

Financing Trends in the Commercial and Industrial (C&I) Rooftop Solar Market in India

September 2021



Financing Trends in the Rooftop Solar Commercial and Industrial Segment (C&I) in India

Scaling up Rooftop Solar Finance in Untapped Markets

Executive Summary

Accessible financing is a prerequisite to drive growth in the rooftop commercial and industrial (C&I) solar market in India. Presently, this segment accounts for almost 75% of the total rooftop solar installations in India with annual additional installations of 1.3 gigawatts (GW) to 1.8GW in the last few years (Figure 1.1).

There are four ways to access funds for rooftop solar installations:

1. Equity investments;
2. Debt capital;
3. Mergers & acquisitions; and
4. Loans or concessional credit lines.

Since 2015, rooftop solar project developers have raised more than US\$2 billion, 48% (US\$985 million) of which came from equity funding and 29% (US\$599 million) from debt. Approximately 45% of these investments have been raised within the first eight months of 2021 alone, indicating a significant growth trend ahead. Almost all (99%) equity investments in this sector came from foreign entities looking to tap the Indian market, given the high growth potential and healthy return on equity (ROE).

Over the last five years, a majority of the funds raised through equity and debt routes has been concentrated within four active players in the segment: Amplus, Fourth Partner, CleanMax and CleanTech. While the four players have been successful in raising funds for their projects and sustaining their business, the sector has seen many major players including Statkraft India, Sterling & Wilson and Azure Power exit the market due to shrinking margins and regulatory setbacks by distribution companies (discoms).

For players who are not able to raise equity or debt investments, raising funds via loans from banks or non-banking financing companies (NBFC) is another possible route. In the past, by virtue of being a nascent technology in the Indian context, banks were reluctant to finance rooftop solar projects due to perceived risks, while NBFCs offered loans with high interest rates, making rooftop solar an unviable option. To combat this, several development agencies are tapping the market via nationalised banks and NBFCs to improve access to affordable financing options, while promoting the use of clean energy. The US\$625 million World Bank-State Bank of India (SBI) credit line and the Green Climate Fund (GCF)-Tata Cleantech credit lines are two major lines of debt funding that specifically target the rooftop solar sector in India.

In terms of funding allocated to developers, projects commissioned under the operating expenditure (OPEX) business model are given preference. The OPEX model accounts for only 10% to 15% of the total number of borrowers. In terms of quantum of loan, however, the share of OPEX is as high as 80% to 85%, due to the large project sizes that translate to larger loan sizes. Of the cumulative ~2 GW of OPEX rooftop solar installations in India, almost 40% of these installations are financed via the two biggest concessional credit lines—the World Bank-SBI credit line and the GCF-Tata Cleantech line.

With a limited number of good, creditworthy customers having ratings above BBB+, this segment is becoming saturated, resulting in reduced demand that has led major developers to look at foreign markets with potential growth opportunities. These developers have also started building projects through offsite open-access private solar parks to cater to the C&I segment.

On the other hand, Micro, Small and Medium-sized Enterprises (MSMEs) and residential customers still remain untapped, and hence offer huge growth opportunities. However, there are many barriers when it comes to financing MSMEs, such as lack of creditworthiness, lack of collateral, long-term uncertainties, and reluctance of renewable energy service companies (RESCOs) to work with MSMEs due to these uncertainties.

**There are many barriers
when it comes to
financing MSMEs.**

To address these barriers, innovative steps have been taken by the World Bank with its upcoming first-loss guarantee fund and the U.S. Agency for International Development (USAID) with a US\$41 million credit line, both of which are discussed in this report.

Based on our analysis, this report lays out recommendations for stakeholders and policymakers to make rooftop solar a more viable and attractive option. Some of these recommendations include:

- Regulations across states need to be consistent and should be implemented

from a long-term perspective.

- Favourable state policies and incentives targeting MSMEs can help make rooftop solar an attractive option to MSME customers.
- Discoms should consider offering lease or power purchase agreement (PPA) services at a lower cost than the private sector because of synergies in marketing, sales operations and large customer base, which can lower customer acquisition costs.¹
- Document verification and other compliance needs to be streamlined/ made online by big lenders such as SBI to ensure a quick turnaround time for rooftop solar loan disbursement for corporates.
- Aggregating smaller projects by developers and engineering, procurement and construction (EPC) contractors to create a large portfolio can help ensure affordable financing by virtue of larger volumes.

¹ IEA and CEEW, [Unlocking the Economic Potential of Rooftop Solar PV in India](#). July 2021.

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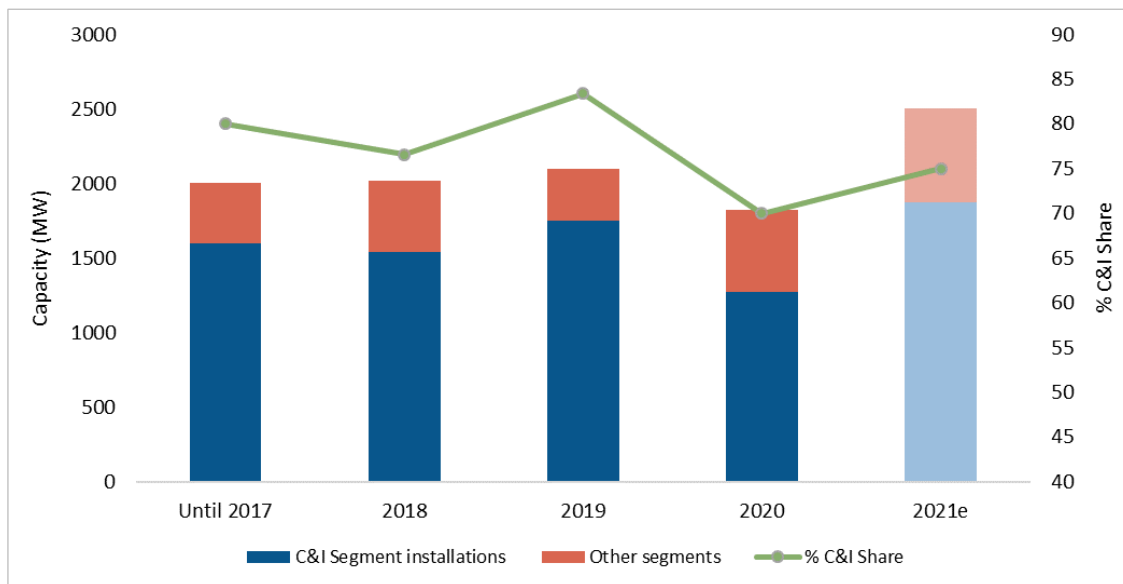
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1. Installation Trends in the C&I Rooftop Solar Sector

In India, the rooftop solar segment installations have been driven by the C&I segment alone. In 2020, C&I installations accounted for 75% of the total rooftop installations as depicted below. However, when compared to the growth in the solar utility segment, the growth of rooftop solar has been painstakingly slow.

As depicted in the figure below, the rooftop solar installations witnessed a slight year-over-year decline of 13% in 2020 due to COVID-related disruptions. However, this period has also seen interest from customers in solar rooftop on account of the increasing need to optimise cost. Also, the lapse of safeguard duty on solar modules at the end of July 2021 signifies the onset of the duty-free period for solar modules,² which can bring the overall installation costs down. This period will last until 31 March 2022, after which a new basic customs duty of 40% will be applied to solar modules.³ These factors combined could translate into an estimated 2,500 megawatts (MW) of new capacity during 2021, a 37% yoy increase in installations.

Figure 1.1: Rooftop Solar Installations Trend in India



Source: JMK Research.

Moreover, most of these rooftop solar installations are concentrated in large industrial states in India, including Karnataka, Tamil Nadu and Maharashtra. These states have high grid tariffs that increase electricity bills for corporates. Switching to rooftop solar helps these companies cut back on these high electricity costs, optimising their expenses. However, one major concern when it comes to adopting rooftop solar involves changing state policies. Since 2019, various restrictive net

² Business Standard. [Expiry of safeguard duty: Boon for solar developers. bane for manufacturers.](#) August 2021.

³ Live Mint. [India to impose steep customs duty on solar cells modules from April 2022.](#) 11 March 2021.

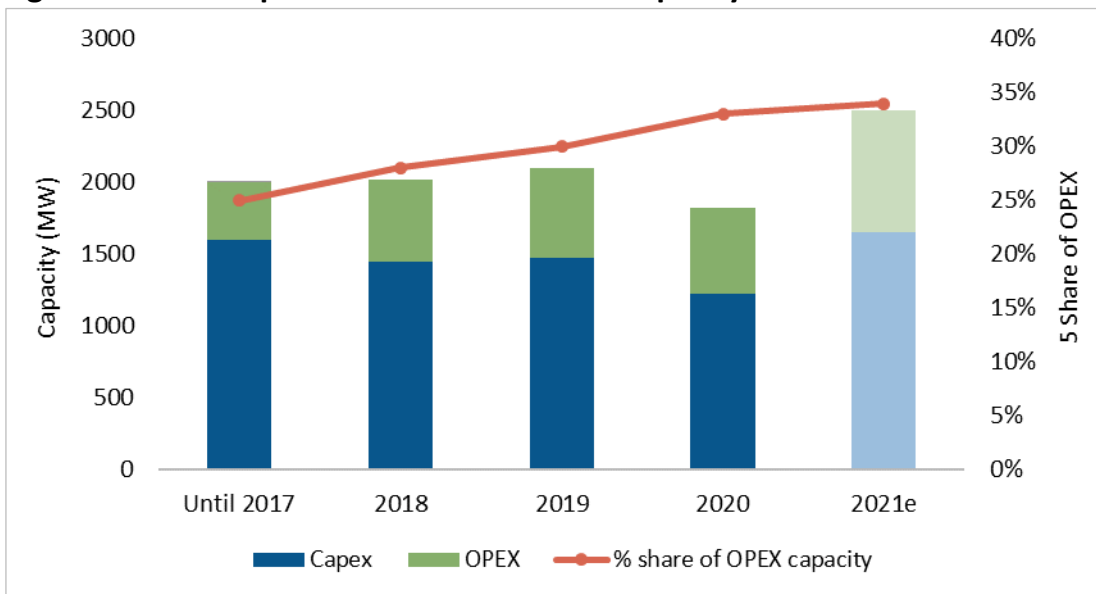
metering regulations have been introduced in states where C&I consumers have been barred from taking advantage of net metering provisions. Allowing net-metering results in lower PPA tariffs and shorter payback periods, translating to higher savings for customers.⁴

Regulators across states are also restricting energy banking, which is an important mechanism for renewable developers to accommodate the seasonal variability and utilise their excess generation. Recently, some renewable energy-rich states have moved from annual to monthly banking periods, and some have completely withdrawn banking facilities for renewable projects.⁵

2. Business Models for Financing Rooftop Projects

The two most adopted business models for rooftop ownership in Indian solar industry are capital expenditure (CAPEX) and operating expenditure (OPEX) models. Figure 2.1 shows the business model adoption trends:

Figure 2.1: Rooftop Solar - OPEX vs. CAPEX Capacity Addition Trend



Source: JMK Research.

The OPEX mode of rooftop solar financing has been gaining market share (in terms of annual capacity additions) gradually in recent years, as depicted above. The OPEX project tariff rate is about Rs3.5-4/kilowatt-hour (kWh; US\$0.047-0.053), less than half the average of most state C&I grid tariffs.

Given the economic impacts of the COVID-19 pandemic, the OPEX model is likely to gain more traction because C&I consumers with liquidity issues will opt for this

⁴ IEEFA and JMK Research. [The Impact of the 10kW Net Metering Limit on India's Rooftop Solar Market India](#). February 2021.

⁵ JMK Research. [Restrictive banking provisions hampering RE adoption in India](#). September 2020.

model to limit capital investment while still being able to save on electricity. According to JMK Research estimates, it is predicted that the share of OPEX projects for 2021 is likely to be 34%, or approximately 850 megawatts (MW), as shown in Figure 2.1.

Lenders such as Tata Cleantech prefer financing OPEX projects since CAPEX financing requires an asset to be kept as a collateral. Many customers, especially small and medium enterprises (SME), put forward assets that have already been collateralised with other lenders. To approve this, the lender needs to issue a No Objection Certificate (NOC) from respective stakeholders. This process of seeking NOCs and approvals ends up taking time, making CAPEX financing less attractive.

Other credit lines from lenders such as the World Bank concessional credit line for rooftop solar projects disbursed via State Bank of India (SBI) finance both OPEX and CAPEX projects. In terms of number of borrowers, the OPEX model accounts for only 10% to 15% of the total number of borrowers. However, in terms of loan amounts, the share of OPEX is as high as 85%, due to the larger project sizes that translate to larger loan sizes.

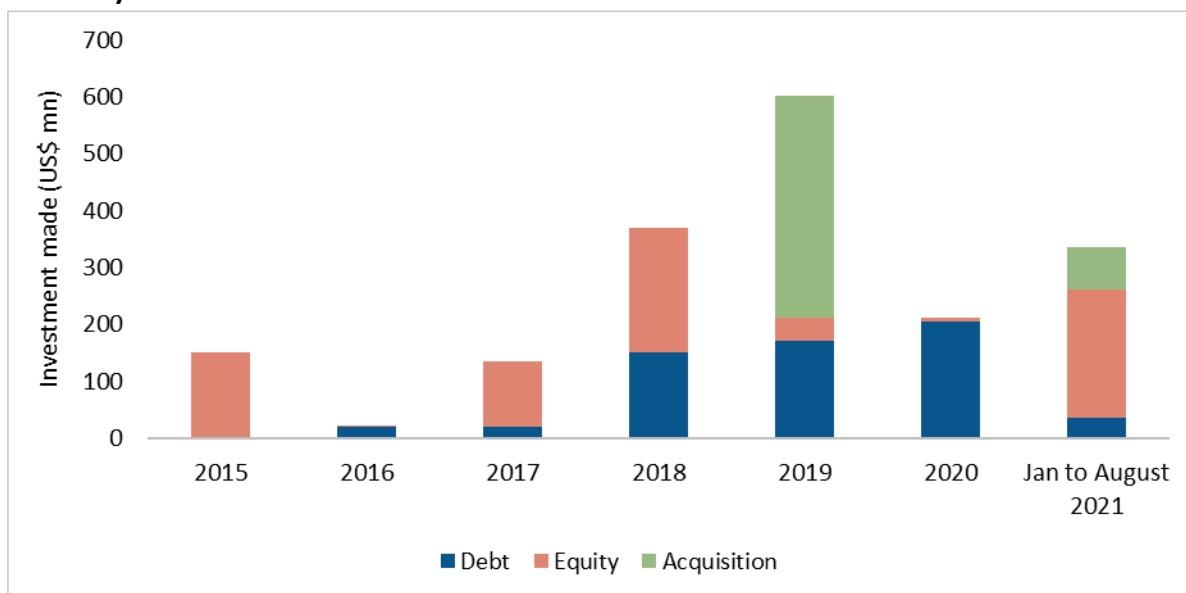
3. Key Investments in the Segment

Since 2015, project developers catering to the C&I sector in India have raised more than US\$2 billion, of which 48% (US\$985 million) was raised as equity funding and 29% (US\$599 million) as debt. The remaining funds are the result of acquisitions, of which the biggest chunk is held by PETRONAS' acquisition of Amplus in April 2019. An interesting trend here is that the majority of investments have come from foreign entities, and the investments have been limited to major players (Fourth Partner, Amplus, CleanMax, Cleantech) who have a sizeable MW portfolio in the C&I space with relatively high experience.

Despite COVID-induced disruptions, investments in the first eight months of 2021 in C&I rooftop solar segment have seen a sudden surge.

Despite COVID-induced disruptions, investments in the first eight months of 2021 in C&I rooftop solar segment have seen a sudden surge, compared to the previous two years (excluding the Amplus acquisition in 2019). The surge was mainly driven by substantial equity investments in Fourth Partner Energy in June 2021 and CleanMax Solar in August 2021, details of which are discussed in Annexure 7.1.

Figure 3.1: Investments Made in the C&I Renewable Space in India (2015-Present)



Source: JMK Research

Note: For acquisition deals from January to August 2021, some deals where investment amounts were not disclosed are not included in this analysis.

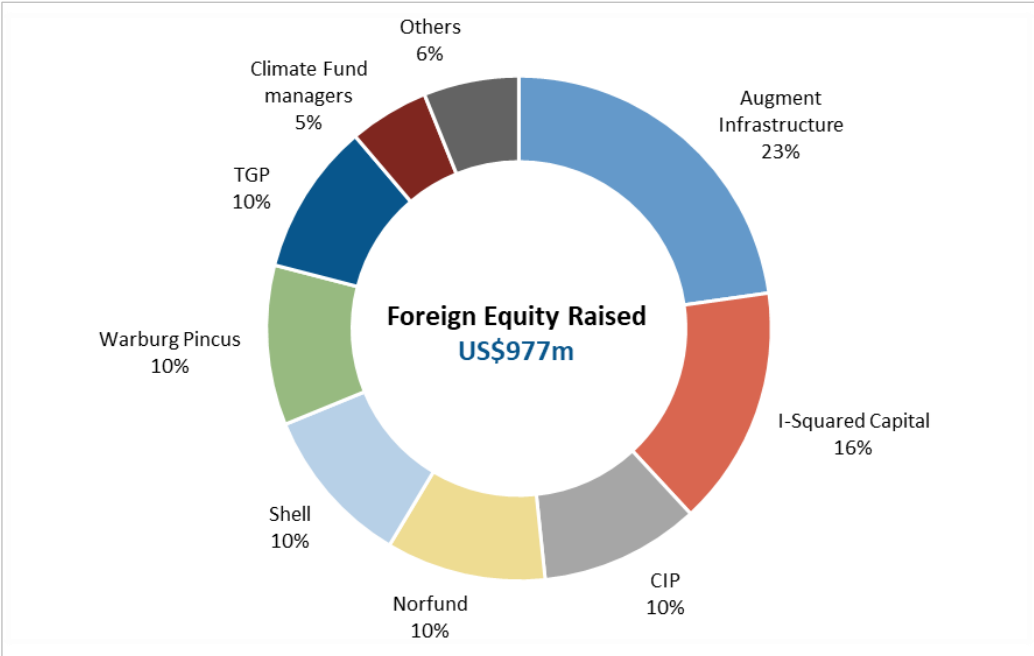
3.A Equity Investments

In the last few years, the Indian rooftop solar space has garnered interest from several investors. Equity investments are vital for the rooftop solar segment to achieve the scale needed to establish the technology as a bankable asset.

An interesting trend to note here is that almost all equity investments come from foreign entities (99%) that are looking to enter the Indian market for the following reasons:

- The Indian solar market is viewed as a high-growth potential market by international investors. Also, solar installations generally have healthy rates of return on equity investments (as much as 14%) compared to investment options in other developed countries.
- In India, these entities can own as much as a 100% stake in renewable energy projects, which is not possible in other countries due to their respective regulations, along with longer PPA durations (usually 10 to 15 years).
- Foreign organisations are looking for investments to meet their Paris Agreement and net-zero emission pledges.

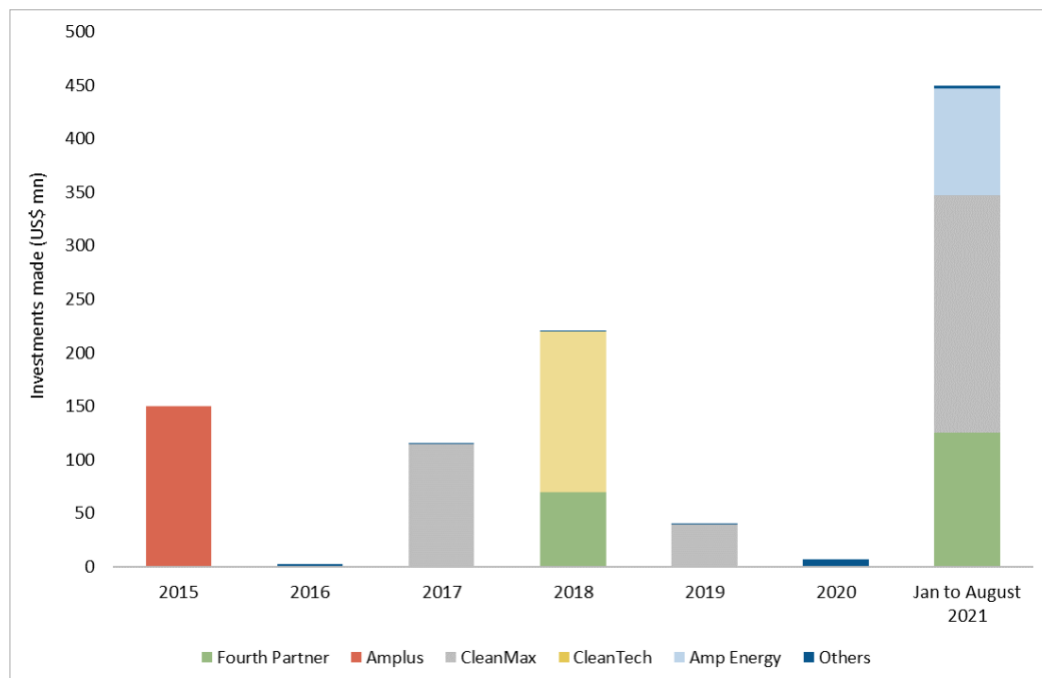
Figure 3.2: Foreign Equity Investments Raised



Source: JMK Research.

As seen from the following figure, equity investments in the segment are concentrated within the established players in the market such as CleanMax (38%), Fourth Partner (20%), Amplus (15%), CleanTech (15%) and Amp Energy (10%). More than 45% of the total equity investments were raised in 2021. The key reasons behind equity investments being concentrated within the players are their relatively higher experience in the Indian solar market, sizeable portfolios, bankable track records and the distribution of portfolios across different states in India, which reduces risks for investors.

Figure 3.3: Equity Investments Raised in Rooftop Solar sector in India (2015-Present)



Source: JMK Research.

3.B Asset Acquisition

So far in 2021, key players such as Statkraft India, Sterling & Wilson and Azure Power have exited the rooftop solar space by selling their portfolios. ReNew Power is also in talks with Amplus Power to sell its rooftop business as well. Key reasons for their exits include:

- With increasing competition, the margins from rooftop solar were shrinking, making rooftop a less viable business option.
- For Azure Power, ReNew Power and Statkraft, rooftop solar was not the main business. Instead, their focus has been more towards hydropower and utility-scale solar projects. As part of their strategic plan, they have decided to offload their small rooftop solar assets to raise capital for developing projects.⁶
- Growing regulatory uncertainty with respect to net metering and banking regulations by discoms, leading to unsustainable business models.

The biggest acquisition was made by Radiance Renewables which acquired all of Azure Power's 152MW of rooftop solar assets. The acquisition was particularly unique in the rooftop solar space considering that Radiance Renewables had no prior experience in developing rooftop projects. Radiance Renewables is a wholly-

⁶ Live Mint. [Rooftop Solar firms mulls asset sale to raise funds](#). 28 July 2020.

owned subsidiary of the Green Growth Equity Fund (GGEF), managed by Eversource Capital (a joint venture between EverStone Capital and Lightsource BP). This fund has received investments from the UK government via the Foreign Commonwealth Development Office and FMO (a Dutch development bank).

Table 3.1: Key Acquisitions Made in the Rooftop Solar Space

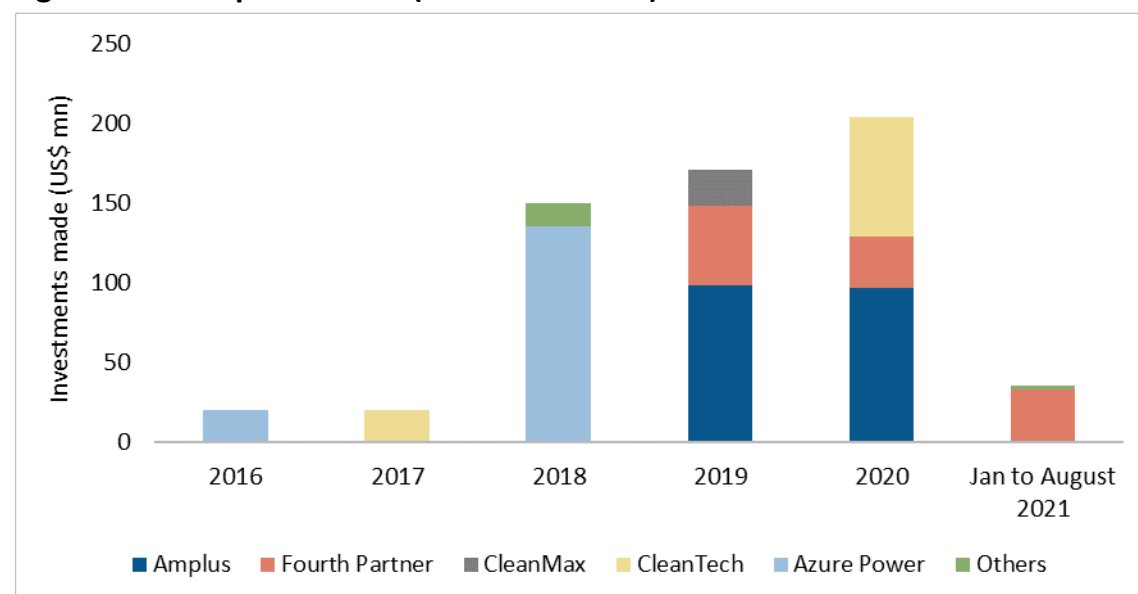
Date	Company Name	Acquirer(s)	Deal Value (in US\$m)	Asset Acquired
July 2021	Statkraft India	Fourth Partner Energy	Undisclosed	8.9MW
April 2021	Sterling and Wilson	Amplus Solar	Undisclosed	7.2MW
April 2021	Azure Power	Radiance Renewables	73.5	152MW
February 2020	Origin Renewables Pvt Limited	Radiance Renewables	Undisclosed	100% stake acquired
April 2019	Amplus	Petronas (Malaysian Oil and Gas conglomerate)	391	100%

Source: JMK Research.

3.C Debt Financing

In addition to the concessional credit lines discussed in the sections below, some individual players have raised debt independently from other lenders. As shown in the figure below, leading Indian players such as Fourth Partner, Amplus and CleanTech have raised funds by getting access to this debt capital, with a steady growth trend over the last few years. The difference between the debt financing raised by players and the traditional method of getting loans is that some of it is mezzanine funding (debt funds that can be converted into equity over time).

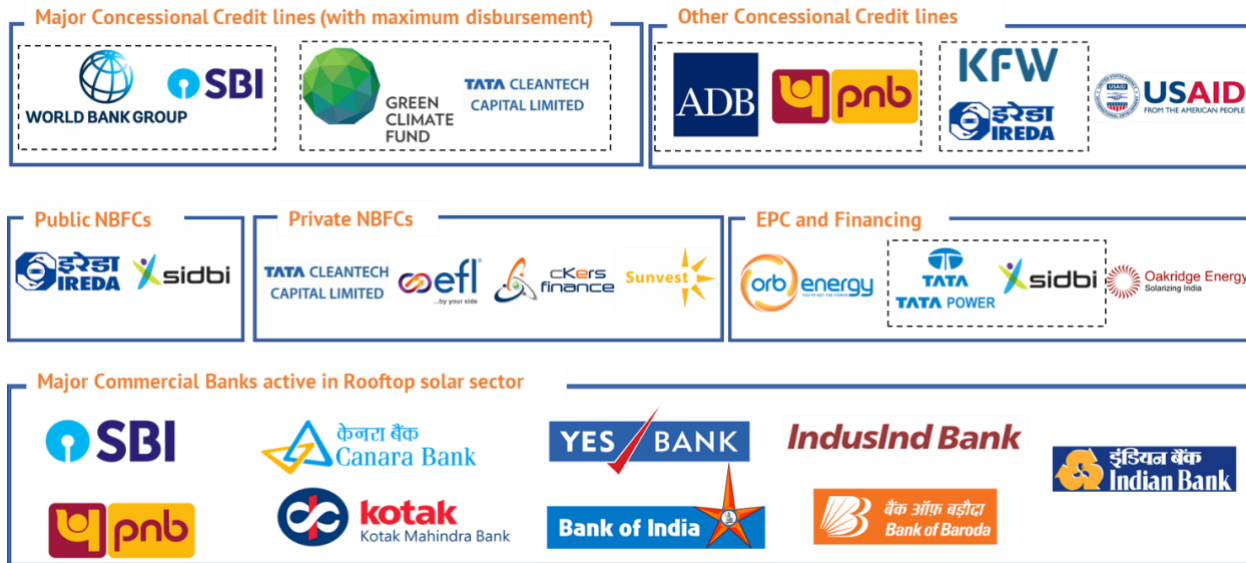
Fig 3.4: Debt Capital Raised (2016 to Present)



Source: JMK Research.

There are a number of financing options available which are specifically for rooftop solar. As highlighted in figure 3.5, financing is not just available at nationalised banks and NBFCs, EPC players also offer financing options bundled with their rooftop solar products. In addition, there are many regional *sahakari* banks that also lend money for these projects at attractive interest rates.

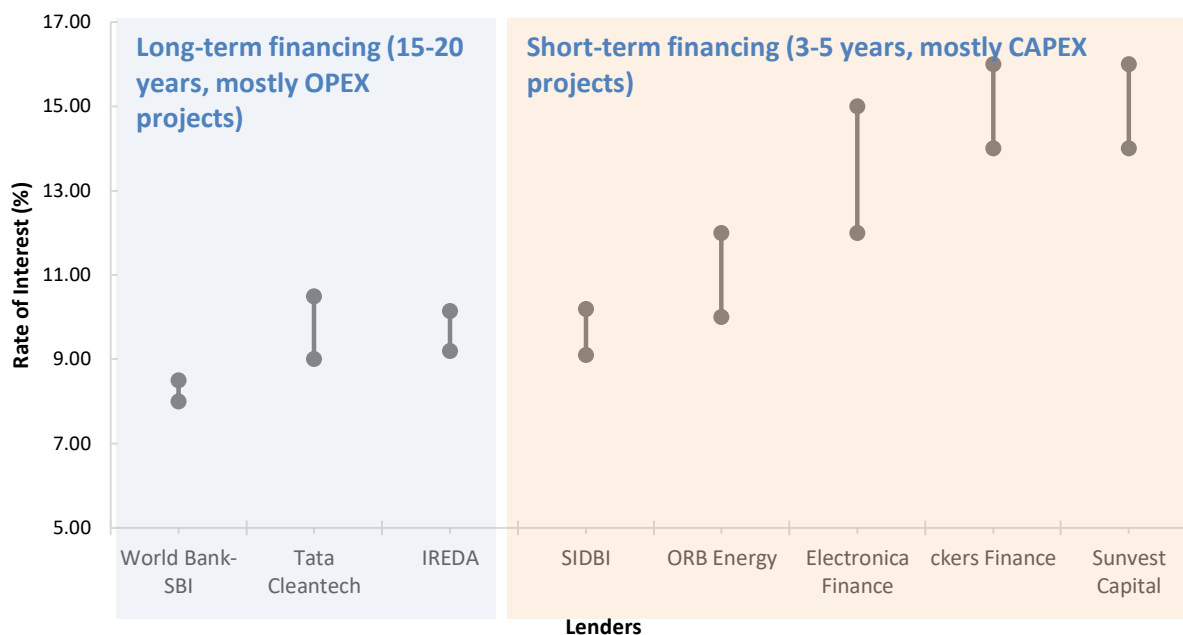
Figure 3.5: Key Lenders in the Rooftop Solar Sector in India



Source: JMK Research.

Based on the loan tenures, the debt financing options available can be categorised in terms of long-term loans and short-term loans. As shown in Figure 3.6, long-term loans tend to have lower interest rates than short-term loans. Long-term loans, however, can in most cases be obtained by customers who opt for OPEX installations and have proven financial track records to minimise default risks. Short term loans, on the other hand have interest rates that can go as high as 15%. The only exception is the rooftop solar offering by SIDBI, which has a short-tenured low interest loan which is available only for MSME customers.

Figure 3.6 Key Lenders in the Rooftop Solar Sector in India



Source: JMK Research.

4. Long-Term Financing for the Large C&I Segment

Financing under this category is usually obtained from concessional credit lines made available by development banks and multilateral agencies. These are typically obtained by corporate players with credit rating of BBB+ and above. The associated loan tenure is typically longer (in the range of 10 to 25 years).

World Bank-SBI line

- The World Bank-State Bank of India (SBI) fund for rooftop solar is a US\$625 million fund, with an additional US\$23 million allotted for technical assistance and first-loss coverage.
- The program started in May 2016 and the deadline is November 2021. The program is likely to be extended, given the amount of unspent funds.
- As of December 2020, the World Bank had disbursed US\$463 million to SBI, of which US\$228 million (49%) was disbursed by SBI for a cumulative project portfolio of 451 MW. While there is no distinction as such between OPEX and CAPEX, minimum project sizes are 100 kilowatts (kW) for CAPEX models and 1 MW total portfolio for RESCOs.⁷

⁷ Amit Jain. *Disclosable Version of the ISR - Grid-Connected Rooftop Solar Program - P155007 - Sequence No : 10 (English)*. Washington, D.C. : World Bank Group. 2020.

- Within the SBI network, 116 SME branches across the country have been designated to handle the World Bank credit line.⁸
- To boost smaller projects, a customised loan product for projects as large as 1MW capacity is eligible for funding.
- Although initial progress has been slow in terms of loans from the World Bank-SBI concessional credit line, it is likely to pick up pace in next few years now.

Tata Cleantech-GCF line

- Tata Cleantech is another major lender in this space, which has obtained funds from the Green Climate Fund (GCF). Tata Cleantech is a joint venture between Tata Capital Limited and International Finance Corporation (IFC), World Bank Group.
- These loans are offered at an interest rate of 9% to 10%, and the loan tenure depends on the length of the PPA term and the creditworthiness of the customer.
- A majority of the projects financed by the fund are based on the OPEX model.
- As of August 2021, Tata Cleantech has contributed to the development of around 300MW of rooftop solar projects.
- In January 2021, Tata Cleantech received another line of debt funding from the Commonwealth Development Corporation (CDC) Group, amounting to US\$30 million, which will be used towards financing clean energy projects, as well as water and e-mobility solutions.⁹
- In March 2021, it signed an agreement with Japan International Cooperation Agency (JICA) for as much as 10 billion yen (approximately US\$91 million) in a loan for renewable energy projects.¹⁰ The loan will be disbursed through the private sector investment finance scheme of the JICA and will be co-financed with the Sumitomo Mitsui Banking Corp.

⁸ State Bank of India. [SBI – World Bank: Grid Connected Rooftop Solar PV Program](#).

⁹ VC Circle. [CDC lends to Tata Capital-IFC's cleantech finance joint venture](#). 28 January 2021.

¹⁰ The Hindu Business. [Tata Cleantech secures up to 10 billion yen loan from JICA](#). 25 March 2021.

Table 4.1: Current Status of Funds Allocated Under Concessional Credit Lines

Year	Lender	Borrower	Loan Approved	Current Status
2016	World Bank	SBI (State Bank of India)	US\$625m	World Bank has disbursed US\$463 million to SBI, out of which US\$228 million have been disbursed by SBI as of Dec 31, 2020; loans for about 451MW rooftop solar projects has been sanctioned as part of this line.
2016	Asian Development Bank	PNB (Punjab National Bank)	US\$500m	Under the first tranche, US\$100 million will be disbursed. As of March 2020, ¹¹ US\$20 million has been disbursed by ADB to PNB, out of which US\$7 million have been disbursed to customers.
2015	KFW	IREDA (Indian Renewable Energy Development Agency)	US\$340m	Fully disbursed for RE projects with one small component of rooftop solar
2019	Green Climate Fund (GCF)*	Tata Cleantech	US\$100m	So far US\$50 million has been disbursed to Tata Cleantech. As of 31 July, 2021, loans for nearly 300MW of rooftop solar projects have been disbursed as part of this line.

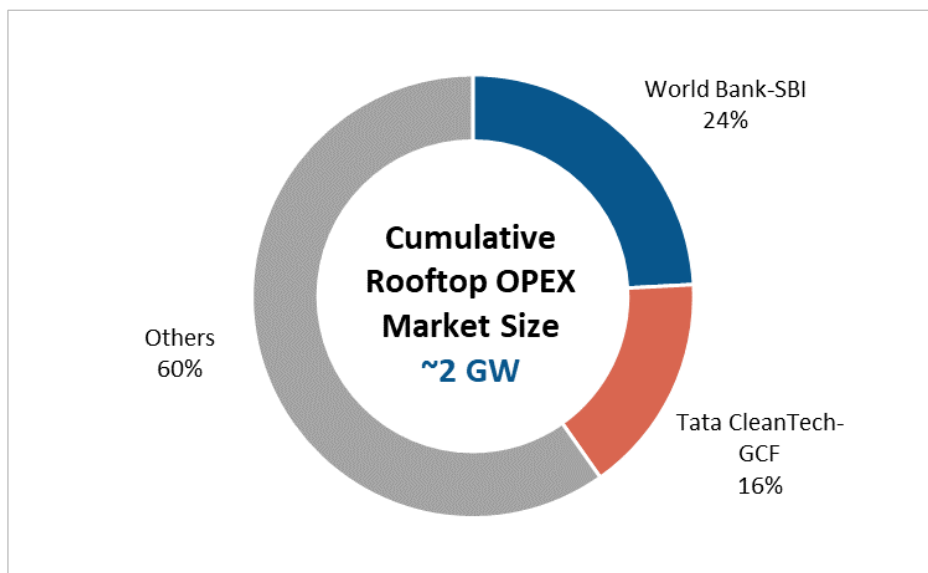
*The credit line in total amounts to US\$250 million from which GCF's contribution is a US\$100 million credit line, followed by additional co-financing from Tata Cleantech (US\$100 million) and from private equity investors (US\$50 million).

Source: World Bank, ADB KFW, GCF, JMK Research

Concerning the type of business models that are funded via debt mechanisms, the World Bank-SBI line and the Tata Cleantech fund line account for more than 40% of the OPEX installations. In terms of aggregate project capacity, the World Bank-SBI line has funded 451MW of rooftop solar projects, and the Tata Cleantech-GCF line has funded approximately 300MW of rooftop solar projects.

¹¹ Asian Development Bank (ADB). [Solar Rooftop Investment Program - Tranche 1: Audited Project Financial Statements \(April 2019-March 2020\)](#). March 2021.

Figure 4.1: Share of Rooftop Solar OPEX Market Funded Under Different Debt Mechanisms, as of July 31, 2021



Source: JMK Research.

Other than the concessional credit lines, there are also public NBFCs like the Indian Renewable Energy Development Agency that offer loans to the C&I segment.

Indian Renewable Energy Development Agency (IREDA)

- IREDA is a Mini Ratna (Category-I) Government of India enterprise under the administrative control of the Ministry of New and Renewable Energy (MNRE). It was created in 1987 to work as a specialised non-banking financing agency for promoting, developing and extending financial assistance for projects relating to new and renewable sources of energy and energy efficiency/conservation.
- IREDA offers a loan scheme for financing rooftop solar PV grid-connected/interactive power projects (industrial, commercial and institutional).
- This scheme is available for all grid-connected/interactive solar PV projects located on rooftops. The project capacity must be at least 1 megawatt-peak (MWp). It is mandatory for customers to submit external credit rating assessments done by IREDA-approved credit agencies.
- IREDA conducts credit ratings for all grid-connected projects and provides grading in a band of five grades (I to V) based on the risk assessment. The interest rates are linked with the grades:

Rooftop Solar Loan Scheme	Credit Rating				
	Grade I	Grade II	Grade III	Grade IV	Grade V
Interest Rate	9.20%	9.45%	9.65%	9.90%	10.15%

- System aggregator and roof owners need to be under a roof lease and operation and maintenance (O&M) agreement. Direct applicants are required to submit O&M agreements for loan tenures or performance guarantees. Roof owners must enter into an agreement with the respective discom and aggregator to determine the tariff rates under the particular net metering/ gross metering policy.
- With the equity infusion of Rs15bn by the Government of India during the Union Budget FY2021/22, IREDA will be able to extend an additional loan facility of Rs120 billion, in addition to its existing book size of Rs270 billion.
- The additional equity will also improve its capital adequacy, which will help IREDA in borrowing at lower interest rates, thus lowering the interest rates for developers. It is expected to now be able to finance around 4.5GW of renewable projects worth Rs180-190 billion.

5. MSME Financing

So far, the growth seen in the rooftop solar C&I segment has largely been driven by a few large creditworthy organisations. This is because financial institutions prefer borrowers with a strong financial track record and credit rating of BBB+ or better. However, if accessible financing options are made available, growth can also be replicated in MSMEs as well, which can help the rooftop solar market expand.

If accessible financing options are made available, growth can also be replicated in MSMEs.

The market segment is still relatively untapped because of many challenges. These barriers are not just limited to financing for rooftop solar, but also extend to MSME abilities to raise funds to scale up (and in many cases, to sustain) their business.

Lack of Creditworthiness

Although Reserve Bank of India (RBI)-issued guidelines advise MSMEs to undergo credit assessment from RBI-approved credit rating agencies like Investment Information and Credit Rating Agency of India Limited (ICRA), Credit Rating Information Services of India Limited (CRISIL), and Credit Analysis and Research Limited (CARE), a majority of MSMEs still lack them. This makes banks and lending institutions reluctant to lend to MSMEs that are unable to establish their creditworthiness.

Reluctance From RESCOs to Develop Projects for MSMEs

RESCOs are reluctant to develop projects for MSMEs due to concerns about their ability to honour PPAs. While banking institutions have the right to assets of the borrower in case of default, there is no such relief given to RESCOs which borrow

from banks on behalf of MSMEs. Because of the lack of protection from default, RESCOs are generally unwilling to enter into long-term agreements with MSMEs.

Long-term Uncertainties

A large proportion of RESCOs are reluctant to commit to long-term projects for MSMEs due to the uncertainty about the future and longevity of the businesses of MSMEs. This uncertainty, coupled with a lack of collateral and good credit history, increases banks' reluctance to lend to this segment.

Failure to Put Up Collateral

To reduce risks, banks place strict lending guidelines, including mandating collateral, especially when considering larger loans. Sufficient collateral often is difficult for many MSMEs to provide.

Banks are required to refrain from asking for collateral for loans of as much as Rs10 lakhs for MSMEs; if the MSME has a good track record or financial standing, the collateral may be waived for loans of as much as Rs25 lakh, with approval from the appropriate authority.¹² However, in many cases, the initial investment required for the establishment of rooftop solar systems exceeds the threshold specified by RBI, and collateral becomes necessary.

Notably, existing assets are already collateralised in many cases, making it difficult for MSMEs to obtain loans.

Regulatory Barriers

In the past few years, there has been growing inconsistency in policies, making the regulatory environment for rooftop solar very volatile. One of the critical challenges facing rooftop solar adoption is the uncertainty around net metering provision. At first most states' regulations restricted net metering to project sizes of up to 1MW. Later on, the Ministry of Power (MoP) released its draft Electricity (Rights of Consumers) Rules, 2020 which limited net metering to 10kW. This move was heavily criticised by industry players, which led to the MoP raising the maximum restricted load to 500kW for net metering. This led key industrial states with huge rooftop solar potential like Karnataka, Gujarat, Rajasthan, Haryana and Punjab to introduce revised regulatory orders restricting net metering to project sizes of

One of the critical challenges facing rooftop solar adoption is the uncertainty around net metering provision.

¹² The Reserve Bank of India. [Master Direction- Lending to MSME Sector](#). April 2018.

up to 500kW from the previously allowed 1MW limit. Furthermore, many states including Tamil Nadu, Karnataka and Uttar Pradesh have now barred net metering altogether for C&I customers. And in states that allow net metering for C&I customers, the constant fluctuation of the allowed project size for net metering has made the sector volatile in nature.

Many industry experts believe that policy makers should remove net metering restrictions, especially in the nascent stages, to help the growth of the rooftop solar sector. This is essential for MSMEs, since these companies typically work for only about 300 days a year (given that they usually function six days per week and close for national holidays) and hence, energy generated from rooftop solar during the other 65 days cannot go unutilised.

Lack of Equity Funding

For rooftop solar to grow, rooftop solar needs to be recognised as a bankable asset. If equity funds can carry out pilot projects, this will increase the confidence of lenders.

5.A. Innovative Ways to Cater to the MSME Segment

The nature of the MSMEs is such that they are in constant need of finance to grow their business, while looking out for frugal ways to run their day-to-day operations. Given that electricity costs account for between 5% and 20% of operation costs (depending on the nature of the industry), rooftop solar offers MSMEs an excellent cost-optimisation avenue.¹³ There are four primary demands of MSMEs with regard to financing options for rooftop solar installations. They are:

- Non-collateralised financing;
- Longer-tenure loans;
- Lower interest rates (typically below 10%); and
- Hassle-free paperwork and quick loan approval processes.

Many steps have been taken to ensure credit exists for MSMEs. These steps have been assisted by the RBI-issued guidelines, which define both MSME and renewable energy as priority lending categories.¹⁴

¹³ Deloitte and Climate Investment Fund. *Scaling up of rooftop solar in the SME sector in India*. April 2019.

¹⁴ The Reserve Bank of India. *Master Directions – Priority Sector Lending (PSL) – Targets and Classification*. 11 June 2021.

5.A.1 Financing via NBFCs Dedicated to MSMEs

To facilitate rooftop solar adoption in the MSME segment, specialised non-banking financial companies (NBFCs) and funds have formed strategic partnerships to develop and scale commercial rooftop solar finance solutions.

Tata Power-SIDBI Tie-up

- In January 2021, Tata Power announced its partnership with Small Industries Development Bank of India (SIDBI) to offer easy and affordable financing for MSME customers in the rooftop solar segment.¹⁵
- The pair have designed a unique solar financing solution for MSME customers helping them switch to rooftop solar without any collateral at an interest rate of less than 10%, with a claimed turnaround time of seven days and disbursement in four days.
- The loan is available exclusively for Tata Power customers for both on- and off-grid applications. For non-Tata Power customers, SIDBI offers its rooftop solar loan, as shown in Table 7.3.

USAID-DFC-Encourage Capital

- The U.S. International Development Finance Corporation (DFC) and the U.S. Agency for International Development (USAID) are jointly sponsoring a US\$41 million loan portfolio guarantee to aid rooftop solar adoption in the SME segment, which started in March 2021.¹⁶
- DFC and USAID have partnered with the New York-based Encourage Capital, an environment-focused investment firm, and two Indian non-banking financial companies, cKers Financial and Electronica Finance Limited (EFL), to address the challenges posed by carbon emissions. Encourage Capital has invested US\$15 million in EFL, which will use the USAID-DFC loan portfolio guarantee to stimulate the rooftop solar market.

¹⁵ Tata Power. [Tata Power partners with SIDBI to launch affordable & collateral-free financing for Rooftop Solar for MSMEs Consumer](#). 5 January 2021.

¹⁶ USAID. [USAID and DFC announce \\$41M loan guarantee program to finance rooftop solar](#). 18 March 2021.

Case Study: Electronica Finance Limited (EFL)

Overview: EFL is a part of the SRP Electronica Group. Established in 1990, it is well known for financing industrial machines and equipment. EFL has a pan-India presence with more than 70 branches across more than 55 cities and has so far served more than 7,500 customers and financed assets in the excess of Rs 1500 crores.

Experience in rooftop solar: The company first came out with its rooftop financing product in 2016 and was one of the first NBFCs to do so. However, this offering was withdrawn after six months due to lack of consumer awareness, as well as high installation costs at the time and a non-conducive regulatory environment. However, in October 2019, EFL re-entered this market with its rooftop solar financing product. Unlike the first effort, consumers, especially ones in the MSME segment, are now more aware about the benefits of rooftop solar and policies are also more favorable. So far, EFL has sanctioned rooftop solar loans for over 75 accounts.

Source of funds: In December 2019, EFL secured an equity investment of US\$15 million from Encourage Capital and has also obtained a US\$41 million credit line from USAID via Encourage Capital.

Credit Assessment: With more than 30 years of experience in the MSME segment, EFL understands its dynamics. To assess the lender's creditworthiness (other than checking customers' balance sheet and credit ratings), EFL also tries to understand the business model, their vendor assessment, market reputation, and organization cash flows. Further, EFL only lends to projects that have quality of solar panels and inverters.

Details of Typical Loan for Rooftop Solar Plants

Parameter	Description
Down payment	0-30%
Interest rate	12-15%
Tenure	Up to 5 years
Average project size	75-150 kW

Partial Credit Guarantee from USAID

Recently, EFL received a credit guarantee grant from the USAID and DFC via Encourage Capital for first-loss coverage for MSME rooftop solar financing. This will allow EFL to absorb risks (40% to 60% first-loss coverage) in the event of defaults.

Orb Energy

- Another innovative player in this space is Orb Energy. It is a vertically integrated provider of solar energy solutions, from manufacturing to sales to installation and finance.
- The credit options offered by Orb ensure that the customer spends less than their current electricity expenses.
- An Annual Maintenance Contract (AMC) for service infrastructure ensures that the customers continue to receive the benefits of rooftop solar.
- MSME financing accounts for nearly 40% of Orb Energy's revenue. As of August 2021, the total loan quantum extended specifically to SME rooftop solar projects amounts to Rs. 69.28 crore. The company has lent to roughly 200 SMEs.
- The total installed base of rooftop solar customers of Orb Energy is more than 110MW, of which more than 30MW has used Orb's in-house financing.

Case Study: Orb Energy

Overview: Orb Energy is an interesting case study, as it is one of the few players in this segment to build a successful business. It is a **vertically integrated provider of solar energy** solutions, from manufacturing to sales to installation and finance. Headquartered in Bengaluru, Karnataka, Orb has sold more than 160,000 solar systems, with cumulative installations of more than 110MW of rooftop solar systems, of which more than 30MW has used Orb's in-house financing. Total amount lent to SMEs, as of August 2021, is Rs. 69.28 Crore.

Funding for India Operations

The company is backed by USAID/DIV. Other players that have invested in Orb are:

Date	Investor(s)	Investment type	Deal Value (in US\$M)
2017	FMO, Overseas Private Investment Corporation (OPIC), Pamiga Finance SA, German Investment Corporation (DEG)	Debt + Equity	15
2017	US International Development Finance Corporation (DFC)	Debt	10
2019	Royal Dutch Shell Plc	Equity	Not Disclosed

Note: More than US\$10 million of the US\$15 million deal was raised as long-term debt from OPIC to grow Orb's in-house finance facility of rooftop solar panels for Indian SMEs and to expand its Kenya operations.

Additionally, Orb attracted a US\$2 million equity investment from FMO in January 2015 to replicate its unique solar energy retail model in Kenya.

Service Offering (Financing):

One-stop solution for end customer: The company is a vertically integrated business providing modules, Energy Performance Contracting (EPC) services, and project financing, serving as a one-stop solution for customers. Orb offers low-cost credit to its customers to make the up-front costs of a rooftop solar system affordable.

Parameter	Description
Collateral	No collateral requirement
Turnaround duration for loan disbursement	7-10 days
Down payment	0-25%
Interest rate	12%
Tenure	2-5 years

Essentially, the credit options are so tailored that customers save money on electricity after installing rooftop solar. The Equated Monthly Installment (EMI) paid by the customers is structured in a manner that less than or equal to their electricity bills.

5.A.2 Financing via First-Loss Financing Arrangements and Risk Absorption Funds

Innovative financing models supported by MNRE and Ministry of MSME could lead extensive adoption of solar power in this segment.

The MSME sector, through SBI's current rooftop solar lending portfolio, can leverage concessional debt and fulfil India's ambitious target for large-scale implementation of rooftop solar. The World Bank is working with the Ministry of MSME to bring in a credit guarantee mechanism catering to MSMEs that would like to reduce their long-term energy expenses by investing in rooftop solar. Under its current rooftop solar fund, the World Bank has allotted US\$23 million as a risk cover against default as a first-loss cover. This enables SBI to lend prospective customers who are perceived as a risk. This was a pilot project to allow the bank to absorb the initial risk. After its success, reports suggest that the World Bank is lining up another US\$100 million fund to allow MSMEs to obtain concessional credits under the scheme.

6. Conclusion and Recommendations

The C&I market has made significant strides in adopting rooftop solar in the last four or five years in India. These are mostly good creditworthy customers with BBB+ ratings that have easy access to finance. Top project developers are also focusing on this segment. However, with this market getting saturated, most big project developers are now either taking the open-access route or tapping into the international market to scale up growth.

So far, concessional credit lines by World Bank-SBI and Tata Cleantech-GCF have provided that initial momentum to scale up the large C&I segment. At present, most of these concessional credit lines are in the form of long-term loans that have lower interest rates, while loans offered by NBFCs and private lenders have shorter tenures and higher interest rates. This is mainly for high-risk categories such as the MSME segment.

The MSME sector represents a future gold mine for rooftop solar adoption, considering the significant potential in electricity cost savings it can offer. Textile, food and packaging are among key industries in which there is substantial rooftop solar adoption potential. However, a major barrier to rooftop solar adoption in MSME segment was financing due to lack of good credit ratings.

**The MSME sector
represents a future
gold mine for rooftop
solar adoption.**

Credit enhancement schemes are now needed to cater to the risks of this segment. The upcoming first-loss credit line from World Bank and a US\$41 million line-of-credit from USAID and DFC for the MSME sector is expected to enable lenders to absorb risks and increase access to collateral-free loans. Even equity funds like Encourage Capital are tying up with regional NBFCs to cater to semi-urban cluster bands for solar system sizes smaller than 15 kilowatts (mainly residential and small C&I segments).

Furthermore, with the limitation of most big lenders serving and concessional credit lines being offered to the top seven or eight rooftop solar developers, one-stop financing solutions by EPC players such as Tata Power Solar and Orb Energy are also likely to scale up going forward. Tie-ups such as the Tata Power-SIDBI and Encourage Capital-Electronica Finance Limited that specifically cater to MSMEs are positive developments in this industry. For Orb Energy, according to company officials, the net portfolio is expected to double and surpass Rs100 crore in fiscal year 2021-22.

While these positive steps have been taken to make financing for rooftop solar more accessible, there is a need for innovations to scale up the financing of rooftop solar in India, especially in untapped market segments. Based on the information analysed and presented in this report, the following recommendations are made:

Avoid Regulatory Flipflops

- Regulations across states need to be consistent and should be implemented from a long-term perspective.
- Regulatory flip-flops still pose a major challenge for the rooftop solar market in India. Restricting project sizes from 1 MW to 500 kW for net metering provision can be detrimental in scaling up rooftop solar in the untapped sections, considering the potential cost-saving benefits.

Favorable State Policies for MSME Segment

- Favorable state-level policies with respect to the MSME segment will lead to greater adoption of rooftop solar.
- For example, in Gujarat, incentives are given to MSMEs for as much as 35% of the cost of the plant and machinery. Rooftop solar plant capacity can be as much as 100% of the sanctioned load. The surplus power purchase rate for rooftop solar plants from MSME has also been increased from Rs1.75/kWh to Rs2.25/kWh.

Encouraging Discoms to Participate in Rooftop Solar via the OPEX Financing Route

- OPEX financing has been gaining traction in India and has several advantages over other business models as discussed in section 2.A.
- A joint report by International Energy Agency (IEA) and Council of Energy, Environment and Water (CEEW) finds that monthly leasing or PPA payments for rooftop solar projects can provide much needed long-term stable revenues for discoms¹⁷.
- If planned well, discoms can offer lease or PPA services at a lower cost than the private sector because of synergies in marketing, sales operations and a large customer base, which can lower customer acquisition costs.
- In addition, integrated planning can enable discoms to save on future generation costs, transmission investments and distribution losses. Moreover, owing to large portfolios and a regulated business, discoms may have access to a lower cost of financing than the private sector.

Explore Alternate Arrangements for Disbursing Unutilised Concessional Credit Lines

- The ADB concessional credit line for the C&I segments has largely remained unutilised until now. One of the measures being discussed to expedite its utilisation is adding new implementing agencies or financial intermediaries. These steps will help to utilise the low-cost funding available to the C&I segment.

Aggregation of Smaller-Sized Rooftop Solar Projects

- For smaller-sized rooftop projects, it is difficult to get access to affordable financing by virtue of the project sizes.
- Challenges resulting from the smaller size of projects can be mitigated by aggregating them in large quantities by EPC contractors, so that the entire portfolio can apply for financing. Such aggregators should be able to receive

¹⁷ IEA and CEEW. [Unlocking the Economic Potential of Rooftop Solar PV in India](#). July 2021.

better terms from financial institutions, owing to lower transaction costs and more attractive offers from system installers.

Partial Credit Guarantee Funds

- More risk capital in the form of equity funds is needed to manage first-loss risk.
- Partial credit guarantee funds to hedge the risks of the MSME segment can be extended from various bilateral and multilateral organisations to other lenders as well. At present in the rooftop solar segment, this arrangement is only with Electronica Finance Limited from USAID.

Streamline Loan Disbursal Process

- Document verification and other compliances need to be streamlined and made available online by big lenders such as SBI to ensure quick turnaround times for rooftop solar loan disbursal for corporates.

Equipment Quality

- Implementation of the Approved List of Models and Manufacturers (ALMM) and Bureau of Indian Standards (BIS) by MNRE will also ensure high-quality rooftop solar panels and inverters.¹⁸ This will instill further confidence by rooftop solar lenders.

Even though there is huge potential to be tapped in the MSME segment, many MSMEs are struggling to maintain their day-to-day businesses because of COVID-19 disruptions, making rooftop solar a low priority at this time. We expect the growth of rooftop solar in this segment to be slow for next year or two, but it is likely to pick up pace once the economic conditions are back to normal.

¹⁸ [Ministry of New and Renewable Energy](#)

7. Annexure

Table 7.1: Key Equity Investments in the C&I Renewable Space in India

Date	Company name	Investor(s)	Deal value (US\$m)
August 2021	CleanMax Solar*	Augment Infrastructure (US investment firm)	222.17
July 2021	Amp Energy*	Copenhagen Investment Partners (Danish renewable energy-focused fund manager)	100
June 2021	Fourth Partner Energy	Norfund (Norwegian Investment Fund for developing countries)	100
June 2021	Fourth Partner Energy	TGP's RISE Fund (U.S.-based investment fund for sustainable development)	25
April 2021	Freyr Energy	Total Carbon Neutrality Ventures (VC arm of Total Energies), Schneider Electric Energy Access Asia (subsidiary of Schneider Electric) and C4D Partners (investment firm based in Netherlands)	2.3
April 2020	MYSUN	Existing investors	4.26
March 2020	ZunRoof	Godrej Properties (India conglomerate)	3
October 2019	Orb Energy	Shell (British-Dutch oil and gas conglomerate)	Undisclosed (20% stake owned)
May 2019	ZunRoof	Godrej Properties	1.2
April 2019	CleanMax Solar	UK Climate Investments LLP	39.4
December 2018	Cleantech Solar	Shell New Energies	100
September 2018	Cleantech Solar	Climate Fund Managers (Dutch private green investment management firm)	50
June 2018	Zunroof	Intellectap impact investment network (I3N) [Global network of investors; based in Mumbai, India]	0.23
June 2018	Fourth Partner Energy	TPG Growth	70
February 2018	SunSource Energy	Neev Fund (Jointly sponsored by Department of International Development, UK, SBI and SIDBI)	Undisclosed
November 2017	Cleanmax Solar	IFC (sister organisation of the World Bank)	15
October 2017	Oorjan Cleantech	VC firm, Globevestor and senior directors in banks and financial services companies, including, Sayandev Chakravartti, Aditya Sharma, Nisha Pillai, and Mayur Bhat.	0.45

July 2017	Cleanmax Solar	Warburg Pincus (U.S.-based private investment firm)	100
October 2016	MySun	General Catalyst Partners (U.S.- based private investment firm)	2.5
September 2015	Fourth Partner Energy	Infuse Ventures, The Chennai Angels	Undisclosed
August 2015	Amplus	I-Squared Capital (U.S.-based investment firm)	150

Source: JMK Research.

*Note: Equity raised by AMP Energy and CleanMax is not exclusively for rooftop solar

Table 7.2: Key Debt Investments in the Rooftop Solar Space

Date	Company Name	Investor(s)	Deal Value (in US\$m)
July 2021	MySun	Tata Cleantech and ICF(U.S.-based management consultancy firm)	2.011
April 2021	Fourth Partner Energy	CDC Investments	33 (Mezzanine fund)
September 2020	Fourth Partner Energy	Symbiotics, ASN, Triodos	17.14 (Mezzanine fund)
July 2020	Fourth Partner Energy	ResponsAbility Investments AG (Swiss Enterprise)	15
June 2020	Cleantech Solar	ING Bank NV (Dutch multinational bank)	75
March 2020	Fourth Partner Energy	Gramin Impact India (Indian investment firm)	0.07
January 2020	Amplus	Standard Chartered Bank (British multinational bank)	96.8
December 2019	Fourth Partner Energy	Bank of America (American multinational bank)	50
November 2019	Amplus	Standard Chartered Bank	48.2
July 2019	Amplus	Standard Chartered Bank	49.6
March 2019	CleanMax Solar	PTC India	22.6
November 2018	Freyr Energy	C4D partners, a Netherlands- based impact investment fund	Undisclosed
June 2018	Azure Power	IFC, FMO, Société de Promotion et de Participation pour la Coopération Economique (Proparco) (French development finance institution), and Oesterreichische Entwicklungsbank AG (development bank of Austria)	135
January 2018	Orb Energy	Overseas Private Investment Corporation (OPIC-U.S.-based private investment	15

		firm) and FMO (Dutch development bank)	(Mix of Equity and Debt)
November 2017	Cleantech Solar	ResponsAbility	20
October 2016	Azure Power	OPIC	20

Source: JMK Research.

Table 7.3: Summary of Key Lenders Active in the Rooftop Solar Space

Key lenders	Rate of interest	Key features	Key Advantages
World Bank-State Bank of India (SBI)	8-8.5%	<ul style="list-style-type: none"> Financing grid-connected solar rooftop projects for C&I + institutional segments Repayment period is up to 15 years Debt Equity ratio 75:25 Finance both OPEX and CAPEX projects. In terms of number of borrowers, RESCO's (OPEX) account for only 10% to 15% of the total number of borrowers, however in terms of quantum of loan, the share of RESCO's is as high as 85%. 	<ul style="list-style-type: none"> With a far-reaching branch network across India, SBI stands out as the enabler to scale rooftop solar financing. With the introduction of World Bank's credit, their personnel is trained and acclimatised to dealing with loans of this nature. SBI has a lot of MSME customers who can top up their existing loans for rooftop solar plants.
Green Climate Fund (GCF)- Tata Cleantech	9-10.5%	<ul style="list-style-type: none"> Loan tenure depends on PPA terms (usually 15 to 20 years) These loans are offered mostly for OPEX projects. 	Tata Cleantech so far has financed a cumulative of 300MW rooftop projects.
Asian Development Bank (ADB)-Punjab National Bank (PNB)	>8.35%	<ul style="list-style-type: none"> PNB has availed a line of credit of US\$500 million from Asian Development Bank for financing rooftop PV SRT Funding large C&I-SRT projects on standalone or aggregated basis Maximum tenure: 15 years Debt Equity ratio: 70:30 	This loan specifically targets C&I customers who can obtain loans for solar rooftops at relatively lower cost of funds. With PNB's wide-reaching branch network, prospective players can easily apply for the loan without geographic constraints.
IREDA (Indian Renewable Energy Development Agency)	9.2-10.15%	<ul style="list-style-type: none"> Financing up to 70% of project cost Maximum repayment time: 10 years Construction time: 12 months from first disbursement 	As an institution that focuses solely on financing renewable energy projects, IREDA can play a pivotal role in scaling rooftop solar in the untapped segments of the market.

		<ul style="list-style-type: none"> • Collateral: Minimum 10% to 20% of loan amount • Mandatory to submit external credit rating under Rooftop Grading System from empaneled credit rating agencies of IREDA. 	
Indian Bank	8.3-12.55%	<ul style="list-style-type: none"> • No ceiling on loan amount, with financing up to 75% of project costs and margins of 25% • Repayment period: 15 years 	Indian Bank provides low-cost funds for rooftop solar, of which existing home-loan customers can take advantage of by taking a top-up loan
Small Industries Development Bank of India (SIDBI)	9.1-10.2%	<ul style="list-style-type: none"> • Tenure: As much as five years • Loan Amount: RS 10 lakh-RS 250 lakh • Finance as much as 100% of project cost. • Plant Capacity: 25kW to 500kW; power output should be lower than current consumption from grid • Collateral/Margin: 15% to 25% of financial assistance required as Fixed Deposit (FD) 	As an organization whose niche is MSME financing, SIDBI has a deep understanding of MSME behaviors and can be pivotal in scaling rooftop solar in this particular segment. In January 2021, Tata Power announced its partnership with SIDBI to offer easy and affordable financing scheme for MSME customers in the rooftop solar segment. ¹⁵
Orb Energy	12%	<ul style="list-style-type: none"> • Down Payment: 0% to 25% • Tenure: Two to five years • Monthly EMI is structured in such a manner that the customer pays equal to or less than its electricity consumption from the grid. 	<ul style="list-style-type: none"> • Being a vertically integrated company, Orb manufactures its own components, does EPC, and financing, as well as takes care of the project maintenance, making it a one-stop solution for customers with hassle-free loan approval, EMI structures and project commission. • Quick turnaround time and max loan disbursal in seven to 10 days • Total amount lent to SMEs, as of August 2021, is Rs. 69.28 Crore
Electronica Finance	12-15%	<ul style="list-style-type: none"> • Maximum 75% finance of project cost • Loan term up to five years • Loan amounts up to Rs15 lakh is collateral free 	<ul style="list-style-type: none"> • Experienced player with 31 years of experience in dealing with MSME segment

		<ul style="list-style-type: none"> • Margin required: 15% to 30%, depending on customer • 85% disbursed at start of project and balance after project commissioning • Project size: Up to 250 kW 	<ul style="list-style-type: none"> • Quality of solar panels and inverters is also another criterion for loan sanction • Main advantage of EFL over lenders such as banks is their quick turn-around time • So far, EFL has sanctioned rooftop solar loans for over 75 accounts.
cKers Finance	>14%	<ul style="list-style-type: none"> • Tenure three to five years • Growth-focused organization with a two-year track record and proven unit-level economics 	Loans from these NBFCs are generally taken by customers who have not been able to secure funds from the above-mentioned source. In most cases, these funds are obtained during the initial stages of the project. Once the bankability of the project can be established by citing generation records, consumers can apply for project refinancing at lower interest rates from other lenders if needed.
Sunvest Capital	14-16%	<ul style="list-style-type: none"> • Lends only to grid-connected solar projects having either net or gross metering arrangement and does not offer loans to off-grid systems or any systems that have a storage component • Loan size: Rs1 lakh to 50 lakhs • Tenure: Three to seven years • Down payment: 30% 	

Source: JMK Research.

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