

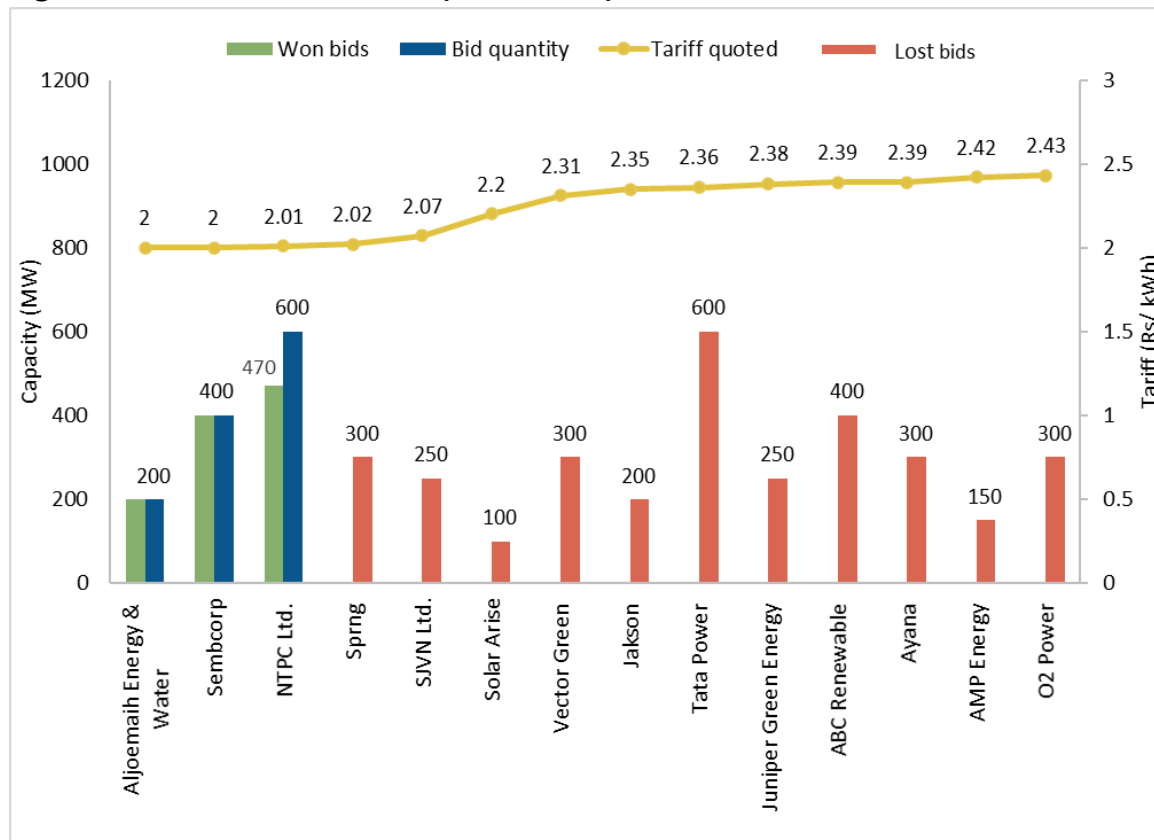
# Why India's Solar Power Tariffs Reached an Historic Low

*New Record of Rs2 Per kWh*

## Executive Summary

In less than five months, India has witnessed two new record low solar power tariffs. The Solar Energy Corporation of India Ltd. (SECI) auction on 23 November 2020 saw the lowest tariff yet of Rs2/kWh. The tariff-based bidding was conducted for the selection of solar power developers to set up 1,070 megawatts (MW) of grid-connected solar PV projects on a 'build-own-operate' (BOO) basis in Rajasthan (Tranche-III). With 14 developers participating, the tender was oversubscribed by 3,280MW, attracting a total of 4,350MW of bids. SECI's 2 gigawatt (GW) solar tender under inter-state transmission system (ISTS) (Tranche-IX) auction on 30 June 2020 set the previous lowest winning (L1) tariff record of Rs2.36/kWh.

**Figure 1: SECI 1,070MW Solar (Tranche-III) Tender Result Details**



Source: SECI, JMK Research.

---

Saudi Arabia-based Aljomaih Energy and Water Co. and Singapore-listed Sembcorp Energy's India arm Green Infra Wind Energy Ltd. were the L1 bidders with a tariff of Rs2/kWh for 200MW and 400MW capacities respectively. State-owned NTPC Ltd. won the contract for the remaining 470MW as it quoted the second lowest (L2) bid of Rs2.01/kWh. The commissioning timeline for these projects is 18 months from the date of signing power purchase agreements (PPA). This is the first SECI tender where the majority of capacity (600MW) has been won by foreign developers.

Key factors behind this historic low tariff are:

- Power purchase assurance for the developers as the power sale agreement (PSA) between the intermediary procurer SECI and the buying entity has already been signed. Power procured by SECI has been provisioned to be sold to Rajasthan Urja Vikas Nigam Limited (RUVNL).
- Wider access to low cost financing (cheaper interest rates) by international developers based out of Saudi Arabia (Aljomaih Energy and Water Co.) and Singapore (Sembcorp) as well as government entities like NTPC which can secure debt at a rate of 7-7.5%. Since they can source funds at lower rates their return on equity expectation is also lower. As per Annexure 1, U.S. long-term interest rates have hit a six decade low of 0.7% this year while German government interest rates are negative.
- The prospect of installation of bifacial modules and single-axis trackers. Greater specific generation from this system reduces the levelised cost of energy (LCOE) of the overall solar plant.
- Expectation of a fall in module prices due to an expected surge in production. Expansions of existing production facilities were announced in the ongoing fiscal year by leading Chinese players including Risen Energy (13GW cell and module cap. expansion plan), Trina Solar (15GW module cap. expansion plan), ZnShine (10GW module cap. expansion plan), Canadian Solar (9.5GW module cap. expansion plan1), China Longi (15GW module cap. expansion plan2) et al.
- Higher DC overloading factor (as high as 50%) because of acceptance of string inverters across large scale solar projects.
- If Safeguard Duty (SGD) is not extended beyond July 2021 then it is possible that no SGD will be applicable to modules supplied for these projects. With the 18-month commissioning timeline for this tender, it is likely that modules will only be procured after July 2021.
- If exemption from Basic Custom Duties (BCD) is introduced in the next few months, these projects will get a pass through under 'change in law' clause.

---

<sup>1</sup> PV Magazine. [Canadian Solar flags up polysilicon, glass and EVA shortages](#). 19 November 2020.

<sup>2</sup> PV Tech. [LONGi defies gravity with record revenue, profit, and module shipments in first half 2020](#). 29 August 2020.

- An aggressive and competitive move to enter a new market by Saudi Arabian company Aljomaih Energy and Water Co. Sembcorp also went aggressive to secure its first big project in solar after 2013. It is one of the leading project developers in India with a wind portfolio of over 1.8GW but has to date just two utility scale solar projects of 35MW.

## Sensitivity Analysis

### *Extent of the Effect of Major Factors on Latest Solar Tariffs*

In order to comprehend the critical factors and their impacts that are driving the solar tariffs to unprecedented lows, a hypothetical model was designed. In this model, the solar PV project is assigned a capacity of 400MW and assumed to be located in Rajasthan.

Details of key assumptions for the analysis are provided in table 1 below.

**Table 1: Assumptions For Sensitivity Analysis (400MW In Rajasthan)**

S. No	Parameter	Units	Value
1	Project Capacity (AC)	MW	400
2	DC Overloading Ratio <sup>3</sup>	%	50%
3	Project Capacity (DC)	MW	600
4	Project Cost (On DC basis)	Rs Crores/ MW	2.4
		US\$ million/ MW	0.33
5	DC Capacity Utilisation Factor (CUF) – 1st year	%	19.5%
6	AC Capacity Utilisation Factor (CUF) – 1st year	%	29.25%
7	Degradation Factor	%	2% for 1st year 0.5% for subsequent years
8	Long Term Interest Rates	%	7.5%
9	Return on Equity	%	13%
10	Loan Tenor	Years	25
11	Depreciation (Straight Line Method)	%	3.6%
12	Debt/Equity Ratio		75:25
13	Safeguard duty/ BCD applicable		NIL
14	Expected Commissioning Date		June 2022
15	Project Location		Rajasthan
	Tariff Discovered (Rs/ kWh)		2.00
	Tariff Discovered (USc/ kWh)		2.78

Source: JMK Research. \*Average conversion rate taken is 1 USD= Rs72.

<sup>3</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. For Bifacial modules, the overloading ratio generally varies between 23 and 25% for optimum generation.

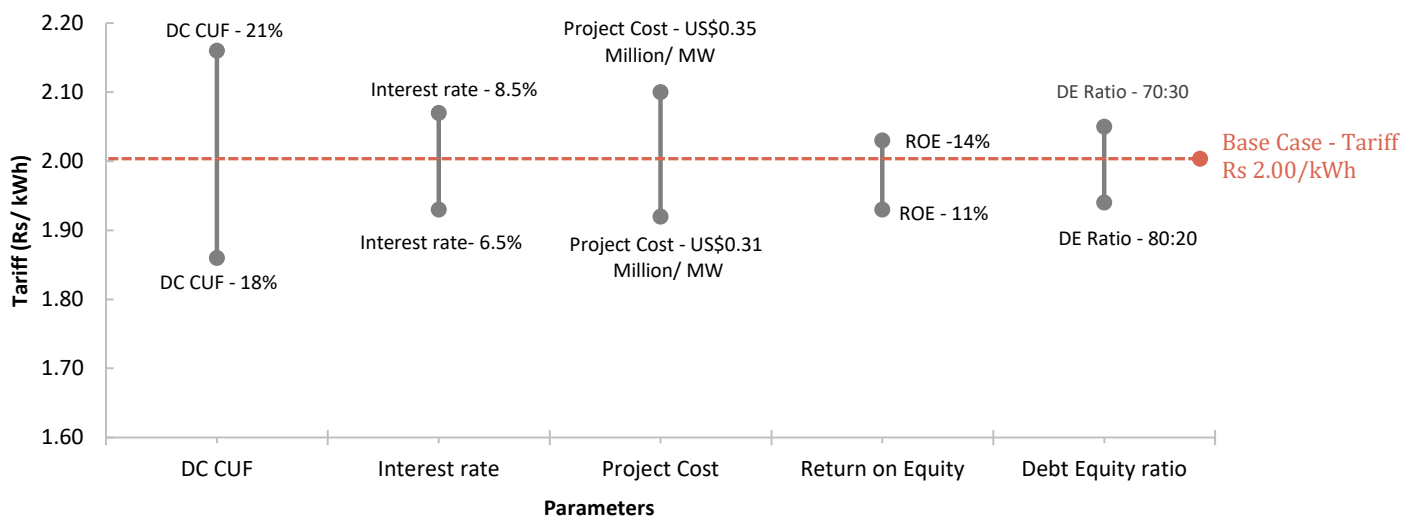
According to this model, two key factors drove the tariffs to Rs2/kWh:

Access of low cost financing at 7-7.5% for government entities like NTPC and for international developers able to arbitrage multi-decade, record-low OECD interest rates, even adjusting for a significant combined currency and country risk premium for India.

Expectation that mono PERC module prices will fall 10-15% to reach US\$19-20/Wp (watt peak) by 2022, excluding duties and taxes.

In addition to low cost financing and module price deflation, there is another possibility for such a low tariff of Rs2/kWh. The adoption of higher efficiency bifacial modules with single axis trackers increases the CUF by 4% to 23% which leads to higher generation. However, lenders in India are reluctant to fund this technology because of an absence of any previous project history or track record, despite its rapid adoption and use in various other countries including the UAE (refer to our report on India Unable to Compete with Record Low Solar Tariffs for more details).

**Figure 2: Sensitivity Analysis Viz-A-Viz Tariff for Solar Projects**



Source: JMK Research.

Key findings include:

- Capacity Utilisation Factor (CUF):** Project CUF is dependent on project location, operations and maintenance (O&M) practices adopted, equipment quality, and technology. Since Rajasthan is a good solar resource region with solar insolation ranging from 19-21%, depending on the site. A 3% drop in CUF results in a ~14% increase in tariff.
- Project costs:** Modules constitute some 64% of total project cost in India. Any change in the module costs has a considerable impact on returns. There

is a 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). A 14% fall in project costs (US\$0.31m/MW) leads to a 9% tariff reduction.

- **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%. However international developers and government entities can secure funds at lesser rates, even allowing for currency and country risk premia. An increase or decrease of 2% in interest rates leads to approximately a 7% increase/decrease in the price of tariffs.
- **Return on equity (ROE):** ROE also plays a major role in tariffs. If a developer is aggressive and desperate to build its project pipeline then its ROE expectation is also low. Even large national and international project developers with access to low-cost financing (both debt and equity) have lower ROE expectations than Indian investors. A 3% change in the base ROE changes the tariff by about 5%.
- **Debt equity ratio (D:E):** A 10% change in debt equity ratios leads to a ~5% change in tariffs.

## Conclusion

India is seeing aggressive tariffs for various reasons. Increased interest from new global entrants, availability of low cost funding, expectation of falling module prices, and possible adoption of new technology to increase generation are some of the factors driving the tariffs to a new low. No applicability of SGD and BCD on modules for this specific tender is also one of the reasons for lower tariffs.

Even though low tariffs are able to justify the returns, there are significant risks that a large scale solar project faces that must be accounted for. 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.

Risks that need to be taken into consideration before taking such aggressive steps include lesser generation on account of lower radiation than estimated, inadequate O&M practices, equipment failure, floating interest rates that change in line with RBI guidelines, rise in module costs due to various global demand and supply factors, currency fluctuation leading to higher prices for imported modules and inverters, power offtake risk of loss making distribution companies (discoms) and curtailment issues.

There are still big question marks over the technologies these projects will adopt and lenders that will back them. Also whether these projects only need financial engineering, or require adoption of new technologies with higher generation, or a mix of both is a space to watch.

This new low tariff will also impact discoms which will likely treat it as a new benchmark. This can further delay signing of PSAs of previously awarded but yet-to-be signed renewable projects between discoms and SECI. Project quality might also be impacted or compromised by such aggressive tariffs.

Time alone will tell whether this tariff is viable but clearly this bidding has demonstrated the very strong global investor confidence in the Indian solar sector even amidst the pandemic. It sets yet another tough benchmark for the whole industry, but also highlights the cost reduction opportunities for India as it builds a more sustainable, more domestic-based energy system in its drive towards zero emissions electrification of the economy.

## Annex 1: US Government Benchmark Interest Rates

Long-Term Interest Rates, % Per Annum, Jan 1990-Oct 2020



Source: OECD Data.

---

## About JMK Research & Analytics

JMK Research 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)

## About IEEFA

The Institute for Energy Economics and Financial Analysis (IEEFA) examines issues related to energy markets, trends and policies. The Institute's mission is to accelerate the transition to a diverse, sustainable and profitable energy economy. [www.ieefa.org](http://www.ieefa.org)

## About the Authors

### Jyoti Gulia

Jyoti Gulia is the Founder of JMK Research. Jyoti has about 14 years of rich experience in the Indian renewable sector. Her core expertise includes policy and regulatory advocacy, assessing market trends, financial modelling and advising companies on their business strategy. She has worked with leading management consulting companies in the Indian renewable energy sector including Bridge To India, Tecnova, Infraline and CRISIL. [jyoti.gulia@jmkresearch.com](mailto:jyoti.gulia@jmkresearch.com)

### Vibhuti Garg

Energy Economist Vibhuti Garg has advised private and public sector clients on commercial and market entry strategies, investment diligence on power projects and the impact of power sector performance on state finances. She also works on international energy governance, energy transition, energy access, reallocation of fossil fuel subsidy expenditure to clean energy, energy pricing and tariff reforms. [vgarg@ieefa.org](mailto:vgarg@ieefa.org)

This report is for information and educational purposes only. The Institute for Energy Economics and Financial Analysis ("IEEFA") does not provide tax, legal, investment, financial product or accounting advice. This report is not intended to provide, and should not be relied on for, tax, legal, investment, financial product or accounting advice. Nothing in this report is intended as investment or financial product advice, as an offer or solicitation of an offer to buy or sell, or as a recommendation, opinion, endorsement, or sponsorship of any financial product, class of financial products, security, company, or fund. IEEFA is not responsible for any investment or other decision made by you. You are responsible for your own investment research and investment decisions. This report is not meant as a general guide to investing, nor as a source of any specific or general recommendation or opinion in relation to any financial products. Unless attributed to others, any opinions expressed are our current opinions only. Certain information presented may have been provided by third-parties. IEEFA believes that such third-party information is reliable, and has checked public records to verify it where possible, but does not guarantee its accuracy, timeliness or completeness; and it is subject to change without notice.