

# Key Considerations for Developing Rooftop Solar Photovoltaic Installations

Successful execution and delivery of expected returns requires careful management of the complex route to rooftop solar development.

## Executive Brief



Ontario's Feed-in-Tariff (FIT) program presents a compelling business model for commercial and industrial building owners interested in generating clean solar power on their rooftops. Renewable energy developers have succeeded under similar tariff models across Europe, growing a new industry that has attracted dramatic growth in investment capital. ★

Here in Ontario, the tariff rates are higher than anywhere in the world, backed by a twenty-year contract with the Ontario Power Authority. As a result, there are many new renewable energy startups (and some experienced developers) entering the Ontario solar market.

As Ontario's building owners evaluate this opportunity, it is critical to understand the many complexities specific to rooftop solar development. Based on our experience developing hundreds of rooftop projects across Europe, we believe that project success is dependent upon the following key considerations.

## Access to Financing and Startup Capital

Solar projects are capital intensive. For 250kW projects, the costs for fees and securities can be upwards of \$100,000 before the panels are even purchased, at which point an investment upwards of \$1,300,000 is required.

Favorable financing terms are a key component to the creation of a successful investment profile. Many of the Canadian lenders have very little experience with investment in renewable energy projects and therefore financing is only awarded to project proponents that can demonstrate experience, combined with a bankable project plan.

## Revenue Modeling

The key metric for this investment is consistent, reliable power production over a twenty-year term. Accurately forecasting this production is very site-specific and comes from experience, reliable data, design expertise, and an intimate knowledge of various photovoltaic (PV) technologies.

For example, have you completed accurate horizon surveys? Do you understand the effects of shading, snowfall, debris and other site-specific factors that will impact power production? These are critical considerations to gaining a realistic view of the power production potential of the site.

## Structural Considerations

Protecting your existing structure is paramount. In the Ontario climate, there are several structural considerations that require careful examination, and in some cases, detailed modeling to properly understand.

Careful analysis of the existing building by a qualified structural engineer, combined with a detailed analysis of the impacts of the panels themselves is a critical step of the design process. Proceeding with anything less than this degree of rigor is a mistake when dealing with the complexities presented by the Ontario climate.

## Technology Selection

There are many PV technologies and mounting systems available on the market. Selecting the best solution for your roof requires the right technology, for the right roof, at the right price. ★

Every roof is different (structurally, membrane differences, orientation, geometry, rooftop furniture, etc.). Your ability to maximize power production (and therefore revenue) depends on your ability to deploy the technology best suited to the characteristics of your building.

As a project proponent, you must ask yourself questions such as: Is this chosen technology proven in a comparable climate? Is there performance data available? Is the mounting system appropriate for the existing structure? Is the manufacturer a reputable, bankable entity?

At the same time, a developer must ensure its solar equipment meets the domestic content requirements as stipulated in the FIT program specifications (50 per cent raising to 60 percent in 2011). ★

With the Ontario solar manufacturing market still in its infancy, there are very few options for PV technology at a feasible price point. Therefore, the domestic content requirement can significantly impact your cost structure if you don't have access to a competitively priced supply chain. This usually only comes with buying power and economies of scale of a large solar project portfolio.

## Project Management

Installation of rooftop solar projects requires management of permitting processes generally involving the Ontario Power Authority, Distribution Companies, municipalities (building permits) and the Electrical Safety Authority.

The FIT process is still in its infancy and as such, navigating the changing waters of the process will be challenging. Projects can be optimized only if the proponent has an intimate knowledge of the requirements and process surrounding domestic content, approvals, design, reporting, timelines and the agencies and stakeholders interacting with the project. Building the right project team

★ [http://en.wikipedia.org/wiki/Solar\\_panel](http://en.wikipedia.org/wiki/Solar_panel)

★ Page 6: [http://fit.powerauthority.on.ca/Storage/101/11057\\_FIT\\_Program\\_Overview\\_July\\_6\\_10\\_version\\_1.3.1\\_final\\_for\\_posting.pdf](http://fit.powerauthority.on.ca/Storage/101/11057_FIT_Program_Overview_July_6_10_version_1.3.1_final_for_posting.pdf)

of specialists and managing them through the process can mean the difference between a project that is on time and on budget and one that is not.

## Array Design

A rooftop solar array will not meet its fullest production potential without an effective DC design from an expert in solar engineering. Optimizing an array design involves such considerations as: varying resistance across the array, temperature differential, incompatible panels, differential shading, proper degradation calculations, optimization of panel spacing and layout, understanding snow melt and an intimate knowledge of the PV technology.

Attention to these design details goes straight to the bottom line as power production is maximized.

## Installation Expertise

Safety and quality are the two main objectives of the construction of the array to ensure no performance issues and/or accidents. Proper procedures and documentation all require the involvement of an experienced, reputable contractor.

Working with a contractor will ensure the protection of your existing roof system and minimize your exposure through warranties and guarantees on the work.

## Insurances

The solar PV array should be insured on a broad form and replacement cost basis and include liability insurance. Proper installation from an experienced contractor, a comprehensive

operations and maintenance program and maintenance of a suitable security system on the PV array will ensure the most favourable conditions and costs.

## Maintenance

In order to meet the predicted power production supporting your investment, a comprehensive maintenance program is required. This includes regular cleaning of the panels, digital monitoring and analysis of performance, emergency response, regular inspection of array connections/safety considerations. Knowing what to look for and how to make the necessary ongoing adjustments ensures the array is performing as expected.

Further, it is necessary to establish and manage sinking funds to cover replacement costs of fixtures. For example, for larger commercial installations, the inverter will be replaced during the twenty-year term at a cost of over \$100,000.

## Operations

Operating the solar array requires administrative resources. Systems and personnel must be in place to successfully operate a solar array, from the management of the payments with the local distribution company and the Ontario Power Authority, management of reserve funds for inverter replacement, panel repair/replacement, array removal for roof maintenance, operations and maintenance contracts, insurances, reporting and array disposal at the end of project lifecycle.



## Conclusion

Ontario's Feed-in-Tariff program presents an opportunity for building owners to create new revenue from their building by generating clean solar power on their rooftop. Maximizing your investment returns while mitigating your risks requires unique skills and resources. Executed

well, investment in solar panels will generate returns in the range of eight to ten per cent. Missing the mark on any of the above can quickly diminish your expected returns, or in some cases, turn your investment into a cost.

There are options for those who would like to benefit from solar arrays on their rooftops, without committing the required resources or taking the risks associated with rooftop solar projects. One such option is leasing your roof to a qualified, experienced developer who will finance, design, install, maintain, and operate the solar array. Likewise, developers can offer joint venture models for cost and revenue sharing, which also work to reduce the capital outlay and risk to the building owner. Such models enable a greater number of building owners to boost the cashflow of real estate assets at no cost or commitment of resources, while participating and making a valuable contribution to the sustainable energy initiatives of the Province of Ontario.



Donaldson Europe - Bruges - Belgium - 970 kWp



# Canada Aviation and Space Museum

## Ottawa, Ontario, Canada

The Canada Aviation and Space Museum features an internationally acclaimed aeronautical collection. This will be the first museum in Canada to integrate solar energy production into its facility infrastructure.

### About the solar installation

- Location: Ottawa, Ontario, Canada
- Operational: Spring 2011
- Installation type: rooftop
- System size: 295 kWp
- Covered area: 6,500 m<sup>2</sup>
- Number of solar panels: 2,051
- Solar panels: UNI-SOLAR® photovoltaic laminate
- Energy production: 325 MWh/year

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Balta - Sint-Baafs-Vijve - Belgium - 4.385 MWp



St. Charles - Perpignan - France - 9.1 MWp

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