# 2016 FIT Price Review Submission to the Independent Electricity System Operator (IESO)

**August 14, 2015**

**Canadian Solar Industries Association (CanSIA)**
**www.cansia.ca**

# Contents

# Introduction

CanSIA is a national trade association that represents the solar energy industry throughout Canada. CanSIA's vision for Canada's solar energy industry in 2020 is for solar electricity to be a mainstream energy source and an integral part of Canada's diversified electricity mix. CanSIA is also targeting the solar electricity industry to be sustainable, with no direct subsidies, and operating in a supportive and stable policy and regulatory environment that recognizes the true value of solar.

As has been evident in the past, the willingness of the Independent Electricity System Operator (IESO) to elicit and incorporate the feedback of industry stakeholders has shown marked benefit in the quality and design of procurement programs for Ontario's power sector and particularly the development of renewable procurement in the Province. As Ontario continues to further its commitments to renewable energy, CanSIA is pleased to provide meaningful feedback to the IESO, providing accurate and timely information for consideration in the FIT Price Review consultation.

CanSIA wishes to further emphasize the commitment of the association to work with the IESO to identify opportunities for efficient procurement design and potential impacts to both industry stakeholders and everyday ratepayers in Ontario. In relation to this commitment, CanSIA wishes to recognize and thank the IESO for its participation in the Distributed Generation Task Force (DGTF). The work of the DGTF represents a significant opportunity to continue the pricing trend of solar toward market competitiveness and to help achieve the collective goal of the Ministry of Energy, IESO, and CanSIA of achieving the province's reliability, cost and climate change objectives for electricity supply.

While this submission mainly relates to the setting of prices for the 2016 FIT and microFIT Price Schedule, CanSIA emphasizes that there are numerous opportunities for programmatic changes to both the FIT and microFIT Programs which could lead to lower costs to developers and thus lower prices set by the IESO. During the FIT 4 consultation, CanSIA worked closely with the solar industry and advisors to develop and communicate several recommendations to the IESO for the program design and implementation of this procurement. In brief, CanSIA's key position submitted January 23, 2015, and aligned herein, is to support the principal of FIT Price Schedule digression at a rate consistent with the ability of the sector to deliver quality and safe generation assets through policy and regulatory streamlining and simplification. CanSIA will look to engage with the IESO and the Ministry of Energy on these issues during upcoming program design discussions for the next iterations of the FIT and microFIT Programs.

# Procurement Policy

## Price Review Schedule

CanSIA is supportive of the IESO's decision to run a Price Review in advance of the 2015 FIT Application Period. Establishing price certainty in advance of submitting an Application is critical to establish equipment supplier contracts and lease arrangements as well as to determine to what extent an Applicant will be able to pursue Price Reduction Priority Points. CanSIA and the IESO are aligned on the benefits offered by Price Reductions and having price certainty will allow Applicants to incorporate Price Reductions to the greatest extent they are able/willing.

CanSIA further recommends that the IESO and Ministry of Energy work collectively to amend the FIT Rules going forward to modify the existing Price Review schedule. Currently the IESO has been directed by the Ministry of Energy to initiate a Price Review annually in October and to post a Price Schedule no later than November which will be effective January 1 of the following year and be applicable to any FIT procurement run in that year. CanSIA recommends that a Price Review be run in advance of any Application Period to align prices with the costs of development applicable to a particular Application Period and to ensure that there is always a known Price Schedule established in advance which will be effective for a particular Application Period. Making this change will create price certainty for each Application Period and reduce the risk associated with the current directed process.

While we understand that the IESO is only seeking comments on the 2016 Price Review Questionnaire and Price Schedule at this time, CanSIA requests that the IESO consider this feedback for the 2016 FIT Application Period.

# Questionnaire Responses

CanSIA has provided data tables as appendices to this submission as well as Microsoft Excel versions of those same tables as attachments to the covering email. The answers below are meant to supplement and explain the relevant data points associated with the questions. The data upon which this submission is based has been collected from third-party consultants, CanSIA member companies, and identified public sources.

## Economic and Financial Considerations

### IESO Question 1

What are the costs of capital (both debt and equity) required to develop a renewable energy generation project and how do these costs vary with technology and project size?

a. Describe and quantify any anticipated economic and financing trends that may substantially affect these costs.

#### CanSIA Response

The cost of construction financing/debt in Ontario for FIT sized projects remains in the 5% range while term financing is generally available at approximately 7%. The cost of debt for FIT sized projects is influenced heavily by whether a particular project is being financed as a one-off or as a part of a larger portfolio. Projects financed as a part of a portfolio generally have access to cheaper debt as well as having a larger number of MW over which to spread the fixed due diligence and legal costs. Equity costs remain in the 9 – 10.5% range depending on the time frame and nature of the project. CanSIA has used a 9% discount rate and cost of equity for modelling purposes in line with past public indications from the IESO of targeting a 9% rate of return on equity for FIT projects.

microFIT projects financed by homeowners continue to include mortgage backed options providing up to 100% of purchase price depending on collateral used and up to 20 year amortization of the loan. Most homeowners following this model use cash or line of credit financing for these projects and an average interest rate on a debt equity split of 85%/15% of approximately 5-7%. Use of these types of loans to finance microFIT projects has declined, however.

Uptake in the microFIT program has, since price reductions instituted in 2012, declined significantly up until 2015 in which a marked improvement in uptake has occurred (see Table 1, below)[1]. The decreases in procurement in 2012-2014 were due largely to homeowners having insufficient access to capital or debt financing to undertake a project given the lower prices offered and a rejection rate reported by solar system providers of approximately 75-80% from banks. Progress in 2015 is currently in-line with coming close to or meeting the full 50 MW Procurement Target due mainly to financing options offered by solar provider companies who are able to finance system costs over a larger portfolio of projects, essentially acting as a bank to the customer. The continued success of this model is currently in question, however, due to confusion surrounding the permissibility of redirections of settlement payments on behalf of the Contract holder from LDCs to solar providers.

[1] http://microfit.powerauthority.on.ca/sites/default/files/bi-weekly_reports/Bi-Weekly-microFIT-Report-2015-08-07.pdf.

**Table 1: Progress Against microFIT Procurement Targets 2012-2015**

| Year | mFIT Procurement Target (MW) | MW Procured (MW) | % of Procurement Target Procured |
|---|---|---|---|
| 2012 | 50 | 31.8 | 64% |
| 2013 | 30 | 4.9 | 16% |
| 2014 | 65.3 | 14.2 | 22% |
| 2015 | 50 | 26.9 | 54% |

## IESO Question 2

Do the current FIT prices allow a renewable energy developer to earn a reasonable rate of return? If no, please describe recommended adjustments and provide supporting evidence.

a. What is considered a range of "acceptable" rates of return on equity for a renewable generation contract in Ontario's current financial market? Please provide an explanation for your answer, including worked calculations where possible.

## CanSIA Response

When the FIT and microFIT Programs were launched in 2009 the Ontario Power Authority signaled through public webinars and website content that the prices offered to generators were developed in order to target an 11% rate of return on equity. In 2012 with the release of FIT 2 and microFIT 2, the Ontario Power Authority communicated via public FAQs and Price Review questionnaires that the targeted rate of return on equity had been reduced to 9%. In lieu of further information from the IESO it is assumed that this targeted 9% rate of return has been maintained throughout subsequent iterations of the programs and Price Schedules.

CanSIA recommends maintaining at least a 9% rate or return for solar projects (both Rooftop and Non-Rooftop) given the following considerations:

- Comparison vs. other entities: LDCs in Ontario have in the past required at least a 10 – 10.5% rate of return for projects undertaken by the non-regulated side of their business operations due to the higher risks associated with projects whose costs are not recoverable through the rate base. This may be shifting to the 9% range for the FIT 4 Application Period taking into account the greater difficulty of executing a project with lower tariff rates.

- Exchange rate devaluation: Current devaluation in the exchange rate of the Canadian dollar (CAD) vs. the US Dollar (USD) have resulted in cost increases. For solar projects the low value of the CAD has significant impacts on the price of major equipment including modules, racking, and balance of system (BOS). In September 2014 the Bank of Canada's monthly average exchange rate was 1.1012 and by August 7, 2015 that exchange rate had increased to 1.3122.[2]

[2] http://www.bankofcanada.ca/rates/exchange/.

**Figure 1: CAD/USD Noon Exchange Rate**


A number of large financial institutions have forecasted the weak CAD to continue into at least Q4 2016 including RBC Financial, Scotia Bank and National Bank Financial Markets.[3] This continued weakness against the USD has a significant impact on the costs of solar development in Ontario.

For some solar developers (especially microFIT developers) the cost of the major equipment described above can be as high as 58% of the total project cost. The devaluation experienced between September 2014 and August 2015 (~ 19% drop) results in up to 24% increase in module prices[4] and up to a 12% increase in the total cost of major equipment (depending on the provider). CanSIA understands that the IESO cannot expect to predict the extent of changing exchange rates, however, given the devaluation currently being experienced, the forecasted continuation of that devaluation and the severe impact that reductions can have on project costs, it is reasonable to maintain current targeted rates of return of at least 9% in order to provide some degree of flexibility to developers to cope with this variability.

## IESO Question 2(b)

For solar PV: The cost of solar is declining dramatically. Recent procurements in other jurisdictions have seen prices for solar PV at or below US$0.04/kWh. Where does Ontario fit into this trend? Should solar prices in Ontario be set this low? Please explain why or why not?

### CanSIA Response

PPA prices at or below $USD 0.04/kWh have been announced in the US as recently as July 2015. For example the $USD 0.0387 PPA price for First Solar Inc.'s 100 MW Nevada facility has been filed with the Public Utilities

[3] http://www.rbc.com/economics/economic-reports/pdf/financial-markets/rates.pdf, http://www.gfx.gbm.scotiabank.com/Chart_Feed/fxout.pdf and https://www.nbc.ca/content/dam/bnc/en/rates-and-analysis/economic-analysis/forex.pdf.

[4] Please see Appendix C for a description of current international and Chinese module spot prices from Bloomberg New Energy Finance. This spot price in USD has been adjusted by current USD/CAD exchange rates provided by the Bank of Canada to determine the impact of the CAD devaluation on module costs.

Commission of Nevada.[5] It is difficult, if not impossible, to compare these rates to rates offered in Ontario given the different parameters that exist for large utility scale projects in certain regions of the US and FIT sized projects in Ontario. PPA prices such as these are currently unfeasible for FIT projects in the Ontario context due to market and procurement differences between the two jurisdictions including, but not limited to:

- Irradiance levels: PPA prices such as these are generally for projects located in the South Western United States which experience an irradiance level of approximately 2100-2300 kWh/m² (Nevada, Texas, California etc.). Ontario, however, rarely experiences irradiance levels higher than 1100-1300 kWh/m² resulting in lower annual energy production/capacity factors.[6] Irradiance is generally accepted to have a large impact on the capacity factor of a system.

- Investment Tax Credit (ITC): Solar projects in the US are eligible for a 30% ITC which significantly reduces the total project cost to the developer by allowing them to credit 30% of the eligible project costs against their tax requirements.[7] A similar ITC is not available to projects developed in Ontario.

- Economies of scale: Both PPA prices quoted above are for large utility scale projects allowing developers to capture $/kW savings by buying equipment in bulk as well to spread fixed costs such as interconnection over a larger number of MW thereby reducing the $/kWh price required to recoup expenses. Utility scale projects are also generally able to secure better financing terms than smaller scale projects which reduces the cost of debt. Neither of these scenarios are generally available to developers under the FIT Program which caps projects at 500 kW.

- Partnership requirements: As supported by the IESO's December 2014 Discussion Paper on Enhancements to the FIT Program, in order to be successful in the FIT Program, projects in the past must have included Economic Interest from one of the 3 prioritized groups. Including these partners increases the cost of partner acquisition, legal/corporate structuring, and post-contract Supplier Event of Default risk which drives up the price required in order to make the project economic. PPAs in the United States generally do not include similar requirements allowing them to propose lower rates.

- System optimization: The FIT Program incorporates a DC/AC overbuild ratio restriction of 120% which limits the ability of Applicants to optimize system design for the lowest possible $/kW cost. PPA costs above are for projects where the DC/AC ratio is not determined by the off-taker which allows lower overall bid prices. CanSIA has provided additional information regarding the DC/AC overbuild ratio in response to IESO Question 8.

- Environmental attributes/RECs: While unclear from the publically released information regarding the project sited above, the proponent may have retained rights to any environmental attributes or RECs which could have provided an alternate revenue stream via an off-take agreement for those instruments. FIT and microFIT Contracts stipulate that any environmental attributes generated by the project are retained by the IESO, which removes this potential income stream from the Supplier.

- The results off the LRP I RFP process will likely provide insight into how low PPA prices for large centralized Rooftop Solar and Non-Rooftop Solar systems can be in an Ontario context when certain of these barriers are removed. It is also important to recognize that the value proposition of centralized generation is different than that of distributed generation. Distributed generation brings the possibility of added benefits accrued

[5] http://pucweb1.state.nv.us/PDF/AxImages/DOCKETS_2015_THRU_PRESENT/2015-7/3615.pdf
[6] http://solargis.info/doc/free-solar-radiation-maps-GHI.
[7] http://www.seia.org/policy/finance-tax/solar-investment-tax-credit.

from deferred or avoided transmission and distribution system upgrade costs while centralized generation is geared largely towards bulk supply.

### IESO Question 3

What prices would you recommend for 2016, in $/kWh, for each technology and size tranche and why? Provide/attach justifications for differences between your recommended prices and global pricing levels.

### CanSIA Response

The prices below represent CanSIA's recommended prices for the all solar price tranches.

CanSIA recommends maintaining the prices established for solar projects in the 2014 Price Schedule for the 2015 Application Period. While certain costs have declined since the CanSIA provided data for the setting of the 2014 Price Schedule, there are a number of factors which have led to increased costs for certain portions of total project cost including a lower exchange rate and high connection costs. Further, a high percentage of FIT 3 Contracts remain unconstructed largely due to the relative increase in costs of equipment occurring as a result of the devaluation of the Canadian Dollar. This market signal demonstrates that EPCs and developers are encountering difficulty completing installations even at currently established prices.

**Table 2: CanSIA Recommended Contract Prices**

| Size Tranche | ¢/kWh |
|---|---|
| microFIT Rooftop ≤10 kW | 38.4 |
| microFIT Non-Rooftop ≤10 kW | 28.9 |
| FIT Rooftop >10 kW ≤100 kW | 34.3 |
| FIT Rooftop >100 kW ≤500 kW | 31.6 |
| FIT Non-Rooftop >10 kW ≤500 kW | 27.5 |

Rationale for the differences between these prices and global prices for PPAs have been included as responses to other questions in the questionnaire and so have not been repeated here.

## Project Development Costs

### IESO Question 4

The IESO is seeking submissions that include specific cost data with respect to capital costs, operational costs, capacity factors, project financing information (e.g., cost of project and construction financing, debt terms, debt service coverage ratio requirements) and other costs and factors which influence the levelized cost of electricity for the various technologies and size tranches in the FIT and microFIT programs. Please include any data tables or excel spreadsheets, as necessary.

a. Please identify any cost categories that differ significantly between Ontario and other jurisdictions, and explain such differences.

### CanSIA Response

Please see Appendix A and B for FIT and microFIT data tables including requested cost data.

The main costs that differ between Ontario and other jurisdictions include modules, inverters and racking due to the low Canadian Dollar, interconnection costs, and soft costs.

According to data released by the Laurence Berkley National Laboratory (LBNL) the median price of residential systems installed in the US in 2014 in ($USD) was $4,300/kWdc. For commercial systems ≤ 500 kW the median price was $3,900/kWdc. The report identifies a high amount of variability across US states and so also reports high and low values for installed prices. It is important to note that the LBNL report identifies several limitations with their data including that the figures are self-reported by installers and so likely includes margins, it is historical data from the previous year and so does not necessarily represent current install prices, and does not factor in any eventual rebates or incentives available to the project. It is also unclear from the LBNL report if their values incorporate any aspects of ongoing operation and maintenance costs. These factors mean that the reported US installed costs are likely higher than the actual costs of development. The US data is also presented in $kWdc and for smaller system sizes (residential – 6.3 kW and commercial – 30 kW) making it not directly comparable to the Ontario data presented within this submission. For example, for smaller system sizes like these, the per kW cost of any individual line item, such as modules or inverters, would likely be higher than the cost for that same line item reported in the CanSIA submission which which is presented in $/kWac, does not incorporate ongoing operation and maintenance costs, and is modeled based on larger system sizes (residential 10 kW and commercial 10-100 kW or 500 kW).

Keeping these factors in mind, when converted to $USD using the Bank of Canada's average exchange rate for 2014 (0.9054), the total installed cost of Rooftop Solar systems in Ontario compare favorably to installed costs in the US. Please note that values for "Total Development Costs in Ontario" are based on CanSIA data from this submission. Please also note that system costs in Ontario continue to track above system costs in European markets including Germany and Italy, and Asian markets including China.[8]

**Table 3: Canada vs United States Rooftop Solar Installed Cost Comparison ($USD)**

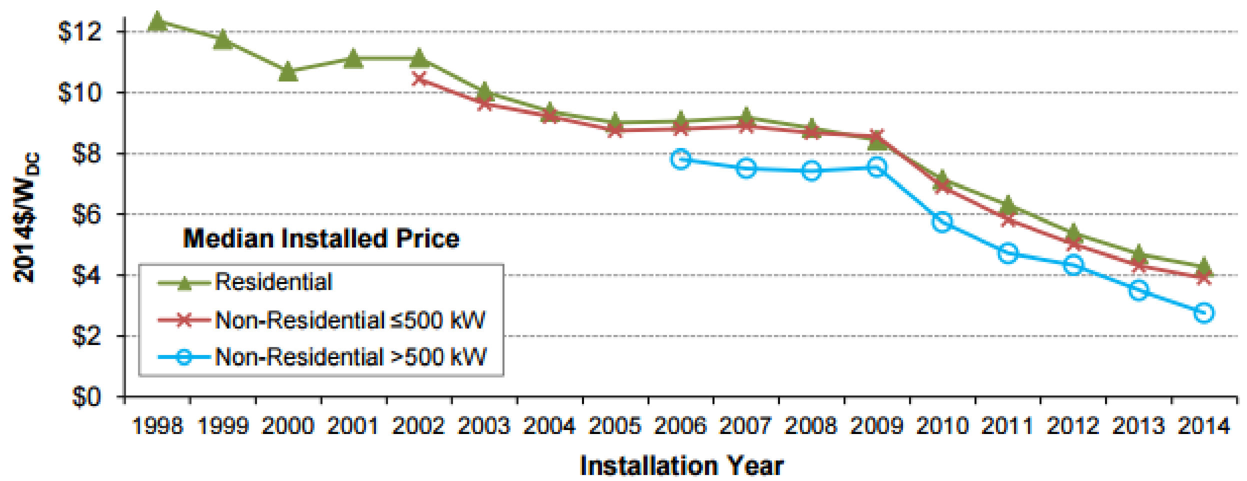
| Cost Category | Unit | Residential ≤ 10 kW | Commercial 10 kW – 100 kW | Commercial ≤ 500 kW |
|---|---|---|---|---|
| Total Development Costs Ontario* | $/kWac | $ 2,760.55 | $ 3,105.52 | $ 2,701.71 |
| Low System Cost US (2014) lowest 20% | $/kWdc | $ 3,500.00 | $ 3,100.00 | $ 3,100.00 |
| Median System Cost US (2014) | $/kWdc | $ 4,300.00 | $ 3,900.00 | $ 3,900.00 |
| High System Cost US (2014) highest 20% | $/kWdc | $ 5,300.00 | $ 4,900.00 | $ 4,900.00 |

* Total Development Costs Ontario are presented in $USD/kWac while US costs are presented in $USD/kWdc.

Figure 2, below, shows the long term trajectory of US installed prices. While prices continue to fall for all project sizes, the amount of decline between 2013 and 2014 has levelled off and is falling less sharply.

[8] http://emp.lbl.gov/sites/all/files/lbnl-188238_0.pdf, pg. 23.

**Figure 2: Long Term Trajectory of US Installed Prices[9]**




*Notes: See Table 1 for sample sizes by installation year. Median installed prices are shown only if 20 or more observations are available for a given year and customer segment.*

Please see CanSIA Response to IESO Question 2 for explanation of the effect of the low Canadian Dollar.

Please see CanSIA Response to IESO Question 6 for explanation of interconnection costs.

Please also see CanSIA Response to IESO Question 2(b) for further rationale for differences between costs/PPA prices between Ontario and other jurisdictions.

### IESO Question 4(b)

Some stakeholders have commented previously on the difficulty of winter installations. While there may be periods in Ontario when weather can impact construction, the IESO would like examples of winter construction challenges that would significantly differ between renewable energy and other infrastructure construction. Please comment with specific examples and cost implications.

### CanSIA Response

While installing larger FIT projects in the winter is more difficult than installing in the summer months, the challenges are not insurmountable. Some of the difficulties of winter installations include:

- Ground freezing: For Non-Rooftop Solar projects the costs to install in the winter can be increased due to ground freezing and the added construction time necessary to complete installation.

- Unsafe roof conditions: For Rooftop Solar projects construction may take longer in the winter months due to delays caused by unsafe roof conditions (icing, inclement weather etc.). Delays caused by snow piling up on roofs and snow removal are common as are factors such as delays associated with working on pitched roofs or working on white membrane roofs (which are much more slippery in the winter) and problems locating racking footings.

[9] http://emp.lbl.gov/sites/all/files/lbnl-188238_0.pdf, pg. 15.

- Avoiding damage to roofs: Some projects require the removal of existing ballast (roof rock) prior to the construction of a ballast mount system. If the existing ballast is frozen, installers need to wait until it thaws in order to avoid risking damage to the existing roof. Frozen roofs are also more friable resulting in the need for additional roof protection to avoid crushing installation below the membrane.

- Construction delays: Snow removal on roofs in order to accommodate work has been particularly expensive over the past two winter seasons. Certain CanSIA members that are EPCs have reported as much as a 20% increase in labour costs due to snow removal.

- Commissioning: Commissioning any solar PV system requires a minimum amount of plane-of-array [POA] irradiance (in the 400 to 600 W/m2 range), and it is very difficult to get this level of POA irradiance in the winter. This is a unique challenge to solar construction in the winter that other infrastructure capital projects are not exposed to – Developers need a minimum amount of solar irradiance (as described above) when conducting IR Scans and IV Curve Traces, in order to confirm safe operation of a DG facility before declaring commercial operation. And this is very difficult to accomplish during winter months.

CanSIA strongly recommends structuring the Procurement Schedules/timing of Application Periods and Contract offerings to provide Applicants with the greatest amount of construction time falling within the summer months. Specifically, structuring these periods so the construction and commissioning period (post-NTP) will fall within summer months will aid in ensuring that these avoidable soft cost increases are manageable or eliminated, where possible.

### IESO Question 5

Are there any recent technologies or process improvements that have affected costs or may affect costs in the future? If so, please describe.

a. For solar PV: What are the highest wattage panels available in Ontario at this time? What are the highest wattage panels expected to be installed in 2018?
b. For solar PV: How prevalent is the use of microinverters or power adaptors on commercial scale rooftop systems? Are there other innovations that are being used/considered to optimize central inverter systems?
c. For solar PV: Has the trend to racking standardization accelerated or remained stagnant over the past 2–3 years? What is now the dominant racking type?
d. For solar PV: Please comment on the additional upfront and ongoing costs of integrating storage into a system, and the corresponding benefits of doing so. How is the costs expected to decline by 2018?

### CanSIA Response

- Module wattage: For 60-cell modules, 285 W are commonly available in Ontario with expected outputs exceeding 310 W by 2018. For 72-cell modules, 335 W are commonly available in Ontario with expected outputs exceeding 375 W by 2018.

- Microinverters: The use of microinverters and optimizers in Ontario has decreased overall for commercial installations. Comparable data for US systems, for example, show only 20% of ≤ 500 kW systems using microinverters.[10] CanSIA expects to see microinverters and optimizers being employed more on flat commercial roofs to reduce BOS wiring costs. On sloped roofs, CanSIA does not expect an increase of

[10] http://emp.lbl.gov/sites/all/files/lbnl-188238_0.pdf, pg. 38.

microinverters or optimizers due to the high replacement costs of removing rows of modules to access them before these products become more reliable.

In the US residential sector microinverters have a larger share of the market, representing more than 35% of systems installed in 2014. Costs for microinverters, however, are higher than for standard string inverters. Reductions in BOS and soft costs can potentially offset these higher inverter costs.[11]

- Racking: Racking remains relatively standard within the industry, however, more developers are utilizing corner supported racking as it becomes accepted by structural and electrical engineers. Additionally, some new non-metallic (composite/plastic/ABS) racking system structures are being introduced to the market. While CanSIA is monitoring developments on new non-metallic mounting systems, member companies preference is to use manufacturers that offer mounting systems that use aluminum structures, stainless steel fasteners, no self-tapping screws, good installation procedures (with torque settings for all fasteners) and with no requirement for on-going verification of torque settings on fasteners after Commercial Operation. The dominant racking type is trending towards open structure (for reduced cell temperatures) and without north-south rails (for reduced cost).

- Storage: Current costs for residential storage systems (3 kWh) range from $500/kWh and up depending on the specific type of storage technology. The ongoing costs are assumed to be electricity costs (i.e. the cost of charging the battery from the grid minus the benefit of avoided electricity costs from using the charged battery instead of higher cost electricity from the grid). These ongoing costs are not assumed to change drastically over the life of a residential storage unit.

  CanSIA would support a thorough investigation into the feasibility of changing the restriction on adding battery storage for past and future Contracts and would be happy to work cooperatively with the IESO in this endeavor.

### IESO Question 6

What is the range of typical connection costs for LDCs across Ontario for each of FIT and microFIT (excluding equipment or system upgrades that are unique to a specific project)?

a. In terms of project interconnection costs, what variance, if any, has been observed for actual costs incurred versus estimates (both initial developer design estimates and those provided by the LDC during early project development)? Have there been any noticeable changes in LDC estimate/actual variances since the inception of the FIT and microFIT programs?

### CanSIA Response

Interconnection costs vary widely across LDCs and projects making it difficult to provide a single value for IESO consideration. CanSIA has provided a range for FIT projects in the past of $7,000 - $90,000 depending on the site specific parameters of a connection/CIA and is unable to provide a more exact figure at this time.

Important factors influencing connection costs as well as fluctuations between initial estimates and final costs for FIT projects include:

- Control and monitoring systems: Supervisory Control and Data Acquisition (SCADA), the computer system that monitors and controls substations, transformers and other electrical assets such as solar generators, is currently one of the most influential cost factors. SCADA is being required on most new solar projects in

[11] http://emp.lbl.gov/sites/all/files/lbnl-188238_0.pdf, pg. 38.

order to provide visibility and control of solar systems to LDCs. SCADA costs are approximately $15,000 – 25,000.

- Transfer trip protection: Over the course of the FIT Program transfer trip capability has not generally been required for projects ≤500 kW, however, the inclusion of this requirement for projects of this size is becoming more common as higher levels of penetration on single feeders is experienced. While the cost of installing transfer trip capabilities can range from $65,000 - $400,000, costs towards the high end of this range can compromise the economics of a FIT Project. Cost variability for transfer trips depends on factors including whether a TS already has equipment installed to accommodate the transfer trip, and the distance between the project and the TS.

Interconnection costs for microFIT projects remain in the $145 – 325/kW range depending on whether the project is a Rooftop or Non-Rooftop, and across different LDCs which continue to have a range of connection costs depending on location and site specific parameters.

While not the direct subject of this submission, CanSIA is confident that interconnection costs in Ontario show opportunities for reduction. CanSIA is working with LDCs through the Distributed Generation Task Force to identify barriers to and opportunities for reductions.

### IESO Question 7

Identify the project development/construction costs anticipated to have the greatest potential for reductions/improvements in the near-term (e.g., 6–12 months) and long-term (e.g., 1–5 years)? Are there specific cost groups that are expected to increase? If yes, what are the drivers of these increases?

### CanSIA Response

- Modules: Prices are expected to have some room for continued decreases in the long-term due to the removal of domestic content restrictions for the FIT and microFIT programs. This change has begun to allow the penetration of the Ontario market of a greater proportion of internationally manufactured modules giving the international module spot price more direct relevance for costs in Ontario. In the near-term, the recent ruling from the Canadian International Trade Tribunal (CITT) will increase costs for modules manufactured by the affected companies which causes an overall upward trend in module costs from current levels. Of course, developers have the option of using domestically or other internationally produced modules in order to avoid these tariffs.

**Table 4: Margins of Dumping and Amounts of Subsidy by Exporter[12]**

| Exporter | Margin of Dumping* | Amount of Subsidy per Watt (RMB) |
|---|---|---|
| Canadian Solar Manufacturing (Changshu) Inc. & Canadian Solar International Limited | 83.20% | 0.014 |
| Changzhou Trina Solar Energy Co., Ltd. | 120.50% | 0.018 |
| Hefei JA Solar Technology Co., Ltd. | 48.40% | 0.011 |
| Jinko Solar Co., Ltd. | 112.60% | 0.028 |
| Zhejiang Jinko Solar Trading Co., Ltd. | 115.90% | 0.046 |

[12] http://www.citt.gc.ca/en/node/7363.

| | | |
|---|---|---|
| Renesola Jiangsu Ltd. | 9.30% | 0.003 |
| Wuxi Taichen Machinery & Equipment Co., Ltd. | 25.90% | 0.074 |
| Wuxi Suntech Power Co., Ltd. | 154.4%** | 0.032 |
| All Other Exporters | 154.40% | 0.34 |

* As a percentage of export price.
** Denotes rate for all other exporters.

Additionally, module (and other major equipment) costs have increased in cost in the near-term due to the weak CAD in relation to the USD.

- Interconnection costs: One factor which may result in reductions in the near-term is the possibility that the Ontario Energy Board will rule that the cost of SCADA systems are required to be borne by the LDC rather than the developer. Currently, SCADA systems must be paid for by the developer which leads to increased interconnection costs. The OEB is currently deliberating on a rate case put forward by Toronto Hydro which includes LDCs socializing the cost of SCADA. A determination on the rate case is expected in the fall of 2015.

  As outlined in the CanSIA Response to IESO Question 6, interconnection costs will likely continue to increase if instances of transfer trip protection requirements increase. It is important to note that the application of a high-cost transfer trip protection system for a 500 kW project quickly makes the economics of that project untenable.

- Debt costs: CanSIA anticipates an increased cost of debt in the mid to long-term once the Bank of Canada increases interest rates. Despite the recent drop in interest rates by 0.25% in response to the sharp drop in oil prices, the Bank of Canada forecasts the real GDP growth at an average of 2.5% in 2015 and 2016[13], which will likely result in an interest rate hike in mid-2016.

- Legal/engineering costs: CanSIA is hopeful that legal and engineering costs will reduce in the long-term as more law firms understand solar transactions and develop standard contract templates, and as engineering vendors improve their internal processes due to further experience.

- Construction costs: The industry has been able to reduce construction costs in recent years as a result of improved construction processes (planning, mobilization, construction and de-mobilization) and as a result of improved ability to construct and commission in accordance with developer requirements and specifications. This cost reduction is mitigated, however, by improved diligence and specification of quality assurance and commissioning processes, which tends to increase capital cost.

- mFIT financing and capital costs: Please see CanSIA responses to IESO Questions 12 and 14.

## IESO Question 8

For solar PV: There have been stakeholder requests to increase the FIT DC/AC overbuild ratio beyond 120%. Please provide information about the additional generation which can be achieved by building projects that exceed the 120% limit. How should an increased overbuild limit impact the price? If there were no overbuild limit, what would the ideal overbuild ratio be? What would the percentage increase in generation be for this ratio vs. 120%?

[13] http://www.bankofcanada.ca/wp-content/uploads/2015/07/mpr-2015-07-15.pdf, pg. 13.

### CanSIA Response

The 120% overbuild restriction for FIT solar projects was introduced during FIT 2 in order to curb the practice of large overbuild ratios as an overbuild had not been assumed in the determination of the Price Schedule. Incorporating an overbuild into the determination of the Price Schedule effectively addresses the IESO's concerns regarding the rate paid in comparison to the assumed energy production and capital costs of a system. Increasing the DC/AC ratio of solar system generally increases the annual energy production of the system while simultaneously increasing the capital costs of the system. Not all of the capital costs of system increase by increasing the DC portion of the ratio (modules, racking, BOS, land acquisition, are the main costs which increase as the DC/AC ratio is increased). It is generally accepted within the solar industry that a 30-40% overbuild, where land/space permits, is the ideal amount, after which the increases to energy production begin to be offset by the increases to capital costs.

CanSIA understands that the FIT 4 Rules (including DC/AC overbuild restriction) have been finalized for the 2015 Application Period. CanSIA recommends permitting overbuilds for FIT projects of up to 135 – 140% and incorporating those increased capital costs and energy production values into the modelling exercise for price setting for the next iteration of the FIT Rules. CanSIA would be pleased to work with the IESO on determining appropriate capital cost and capacity factor increases based on the selected ratio.

## Ongoing Projects Costs and Performance

### IESO Question 9

How have ongoing operation and maintenance costs for existing facilities tracked relative to estimates assumed during initial project design? Have costs been higher/lower than expected?

### CanSIA Response

CanSIA has provided operation and maintenance costs for FIT and microFIT systems in Appendices A and B.

Solar developers and owner/operators have seen some increases to operation and maintenance costs due to inverter replacement and resulting production drops.

### IESO Question 10

Have any recent technology or process improvements had an impact on generally accepted performance assumptions (e.g., average capacity factors, equipment replacement, maintenance outages) for renewable energy projects? How has ongoing performance of renewable generation projects tracked relative to estimates?

### CanSIA Response

- Average capacity factors: The average capacity factor for FIT projects is 15-16% and the average capacity factor for microFIT projects is in the 12-13% range given restrictions on factors such as shading, title angle, snow cover and soling which are more difficult to address or remedy in a residential context. The effects of planned and unplanned outages are incorporated into the assumed average capacity factors.

- Equipment replacement: Most equipment used for a solar project will last the full 20 years of the FIT or microFIT contract including: modules, racking, and most components included in BOS. Inverters, however, are very likely to require ongoing maintenance and internal component replacement in the case of larger centralized inverters, and the possibility of outright replacement in the case of residential systems. CanSIA has included these costs in the Fixed Operating and Maintenance Costs of our submitted data tables.

## Prioritization Costs and Other Considerations

### IESO Question 11

In relation to the items below, please identify and describe any:

a. Administrative (e.g., legal, financial, etc.) costs associated with arranging partnership structures necessary to qualify for a Contract Capacity Set-Aside (as defined in the FIT Rules);
b. Unique implications or advantages (e.g., taxation) of operating a project in a partnership structure; and
c. Costs associated with obtaining FIT priority points.

### CanSIA Response

CanSIA understand the policy rationale for including the Contract Capacity Set-Asides and associated Price Adders for Participation Projects within the FIT Program. The additional legal and financial costs associated with bringing one of these partners on-board, coupled with the commensurate drop in project revenues, applies to all developers who form partnerships with one of the three prioritizes groups. It is noted that the Price Adders are intended to compensate developers for these increased costs, however, Price Adders are not available to Applicants proposing Rooftop Solar projects. As supported by the IESO's December 2014 Discussion Paper on Enhancements to the FIT Program, over 80% of Applications and Contracts under the FIT 3 procurement were for Rooftop Solar. This means the majority of Applicants to the program are required to bring on participation from one of these groups in order to have access to the Contract Capacity Set-Aside but are not afforded Price Adders in order to cover the additional costs.

CanSIA does not assume that Contract Capacity Set-Asides will be removed from the FIT Program for the FIT 4 Application Period and as such recommends extending the Price Adders to Rooftop Solar Projects for the FIT 4 Price Schedule in order to equalize the effects of the policy across all Applicants. Given the presence of Price Reduction Priority Points in FIT 4, the Price Adder has the potential to create an un-level playing field for Rooftop Solar vs. all other Renewable Fuels. As recommended in CanSIA's feedback on program design for FIT 4, we also recommends reducing the MW allowances for Contract Capacity Set-Asides to 1/3 of the total Procurement Target in future procurements in order to lessen the impact that the Price Adders have on the overall program cost. This will also open up the Procurement Target to more private companies which allows for entities better suited to utilize Price Reductions to receive more Contracts, thus reducing the ratepayer impact.

As provided in CanSIA's feedback on program design for FIT 4, CanSIA supports the inclusion of Price Reduction Priority Points and council resolution based Priority Points. Price Reduction Priority Points encourage the lowest cost projects to be successful and council resolutions provide evidence of community support for renewables. While council resolutions do necessitate additional spending and thus an increase to project cost, CanSIA believes community support is an important indicator of success for the FIT Program.

## Additional Questions

### IESO Question 12

What are the main reasons, if any, for differentials between Ontario pricing and current global pricing for renewable energy projects? Will these differentials remain constant or are changes/reductions foreseen? Please comment, if possible, on each of project development, permitting, equipment, construction, operation and maintenance.

### CanSIA Response

The three most important differences between Ontario pricing and current global pricing trends for solar projects are soft costs, the current low value of the Canadian dollar, and interconnection costs. While other differences exist between global pricing trends and trends within the Ontario market, CanSIA is highlighting these factors as they offer significant opportunities for reduction if addressed collectively by the Ministry of Energy, the IESO, and industry participants.

- Soft costs: Soft costs include a variety of items such as; administrative costs, legal and financing costs, labour, permitting, inspections, customer acquisition, and installer/integrator margins.[14] Some of these sub-categories are not immediately addressable by the IESO or the Ministry of Energy (e.g. customer acquisition, permitting, and inspections). Actions can be taken, however, to address certain administrative, legal and financing costs in the microFIT Program by eliminating the Eligible Participant Schedule and private businesses to participate and hold Contracts. This single change is the most easily implementable for bringing down soft costs and thus the microFIT rates. In the FIT Program, phasing out Contract Capacity Set-Asides and opening up the full annual Procurement Target to competition from non-Participation Projects will similarly reduce financing risk (due to strict post-Contract Supplier Event of Default provisions for the loss of partners), financing cost and administrative/legal costs of finding and solidifying external partnerships.

- Interconnection costs: Please see CanSIA Responses to IESO Questions 6 and 7 for explanation of interconnection costs.

- Low Canadian Dollar: Please see CanSIA Response to IESO Question 2 for explanation of the effect of the low Canadian Dollar.

- Please also see CanSIA Response to IESO Question 2(b) and IESO Question 4 for further rationale for differences between costs/PPA prices between Ontario and other jurisdictions.

### IESO Question 13

For solar PV: What will the effect be, if any, of the Canada Border Services Agency's recently imposed tariffs on solar panels manufactured by certain Chinese suppliers?

#### CanSIA Response

Please see CanSIA Response to IESO Question 7.

### IESO Question 14

For residential rooftop solar PV: The U.S. Department of Energy's SunShot initiative continues to analyze the cost differentials between residential rooftop solar systems in Germany and the U.S. In the past 1–2 years, has there been more alignment between German and U.S. residential rooftop solar costs? To what degree do Ontario system costs (from a homeowner's perspective) align with or differ from both German and U.S. costs? List the main barriers, if any, to matching German costs in the Ontario market.

a. Are these barriers unique to microFIT or applicable to FIT as well?

#### CanSIA Response

The most easily addressed barrier to further alignment between cost differentials for microFIT sized systems in the US, Germany, and Ontario is the prohibition of third-party ownership of contracts within the microFIT Program (i.e. the Eligible Participant Schedule). Both the US and Germany allow systems to be installed on a residential property but owned by a third-party (roof leasing). In the US and Germany (which have robust net-metering programs) the model used is often a PPA whereby the third-party sells the generated electricity to the homeowner at a cost lower than the retail rate of electricity. Ontario's market is currently structured differently in that the microFIT Program

[14] http://www.rmi.org/Knowledge-Center/Library/2013-16_SimpleBoSRpt.

requires injection to the grid rather than self-consumption, however, third-party ownership of the microFIT Contract would allow greater access to capital, greater economies of scale for purchasing equipment and installation labour, as well as reduced administrative and legal costs.

Focusing on the cost benefits of third-party ownership will be a central theme of CanSIA's Distributed Generation Task Force and CanSIA looks forward to discussing recommendations for third-party ownership with the IESO in the context of program design for the next iteration of the microFIT Program.

# Closing and Recommendation

CanSIA is pleased to provide these recommendations and to work closely with the IESO throughout regular and consistent stakeholder engagement activities. CanSIA strives to be a credible partner to government and the IESO as it engages in these critical policy making activities and looks forward to the opportunity to discuss these recommendations.

While the costs of developing solar projects in Ontario have decreased from values included in CanSIA's 2014 Price Review submission, these decreases do not warrant lowering the currently posted rates. Increased connection costs, connection cost risks associated with transfer trip requirements, and unanticipated currency devaluation has contributed to increases for large portions of project costs which must be accounted for. There is also a current lack of construction occurring of FIT 3 projects which indicates that developers are finding it difficult to construct at currently established rates given these cost increases. Cansia therefore recommends maintaining the rates of the 2015 Price Schedule for the 2015 Application Period.

It is also important to note that the presence of Price Reduction Priority Points incorporates a strong competitive signal to participants. Given the up to 12% reductions in Contract Price that could be seen as an effect of these points as Applicants seek to have the best possible change of securing a Contract, it is reasonable to monitor (1) the extent to which Price Reductions are pursued given current cost constraints, and (2) the extent to which projects that incorporate Price Reductions are able to be financed and constructed.

CanSIA is confident that significant opportunity exists to reduce soft costs caused by barriers in the Ontario market place as well as certain programmatic costs incorporated into the FIT and microFIT Programs themselves. The Ministry of Energy and CanSIA are currently investigating ways to reduce those costs through the Ministry's Net Metering/Self Consumption Advisory Working Group and CanSIA's Distributed Generation Task Force. CanSIA would welcome the opportunity to meet with the FIT and microFIT Teams to discuss these recommendations once the FIT 4 Application Period has closed.

Yours sincerely,

John Arthur Gorman

President, CanSIA

# Appendices

## Appendix A: FIT System Cost Data

| | | Rooftop | Rooftop | Non-Rooftop |
|---|---|---|---|---|
| **System Assumptions** | | | | |
| Capacity | kWac | 100 | 500 | 500 |
| DC Overbuild | DC/AC | 120.0% | 120.0% | 120.0% |
| Average Annual Capacity Factor | - | 15.6% | 15.6% | 15.6% |
| Annual Degradation Factor | - | 0.70% | 0.70% | 0.70% |
| Project Life | Years | 20.00 | 20.00 | 20.00 |
| **Financial Assumptions** | | | | |
| Debt | - | 80% | 80% | 80% |
| Equity | - | 20% | 20% | 20% |
| Debt Term | Years | 20 | 20 | 20 |
| Debt Interest Rate | - | 7% | 7% | 7% |
| Target ROE | - | 9% | 9% | 9% |
| **Development Costs** | | | | |
| EPC | | | | |
| Modules (DC) | $/kWdc | $ 900.00 | $ 850.00 | $ 850.00 |
| Inverters (AC) | $/kWac | $ 300.00 | $ 250.00 | $ 250.00 |
| Racking/Mounting (DC) | $/kWdc | $ 300.00 | $ 300.00 | $ 230.00 |
| BOS (DC) | $/kWdc | $ 1,100.00 | $ 950.00 | $ 950.00 |
| Interconnection Costs | $/kWac | $ 70.00 | $ 14.00 | $ 14.00 |
| Other Costs (Engineering, Permitting, Legal etc.) | $/kWac | $ 300.00 | $ 200.00 | $ 200.00 |
| **Total Development Costs** | $/kWac | **$ 3,430.00** | **$ 2,984.00** | **$ 2,900.00** |
| **Annual Operation and Maintenance Costs** | | | | |
| O&M Cost | $/kWac | $ 27.00 | $ 27.00 | $ 11.00 |
| Lease | $/kWac | $ 71.00 | $ 71.00 | $ 71.00 |
| Insurance | $/kWac | $ 10.00 | $ 10.00 | $ 8.00 |
| **Total Annual Operation and Maintenance Costs** | $/kWac | **$ 108.00** | **$ 108.00** | **$ 90.00** |

# Appendix B: microFIT System Cost Data

| | | Rooftop | Non-Rooftop |
|---|---|---|---|
| **System Assumptions** | | | |
| Capacity | kWac | 10 | 10 |
| DC Overbuild Ratio | DC/AC | 100.0% | 100.0% |
| Average Annual Capacity Factor | - | 13.0% | 13.0% |
| Annual Degradation Factor | - | 0.70% | 0.70% |
| Project Life | Years | 20.00 | 20.00 |
| **Financial Assumptions** | | | |
| Debt | - | 80% | 80% |
| Equity | - | 20% | 20% |
| Debt Term | Years | 20 | 20 |
| Debt Interest Rate | - | 7% | 7% |
| Target ROE | - | 9% | 9% |
| **Development Costs** | | | |
| EPC | | | |
| Modules (DC) | $/kWdc | $ 900.00 | $ 900.00 |
| Inverters (AC) | $/kWac | $ 667.00 | $ 667.00 |
| Racking/Mounting (DC) | $/kWdc | $ 320.00 | $ 320.00 |
| BOS (DC) | $/kWdc | $ 895.73 | $ 895.73 |
| Interconnection Costs | $/kWac | $ 145.00 | $ 40.00 |
| Other Costs (Engineering, Permitting, Legal etc.) | $/kWac | $ 121.25 | $ 32.00 |
| **Total Development Costs** | $/kWac | **$ 3,048.98** | **$ 2,854.73** |
| **Annual Operation and Maintenance Costs** | | | |
| O&M Cost | $/kWac | $ 42.00 | $ 42.00 |
| Lease | $/kWac | $ - | $ - |
| Insurance | $/kWac | $ 40.00 | $ 40.00 |
| **Total Annual Operation and Maintenance Costs** | $/kWac | **$ 82.00** | **$ 82.00** |

# Appendix C: International Module Spot Price