FIT/mFIT: 2017 Price Review

1. Introduction

The Canadian Solar Industries Association (CanSIA) is a national trade association that represents the solar energy industry throughout Canada. CanSIA's vision for Canada's solar energy industry is for solar electricity to be a mainstream energy source and an integral part of Canada's diversified electricity mix by 2020. CanSIA also intends for the solar electricity industry to be sustainable, with no direct subsidies, and operating in a supportive and stable policy and regulatory environment within a similar time frame.

CanSIA's members have contributed to this submission through the provision and review of development cost data (installed and operation/maintenance) for all project size tranches. Please note that data provided within this submission is intended to reflect microFIT systems installed in 2017/2018 and FIT systems installed in 2019/2020. Data supplied previously in CanSIA's 2016 Price Review submission reflected 2015 development costs. In-line with the IESO's stated objective of using the Price Review as a forward looking mechanism, CanSIA has changed approach for this submission.

In making a forward looking assessment of installed costs in Ontario it is useful to compare against current and forecasted installed costs for similar sized projects in the United States. Table 1 below includes CanSIA's installed cost data in CAD and USD as a comparison between in Ontario costs and US 2015 costs and forecast 2020 costs. CanSIA's installed cost forecasts are in all cases lower than US data for similar sized systems in 2015 and come close to US installed costs in 2020. It is important to note that the Sunshot forecasts for 2020 are both aggressive as well as backed by multi-million dollar government cost reduction initiatives focused on research/analytics and deployment strategies. The US market also benefits from massive economies of scale in comparison to Ontario. That costs in Ontario will be so close to the Sunshot forecasts in and around 2020 is a remarkable achievement.

Table 1: Comparison of Installed Cost Forecasts

Renewable Fuel	Project Capacity (kW)	CanSIA Installed Cost ($/W CAD)	CanSIA Installed Cost ($/W USD)	NREL Installed Cost 2015 ($/W USD)*	NREL Installed Cost 2020 ($/W USD)*
Rooftop	6	2.84	2.16	3.10	1.60
Rooftop	10	2.75	2.09	3.10	1.60
Rooftop	100	2.58	1.96	2.20	1.30
Rooftop	500	2.40	1.83	2.20	1.30
Non-Rooftop	10	2.58	1.96	3.10	1.60
Non-Rooftop	500	2.27	1.73	2.20	1.30

*Source: NREL/TP-6A20-65872

2. FIT

2.1 Percentage Difference Between Utility Scale and Commercial Scale Solar

The IESO has requested information as to whether prices for solar projects should continue to be reduced, taking into consideration low PPA rates in jurisdictions like Dubai and the recent LRP I contract awards which achieved an average price of 15.6 ¢/kWh. During the 2016 Price Review CanSIA supplied a 6 point list with regards to why utility scale projects in Dubai or the South Western United States are able to achieve very low prices for solar including: higher irradiance levels, incentives (such as the Investment Tax Credit), economies of scale, ability to optimize DC/AC ratios, ability to sell environmental attributes, and the programmatic costs inherent within the FIT Program. These points remain relevant in explaining differences between very low utility scale PPA prices and FIT prices for commercial and residential scale solar.

It is also important to note that the LRP I average price of 15.6 ¢/kWh should be expected to be lower than FIT prices for Non-Rooftop Solar and especially for Rooftop Solar. LRP projects benefited from large economies of scale and system production characteristics that FIT sized projects do not have. The small difference that exists between the LRP I average price and the FIT price established by the 2016 Price Schedule of 20.9 ¢/kWh is more so indicative of the FIT price being set lower than what would normally be expected based on the difference between the Levelized Cost of Electricity (LCOE) for similar sized projects developed in the United States.

Table 2: Percentage Difference between US/CAN Project Scale LCOEs

Project Scale	LCOE (¢/kWh)	Percentage Difference
LRP I Non-Rooftop	15.6 CAD	34%
FIT 500 kW Non-Rooftop	20.9 CAD	
NREL 2015 Utility*	8 - 13.1 USD	33% - 119%
NREL 2015 Commercial*	10.6 - 17.5 USD	

*Source: NREL/TP-6A20-65872

2.2 Account for Reasonable Operation and Maintenance Costs

The IESO has requested information as to whether current FIT rates allow developers to earn a reasonable rate of return. In comparing the values for installed costs used by the IESO during the 2016 Price Review and the values for installed costs supplied by CanSIA in this submission, it is clear that there is not a large difference between the overall installed costs being used by both parties. Differences do exist, however, in the respective treatment of operation and maintenance costs.

While the IESO did not release ongoing operation and maintenance cost date, it was identified during the 2016 Price Review that the FIT price setting methodology does not incorporate any values for leasing

costs. CanSIA has, and continues, to emphasize that the cost of leasing rooftops or land are the central component of ongoing operation and maintenance costs and has a large impact on whether a project developer is able to earn a reasonable rate of return based on the established prices. Depending on the particular circumstances leases can range from $0.04 - $0.07/W on an annual basis. While not one of the largest components of cost in year one of a project, these costs continue to exist each year of the 20 year term of the contract.

Leasing the property on which a FIT project is located has been a constant in the development model since the FIT Program was introduced in 2009 and the IESO has specifically allowed for this development model by including leases and options to lease as eligible forms of Access Rights. While there is a difference between allowing the development model and encouraging it, the IESO has stated that the setting of the Price Schedule is a "cost-based assessment" of project development in Ontario. Additionally, the Minister's direction from September 24, 2009 specifies that that "In setting and re-setting prices in accordance with the program rules, the OPA should generally be guided by the principle that the prices should seek to cover the costs that the projects of a particular type and size category are generally expected to experience, plus a reasonable return on investment." Lease costs have been a portion of project development costs throughout the FIT Program and will continue to be a portion of development costs going forward both under the remaining two FIT procurements.

Including lease costs facilitates the developer led model making it not only a reasonable cost to include in the determination of the Price Schedule, but also a desirable cost to include. Leasing is a staple of the developer led model and the developer led model is what allows the introduction of larger economies of scale through portfolios of projects. A single owner building a project on a property that they already own are generally "one off" projects that do not bring the same cost benefits afforded to a larger project portfolio. Portfolios allow greater purchasing power for equipment as well as access to better financing and legal terms and the ability to spread ongoing operation and maintenance costs over more MW resulting in a lower cost per watt across the portfolio. The cost benefits of developing larger amounts of MW simultaneously, rather than one-off projects, is generally accepted and supported. The need to develop portfolios, rather than one off projects, is further supported by the recent FIT 4 Contract award wherein 701 of the 907 (77%) Solar projects were held by only 39 Applicants. In other words, Applicants generally needed to pursue portfolios of projects in order to make projects economic at the reduced rates.

Meeting aggressive forward looking cost digression targets will likely only be achievable through a developer led model. Owner operator entities will continue to face cost challenges created by the one-off nature of their project development.

2.3 FIT 3 / FIT 3.1 Development Progress and Implications

Another factor which must be taken into account when determining a reasonable Base Price for FIT projects is the likelihood that projects will be able to be developed through to commercial operation.

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It is difficult to provide data to the IESO with regards to the percentage of FIT 4 Applications and Contracts (that pursued Price Reduction Points or otherwise), that represent speculative projects (i.e. projects that do not have a clear path forward to financing, construction and Commercial Operation (COD)). As discussed in CanSIA's previous Price Review submission, one correlating data point which provides insight into Suppliers ability to complete projects at FIT 4 prices is the extent to which the industry has achieved Notice to Proceed (NTP) for FIT 3 Contracts. FIT 3 Contracts were subject to Price Schedules which include rates that were, on average, 26-30% higher than FIT 4 rates.

Table 3: FIT Price Schedule Comparison

Renewable Fuel	Size Tranche	FIT 3 Price (¢/kWh)	FIT 3.1 Price (¢/kWh)	FIT 4 Price (¢/kWh)	Average % Decrease
Solar PV Rooftop	>10 kW ≤100 kW	34.5	34.3	24.2	30%
Solar PV Rooftop	≤ 500 kW	32.9	31.6	22.5	30%
Solar PV Non-Rooftop	≤ 500 kW	28.8	27.5	20.9	26%

Using the Milestone Dates for Commercial Operation (MCOD) for FIT 3 and FIT 3.1 contracts in conjunction with the date of the posting of the Contract Offer List (+3 months to allow for contracts to actually be offered which sets the relevant MCOD) it is evident that the majority of Rooftop Solar contracts should have been in COD as of mid-September 2016 at the latest.

Table 4: FIT 3 and FIT 3.1 Rooftop Solar Facilities MCOD

Procurement	Contract Date	Procurement Target (MW)	Rooftop Projects (MW)	Rooftop MCOD
FIT 3	July 30, 2014	123.5	85.49	January 30, 2016
FIT 3.1	December 19, 2014	100	65.798	June 19, 2016

*Adding 3 months to June 19, 2016 sets a max Rooftop Solar MCOD of September 19, 2016.

Using the IESO's Quarterly Report on Contracted Electricity Supply (Q1 2016) it is evident that out of the total contracted solar MW for FIT 3 and FIT 3.1 that only 6% have reached commercial operation (COD) and only 36% have achieved NTP. The majority of contracts (64%) have not yet achieved NTP.

Table 5: FIT 3 and FIT 3.1 Development Progress

Development Stage	MW	Percent of Total
Pre NTP	139.2	64%
NTP	64.5	30%
COD	12.6	6%
Total	216.3	100%

As the IESO's Quarterly Report does not provide a breakdown between Rooftop Solar and Non-Rooftop Solar for FIT 3 and FIT 3.1, it is not possible to determine what percentage of projects are of these different Renewable Fuels. Even assuming, however, that all NTP and COD projects are Rooftop Solar (which is reasonable given their 18 month MCOD vs 3 years for Non-Rooftop Solar), roughly 48% of Rooftop Solar contracts have not achieved COD.

Table 6: FIT 3 and FIT 3.1 Rooftop Development Progress

Development Stage	MW	Percent of Total
Pre NTP	70.6	48%
NTP	64.5	44%
COD	12.6	9%
Total	147.7	100%

Given that Rooftop Solar projects should have reached COD by September 2016 and 48% of contract capacity has not achieved NTP, it is reasonable to assume that developers are having issues completing projects. CanSIA's Members have communicated that this is in large part due to issues with the applicable rates set for these projects. CanSIA assumes similar levels of, if not more, issues will be experienced given the large price decrease applicable to FIT 4 Contracts. For this reason it is not entirely reasonable to assume that Applicants pursuing Price Reduction Priority Points correlates to an ability to capture reasonable rates of return with lower prices. This activity has been, in part, driven by competitive pressures to secure a contract based on speculation of future costs that may or may not turn out to be true. The high percentage of FIT 3 and FIT 3.1 contract that have not reached NTP should be indicative that development costs could very well be higher than is economic given the rate structure applicable.

2.4 Price Reduction Priority Points and Tiers

The IESO has signaled within the draft FIT 5 Rules that the Price Reduction Tiers will be set through analysis conducted for the FIT/mFIT Price Review. CanSIA recommends maintaining the maximum previous maximum Price Reduction Tier of 12% and including further differentiation within the remaining tiers (i.e. creating additional tiers between 4 – 12% and thus additional differentiation between Applications).

The current Price Reduction Tiers have only three levels which does not differentiate drastically between Applications causing increased reliance on time stamp to determine the order of connection testing. Further, creating additional Price Reduction Tiers will enable Applicants to select the tier that is most appropriate for their particular cost structure rather than, for example, selecting a lower tier because they cannot economically make a higher tier work (thus not capturing all savings that could be captured), or, choosing a higher tier than is feasible in order to secure a competitive advantage.

The IESO has also identified that the average price reduction for Rooftop Solar was 5.4% and the average price reduction for Non-Rooftop Solar was 2.4%. From the IESO presentation delivered at CanSIA's Solar Ontario conference it is also clear that out of complete and eligible Applications: approximately 300 Applications selected Tier 1, approximately 30 Applications selected Tier 2, and approximately 270 Applications selected Tier 3. Tier 1 and Tier 3 received the most activity while Tier 2 was relatively underutilized. This supports CanSIA's recommendation that additional Price Reduction Tiers should be included between 4% and 12% to better enable those Applicants that select Tier 1 to increase their Tier when they are not able to make the full jump to Tier 2 at 8%.

2.5 Implement No Greater Than a 5% Base Price Reduction

Taking into consideration the slow development of FIT 3 Contracts and therefore the implied difficulty of completing projects at prices 26-30% higher than FIT 4 prices, CanSIA understands that part of the IESO's intention is to set prices lower in order to encourage industry to aggressively pursue cost reductions. CanSIA agrees with the goal of pursuing cost reductions and highlighted this goal within our Distributed Generation Task Force's Recommendation Report.

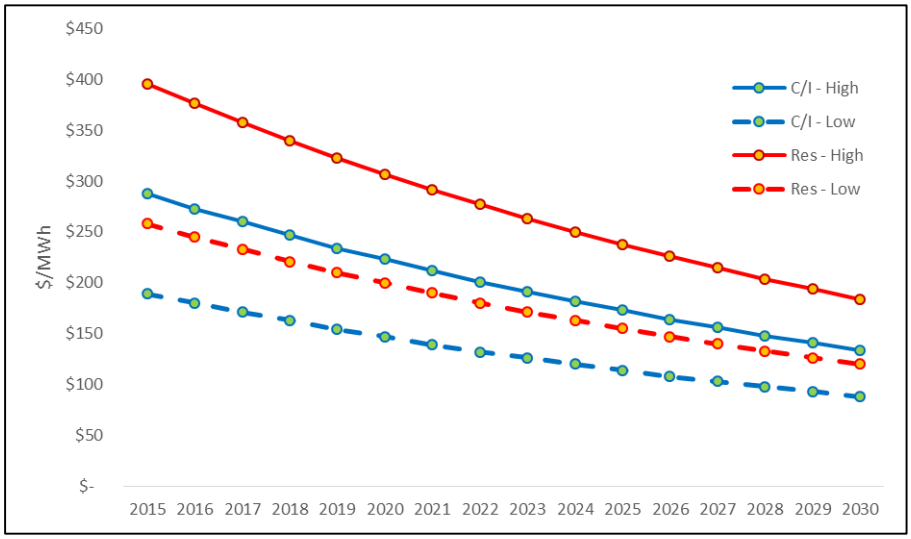
There are a number of solar industry experts that have differing views on the pace of cost reductions for solar PV into the future, but there is unanimous consensus that costs will continue to decline.

- NREL projects 0.4 - 4.7% annual system cost decline 2014-2025
- IEA projects 4.2% annual system cost decline 2015-2020
- Green Tech Media Research projects 5.6% annual module cost decline 2012-2017
- Tracking the Sun VIII – LBNL Sunshot (expects a 9% 2015 reduction)
- ITNPV projects 3.5% average annual system cost decline 2015-2025

The recommendations put forward by CanSIA's DGTF targeted a 5% annual installed cost decrease over next 20 years for residential and commercial/industrial solar generation facilities. Price decreases are driven by technological advances and addressing barriers to the adoption of solar generation including soft costs. The DGTF developed a simplistic financial model to determine revenue requirement for future DSG installations. Financial results were modeled based on a range of input assumptions to account for a variety of different business models and financial options available to DSG developers and DGTF members.

The cost of solar is shown as a range of values representing the 20-year revenue needed to support the investment in a given year. A range of revenue requirements was used instead of a single data point to capture the variety of internal and external cost and revenue structures of customers.

Figure 1: DSG Investment Threshold



In keeping with the recommendations of the DGTF, an assumed 5% per year cost digression applied to CanSIA supplied install costs in both the 2016 and 2017 Price Reviews, CanSIA recommends implementing no greater than a 5% reduction to the Base Price for FIT projects. It is important to emphasize that the 5% reduction in installed costs is as much a target as a forecast. Installed costs supplied by CanSIA within this submission are in some cases higher than the IESO forecasted costs from the 2016 Price Review – this would imply that some projects would remain uneconomic (having a negative NPV) at both the 2016 prices as well as at digressed 2017 prices. Nevertheless, CanSIA wishes to move the commercial solar industry forward in terms of cost digression at a measured pace. Further, in order to reach an economic balance between revenue required and revenue available from net metering systems (i.e. grid parity) by 2022, cost reductions of this scale will be required. CanSIA further emphasizes that changes to connection processes, connection costs, permitting, and other soft costs will be required to achieve this goal.

Given higher development costs for microFIT sized systems and comparatively low uptake since the imposition of the 2016 Price Schedule, CanSIA has a distinct recommendation on changes to the microFIT prices, detailed below.

3. microFIT

3.1 mFIT Application Rate and Implications

Since the introduction of the 2016 Price Schedule on January 1, 2016, the microFIT Program has seen consistently lower rates of Application than during the same time period during 2015. Taking total application values from the two microFIT Bi-Weekly Reports from late April/early May in 2015 and 2016

there is a 38% reduction in the total number of Applications that had been submitted in 2016 vs the same time period in 2015. This time period has been chosen for comparison as it was the Bi-Weekly Report released closest to the suspension of the microFIT Program (on April 25, 2016) in order to remove that event and its effects on Application rates from the comparison.

Table 7: microFIT Application Volume Comparison

Bi-Weekly Report Date	Total Applications	Total MW	Procurement Target Remaining
29-Apr-16	1,324	13.017	45.6
01-May-15	2,132	21.091	36.7

The microFIT Program was re-opened on June 21, 2016. Over the course of the month between June 21, 2016 and the July 22, 2016 Bi-Weekly Report posting approximately 172 Applications were submitted. At the current post-suspension rate of Application (i.e. 172/month) the microFIT Program will under subscribe its 50 MW Procurement Target by at approximately 37 MW. In order to achieve the Procurement Target the Application Rate would need to increase by approximately 423% to 900 Applications/month. Achieving an Application rate of 900 Applications/month is incredibly unlikely, given all periods of historical Application rates, making it just as unlikely that the full microFIT Procurement Target of 50 MW will be utilized in 2016.

The one current factor that could have a positive effect on Application rates is the introduction of a slightly higher price for Rooftop Solar projects that are ≤ 6 kW. As the Bi-Weekly Report does not provide a breakdown between projects that are ≤ 6 kW, and projects that are >6 kW it is difficult to assess whether new Applications are focused on the smaller size tranche (for which a higher price of 31.3 (¢/kWh) was introduced).

3.2 Maintain microFIT Contract Prices

Current rates of application have slowed dramatically since the introduction of the 2016 Price Schedule and while installed costs are expected to be lower than previously indicated in CanSIA's 2016 Price Review submission (as they have been forecast out to 2017/2018 and evaluated by members), they will not be low enough within the 2017/2018 timeframe to warrant a further price decrease. Currently established contract prices are clearly proving very difficult for solar companies to build (as evidenced by reduced application rates) and installed costs remain higher than those used by the IESO in the development of the 2016 Price Schedule.

For these reasons it is CanSIA's firm recommendation that microFIT contract prices be maintained for the 2017 period.

4. Conclusion and Summary of Recommendations

The installed cost of solar in Ontario continues to drop over time and has made excellent progress when compared to US installed costs for similar sized projects. CanSIA supports taking a fact based, reasonable approach to FIT price setting that takes accounts of this reality but which maintains an applicant's ability to receive a reasonable rate of return on their investment.

The IESO, during the 2016 Price Review, implemented steep reductions to the prices for both FIT and microFIT Projects. These price reductions have had mixed results. For FIT, interest remains strong – for microFIT, Application rates have declined and it is almost assured that the 50 MW Procurement Target will not be fully utilized.

CanSIA has provided install cost values for all project size tranches which forecast the install cost for microFIT systems in 2017/2018 and FIT systems in 2019/2020. Using these values, their associated LCOEs, and analysis of trends experienced within the FIT and microFIT Programs, CanSIA recommends the following:

1. Implement no greater than a 5% reduction to the Base Price for FIT;

2. Incorporate reasonable leasing costs as a component of ongoing operation and maintenance costs for FIT;

3. Maintain the current maximum Price Reduction Tier of 12% and add additional tiers between 4 – 12%; and

4. Maintain current contract prices for microFIT.

Thank you for the opportunity to provide input into the 2017 Price Review. CanSIA staff are available to answer any questions with regards to this submission at your convenience.

Sincerely,

Ben Weir
Director of Policy and Regulatory Affairs
Canadian Solar Industries Association

CC: John Gorman, President & CEO, Canadian Solar Industries Association
Wes Johnston, Vice President, Canadian Solar Industries Association

5. FIT/microFIT Development Cost Data

5.1 FIT

		Rooftop	Rooftop	Non-Rooftop
System Assumptions				
Capacity	kWac	100	500	500
DC Overbuild Ratio	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%
Install Costs				
EPC				
Modules (DC)	$/Wdc	$ 0.69	$ 0.69	$ 0.66
Inverters (AC)	$/Wac	$ 0.18	$ 0.18	$ 0.19
Racking/Mounting (DC)	$/Wdc	$ 0.20	$ 0.20	$ 0.18
BOS (DC)	$/Wdc	$ 0.90	$ 0.77	$ 0.74
Interconnection Costs	$/Wac	$ 0.06	$ 0.06	$ 0.04
Other Costs (Engineering, Permitting, Legal etc.)	$/Wac	$ 0.20	$ 0.16	$ 0.15
Total Development Costs	$/Wac	**$ 2.58**	**$ 2.40**	**$ 2.27**
Annual Operation and Maintenance Costs				
O&M Cost	$/Wac	$ 0.03	$ 0.03	$ 0.01
Lease	$/Wac	$ 0.04	$ 0.04	$ 0.04
Insurance	$/Wac	$ 0.01	$ 0.01	$ 0.01
Total Annual Operation and Maintenance Costs	$/Wac	**$ 0.08**	**$ 0.08**	**$ 0.06**

5.2 microFIT

		Rooftop	Rooftop	Non-Rooftop
System Assumptions				
Capacity	kWac	6	10	10
DC Overbuild Ratio	DC/AC	100.0%	100.0%	100.0%
Average Annual Capacity Factor	-	13.0%	13.0%	13.0%
Annual Degradation Factor	-	0.70%	0.70%	0.70%
Project Life	Years	20.00	20.00	20.00
Financial Assumptions				
Debt	-	85%	85%	85%
Equity	-	15%	15%	15%
Debt Term	Years	20	20	20
Debt Interest Rate	-	7%	7%	7%
Target ROE	-	9%	9%	9%
Install Costs				
EPC				
Modules (DC)	$/Wdc	$ 0.90	$ 0.81	$ 0.81
Inverters (AC)	$/Wac	$ 0.60	$ 0.60	$ 0.60
Racking/Mounting (DC)	$/Wdc	$ 0.29	$ 0.29	$ 0.29
BOS (DC)	$/Wdc	$ 0.81	$ 0.81	$ 0.81
Interconnection Costs	$/Wac	$ 0.13	$ 0.13	$ 0.04
Other Costs (Engineering, Permitting, Legal etc.)	$/Wac	$ 0.11	$ 0.11	$ 0.03
Total Development Costs	$/Wac	**$ 2.84**	**$ 2.75**	**$ 2.58**
Annual Operation and Maintenance Costs				
O&M Cost	$/Wac	$ 0.04	$ 0.04	$ 0.04
Lease	$/Wac	$ -	$ -	$ -
Insurance	$/Wac	$ 0.04	$ 0.04	$ 0.04
Total Annual Operation and Maintenance Costs	$/Wac	**$ 0.08**	**$ 0.08**	**$ 0.08**

*Non-Rooftop ≤10 kW is modeled as a fixed tilt system.