

# Elevated Solar Module Prices: Rainy Days Ahead for Developers?

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## Background

Solar modules account for about 65% (at the present price levels) of the overall cost of setting up a solar power project. With domestic production only making up for 20%<sup>1</sup> of the annual requirements and reliance on imports from China being heavy, India's ambitious renewable energy plans are exposed to geographical and geopolitical risks. Hence, despite the government's focus on boosting domestic manufacturing of modules and setting up fully-integrated manufacturing lines, it would take a significant amount of time for the domestic ecosystem to be fully functional and meet demand by itself. In the interim, import dependency would continue.

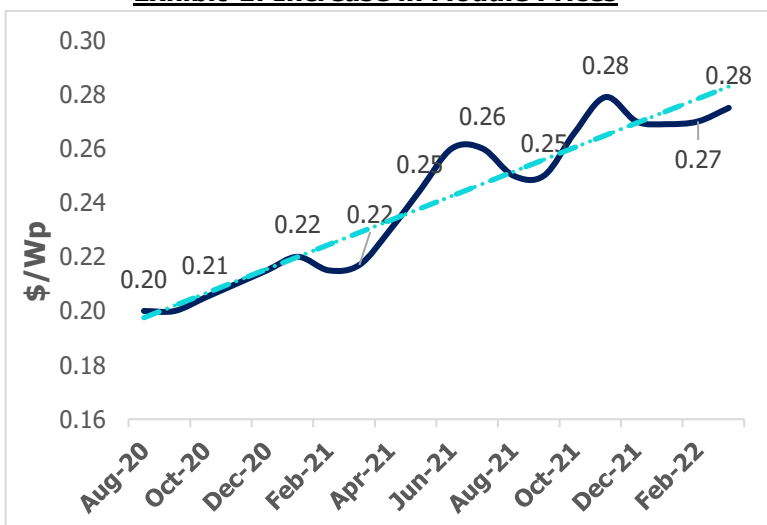
Over the past 18 months, the prices of solar modules have risen significantly, thereby putting pressure on the return metrics for the developers. The landed cost of solar modules has gone up further as the Ministry of New and Renewable Energy has announced the applicability of Basic Customs Duty (BCD) of 25% on imported solar cells and 40% on imported modules from April 1, 2022. The Goods and Services Tax (GST) council had also increased GST on the modules to 12% in October 2021 from 5%.

In this report, **CareEdge Ratings** has analysed the key reasons for the increase in the prices of the modules, the extent of the increase as well as its impact on the coverage indicators of the existing projects. CareEdge Ratings has also assessed the expected tariffs required in the upcoming bids to ensure the developers of similar returns as they were getting previously.

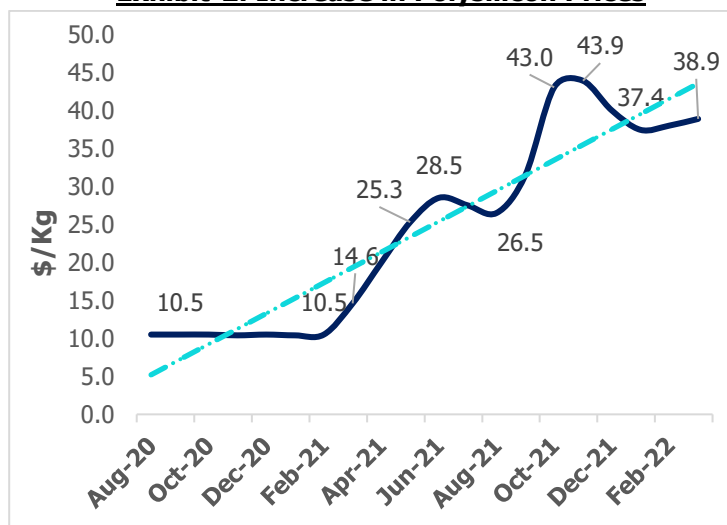
## Increase in Prices of Solar Modules

The prices of imported Mono PERC PV modules in India have risen by over 35% (shown in Exhibit-1) from around 20 cents/watt in August 2020 to around 28 cents/watt in March 2022. This is primarily because of an increase in the polysilicon prices (shown in Exhibit-2), which is a key input for PV modules.

**Exhibit-1: Increase in Module Prices**



**Exhibit-2: Increase in Polysilicon Prices**



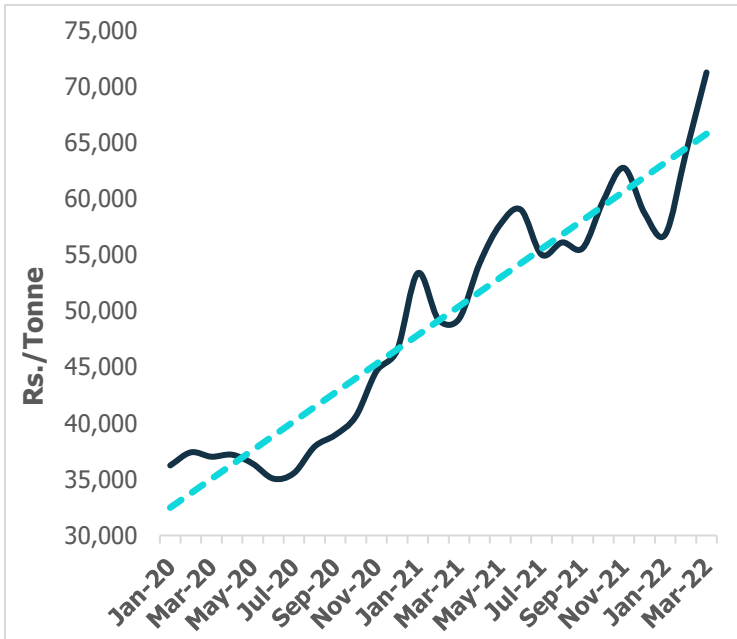
Source: PV Infolink, CareEdge Ratings

The key reasons for the increase in module prices are mentioned below:

<sup>1</sup> Source: Economic Times

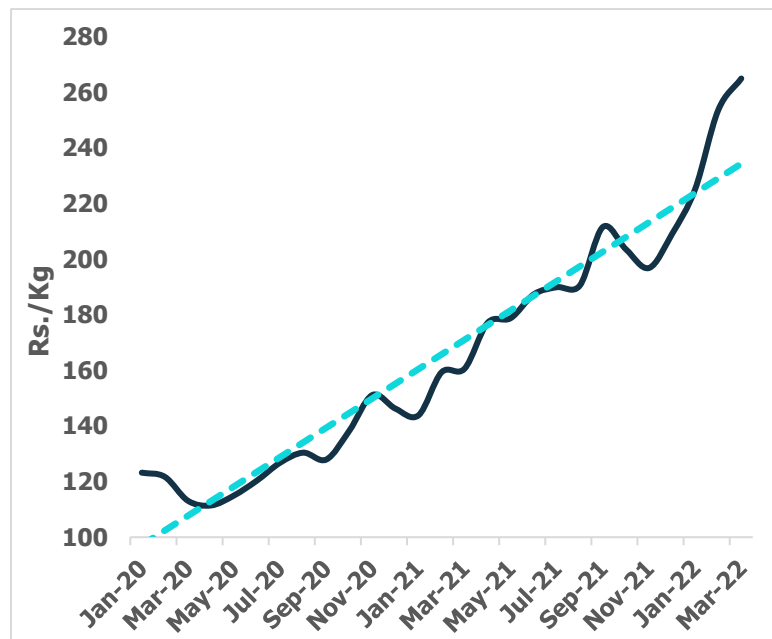
- Supply-chain Disruptions** - Polysilicon is a key raw material in solar module manufacturing. Over the years, its price reduction has been a major factor contributing to the decline in solar module prices, leading to competitive tariffs. However, the prices of polysilicon increased significantly from USD 10 per kg in August 2020 to USD 44 per kg in November 2021 and currently are around USD 39 per kg. This multifold increase in prices has primarily resulted in increased module prices. Moreover, other disrupting factors in the module supply chain include price hikes for commodities such as glass, steel and aluminium, shortage of containers and increase in freight rates, etc. As reflected by Exhibit-3 and Exhibit-4, the prices of steel and aluminium have increased by around 95% and around 115%, respectively, from January 2020 to March 2022. Such disruptions were exacerbated due to various Covid-19-induced lockdowns.

**Exhibit-3: Movement in Steel Prices**



Source: Steel Insights, CareEdge Ratings

**Exhibit-4: Movement in Aluminium Prices**



Source: Investing.com, CareEdge Ratings

- Impact of BCD and ALMM** – As BCD became applicable from April 2022, the developers, to save on costs, have pre-emptively stocked modules ahead of time. This is reflected by an increase in the imports to 9.7 GW in Q4 FY22 as against 3.1 GW in Q4 FY21<sup>2</sup>. The government has mandated procurement of modules for use in government projects, government-assisted projects, projects under government programmes, open access, and net metering projects in the country from original equipment manufacturers (OEMs), which are a part of the Approved List of Models and Manufacturers (ALMM). This presently only includes domestic manufacturers. Anticipating a rise in the demand, the domestic manufacturers have also increased their prices.
- Increase in Demand for Solar Modules** – Solar power installations have increased at a compounded annual growth rate (CAGR) of 23% from CY16 to CY21<sup>3</sup>, as a decline in the solar cost has made it competitive with respect to other sources of generation. Increased emphasis on procuring power through cleaner sources as well as global commitment to reduce carbon emissions has buoyed demand, too. This has resulted in demand outpacing supply over the past few quarters and in turn, increasing the cost of modules.

The power crisis in China, which accounts for a major portion of global production, has also impacted the supply of modules.

<sup>2</sup>Source: Mercom

<sup>3</sup>Source: IRENA

These inflationary pressures are likely to put upward pressure on the capital cost of the solar power projects and impact the returns for the developers who have projects under construction. Moreover, the bid tariffs in the subsequent auctions are likely to increase, as the developers will have to factor in the increase in input prices along with the implementation of BCD on solar PV cells and modules and the recent increase in GST.

### Price Built-up of Solar Modules

At present, the delivered price (on cost, insurance, and freight [CIF] basis) of imported solar modules and cells from China is around 30 cents/Wp and 18 cents/Wp, respectively. Additionally, modules and cells attract BCD of 40% and 25%, respectively, and cess of 10% on BCD. A GST of 12% is applicable on the solar equipment. To be more cost-effective, Indian developers are exploring entering into framework agreements with domestic module manufacturers, assuring them of substantial offtake over a period. As a part of this arrangement, domestic OEMs would import cells from the preferred Chinese manufacturers and convert them into modules for Indian developers thereby saving cost, as there is a difference between the BCD applicable on cells vis-à-vis modules.

The build-up of prices of modules under different scenarios is tabulated below:

#### Exhibit-5: Module and Cell Price Build-up

<b>Pre BCD</b>				
<b>Module Cost (Cents/Wp)</b>	<b>BCD@40%</b>		<b>GST@12%</b>	<b>Final Landed Cost (Cents/Wp)</b>
30	NA		3.6	~34
<b>Post BCD</b>				
<b>Import of modules</b>				
<b>Module Cost (Cents/Wp)</b>	<b>BCD@40% Cess of 10% on BCD</b>		<b>GST@12%</b>	<b>Final Landed Cost (Cents/Wp)</b>
30	13.2		5.2	~48
<b>Import of cells and domestic conversion to modules</b>				
<b>Cell Cost (Cents/Wp)</b>	<b>Conversion Cost (Cents/Wp)</b>	<b>BCD@25% Cess of 10% on BCD</b>	<b>GST@12%</b>	<b>Final Landed Cost (Cents/Wp)</b>
18	14	5.0	4.4	~41

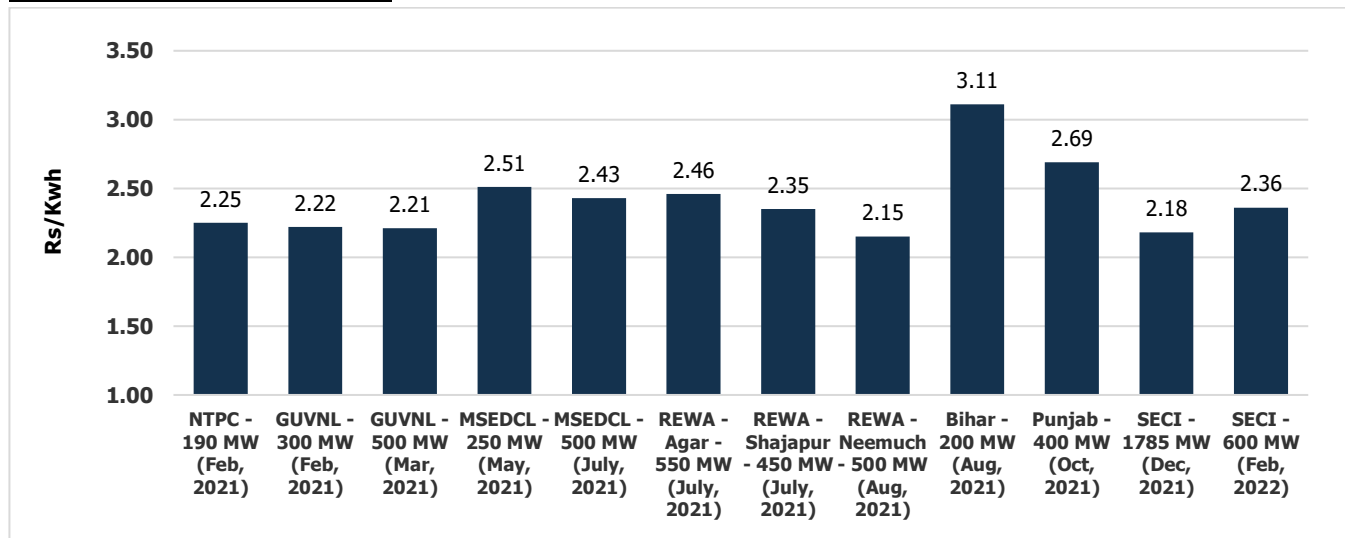
Source: CareEdge Ratings

As reflected in the table above, the landed price of imported modules has increased by around 41% from 34 cents in the pre-BCD regime to 48 cents in the present regime. However, most of the developers are expected to source imported cells and procure modules domestically, which will moderate the price increase to 7-8 cents. However, given the limited domestic module manufacturing capacities, and most of them are not capable enough to manufacture high-efficiency Mono PERC modules, the availability of domestic capacity would remain a challenge in the near to medium term.

### Recent Bidding Trends

While the impact of the rising module prices and the imposition of the BCD on imported PV modules were expected to increase the bid tariff rates by about 55-60 paise/unit, the actual increase in the bid tariff rates remained lower with most of the bid tariffs remaining around ₹2.3-2.4 per unit. One of the bids witnessed a tariff rate of ₹2.15 per unit in August 2021 (tariffs of recently bid projects are presented in Exhibit-6). This can be attributed to the favourable interest rate regime, lower expected return thresholds, and location-specific elements like lower capital costs associated with the transmission infrastructure and favourable irradiation prospects.

### Exhibit-6: Recent Bid Trends



Source: CareEdge Ratings; Counterparties in REWA projects include MPPMCL and Indian Railways

The tariffs in recent bids have not increased commensurate to the rise in module prices as developers are expecting the prices to correct over the next six to nine months, once the supply chain challenges alleviate. Some developers have even preponed their purchases to avoid any incurrence of BCD. As per CareEdge Ratings, in case the prices do not correct, a significant portion of the capacity under development would remain exposed to the implementation risk.

### Impact on Debt Protection Metrics of Projects

The viability of competitively bid-based solar tariffs is critically dependent upon the capital cost, the plant load factor (PLF) level and the availability of long tenure debt at cost-competitive rates. With the use of imported modules in most cases, the capital cost remains exposed to the volatility in the PV module price level and INR-USD exchange rate. The increase in module prices and implementation of duties and higher taxes has already resulted in moderation in debt protection and return metrics of the projects.

Without the application of BCD, a project having a bid tariff of ₹2.4 per unit, and sourcing modules at 34 cents/watt would have resulted in an average project debt-service coverage ratio (DSCR) of around 1.2x.

### Exhibit-7: Impact of Increase in Module Prices on Average DSCRs (Prior to Applicability of BCD)

DSCR	Tariff	Price (USD/Wp)					
		0.28	0.30	0.32	0.34	0.36	0.38
2.00	2.00	1.12	1.08	1.03	0.99	0.96	0.92
	2.20	1.24	1.20	1.15	1.11	1.06	1.03
	2.40	1.36	1.31	1.26	<b>1.21</b>	1.17	1.13
	2.60	1.46	1.41	1.36	1.31	1.27	1.23
	2.80	1.56	1.51	1.45	1.41	1.36	1.32
	3.00	1.67	1.61	1.55	1.50	1.45	1.41

Source: CareEdge Ratings, Debt and equity ratio of 70:30, the interest rate of 9.0% with repayment tenure of 20 years post-COD, DC PLF of 19.2%, DC-AC ratio of 1.5x and degradation factor of 0.7% per year; INR-USD exchange rate of 76; O&M cost of ₹2.5 lakh per DC MW with an annual escalation of 4.0%.

Post application of BCD, the already-won projects, wherein the modules have not been sourced, are expected to turn unviable, and the same has been reflected in the exhibit below. For a project to provide the same level of debt coverage and operate with imported modules, the bid tariffs should be closer to ₹3 per unit at the prevailing module prices.

### Exhibit-8: Impact of Increase in Module Prices and BCD (Import of Modules) on Average DSCRs

DSCR	Price (USD/Wp)					
	0.42	0.44	0.46	0.48	0.50	0.52

<b>Tariff</b>	<b>2.00</b>	0.85	0.83	0.80	0.78	0.75	0.73
	<b>2.20</b>	0.95	0.92	0.89	0.86	0.84	0.81
	<b>2.40</b>	1.04	1.01	0.98	<b>0.95</b>	0.92	0.90
	<b>2.60</b>	1.14	1.10	1.07	1.03	1.00	0.98
	<b>2.80</b>	1.23	1.19	1.15	1.12	1.09	1.06
	<b>3.00</b>	1.31	1.27	1.24	<b>1.20</b>	1.17	1.14

Source: CareEdge Ratings, Debt and equity ratio of 70:30, the interest rate of 9.0% with repayment tenure of 20 years post-COD, DC PLF of 19.2%, DC-AC ratio of 1.5x and degradation factor of 0.7% per year; INR-USD exchange rate of 76; O&M cost of ₹2.5 lakh per DC MW with an annual escalation of 4.0%; BCD on modules at 40%.

However, in case a project deploys only imported cells, wherein the modules are manufactured domestically from the imported cells, the expected tariff to maintain the same level of debt protection would be around ₹2.7 per unit. Moreover, an increase in the module price level by about 2 cents/watt is likely to moderate the debt service coverage metrics for the project developers by about 3-4 basis points.

#### **Exhibit-9: Impact of Increase in Module Prices and BCD (Import of Cells) on Average DSCRs**

<b>DSCR</b>		<b>Price (USD/Wp)</b>					
		<b>0.35</b>	<b>0.37</b>	<b>0.39</b>	<b>0.41</b>	<b>0.43</b>	<b>0.45</b>
<b>Tariff</b>	<b>2.00</b>	0.97	0.94	0.90	0.87	0.85	0.82
	<b>2.20</b>	1.08	1.04	1.01	0.97	0.94	0.91
	<b>2.40</b>	1.19	1.15	1.11	<b>1.07</b>	1.03	1.00
	<b>2.60</b>	1.29	1.24	1.20	1.16	1.13	1.09
	<b>2.70</b>	1.33	1.29	1.25	<b>1.21</b>	1.17	1.14
	<b>2.80</b>	1.38	1.34	1.30	1.26	1.22	1.18
	<b>3.00</b>	1.47	1.42	1.38	1.34	1.30	1.27

Source: CareEdge Ratings, Debt and equity ratio of 70:30, the interest rate of 9.0% with repayment tenure of 20 years post-COD, DC PLF of 19.2%, DC-AC ratio of 1.5x and degradation factor of 0.7% per year; INR-USD exchange rate of 76; O&M cost of ₹2.5 lakh per DC MW with an annual escalation of 4.0%; BCD on cells at 25%.

#### **CareEdge Ratings View**

CareEdge Ratings expects the rise in module prices to adversely impact the project returns for developers, who have not been able to source the modules so far, as a rise in the module price fails to abate. Moreover, with the basic customs duty kicking in from April 1, 2022, the landed cost of solar modules has further gone up jeopardising the returns for projects, which cannot avail recovery of extra project costs under the change in law clause. Furthermore, CareEdge Ratings expects the future bid tariffs to increase to around ₹2.7 per unit to ensure similar returns for developers, provided module prices remain firm.

#### **Outlook on the Sector and Way Forward**

There has been significant traction in solar power installations over the past few years and the cumulative solar power capacity has surpassed the installed wind power capacity, despite its late and slow start. As of March 31, 2022, India has an installed solar capacity of 54 GW. The overall renewable energy installations have increased at a CAGR of 17% from FY16-FY22. Over the years, the renewable energy industry has benefitted on account of the government's strong policy support, India's largely untapped potential, the presence of creditworthy central nodal agencies as intermediary procurers and improved tariff competitiveness. Going forward, with India setting up an ambitious target of achieving 500-GW non-fossil fuel capacity by 2030, the regulatory framework is expected to remain supportive.

However, the developers are expected to face challenges in the near term on account of the rising cost of modules and other ancillary products along with the imposition of basic customs duty on cells and modules from April 2022 onwards, increased GST on solar equipment, which is expected to further drive up costs and result in an increase in bid tariffs for new projects. Nevertheless, CareEdge Ratings estimates the tariffs of the upcoming projects to remain competitive below ₹3 per unit.

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