Tax Credit.

#### World-class research centres in cleantech R&D

With generous funding and tax incentives available for research and development, Ontario is also home to a number of top-calibre research centres specializing in cleantech R&D. The following profiles represent some of Ontario's leading-edge cleantech research centres.

#### Waterloo Institute for Sustainable Energy (WISE)

Established at the University of Waterloo in 2008, WISE is made up of more than 70 faculty members, with graduate students and post-doctoral fellows working as multidisciplinary research teams across the Engineering, Science and Environment departments.<sup>xxii</sup> The Institute is the focal point at the University of Waterloo for research in energy studies.<sup>xxiii</sup> In collaboration with utilities, private sector partners, government agencies and civil society groups, the Institute's goal is to foster the development of innovative technologies as well as alternatives to existing energy production and delivery systems, and to promote energy efficiency and environmental sustainability.

#### McMaster Institute for Energy Studies (MIES)

Founded in 1980, MIES is an interdisciplinary institute for the study of energy extraction, transformation, generation, transportation and end-use.<sup>xxv</sup> MIES provides a forum for cooperation and interdisciplinary interactions between McMaster faculty members in the fields of study related to energy, and acts as a point of contact at McMaster for energy-related opportunities.<sup>xxvi</sup> MIES is home to a number of innovative programs in photovoltaics, solar, wind, fuel cells, nuclear energy, and conservation and energy modeling.<sup>xxvii</sup> The Institute's core research initiatives relate to energy generation, conservation, storage and delivery. Some current research areas include electric vehicles, thermal energy storage and smart-grid technologies. MIES is unique in that it also includes energy-policy studies and faculty from McMaster's Department of Economics. MIES focuses on policy analysis and consumer behaviour as well as on engineering and technical issues in the energy sector.

#### Ontario Centre of Excellence for Energy

The Ontario Centre of Excellence for Energy invests in and promotes cutting-edge research collaborations between industry and colleges, universities and research hospitals.<sup>xxviii</sup> The Centre engages the brightest minds at Ontario's universities and colleges to develop

innovative solutions for current energy challenges.<sup>xxix</sup> The Centre supports the research and development of competitive, industrially-relevant technologies.<sup>xxxi</sup> The Centre's mission is to bring these technologies to the marketplace in order to provide Ontarians with viable, affordable long-term energy supplies while improving the net impact of society on the environment. In the process, their aim is to help build a strong, competitive energy sector in the province.<sup>xxxii</sup>

#### CanmetENERGY

Administered by Natural Resources Canada, CanmetENERGY is the largest energy, science and technology organization working on clean-energy research, development, demonstration and deployment in Canada. With over 450 scientists, engineers and technicians, CanmetENERGY is a knowledge centre for scientific expertise in clean-energy technology.<sup>xxxiii</sup> CanmetENERGY is actively involved in the research and development of renewable energy technologies, working not only to meet energy demands but also to reduce the technical and financial risks associated with each technology.<sup>xxxiii</sup> This work is performed alongside industry to establish standards and to openly share new knowledge and information about renewable energy technologies. Current work at CanmetENERGY is focused on improving the efficiency and cost-effectiveness of emerging hydro technologies, as well as conducting research into the integration of renewable and decentralized energy resources into Canada's existing electricity networks.<sup>xxxiv</sup>

#### Photovoltaic Innovation Network

The Photovoltaic Innovation Network is a partnership between the research community, industry, government, funding agencies, and advocacy groups to foster and accelerate the widespread adoption of photovoltaics as a renewable energy resource in Canada.<sup>xxxv</sup> The purpose of the Network is to facilitate collaboration between industry researchers in the photovoltaic community across Canada.<sup>xxxvi</sup> The Network aims to foster a base of knowledge and technology that will help Canada compete globally in this rapidly growing sector.<sup>xxxvii</sup> The Network supports the development of new intellectual property in photovoltaics and its adoption by Canadian industry, in order to meet the strong domestic demand for photovoltaic technology currently met by foreign companies.<sup>xxxviii</sup>

#### How are R&D institutions supporting the creation of cleantech jobs in Ontario?

Ontario's cleantech R&D institutions are responsible for developing talent, creating jobs in the renewable energy sector, and helping commercialize renewable energy technologies through the creation of start-up companies. At the Ontario Centre of Excellence in Energy, programs are in place to support research at academic institutions in tandem with industrial R&D efforts. The Centre also runs commercialization programs to take new renewable energy technologies from the laboratory to the market place. According to Dan McGillivray, Managing Director at Ontario Centres of Excellence, the Centre is also mandated to "help develop the next generation of innovators." It helps facilitate the transfer of students from academia to commercial enterprises that work with renewable energy technologies. Additionally, the Centre assists with the management of the Ontario Power Authority's Technology Development Fund.

#### Renewable energy equipment manufacturing in Ontario

In order to meet domestic content requirements stipulated by FIT contracts, renewable energy project developers must extend equipment procurement contracts to local renewable energy equipment manufacturers. At present, the local manufacturing

**Figure 5** Selected funding programs for Cleantech R&D.

<p><b>Innovation Demonstration Fund</b></p>	<p><a href="http://www.mri.gov.on.ca/english/programs/idf/guidelines.asp">http://www.mri.gov.on.ca/english/programs/idf/guidelines.asp</a></p>	<p>The Innovation Demonstration Fund (IDF) is a discretionary, non-entitlement funding program administered by the Ministry of Research and Innovation that focuses on the commercialization and initial technical demonstration of globally competitive, innovative Green technologies, processes and/or products.<sup>xvi</sup></p> <p>The objective of the IDF is to help companies in their efforts to commercialize innovative technologies in Ontario by mitigating the risk of projects with significant pilot-scale technical hurdles. The IDF is not aimed at routine engineering, upgrading, or improvements to existing processes, designs or products.<sup>xvii</sup></p>
<p><b>Sustainable Development Technology Canada (SDTC)</b></p>	<p><a href="http://www.sdtec.ca">www.sdtec.ca</a></p>	<p>Sustainable Development Technology Canada (SDTC) is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies which provide solutions to issues of climate change, clean air, water quality and soil, and which deliver economic, environmental and health benefits to Canadians.<sup>xviii xix</sup></p> <p>SDTC operates two funds aimed at the development and demonstration of innovative technological solutions. The \$550 million SD Tech Fund<sup>TM</sup> supports projects that address climate change, air quality, clean water, and clean soil. The \$500 million NextGen Bio fuels Fund<sup>TM</sup> supports the establishment of first-of-kind large demonstration-scale facilities for the production of next-generation renewable fuels. To date, SDTC and its project partners have invested more than \$1 billion in getting clean technology solutions to market. Funding is only part of SDTC's mandate. SDTC also helps innovators strengthen their management capacity and secure follow-on funding.<sup>xx</sup></p>
<p><b>Program of Energy Research and Development (PERD)</b></p>	<p><a href="http://www.nrcan-rncan.gc.ca">www.nrcan-rncan.gc.ca</a></p>	<p>The Program of Energy Research and Development (PERD) is a federal, interdepartmental program operated by Natural Resources Canada (NRCan). PERD funds research and development designed to ensure a sustainable energy future for Canada in the best interests of both our economy and our environment. It directly supports energy R&amp;D conducted in Canada by the federal and provincial governments, and is concerned with all aspects of energy supply and use. The Office of Energy Research and Development provides PERD funds directly to partner departments and agencies, which then team up with federal laboratories, the private sector, associations, universities, provincial and municipal governments, or international organizations.<sup>xxi</sup></p>

base for renewable energy equipment is extremely small. One project developer notes that, “There were very few manufacturers in the province prior to the FIT. I think that there’s probably one or two new manufacturers that have moved into the province and started manufacturing since the FIT was implemented, and...there’s probably half a dozen companies that we’re talking to right now that are all considering or planning to start production in the province. But the problem is most of them won’t actually start manufacturing in earnest until they receive orders from renewable energy project developers. They need to have some firm orders in place before they can start the manufacturing process; therefore, [we] are not in a position to start the manufacturing. But...that will be resolved in the coming months. I think, by the end of the summer, there will be a number of new manufacturers in the province that will be starting up their processes.”

**Attracting local investment in cleantech manufacturing**

In addition to the FIT local content requirements, which are geared toward developing local manufacturing capacity for renewable energy equipment, a variety of other incentive programs exist

through federal and provincial bodies that support the expansion of renewable energy equipment manufacturing and generation capacity in Ontario.<sup>xxxix</sup> Two such examples are the Strategic Jobs and Investment Fund, and the ecoENERGY for Renewable Power fund.

**Strategic Jobs and Investment Fund (SJIF)**

The SJIF is a discretionary grant and loan program designed to co-fund investments or expansions of Ontario-based business operations of \$10 million or more, or of businesses that will result in the creation of 50 or more new, high-value jobs. The SJIF targets innovative companies that plan to make anchor investments in Ontario.<sup>xl</sup> Green/clean technology production is one of the four focus areas of the SJIF.<sup>xli</sup>

**ecoENERGY for Renewable Power**

The ecoENERGY for Renewable Power program was launched with the intent to invest \$1.48 billion to increase Canada’s supply of renewable energy.<sup>xlii</sup> The program is expected to fund the construction of 14.3 terrawatt hours of new electricity generation capacity from renewable energy sources.<sup>xliii</sup> To this end, the ecoENERGY for

Renewable Power program provides an incentive of one cent per kilowatt-hour for up to 10 years to eligible low-impact, renewable energy generation projects constructed before March 31, 2011.<sup>xiv</sup>

### **Northern Ontario Heritage Fund Corporation (NOHFC), Northern Energy Program**

The NOHFC enters into partnerships with northern businesses and non-profit organizations in order to pursue innovative solutions for renewable energy generation and energy conservation. The Northern Energy Program is implemented in four streams: Renewable Energy Planning, Renewable Energy Capital Cost-Differential Assistance, New Internal Energy Generation Projects, and Energy Conservation Pilot Projects. For these streams, the NOHFC will provide up to 50% of project costs, to a maximum of \$250,000, \$500,000 or \$1,000,000, depending on the project.

#### Key considerations for establishing manufacturing operations in Ontario

While there are abundant incentives designed to attract investment in the local manufacture of renewable energy equipment, project developers continue to face difficulty satisfying local content requirements as stipulated by FIT contracts.

One project developer notes, *“The FIT domestic content requirement is a very challenging provision. The manufacturing capacity required to meet the Ontario content does not exist currently. Significant investment by manufacturers is required to achieve the content provisions for 2012 and beyond. Whether or not Ontario can attract sufficient manufacturing will depend on timeline and FIT program consistency. It is not clear that manufacturing capacity can be built up fast enough to meet the 2012 requirements. Further, manufacturers will want reasonable certainty that the FIT program will be in place long enough to pay for the investment.”*

These thoughts are echoed by another project developer, *“Attracting foreign investment in manufacturing facilities requires confidence in the longevity of a program. After seeing what’s happened in countries like Spain where they are talking about retroactive price changes, and [with] the reduction in tariffs in Germany, there is hesitation among manufacturers to locate here in Ontario. We think it’s incumbent upon the Government of Ontario that they put a greater emphasis on the longevity of the program to instill confidence in the manufacturers to make those investments. Absent those investments being made, I think the government will face a very difficult decision. You have a large group of developers who have a great deal invested in renewable energy projects, but Ontario may not have [the] manufacturing base to meet their needs. So, the government will have to make one of two decisions. Either lower the local content requirement or create stronger incentives for these manufacturers to locate here. An individual would not buy a home if they didn’t have job security where [they made their] mortgage payment. That’s the same rationale behind the manufacturers. If they don’t have certainty of a program where they are going to be able to make their payments on the cost of the factory, they are not going to build the manufacturing capacity in Ontario. Is it achievable? Absolutely. Can Ontario be an export base? Yes, but the government needs to ensure that manufacturers feel that they are entering a stable environment and not a politically-charged environment where October next year, all programs could come to a grinding halt. The transmission infrastructure also needs to be able to accommodate the new projects that are coming. Given the wide number of companies that have won FIT contracts in the first launch, if you are a manufacturer, you not only have to research the program but you also need to be certain that you are going to get enough of those developers’ business to justify your investment in manufacturing.”*

While on the one hand, Ontario policymakers have sought through the FIT local content requirements to create an environment that welcomes local investment in renewable energy equipment manufacturing, these local content stipulations may have an adverse effect on the stability of the FIT program. According to a researcher, *“It’s a delicate balancing act between making this feed-in tariff program beneficial to Ontario through investments and job creation versus the program collapsing because there is no domestic manufacturing capacity to meet the local content requirements, and insisting on local content could drive up the cost so much that the whole thing actually doesn’t make sense.”*

#### Early movers in local renewable energy equipment manufacturing

Shortly after the FIT program was announced, Sault Ste. Marie-based Heliene was formed. The company, a manufacturer of high-performance solar panels, hopes to become a key participant in the Ontario’s emerging solar energy equipment manufacturing market, positioned to integrate into the solar power generation value chain in Ontario and the midwestern United States. The company expects to create 40 jobs and spur significant investment in the Sault Ste. Marie area. By September of 2010, 20 jobs will be filled, and the company expects to grow to \$2 million in payroll expenses in short order. The jobs will be held mostly by young college or trade school graduates with a specialty in engineering. According to Martin Pochtaruk, President of Heliene, a key advantage of being located in Sault Ste. Marie, is outstanding employee loyalty and very low turnover rates, as well as generous government funding (Northern Ontario Heritage Fund, Sault Ste. Marie Community Improvement Program) and support for the establishment of businesses in northern Ontario. The Sault Ste. Marie community will also benefit indirectly from an increase in demand for supporting services such as insurance, accounting, and legal consultations. Prior to the start of operations, selected employees will be sent to Spain for a six-week training course in the manufacturing process for solar technology.

While ongoing uncertainty about the longevity of the FIT program continues to retard wide-scale investment in renewable energy technology manufacturing capacity in Ontario, FIT incentives that create demand for Ontario-manufactured equipment, combined with generous funding for manufacturers who elect to locate in northern Ontario, together served to mitigate risk and induce Heliene to establish operations in Sault Ste. Marie.

Another early mover in Ontario-based renewable energy equipment manufacturing has been Morgan Solar. A maker of novel concentrated photovoltaic systems for solar energy projects, Morgan Solar has benefitted from an array of federal and provincial funding programs and tax credits. During their research and development phase, the company made use of funding from Canada’s Industrial Research Assistance Program, as well as from Ontario’s Scientific Research and Experimental Development tax credits. More recently, the company was awarded a grant from the Ontario-based Innovation Demonstration Fund. Morgan Solar also received support from the Ontario Centres of Excellence. Locating their manufacturing operations in Ontario made sense from a human resources and lifestyle perspective prior to the implementation of the FIT program. The founder and CTO John Paul Morgan also acknowledges that *“Ontario is a very cost-effective place to grow a business.”* With the implementation of the FIT program, Morgan Solar is now evaluating opportunities in the Ontario market for their products.

## The role of entrepreneurs in Ontario's renewable energy future

Technology innovation and entrepreneurship go hand in hand. Start-up companies leveraging novel technologies to take advantage of new market opportunities create jobs and wealth in their communities. The following are a few examples of important technology innovations poised to play a role in the rapidly growing market for renewable energy and related technologies in North America and beyond.

### Morgan Solar

Morgan Solar has developed a novel solar panel design, one that is able to concentrate the sun's light onto a single point. From this point, a single, high-efficiency solar cell converts solar energy into electricity. Morgan Solar's technology replaces swathes of delicate and expensive photovoltaic panelling with defect-resistant, inexpensive materials, able to generate a comparable electricity yield per panel at a dramatically lower price point. Not only are Morgan Solar's panel materials cheaper, the manufacturing processes used to make the panels are also cost-effective. Instead of high-end electronics manufacturing or semiconductor manufacturing processes, Morgan Solar can leverage much less expensive injection moulding techniques for the fabrication of plastic parts. The company is currently conducting large-scale demonstration projects and anticipates entry into the commercial market in the summer of 2011.

### Wind Simplicity

Wind Simplicity is a Toronto-based manufacturer of small-scale, horizontal axis wind turbines, in the order of three, seven, and 23 kilowatts, on a gearless, direct-drive platform. The company's turbines are compact, lightweight and modular, with cutting-edge efficiency enhancements. Wind Simplicity's manufacturing centre is located in Waterloo, and the company estimates that with each new turbine model, they create approximately 40 new jobs. The company has been the recipient of numerous awards and accolades, celebrating the leading-edge efficiency of its designs. Wind Simplicity is privately financed, and has taken advantage of wage subsidies for its employees as well as tax credits through Ontario's Scientific Research and Experimental Development program.

### OCE-supported projects

- **Wired Sun**—development of ultra high-efficiency flexible thin film solar cells, in collaboration with the University of Toronto
- **ARISE Technologies**—development of high-efficiency silicon solar cells, in collaboration with McMaster University
- **Wenvor Technologies**—developing technologies for efficient wind-energy generation in the far North, in collaboration with the University of Waterloo
- **Biro Air Energy**—manufactures compact wind turbines which employ a patent-pending design to generate superior energy yields over similarly sized turbines

## Opportunities for entrepreneurs in renewable energy— A project developer perspective

From the standpoint of renewable energy project developers, challenges remain in the adoption of new renewable energy technologies.<sup>xiv</sup> One commonly-felt opportunity for improvement is in the monitoring and testing of new and prototype technologies.<sup>xvi</sup> Since there is no widely accredited body able to certify the efficiency and performance claims of new renewable energy technologies, industry is slow to adopt these technologies.<sup>xvii</sup> Without a trusted regulatory body, risk-averse lenders and equity investors prefer to finance proven technologies with a long track record of consistent performance.<sup>xviii</sup>

Another opportunity for start-ups in the renewable energy sector is to establish partnerships with larger firms. As Ontario-based companies, these start-ups can help renewable energy project developers meet their local content requirements by providing services such as land surveys, electrical contracting, soil analysis, geotechnical analysis and engineering consulting.

One project developer observes, *"The module manufacturers are large manufacturers, so where is the room for entrepreneurialism? It's in consulting. It's in doing things as simple as...being an expert in [the] Renewable Energy Act, environmental companies, and land surveying companies."* Project developers also point to opportunities for innovation and entrepreneurship in *"leveraging human ingenuity to find more effective ways to build renewable energy projects."*

Similarly, another potential market opportunity for Ontario entrepreneurs lies in establishing component manufacturing operations in Ontario to help project developers meet local content demand. According to another project developer, *"There's a lot of manufacturing opportunities. It's not just modules, but you have steel post and aluminum structures, you have wiring and wiring harnesses and wiring guides, you have people that have to do surveying, ground work, ground preparation and trenching, and you also need conduits and cables. You have a lot of equipment that is going to be sourced locally. Anything you do outside of Ontario that you could do inside Ontario with Ontario people will be an opportunity, so it will be a market for the next three to five years."*

## Financing renewable energy projects in Ontario

Financing structures for renewable energy projects in Ontario vary significantly depending on the scale of the project. For microFIT projects, financing tends to be fairly straightforward. For FIT projects, financing generally comes from a combination of sources and types, and financing structures are significantly more complex.

### Financing microFIT projects

The microFIT program, geared at solar energy projects with a production capacity of 10kW or less, provides opportunities for a variety of business arrangements.<sup>xix</sup> Most commonly, microFIT projects will be one of the following:

- privately owned
- community-owned
- installed on leased roof space
- installed with leased equipment<sup>i</sup>

Note that in Ontario the OPA has announced that commercial aggregators (e.g., businesses that lease land or rooftops from individuals for multiple renewable energy projects) will no longer be allowed to participate in the microFIT program. According to the OPA, this will ensure that the microFIT program is focused on its original purpose – encouraging homeowners, farmers, farm co-operatives, Ontario's Aboriginal communities, small businesses and institutions such as schools, to own and develop small renewable projects.<sup>li</sup>

MicroFIT projects tend to be organized by private homeowners or farmers, or to be placed on small commercial or institutional properties.

Some financial institutions in Ontario now offer special financial packages and options for the development of microFIT projects. TD Canada Trust has been a first-mover in the microFIT financing market, and has signalled its willingness to work with institutions, homeowners, small businesses, and farmers to develop affordable microFIT financing packages.<sup>lii</sup> RBC is also a player in the market for renewable energy financing. As of October 31, 2009, the company reports having distributed loans for hydroelectricity projects in the amount of \$840 million, loans for wind projects in the amount of \$110 million, loans for biomass projects in the order of \$100 million, and loans to solar equipment manufacturers amounting to \$36 million.

### Home and small business loans

- 1. Home renovation loans:** These are relatively short-term loans (in the range of five to 10 years) offered as standard “home renovation” financing at rates of approximately 6% to 7% by commercial banks and credit unions.
- 2. Home equity loans:** These are secured loans and mortgages at interest rates that reflect current conditions in the home mortgage market, offered by commercial banks.
- 3. Canada Small Business Financing Loan (CSBFL):** The CSBFL is a ten-year government-backed commercial loan.<sup>liii</sup> These loans are provided by Canadian chartered banks at a floating interest rate of prime plus 3%, or at a fixed rate equal to the lender’s single-family residential mortgage rate plus 3%.<sup>liiv</sup> A CSBFL is available to Canadian small businesses with annual sales of less than \$5 million.<sup>liiv</sup> The maximum loan amount under the CSBFL is \$350,000, which may be used to “acquire equipment or make leasehold improvements,” including purchasing and installing renewable energy generation equipment.<sup>livi</sup><sup>liivii</sup>
- 4. Standard commercial bank loan or line of credit:** Offered by commercial banks and credit unions, these loans are offered at interest rates in the range of 6% to 9%.<sup>liiii</sup>
- 5. Secured commercial loans:** These are available to business owners at traditional, secured mortgage interest rates provided that the business owner is willing to use the equity in his or her commercial buildings to secure the loan.<sup>lix</sup>

### Farm loans

**Farm Credit Canada Energy Loan:** Farmers who obtain at least 51% of their income from agricultural sources are eligible for a loan from Farm Credit Canada in order to purchase and install on-farm renewable energy generation systems.<sup>lix</sup> Variable or fixed interest rates are available.<sup>lxi</sup>

### Private leasing companies

**Solar equipment leasing programs offered by private companies:** There are several private leasing companies offering financing for the acquisition and installation of solar energy generation equipment in Ontario. One company, Lease Capital Corporation of Canada, offers a solar leasing program for Ontario residents.<sup>lxii</sup> The program offers fixed monthly lease payments for terms ranging from three to eight years.<sup>lxiii</sup> One advantage of equipment leasing arrangements is that Ontario residents wishing to install solar PV or solar water heater systems may be eligible for certain tax benefits.<sup>lxiv</sup>

### Financing for community and Aboriginal projects

FIT legislation stipulates that renewable energy producers are eligible to receive an additional amount per kilowatt-hour of energy produced over standard FIT rates, an “add-on,” based on the degree of equity participation of community or Aboriginal groups in renewable energy generation projects.<sup>2</sup> Figure 6 lists available FIT “adders” for each type of energy generation technology.

Since these “adders” can increase the income per kilowatt-hour of renewable energy projects by as much as 4%, there is substantial value in Aboriginal and community involvement in renewable energy projects.

In addition to FIT rate “adders,” renewable energy projects with community or Aboriginal participation are eligible for reduced security payments when the FIT application is submitted, at contract issuance, and before commercial operation.<sup>lxv</sup>

### The Community Power Fund (CPF)

Established in 2007, the Community Power Fund, a non-profit co-operative corporation, was founded to support the project development activities of Ontario-based community organizations pursuing local renewable energy projects.<sup>lxvi</sup> The Community Power Fund works to support community ownership of renewable energy projects, creating jobs and promoting local investment in renewable energy. The Fund offers a number of financing instruments to promote community power including grants, loans and investment equity.<sup>lxviii</sup> These instruments include the Community Power Fund grant program, the Community Energy Partnerships Program, and Community Power Capital.<sup>lxviii</sup>

- The Community Energy Partnership Program is managed by the Community Power Fund and accounting firm Deloitte on behalf of the Ontario Power Authority. The program is designed to provide financial resources to community organizations wishing to develop and own renewable energy projects in Ontario. The program provides grants of up to \$200,000 per project in order

**Figure 6** Feed-in tariff rate adders for renewable energy projects with community and Aboriginal participation.

Renewable Fuel	Maximum Aboriginal price adder (cents/kWh)	Maximum community price adder (cents/kWh)
Wind	1.5	1.0
Solar PV (ground-mounted)	1.5	1.0
Water	0.9	0.6
Biogas	0.6	0.4
Biomass	0.6	0.4
Landfill Gas	0.6	0.4

**Source:** Reproduced from Ontario Power Authority: FIT Price Schedule. Updated July 2, 2010.

2 See Appendix A for an expanded explanation of “community” and “Aboriginal” in the context of FIT contracts.

to cover such expenses such as feasibility analyses, resource assessments, business planning and engineering studies.

- Community Power Capital is a social finance organization geared at designing, developing and managing funds to invest in Ontario-based Community Power projects.

According to Deborah Doncaster, Executive Director of the Community Power Fund, a major challenge for community renewable energy projects is a lack of experience in renewable energy project management and capital finance. Once a renewable energy project has been initiated and a FIT contract is secured, Community Power Capital is able to work with proponents on a capitalization strategy that supplements the community investment capital they intend to raise. Through private equity vehicles and special purpose debt funds, Community Power Capital can provide early-stage capital in advance of or in addition to the community capital raised by the local group. This introduces specialized expertise and anchor investors to community renewable energy projects and reassures potential community investors about the execution of the project.

Another challenge in attracting community investors to renewable energy projects is that many find a twenty-year timeline too long a period over which to recoup their funds. The Community Power Fund is now working to structure financial instruments that will allow investors to invest in community power projects over shorter timelines, making these projects more attractive for investors.

#### Case studies

##### **The Pukwis Community Wind Park**

The Pukwis Community Wind Park is a joint venture between the Chippewas of Georgina Island First Nation and a community-based co-operative, Pukwis Energy Co-operative.<sup>lxxix</sup> The Wind Park is a planned 54 MW wind farm, first conceived in 2002 between former Chief, Hugh Big Canoe, and Windfall Ecology Centre's founder and executive director, Brent Kopperson.<sup>lxxx</sup> The Pukwis Energy Co-operative, a 49% owner in the project, will be made up of members from the Greater Toronto Area who have invested in the project through a co-operative share offering enabled by the *Green Energy and Green Economy Act*.<sup>lxxxi</sup> The Chippewas of Georgina Island are majority shareholders in the project, with a 51% ownership stake in the wind farm. The project will also be financed by a commercial bank loan secured by a long-term power purchase agreement from the Ontario Power Authority.<sup>lxxxi</sup> Community members wishing to invest in the project must join the Pukwis Energy Co-op for a one-time fee of \$25.<sup>lxxxii</sup> Members must then purchase a minimum of ten preference shares at \$100 each, for a minimum investment of \$1,025.00.<sup>lxxxiv</sup> The estimated annual return for investors in the project is 10% over the anticipated twenty-year life of the project.<sup>lxxxv</sup>

The project was awarded a FIT contract from the Ontario Power Authority on April 8, 2010, and on June 22, heavy equipment was deployed to the project site to begin the construction of roads and take core samples to inform foundation design.<sup>lxxxvi</sup>

Upon completion, the Pukwis Community Wind Park will be connected to the Ontario electricity grid and will produce sufficient electricity to power 7,500 homes, displacing an estimated 15,000 tonnes of greenhouse gases annually.<sup>lxxxvii</sup>

The Pukwis project demonstrates the unique advantages of community financing to drive renewable energy projects forward. The Pukwis Energy Co-operative was incorporated under the *Ontario Co-operative Corporations Act*. The *Act* specifies that

incorporated co-operatives must be run democratically, with each member receiving one vote in company decisions, regardless of whether their financial stake in the project is \$1,000 or \$1,000,000. This ensures that renewable energy projects are managed according to the best interests of the majority of the co-operative members. At the same time, returns on investment are proportional to the investment made in the co-operative by each member.

##### **Neighborhood Unitarian Universalist Congregation of Toronto**

On June 6, 2010, the Neighbourhood Unitarian Universalist Congregation (NUUC) celebrated the groundbreaking of their community-financed solar energy project at their church in east Toronto. Members of NUUC had long wanted to initiate a group project that would help to reduce their carbon footprint. For several months, the congregation's Green Committee had been evaluating options for incorporating renewable energy into the operation of their church, but found most systems to be too costly for a small community group. Once Ontario's FIT program came into effect, congregation members realized that they had an opportunity to participate in a renewable energy project that would be financially self-sustaining.

Half of the equipment purchase and installation costs of the 21 kW church solar system (totaling \$220,000) were financed by an interest-free loan from the City of Toronto Green Energy Fund. The other half of the required funds was raised both through donations and through the sale of debentures to members of the community. NUUC sold 110 debentures at a cost of \$1,000 each, and offered an annual interest rate of 5% on each note. The debentures were offered for a twenty-year term, but are redeemable by NUUC at any time prior to maturity, by paying back the debenture holder the amount of their principal and any interest owing. Debenture holders can also turn the principal value of their debentures into a donation to the project and receive an income tax credit for their donation. These terms made the debentures attractive instruments for community members wishing to support the project. Financing the project with debt also allowed NUUC to retain ownership of the system and did not require the incorporation of a co-operative. According to a member of the congregation, "*There is a standard approach...to create a co-operative, but it's a more complex structure than we felt that we wanted to manage.*"

The NUUC's approach allowed individuals in the community to participate in a renewable energy project, earning income in the form of interest without the same obligations that come from having an ownership stake in the profits of the system. Another benefit for non-profit-owned renewable energy projects with FIT contracts is that the revenues accruing from the sale of electricity are earned on a tax-exempt basis. If such revenues were earned by individuals or companies, taxes would be paid. Also, incremental energy-generating capacity can be added to the system with a minimum of paperwork after the launch of the initial installation. Finally, while the marketing and distributing of financial securities to the general public is heavily regulated, charities enjoy certain exemptions from these rules. Since communities in general are keenly interested in renewable energy, charitable organizations can easily use this structure to reach out to their networks to generate interest in renewable energy projects.

A challenge remaining for non-profits wishing to participate in small renewable energy projects is that these groups risk losing their status as charitable organizations if they become revenue-generating entities. Creating a special provision for FIT-supported

renewable energy generation in the laws governing Canadian non-profits, or providing additional clarity to non-profits on this issue, would go a long way to encourage more projects of this type in Ontario's communities.

### Financing FIT projects

While the financial structures that play a role in renewable energy are closely similar to those of traditional infrastructure projects, there are characteristics that make the financing of renewable energy projects unique. Renewable energy is a heavily legislated sector of the economy, influenced by Acts and programs implemented by government. Regulations, subsidies, tax credits, grants, and tradable certificates are all policy instruments that frequently play a role in the sector. In order to understand how renewable energy projects in Ontario are brought to life, it is essential that the influence of these instruments on financing alternatives be taken into account.

### Capital markets

While Ontario's FIT programs ensure a reasonable return on investment for renewable energy projects, the construction of large-scale renewable energy assets can cost millions of dollars.

Typically, about 75% to 80% of renewable energy project costs are financed by debt in the form of project financing from major banks, lending institutions and banking syndicates who earn a relatively small return on their funds. A smaller portion comes from equity; selling a stake in the returns of renewable energy assets themselves. Equity is sourced from project developers as well as from public and private equity investors.

### Private equity

Private equity investors in renewable energy may either fund projects through construction with the goal of selling the completed asset for a return, or invest in the renewable energy assets and earn a return on their ongoing operation. Private equity investors may invest their funds in the companies owning the renewable energy assets, in a renewable energy project itself, or in a portfolio of renewable energy projects.<sup>lxviii</sup>

### Public markets

Renewable energy project developers may also choose to go public, raising equity capital in the public markets, and selling a portion of their companies in exchange. Obtaining capital from the public markets is generally only an option for an established renewable energy project developer with a track record of profitable projects.

### Bonds

A negligible amount of renewable energy asset financing also comes from the issuance of bonds. Participation in the project bond market requires that bonds be rated as investment grade. Onerous rating requirements for investment grade renewable bonds have made the issuance of renewable energy project bonds a relative rarity.<sup>lxix</sup>

### Venture capital

Although venture capital investors typically do not play a role in financing the construction of renewable energy assets directly, venture investors fund promising renewable energy technologies in the initial stages of the commercialization process.

Each source of capital has well-defined risk tolerances and return expectations. The higher the expected internal rate of return on the funds invested, the higher the inherent risk of the investment. Renewable energy project risk is perceived by financial institutions as primarily related to the risk of the renewable energy technology employed, and execution risk on the part of the project developer. Key factors considered by potential renewable energy project funders include the proposed size of the project, the creditworthiness of the project developer, the proposed debt/equity ratio, the type and quality of any third-party contracts, and any regulatory or environmental concerns.<sup>lxxx</sup>

Figure 7 compares return on investment expectations and risk factors across different funding sources for renewable energy projects.

Canadian banks have yet to develop a significant presence in the renewable energy sector. The majority of Canada's major FIT-supported renewable energy projects have been financed with debt

**Figure 7** Risk and return profiles for different sources of renewable energy project financing.

Venture Capital	Private Equity	Infrastructure Funds	Pension Funds	Bank Mezzanine Debt	Bank Senior Debt
Start ups, new technology, prototypes	Pre-IPO companies, Demonstrator technology	Proven technology, Private companies	Proven technology	Demonstrator/ Proven technology, New companies	Proven technology, Established companies
>50% IRR	35% IRR	15% IRR	15% IRR	LIBOR + 700bps	LIBOR + 300bps

**Source:** Reproduced from *Private Financing of Renewable Energy—A guide for policy makers*.<sup>lxxxi</sup>

\*\* The diagram is reflective of current market conditions and is valid as of June 2009

from German banks. Germany has had a FIT program of its own in place for nearly two decades, and German banks are leaders in financing renewable energy projects around the world. Whereas Canadian banks still perceive renewable energy projects to be relatively high-risk endeavours, German banks have developed expertise in the sector and a comfort level with renewable energy that far exceeds that of domestic financing institutions.

In 2008, the financing of renewable energy assets accounted for the majority of new investment in green energy. A total of \$136.1 billion flowed to renewable energy assets in 2008, a 23% increase over the previous year.<sup>lxxxii</sup>

Figure 8 illustrates new renewable energy asset financing (\$ US billions) from 2002 to 2008.

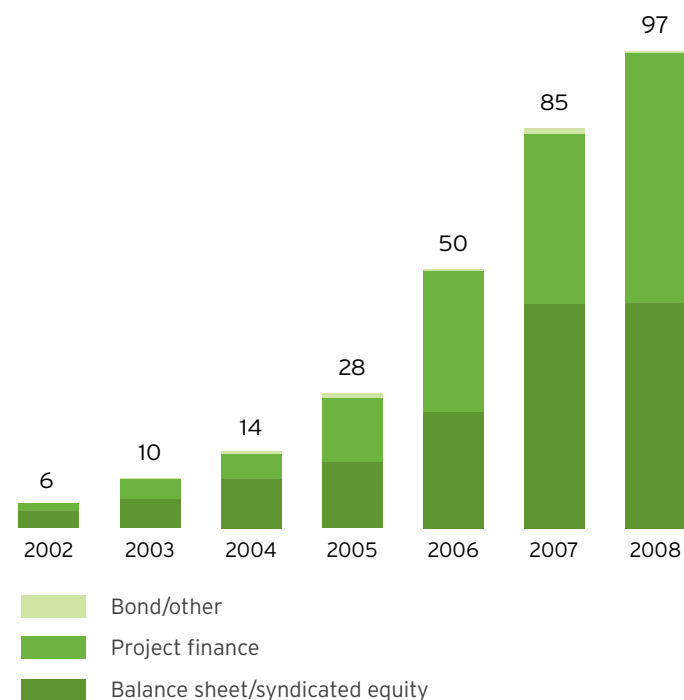
### Managing financial risk in renewable energy

Renewable energy projects could not be brought about without an array of strategies designed to manage risk for lenders and equity investors.

#### Project phasing

Renewable energy project developers generally structure their projects to be attractive to lenders and investors by organizing their financing process in two phases. The first phase, involving siting, permitting and establishing a FIT contract with the OPA, is generally self-funded. Dollars invested early in the project development process face the greatest measure of risk, because project abandonment is most likely at this stage. Once a project site

**Figure 8** New renewable energy asset financing by security type, 2002-2008 (\$ US billions)



**Source** Reproduced from Greenwood, Chris et al. (2009). *Global Trends in Sustainable Energy Investment 2009: Analysis of Trends and Issues in the Financing for Renewable Energy and Energy Efficiency*. Pg. 36.

has been secured, the energy resources verified, and the appropriate permits and power purchasing agreements obtained, the risk of project abandonment declines. Hence a debt or equity arrangement is much more attractive for an external funder in the latter phase of the project development process.

#### Expertise and diverse project portfolio

One experienced project developer notes that a key risk management strategy employed by his company is to consistently make use of top-calibre engineers, attorneys and consultants, and to perform a great deal of due diligence early in the site selection process. Leveraging the knowledge and track records of expert talent in the renewable energy sector helps to reassure lenders and investors that the execution risk for a renewable energy project will be held to a minimum. This project developer also points out that developing a number of projects simultaneously also mitigates the risk of any one project failing to reach the operational stage.

### Developing financial instruments to manage risks in renewable energy

In order to foster renewable energy projects in Ontario, it will be necessary for the province's financial institutions and insurers to develop a strong base of expertise in the sector. An understanding of the nature of the risks faced by renewable energy project developers is crucial, as is an abundance of technical knowledge and expertise in evaluating and modelling historical weather data. In addition, insurers and financial institutions must improve their ability to value renewable energy projects, particularly those that operate on a smaller scale. These projects are currently faced with extremely low insured values, increasing the difficulty of obtaining financing. A final means of expanding insurance options for renewable energy projects would be to allow foreign insurers greater access to the Ontario renewable energy market.

The United Nations Environment Programme has compiled a list of financial instruments commonly used to mitigate different renewable energy project risk factors. Figure 9 provides this information.

### Key actions and considerations for connecting a microFIT project to the grid

Securing a grid connection for a renewable energy project under Ontario's microFIT program is a three-phase process. While the first and third phases are relatively straightforward, the second phase is slightly more involved. Figure 10 presents an overview of the required actions on behalf of the microFIT project developer to secure a grid connection for their project.<sup>lxxxiii</sup>

#### Tax implications for microFIT projects

Participation in the microFIT program entails a business relationship between the Ontario Power Authority and the microFIT project owner/developer. This relationship results in business income to the renewable energy project. It is important to consult the Canada Revenue Agency for information on reporting business income and collecting and remitting HST.

#### Property taxes

The installation of a microFIT renewable energy project may add to the value of a property. Similar to a home improvement project, this can mean that the assessed property market value may increase and

**Figure 9** Instruments for mitigating the financial risk of renewable energy projects.

	Renewable energy project risks	Financial risk management instruments
Large-scale project risks	<b>Pre-construction phase</b>	<ul style="list-style-type: none"> <li>• Grants</li> <li>• Contingent grants</li> </ul>
	<b>Construction</b>	
	Construction risk	<ul style="list-style-type: none"> <li>• Insurance damages</li> </ul>
	Counterparty risk	<ul style="list-style-type: none"> <li>• Performance guarantees</li> <li>• Liquidation damages</li> </ul>
	<b>Operating phase</b>	
	Performance risk	<ul style="list-style-type: none"> <li>• Insurance</li> </ul>
	Counterparty risk	<ul style="list-style-type: none"> <li>• Performance guarantees</li> <li>• Liquidation damages</li> </ul>
	Energy resource risk/weather risk	<ul style="list-style-type: none"> <li>• Weather insurance /derivatives</li> </ul>
	Credit risk	<ul style="list-style-type: none"> <li>• Guarantees</li> <li>• Credit derivatives</li> </ul>
	<b>All phases</b>	
	Financial risk	<ul style="list-style-type: none"> <li>• Standard derivative products</li> </ul>
	Political risk	<ul style="list-style-type: none"> <li>• Political risk insurance</li> <li>• Export credit guarantees</li> </ul>
	Force majeure risk	<ul style="list-style-type: none"> <li>• Insurance</li> <li>• Catastrophe bonds</li> </ul>
Risks associated with small-scale projects	Credit risk	<ul style="list-style-type: none"> <li>• Guarantees</li> <li>• Credit lines</li> </ul>
	Risk of physical damage/theft	<ul style="list-style-type: none"> <li>• Insurance</li> </ul>

**Source** Reproduced from *Financial Risk Management Instruments for Renewable Energy Projects*, UNEP 2008, Page 1

**Figure 10** Connecting microFIT projects to the grid.

Phase	Activity	Process leader	Deadlines/Observations	Reference
<b>Submitting an application</b>	Register with OPA	OPA	Register on the OPA's microFIT program website.	microFIT program overview v.1.5 Section 3.2 Page 23
	Submit application to OPA	OPA	Receive a project reference number when an application is submitted.	microFIT program overview v.1.5 Section 3.2 Page 24
	Conditional Offer issued by OPA	OPA	Offer will expire 12 months from date it was issued.	microFIT program overview v.1.5 Section 3.3 Page 24
<b>Getting connected</b>	Discuss connection options with LDC/ESA and develop project installation plan with LDC	LDC/ESA	Before a connection request is submitted.	microFIT program overview v.1.5 Section 2.1 Page 15, and section 4.1 Page 25
	Submit a connection request	LDC	LDC will review the connection request and make an offer to connect the project within 15 days	microFIT program overview v.1.5 Section 4.1 Page 26
	Receive Offer to connect from LDC and Indicate Intention to Connect from LDC	LDC	The offer to connect remains in effect for 30 days. The project developer must indicate their Intention to Connect within this timeframe.	microFIT program overview v.1.5 Section 4.1(a) Page 26
	Apply and receive corresponding building permits	Municipality	Before project construction has begun.	microFIT program overview v.1.5 Section 2.2(a) Page 20
	Apply and receive Renewable Energy Approval (REA)	Ministry of Environment	Before project construction has begun.	microFIT program overview v.1.5 Section 2.2(b) Page 21
	<b>Begin the installation of your project</b>			
	Complete safety inspection	ESA	After the project has been installed, the project developer must complete a safety inspection with the ESA.	microFIT program overview v.1.5 Section 4.2 Page 26
	ESA gives the LDC the approval to connect the electrical service	ESA	The project will not be connected to the grid until the LDC receives a letter of authorization from ESA.	microFIT program overview v.1.5 Section 4.2 Page 26
	Payment of connection costs to LDC	LDC	Before the LDC finalizes the connection.	microFIT program overview v.1.5 Section 4.3 Page 27
	Sign connection agreement with LDC	LDC	Before the LDC finalizes the connection.	microFIT program overview v.1.5 Section 4.3 Page 27

Complete generation meter installation with LDC	LDC	LDC will respond within five days to complete the generation meter (once the above requirements have been met).	microFIT program overview v.1.5 Section 4.3 Page 27
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**Connection completed**

<b>Accepting your contract</b>	LDC submits information about your project to OPA	LDC	Check with the LDC.	microFIT program overview v.1.5 Section 5.1 Page 28
	Receive and review standard microFIT contract from OPA	OPA	Log in to the "my microFIT" home page. The contract offer must be accepted within 45 business days, otherwise the offer will be withdrawn.	microFIT program overview v.1.5 Section 5.1 Page 28
	Accept OPA standard microFIT contract	Project developer	Accept the contract by clicking the "I Accept" button online.	microFIT program overview v.1.5 Section 5.1 Page 28

**Receive payment for electricity produced**

impact property taxes. In order to understand the impact that a small-scale renewable energy project might have on property taxes, it may be useful to consult the Municipal Property Assessment Corporation, the provincial agency responsible for these assessments.<sup>lxxxiv</sup>

**Project timelines**

A key challenge voiced by many participants in Ontario’s microFIT program is the management of project timelines in conjunction with the necessary responses from regulatory authorities and government. Delays in response times become particularly onerous when project financing or construction contracts hang in the balance. MicroFIT project owners/developers should consult with those who have undertaken similar projects in the past in order to accurately anticipate potential delays due to lags in response times from government bodies and regulatory authorities.

In addition, many microFIT project developers have noted with surprise the time commitment and the length of time required to secure a microFIT contract and begin generating electricity and revenues from their renewable energy project.

**Key actions and considerations for connecting a FIT project to the grid**

**Summary chart of key requirements for FIT projects**

Figure 11 summarizes the key steps necessary to obtain a FIT contract for a large-scale renewable energy project in Ontario.<sup>lxxxv</sup>

**Milestones for project developers who have been awarded a FIT contract**

After a FIT contract is awarded, renewable energy project developers must meet a number of milestones, as described in Figure 12.

While this table is an attempt to create a comprehensive listing of the key milestones project developers must meet after being issued a FIT contract, it should not be used as a definitive guide

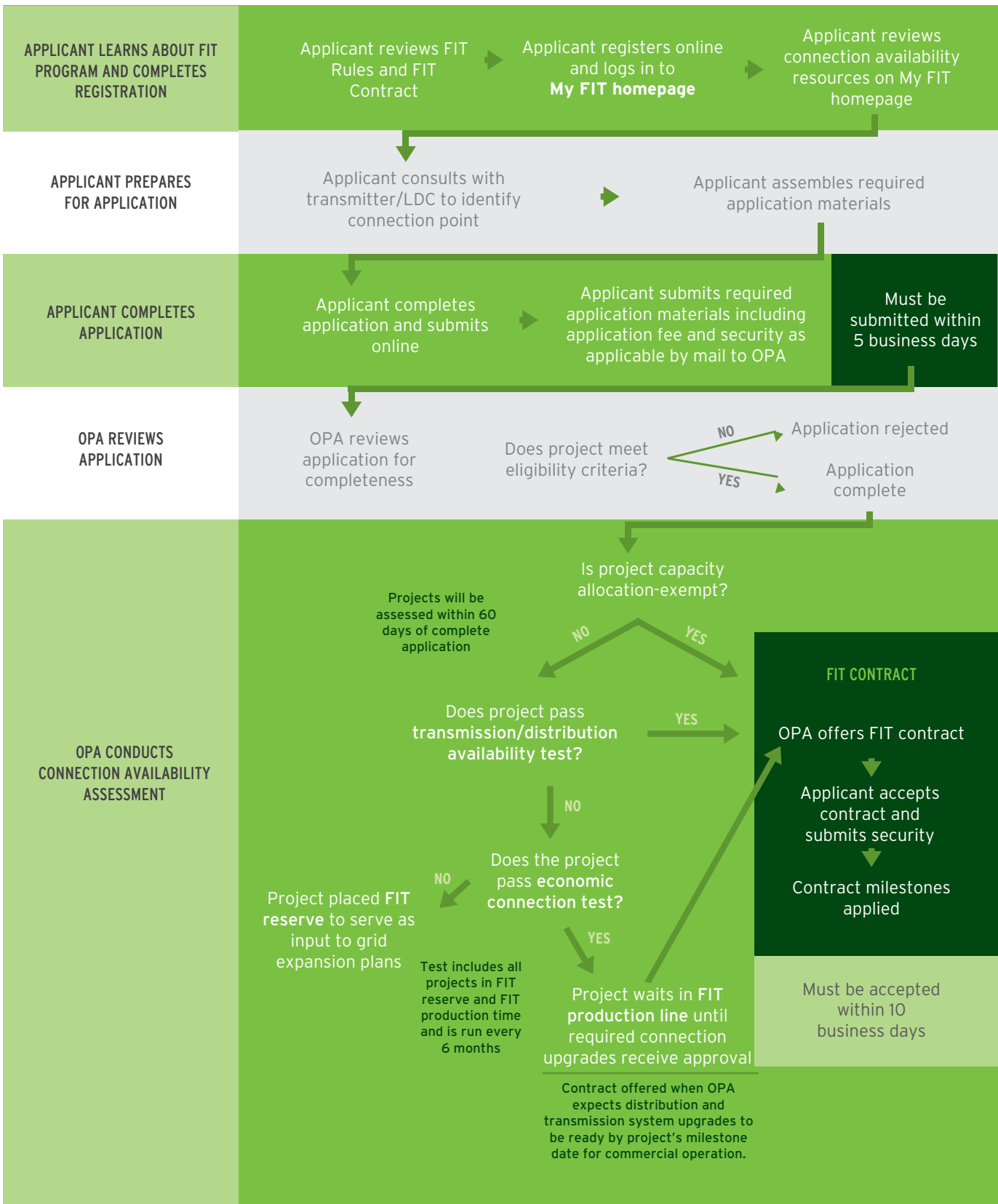
to the process. Please refer to the Ontario Power Authority ([www.powerauthority.on.ca](http://www.powerauthority.on.ca)) for detailed program information and updates.

**Licenses and approvals**

A number of licenses and approvals are typically required when developing a renewable energy project. It is the responsibility of the project developer to ensure that the renewable energy project complies with all laws and regulations and that all the necessary licenses, codes and permits are in place. These may relate to zoning, safety matters, environmental impacts and other issues. A best practice is to conduct a thorough investigation of all such requirements prior to filing a FIT contract application. For more information on the permitting and licensing requirements for FIT projects, please refer to section 6.3 of the Ontario Power Authority’s “FIT Program Overview,” pages 27 and 28.

Figure 13 highlights some of the Ontario permitting and licensing bodies that are involved in the FIT application process.

**Figure 11** FIT contract application process steps.



**Source:** Reproduced from the Ontario Power Authority, [http://fit.powerauthority.on.ca/Page.asp?PageID=1226&ContentID=&SiteNodeID=1102&BL\\_ExpandID=260](http://fit.powerauthority.on.ca/Page.asp?PageID=1226&ContentID=&SiteNodeID=1102&BL_ExpandID=260).

**Figure 12** FIT project milestones, post-FIT contract.

No.	Activity type	Activity name	Description	Deadline	Process leader	Fees and/or securities	Additional information	Notes
<b>FIT Contract Issued</b>								
1	Fee and securities	First completion and performance security	To provide a measure of certainty to the OPA and Ontario's electricity system planners that FIT Program contract holders will complete their projects as intended.	Due within 10 business days of FIT contract offer	OPA	\$50/kW for solar PV \$20/kW for others \$5/kW Aboriginal and community projects (reimbursable once project reaches commercial operation, also reimbursable under 2.4 (a) and 2.1(g) FIT contract V 3.1.1)	FIT contract V 1.3.1_ Article 5 FIT Rules Version 1.3.1_Section 3 & 6	Contact the OPA to confirm this deadline is applicable for specific projects, particularly if the issuance of a letter of credit is planned. (FIT Rules Version 1.3.1_Exhibit A)
2	Milestones	Impact Assessment	Connection Impact Assessment (CIA) is a more detailed assessment of a project's impact to the grid. The results include a technical report outlining project feasibility, technical specifications needed for the project and the impact the project would have on the distribution grid.	Each contract will be issued with a specific time in which to apply for a CIA (referred to as the "impact assessment priority start and stop time").	LDC	Yes. Depends on LDC fees	FIT contract V 1.3.1_ Article 2.3 & Item # 18 FIT Rules Version 1.3.1_Section 3.2	A) The IESO and the transmitter together will take no longer than 150 days after the application is deemed complete to provide an assessment of whether the project can proceed to the next phase of development ( <a href="http://www.ieso.ca/imoweb/fit/fit.asp">http://www.ieso.ca/imoweb/fit/fit.asp</a> )
			Transmission Customer Impact Assessment (Customer IA) determines the extent to which the project impacts other transmission-connected customers.	Each contract will be issued with a specific time in which you should apply for your Customer IA (referred to as the "impact assessment priority start and stop time").	IESO & Transmission company	Yes. Depends on transmission company fees	FIT contract V 1.3.1_ Article 2.3 & Item # 18 FIT Rules Version 1.3.1_Section 3.2	B) Applicants can apply for their Impact Assessment after this window of time expires, but they may lose priority behind other FIT contract holders connecting to the same LDC or transmitter. (FIT Contract Version 1.3.1_ Article 2.3 (c))
			System Impact Assessment (SIA) is a mandatory assessment conducted by the IESO to assess the impact of the connection proposal on the reliability of the integrated power system for projects greater than 10MW.	Each contract will be issued with a specific time in which to apply for a SIA (referred to as the "impact assessment priority start and stop time").	IESO	Yes.  The following study deposits are required for SIAs:  Load facility - \$20,000 Embedded Generation facility - \$20,000 Ancillary service facility - \$20,000. Non-embedded generation facility - \$30,000. Transmission facility - \$40,000	FIT contract V 1.3.1_ Article 2.3 & Item # 18 FIT Rules Version 1.3.1_Section 3.2 IESO_Market Manual 2: Market Administration. Part 2.10: Connection Assessment and Approval. Issue 9.0. Section 8.4.2.	
3	Milestones	REA	Renewable Energy Approval (REA) integrates provincial review of the environmental issues and concerns that were	Before Notice to Proceed request	Ministry of the Environment	Yes. TBD	FIT contract V 1.3.1_ Article 2.4 (b)	This is a process requiring a great deal of front-end preparation. A tremendous amount of work and

previously addressed through the local land use planning process (e.g. zoning or site planning), the environmental assessment process and the environmental approvals process (e.g. Certificates of Approval, Permits to Take Water).

consultation must take place before a FIT application can be completed. For more information on this process, please refer to page 25, "Working with the Ministry of the Environment."

4	Milestones	Domestic Content Plan	The FIT contract requires wind projects greater than 10 kW and all solar projects to include a minimum amount of goods and services sourced in Ontario. The Domestic Content Plan outlines how a project developer plans to meet the domestic content requirements.	Before Notice to Proceed request	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.4 (b)	OPA's Proposal to Amend FIT Contract, Exhibit D, Domestic Content Table For Wind Projects, June 2010 <a href="http://fit.powerauthority.on.ca/Page.aspx?PageID=924&amp;ContentID=10662&amp;SiteNodeID=1054">http://fit.powerauthority.on.ca/Page.aspx?PageID=924&amp;ContentID=10662&amp;SiteNodeID=1054</a>
5	Milestones	Financial Plan	List all sources of equity or debt financing for the development of the project.	Before Notice to Proceed request	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.4 (b)	Project developers must also include signed commitment letters from sources of financing collectively representing at least 50% of the expected development costs. (FIT contract V 1.3.1_ Article 2.4 (b))
6	Contract Requirements	Notice to Proceed (Pre-requisites)	This step involves submitting a request for a Notice to Proceed from the OPA. This is done once the required approvals and permits have been obtained. The notice to proceed request must include:  1) a copy of the Impact Assessment(s) as applicable: • connection impact assessment • system impact assessment • customer impact assessment  2) a copy of the Renewable Energy Approval  3) the Domestic Content Plan  4) the Financing Plan	No later than six months before the milestone date for commercial operation. Note: For capacity-allocation exempt projects, a completed Notice to Proceed request must be provided no later than the milestone date for commercial operation.	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.4 (b)	

7	Fees and securities	Second completion and performance security	Defined as the incremental Notice to Proceed security.	Due within 30 days of the Notice to Proceed being issued	OPA	\$25/kW for solar PV \$10/kW for all other projects \$5/kW for community-based or Aboriginal projects with greater than 50% participation levels. (Reimbursable once project reaches commercial operation, also reimbursable under FIT contract V 3.1.1, 2.4 (a) and 2.1(g))	FIT contract V 1.3.1_ Article 5 FIT Rules Version 1.3.1_Section 3 & 6	
8	Contract Requirements	Commercial operation prerequisites: These time frames begin on the FIT contract date, and depend on the type of project as follows:  • three years for solar PV, bioenergy and on-shore wind • four years for off-shore wind • five years for water-power	Electricity supply contract and approved metering plan.	Before Commercial Operation Date (COD)	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Articles 2.2 (c ), 2.5 & 2.6	OPA's update in-series connection systems <a href="http://fit.powerauthority.on.ca/Page.aspx?PageID=924&amp;ContentID=10261">http://fit.powerauthority.on.ca/Page.aspx?PageID=924&amp;ContentID=10261</a>
			A single-line electrical drawing that identifies the connection point and the transmission and distribution facilities, including the transformer station(s), that are in proximity to the project.	Before milestone date for Commercial Operation Date (COD)	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.5 & 2.6	
			At least 90% of the FIT contract capacity must be installed.	Before Commercial Operation Date (COD)	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.5 & 2.6	
			Independent Engineer Certificate (IE Certificate) from an independent engineer. This is a list of documents needed to assess whether the COD has been achieved.	Before milestone date for Commercial Operation Date (COD)	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.5 & 2.6	
			A declaration of commercial operation must be submitted in the prescribed form to the OPA (see Exhibit F of the FIT contract agreement).	Before milestone date for Commercial Operation Date (COD)	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_ Article 2.5 & 2.6	
9	Contract Requirements	Domestic Content Report	A report outlining how the project has met the domestic content requirements.	Within 60 days after the project reaches commercial operation	OPA	All costs incurred are the responsibility of the renewable energy supplier.	FIT contract V 1.3.1_Article 2.11 & Item 22_Exhibit D	

**Commercial Operation Achieved**

10	Contract Management	Receive payments	Once the project has reached commercial operation (FIT contract V 1.3.1_Article 2.6(a)), payments will begin to arrive for the electricity produced, according to the metering and settlement payment requirements set out in the contract.	N/A	OPA	N/A  First and second completion, and performance securities returned (reimbursable once project reaches commercial operation, also reimbursable under FIT contract. V 3.1.1, 2.4 (a) and 2.1(g))	FIT contract V 1.3.1_Article 4 FIT Rules Version 1.3.1_Section 7	
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## FIT project timelines

Large-scale renewable energy project developers are also subject to delays, bureaucratic “red tape” and extremely long lead times for project phases that rely on responses from government and regulatory bodies.<sup>lxxxvi</sup> This is partly a function of the complexity of the projects themselves, but is also due to the sheer number of permitting agencies, regulators, licensing bodies, approvals and contracts necessary to implement a renewable energy project.<sup>lxxxvii</sup> Another contributing factor is the relative age of the renewable energy industry.<sup>lxxxviii</sup> Authorities frequently lack expertise and experience in dealing with renewable energy projects and technologies.<sup>lxxxix</sup> Work in Ontario is being done to simplify the process for environmental permitting and the establishment of FIT contracts.

To mitigate the potential for project delays, renewable energy project developers should keep the following information in mind:

- a. The province of Ontario has established the Renewable Energy Facilitation Office (REFO), a one-window access point designed to help steer renewable energy project developers (developers, communities, municipalities and individuals)

through the FIT application process.<sup>xc</sup> The REFO can connect project developers with appropriate resources at partner ministries, agencies and governments, and help to streamline the FIT application process as well as the permitting processes and other necessary administrative steps.

- b. Meet with the relevant local distribution company or transmission facility early in the process to discuss options about connecting to the grid. This meeting should take place prior to preparing a FIT application, since information obtained during the meeting will be useful when completing the application.<sup>xcii</sup>
- c. The FIT contract process requires renewable energy project developers to submit a Domestic Content Plan during the Notice to Proceed phase of the project process. A Domestic Content Report must be submitted within 60 business days of initiating commercial operation. Since the OPA allows developers to submit a Domestic Content Plan prior to the Notice to Proceed phase, it may be valuable to submit the Domestic Content Plan in advance. Developers may receive valuable feedback that can help inform their investment decisions in advance of the Notice to Proceed.<sup>xciii</sup>

**Figure 13** Ministries and authorities involved in FIT project approvals and licenses.

Requirement	Ministry/Agency	Details
Environmental assessment	Ministry of the Environment <a href="http://www.ene.gov.on.ca">www.ene.gov.on.ca</a>	Renewable energy approval may be required for:
	Ministry of Natural Resources <a href="http://www.mnr.gov.on.ca">www.mnr.gov.on.ca</a>	<ul style="list-style-type: none"> <li>• ground-mounted solar PV projects</li> <li>• wind projects</li> <li>• bioenergy projects</li> </ul>
	Renewable Energy Facilitation Office <a href="http://www.ontario.ca/renewableenergyprojects">www.ontario.ca/renewableenergyprojects</a>	Waterpower projects require a class environmental assessment
	Ontario Waterpower Association <a href="http://www.owa.ca">www.owa.ca</a>	
Generating licence	Ontario Energy Board <a href="http://www.oeb.gov.on.ca">www.oeb.gov.on.ca</a>	A generating licence is required for all projects greater than 500 kW.
Safety inspection	Electrical Safety Authority <a href="http://www.esainspection.net">www.esainspection.net</a>	A generating licence is required for all projects greater than 500 kW.
Municipal building permits	Requirements vary for each municipality. Contact your municipality for more details.	

**Source** Reproduced from the OPA's FIT Program Overview, page 27.

## Facilitating the development and use of renewable energy

Part of the FIT application review process is to determine whether there exists sufficient transmission and distribution capacity at the selected grid connection point.<sup>xciiii</sup> Because transmission and distribution capacity lags behind demand, the Ontario Energy Board (OEB) is charged with determining what transmission and distribution upgrades are required to accommodate new renewable energy projects.<sup>xciv</sup> This determination is made by partly by examining the capacity demands of other renewable energy project developers in the same area to assess whether the needed upgrades make economic sense.<sup>xcv</sup> Upgrades that are deemed necessary are incorporated in transmission and distribution capacity expansion plans. Renewable energy projects that require these upgrades will not be offered contracts until the upgrades receive approval from the OEB and it has been verified that renewable energy project completion timelines will coincide with the completion of the upgrades.<sup>xcvi</sup>

Planning for the expansion of transmission capacity in Ontario is a complex and lengthy process. This is because transmission capacity is deeply integrated with other grid functions including generation connection, electricity delivery and reliability of service. Because of the cost, complexity and breadth of transmission capacity expansion proposals, such plans require a lead time of between five and seven years to be realized. Numerous regulatory approvals are involved and such projects generally have a significant impact on the public and on the environment. Transmission capacity expansions are also carried out in specific capacity grades. These capacity grades may not be well matched with capacity needs, and scalability forecasts must be taken into account.<sup>xcvii</sup>

## An overview of the Ontario electricity transmission system

Ontario's electricity transmission system is broken into ten zones and is made up of a 500kW network, a 230 kW network, and several 115 kW networks. Figure 14, reproduced from Ontario's Independent Electricity System Operator, highlights the key characteristics of each zone.

Also reproduced from Ontario's Independent Electricity System Operator, Figure 15 maps the electricity zones described above, as

well as the interfaces and interconnections that link them.

### Working with the Electrical Safety Authority

For microFIT projects, the Electrical Safety Authority (ESA) plays a role near the end of the project development process. Once a microFIT applicant has obtained project approval from the OPA and their local distribution company, they purchase equipment, hire a contractor and commence the installation. Once it is complete, the ESA must inspect and approve the installation. Until this is done, the local distribution company cannot connect the project to the grid.

The ESA's response time for microFIT projects is generally within 24 hours, although this timeframe increases for projects located in more remote regions.

For FIT projects, the ESA plays a role both in the initial phases of project development and during installation.

First, the ESA will inspect FIT project plans in the form of site drawings, which are reviewed for compliance with the Ontario Electrical Safety Code. During installation, representatives of the

**Figure 14** Ontario electricity zone characteristics.

Zone	Zone characteristics
Bruce zone	<ul style="list-style-type: none"> <li>• The generation is mostly nuclear, and some wind.</li> <li>• There are no external interconnections.</li> <li>• The total resources exceed the zone peak demand.</li> </ul>
East zone	<ul style="list-style-type: none"> <li>• The zone is externally connected to the Quebec grid.</li> <li>• The existing interconnection with Quebec is radial.</li> <li>• The zone is also externally connected to the St. Lawrence interface with New York via phase-angle regulator control.</li> </ul>
Essa zone	<ul style="list-style-type: none"> <li>• The generation is totally hydroelectric.</li> <li>• For analytical purposes, Des Joachims generation and 115 kV load, which is physically located in the East zone, has been modelled to be part of the Essa zone. The Essa zone is the primary point of receipt of Des Joachims generation.</li> <li>• There are no external interconnections.</li> </ul>
Niagara zone	<ul style="list-style-type: none"> <li>• The total resources are much higher than the zone peak demand.</li> <li>• The generation is totally hydroelectric.</li> <li>• There is a free-flowing interconnection with New York.</li> </ul>
Northeast zone	<ul style="list-style-type: none"> <li>• The total resources exceed the zone peak demand.</li> <li>• The generation is mainly hydroelectric with some cogeneration, wind and wood waste.</li> <li>• The existing interconnections with Quebec are radial.</li> </ul>
Northwest zone	<ul style="list-style-type: none"> <li>• The total resources generally exceed the zone peak demand.</li> <li>• The generation is mainly hydroelectric with some coal and gas.</li> <li>• The zone is externally connected to the Manitoba and Minnesota systems.</li> <li>• The 230 kV Manitoba interconnections and the Minnesota 115 kV interconnection are under phase-angle regulator control. The Manitoba 115 kV interconnection is radial.</li> </ul>
Ottawa zone	<ul style="list-style-type: none"> <li>• The interconnections with Quebec consist of the two 115 kV circuits, three 230 kV circuits, and the new 230 kV circuits A41T and A42T.</li> <li>• The first five interconnections are radial, while the new two interconnections are bidirectional, connecting Ontario to Quebec through two HVDC convertors located at Outaouais station, in Quebec.</li> <li>• The convertors are currently undergoing commissioning.</li> </ul>
Southwest zone	<ul style="list-style-type: none"> <li>• The total resources are generally balanced with the zone peak demand.</li> <li>• The generation is mostly coal with some wind.</li> <li>• There are no external interconnections.</li> </ul>
Toronto zone	<ul style="list-style-type: none"> <li>• The total resources are less than the zone peak demand.</li> <li>• The generation is mostly nuclear with some gas.</li> <li>• There are no external interconnections.</li> </ul>
West zone	<ul style="list-style-type: none"> <li>• The total resources generally exceed the zone peak demand.</li> <li>• The generation is mostly coal and gas with some wind.</li> <li>• There is partial phase-angle control on the interconnection with Michigan. At some future date, the interconnection will be under full phase-angle regulator control.</li> </ul>

**Source** *Independent Electricity System Operator. Ontario Transmission System, May 2010, page 15.*

ESA will visit the site itself, possibly several times, in order to inspect the building process and offer final authorization for the local distribution company to connect the project to the grid. Response times for FIT project plan reviews generally take about two weeks, while site inspections usually take place within 24 hours.

**Working with the Ministry of the Environment**

In 2009, the approvals process for renewable energy was streamlined with the introduction of the Green Energy and Green Economy Act, and the introduction of the unifying Renewable Energy Approval. A temporary team within the program planning branch of the Ministry of the Environment was assigned to work closely with internal divisions and partner ministries to develop the business processes that would accompany the GEA and the REA.

In order meet the FIT program’s Notice to Proceed milestone, project developers must have obtained a Renewable Energy Approval (REA) from the Ontario Ministry of the Environment. Prior to applying for an REA, renewable energy project developers must have completed all necessary technical studies and consultations as

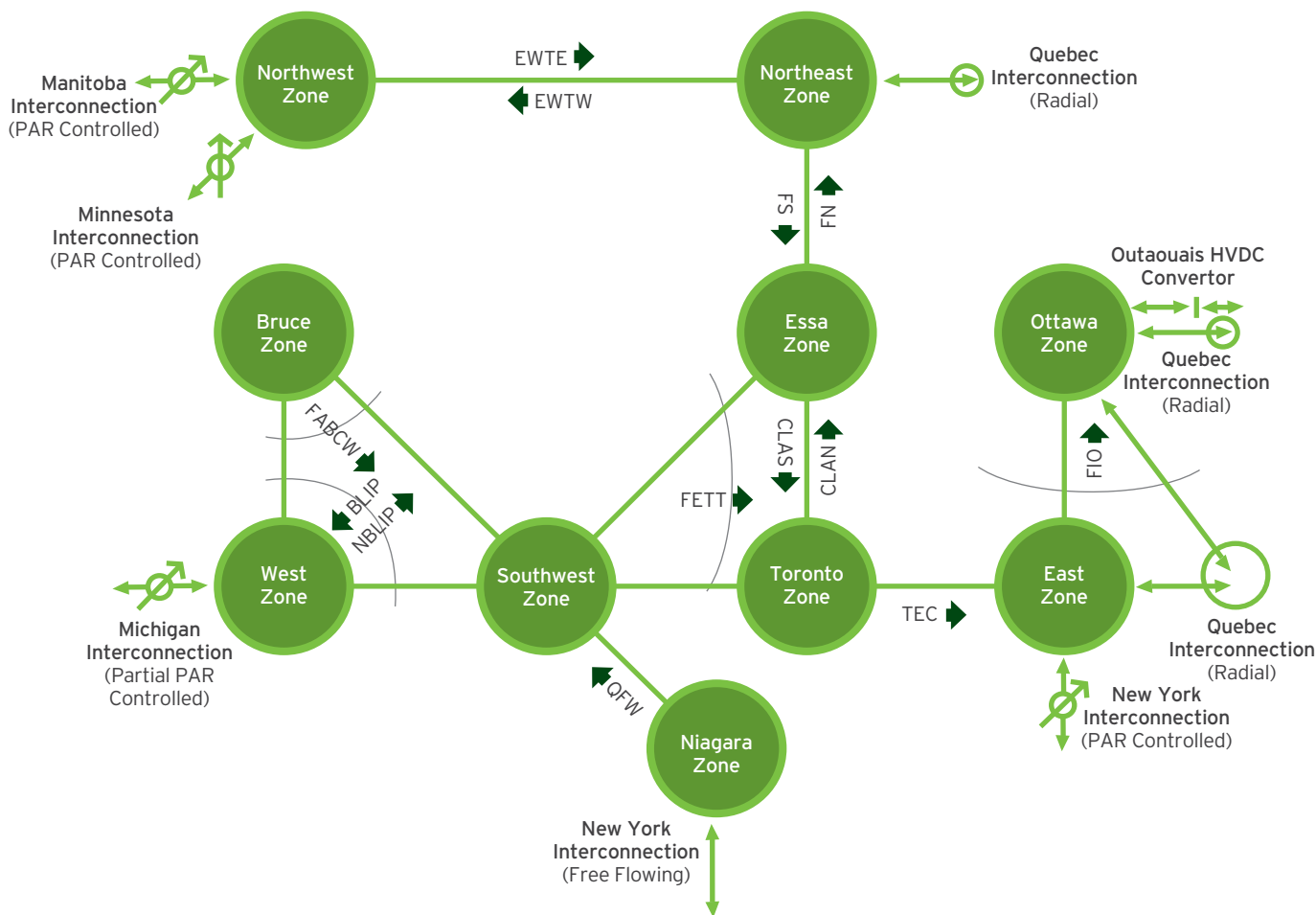
outlined under Regulation 359/09 of the *Environmental Protection Act*. Submission requirements can include other provincial approvals such as site releases, bird and bat studies, natural heritage assessments as required by the Ministry of Natural Resources, road permits and approvals as required by the Ministry of Transportation, or cultural and archaeological assessments as required by the Ministry of Tourism and Culture.

**Working with municipalities**

While municipalities are not directly involved in the FIT project development process, municipalities may charge a development fee at the time of land purchase or building permits. Municipal public utilities commissions are responsible for conducting feasibility studies in order to determine whether or not to levy a connection fee for grid access. In addition to an administrative role, many municipalities are also developing mechanisms to encourage the development of renewable energy projects in their jurisdictions.

As an example, the municipality of Sault Ste. Marie will assist renewable energy project developers to apply for funding from either

**Figure 15** Ontario's zones, interfaces and interconnections.



Source Reproduced from Independent Electricity System Operator, Ontario Transmission System, May 20, 2010.<sup>xcviii</sup>

the Northern Ontario Heritage Fund Corporation or FedNor, both government funding programs geared at creating jobs and securing investment in northern communities. The municipality of Sault Ste. Marie does not charge renewable energy project developers land development fees, and offers assistance with project siting based on comprehensive GIS data. The Sault Ste. Marie Economic Development Corporation also works closely with the municipality of Sault Ste. Marie to ensure that local renewable energy project developers receive the support they need, including hosting job fairs and assisting with candidate screening for newly created jobs.

Municipalities also play a role in the consultation process for projects requiring a Renewable Energy Approval (REA) from the Ministry of the Environment. Municipal consultation is mandatory for all projects requiring an REA, except for small wind projects.<sup>xcix</sup> Consultation with the municipality (or municipalities) in which the facility is to be located is required to take place at least 90 days before submitting an REA application.<sup>c</sup> The Ministry of the Environment provides applicants with a form that outlines the items that must be addressed with municipal officials. The form requests municipal feedback on:

- municipal services and infrastructure (such as proposed road access)
- rehabilitation of areas disturbed and/or municipal infrastructure damaged during construction
- emergency management procedures/safety protocols related to the ongoing management of the facility<sup>ci</sup>

#### Working with the Ontario Energy Board

The Ontario Energy Board (OEB) shares responsibility with other authorities for the planning and approval of electricity infrastructure projects. The OEB also contributes to the formulation of energy generation and transmission policy, focusing on strategies designed to enable renewable energy in Ontario. These strategies include the investigation of incentives and alternative cost-recovery methods for electricity distributors and transmitters faced with mounting capacity demand and the need for greater infrastructure investment. The Board ensures that the financial cost of transmission infrastructure projects is properly allocated between end-use consumers and renewable energy project developers. Overall, the OEB's decisions balance the public interest against the financial risk of an infrastructure expansion project, and through its actions, the Board seeks to provide a measure of regulatory predictability to transmitters and distributors for the long-term adoption of renewable energies.<sup>cii</sup>

Since the implementation of the *Green Energy and Green Economy Act*, the OEB has worked to align its operations with the needs of the new legislation governing renewable energy in Ontario.<sup>ciii</sup>

- a. The OEB has rationalized the process of establishing a grid connection.<sup>civ</sup> Renewable energy generators of less than 500kW annually are exempted from the need for a specific capacity allocation.<sup>cv</sup> For larger generators with capacity allocations, the OEB has made changes to ensure that they have an incentive to move forward with their projects.<sup>cvi</sup> Similarly, the OEB has introduced a simplified electricity generation licensing process for FIT generators that will reduce the time and paperwork required during the licensing process and which will avoid duplication with processes run by the Ontario Power Authority.<sup>cvi</sup>

- b. The OEB has implemented new rules to standardize billing and settlement processes for FIT and microFIT generators.<sup>cviii</sup> There now exists a single means of establishing generator accounts and settling them, regardless of where the projects connect in relation to meters.<sup>cix</sup> The OEB has also implemented a flat fee for monthly service charges that applies to all microFIT generator accounts across the province.<sup>cx</sup>
- c. The OEB has been tasked with ensuring that the cost of the additional investment required for Ontario's electricity distribution infrastructure to accommodate FIT and microFIT projects be shared among all of Ontario's electricity ratepayers, rather than be paid by individual energy generators.<sup>cxii</sup>
- d. The OEB is working to develop a set of guidelines to govern distributor-owned electricity generation projects.<sup>cxiii</sup> These guidelines will allow all renewable energy generators to have timely and non-discriminatory access to the grid.<sup>cxiii</sup>
- e. As network expansion is critical to sustaining investment in the renewable energy sector, utilities must plan their investments with great care—the OEB's distribution planning guidelines, issued in 2009, support electricity distributors as they develop, finance and implement expansion plans for their networks.<sup>cxv</sup>

## Recent developments in the FIT program

Following the launch of Ontario's FIT program in September of 2009, the Ontario Power Authority received approximately 930 applications for FIT contracts, representing an estimated 8,000 MW of renewable energy generating capacity. According to an OPA spokesperson, as of June 4, 2010, another 900 FIT contract applications had been received. To date, 184 large-scale, FIT-supported renewable energy projects (over 500 kW) have been approved, representing a combined electricity generation capacity of 2,421 MW. The FIT program has also seen very strong demand from mid-size renewable energy project developers. An estimated 510 mid-size projects have been approved for a combined electricity generation capacity of 112 MW. Approximately 4,700 conditional offers have been made by the OPA for microFIT projects, subject to grid connection approval from their local distribution companies. These microFIT projects represent a combined electricity generating capacity of 31 MW.

At present, all provincial electricity transmission capacity available to renewable energy projects has been allocated. All new renewable energy projects seeking to establish a FIT contract through the OPA must wait for the results of regional Economic Connection Tests (ECT). These tests evaluate the feasibility of building additional electricity transmission capacity to accommodate proposed renewable energy projects across the province. (The Economic Connection Test [ECT] is explained below and in Figure 11.) The OPA will carry out these tests every six months on a rotating basis throughout the province. The first ECT will take place in August/September 2010.

According to an OPA spokesperson, "because all the transmission was used during the launch period, all new FIT applications that came in before June 4th [2010] are going through what is called an Economic Connection Test. That will be done over the summer and results will

likely be available in early January of 2011.”

### The Economic Connection Test

The Ontario Power Authority’s Economic Connection Test (ECT) process will serve to identify and enable the development of additional transmission capacity where it is most economically viable. The results of these ECTs will trigger development work to be undertaken by electricity transmission bodies under the oversight of the Ontario Energy Board.

The goal of the ECT process is to balance the right-to-connect provision for renewable energy generators with the impact on provincial ratepayers with regard to investments in transmission upgrades. The ECT process also aims to prioritize transmission expansion projects and to coordinate transmission and distribution expansion plans. According to the OPA, the ECT is “an ongoing process to assess economic developments to the transmission system in order to connect FIT applications that could not be accommodated on the existing transmission system”.<sup>cxvi</sup>

### Upgrades to Ontario’s transmission system

Hydro One is a public corporation owned by the province of Ontario. The company owns and operates a 29,000 km high-voltage transmission network and a 123,000 km low-voltage distribution system that serves about 1.3 million end-use customers and smaller

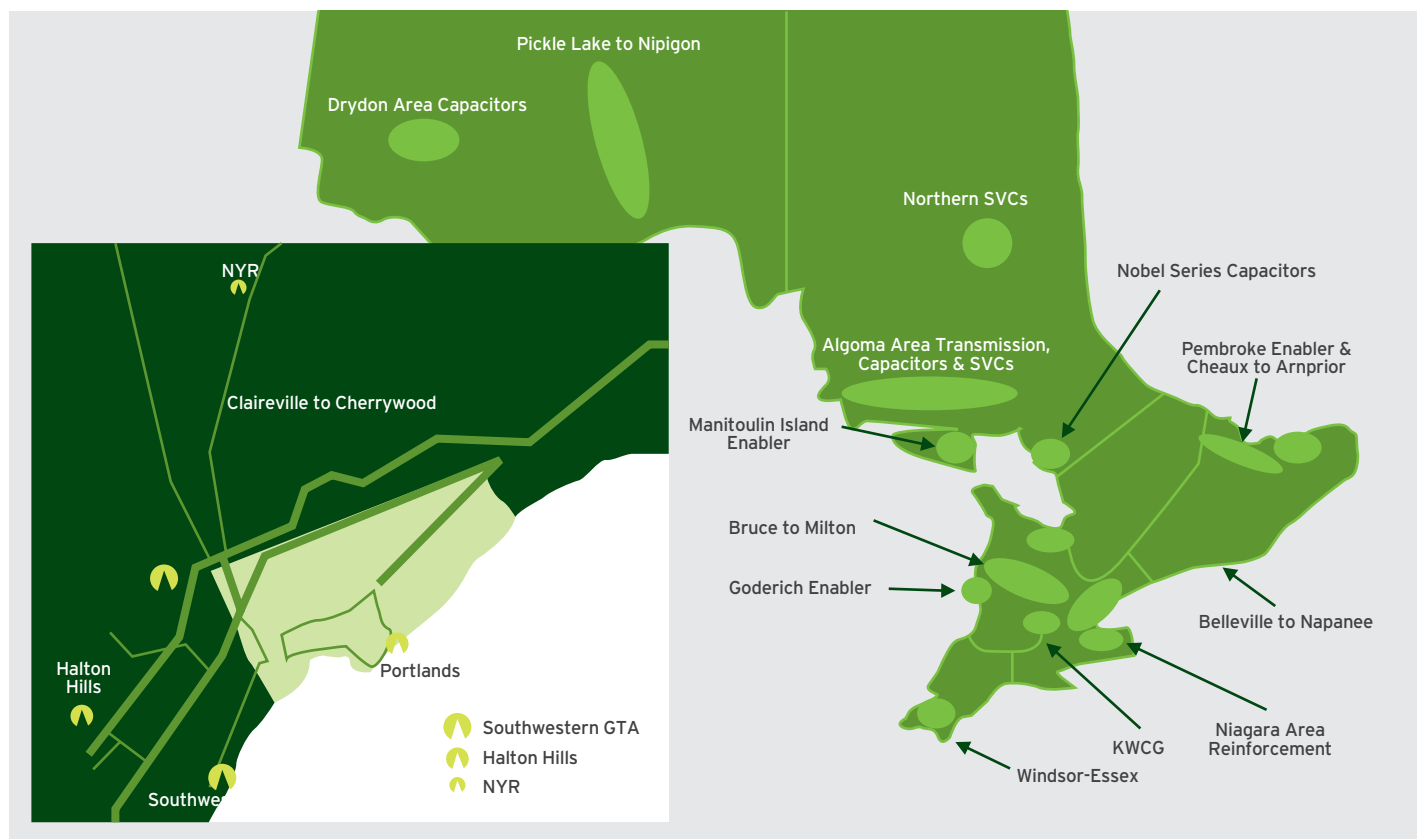
municipal utilities in the province. To prepare for renewable generation in areas of potentially high uptake under the FIT program, the Ontario government has asked Hydro One to proceed with planning and developing major transmission projects across the province. Hydro One is currently working to execute a 1,500MW capacity expansion from the Bruce Power facility to Hydro One’s Milton switching station located in the Town of Milton.<sup>cxvii</sup> This new transmission capacity will be assigned to FIT project developers at the beginning of the next round of Economic Connection Tests slated for the fall of 2010.<sup>cxviii</sup> This and other transmission capacity expansion plans through to 2014 are illustrated in Figure 16.

Figure 17 is a map published by the Ontario Power Authority. It highlights all renewable energy projects that have been offered FIT contracts in Ontario, as well as those that are awaiting the upcoming ECT to determine the feasibility of a grid connection at their location.<sup>cxix</sup>

### Metering

All renewable energy generators under a FIT contract in Ontario are required to install separate meters. Meters must provide data on an hourly basis and must meet with the requirements of the local distribution company or Independent Electricity System Operator. Measurement Canada is the government body responsible for ensuring the integrity and accuracy of measurement in the

**Figure 16** Planned expansion projects for electricity transmission capacity in Ontario, through 2014.



**Source** Reproduced from a presentation delivered by Jason Chee-Aloy, Director of Generation Procurement at the Ontario Power Authority, “Ontario’s Renewable Energy Feed-in Tariff Program,” delivered November 19, 2009.<sup>cxix</sup>

Canadian marketplace. In the case of renewable energy generation, Measurement Canada regulates the means of measuring electricity produced for sale under a FIT contract. Recently, Measurement Canada notified the OPA that metering configurations for FIT and microFIT projects may be incorrect. Specifically, “in-series” metering configurations may result in an unacceptable level of error.<sup>cxxi</sup>

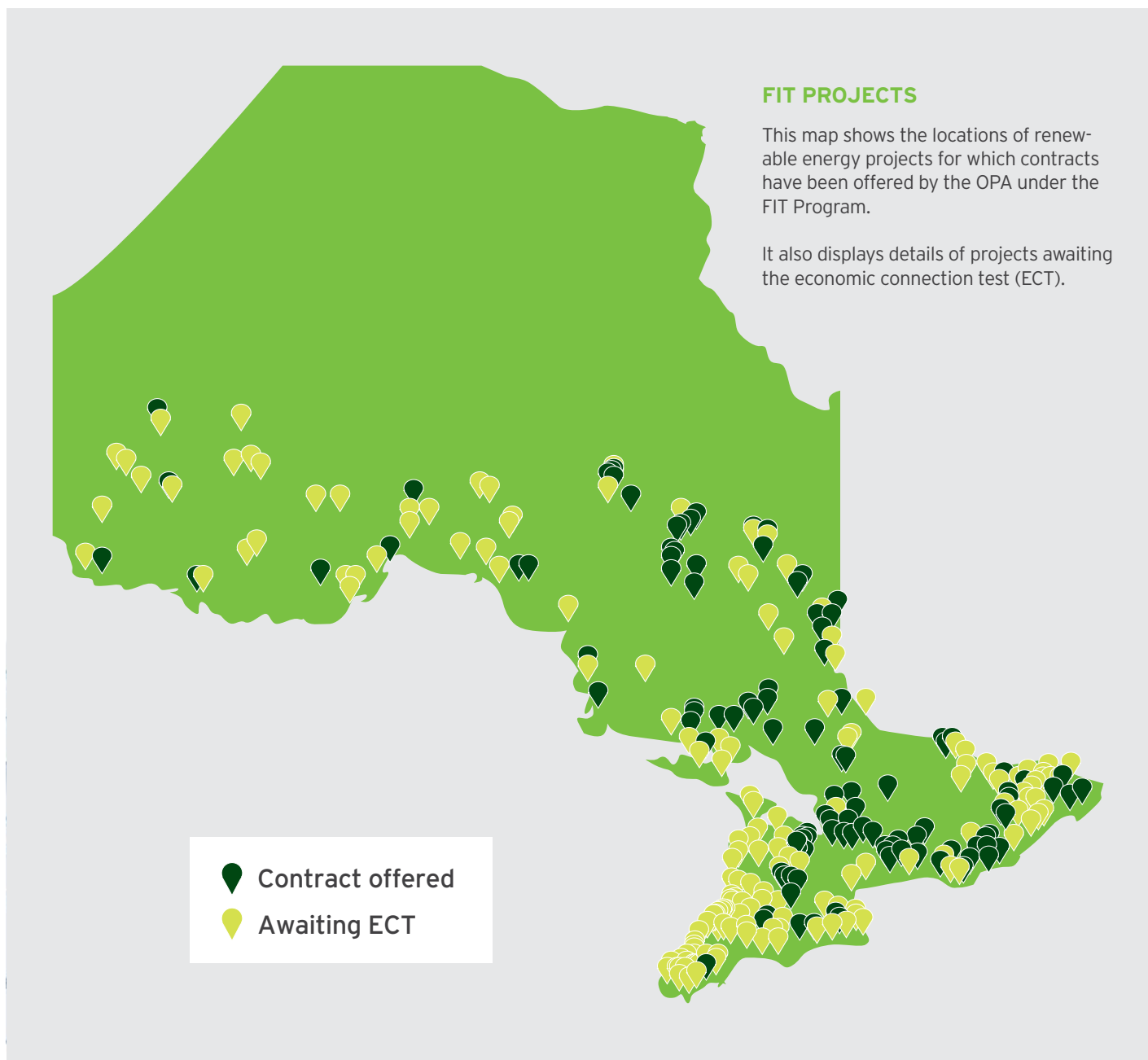
At present, no new FIT contracts will be awarded from the OPA with an in-series metering configuration.<sup>cxxiii</sup> Parallel or direct connections are the only metering configurations currently being accepted.<sup>cxxiv</sup> According to stakeholder feedback, these configurations may be

cost-prohibitive for small producers, and may dramatically slow the development of small-scale renewable energy in Ontario. The OPA is working with Measurement Canada to develop a feasible solution to this issue for renewable energy producers.<sup>cxxv</sup>

### Looking ahead

Feed-in tariffs have proven to be a strong driver of job creation and economic development in the “green” sectors. Several European countries have had feed-in tariff programs similar to Ontario’s FIT program in place for a number of years. The German FIT regime has

**Figure 17** Approved FIT projects to date and FIT projects awaiting Economic Connection Test.



Source Reproduced from a presentation delivered by Jason Chee-Aloy, Director of Generation Procurement at the Ontario Power Authority, “Ontario’s Renewable Energy Feed-in Tariff Program,” delivered November 19, 2009<sup>cxxxi</sup>

enabled the German renewable energy sector to expand by 75% since 2000. Cumulative investment in renewables grew to €30 billion in 2008 and installed renewable energy capacity has tripled in eight years.<sup>cxvii</sup> Employment in the sector has risen to more than 300,000, with an estimated 42,000 working in photovoltaic manufacturing.<sup>cxviii</sup> In France, the number of individuals employed directly in the wind sector has risen from fewer than 100 in 1993 to 7,000 in 2007 as the result of feed-in tariff incentives.<sup>cxviii</sup> Spain's feed-in tariff scheme resulted in the creation of 188,000 direct and indirect jobs in the renewable energy sector.<sup>cxvix</sup>

In order to understand the long-term job creation and economic development potential resulting from Ontario's *Green Energy and Green Economy Act*, a study was undertaken by the Green Energy Act Alliance in partnership with the World Wildlife Fund and BlueGreen Canada. Their report estimates that the *Green Energy and Green Economy Act* could result in an investment of \$47.1 billion in Ontario's "green" sector over the coming 10 years.<sup>cxv</sup> Job creation estimates are based on the experiences of European countries with similar feed-in tariff programs in place, and are modelled on typical job creation profiles in conservation and demand management, hydroelectric power, on-shore wind, bioenergy, waste-energy recycling, solar power, off-shore wind, and smart-grid technologies.<sup>cxv</sup> These estimates are based on the expected additional renewable energy generating capacity to be brought online as mandated by the *Act*.<sup>cxvii</sup> The report concludes with the expectation that the *Green Energy*

and *Green Economy Act* and the FIT tariff incentives could result in the creation of 90,000 new jobs each year with an annual investment of \$4.71 billion in the sector.<sup>cxviii</sup> These new types of jobs will range in scope from construction labourers and sheet metal workers to financial auditors, engineers, concrete-forming operators, secretaries, accountants, building inspectors and research scientists.<sup>cxviii</sup> The majority of these jobs are expected to be in a salary range that exceeds \$20/hour.<sup>cxv</sup> For those that are in the lower salary ranges, these positions will likely provide opportunities for advancement that exceed those available in low-paying service sector jobs, such as in the food service, hotel, or health-care industries.<sup>cxvix</sup>

These job creation estimates are far more ambitious than those put forward by the Green Energy Act Alliance itself, which estimates that the *Act* will be responsible for the creation of 50,000 new green sector jobs over the coming three years.

## Renewable energy policy analysis

### Targets and policies to increase renewable capacity

Government-implemented renewable energy generation targets and incentive policies signal to current and potential market participants that governing bodies are committed to long-term development in the sector. At present, over 70 countries have renewable energy targets in place.<sup>cxvii</sup> Although Canada and the US do not have a

**Figure 18** Success factors for FIT projects.

Dimension	Success factor
<b>Economic</b>	<ul style="list-style-type: none"> <li>• Create green-collar jobs</li> <li>• Create domestic manufacturing and export industry</li> <li>• Drive economic development</li> <li>• Create hedge against conventional fuel price volatility</li> <li>• Enable businesses, urban or rural, to develop new revenue streams</li> <li>• Help to establish supply chains of renewable technologies</li> <li>• Provide investor security</li> <li>• Create stable conditions for market growth</li> <li>• Drive down production costs of green electricity</li> <li>• Develop and expand export opportunities in the renewable energy sector</li> <li>• Simple, transparent policy structure helps encourage new start-ups and innovators</li> </ul>
<b>Political</b>	<ul style="list-style-type: none"> <li>• Increase the stakeholder base supporting renewable energy policies</li> <li>• Demonstrate commitment to renewable energy deployment</li> <li>• Create mechanism for achieving renewable energy and emissions-reduction targets</li> <li>• Increase understanding of potential citizen, community and business roles in environmental protection</li> <li>• Increase energy security and energy independence</li> <li>• Promote a more decentralized and resilient electricity system</li> </ul>
<b>Social</b>	<ul style="list-style-type: none"> <li>• Encourage citizen and community engagement in activities protecting climate and environment</li> <li>• Empower citizens and communities</li> <li>• Increase resilience of communities</li> <li>• Make renewable energy a common part of the landscape and cityscape</li> <li>• Increase public support of renewables through direct stake and increased exposure to renewables</li> </ul>
<b>Environmental</b>	<ul style="list-style-type: none"> <li>• Reduce carbon emissions</li> <li>• Reduce pollution</li> <li>• Encourage energy efficiency measures</li> <li>• Reduce dependence on fossil fuels</li> </ul>

**Source** World Future Council/Sovacool/Jacobs: *Powering the Green Economy. The feed-in tariff handbook, 2010.*<sup>cxli</sup>

system of national renewable energy targets, several US states and Canadian provinces have undertaken to establish targets of their own.<sup>cxviii</sup> A key success factor for renewable energy generation targets is to have supporting conditions in place, as well as penalties for failure to reach established targets.<sup>cxvix</sup> Most countries now favour the FIT model as a means of rapidly increasing the share of renewable energy in the overall energy supply mix.<sup>cxl</sup>

### Analyzing feed-in tariffs as a policy tool

Feed-in tariffs are designed with economic, political, social and environmental goals in mind. In his book, *Powering the Green Economy*, Miguel Mendonca lays out the success factors by which FIT programs are measured (see Figure 18).

Going forward, it will be important to evaluate the performance of Ontario's FIT program as an effective tool for meeting the objectives outlined above.

### Policy-level barriers that could impact the deployment of renewable energy in Ontario

Local project developers and manufacturers in the renewable energy sector have communicated their unease about ongoing government support of renewable energy generation in Ontario. Currently, renewable energy projects in Ontario depend on the support of government in order to compete in the energy market. The following are concerns and vulnerabilities expressed by local participants about the province's renewable energy policy.

#### Revision of FIT rates

In principle, FIT tariff rates (the rate at which renewable energy producers are paid per kilowatt-hour of electricity that they produce) are designed to compensate for the additional cost of producing energy from renewables. In essence, FIT tariffs are engineered to provide renewable energy producers with a fair return for their efforts. FIT tariff levels should therefore be established with an understanding of the underlying "true" cost of renewable energy production in the jurisdiction. This understanding must encompass financing and investment costs, standard debt/equity ratios, taxes, inflation, equipment and construction costs, grid related and administrative costs, operation and maintenance costs, decommissioning costs, and all other costs associated with renewable energy projects. Local power authorities estimate these cost levels based on assumptions about current and future market conditions, and the experiences of other similar jurisdictions. The local power authority then assigns what it feels to be a "reasonable" rate of return for these undertakings over a particular time period. In this way, the financial returns for renewable energy projects are designed to cover all relevant project costs and to deliver an assigned level of profitability to the projects, generally in the range of 5% to 10%.

The OPA recently proposed a new FIT tariff rate for microFIT ground-mounted solar PV projects of 10 kW or less. Formerly, these projects were included in a category of microFIT project that received 80.2 cents per kilowatt-hour of electricity produced. If accepted, the OPA's proposal could mean that FIT rates for these projects fall to 64.2 cents per kilowatt-hour.

The OPA's reasoning for this modification to the FIT tariff rates relates to the cost of "tracking" and "non-tracking" ground-mounted solar panel equipment. The cost for both types of systems has fallen dramatically in recent months. The OPA believes that the new tariff rate for this microFIT project category "levels the playing field" with other project categories. According to the OPA, creating a separate price category for ground-mounted solar microFIT projects ensures

that the program remains sustainable and that Ontario's electricity ratepayers continue to receive good value for their electricity dollars. At the same time, and while the new price category affects only applications submitted after noon on July 2, 2010, this may send a signal to renewable energy project developers that FIT tariff rates could also be subject to sudden change. If renewable energy project developers feel uncertain about rate stability, it may deter development in the sector. A best practice for jurisdictions with FIT programs in place is to make FIT recalculation a transparent process with published dates for tariff rate re-evaluation every several years. Having tariff recalculations take place at known intervals reduces the risk to project developers of investing in projects whose rate of return turns out to be dramatically lower than anticipated.

#### Inconsistent political support for renewable energy systems

While the Ontario FIT program implemented as part of the *Green Energy and Green Economy Act* is widely held to be a progressive and well-designed incentive system, local manufacturers and renewable energy project developers have expressed uneasiness over the longevity and consistency of the program.

For example, Spain's FIT program was originally designed with overly generous incentives, and Spain's solar energy industry went through a boom before collapsing when the government reduced its support for the program.

Ontario renewable energy project developers and manufacturers are concerned that a similar situation could arise in Ontario as a result of the upcoming elections where a possible change in the government could effect a reversal of Ontario's renewable energy policies.

#### Policy change

While program stability is a key issue, outright policy changes can be equally disruptive for the renewable energy sector.<sup>cxlii</sup> In the case of the Danish wind power market, the government elected to replace the prevailing FIT program with a tradable green certificate scheme.<sup>cxliii</sup> Though this scheme was never fully implemented, new wind capacity installations fell from 600 MW in 2000 to a mere 18 MW the following year.<sup>cxliv</sup>

In the US, frequent renewable energy policy changes have created an environment of uncertainty for renewable energy project developers and their investors.

## Community engagement

While project developers play a central role in the renewable energy sector, any discussion of Ontario's FIT program would be incomplete if it neglected to emphasize the importance of community engagement in encouraging the development of renewable energy. Experience shows that renewable energy deployment is accelerated or held back depending on whether policy allows or prevents investment and participation by the general public.<sup>cxlvi</sup> Engaging the public in the renewable energy sector furthers the sector's acceptance and generates support for the transition toward a sustainable energy future.

### Cultural and behavioural acceptance

Overcoming barriers to the cultural and behavioural acceptance of renewable energy is essential to engaging the public. These barriers include

the failure to regard energy consumption as a purchase decision, an ongoing culture of unsustainable energy consumption, and resistance to change.

### Energy consumption as a purchase decision

A lack of attention paid to electricity consumption has resulted in a citizenry that is poorly informed about the economics of electricity generation, and prone to misunderstanding the implications of renewable energy for the climate and the economy.<sup>cxlvii</sup> While gasoline prices, food prices, and real estate prices factor deeply into the financial calculations of individuals and families, kilowatts of electricity are purchased almost unknowingly.<sup>cxlviii</sup> A campaign to educate individuals and families about the implications of their electricity consumption as well as the advantages of energy conservation and renewable energy may prove a valuable first step for jurisdictions hoping to encourage the development of renewable energy.<sup>cxlix</sup>

### A culture of excess

Modern society is subject to an array of influences that encourage unsustainable resource consumption, particularly where energy needs are concerned.<sup>cl</sup> These influences naturally run counter to the interests of the renewable energy sector. Reshaping routines and values to reflect the current realities and future risks of fossil-fuel dependence should be a priority for any jurisdiction hoping to implement energy-conservation policies and legislation that support the development of renewable energies.<sup>cli</sup>

### Resistance to change

Effecting a transition to renewable energy requires communities and municipalities to overcome a long-standing tradition of conventional energy production, distribution and consumption.<sup>clii</sup> For many, these changes are viewed as profound, and possibly jeopardize their prevailing “way of life.”<sup>cliii</sup> Human psychology is deeply resistant to change, particularly when such changes are seen as a substantial departure from current conditions.<sup>cliv</sup> Unless equally or more powerful emotional inducements are applied to shift popular sentiment in favour of renewable energy, the industry will continue to face resistance from those who view renewable energies as a threat to their current lifestyles.

## Conclusion

One of the greatest challenges faced by jurisdictions around the world is to shape the future market for renewable energy and lay the foundation for the transition to a low-carbon economy. Jurisdictions that take measures to signal to their manufacturing base that renewable energy is a sector of essential future significance are set to enjoy an early start in this long-term global opportunity. Ontario’s FIT program has placed the province on a path to leadership in sustainable energy policy and development in North America. While feed-in tariffs are not to be regarded as a final solution for supporting the market for renewable energy, they represent an important first step in defining the sector as a core component of Ontario’s industrial base and the future direction of the province’s energy strategy.

Because project developers are the central stakeholders in the production of renewable energy and link together all the other

players in Ontario’s renewable energy value chain, our analysis has focused on their role.

This report has examined the opportunities and challenges for renewable energy project developers who take advantage of Ontario’s new FIT program in order to capitalize on renewable energy in the province. We have presented important FIT program updates as well as insight from some of the province’s successful project developers, manufacturers, community and Aboriginal groups. We have also highlighted emerging opportunities for entrepreneurs entering the renewable energy ecosystem and have underlined best practices for FIT policy implementation by lawmakers and regulators.

Ontario’s feed-in tariff program has been engineered to serve as a catalyst for the renewable energy industry. The ultimate goal of the program is to bring about a substantial, long-term reduction in the cost of producing energy from renewable sources in Ontario. By setting in motion a mechanism that can bring the price of renewable energy in line with that of energy from fossil fuels, Ontario’s FIT program is a call to action to local entrepreneurs, manufacturers, and financiers—all of whom have an opportunity to play a founding role in the energy industry of the future.

## Appendix A – Definition of “community” and “Aboriginal” in the context of the FIT program

The Ontario Power Authority defines community and Aboriginal projects in the following way, for the purposes of FIT contract applications.

“Community projects” refer to those renewable energy projects owned by:

- a. One or more individuals who are residents of Ontario,
- b. A registered charity with its head office in Ontario,
- c. A not-for-profit organization with its head office in Ontario, or
- d. A “co-operative corporation,” as defined in the *Co-operative Corporations Act (Ontario)*, all of whose members are resident in Ontario.<sup>clv</sup>

Similarly, an “Aboriginal community” here refers to:

- a. A First Nation that is a “Band” as defined in the *Indian Act (Canada)*,
- b. The Métis Nation of Ontario or any of its active Chartered Community Councils,
- c. A person, other than a natural person, that is determined by the Government of Ontario for the purposes of the FIT program to represent the collective interests of a community that is composed of Métis or other Aboriginal individuals, or
- d. A corporation that is wholly owned by one or more Aboriginal communities.



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- xlix. The Ontario FIT program. May 11, 2010. Slide 16.
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