

# Developers and Global Investors Snap Up India's Solar Power Tenders

## *Decoding Tariffs vs. Returns for Solar Projects in India*

### Executive Summary

In the last four years, solar installations in India have grown more than five-fold, from a mere 6 gigawatt (GW) of capacity in 2016 to almost 35GW, achieving more than one-third of the country's ambitious 2022 solar target of 100GW.

With another 23GW of projects in the pipeline and 30GW in the bidding phase, the sun is shining bright for India's rising solar graph.

These numbers, current as of March 31, are a testament to the response from solar developers and global capital providers who, despite some policy headwinds, are willing to invest in the sector despite some of the lowest real solar tariffs in the world.

To earn reasonable returns from infrastructure projects such as these, it is crucial that the developers factor in the risks and rightfully estimate the costs of every component.

It is difficult to generalise the return expectation as every investor/developer has a different objective and the bidding decisions at times are dependent on sources of funds, risk-taking appetite, and the project pipeline.

However, our analysis reveals that under current market conditions, tariffs below Rs2.50/kWh (US\$ 3.47 cents/kWh) are financially unviable in the Indian solar sector today.

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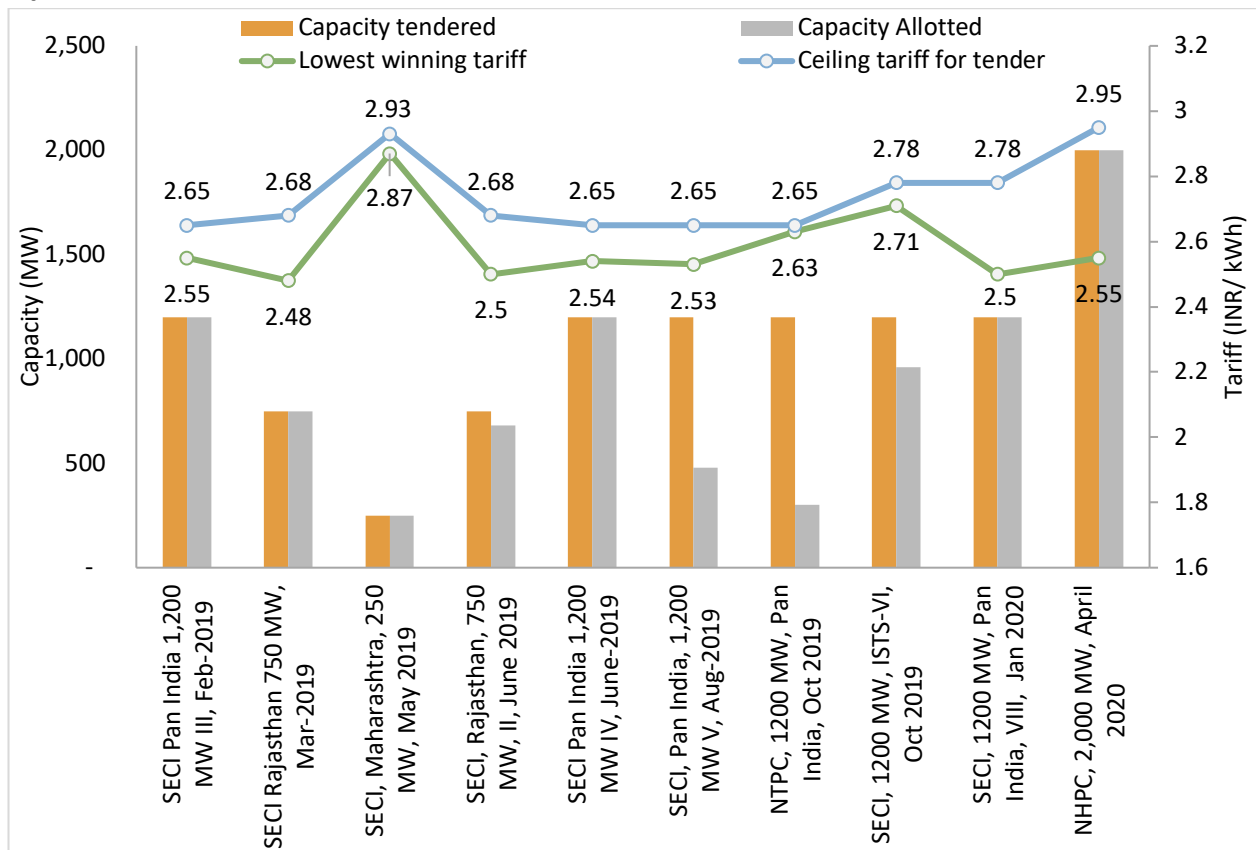
### Introduction

Solar tariffs in India have fallen continuously over the last few years. They only began to stabilize in 2019.

Since 2019, most of the newly-auctioned solar projects saw tariffs in the range of Rs2.50-2.87/kilowatt hour (kWh) (US\$3.5-3.9 cents/kWh). Interestingly, seven of 10 tenders turned up winning tariffs below Rs2.55/kWh (US\$3.54 cents/kWh), which were well below the ceiling. Most of these tenders were fully subscribed, even with such low tariffs. Out of 10 successful auctions, only two specific cases involved tenders that were undersubscribed by more than 60%.

Clearly, there has been no visible impact of ceiling tariffs on solar auctions in the last few months, but the Ministry of New and Renewable Energy (MNRE) removed ceiling tariffs in February 2020 for all new solar and wind tenders to hasten tender activity and capacity allocation.

**Figure 1: Details of Solar Auction Completed in India from January 2019-April 2020**



Source: JMK Research.

Despite low tariffs, project developers continue to show interest in building their solar portfolios depending upon their project pipeline, cost of financing, ability to negotiate favourable equipment contracts and their internal rate of return (IRR) expectations.

## A Model for Analysing Costs and Tariff Trends

To understand whether project developers were getting a sufficient risk-adjusted return on investment, we built a financial model to analyse the costs and tariff trends in India's utility-scale solar sector.

We took as a base case an example of a 250 megawatt (MW) solar project located in Rajasthan allotted by Solar Energy Corporation of India (SECI), a central government agency. We selected Rajasthan as the project location since it receives the most solar radiation in India.

In our case study, SECI is the preferred primary offtaker as lower tariffs to the tune of Rs2.50-2.55/kWh (US\$3.47-3.54 cents/ kWh) are seen in most of the agency's tenders, consistent with SECI's central government underwriting.

A list of other assumptions and project costs considered for our analysis is in Table 1 below:

**Table 1: Assumptions for Analysis**

S. No	Parameter	Units	Value
1	Project Capacity (AC)	MW	250
2	DC Overloading ratio <sup>1</sup>	%	40%
3	Project Cost	Rs million/MW	38.2
		US\$ million/ MW	0.53
4	Capacity Utilization Factor (CUF)	%	19.50%
5	Cost of Financing	%	11.00%
6	Loan Tenor	Years	18
7	Debt/Equity Ratio		75:25:00
8	Tariff	Rs / kWh	2.55
		US\$ cents/ kWh	3.54
9	Primary Power Offtaker	Solar Energy Corporation of India (SECI)	
10	Secondary Power Offtaker	State DISCOMs	
11	Commissioning date	2021	
12	Project Location	Bhadla Solar Park, Rajasthan	

Source: JMK Research.

\*Average conversion rate taken is 1 USD= INR 72.

<sup>1</sup> A solar power plant rarely produces nameplate capacity power as solar modules operate at their maximum efficiency only during limited peak hours. It has, therefore, become routine industry practice to over-size DC module capacity to generate more power - a concept commonly known as DC overloading.

The key project costs include modules (64%), inverters (7%), and balance of system costs (8%). Other project costs include solar park charges (12%) that are paid to solar park developers for infrastructure and facilities such as land, evacuation, and transmission line connectivity to the inter-state transmission (ISTS) network. Pre-operative, contingency and interest expenses during construction make up the balance of 9% of the total project cost of Rs38.2m or US\$0.53m/MW of capacity.

We have assumed a base case tariff of Rs 2.55/kWh (US\$ 3.54 cents/kWh). With these project costs and assumptions, the equity IRR for solar projects is calculated at 12.9%. The margins have shrunk in the last three years for developers. Earlier equity IRR of more than 14% was considered good, but now with falling tariffs and increasing competition, most developers are estimated to be getting equity returns of 12-13%, leaving very little margin for error if there are unplanned project delays or curtailments. Given the high financial leverage of 75:25 debt to equity, there is scope for a refinancing gain once construction and commissioning risks are removed, with debt priced around 10% annually for 25-year contracts underwritten by SECI.

### *Risk and Sensitivity Analysis*

During a project life cycle, a large-scale solar project can face construction as well as operational risks.

Some of the significant risks that can affect the profitability of a solar project are outlined below:

- **Less-than-estimated generation**

In India, the capacity utilisation factor (CUF) typically ranges from 17.5-20.5% depending on project location, operations and maintenance (O&M) practices adopted, equipment quality and technology. Under present market conditions, solar tariffs in the range of Rs2.50-2.55/kWh (US\$ 3.4-3.54 cents/kWh) are unsustainable if the CUF is below 19%.

In the state of Rajasthan, with high solar radiation (the best in the country) and new module technologies like the Monocrystalline with Passivated Emitter and Rear Cell (PERC), the CUF can easily be between 19-20%. Experts believe that with a DC overloading of 40% and seasonal tilt project configuration and/or bifacial solar modules, CUF can go as high as 22%. However, less generation can also occur because of lower radiation, inadequate O&M practices and equipment failure.

- **Increase in interest rates**

Interest rates are the most significant determinant for tariffs in India. Typically, interest rates for renewable energy projects with a loan repayment tenor of 15 - 18 years vary from 10-12%. These interest rates are not fixed and change frequently over the life of the loan in line with Reserve Bank of India (RBI) guidelines, adding interest rate risk during the repayment period.

- **Import duties on modules**

A 15% safeguard duty applies but is likely to end in July 2020, when a new basic custom duty (BCD) is to be introduced. Industry sources expect the effective BCD to be 5-10% in the initial years, and then increase gradually to 20%.

The final BCD notification has yet to be issued by the Government and is, for now, the only uncertain component that developers cannot assess. Our modelling is predicated on a 10% BCD assumption.

- **Change in module cost**

Modules constitute some 64% of total project cost. Any change in module costs has a considerable impact on returns. There is a substantial lag of 8-12 months between bidding and module procurement for a large-scale solar project. Any rise in module prices during this time significantly reduces returns (and vice versa).

- **Currency fluctuation**

Around 70-80% of solar power developers in India have sourced solar modules and other equipment from China, where it is cheaper, and generally higher quality. Depreciation of the rupee increases the prices of imported equipment.

As per RBI norms, project developers in India cannot hedge currency risk for import component (solar modules) unless Letter of Award (LOA) is issued to them. LoA's are issued to developers once bidding has been concluded by the tendering authority. However, there are delays in signing power supply agreements (PSA) with state distribution companies by tendering authority, which in turn holds up LoA's for the developers exposing them to currency fluctuation risk.

- **Payment risk**

In India, tariffs are also driven by the offtake risk profile of central and state government agencies. Central Government tenders have lower tariffs than state tenders because of the added security of payment from the central government agencies such as SECI and NTPC.

The high risk of payment delays from state agencies in the past resulted in low to no participation from bidders in many state tenders. For example, a 2018 500MW solar tender from the Tamil Nadu Generation and Distribution Corporation Ltd. (TANGEDCO) had no response from bidders and was eventually cancelled.

Payments due from state agencies such as TANGEDCO have been delayed by more than a year, raising project developers' payment risk and resulting in minimal or no participation.

- **Project delays**

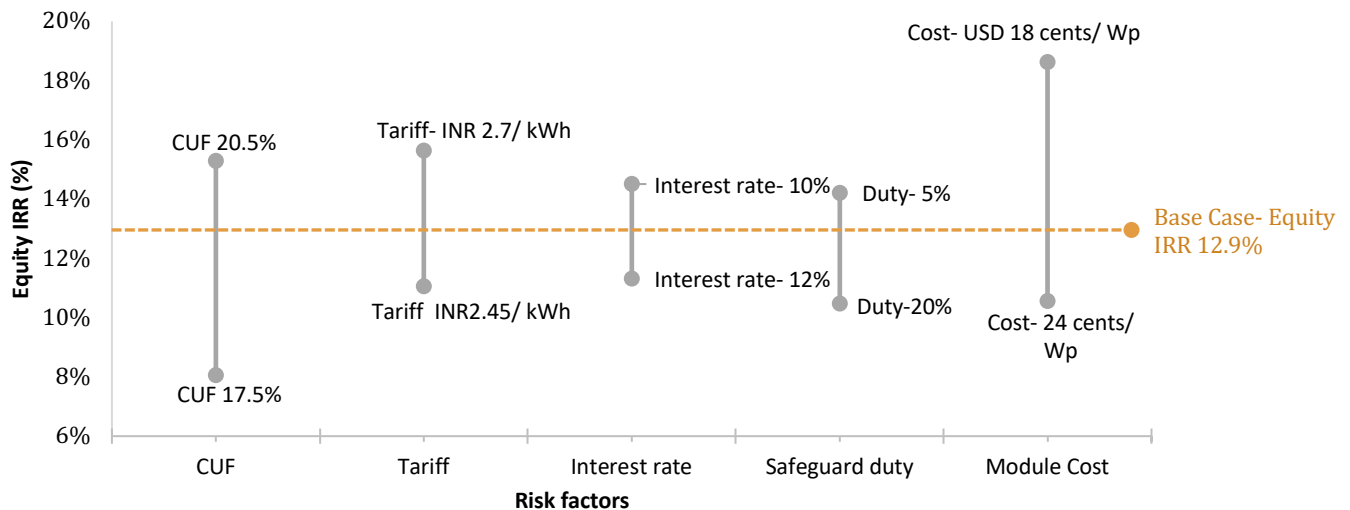
Commissioning can also be held up by execution or land acquisition delays. Projects located in solar parks have minimal land acquisition or grid connection delays, removing a key financial risk (a big attraction for foreign investors).

Project location, offtake risk profile, project size, cost of financing and module costs are the primary variables that affect returns for solar projects in India.

### Results of our Modelling

We have performed the sensitivity analysis on these critical parameters and have calculated the impact on project returns.

**Figure 2: Risk vs. Returns Analysis of Solar Projects in India**



Source: JMK Research.

Figure 2 above shows CUF and module cost have a maximum impact on the equity IRR. A 3% drop in CUF results in an over 7% decline in equity IRR, and a 9% decline in module costs can increase equity IRR by more than 2%. The impact of changes in module costs is significant on equity IRR as safeguard duty is also linked to module cost and hence has a cascading effect on the total costs.

Module costs in India have fallen by more than 12-15% in the past year, to around US\$0.20-0.22/kWh. Some developers have historically bet on module prices falling in the next year and have bid at aggressive tariffs.

Given the COVID-19 pandemic, it is likely that global demand will decline, leading to further falls in module costs over the next few months. Moreover, global module manufacturing capability could **potentially double in the next 2-3 years**, adding enormous economies of scale and potentially flooding the global market, a development likely to drive module costs down in the medium term.

Another critical factor is change in tariffs. A Rs0.05/kWh change in the base case tariff changes the equity internal rate of return (IRR) by about 1%. Under current market conditions, at a capacity utilisation factor below 19.5%, a tariff less than Rs2.55/kWh (US\$ 3.54 cents/kWh) is not sustainable without lower financing and/or reduced landed module costs.

The impact of safeguard duty on project returns is also considerable. For the safeguard duty range of 5% to 20%, the equity IRR varies from 14.2% to 10.5%.

The cost of financing/interest rate is one of the most significant determinants of solar tariffs in India. A 2% dip in the annual interest rate increases equity IRR by more than 3%. International players who have access to low-cost financing (7-9%, including hedging cost) with a longer repayment tenor are able to bid more aggressively than their domestic counterparts. Big national Indian leaders such as Adani Green, Azure Power and Renew Energy are using this advantage via the international green bond market.

Another critical factor is the payment risk profile of the primary power offtaker. For tenders where the primary offtaker is a central government agency such as SECI or NTPC, developers are capable of securing finance at lower interest rates, showing the critical enabling role of the Central Government in reaching Prime Minister Narendra Modi's ambitious target of 450GW of renewables by 2030.

## Conclusion

To earn reasonable returns on solar infrastructure projects, it is crucial for developers to factor in the risks and correctly estimate the cost of every component.

Our analysis shows that under current market conditions, tariffs below Rs2.50/kWh (US\$3.47 cents/kWh) are financially unviable in the Indian solar sector today.

However, it is difficult to generalise the return expectations as every investor/developer has a different objective, and bidding decisions depend on the following factors:

1. **Sources of funds** – Large national and international project developers with access to low-cost financing (both debt and equity) have lower IRR expectations than Indian investors. So, they tend to bid aggressively at global scale compared to Indian counterparts.
2. **Risk-taking appetite** – Some developers bid aggressively on predictions of falling module costs and interest rates, potentially underestimating the currency risk, while some developers take a more conservative approach.
3. **Project pipeline** – Developers with large project pipelines tend to be patient and bid more conservatively compared with developers that have a relatively small or no project pipeline.

Regulators in India are proactive in handling some of the key issues raised by the developers in the past such as removal of ceiling tariffs, enforcing payment

security mechanism like issuance of advance Letter of Credit (LC) in favour of RE developers. Under the recently issued Draft Electricity Amendment Act 2020 and proposed tariff policy, several progressive measures are being planned for the RE sector like introducing a common pan India renewable purchase obligation (RPO) trajectory with stringent penalty mechanism.

There can be few more initiatives that the government can take to hedge some of the risks faced by the Indian RE developers. One of them can be to follow the bidding approach that is being adopted in thermal sector wherein before the bid is planned, relevant approvals are taken from the state regulators and DISCOMS. This would avoid unnecessary delays and help developers streamline their project schedules.



## About JMK Research & Analytics

JMK Research & Analytics provides research and advisory services to Indian and International clients across Renewables, Electric mobility, and the Battery storage market. [www.jmkresearch.com](http://www.jmkresearch.com)

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