

Identifying barriers for
rooftop solar uptake in
MSMEs and development
of a mitigating financial
framework


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SUSTAINABLE PARTNERSHIP FOR
ROOFTOP SOLAR ACCELERATION IN BHARAT







This study “*Identifying barriers for rooftop solar uptake in MSMEs and development of a mitigating financial framework*” was carried out as part of the SUPRABHA - SBI - The World Bank - MNRE Grid connected rooftop solar PV (GRPV) - technical assistance program. The report was prepared over a period of six months through extensive consultations with a wide spectrum of stakeholders.

The overall engagement team was led by Shuaib Kamili (Senior Manager, EY) under the guidance of Ashish Kulkarni (Associate Partner, EY) and Yuvaraj Dinesh Babu Nithyanandam (Senior Advisor, EY & Program Leader, SUPRABHA). The core EY team members who worked on the research, analysis and drafting of report for this engagement include Hemangajit Kakati, Mankirat Kaur, Faris Zulfiqar, Vishal Sukhija and Ashish George Kuttickal. The core team from EY received valuable support and inputs from the World Bank team comprising Mr. Don Purka, Ms. Mani Khurana and Dr. Amit Jain. We would like to express our thanks to State Bank of India officials

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During the course of the report, we interacted with the officials of various leading institutions, who shared their experiences with us. Our colleagues at EY also provided formal and informal guidance throughout the development of this report and we would like to express our gratitude to them as well.



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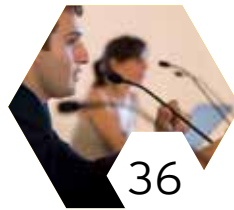
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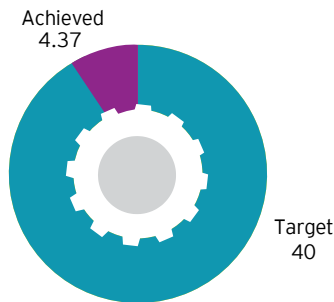
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Executive summary



The study, 'Identification of barriers for rooftop solar uptake in MSMEs and development of a mitigating financial framework', aims to understand and zero in on the barriers faced by micro, small and medium enterprises (MSMEs) in undertaking rooftop solar projects, with a special focus on the issues MSMEs face in financing rooftop solar and also to create a financial instrument, which can mitigate these barriers and lead to rooftop solar propagation among MSMEs.

Rooftop solar scenario (in GW, as of March 2019)



Source: BRIDGE TO INDIA report on India Solar Rooftop Map, June 2019

The uptake of rooftop solar in MSME sector faces a host of challenges ranging from low levels of awareness about the technical and commercial benefits of this form of energy and various business models of deployment, to lack of adequate financing for rooftop solar. The MSMEs also feel the rooftop solar sector does not have a structured and standardized offering in terms of asset quality which discourages MSMEs to invest in the rooftop solar assets, that require high amount of capital. Financial institutions have a similar concern with regard to the lack of standardization in the rooftop solar segment and also about the credit and repayment risks from lending to MSME sector.

A Framework for Uptake of Rooftop solar in MSMEs (FURM) has been introduced which may help in addressing the concerns of various stakeholders and will go a long way in building the rooftop solar market in the country. FURM, which comprises of standardization, credit risk mitigation and insurance cover as the pillars (explained in detail in the report) can help in addressing the concerns of various stakeholders and will go a long way in building the rooftop solar market in the country.

The backdrop of this study is the slow growth in rooftop solar vis-a-vis the ambitious target of the Govt of setting up 100 GW solar installations, including 40 GW of rooftop solar by 2022. This government drive has incentivized the achievement of solar PV, but the pace of rooftop solar installations has been considerably slower. According to India Solar Rooftop Map, June 2019, a report by BRIDGE TO INDIA, around 70% of this capacity has been achieved in the commercial and industrial (C&I) sector in India, but even in this sector the success has been limited to

medium- and large-sized players. The uptake of rooftop solar in the MSME sector has been quite low despite the MSME sector comprising the largest number of players in the C&I segment.

Rooftop solar potential in MSMEs and barriers to propagation

The starting point of this study was to estimate the rooftop solar potential of the MSME segment. For that, the study used a two-pronged approach - a top down approach, which takes the overall industrial power demand as a starting point and calculates proportionate MSME consumption, and a bottom up approach, which considers aggregating the power demand of MSME clusters in India. The rooftop solar potential in MSMEs has been estimated after taking a few assumptions regarding the percentage of the power demand that rooftop solar is likely to meet.

Both these approaches point to a huge potential of ~16 GW-18 GW of rooftop solar in MSMEs. This potential, if unlocked, can go a long way in meeting the government's target of 40 GW rooftop solar by 2022. However, despite this huge potential, the rooftop solar sector as a whole, and especially in the case of MSMEs hasn't taken off as planned.

The key reasons for the non-offtake of rooftop solar in MSMEs are financial barriers and operational barriers. The first part of this study looks at the various issues uptake of solar rooftop in the MSME sector in detail while the second part tries to build a framework to mitigate the concerns and provide a stable structure for the rooftop solar installations to grow in the country.

Cluster selection

In order to understand these issues in detail as well as take steps to mitigate them, two electricity-intensive MSME sectors have been selected. A detailed selection methodology has been adopted to arrive at the sectors to be studied as part of this activity.



MSME rooftop solar potential


Source: EY analysis

The process involved trimming down a detailed list of 388 MSME clusters (as given by Development Commissioner (MSME) in India) to a list of final 10 sectors for further comparisons, by applying the initial filters of electricity consumption and electricity dependency of sectors, which brings us to a list of sectors which stand to gain the maximum by switching from conventional power to grid connected rooftop solar.

These sectors have then been ranked on the basis of a selected set of macro-economic, technical and financial parameters, assigning appropriate weightages to each of them. Macro-economic parameters give an understanding of growth - historic and prospective, technical parameters help in assessing the energy needs and how much energy could be substituted through rooftop solar and financial parameters provide the credibility of the sector from a lending perspective.


Macro

- ▶ Industry contribution to GDP (5%)
- ▶ Industry CAGR (15%)
- ▶ Sector employment (5%)




Technical

- ▶ Electricity cost percentage of the total production cost (25%)
- ▶ Rooftop solar suitability (15%)



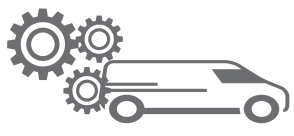
Financial

- ▶ Industry credit growth (17.5%)
- ▶ Industry NPA rate (17.5%)




Source: EY analysis

The sectors with the maximum weighted average scores were selected for a detailed study. These sectors were the cold chain sector in the service industry and automobile component manufacturing MSMEs in the manufacturing industry. These two sectors also have a significant presence and geographical reach throughout the country.



1

Auto and engineering products



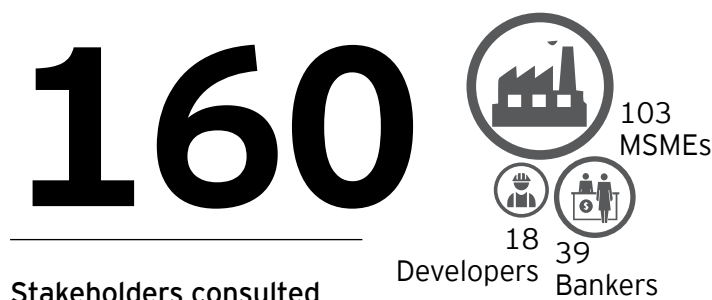
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Cold chain/warehousing

Source: EY analysis

Stakeholder consultations

The cold chain and automobile component manufacturing MSMEs, along with various financial institutions and developers have been consulted through various modes of communication such as one-to-one meets, workshops, site visits, surveys and telephonic interviews to understand their views on the issues in the rooftop solar space.



Source: EY analysis

Prominent financial institutions, which have a working relationship with MSMEs, cold storage MSMEs, auto component manufacturers involved in the manufacturing of diverse products such as castings and forgings, lights, wiring, springs, fasteners, etc. and of few leading developers have also been consulted for their insights. Besides this, two workshops were carried out with MSMEs, one in Agra in August 2018 and the other one in Delhi in September 2018. The MSMEs were consulted for their views on rooftop solar, their awareness about and receptiveness to business models such as the renewable energy service company (RESCO) model and their funding sources - self-funding or borrowing from banks, NBFCs, etc. The financial institutions were asked about their views on lending to MSMEs and innovative financial frameworks that can be looked at for mitigating the issues in the offtake of rooftop solar in MSMEs; and the developers on the issues they have faced till date with regard to operations and financing in scaling up. The questionnaires were framed to gauge the various stakeholders including MSMEs, FIs and developers on awareness, receptiveness and financing.

Awareness of RTS benefits and business models

Financing of capital expenditure and relationships with banks



Receptiveness towards RTS installation and RESCOs' involvement

Source: EY analysis

High

- Awareness of cold chain and auto components MSMEs on benefits of RTS
- Receptiveness of auto component MSMEs to RESCO

Low

- Conversion of RTS awareness to RTS installations
- Awareness of cold storage and auto components MSMEs on RESCO
- Receptiveness of cold storage MSMEs to RESCO

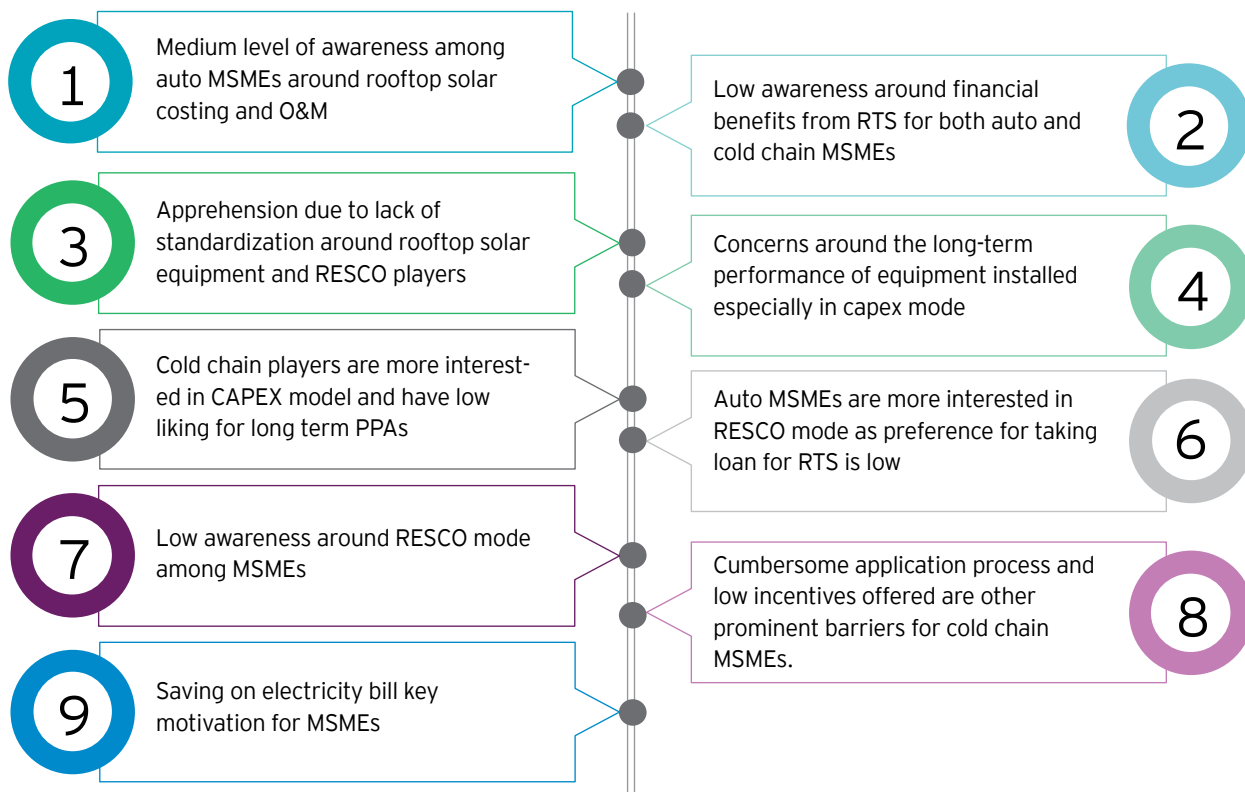
higher in the auto sector (where electricity is a relatively lower portion of operating cost). However, economics of individual players also affect MSME's decision-making. Amongst most players the motivation to move towards rooftop solar is impeded by the high cost of equipment and the lack of capital availability, more so in the case of cold chain MSMEs. MSMEs also

Source: EY analysis

The insights from the stakeholder consultations show that the consulted MSMEs are aware about the rooftop solar front, but are not mindful of the various business models such as the RESCO model. When the MSMEs were informed about the prevalence of these two modes namely CAPEX and RESCO, the receptiveness for CAPEX mode was found to be higher in cold chain players (where electricity is a significant operating cost) and the receptiveness for RESCO mode

seem to be concerned about the varying levels of quality and price of equipment. A snapshot of the key takeaways from the MSME consultation exercise is presented below. The details of these consultations and the insights gathered from the stakeholders have been captured in the stakeholder consultation section of the report.

Salient findings from consultations



Source: EY analysis

During our interactions with financial institutions, we found that they remain concerned over the low creditworthiness and short business horizon of MSMEs. FIs are interested in financing mechanisms which may mitigate their risk to MSME sector lending. They feel that without the support of enabling financial frameworks, their lending outlook would remain cautious towards MSMEs. Since solar rooftop may not form the core operations of MSMEs, it may invite higher risk perception.

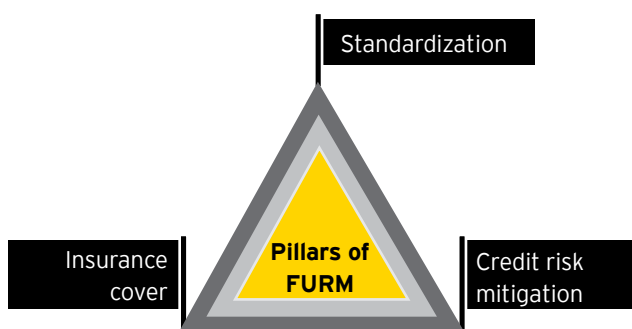
The developers expressed concern over long evaluation and loan disbursement cycle of the banks which adds stress to the RESCOs' future finances. Also, stringent covenants put by banks increases the DSRA size and reduces project leverage.

Framework for Uptake of RTS in MSMEs (FURM)

Based on the insights gathered from the extensive stakeholder consultations, which have been briefly mentioned in the previous section, the study identified a few salient actionable points or areas of concern. The mitigation of these points has the potential to enhance the uptake of rooftop solar significantly in the MSME segment. Deep analysis and extensive brainstorming sessions on measures that can be taken to mitigate these concerns of different stakeholders have thrown up a few relevant steps. These steps have been modelled into a framework, which has been abbreviated as FURM (Framework for Uptake of RTS in MSMEs).

A few barriers identified through stakeholder consultations are:

1. Lack of awareness
2. Quality concerns
3. Credit risk



Source: EY analysis

Quality concerns can be addressed through standardization (of equipment, service companies and operation and management (O&M) regime) and insurance coverage on equipment performance, whereas credit risk can be addressed through measures such as credit guarantee. Lack of awareness can be mitigated through outreach programs, which are beyond the scope of this report.

Standardization can help financial institutions in assessing projects in a more streamlined way. At the same time, it will help MSMEs make an informed choice from among the options available in the market.

Performance insurance can help financial institutions, developers and MSMEs (in case of CAPEX mode) to mitigate the impact of unpredictability of project yields due to variability of solar irradiance and system underperformance.

While financial institutions and other stakeholders are receptive towards rooftop solar, risks related to payment delay and payment default in lending to MSMEs still remains. To help mitigate these risks, **credit risk mitigation** measures can be taken up which will provide the requisite cushion to financial institutions. Credit Guarantee Mechanism has been zeroed down as a viable risk mitigation option after deliberating on various other mechanisms such as payment security mechanism, supply chain financing, credit insurance, asset-backed securitization, etc. Issues with other financing options pervade such as the possibility of large auto players not willing to be a part of supply chain financing, delay in disbursement of viability gap funding (VGF), premium in credit insurance increasing the cost of financing apart from not being allowed in India, etc. While these instruments have their own set of merits and demerits, a credit guarantee mechanism is highly suitable to mitigate the risks associated with lending to MSMEs as the instrument covers credit risk to an extent and offers ways to mitigate risks. Moreover, it has been used earlier. So the acceptance, ease of operationalization and awareness with the lenders is also high. A credit guarantee mechanism provides guarantees on loans to borrowers by covering a share of the default risk of the loan. In case of default by the borrower, the lender recovers the value of the guarantee from the guarantor. A study of the international experiences on credit guarantee schemes and options on credit guarantee cover was also carried out to understand how the various credit guarantee schemes were implemented across the world and what the scheme dynamics were i.e., the eligibility criteria, coverage ratios, fees and pricing, payment rules and collateral rules. The study of these dynamics helped to prepare an outline of a prospective credit guarantee (CG) mechanism.

Proposed CG options

Four options of implementing CG mechanism have also been deliberated upon. These schemes will be managed by an implementing agency which will be selected/appointed by the CG provider. This may vary from a bank, an agency or an NBFC who will have the responsibility of administrating the scheme's implementation. The implementing agency will charge a pre-decided percentage fee. To extend the coverage, a number of financial institutions, called as participating financial institutions (PFIs) will be selected on the basis of their financial strength and network of branches to ensure a wide spread outreach. These PFIs will be allocated a CG limit which will be calculated based on the total amount of rooftop solar loans provided.

A snapshot of the four CG options conceptualised as an outcome of the insights received from extensive stakeholder consultations and best practices followed worldwide, has been illustrated hereafter.

Fixed coverage CG

A fixed CG cover to the participating financial institutions is envisaged. Under this, the evaluation of both the borrowers and final power off-takers will be the responsibility of the financial institutions. The CG cover gets activated and disbursement takes place once the loan gets classified as loss asset by the

FI. A fixed cover of up to 50% of the loan amount under the CAPEX and RESCO mode will be provided.

Portfolio-based CG

It will cater to the RESCOs only and will be operational only under "portfolio lending" approach. Portfolio lending approach refers to the evaluation of the complete portfolio of loans, not on individual basis, but as a single loan. This method of loan evaluation will help in reducing the time taken to evaluate each loan in the portfolio. Under

this approach, CG cover gets triggered only when the entire portfolio defaults instead of default by a single loan. This approach gives more freedom to RESCO player to create a portfolio on the basis of its risk appetite, probability of cash flows and excess spread charged to the risky consumers so as to cover the default up to a certain range internally from the portfolio cash flows.

Variable coverage CG

CG coverage percentage for the borrower will be decided on the basis of a matrix which is developed based on the credit rating of the individual MSMEs; higher the rating, the lower maybe the CG coverage percentage.

In case of MSMEs, a large number of firms are unrated. In such a case, the banks can develop their internal scoring sheet which accounts for the credit history of the MSME, outstanding loans and credit worthiness and based on the points scored, it can categorize the CG coverage percentage.

ABS-based CG

Under this category, CG coverage can be extended to support asset securitization. It is a long-term market making model which can be implemented once the rooftop solar market reaches a certain scale. Asset-based securitization (ABS) model for rooftop solar will initially require credit enhancement support

which thereafter can be removed once the market for rooftop solar loans develops significantly and the investors start trusting the viability of rooftop solar segment.

The report also looks at the various scenarios of the leverage generated with CG mechanism and the amount of installations it can lead to has been computed. Assuming a corpus of US\$ 200 million available to support the CGM framework, it has been computed that with 50% fixed CG coverage, the total rooftop installation which can be supported is 1535 MW. Under the variable percentage CG coverage, wherein the CG cover is based on the credit rating of the MSMEs, a weighted average CG cover of ~30% has been arrived at, which can support a total of 2623 MW of rooftop solar installations.

Apart from these measures, the study also proposes a media and outreach exercise with the help of the stakeholders associated with MSMEs, such as financial institutions, government bodies, MSME associations, corporates, etc. This will help in the knowledge sharing of the benefits of rooftop solar to MSMEs. All the measures proposed as a part of the report will go a long way in encouraging the MSMEs to turn green, cut down on their energy expenses, become more energy efficient and contribute to a cleaner and better India of the future.

Part

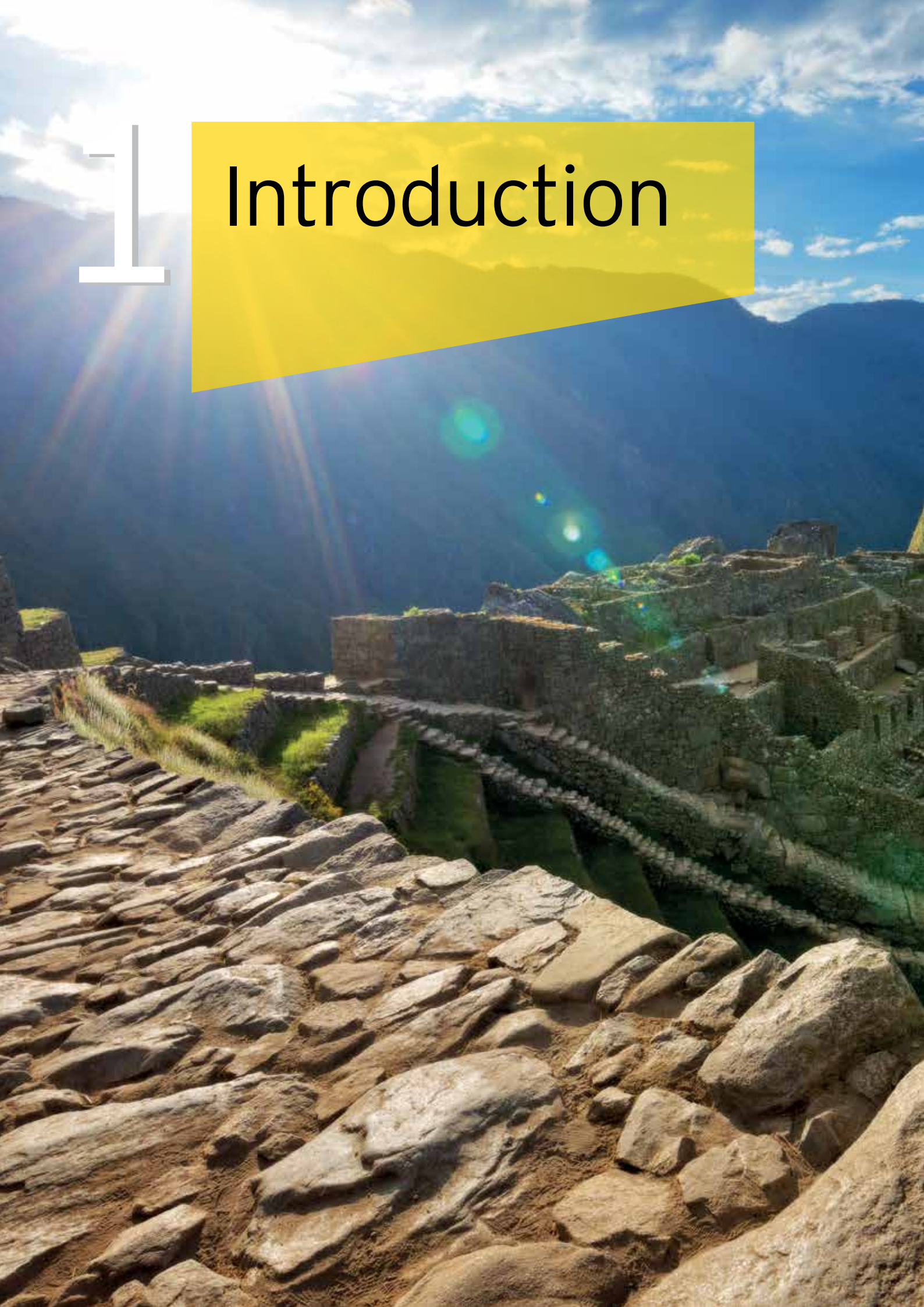


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Introduction



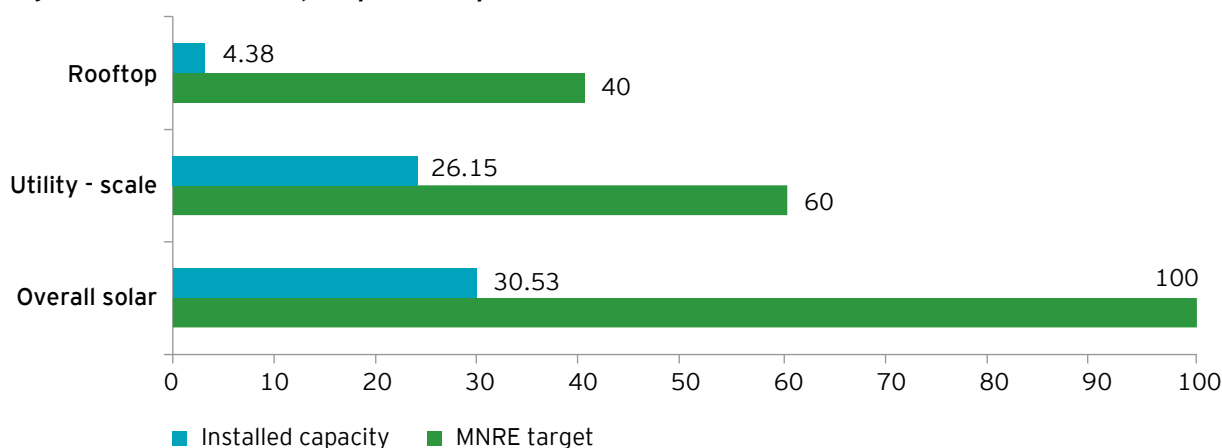
This study is implemented under SUPRABHA - The WB-SBI Rooftop Solar - technical assistance program. The program is presently assisting agencies of 17 states in creating enabling framework for large-scale deployment of grid connected rooftop solar PV (GRPV) projects. As a part of this engagement, the program is undertaking various activities including framing of policy and regulatory framework, streamlining the processes, developing and implementing web-based tools, enhancing technical knowledge and disseminating awareness to help accelerate deployment of GRPV projects in states. The genesis of the study is the target of 100 GW set by Gol for solar installations in the country. Of the 100 GW target, 40 GW is envisaged to be setup for rooftop solar in India.

number of measures to promote the GRPV sector at the state and national level, there has been a modest uptake of GRPV capacities in India. Challenges due to policy, regulation, financing and implementation issues prevail in this sector.

One of the key issues is the prevailing uncertainty in the institutional framework as well as access to finance for GRPV deployment that needs to be addressed through various interventions.

Under Phase-II of Grid Connected Rooftop Solar Programme of MNRE, a comprehensive action plan has been designed for incentivization of rooftop solar uptake by DISCOMs with a special focus on the residential sector. However, any concrete plan for MSMEs in this regard has not been mentioned.

Figure 1. Solar installed capacity in India by March 2019 (in GW)



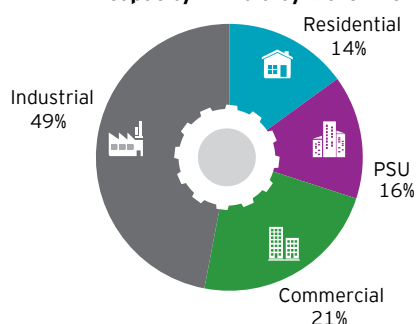
Source: Industry reports

There has been a substantial growth in solar installations in India during the past few years. Most of the installed capacity, however, have come up in the ground mounted space, while a lot of effort needs to be put in to fast track the growth in GRPV installations in India. GRPV market in India is witnessing substantial interest from entrepreneurs, developers, financial institutions, development banks, end-users, as well as government entities. Although Gol, in partnership with the state governments and regulators, has adopted a

As per March 2019 figures, India has installed a total capacity of 31.5 GW of solar PV, GRPV contributing 4.4 GW of the total capacity. A further breakdown of the installed rooftop solar installations shows that the C&I segment is leading the drive towards rooftop solar, comprising around 70% of the total installed rooftop solar capacity. The C&I sector has seen the maximum rooftop installation till date as the higher grid tariffs for these consumers makes installing rooftop solar an attractive commercial proposition in most states. With the trend of decrease in the equipment costs, further benefits for the C&I segment will be seen in the future, provided the issues plaguing the segment are mitigated. Considering the current growth of capacity in solar rooftop, achieving the MNRE target of 40 GW till FY 22 may prove to be a tall order.

On analyzing the C&I rooftop installations, it was found that large industrial players have installed a significant portion of the rooftop. The MSME segment, which contributes to 38% of the Indian economy in terms of the GDP, has a huge geographical presence and presents good scope for additions in rooftop solar installations, which

Figure 2. Category-wise split of solar installed capacity in India by March 2019



Source: BRIDGE TO INDIA report on India Solar Rooftop Map, June 2019

if tapped properly, can go a long way towards meeting the ambitious targets of 40 GW rooftop solar by 2022.

As per the GoI definition¹, MSMEs are broadly defined as follows:

Table 1. Definition of MSMEs as per GoI

	Enterprises engaged in the manufacture or production, processing or preservation of goods	Enterprises engaged in providing or rendering services
Micro	Where investment in plant and machinery does not exceed INR25 lakhs	Where investment in plant and machinery does not exceed INR10 lakhs
Small	Where investment in plant and machinery is more than INR25 lakhs but does not exceed INR5 crores	Where investment in plant and machinery is more than INR10 lakh but does not exceed INR2 crores
Medium	Where investment in plant and machinery is more than INR5 crores but does not exceed INR10 crores	Where investment in plant and machinery is more than INR2 crores but does not exceed INR 5crores

Source: Government of India

The definition of MSME that is used by financial institutions like State Bank of India conforms to the Micro, Small, and Medium Enterprises Development Act, 2006, wherein the definition of MSMEs given by GoI holds true².

To give a brief about the magnitude and significance of this sector, as per MSME estimates, this sector generates 100 million jobs, distributed over the expanse of 46 million industrial units throughout the nation. The sector is engaged in the manufacturing of more than 6,000 types of items, which translates itself to a significant 38% contribution to the nation's GDP, and 40% and 45% share of overall exports and manufacturing output, respectively³.

Realizing the potential of this sector in adding to the country's rooftop solar capacity, this study aims to quantify the rooftop solar potential of MSMEs and the barriers that are preventing the offtake of the rooftop solar in MSMEs. It also studies the existing financial instruments catering to MSME segments and suggests a possible financial framework to address

these barriers by laying an emphasis on supporting those sections of MSMEs which have a poor credit rating and find difficulty in accessing finance. (40% of MSME lending done through informal channels, and 25% through invisible (proprietor) borrowing)⁴

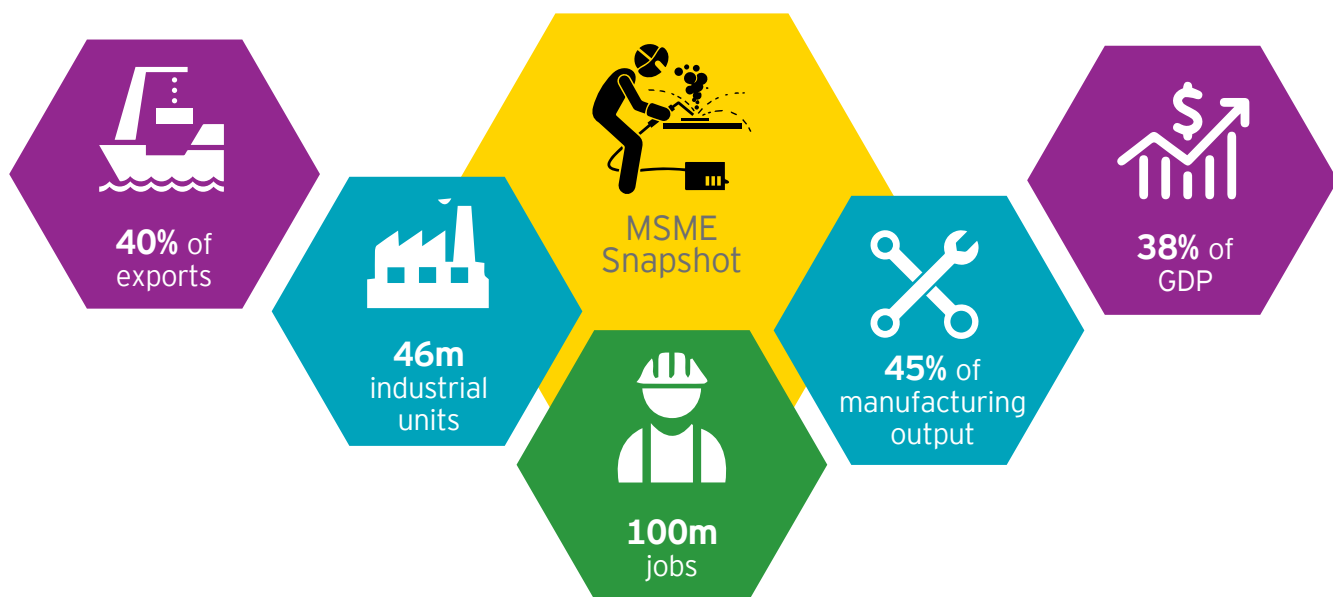


1 <https://msme.gov.in/faqs/q1-what-definition-msme>

2 <https://sbiforsme.bank.sbi/SME/ssiCharter.htm?execution=e7s1>

3 <http://www.makeinindia.com/article/-/v/nurturing-a-manufacturing-culture>

4 Credit Disrupted-Digital MSME Lending in India, Omidyar and BCG



“

The greatest thing in this world is not so much where we stand as in what direction we are moving.

Johann Wolfgang von Goethe

2

Rooftop Solar potential in MSME sector



As the first step, an attempt was made to find out the rooftop potential available with MSME segment in India. To achieve this, the following two potential approaches were adopted:

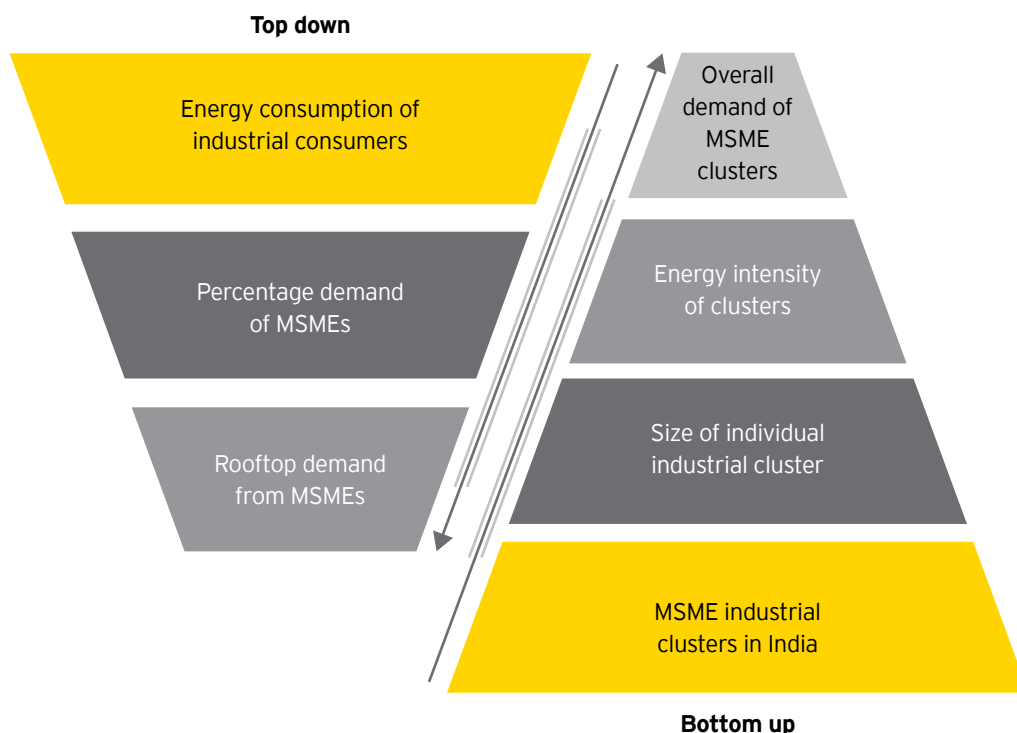
Top-down approach | Bottom-up approach

The top-down approach involves estimating the MSME energy consumption by firstly looking at the total energy consumption of industrial consumers in the country, estimating the percentage demand of MSMEs out of the total industrial demand and finally arriving at the rooftop potential for MSMEs, based on the

2.1 Analysis through top-down approach

Based on Energy Statistics 2017, the total demand from industrial consumers in India in 2016 was 424 billion electricity units (BU or TWh), out of which total energy demand from utilities was 286 billion electricity units. The rest of the 138 billion electricity units of energy consumption was met through captive power generation. Maharashtra, Gujarat, Tamil Nadu,

Figure 3. Approach for computation of rooftop potential available in MSMEs in India



Source: EY analysis

assumptions related to MSMEs meeting a portion of their energy demands through rooftop solar, as shown in Table 2.

The bottom-up approach involves looking at energy requirements of the various MSME clusters in India by estimating the average size of each industrial cluster, the energy profile (energy intensity) of each cluster and the number of clusters, which again gives us the rooftop potential in MSMEs.

Uttar Pradesh, Punjab, Karnataka, Andhra Pradesh, Rajasthan, Telangana, Haryana, Madhya Pradesh and West Bengal are the top 12 states in terms of energy consumption in the industrial sector..

As per a study undertaken by SIDBI ⁵, 48% of the energy demand in the industrial sector comes from MSMEs.

The calculation below shows the energy demand from MSMEs is estimated at 204 BU (TWh) annually:

Energy demand of industrial MSMEs X % demand from MSMEs = demand from MSMEs

424 BU X 48% = 204 BUs

⁵ http://sameeksha.org/pdf/presentation/SIDBI_Energy-Efficiency-Initiatives-for-MSMEs.pdf

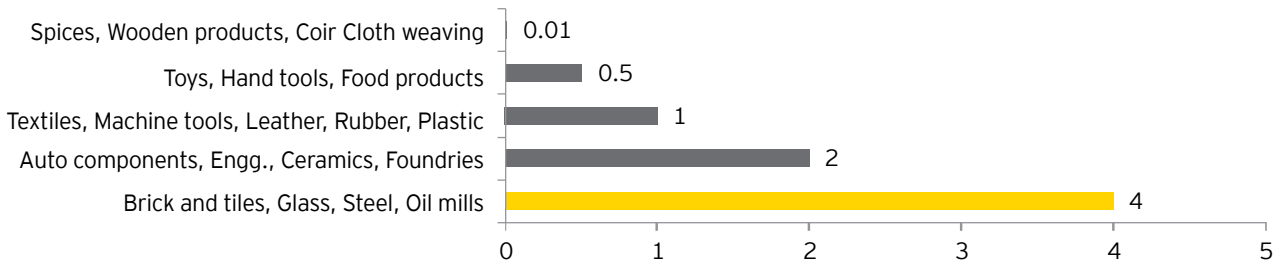
2.2 Analysis through bottom-up approach

The number of clusters has been taken from the development commissioner MSME cluster list, which provides details of 388 clusters in the country. As these clusters are of varying sizes, they have been split into four categories.

For each cluster, the number of registered units that have been considered are the lower limit of the range for conservative estimates. For example, the number of units considered in the range 500--1000 units is 500 units.

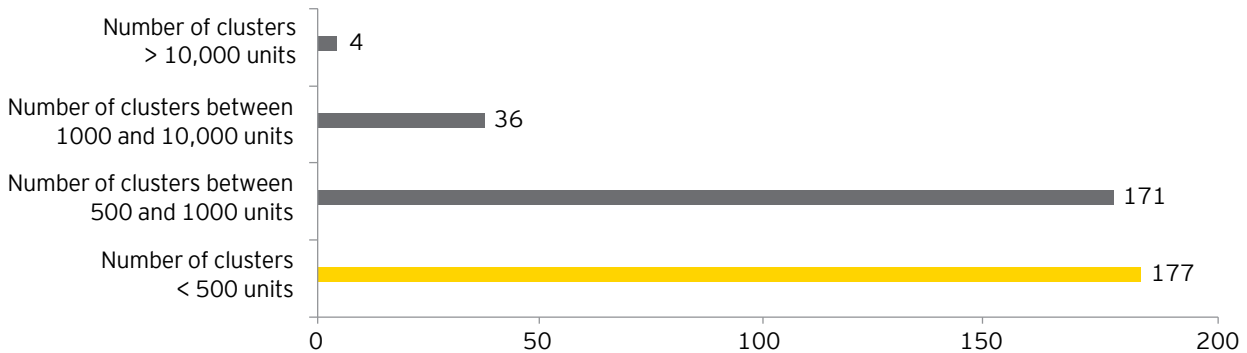
These units have been further categorized on the basis of their energy consumption profile (energy intensity) depending on the type of industry based on discussions with industry experts and other secondary data. The number of units classified as per the average energy consumption is given in figures 5 and 6:

Figure 4a. Average energy consumption based on type of industry Energy consumption (MU/annum)



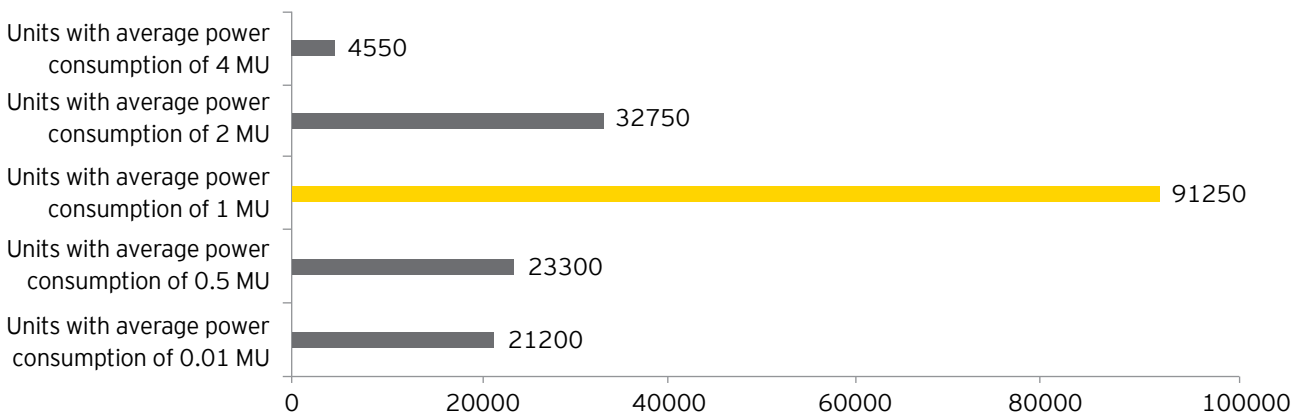
Source: Energy Intensity Report by BEE

Figure 4b. Split of industrial clusters in terms of number of units per cluster



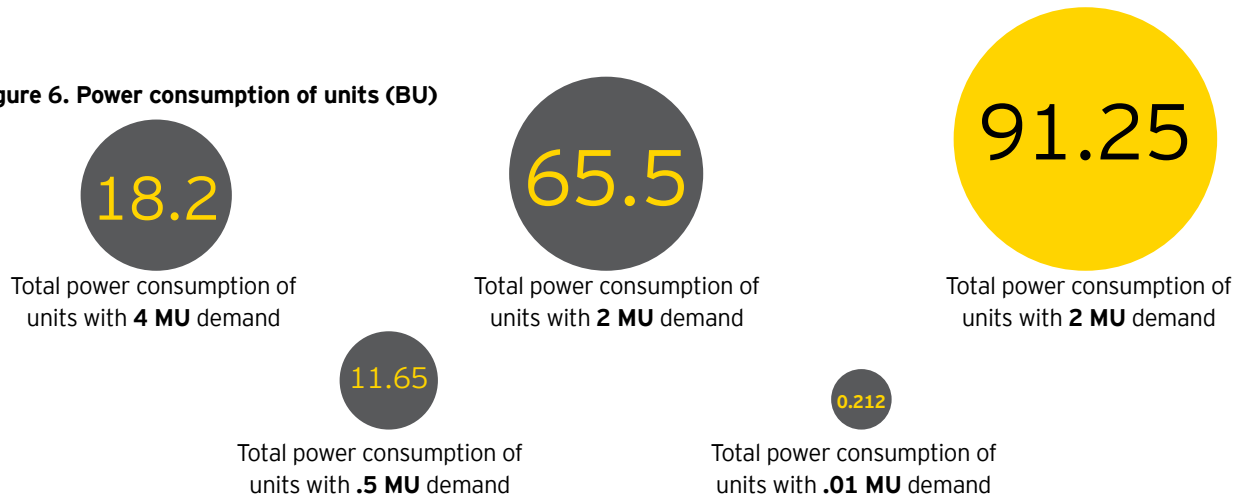
Source: Energy Intensity Report by BEE

Figure 5. Number of units as per average energy consumption



Source: Energy Intensity Report by BEE supplemented by EY analysis

Figure 6. Power consumption of units (BU)



Source: Energy Intensity Report by BEE supplemented by EY analysis

An addition of these energy demand figures in BU gives the energy demand in MSMEs, which estimates to 186.81 BU.

The following formula has been used, wherein the data from the previous graphs has been incorporated:

MSME industrial clusters X size of individual clusters X energy intensity of clusters based on the type of industry = overall demand of industrial MSMEs

Source: EY analysis

From this energy demand, the rooftop potential of MSMEs can be estimated. The following factors have been considered to evaluate the demand of rooftop solar installation in MSMEs:

- ▶ Overall energy demand from industrial MSMEs (from top-down and bottom-up approaches)
- ▶ Likely percentage of consumers owning their roof: 60% (based on primary estimates by EY)
- ▶ Likely percentage of consumption met from solar rooftop: 15% (based on primary estimates by EY)

Following are the calculations that have been carried out based on the aforementioned two approaches in Table 2 below.

The estimated rooftop solar potential from the top-down approach gives us a figure of 17.9 GW, whereas the bottom-up approach brings us to a figure of 16.4 GW.

So, it is observed that both the approaches converge to rooftop solar potential figure of ~16.5 GW to ~18 GW in the MSME segment. This is clearly a huge potential, which if properly tapped, can go a long way towards meeting half of the rooftop solar target of 40 GW by 2022.

Table 2. Estimated rooftop solar potential in MSME segment by FY22

Demand category	Top-down approach	Bottom-up approach
Energy demand by MSMEs (TWh or BU)	204	187
Growth estimate for FY 16-22	6.50%	6.50%
Energy demand in FY 22 (BU) (A)	298	273
Likely % of consumers owning their roof (B)	60%	60%
Likely % of consumption met from solar rooftop (C)	15%	15%
Overall contribution from solar rooftop (BU) (D=A*B*C)	27	25
Potential capacity in MW @ 17% CUF by FY22	17,989	16,490

Source: EY analysis

3

Barriers to rooftop solar adoption in MSMEs



Rooftop solar in sectors such as residential, PSU and large C&I have their own unique incentives to adopt rooftop solar. However, for the MSME segment, the situation is different and difficult, though the potential is substantial.

There are several issues impeding the drive towards rooftop solar by MSMEs. These issues broadly range from financial issues such as lack of good financing options for MSMEs, requirement of collateral, poor credit rating, etc. to operational issues such as lack of uniform policies, lack of awareness, lack of suitable rooftop structure, etc. Some of these barriers are listed out in the subsequent section.

3.1 Financial barriers



Rooftop solar projects are moderately long-term projects which need high upfront capital. Lack of access to finance significantly impedes the uptake of rooftop solar by MSMEs. Out of a total outstanding credit of INR26,041b as in November 2017, according to the Economics Survey 2017-18, 17.4% went to MSMEs. The share is disproportionately small given the fact that the share of MSME sector in the country's Gross Value Added (GVA) is approximately 32%. Thus, more than being an issue related only to rooftop solar, the lack of offtake of rooftop solar is due to the inherent issues associated with MSMEs.

Due to the higher tariffs in the commercial and industrial sector, rooftop solar is self-sustainable. However, MSMEs have their unique challenges due to the operational and financial barriers in these segments.

Some of the financial barriers faced by MSMEs in installing rooftop solar systems are:

Credit worthiness: RBI guidelines encourage reputed credit rating agencies to do credit rating of MSME units to facilitate credit flow to the MSME sector and enhance the comfort level of lending institutions. Banks are advised to consider these ratings as per the availability and wherever appropriate, to structure their rates of interest depending on the ratings assigned to the borrowing MSME units⁷. However, as per an external study⁸ conducted, it is estimated that close to 94% of the MSMEs are unregistered, without any credit ratings. Their financial transactions are conducted in cash and they do not have financial records. This makes it very difficult for the banks and other financial institutions to assess their credit-worthiness. As a result, MSMEs find it challenging to access external finance, let alone green finance.

Industry sources state that many MSME units, which have received some credit limit, neither have an external credit rating nor have managed to get investment grade ratings. Investment grade rating would typically mean a rating of BBB or higher by RBI-approved credit rating agencies such as CRISIL, ICRA and CARE⁹.

Also, MSMEs in some sectors have high NPA rates (ranging from 14% to 17%) and also low credit growth rate (less than 2% in steel and metal products, etc.). There are traditional risks associated with these sectors and thus an increased risk aversion of banks in lending to these sectors.

Insufficient financing options: after RBI issued guidelines categorizing the renewable energy sector under priority lending status¹⁰, it was expected that credit availability to MSMEs would be enhanced, especially for clean energy related requirements. While there are quite a few financing schemes targeting energy efficiency programs in MSMEs, these do not cater specifically to the installation of rooftop solar systems.

As per EY analysis, out of the 27 public sector banks providing financing to MSMEs, only five have specific energy efficiency financing products and none of them have loans for pollution control

6 <https://economictimes.indiatimes.com/small-biz/sme-sector/economic-survey-large-businesses-corner-82-6-of-credit-MSMEs-get-a-paltry-17-4/articleshow/62693254.cms>

7 <https://www.rbi.org.in/commonman/english/scripts/FAQs.aspx?id=966>

8 http://www.switch-asia.eu/fileadmin/user_upload/Publications/2016/Green_Finance_Study_-_2016_-_India.pdf

9 <http://www.thehindu.com/todays-paper/tp-business/SBI-diktat-to-affect-credit-to-small-medium-sized-firms/article14986586.ece>

10 <https://www.rbi.org.in/Scripts/FAQView.aspx?id=87>

and cleaner production measures. Only three venture capital funds - Infuse, Global Environment Fund and Green India Venture Fund focus solely on the green technology sector. Funding available through Indian incubators is usually inadequate to develop green technology products and services, discouraging innovation in green technologies.

- ▶ **High initial capital:** the capital cost required for the installation of a rooftop solar system is high for the annual savings it generates. A typical 1 kW system costs around INR59,000¹¹. The general payback period for 15-20 kW systems is typically estimated at 7-10 years (although this varies significantly between states and consumer types), which discourages MSMEs from locking in capital, especially as commercial/industrial establishments typically don't want to divert the capital to non-business and non-core activities¹². Therefore, the high initial capital required for installing rooftop solar proves to be deterrent for MSMEs.
- ▶ **RESCO issues:** the reluctance of RESCOs due to concerns regarding the ability of MSMEs to honor power purchase agreements (PPAs) and lack of protection mechanisms poses a big problem in implementing rooftop systems. While banking institutions have the right to assets of the borrower in the event of default, there is no such power given to RESCOs who work with the help of borrowing from banks. Therefore, they may not be willing to take the risk of entering into long-term agreements with MSMEs. Policies can provide backings from central or state governments or states to PPAs, and local DISCOMs may be legally made a party to these contracts to improve compliance.
- ▶ **Long-term business viability:** a large number of MSMEs are often unregistered and may not be fully working within the purview of company laws and banking systems. These MSMEs conduct financial transactions primarily in cash and do not have adequate financial records¹³. There is also no clarity on the long-term operational existence of many industries. This effect is amplified in the case of MSMEs because in the event of non-availability of adequate credit, there is a higher chance of these enterprises to wind up. This results in financial institutions becoming reluctant to extend long-term credit to these enterprises for implementation of rooftop solar systems.



- ▶ **Collateral requirement:** banks are usually risk averse and often have stringent lending guidelines which require collaterals, usually a property - either land or buildings. They usually provide recourse loans for renewable energy projects based on existing relationships with customers. Often, MSMEs face difficulty in providing adequate property as collateral, especially if they plan to take up larger amounts of financing¹⁴.

According to an RBI circular, banks are mandated not to ask for collaterals in case loans upto INR1m extended to units in the MSME sector¹⁵. Further, banks may, on the basis of a good track record and financial position of the MSME units, increase the limit of dispensation of collateral requirement for loans up to INR2.5m with the approval of an appropriate authority.

However, more often than not, the initial investment required for the establishment of rooftop solar systems exceeds the threshold amount specified by RBI and hence collaterals become necessary.

11 <https://mnre.gov.in/sites/default/files/uploads/benchmark%20cost%202019-20%20%281%29.pdf>

12 <https://amplussolar.com/blogs/?p=486>

13 http://www.switch-asia.eu/fileadmin/user_upload/Publications/2016/Green_Finance_Study_-_2016_-_India.pdf

14 <https://www.rbi.org.in/commonman/english/scripts/FAQs.aspx?id=966>

15 <https://www.rbi.org.in/commonman/english/scripts/FAQs.aspx?id=966>

3.2 Operational barriers



The following are some of the major operational barriers faced by MSMEs while implementing rooftop solar systems:

- ▶ **Non-existent quality control parameters:** there is a low entry barrier for system integrators as well as concerns about equipment quality, raising concerns over long-term rooftop system operations. The efficiency and quality of solar panels produced by the Indian players is not at par with its global counterparts because of the lack of technical expertise and intellectual property¹⁶.
- ▶ **Consumer awareness:** as per EY's secondary research, there is a lack of consumer awareness in benefits of a rooftop solar system, equipment standards, financial instruments in the market, etc. In a recent survey, 71% of MSMEs reported that they were unaware of the Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) program. Out of the 29% of MSMEs that were aware, 99% found difficulty in obtaining information from banks. Bank officers often lack knowledge on green technologies and business models as well as risk assessment tools for green finance products¹⁷. They also lack the awareness of benefits to be accrued out of rooftop solar systems along with ways to utilize them in the best possible manner. Therefore, the rate of uptake is slow. Providing information about quality, cost and benefits of adopting solar, clearing confusions regarding interconnecting with the grid or metering, etc. can help MSMEs to choose the right rooftop solar solutions. Although, National Solar Energy Federation of India (NSEFI) and MNRE are putting efforts to raise awareness through television and radio media, other significant steps are required to be taken in spreading awareness on the benefits of rooftop solar¹⁸.
- ▶ **Regulatory issues:** non-uniform regulatory procedures in different states make it difficult for MSMEs to refer to the set procedures. Policies like net-metering and gross-metering for solar rooftops have been announced by almost all states. But the implementation of these policies has been quite slow¹⁹. One of the reasons behind this is the takers' lack of clarity on procedures for applying for a new rooftop solar connection.

Lack of clarity in kW unit scaling, and non-availability of skilled professionals in handling or explaining net-metering model have created problems in the uptake of rooftop solar on a large scale.

- ▶ **DISCOM apathy:** lack of DISCOM initiatives in (a) executing net metering regulations, (b) streamlining processes and (c) in being part of payment security mechanisms are barriers in the uptake of rooftop solar systems. In some states, it takes almost three to six months to receive a net-metering connection. However under Phase-II Programme of MNRE, the focus has been centered on DISCOMs, with performance based incentives being provided to DISCOMs based on the RTS capacity achieved. Unless DISCOMs have a stake in the rooftop solar implementation, it is difficult to witness a boom in the rooftop solar market.
- ▶ **Non-availability of rooftop space:** available rooftop space in industries are limited by structural issues, piping layouts, congested industrial areas and placement of other equipment. In addition to this, shade and angle of inclination of the roof becomes an important factor to be considered while installing rooftop systems. Even with the availability of appropriate rooftops, consumers may not want to allocate their rooftops for solar system as they may use it for various alternate purposes of different and enhanced value. As a solution to this, a superstructure on the top of rooftops for installation of solar panels can be considered.
- ▶ **Maintenance issues:** MSMEs lack the capacity and knowledge to maintain the installed equipment on their premises. Various components, including the solar panels, mounting structures, inverters, batteries, cables, junction boxes, etc. need to be maintained. This technical maintenance may not be a core competency for the MSMEs and thus may require a further investment in training the staff or maintenance personnel or even an engagement of third party for the maintenance.

¹⁶ <https://amplussolar.com/blogs/?p=486>

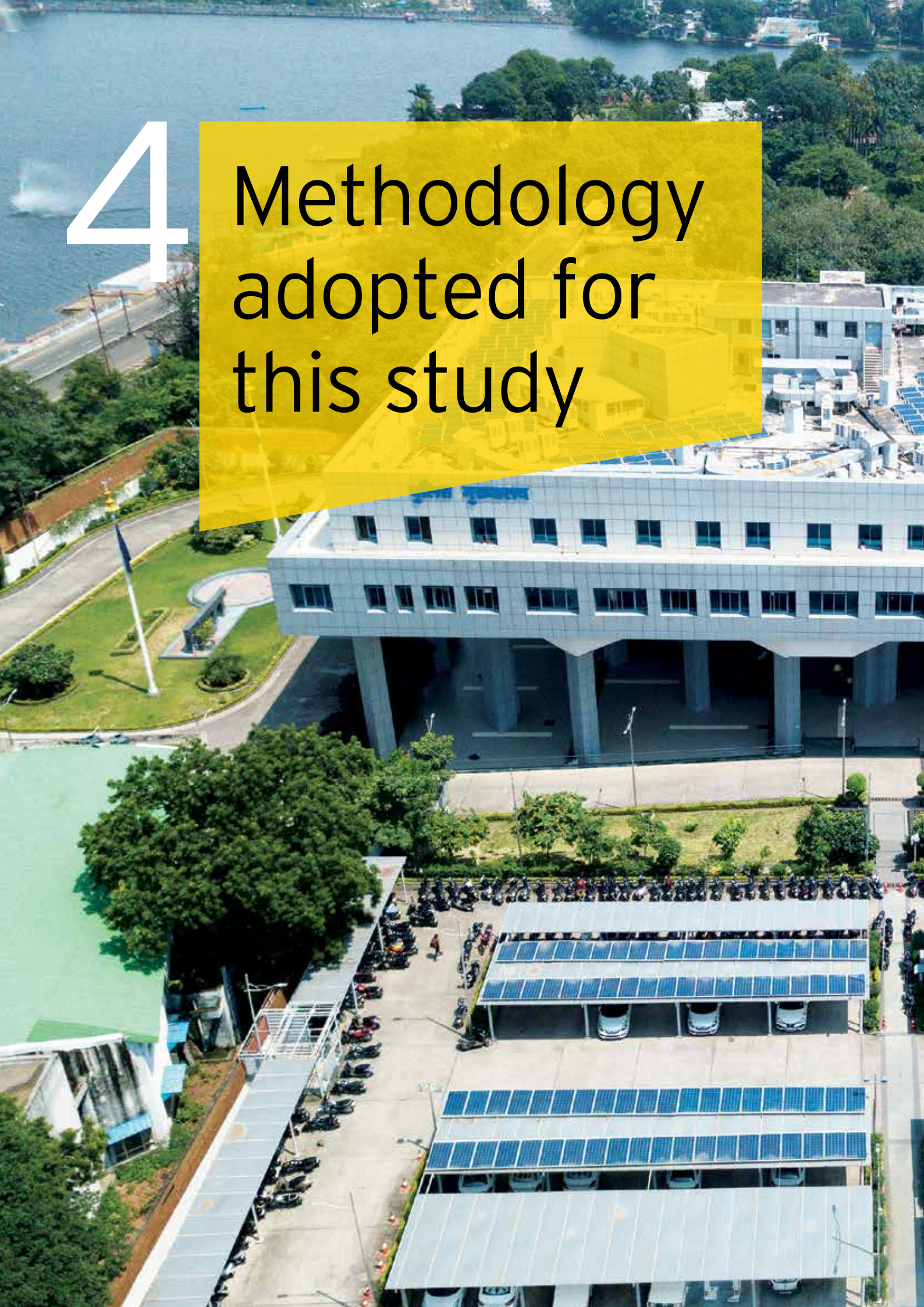
¹⁷ http://www.switch-asia.eu/fileadmin/user_upload/Publications/2016/Green_Finance_Study_-_2016_-_India.pdf

¹⁸ <https://www.vikramsolar.com/rooftop-solar-in-india-undeniable-growth-yet-challenges-exist/>

¹⁹ <https://www.businesstoday.in/magazine/features/the-sun-has-never-shone-brighter-for-the-rooftop-solar-market-in-india/story/242977.html>

4

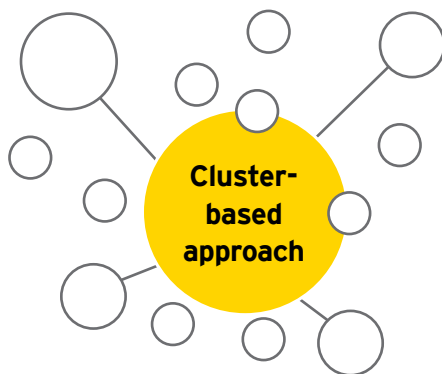
Methodology
adopted for
this study



The study has taken a cluster-based approach to review and analyze rooftop solar adoption by MSMEs and devise solutions for increasing the uptake of rooftop solar. A cluster is a geographical area where firms from the same industry typically are located together in a close proximity. It enables small companies to enjoy the same benefits as big firms through economies of scale. By being together, firms are able to reap benefits from neighborhoods' pool of expertise, focused approach and skilled workers²⁰.

The cluster-based approach towards increasing rooftop solar uptake in MSME is feasible, owing to similar characteristics among units in a cluster such as geographical location, markets, products, technology deployed and similar development issues, the collection of data and understanding of issues turns out to be more resource efficient and effective. As a result, more conclusive takeaways can be expected from such an approach.

At the outset, the study has focused on identifying the sectors/clusters, which are best suited for undertaking this study.

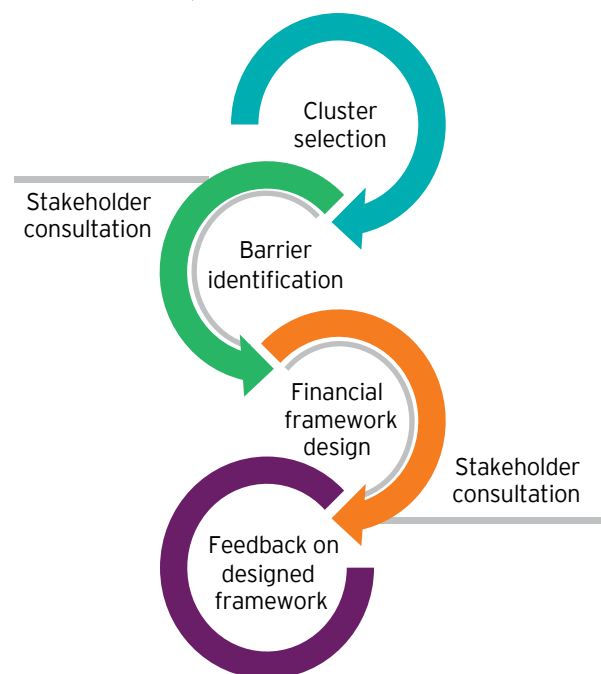


This has been carried out by ranking the sectors based on different logical parameters such as macro parameters, financial parameters and technology (energy-related) parameters. Based on a detailed analysis and after consulting with stakeholders, the top sectors have been shortlisted that can best leverage the results out of this study.

The next step of this process involves studying the barriers that are plaguing these sectors and preventing them from adopting rooftop solar to the extent possible as per their available potential.

As laid out, the barriers are mostly on the financial and the operational aspects. For understanding specific barriers in these sectors, detailed consultations have been conducted with stakeholders such as MSMEs, developers serving these sectors, as well as financial institutions responsible for lending to these companies. Each has its own specific reasons for not supporting or adopting rooftop solar in MSMEs. A study of financial instruments that already exist in the market has also been carried out to study their suitability to the purpose of rooftop solar offtake, and also the demerits in these instruments, which can be plugged in to better serve the MSME sector for offtake of rooftop solar.

Figure 7. Cluster-based approach towards rooftop solar uptake



Source: EY analysis

Finally, the findings made on the basis of the previously mentioned studies and stakeholder consultations have been analyzed, and used to design a financial framework that suits the offtake of rooftop solar in MSMEs.

This financial framework is envisaged to be based on risk profiling of different MSME sectors and is focused on addressing the concerns of both the lenders and the borrowers (MSMEs or developers).

²⁰ <https://www.economist.com/node/14292202>

The study considered the government published list of MSME clusters available on the Development Commissioner (DC) MSME website. This list of 388 clusters was further clubbed into a list of 21 broad sectors, on which initial filters were applied.

Initial filters were used to eliminate the sectors which are not suitable for rooftop solar offtake, by considering the electricity consumption and dependency of these sectors and removing the ones for which electricity does not form a significant component of its energy demand.

The remaining sectors were then ranked on their suitability to the adoption of rooftop solar on the basis of multiple factors categorized under macro, technical and financial to finally arrive at those sectors, which are best suited to the adoption of rooftop solar.

Following key steps were taken in this study to arrive at the sectors to assess rooftop uptake:

4.1 Initial filtering of sectors

To arrive at a trickled-down list, the MSME sectors were subjected to the filters illustrated below, thus enabling the selection of sectors on which further analysis can be conducted. The following two filters have been initially considered to understand rooftop suitability in the sectors:

The electricity consumption of the sectors:

this factor reflects the average volume of electricity used by a single unit of the studied clusters. This is an important parameter to consider because it represents the potential that rooftop solar systems have in these units in reducing the expenses incurred in meeting their electricity demand.

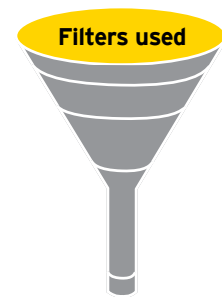
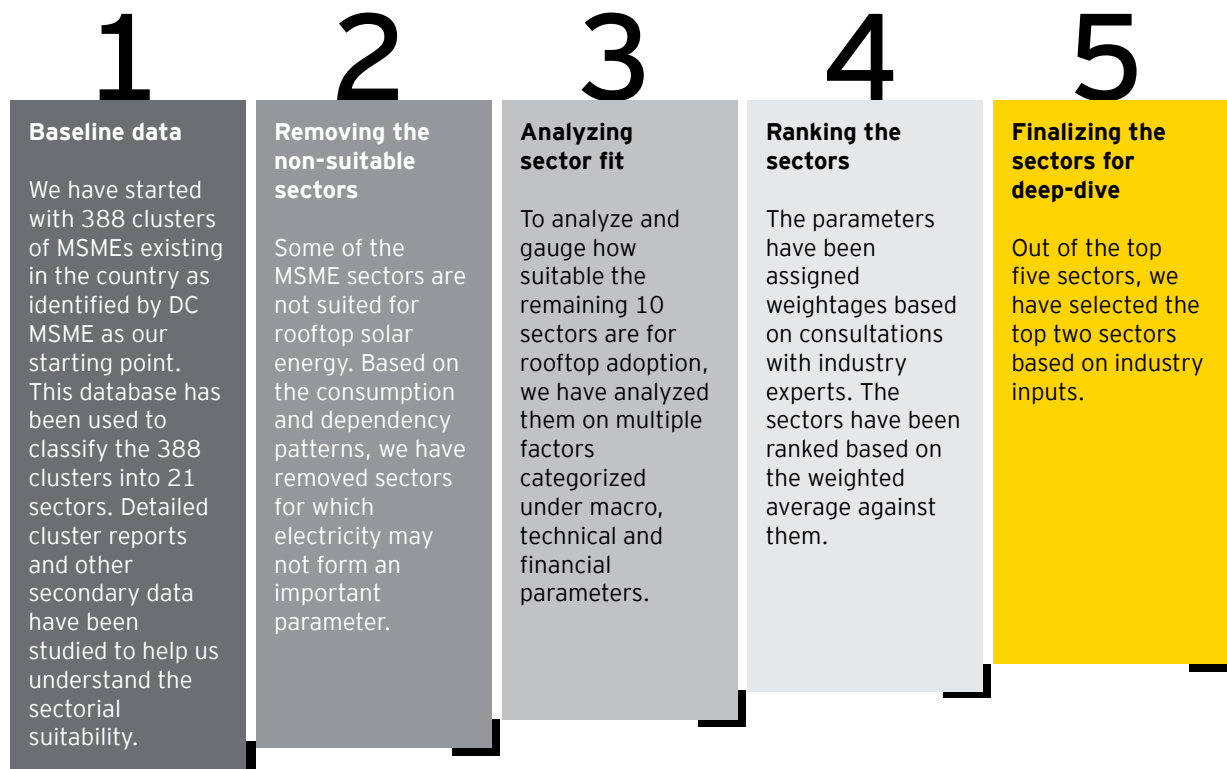


Figure 8. Approach to selection of sectors to be studied





This study has considered the unit-wise electricity consumption (in kWh/annum), which has been estimated by dividing the total electricity consumption in all the clusters studied under a sector by the number of units in these clusters.

The dependency on electricity in meeting energy demands:





this factor is a reflection of the significance electricity holds in comparison to energy from other fuel sources, in meeting the energy demands of the individual units/clusters/sectors. It is important to consider this parameter as a filter because the percentage of electricity dependence is a direct reflection on the level of inclination of units towards moving for rooftop solar.

This study has found out, or in cases, calculated, the electricity dependency as a percentage of the total energy consumptions of the clusters from the reports analysed in secondary research, and has averaged them out to get a picture of energy dependency of the entire sector.

Based on their prominence against these two parameters, the sectors were ranked. This helped in arriving at the final selection of sectors most suited for targeting offtake of rooftop solar. Accordingly, six sectors were found to be highest in ranks when considering their prominence under both these parameters. These sectors are cold chain, plastic, pharma, leather, rice mills and foundry. Apart from this,

Table 3. Factors for the selection of sectors for further studies

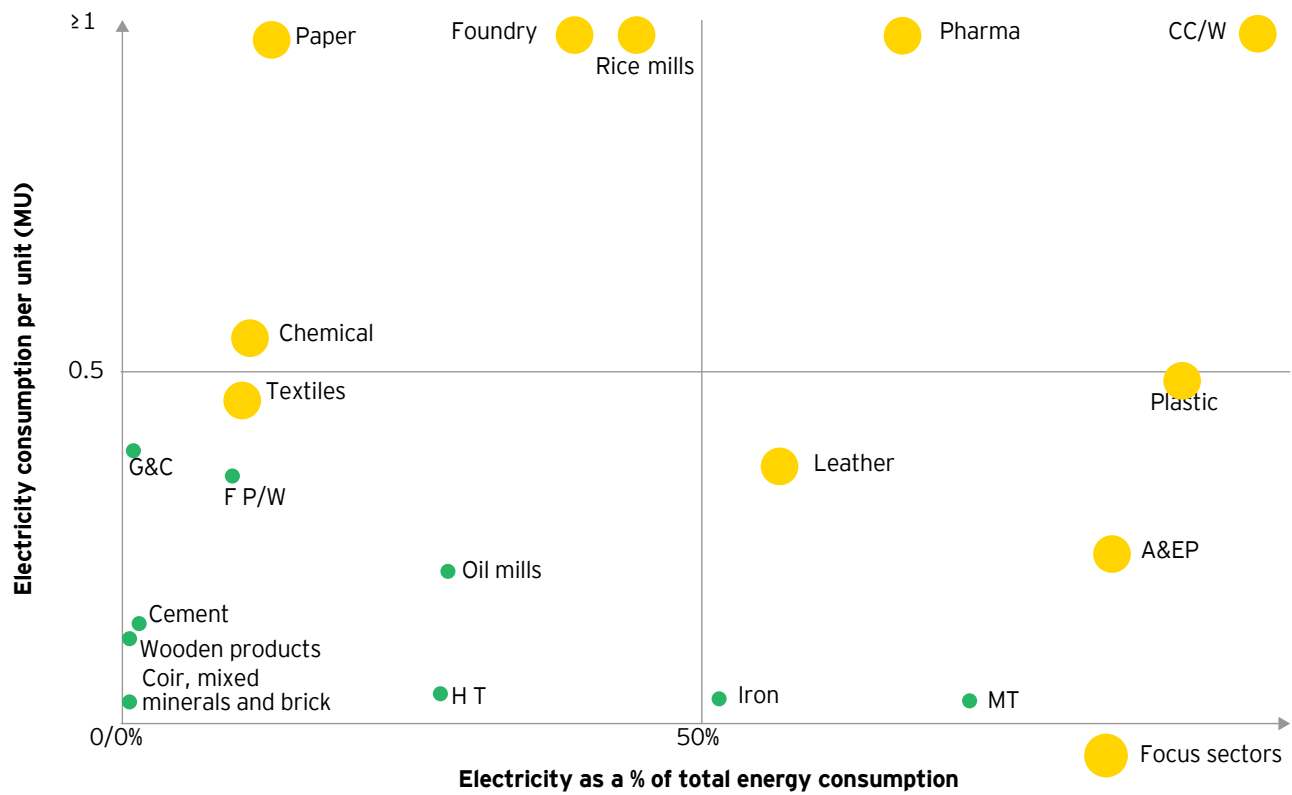
Industries	Electricity consumption (Mwh/per annum)	Number of units in the cluster	Weighted average electricity (Mwh) per unit	Weighted average electricity % of the total energy consumption	Industries selected
Cold chain warehousing	2,44,238.63	244	1,321.57	93%	✓
Plastic	1,42,072.08	440	428.04	86%	✓
Auto and engineering products	14,96,735.86	17,965	150.02	80%	✓
Machine tools	20,468.80	400	51.17	74%	
Pharma	59,615.38	52	1,146.45	64%	✓
Leather	58,580.31	205	285.75	58%	✓
Iron	33,517.66	457	47.88	52%	
Food processing (rice mills)	9,90,259.61	1,020	1,455.10	47%	✓
Foundry	42,59,132.70	7,361	1,251.46	41%	✓
Agricultural mills (oil mills)	6,512.80	30	217.09	36%	
Hand tools	1,15,416.12	1,005	76.98	32%	
Paper	1,77,939.00	29	6,135.82	15%	✓
Food processing/ warehousing	1,42,047.41	1,225	290.90	14%	
Chemicals	11,99,129.29	1,788	669.53	13%	✓
Textiles	19,09,153.87	22,765	383.65	12%	✓
Cement	14,188.60	75	189.18	6%	
Glass and ceramics	10,69,576.21	1,690	309.88	5%	
Wooden products	71,187.23	696	102.28	4%	
Coir	2,317.51	451	5.13	3%	
Mixed minerals	19,922.19	381	65.96	3%	
Brick	30,249.63	1,58,550	21.60	0%	
Grand total	1,20,62,260.90	2,16,829	663.10		

- A**  Top 11 based on the weighted average electricity consumption (Mwh/pa) per unit
- B**  Top 11 Weighted average electricity % of the total energy consumption
- C**  6 industries common to both (A & B)
- D**  Other 4 potential industries

auto and engineering products also scored very high against the electricity dependency filter. Three other sectors which scored moderately high against these two filters are paper, chemicals and textiles. The following working table shows how the comparisons were done on the basis of these two parameters, which led to the sectors on which further detailed analysis has been done.

As a comparative representation, the sectors have been stacked against each other, and have been projected taking both the parameters into consideration. As seen from the graph below, most of the chosen sectors appear in the 1st, 2nd or 3rd quadrants, which is a fair reflection of their high electricity consumption as well as dependence, as has been pointed out in this section.

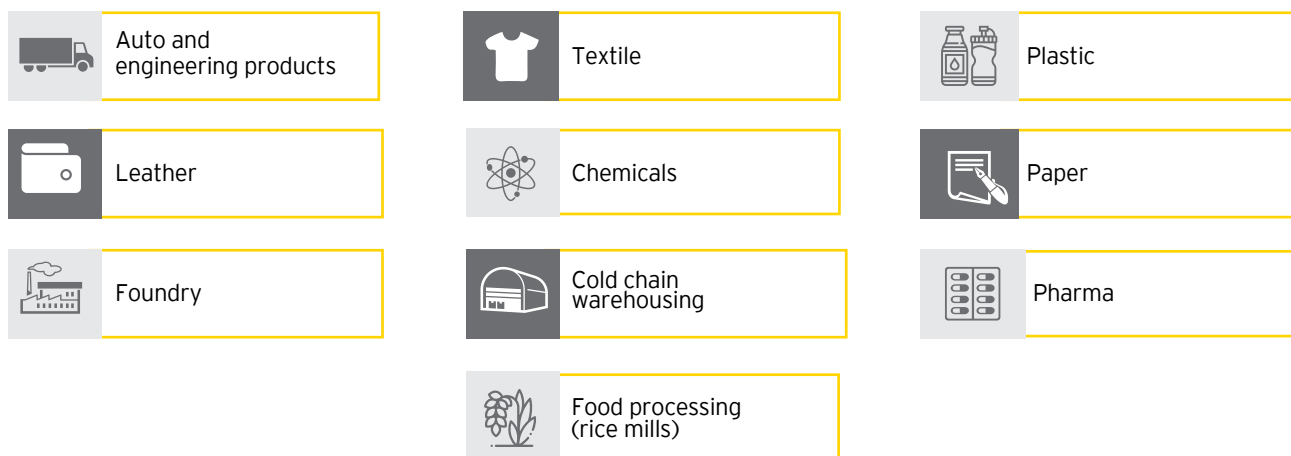
Figure 9. Matrix to ascertain sector dependence on electricity



Source: EY analysis

The shortlisted sectors for further detailed analysis are provided below:

Figure 10. Sectors shortlisted for detailed analysis



Source: EY analysis

4.2 Parameters for ranking the sectors

The sectors shortlisted above are then measured against various parameters, taking into consideration macro, technical and financial aspects. For initiating the process of ranking, the following parameters have been considered to compare the sectors:

- ▶ **Sectoral GDP contribution:** The contribution of MSMEs to the non-agriculture GDP is a sizeable 37%²¹. To gauge the contribution made by the shortlisted sectors, the GDP contributions of the individual sectors have been considered. This parameter shows the magnitude and size of the sector, which in turn justifies targeting interventions in these sectors.
- ▶ **Sector growth:** The growth rate of the sectors by comparing their respective CAGRs has been considered. The parameter compares the trend of growth of the sectors, helping us focus on sectors, which are showing good overall growth trends.
- ▶ **Employment:** The MSME sector in India employs about 117 million people²² across various sectors, constituting 40%²³ of the workforce. This parameter compares sectors on the basis of the inclusiveness of the impacts that can be witnessed by focusing on these sectors.
- ▶ **Electricity/production costs:** The electricity costs as a percentage of average production costs has been considered. Energy consumption, including electricity is a significant part of the cost incurred by industries, and rooftop deployment can help in mitigating this cost. Thus, sectors with dependence on electricity as a large portion of their production costs would be more likely to switch to solar rooftop to meet their energy needs. Hence, it is one of the most important parameters indicating affinity of MSMEs towards uptake of rooftop solar.
- ▶ **Rooftop solar suitability:** Rooftop specifications like availability of rooftop area and its structural quality have also been considered. This factor provides a general idea of theoretically how receptive the infrastructure at the units will be towards installation of rooftop solar equipment. Thus, sectors typically having asbestos sheet roofs would have a low ranking than the ones having a reinforced cement concrete roofs. Also, in some sectors and industries, piping works are often laid out at the rooftop, leaving less space for rooftop installations.
- ▶ **Credit growth:** Credit growth for overall MSME has been 19.3%²⁴ year-on-year (yoy) in the quarter ending December 2018. This parameter is important because it indicates sectoral outlook of financial institutions and financiers.
- ▶ **NPA rates:** MSME is the only segment that showed NPA rates less than 12% in the two-year period from Dec 2015 to Dec 2017. The 2016-17 data released by SIDBI and CIBIL has been considered. This parameter is important to a financier, thereby providing comfort that defaults are low and investing in this sector is less risky.

21 <http://pib.nic.in/newsite/PrintRelease.aspx?relid=107201>

22 <http://www.makeinindia.com/article/-/v/msme-sector-achievement-report>

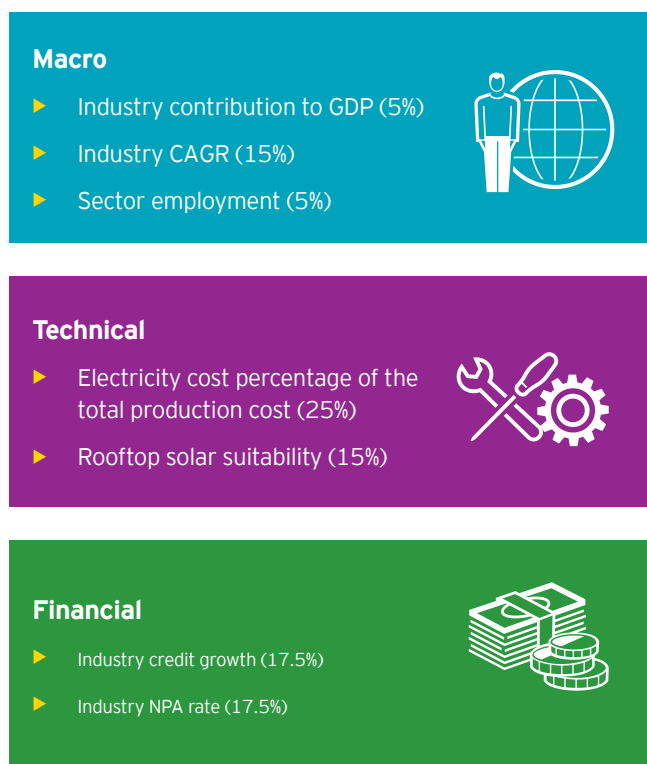
23 <https://economictimes.indiatimes.com/small-biz/policy-trends/MSMEs-employ-close-to-40-of-indias-workforce-but-contribute-only-17-to-gdp/articleshow/20496337.cms>

24 <https://newsroom.transunioncibil.com/transunion-cibil--sidbi-msme-pulse-quarterly-report-signals-speedier-credit-growth-revival/>

4.3 Shortlisted sectors for final study

The parameters mentioned in the previous section have been assigned suitable weightages and the selected sectors have been rated against these parameters.

Figure 11. Rating of parameters on the basis of macro, technical and financial parameters



Source: EY analysis

As evident from the boxes above, the highest weightage of 40% has been assigned to the technical parameters, because these parameters best represent the inclination of an MSME to switch to rooftop solar, with a view to reducing their dependency on high electricity tariffs.

Financial parameters have been assigned a weightage of 35%, with both NPA rate and credit growth both being assigned moderately high weightages of 17.5% each, taking into consideration the concerns of financial institutions in reaching out to these sectors.

Along with it, macro parameters have also been assigned a cumulative weightage of 25%, with industry CAGR contributing a maximum of 15% to it. This is because due importance has been given to the high-growth aspect of sectors, considering that growing sectors will be sustainable in the long run and will be more inclined towards taking up progressive initiatives like rooftop solar.

Scoring: The process of linear transformation has been used for arriving at the scores on the basis of each datasets for each of the sectors. The entire data for every scoring indicator is fitted into a linear curve:

$$Y = mx + C$$

Where,

- ▶ y is the dependent variable which corresponds to the score for each sector.
- ▶ x is the independent variable which corresponds to the value that a particular state corresponds to for a specific dataset.

The maximum and minimum values in each dataset is set as the upper and lower limits. That is to say, the maximum value is set as the upper limit i.e., five and the minimum value is set as one, the lower limit. Thus, the score ranges from one to five for each of the scoring indicator. This has been done to arrive at a relative ranking amongst the sectors.

The maximum and minimum value depends on the nature of the indicator such as:

- ▶ Positive indicators: where higher the value, better the performance (say in the case of CAGR)
- ▶ Negative indicators: where lower the value, better the performance (say in the case of NPA Rate)

Illustration

In Annexure-I the values for electricity as a % of total production costs (TPC), a positive indicator, ranges from the lowest value of 1.60% (for auto and engineering components) to 26.86% (for cold chain). The upper limit is set at 26.86 while the lower limit is 1.60. Using these two values, two equations are arrived at:

- 1 $26.86m + c = 5$ (the sector with highest value scores the highest)
- 2 $1.60m + c = 1$ (the state with the lowest value scores the lowest)

By simultaneously solving the above two equations, the values of “m” and “c” are arrived at using which the values for the other sectors can be scaled in the scores in the range of one to five. So for a sector like rice mills, with electricity dependency of 10.44% has a score of 2.40. Had this parameter been a negative indicator, the equation would have been:

- ▶ $26.86m + c = 1$ (the sector with lowest value scores the highest)
- ▶ $1.60m + c = 5$ (the sector with highest value scores the lowest)

Finally, the weightages assigned to each of the parameters are multiplied to the score obtained in the grading scale, to arrive at the final weighted score for each sector for that particular parameter.

Working charts for two aforementioned parameters, namely “Electricity as a % of TPC” and “NPA rate” have been included in the annexure to give a visual representation of the process followed.

These industry scores arrived at for a particular sector against the eight parameters are finally added up to give the final industry score for each of the sectors.

These scores have been compared to come up with a final list of ranking for these sectors.

The working sheet of the final ranking sheet has been shown below:

Table 4. Assessment of selected ten industries for MSME rooftop study

Ranking	Industry/weightages	Industry score (out of 5)	Electricity % of TPC	Industry contribution to GDP	Industry CAGR	Sector employment	Rooftop solar suitability	Industry credit growth	Industry NPA rate (% Dec'17)
		100%	25%	5%	15%	5%	15%	17.5%	17.5%
1	Auto & engineering products	3.39	0.25	0.25	0.65	0.16	0.75	0.69	0.64
2	Cold chain/warehousing	3.06	1.25	0.06	0.75	0.11	0.15	0.34	0.41
3	Leather	2.68	0.51	0.07	0.28	0.06	0.15	0.74	0.88
4	Plastic	2.49	0.49	0.06	0.33	0.07	0.15	0.88	0.53
5	Foundry	2.35	0.39	0.06	0.31	0.06	0.75	0.61	0.18
6	Paper	2.09	0.31	0.05	0.24	0.05	0.75	0.18	0.53
7	Textiles	2.07	0.27	0.16	0.28	0.25	0.15	0.50	0.47
8	Pharma	2.05	0.50	0.10	0.38	0.05	0.15	0.34	0.53
9	Chemicals	1.92	0.25	0.10	0.26	0.05	0.15	0.57	0.53
10	Food processing (rice mills)	1.84	0.60	0.08	0.15	0.11	0.15	0.34	0.41

Source: EY analysis and secondary sources

4.4 Sector profiles

Thus, on the basis of the above analysis, the top two sectors arrived at are depicted below:

Figure 12: Sectors selected for detailed study for the MSME rooftop solar study



Auto and engineering products



Cold chain/warehousing

Source: EY analysis

Apart from upcoming trumps in the analysis, these two sectors hold other solid reasons, which strengthens the case to work in these two sectors.

The fact that one of them is from manufacturing while the other is from the services also enables the study team to work with a good diversity of sectors. A look at the geographical distribution of these two sectors also shows their huge geographical diversity, allowing the study team to work with clusters from diverse geographies and conditions.

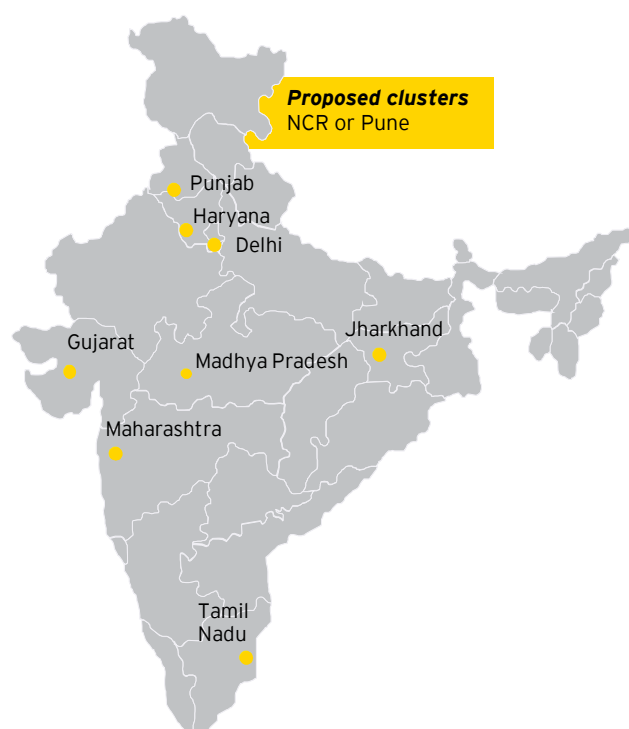
A brief of these two sectors has been illustrated below:

Auto components

The auto sector in India is one of the largest in the world, and it contributes to around 7% of the GDP of India. India is also a major auto exporter, with a growth in exports of 15.81% y-o-y April 2017 to February 2018. The industry has also attracted foreign direct investment worth US\$18.41 billion between 2000 and 2017, making it a highly sought-after sector²⁵.

According to media reports, auto players like M&M and Tata Motors have taken a lead in this new pursuit of clean technology, going by the contracts awarded by Energy Efficiency Services Limited (EESL).

Figure 13. MSME clusters for auto components manufacturing



Source: EY analysis

The Indian automotive aftermarket is estimated to grow at around 10%-15% to reach US\$16.5 billion by 2021 from around US\$7 billion in 2016. It has the potential to generate up to US\$300 billion in the annual revenue by 2026, create 65 million additional jobs and contribute over 12% to India's GDP.²⁶

It is also a highly energy-intensive sector, with energy costs varying from 2% of manufacturing costs in fabrication to 44% in foundry.²⁷ Additionally, the energy used also mostly comes from electric power, with many organizations like Maruti maintaining captive power plants for their consumption.

Financially, the ancillaries working with the auto industry have a good access to finance as they are backed by order books from auto majors like Tata Motors, Honda, Maruti, etc.

Cold chain

A cold storage is a temperature controlled storage space catering mainly to agriculture and food industries. Cold storages are used for the storage and distribution of perishable goods such as fruits and vegetables, dairy products; frozen foods such as meat and ice cream, and temperature-sensitive pharmaceutical products. Given that India is primarily an agricultural country, cold storage has a huge potential in India. The sector is unorganized and dominated by traditional cold storage facilities.

There are high expectations from this sector with CRISIL revealing growth figures of 13%-15% from 2017-22 as compared to 11%-13% growth that was registered in the previous five years. The growth areas are mostly expected to be in meat, seafood and bio-pharmaceuticals, which are highly export-driven sectors. This will in turn help the industry reach turnover figures of INR472b in fiscal 2022 from INR248b in fiscal 2017²⁸.

25 <https://www.ibef.org/industry/india-automobiles.aspx>

26 <http://siamindia.com/uploads/filemanager/47AUTOMOTIVEMISSIONPLAN.pdf>

27 http://sameeksha.org/pdf/clusterprofile/Faridabad_mixed_engineering_cluster.pdf

28 <https://www.thehindubusinessline.com/economy/cold-chain-pie-to-nearly-double-in-5-years-crisil/article22692968.ece#>

Wastage of fruits and vegetables is still regarded high at 15%-16%. This is mainly due to the cold storages mostly being available near consumption centers rather than near farm gates. This calls for investment in cold storages 50km-150 km from the farm gates as well as meat production centers so that an efficient cold chain grid is built across India. Investment in refrigerated vehicles is also the need of the hour. Hence there is still tremendous potential for the sector to grow at good rates.

This is also an energy-intensive sector, with energy accounting for 28%-30% of the total cold storage expenses. Out of the total energy consumption, electricity accounts for a major chunk of the share, contributing to more than 90% of the energy consumption in many cold storage facilities. Electricity in fact is the only source of power in cold storages, apart from diesel gensets (DGs) used as backup power. This makes the sector feasible for investment in rooftop solar as it can help in reducing the dependency on high electricity costs.

Figure 14. MSME clusters for cold chain storage in India



Source: EY analysis

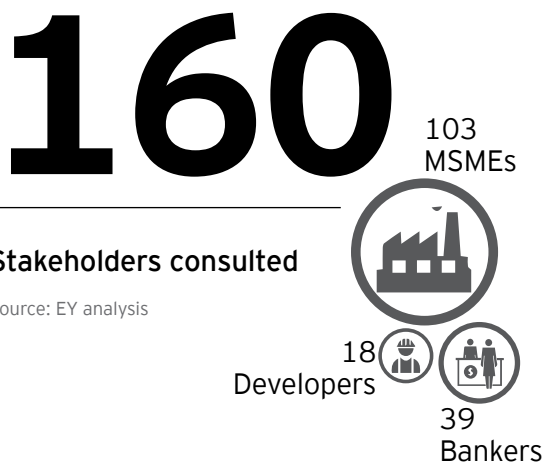
A close-up, profile view of a man with dark hair and a beard, wearing a dark suit jacket over a light-colored checkered shirt. He is speaking into a black gooseneck microphone. In the background, another person is visible but out of focus. A yellow rectangular box is overlaid on the image, containing the number '5' and the text 'Stakeholder consultations'.

5

Stakeholder
consultations

5.1 Background

Through this study, the barriers to rooftop solar uptake in MSME segment, especially under the two sectors of auto component manufacturing MSMEs and cold chain MSMEs have been studied. For this purpose, more than 150 stakeholders have been consulted throughout the course of this study. This includes financial institutions, developers and auto component and cold chain MSMEs from Gurgaon, Manesar, Faridabad, Indore, Pithampur, Agra, Guntur, etc.



The MSMEs have been consulted primarily to get an understanding of their awareness about the various aspects of rooftop solar such as financing, business models and regulatory. They have also been enquired on their willingness to switch to rooftop solar, and the barriers that are impeding their move to rooftop solar. The study has also tried to understand the financing behavior of MSMEs regarding their mode of access to finance, and the barriers to raising finance. Financial institutions have also been consulted regarding the current lending scenario in the rooftop solar space, their experience in MSME lending and their opinion on innovative financial mechanisms that can work in this sector. Developers have been asked about their experience in borrowing, and in investing in the MSME space.

Figure 15. Stakeholders consulted for the study



Lenders



Auto component manufacturers



Cold chain



Developers

Source: EY analysis

5.2 Profile of the stakeholders consulted

The stakeholder consultations have been conducted in discussion format, touching upon topics relevant to this study.

The following sets of stakeholders have been consulted as part of this study:

Financial institutions under the following broad categories have been approached for this study

- ▶ Private sector banks
- ▶ Public sector banks
- ▶ Non-banking financial companies (NBFCs)

Consultations through face-to-face meetings and telephonic discussions were undertaken covering aspects such as their experience with MSME players, the criteria they have in place in approving loans to MSMEs and their inputs on the existing financial instruments as well as interventions that can be made to increase solar rooftop acceptance. Also, a survey with 22 SBI SME relationship managers was done during their training session held at their academy on rooftop solar, whose findings are mentioned later in the report.

Following sectors have been covered, from **MSME side**:

- ▶ Cold storage and warehouse players
- ▶ Automobile component manufacturers
 - ▶ Tier-II category (manufacturers who supply to the big auto giants like Maruti, Honda, Ford, etc.)
 - ▶ Tier-III category (manufacturers who supply to Tier-II manufacturers)

The automobile component manufacturers that have been consulted are involved in the manufacturing of diverse automotive components such as automobile lights, fasteners such as nuts and bolts, nickel plating, castings and forgings, springs, foundry, etc.

The third section of stakeholders consulted as part of this study are **developers** involved in the business development, installation and maintenance of rooftop solar power projects.

5.3 Approach

Figure 16. Approach adopted for carrying out stakeholder consultation study



Source: EY analysis

The stakeholder consultations with the MSMEs, financial institutions and developers have been conducted through different modes of approach, with the objective of capturing the most relevant information at this stage of the study.

The interactions with MSMEs were carried out through survey questions and the resulting discussions that evolved from them. Financial institutions were approached with a questionnaire encapsulating the topics relevant to them, whereas discussions with developers captured their concerns and suggestions for the rooftop solar sector to take off.

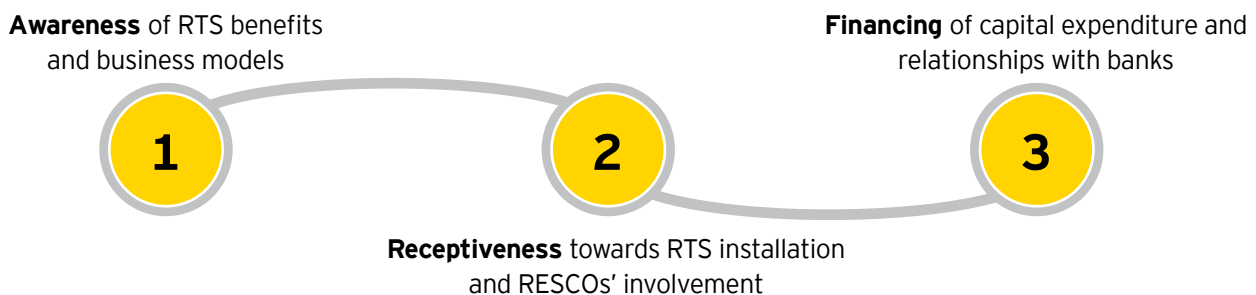
5.4 Areas of discussion

This report covers the discussions that have been conducted with MSMEs, financial institutions and developers. The discussions with various stakeholders have tried to cover different aspects relevant to the stakeholders such as financing issues of MSMEs and experience of lenders on working with MSMEs, ultimately with the objective of mitigating the relatively poor state of lending to MSMEs, especially for rooftop solar. While in the case of MSMEs, the exercise has focused on the MSMEs' perspectives on rooftop solar as well as financing; the focus in case of the financial institutions has been to understand their lending situation in rooftop solar, their experience with MSMEs and alternate financial mechanisms that can help mitigate issues in this sector. In case of developers, the discussions mostly hovered around issues faced by developers in the nascent rooftop solar space.

Discussions with MSMEs

Our discussions with MSMEs have covered the following major areas of study:

Figure 17. Parameters gauged by the stakeholder consultation study



Source: EY analysis

Awareness: In our consultations, an attempt has been made to gauge the awareness of these MSMEs towards the benefits that rooftop solar has on offer for them.

The conversations were initiated by trying to get an idea of their line of business, their electricity consumption reflected by their monthly electricity bills and their rooftop area which can be used for installation of rooftop solar. Subsequently, the respondents were asked whether they were aware about the existence of rooftop solar systems and the benefits they have for their business. On the awareness side, they were also questioned on their awareness about the business models of RESCOs wherein another company comes and installs rooftop solar systems on their rooftops.


Receptiveness: The receptiveness of MSMEs towards installing rooftop solar now and in the future, has been assessed.

If an MSME had installed a rooftop solar on their premises, they were asked how satisfied they were with respect to the performance of the system. If it was a case of the MSME not installing a rooftop solar, they were asked whether the reasons for non-installation were operational, financial or anything else. They were then asked whether they were planning to install rooftop solar on their property any time in the future. MSMEs that had not installed a rooftop solar were also asked whether they would be receptive towards the idea of another company renting their roof and installing the same, for which they would be signing a power purchase agreement (PPA) with the company at a rate lower than what they were paying to the DISCOM.

Financing: An attempt has also been made in these discussions to understand the financing needs and availability of these MSMEs. Questions have been formulated in order to understand whether these MSMEs will be more inclined towards approaching banks for loans or self-financing the installation in the future. Their general behavior towards financing has also been explored by asking them their affinity towards approaching banks for their general capex requirements, the parameters on the basis of which banks accept/reject their applications and whether they prefer borrowing from banks, self-financing it or using any other means for their financing requirements.

Following is a depiction of some questions put forward to MSMEs to understand the above-mentioned aspects:

Figure 18. Questions put forward to MSMEs

 <p>Awareness</p>	<ul style="list-style-type: none"> ▶ Are you aware about the benefits rooftop solar has for your business? ▶ Have you ever come across any ads on rooftop solar? ▶ What are your reasons for installing rooftop solar? ▶ Are you aware of the RESCO business model?
<p>Receptiveness</p> 	<ul style="list-style-type: none"> ▶ Are you thinking of installing RTS in the future? ▶ Will you be okay with a RESCO coming and installing RTS system on your roof? ▶ Will you be comfortable with approaching banks for a loan?
 <p>Financing</p>	<ul style="list-style-type: none"> ▶ How do you finance your capital expenditure needs? ▶ On what parameters do banks evaluate you on, while disbursing loans? ▶ Is it easy or difficult for you to get loans from banks? What is the reason?

Source: EY analysis

Discussions with financial institutions

The discussions with financial institutions have focused on the following areas:

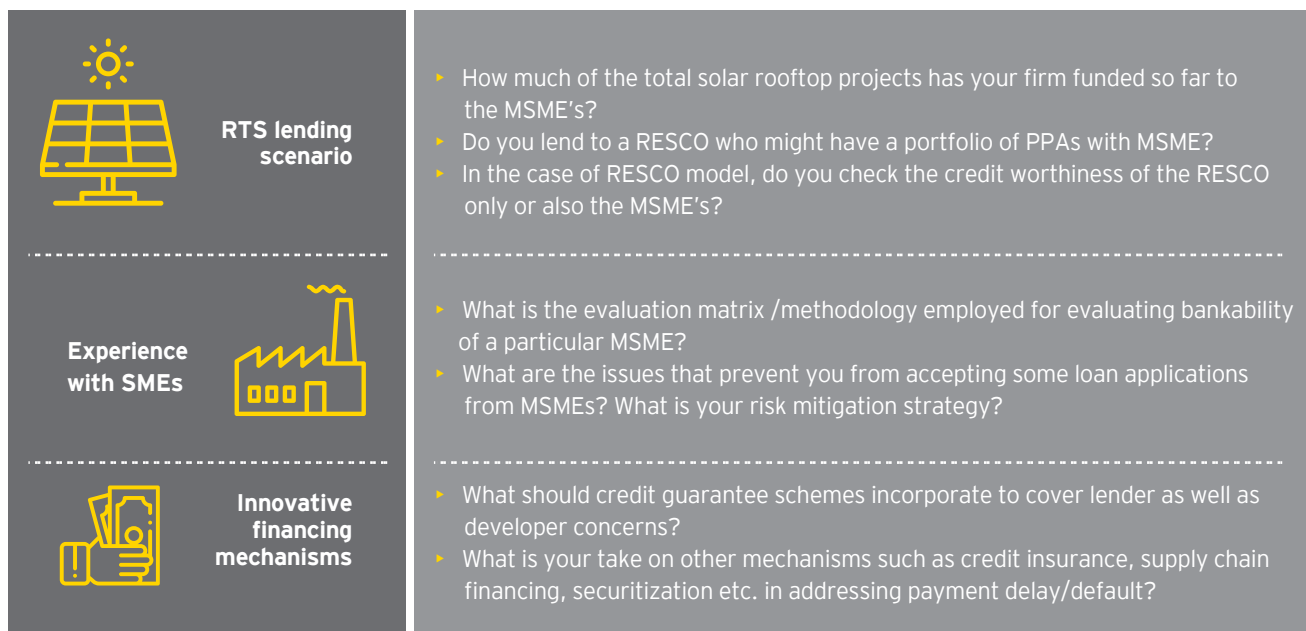
The consultations initially focused on understanding the **level of lending** that has happened **in the rooftop solar** sector along with the opinion of financial institutions with regard to the **involvement of RESCOs**, whether their involvement changes the lending pattern or procedure of financial institutions. Subsequently the discussion with financial institutions have been on the **lending situation with MSMEs**, the criteria used to assess their loan applications and the issues faced by financial institutions with regard to default/repayment.

Lastly, the financial institutions were also asked about their opinions on additional measures or alternate mechanisms that can be brought in to mitigate the situation of poor lending scenario in case of MSMEs.

Interactions with the client facing managers of SBI were conducted to get ground level feedbacks on the awareness, options, benefits, acceptability and uptake of rooftop projects in MSMEs located in various parts of the country.

Following is a depiction of some questions put forward to MSMEs to understand the above-mentioned aspects:

Figure 19. Questions put forward to lenders

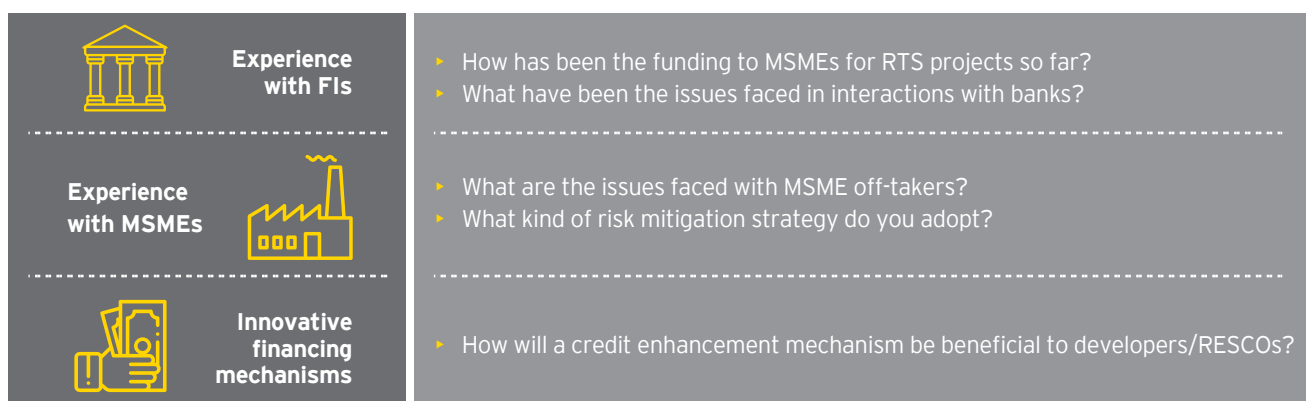


Source: EY analysis

Discussions with developers

The discussions conducted with developers have been largely open-ended ones. In these discussions, their viewpoints regarding their concerns about the rooftop solar sector not taking up and their suggestions on what can be done to provide them better support have been captured in brief towards the end of this report.

Figure 20. Questions put forward to developers



Source: EY analysis

5.5 Findings

Stakeholder consultations have been conducted with MSMEs (from the auto component manufacturing and cold chain spaces), financial institutions and developers. The insights received have been listed out below in the following sections.

MSMEs

The discussions are focused on understanding the awareness levels of MSMEs with regard to rooftop solar, their perception towards rooftop solar and RESCO model and also their financing behavior.

Awareness

One of the objectives of conducting the consultations with MSMEs was to gauge their awareness levels related to various aspects of rooftop solar, primarily under three broad heads:

- ▶ Financial
- ▶ Business models
- ▶ Regulatory

Under the financial head, the MSMEs were asked about their awareness levels on the project size suitable for their requirements, the capital costs required to fund that investment, the OPEX costs that would be required for the operations and maintenance along with the benefits that installation of a system provides. Under the category of business models, the MSMEs were enquired about their awareness of the self-financing or CAPEX model and the rent-a-roof or RESCO model. The MSMEs were also asked whether they were aware about net metering and gross metering.

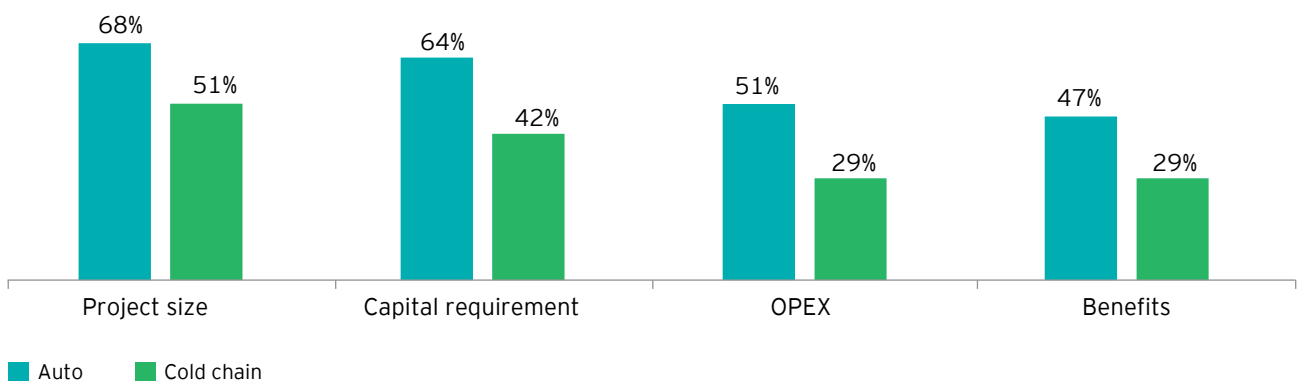
Awareness of MSMEs consulted on rooftop solar is relatively high, compared to their awareness of RESCOs, which has been found to be quite low.

MSMEs do not have adequate awareness about post-procurement technical aspects of a solar system such as OPEX and returns

Based on the discussions, the responses received from both the automobile component manufacturers as well as the cold chain players have been collated into a scale of one to five, a lower score reflecting lower awareness levels of rooftop solar among the MSMEs, and a higher score tending towards 5 reflects higher awareness levels about rooftop solar among the MSMEs contacted.

The low awareness in MSMEs regarding RESCOs points to the low penetration of RESCOs in the MSME space.

Figure 21. Awareness on rooftop solar project requirements



Source: EY analysis

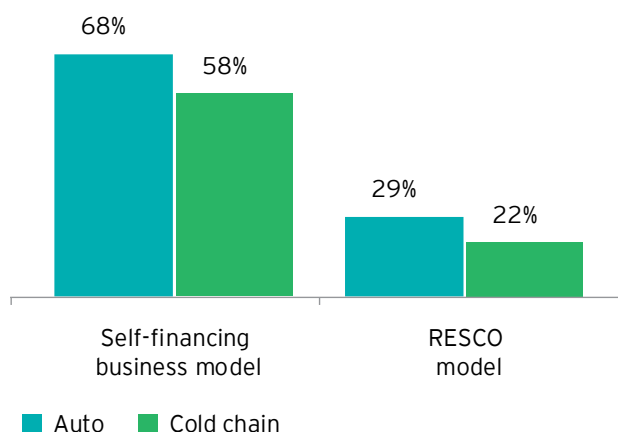
From the above ratings scale, it is evident that the cold chain and the automotive MSMEs seem to be aware about the aspects related to rooftop solar. However, in all the parameters, the auto component MSMEs that were consulted seem to have better awareness levels compared to cold chain MSMEs. Both sectors of MSMEs have a fairly good idea about the project size requirements for their business, with almost 68% of the auto component MSMEs coming up with good awareness levels. 51% of the cold chain MSMEs too showed good awareness levels regarding project sizing. The awareness of both sets of MSMEs in case of the capital requirement for installing the requisite capacity was also found to be adequate, with 64% of the auto component MSMEs showing good awareness levels and 42% of the cold chain MSMEs showing decent awareness. However, when enquired about their awareness of the operational costs involved in maintaining a solar system and the returns as well as benefits that can be accrued from installing a solar system, the awareness levels of MSMEs dropped. Whereas the auto component SMEs showed awareness levels of 51% and 47% across these two parameters and only a meagre 29% of the cold chain SMEs showed decent awareness levels regarding these two parameters.

These figures show that MSMEs have decent awareness regarding broad parameters, but their awareness regarding specific numbers such as OPEX and benefits is not ample.

MSME players that have been contacted about the existence of renewable energy service companies (RESCOs) have been found to be quite lopsided. Our consultations revealed that MSME players are unaware about the existence of such service companies, which would enable them to forego the upfront cost of installation that rooftop solar demands. The plot of RESCO awareness among cold storage players shows only 29% of the auto component manufacturing MSMEs and only 22% of the cold chain MSMEs showing some awareness of RESCOs.

This points to the quite a low penetration of RESCOs in the MSMEs space. However, both these sets of MSMEs have a decent awareness about the self-financing model.

Figure 22. Awareness of MSMEs on business models



Source: EY analysis

Some of the MSMEs contacted have done a cost-benefit assessment of the impact of rooftop solar on their business, and are either in the process of going ahead with the installation, or have faced hurdles during the assessment, which has convinced them to shelve the idea of investing on rooftop solar. But this is not the case with most other MSME players contacted, and without a proper assessment, they are not fully aware of the financial benefits they can accrue from the system.

The awareness regarding the awareness on regulatory issues such as net metering and gross metering was found to be in the medium range.

Receptiveness

Having assessed the awareness levels in MSMEs on rooftop solar and RESCOs, the level of receptiveness among both sets of MSMEs was assessed.

As a next step, this study has sought out to assess the receptiveness of these MSMEs towards these two aspects:

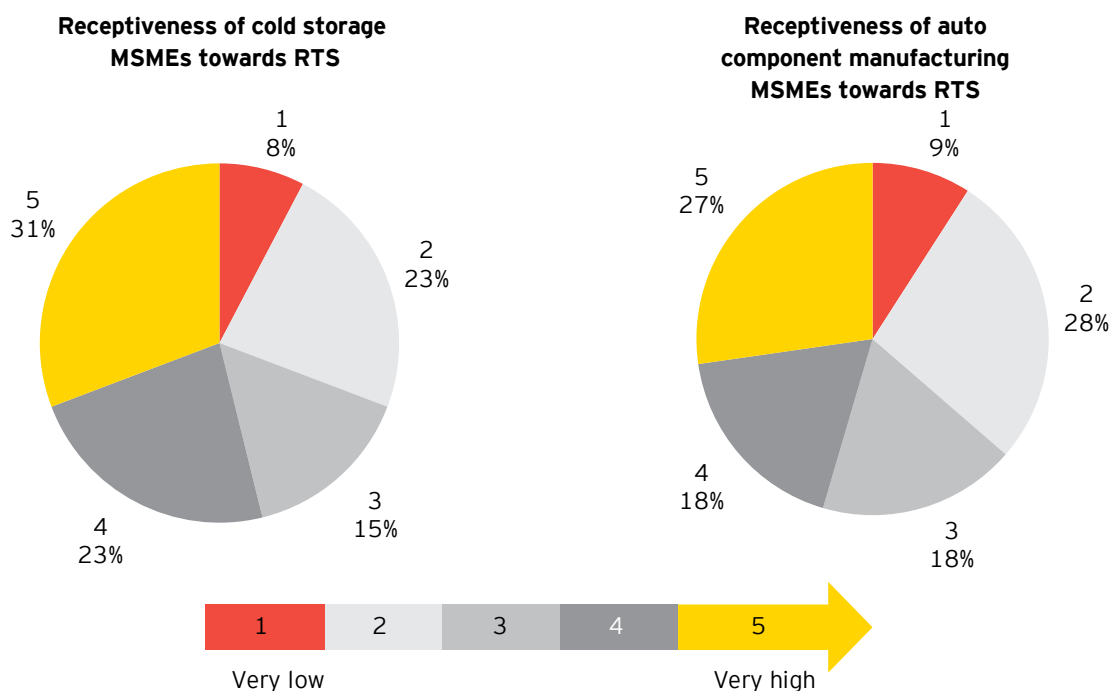
- ▶ Receptiveness of MSMEs towards future installation of rooftop solar
- ▶ Receptiveness of MSMEs towards adopting alternate models like RESCO

It seems that MSMEs for whom electricity forms a sizeable percentage of production costs, are more comfortable going for CAPEX, rather than depending on a RESCO.

As can be seen from the ratings scale below, there is a concentration of responses on the higher side of the scale for the cold storage MSMEs, with 54% of the responses being lodged on the extreme higher side of the scale, and another 15% on the moderately high side, which points to the fact that cold storage units consider investment in rooftop solar to be very important for the running of their businesses.

In case of the automobile component manufacturing MSMEs, a somewhat similar trend is seen, with 45% of the responses being lodged on the extreme higher side of the scale and another 18% of the responses showing moderate receptiveness of MSMEs towards rooftop solar.

Figure 23. Receptiveness of MSMEs towards rooftop solar



Source: EY analysis

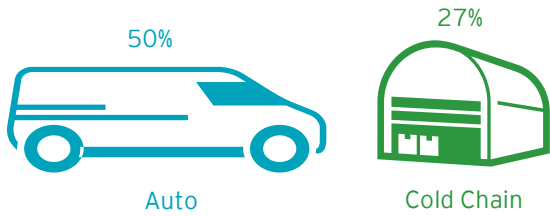
Receptiveness towards rooftop solar in both sectors of MSMEs consulted is high. However, receptiveness to RESCOs has been found to be relatively high in auto component manufacturing MSMEs as compared to cold storage MSMEs.

This shows that receptiveness towards the existence and benefits of rooftop solar among these MSMEs is high.

The reasons behind the considerably low receptiveness of some MSMEs towards rooftop solar were also investigated. Some of the reasons are:

- ▶ Businesses having inadequate roof structure (made of asbestos, etc.)
- ▶ Businesses having inadequate roof strength
- ▶ Businesses operating out of rented properties
- ▶ New businesses concentrating on other capex investment
- ▶ Businesses whose funds were stuck up in other operational expenses

Figure 24. Receptiveness of MSMEs to RESCO mode

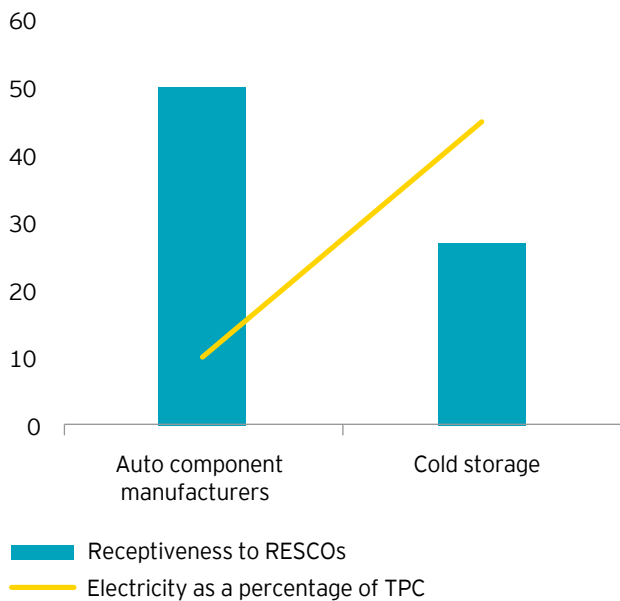


Source: EY analysis

The receptiveness among MSME players that have been contacted regarding the adoption of Renewable Energy Service Companies (RESCOs) model has been found to be quite favorable among the automobile component manufacturing MSMEs. Our consultations have found that many of the MSME players are quite eager to embrace the RESCO model, which would enable them to forego the upfront cost of installation that roof solar demands as well as concentrate on their core operations. The plot of RESCO receptiveness among automotive component MSMEs shows 50% of the respondents being quite eager to adopt the RESCO model. However, in case of the cold chain MSMEs, the graph shows only 27% of the MSMEs being receptive towards RESCOs.

This difference in behavior and perceptiveness towards RESCOs between the auto component manufacturing MSMEs and the cold storage MSMEs (50% of automobile component manufacturing MSMEs consulted have a receptivity towards RESCOs as opposed to 27% of cold storage MSMEs showing a receptivity towards RESCOs) can be explained on the basis of the fact that electricity comprises of a relatively low percentage of the overall costs in an auto component manufacturing unit (around 10% as per the findings on the clusters studied as part of the exercise on selecting the sectors for this study) compared to about 45% (as per the findings from the sector selection exercise) in the case of cold storage. So, it can be said that reducing electricity costs is a more major concern of cold storage MSMEs compared to automobile component manufacturing MSMEs, and hence they will be more interested in investing their own capital in installing rooftop solar systems on their property, as well as taking more interest in maintaining the equipment themselves, as it is part of their core expenses. An auto component manufacturing MSME, on the other hand, does not consider this expense as one that attains priority over their other CAPEX requirements, and hence would be willing to delegate the upfront investment as well as maintenance to a RESCO. However, there are exceptions depending upon the non-availability of finances with a cold storage unit or the desire of an auto unit to own the solar plant, owing to surplus availability of funds.

Figure 25. Receptiveness of cold storage towards RESCOs

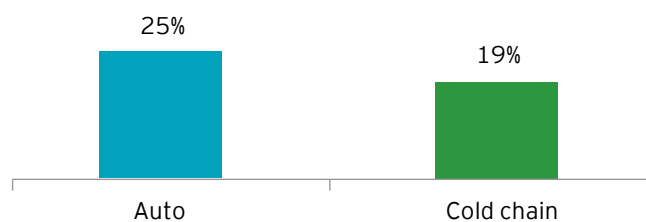


Source: EY analysis

The above-mentioned findings are being illustrated in Figure 27.

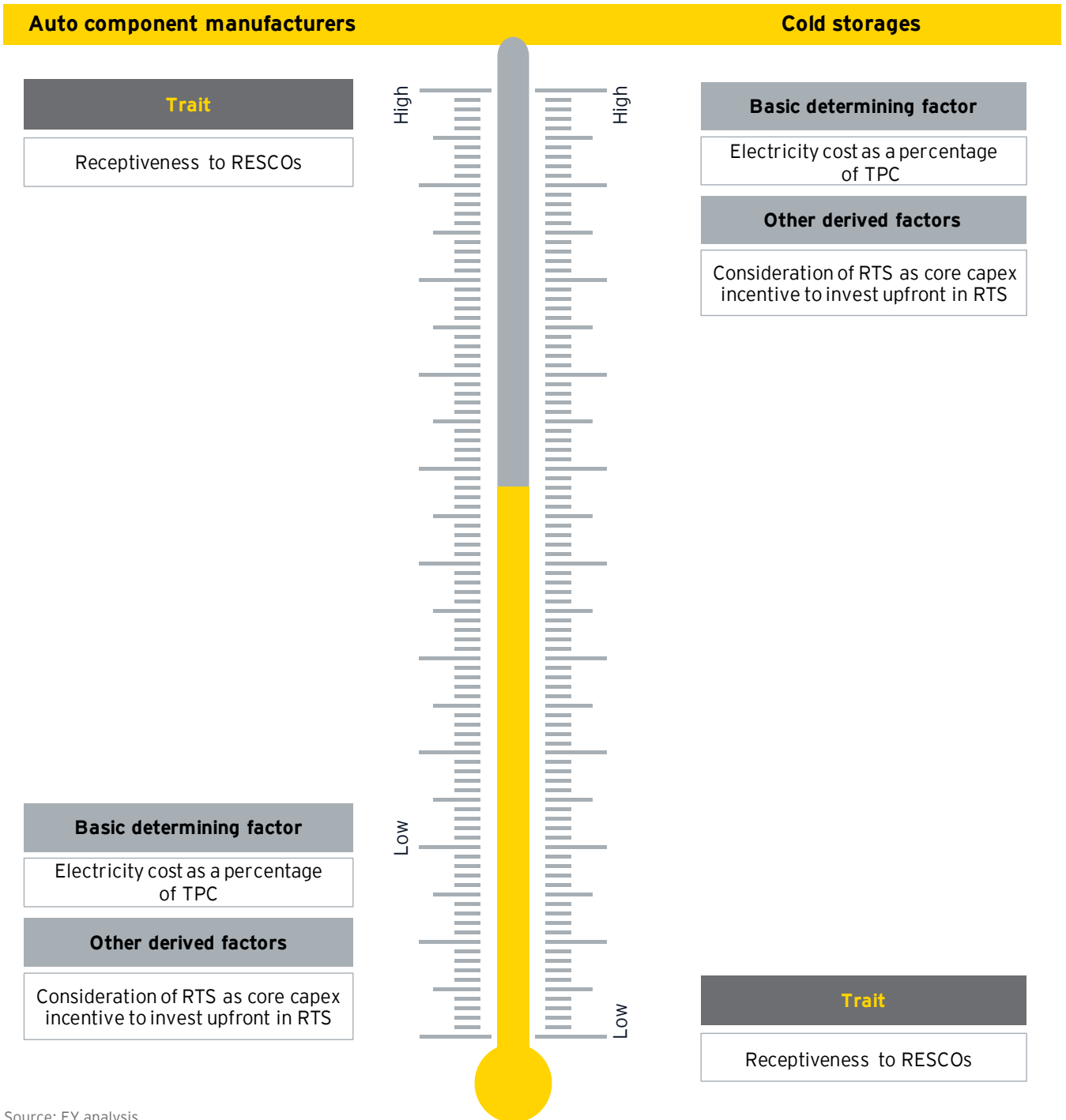
Since PPAs are a major aspect of the business model of RESCO, this study also tried to gauge the appetite of MSMEs towards signing long-term PPAs with RESCO companies. Even though there was a huge variation in the acceptance of RESCOs between the two sets of MSMEs, they were almost unanimous in their poor receptiveness towards signing long-term PPAs with RESCOs. The receptiveness of both the cold chain and auto MSMEs towards signing long-term PPAs remained near a measly 20%, showing that long-term PPAs remain a barrier towards adoption of the RESCO model in the MSME space.

Figure 26. Interest in long-term PPAs



Source: EY analysis

Figure 27. Difference between auto and cold chain SMEs in their receptiveness to RESCOs



Source: EY analysis

Motivation to switch to rooftop solar

Even though the uptake of rooftop solar amongst MSMEs has not been very high, many of them have shown interest in installing rooftop solar in the future. They realize the importance of rooftop solar in helping them reduce the bills. A select few have even attended rooftop solar workshops, while a few others have contacted rooftop solar companies to get a hang of the technicalities involved in procuring rooftop solar systems for their use.

As a part of this study, MSMEs were asked about their motivations behind thinking of switching to rooftop solar. As seen from the graph below, in the case of both sets of MSMEs, savings on electricity bills seem to be the biggest motivation behind willing to switch to rooftop solar, with 75% of auto component MSMEs and 94% of cold chain consulted verifying the same. While a few MSMEs quipped about being environment-friendly too, this section of respondents were mostly from the more resourceful MSMEs.

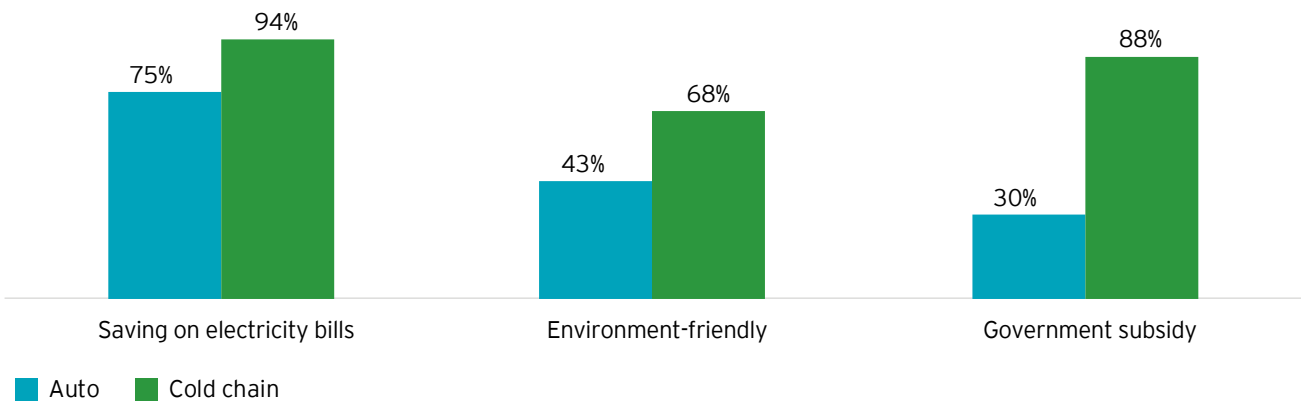
It can also be seen from the graph that a sizeable section of cold chain MSMEs, 88% as per the study conducted, are also motivated by the subsidies offered to them under various schemes. However, many of them are of the view that having schemes on paper do not translate to ease of access on the ground. Cold chain MSMEs have expressed their anguish at the non-uniformity of subsidy schemes across states and their non-accessibility on the ground.

Barriers to uptake of rooftop solar

Despite the motivations to rooftop solar expressed by the MSMEs, the actual uptake in rooftop solar in MSMEs has been minimal. During the course of the study, MSMEs were also asked about the barriers they face that refrains most of them to take recourse to rooftop solar.

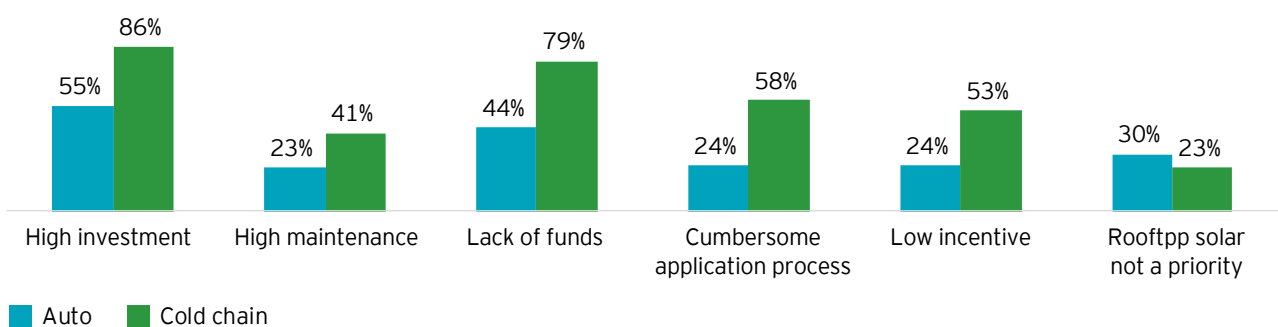
As can be seen from the above figures, the perception that installation of rooftop solar involves high investment, coupled with the lack of availability of funds, seems to be a major stumbling block for MSMEs willing to make the switch to

Figure 28. Motivation to switch to rooftop solar



Source: EY analysis

Figure 29. Barriers to rooftop solar adoption



Source: EY analysis

rooftop solar. The lack of funds appears to be more acute among the cold storage MSMEs compared to the auto component MSMEs, with 79% of cold storage MSMEs quipping lack of funds as a barrier vis-à-vis 44% of auto component MSMEs having the same view. Auto component MSMEs find it easier to access loans based on their long-term existing relationships with bank, as well as due to having high profile auto players as their clients, which gives a stability to the cash flow. However, this is not the case with many cold chain MSMEs, and they have expressed concerns about their dealings with banks.

The study also enquired whether rooftop solar itself was less of a priority for MSMEs. But this does not seem to be the case, as only 23% of cold chain MSMEs and 30% of auto component MSMEs have said that rooftop solar is not an immediate priority for them. Another interesting inference that can be drawn from this statistic is that rooftop solar is more of a priority for cold chain MSMEs, which corroborates the earlier analysis showing the significance of rooftop solar in cold chain MSMEs, due to their higher dependence on electricity.

Financing

Through these consultations, an attempt has also been made to explore the financing behavior of these MSMEs.

In this context, the preferred mode of financing of the MSMEs was explored. The MSMEs were asked about their preferred mode of financing in case they would be interested in investing in rooftop solar systems. Most of the respondents among the automobile component manufacturing MSMEs responded that they would prefer taking the route of self-financing in case a rooftop solar system was invested in.

Initial thoughts behind this pattern could be a poor relationship with the financial institutions, thus making the MSMEs hesitant to approach them for loans. However, after conducting an enquiry about their relationship with bankers, most of them again quipped that they enjoyed very good relationship with their financial institutions, as a result of which, getting loans was not a very difficult task for them. However, most of them would not prefer to approach banks for rooftop solar loans.

Topics explored

- ▶ Preferred mode of financing
- ▶ Ease of accessing loans

The survey result shows there is a high potential of financing as there exists a demand for rooftop solar amongst MSMEs, but lack of funds seem to be a major stumbling block for both sets of MSMEs, more so for cold chain MSMEs.

Auto component manufacturing MSMEs have good relationships with banks; however they prefer to approach banks mostly for their core capex requirements.

Some aspects which can be considered, explaining the preference of the automobile component manufacturing MSMEs to opt for self-finance rather than approach banks for loans are:

Many of these automobile component manufacturing MSMEs have a good running business, courtesy of being suppliers to big automobile manufacturers such as Maruti, Honda, Denso, etc. Thus, they have a good amount of working capital with them, which they can utilize to invest in rooftop solar, as per the requirements.

These MSMEs keep approaching banks for loans for their capex requirements in new machinery, infrastructure, etc. due to which there is an accumulation of loans against their accounts. Hence, if in the future they need to access bank loans again, they would rather do it for their core requirements, rather than accumulating more debt to finance rooftop solar installations.

However, the response from cold storage MSMEs differs somewhat compared to the automobile component manufacturing MSMEs.

- ▶ The cold storage MSMEs responded and mentioned that getting loans is not a stroll in the park, as many of them are small units with low turnover, which makes it difficult for them to convince banks to lend them.
- ▶ One respondent quoted the high processing charges of banks as a barrier to borrowing from banks, and he had applied for a loan only because it is a mandatory condition for availing subsidy from National Horticulture Mission.
- ▶ The requirement of collateral was also an issue with some MSMEs from this sector.

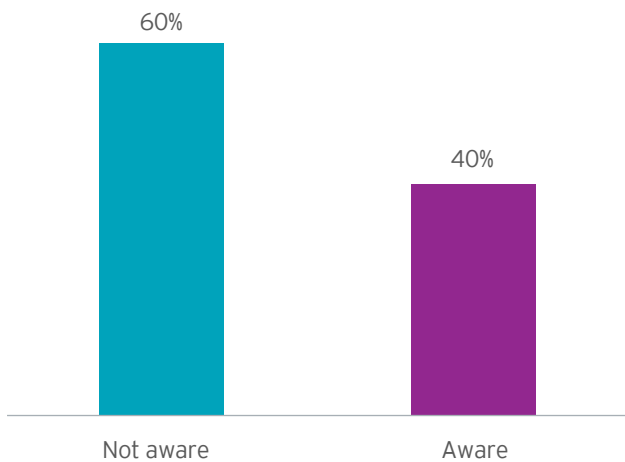
Financial institutions

If the purpose of designing a financial framework to help in the off-take of rooftop solar by MSMEs has to succeed, then financial institutions definitely need to be a part of such an exercise. This study has also focused on getting inputs from the financial institutions' perspective with regard to their vast experience with MSMEs.

Financial institutions under different categories such as public-sector banks, private-sector banks and non-banking finance companies (NBFCs) were consulted on this issue. The financial institutions that have been reached out to on various occasions are State Bank of India, Tata Cleantech, Standard Chartered, NABARD, Yes Bank, SIDBI, SBI Capital Markets, IREDA and Loans4SME. Also, a survey with 22 State Bank of India officials (SME/relationship managers) of local branches was carried out as a part of the study.

An attempt was made to understand the awareness levels

Figure 30. Awareness of financial institutions around rooftop solar models



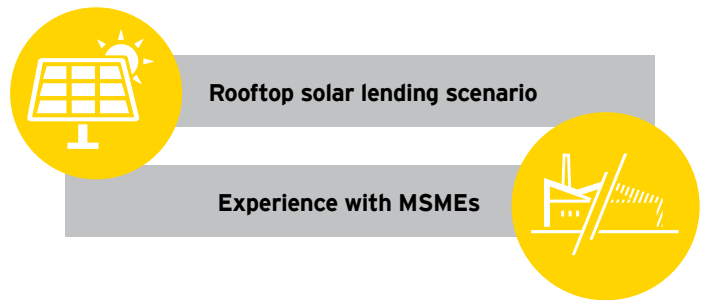
Source: EY analysis

among financial institutions about rooftop solar. It was found out in the survey that a majority of the financial institutions were not very aware of aspects of rooftop solar projects.

The areas that have been discussed upon in the consultations with the aforementioned financial institutions are:

- ▶ Their lending scenario with respect to rooftop solar
- ▶ Their experience with MSMEs
- ▶ Their viewpoints on issues related to SME lending
- ▶ Their take on interventions or alternate mechanisms that can be looked at for catering to this sector

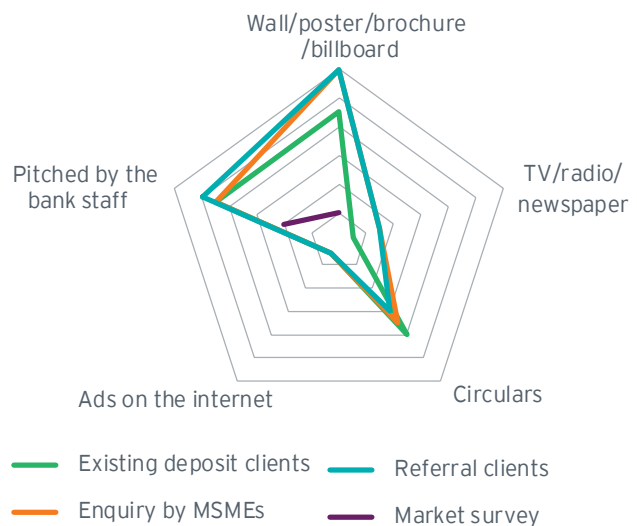
The responses received from these major financial institutions have been collated under the following buckets.



Rooftop solar lending scenario

At the onset, to gauge the lending sector, financial institutions were asked to share their approach in identifying

Figure 31. Survey: seeking potential MSME clients and marketing of MSME schemes



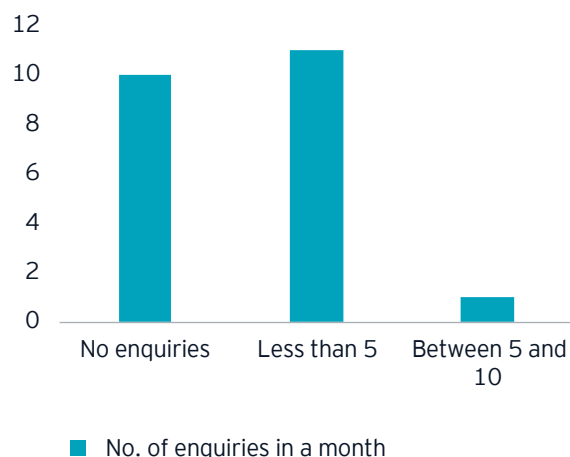
Source: EY analysis

potential MSME clients and methods used by them to communicate the various schemes to MSMEs. Based on the responses received, financial institutions indicated that they often use printable ads, circulars and pitching to communicate MSME schemes. This is often done to existing deposit clients, or clients referred to them.

As a part of the discussions with the bankers, the lending scenario of these banks with respect to rooftop solar was touched upon. Based on our survey, bank officials indicated that they had on an average received less than five enquiries about rooftop solar financing in a month and they had extended less than 10 loans in the past one year

for rooftop solar to MSMEs. Financial institutions have been generally hesitant towards lending to MSMEs for rooftop solar. Further consultations with SBI and other players in the market helped us realize that, lending has taken place overall for rooftop projects but, this lending has mostly been to big players, which have good creditworthiness. Some other financial institutions have funded MSME solar rooftop projects, but only on a small scale to clients with high comfort levels so as to reduce risks around due diligence done before funding these projects. Financial institutions also indicated that standardization and quality frameworks in terms of equipment, developers and contracts would greatly help in reducing evaluation times, risk assessment and disbursement.

Figure 32. Survey: response by lenders on the average number of enquiries received about rooftop solar financing in a month



Source: EY analysis

Figure 33. Survey: response to number of MSMEs who were lent to in the past one year

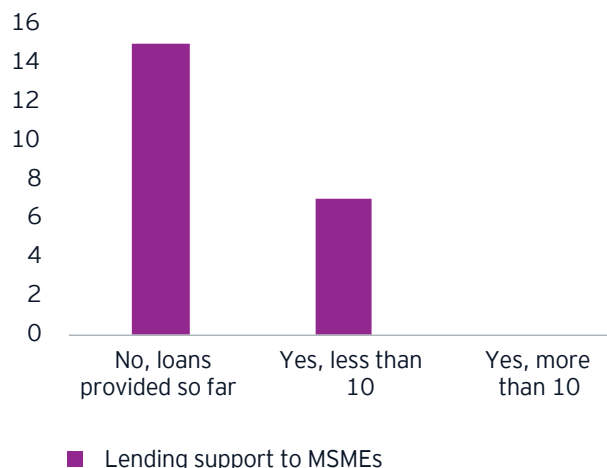
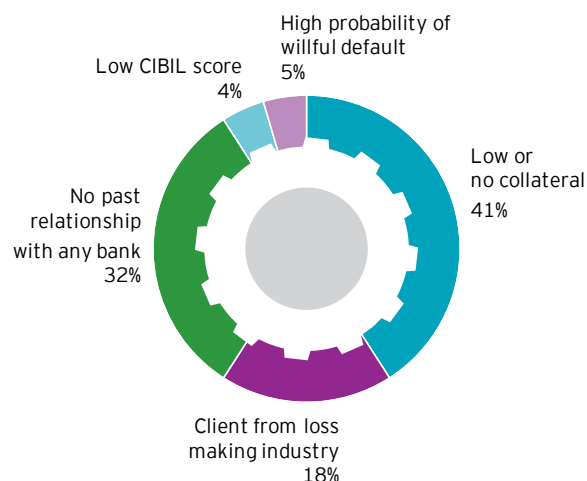


Figure 34: Survey: reasons for not granting loans freely to MSMEs for rooftop solar



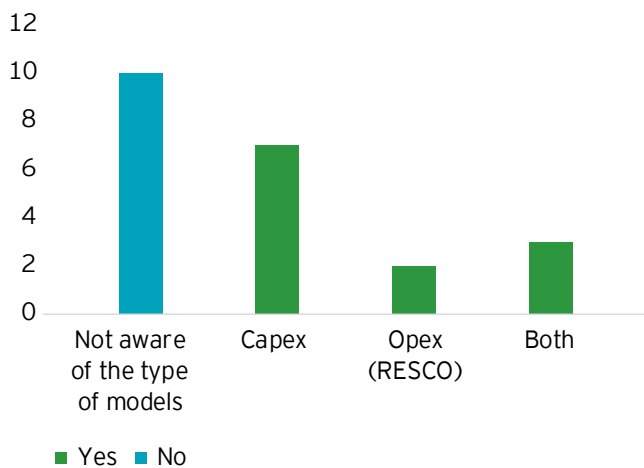
Source: EY analysis

As can be seen from the chart above, the biggest reasons indicated for reluctance to lend to MSMEs by the bank officials have been the lack of collateral or security that can be provided by the borrowers and the absence of credit history of the borrowers. From this, it can be inferred that banks' reluctance to lend to such clients may be reduced if steps are undertaken which offer some capital protection to the financial institutions, thus increasing their risk-taking capacity.

Opinion on RESCO mode

Financial institutions' opinions on the feasibility of RESCO business model was also sought upon during further consultations. Most of them opined that a portfolio approach to bunching consumers with whom PPAs have been signed can help reduce default risk to some extent, but nevertheless credit viability assessment of end consumers also needs to be carried out, because if a scenario arises where a few MSMEs in the portfolio go default then as a result of it, the RESCO becomes a non-performing asset (NPA).

Figure 35. Survey: comfort in lending for rooftop solar to MSMEs



Source: EY analysis

In a RESCO model, the financial institutions also mentioned that among the parties involved in a PPA, either the RESCO or the off-takers need to have a strong credit profile for the loan application to be processed.

Experience with MSMEs

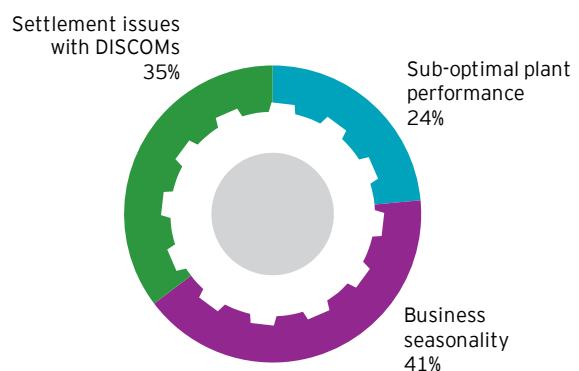
The issues or concerns that financial institutions have towards lending to MSMEs is a result of the procedures or criteria that are followed in banks, and the resulting failure of MSMEs to adhere to such requirements ultimately leads to hesitancy on the part of the financial institutions to lend to these sections. To arrive at the concerns that banks have regarding lending to MSMEs, information regarding the lending parameters that banks follow in serving MSMEs was sought from them.

Assessment criteria

Based on their input, an existing relationship with banks obviously helps in cutting ice and making the process easier for both the lender and the borrower. On a standalone basis, these are some of the criteria banks use to assess its financial institutions:

- ▶ Cash flows
- ▶ Industry involved
- ▶ Gearing ratio
- ▶ DSCR
- ▶ Profitability
- ▶ Lender's internal rating

Figure 36. Survey: reasons behind MSMEs delaying loan payment



Source: EY analysis

Issues with lending to MSMEs

In our survey of bank officials who disburse loans to MSMEs, it was mentioned that the reasons behind delays of loan payment was due to seasonality in the business of MSMEs and settlement issues they face with the DISCOMs. Delays in settlement of net metering where possible or other hurdles from utilities also have been shown to have an impact of the MSME payment capability.





Most of the financial institutions who were consulted, are also of the view that most MSMEs suffer from poor cash flows, which act as a hurdle for the MSMEs towards repaying their debts.

Usually for MSMEs, their cash flows are significantly tied up for funding their business requirements. Hence, they may not have enough cash flows to finance their rooftop solar installation requirements.

One lender was of the view that many MSMEs do not have long-term visibility regarding their business horizon. Taking into account the repayment period for a 10 kW -15 kW system to be seven-eight years, this makes it a dicey situation for bankers to lend to such MSMEs when they do not have a long-term business existence horizon.

The creditworthiness of MSMEs is thus a big factor for financial institutions when assessing MSMEs. The internal

Issues highlighted

-  Poor cash flows
-  Low creditworthiness
-  Short business horizon
-  Lack of collateral

Source: EY analysis

rating systems followed by some financial institutions usually have a lower rating for MSMEs, which puts them at a disadvantage while borrowing from banks. There is a need for a proper lending structure to gauge the credit worthiness of the borrower (especially when the borrower is an MSME).

Developers

Many off-takers (present and future) in the rooftop solar market have concerns about the initial upfront cost to be incurred in investing in a rooftop solar system. Even a 10 kW system may set back the off-taker by an amount of INR 0.5m, which may be a hefty amount for many MSMEs, not only due to their businesses not being enough to support such investments, but also due to their capital being tied up in other operations.






Moreover, some businesses may not be willing to devote concentration and resources on the installation and maintenance of equipment that may not be core to their operations.

In both these scenarios, developers come into the picture to enable businesses to enjoy the benefits of cost reduction, etc. that rooftop solar has for their businesses.

Thus, consultations with developers form a major part of the overall scope of this study. The insights received from developers is being summarized in the section mentioned below.

Some developers have emphasized the need for banks to evaluate the credit worthiness of MSMEs. Banks assessment on the feasibility of lending to MSME's shared with the developers would help the developers to sign PPAs with those off-takers who have a good cash flow and a low probability of default.

Points highlighted by developers

-  Bank help on SME credit assessment
-  Portfolio approach
-  Importance of secondary market
-  Off-taker default probability assessment
-  EMI method to sell small systems

Source: EY analysis

They also proposed a portfolio of PPAs with MSMEs from different sectors, rather than industry specific PPAs. This proposition would help the developers not only diversify their risks but also the risks of the financial institutions funding in this case as a premium, where one would compensate the other.

There was also an emphasis on the need of a secondary market as risk mitigation factor in case of default of an off-taker, thereby highlighting the need of asset appraisal as an important parameter in the rooftop solar sector.

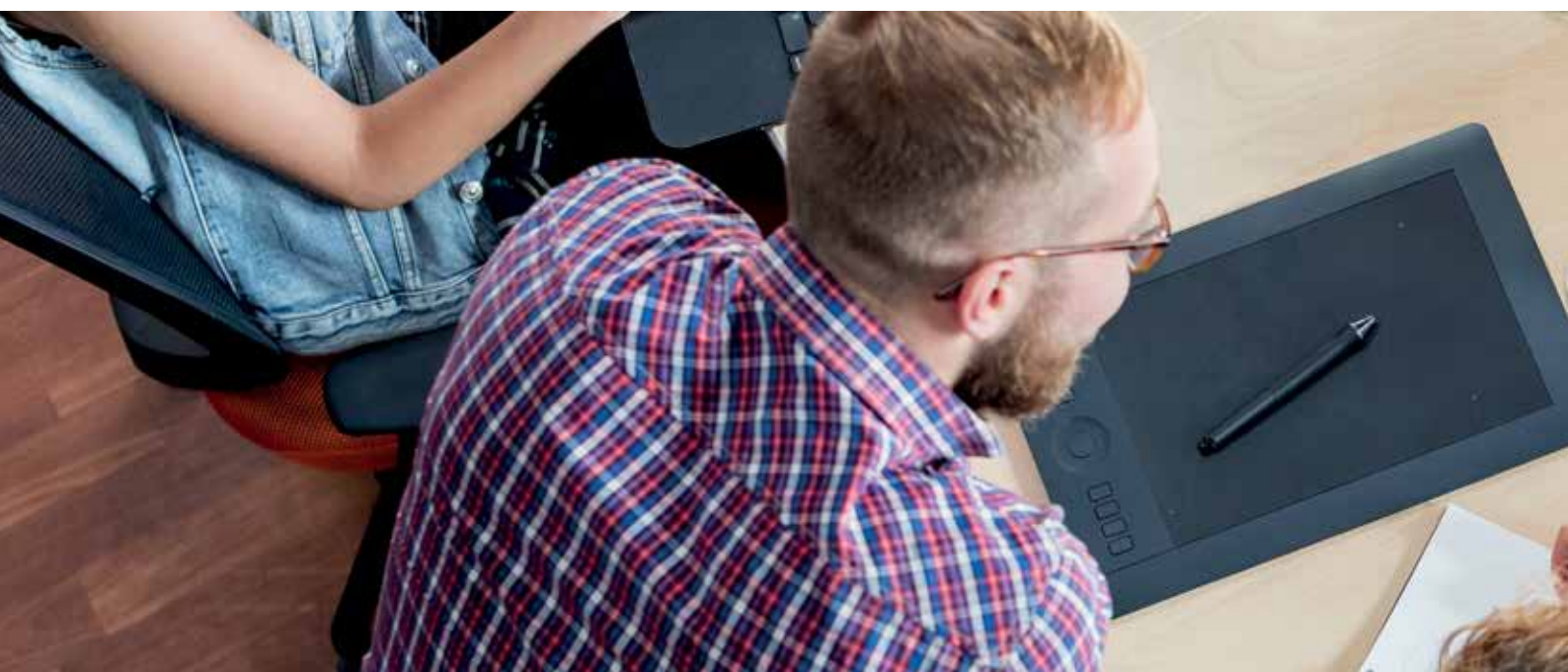
The need for having a mechanism to assess the probability of default of an off taker, a mechanism to calculate actual loss in case of default and a framework to mitigate these risks has also been suggested by developers.

Another point quoted by the developers is that they are increasingly adopting EMI options to sell small systems whilst also ensuring that they comply with RBI in not functioning as NBFCs.

Figure 37. Issues highlighted by developers during stakeholder consultation exercise

- 1 ▶ Low awareness amongst bankers around rooftop solar sector and its systemic issues and business models leading to skepticism in lending
- 2 ▶ Lack of collateral in case of RESCOs makes bankers more cautious
- 3 ▶ Portfolio lending approach not practiced in its true sense by banks for portfolio lending
- 4 ▶ Strict covenants by bankers and increase in the Debt Service Reserve Account (DSRA) size reduces the project leverage
- 5 ▶ Low willingness amongst banks in taking long-term exposure on sector
- 6 ▶ Long evaluation and loan disbursement cycle of banks add stress to the RESCOs finances further

Source: EY analysis

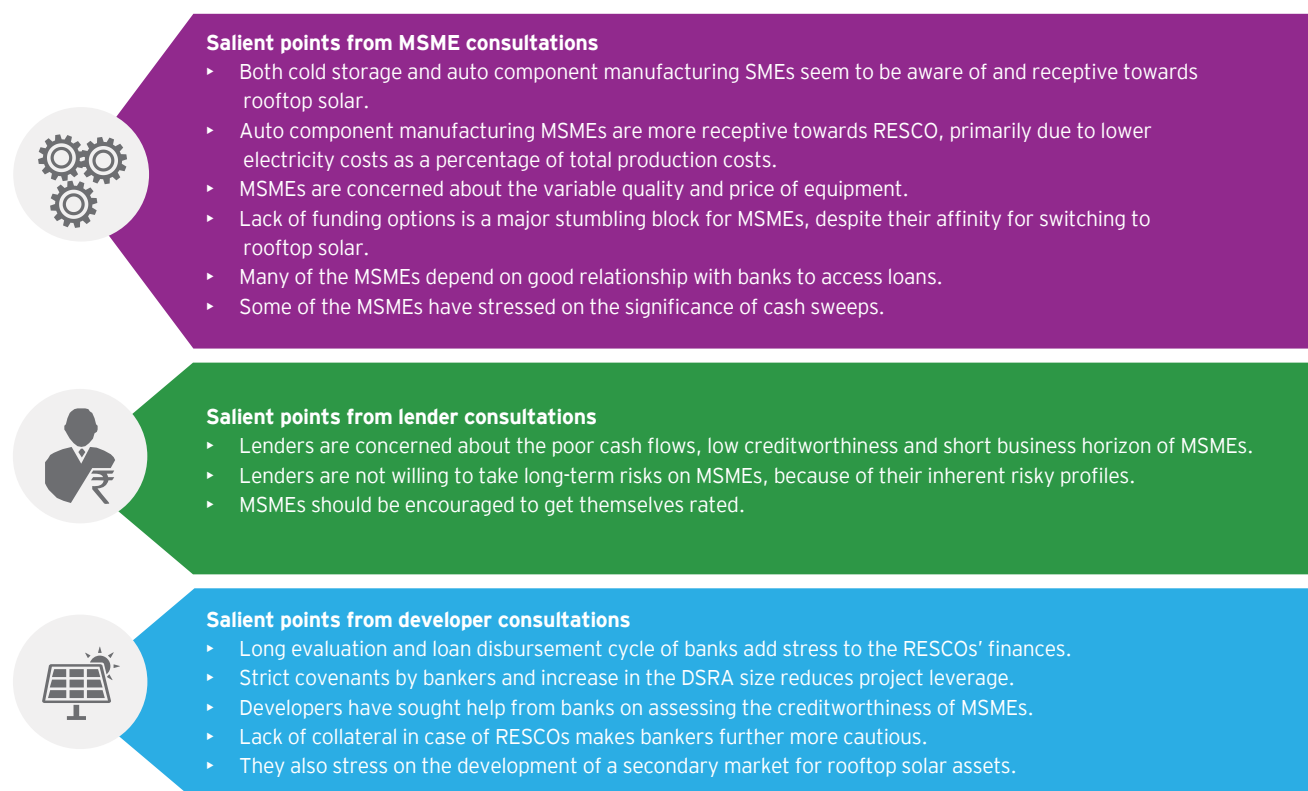


5.6 Summary

The insights received from the stakeholder consultations, majorly with financial institutions, developers and MSMEs, coupled with EY analysis and research forms the basis of our work on developing a framework for uptake of rooftop solar in MSMEs.

A summary of the insights received from the consultations conducted are being represented below:

Figure 38. Summary of insights from stakeholder consultations.ai



Source: EY analysis



Part



B





A stack of wooden planks is visible on the left side of the image. On the right side, a hand is holding a yellow sticky note. The sticky note is partially overlapping the text area.

6



Framework for mitigating barriers

The consultations conducted with the three sets of stakeholders have yielded findings on various aspects of rooftop solar from the perspective of the stakeholders.

Based on these findings, this study attempts to put forward some solutions to address a few issues expressed by the various stakeholders.



Stakeholder concern	Proposed measure
 Poor awareness of rooftop solar aspects	 Media and outreach campaign to reach out to MSMEs

It has been observed that even though most of the MSMEs have a rudimentary understanding of rooftop solar, they are not highly aware of the intricate details such as financial benefits to be accrued from investing in rooftop solar infrastructure as well as the expenses incurred in maintenance of the equipment. Due to the lack of adequate information, MSMEs are reluctant to take a step towards investing in rooftop solar. To tackle this issue, a well-thought out media and outreach strategy is required to percolate the information regarding benefits and incentives that MSMEs may accrue from its installation. Such an exercise may require the involvement of government bodies, corporates, financial institutions, educational institutions, etc. The implementation of this exercise is beyond the scope of this study. However, it is an aspect which requires proper attention.



Stakeholder concern	Proposed measure
 Inadequate information base to make an informed decision regarding the existing choices in the market	 Standardization of norms on equipment, service companies and O&M

Many MSMEs have also expressed their concern and lack of trust regarding the huge variations in price and quality of equipment. The lack of knowledge regarding known make of equipment is a concern for MSMEs, especially for cold chain MSMEs, most of whom are more inclined towards investing their own money for procurement of rooftop solar equipment. The genesis of this issue is the absence of known standards of equipment that buyers can refer to or rely upon. This study has recommended that incorporation of standards can go a long way in easing the trust issues in the minds of buyers, and thus help in promoting the

business. These standards have been incorporated as one of the pillars of the multi-tiered framework that will be dealt in detail in the coming sections.

Stakeholder concern	Proposed measure
 Low bankability of MSMEs (due to collateral issues, short business horizon, variable cash cycle, etc.)	 Credit enhancement support to lenders

Various concerns from the financial institutions have also been attempted to be resolved through the framework. The main concerns of the financial institutions have been regarding the non-bankable situation of many MSMEs. Bankers have expressed apprehensions regarding the short business horizon of MSMEs, their variable cash flow cycles, the ineptitude of MSMEs to service loans due to their inability to produce collaterals of the required magnitude. This has led the banks to think twice before lending to MSMEs, thus hampering the credit scenario. Bankers have sought adequate protection for themselves to be able to lend out to MSMEs, so that the risk of delay in payment or payment default payment can be mitigated to an extent. This concern has been expressed by many bankers. To tackle this issue, this study has considered many options which have the capacity to reduce the risk of the lender, namely payment security mechanisms, credit guarantee mechanisms and asset-backed security mechanisms. After analyzing the various options and also post conducting a study on international trends, this study has included a form of credit guarantee mechanism, which has been incorporated as a protection mechanism to the financial institutions. It might offer these financial institutions some incentive to extend lending to MSMEs for uptake of rooftop solar.

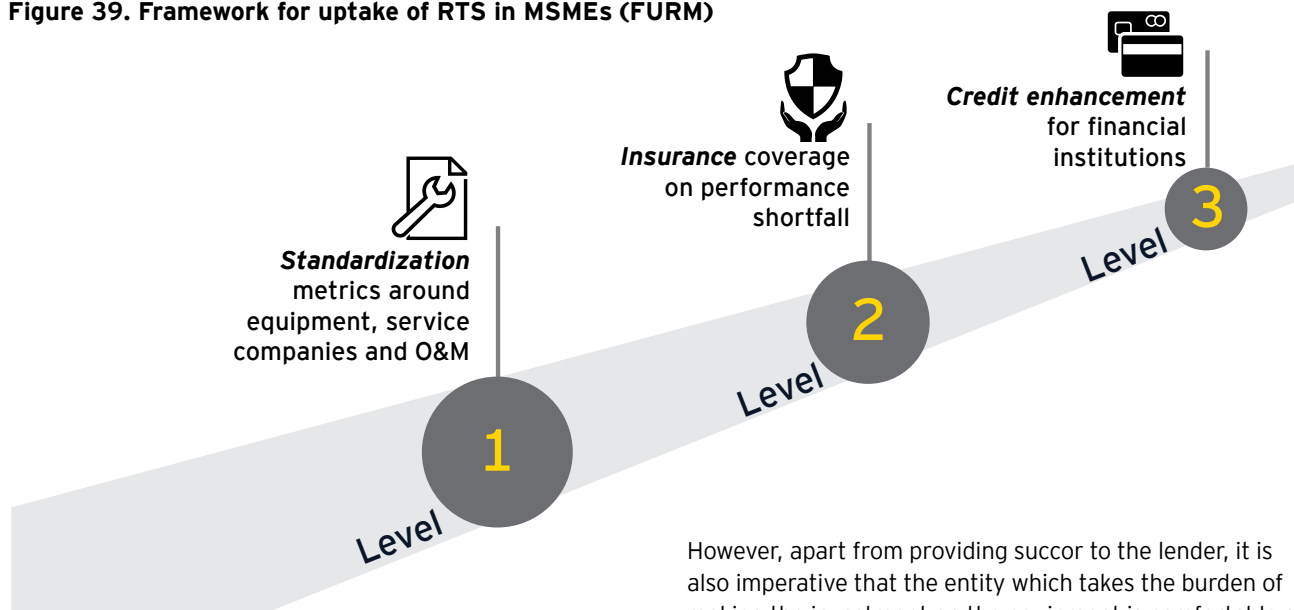
Stakeholder concern	Proposed measure
 Uncertain cash flows from project due to unpredictable generation	 Insurance coverage to protect project cash flows

Financial institutions have also expressed concern about the variable nature of rooftop solar power generation, which may act as an impediment to the ability of the off-taker to reap adequate returns from the installed equipment, and in turn affect his capacity and willingness to repay his loan. Developers are also of the opinion that addition of performance guarantee to the system gives more confidence to both lenders as well as borrowers and hence acts a boost to overall

business prospects. Thus, performance guarantees in the form of insurance has been added as another pillar in the framework being proposed as part of the solution.

Mentioned below is an illustration of the multi-tiered framework being proposed for mitigating rooftop uptake barriers in MSMEs:

Figure 39. Framework for uptake of RTS in MSMEs (FURM)



The three levels that comprises the FURM, namely, standardization, insurance cover and credit enhancement will be explained in detail in the upcoming sections.

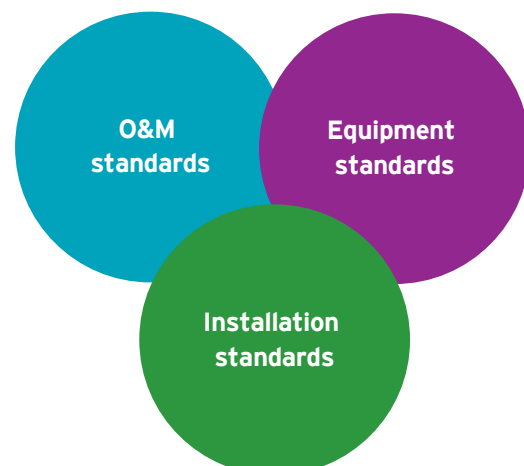
6.1 Standardization

In the process of assessing the viability of a project, be it lending for rooftop solar or for any other, a priority for the lender is always to keenly scrutinize the quality of the borrower, as to whether it has the capacity to repay the amount borrowed within an acceptable payback period. In this respect, banks may assess the borrower (an MSME in case of CAPEX mode or a RESCO) on financial aspects such as their debt to equity ratio, working capital, receivables turnover, etc. Other significant facets that a lender can consider include industry outlook, history of default on payment of utility bills, number of years in existence, capacity of installations done till date, reference from prominent clients, etc. Apart from analyzing the books of the organization, the lender will also assess the proprietor of the entity, considering that the chances of a poor financial record of the proprietor spilling over to the financials of the entity itself exist.

However, apart from providing succor to the lender, it is also imperative that the entity which takes the burden of making the investment on the equipment is comfortable and inclined towards making the investment. The investor in the equipment may seek comfort during two phases of the entire process:

- ▶ Pre-installation phase
- ▶ Post-installation phase

The pre-installation phase is the one before the procurement, when the buyer is deliberating on whether to go ahead with the procurement. The post-installation phase comes after the equipment has been installed in the premises. Each phase has its own barriers which have impeded the proliferation of rooftop solar installation in MSMEs.



6.1.1 Pre-installation phase

The barriers in the pre-installation phase can be looked at separately from the perspective of operations under the RESCO mode as well as the CAPEX mode. In case of the RESCO mode, barriers to uptake identified at this stage has been a lack of trust on the quality of equipment available in the market and also a lack of trust on the capabilities of RESCOs on the part of the MSMEs. In case of the CAPEX mode where the off-taker, that is the MSME, does all the procurement, barriers to uptake are their lack of awareness regarding different aspects of rooftop solar and also lack of trust on the variations in quality of equipment available in the market.

Most of the standards have been proposed in adherence to International Electro-technical Commission (IEC) codes and some on the basis of BS EN codes (British standards).

Moreover, there needs to be standardized manufacturer warranties on modules, inverter and mounts against failure due to manufacturing defects and premature material degradation.

Apart from equipment standardization, some standards or hygiene factors which define the quality of the installation process in case of CAPEX mode are also significant from the point of view of instilling confidence in off-takers. Some aspects which can be covered as part of the quality control of the installation process are:

- ▶ General safety standards such as protective clothing, fire protection and special care during rain and windy conditions

Figure 40. Pre installation concerns/barriers



Source: EY analysis

This study has proposed the incorporation of standards for equipment quality and the installation process as a possible solution to mitigate these barriers. These standards will make it easier for the concerned entity to compare the options available in the market, and make an informed decision about the options to opt for. Standards for equipment can be introduced as per the standards suggested by MNRE²⁹. These can apply to a plethora of equipment that forms a part of the entire solar equipment package, namely,

- ▶ Licensing and certification of solar installers
- ▶ Hiring of a licensed or master electrician
- ▶ Workmanship warranties against faulty installation

The initial three factors provide confidence to the off-taker that the installation process will be as per standard norms, while the fourth factor gives assurance to the off-taker that in case of any defect during the installation process, any damages will be covered as part of the workmanship warranties.

- ▶ Solar PV modules/panels
- ▶ Solar PV inverters
- ▶ Fuses
- ▶ Surge arrestors
- ▶ Cables
- ▶ Earthing/lighting
- ▶ Junction boxes
- ▶ Energy meters
- ▶ Solar PV roof mounting structure

²⁹ https://mnre.gov.in/file-manager/UserFiles/Rooftop-Solar-PV-Quality-Standards_Revised.pdf

6.1.2 Post-installation

The post-installation concerns of off-takers range from the quality of operations and maintenance service that will be provided by the operation and maintenance (O&M) contractor to the level of generation from the installed equipment.

The O&M concerns of the off-taker can be tackled through standards of post-installation servicing, while the concerns regarding the generation capacity of the equipment can be addressed with the help of insurance products that are available in the market. A few aspects of insurance will be taken up as part of the next pillar of the proposed framework.

Figure 41. Post-installation concerns/barriers



Source: EY analysis

Different aspects of the post-installation process that can be looked into for incorporation of standardization are:

- ▶ Frequency of monitoring of equipment (can be a part of the O&M manual or Annual Maintenance Contract).
- ▶ Frequency of cleaning of modules (can be a part of the O&M manual or AMC).
- ▶ Ease of availability of standard parts (time duration for a spare to be available).
- ▶ Presence of service center in the locality/vicinity.
- ▶ Availability of service helpline for resolution of grievances.
- ▶ Adherence to safety standard operating procedure (SOP) applicable during servicing and maintenance (can be a part of the O&M manual).
- ▶ Adherence to standards applicable for monitoring equipment.

Standardization of equipment installed, installation process and the O&M process will enable the off-taker to make an informed comparison amongst the different options available in the market.

6.2 Performance guarantee/insurance

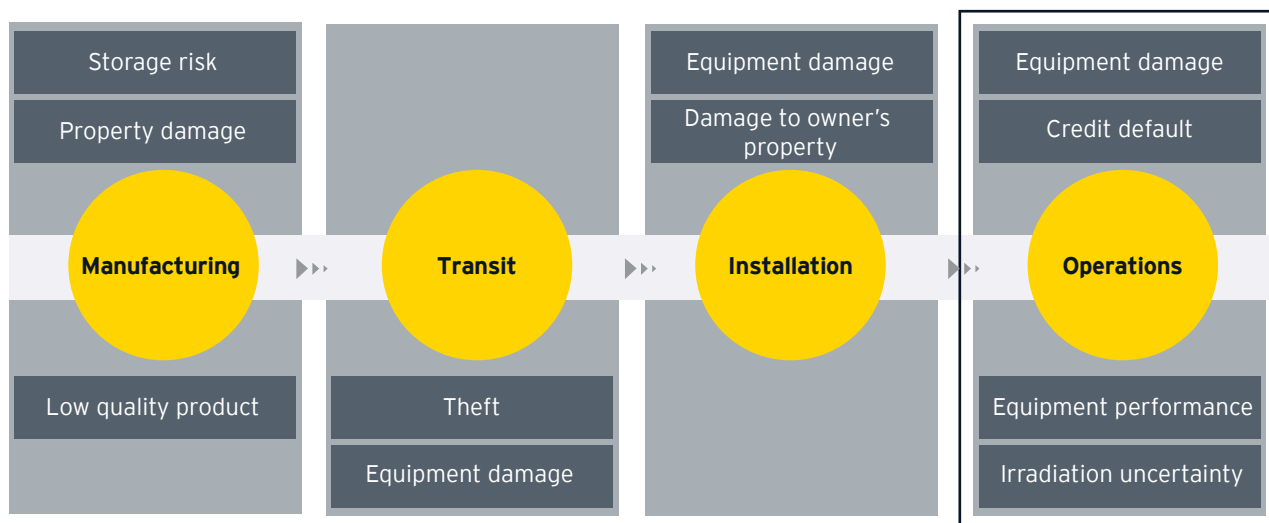
The qualms of off-takers regarding the service quality offered by the O&M contractor can be taken care of by introduction of standardization into aspects of the O&M process. However, another aspect that is concerning for financial institutions and developers in the RESCO mode, and financial institutions and MSMEs in the CAPEX mode is the uncertainty in the generation of energy the equipment, which may be due to defect in the equipment, or shortfall in the estimated irradiation levels.

This is where insurance can come into the picture to mitigate the risks faced by the developer or the off-taker and thus help in providing greater predictability in their investments. Risks are an inherent part of the different stages of the value chains. Some of these risks are depicted in the figure 42:

Risks during manufacturing stage include damage to finished components during storage, damage to manufacturing setup, etc. Theft and damage during transit are some risks during the transit phase, whereas the risks during installation phase may be damage to components during erection, damage to owner's property, etc. This study is primarily concerned with the risks during operational phase. Some of these risks may include:

- ▶ Performance shortfall of the equipment
- ▶ Equipment defect
- ▶ Irradiation uncertainties
- ▶ Credit default

These risks contribute towards creating an apprehension in the minds of the entities undertaking the investment to install the equipment. Financial institutions who are circumspect about lending to entities in the face of uncertain generation are also affected. Credit insurance to mitigate the

Figure 42. Risks in rooftop solar value chain


Source: EY analysis

risks associated with credit default is not allowed in India. However appropriate insurance products meant to mitigate the rest of the unique risks associated at this stage can be a possible solution. Such a product was launched for the first time in the Indian market by HDFC ERGO General Insurance in the name of "Solar Energy Shortfall Insurance Policy"³⁰. It covered the following risks:

- ▶ Unintentional error in the calculation of target production
- ▶ Defect in the installed equipment
- ▶ When actual solar irradiation is less than target production

As of now, this product is being used to cater only to utility-scale projects with a minimum scale of 10 MW. They have

also been approached by developers for insuring of smaller sized projects on a portfolio basis. However, the company hasn't yet taken up smaller sized projects, because even in a portfolio approach, assessment of projects is being done on a piecemeal basis. Since the transaction costs associated with small-scale projects are similar to the ones associated with large-scale ones, the company has concentrated on covering larger scale projects till date. Premium calculation depends on a lot of varying factors, some of them being the reputation of the panel manufacturer, the reputation of the O&M manufacturer, location where the plant is situated, etc. Premium also depends on whether the plant is an existing one, or a greenfield project. Good performance history of an existing plant of course helps in the lowering of risks, and in turn the quantum of premium payable.

Excerpts from an analyzed solar energy shortfall policy

The coverage of the policy is for a period of five years and is triggered when annual output falls below a specified amount, i.e., 90% of the projected yield in this case. The policy covers an amount equivalent to 30% of the projected yield. The projected yield is agreed upon at the inception of the policy and adjusted annually using an already agreed degradation factor. The policy is a non-cancellable one.

The following terms are agreed upon at the commencement of a policy:

- ▶ Target production (in kWh), which is the projected production
- ▶ Agreed upon rate (INR/kWh), is the rate at which the payout will be calculated
- ▶ Energy shortfall annual limit (in INR), which is the maximum energy shortfall that will be covered
- ▶ Annual degradation factor, which is the factor by which production is supposed to decrease every year
- ▶ Insured output factor, is the percentage covered of the energy yield projection

The insured energy yield projection for a particular year is calculated by the following formula:

$$\text{Target production} \times \text{annual degradation factor} \times \text{insured output factor}$$

The energy shortfall is calculated as: **insured energy yield projection - actual energy yield**

This energy shortfall is then multiplied by the agreed rate to arrive at the payout. Of course, the payout has to be within the already agreed energy shortfall annual limit.

However, the policy does not cover lack of performance as a result of physical loss or damage.

Source: HDFC Ergo

³⁰ <https://mercomindia.com/hdfc-ergo-solar-energy-shortfall-insurance-policy-india/>

6.3 Credit risk mitigation

Based on the study of various existing financing instruments, it can be seen that the financing mechanisms for financing rooftop solar are still limited in the country. With a host of multilateral development banks investing in India's rooftop solar story, there exists a chance of creating newer third-party innovative financing mechanisms catering to C&I sector. The implementation of innovative financing mechanisms, can not only provide access to financing to MSMEs but can also protect the interests of the financial institutions to accelerate their deployment. The section below tries to present various mechanisms for credit risk mitigation such as government funding and guarantee schemes.

6.3.1 Payment security mechanism (PSM)

Definition

Payment security mechanism provides liquidity support to a supplier protecting against the delay caused in payment by the consumer of the service. It is essentially done by creation of a separate fund or a Letter of Credit which is drawn upon in the event of delay of payment by the consumer. PSM can be fund based or non-fund based.

In a fund-based PSM, the borrower arranges for money to be deposited to the lender/FI as a payment security. In case of a delay in payment, the lender may choose to set off the dues from the cash deposit received from the off-taker. Upon utilization of the deposit, the consumer is obligated to replenish the deposit to the original amount. In a non-fund-based PSM, the comfort to the lender is provided either by issuance of an LC, setting of an escrow account or by guarantee support by the government. An LC is an irrevocable and unconditional commitment from the consumer's bank to the supplier. In case of a delay in payment from the consumer, the lender may choose to draw on the LC and recover the dues. Upon drawing on the LC, the consumer is obligated to repay the bank the amount utilized and the interest, thereon. Typically, the LC is initially valid for a period of one year and is revolving in nature, thereby being valid for the entire tenor of the agreement between the lender and the consumer.

Use of payment security mechanism in financing rooftop solar for SME sector: In case of rooftop solar, PSM provides liquidity support to FIs and RESCOs in case of any delay in the receipt of payments from the off-taker. It provides an assurance that the payments under power purchase agreements are made on time. Typically owing to the financial position of MSMEs, it may not be possible for them to go ahead with the fund-based PSM as they generally do not have spare cash. In case of non-fund-based PSM, LC is provided by the MSME to the FI/lender to protect it from any delay in payment by the off-taker.

A few issues with PSM for rooftop solar financing are:

- ▶ **Increase in cost of borrowing:** Increases the cost of borrowing for the ultimate borrower as it becomes the responsibility of the borrower to arrange for the LC for which the issuing bank charges a fee.
- ▶ **Does not cover instance of default:** As the name goes for the mechanism, it is a payment security mechanism and may require support of any other mechanism to cover the default, as the coverage for this is limited to only payment security.
- ▶ No coverage to LC issuing bank in the event of MSME's inability to service the drawn LC.
- ▶ The PSM for rooftop solar in its original form suffers from lack of protection of the financial institution/lender who may not be comfortable in lending to the MSME sector due to its unfavorable/lower credit rating.



A payment security mechanism with three-tier security mode can provide more comfort in case of financing for rooftop solar.

PSM mechanism with two or three-tiered structure can be created which provides necessary comfort to the institution lending for rooftop solar financing about the surety of repayment. In such an event, a guarantee fund along with an escrow account can be created which will provide support to the financial institutions financing the rooftop solar, as well as the financial institution which provides LC support for rooftop solar. In the event of a delay, the LC will be utilized to fulfil the repayment obligations in CAPEX mode. However in RESCO mode the escrow account will be accessed to fulfil the payment obligations and thereafter LC will be utilized for the balance requirement. In the event where an off-taker is not able to repay the LC to an issuing bank at the stipulated time, the payment security fund will be exercised and the implementation agency will repay the LC to an issuing bank for the part of amount of the funds.

A PSM relying completely on public funds as backstop arrangement to make good the delay in totality may not be a prudent mechanism for the sector as it may lead to stakeholders (FIs, SMEs, developers and RESCOs) doing lower due diligence with little concern about repayment for the services/goods used.

are usually provided against a fee, covered either by the borrower, the lender or both. In case of a default, the lender usually is obliged to proceed with the collection of the loan and share the proceeds with the guarantor. Credit guarantees allow the partial transfer of credit risk stemming from a loan or a portfolio of loans. In partial CGS, loans offered by a financial institution to the borrower are partly guaranteed by a third-party (typically a government agency) subject to the payment of a premium and other rules and conditions. When default occurs, the lender is compensated by the guarantor as per the initial agreement.

Credit Guarantee Schemes can be public or privately funded. In public CGS, funding is provided by government which usually arise out of policy initiatives to improve the access to finance. Private CGS is mostly prevalent in developed economies where members jointly provide guarantees on the loans taken by the individual members.



Credit guarantee schemes provide guarantee to the lender to make good the loss due to loan default. CGS can be both public and privately funded.

6.3.2 Credit guarantee

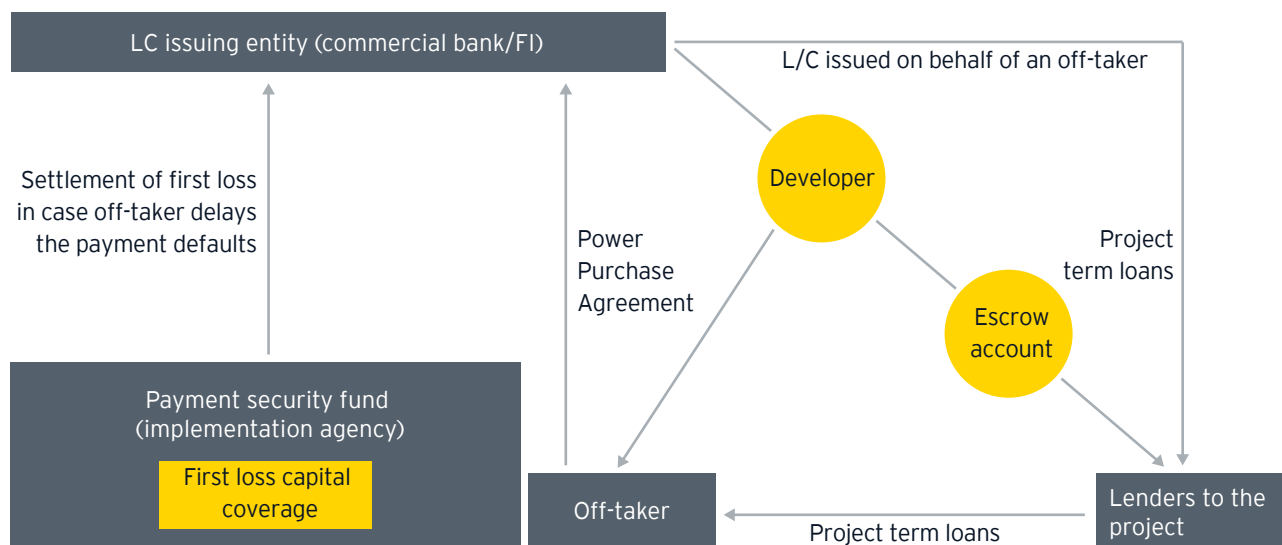
Definition

Credit guarantee schemes/mechanisms (CGSs/CGMs) provide guarantees on loans to borrowers by covering a share of the default risk of the loan. In case of default by the borrower, the lender recovers the value of the guarantee. Guarantees

Use of credit guarantee schemes in financing rooftop solar for SME sector

Credit guarantee schemes (CGSs) are used in many developed and developing economies to alleviate the constraints facing SMEs in accessing finance. This is essentially because financial institutions are usually

Figure 43. Broad framework of PSM facility



Source: EY analysis

reluctant to extend uncollateralized credit to SMEs, even at high interest rates, due to the high costs of obtaining adequate information on the true credit quality of typical small and young companies. In case of rooftop solar, creation of CGS will cover the event of default owing to the non-repayment of loan. The financial institution lending to rooftop solar owner for installation of rooftop solar plant will be protected by a CGS which will provide funds in the event of default on the loan. CGS can cater under both CAPEX and RESCO model. Under RESCO mode, a separate escrow account will be created to receive payments from off-taker. Financial Institutions (FIs) will have the first right over the funds, and only after their repayment obligations are met, will the RESCO have the right over the remaining funds. A CGS will result in financial institutions (FIs) getting confidence about repayment. Additionally, it will result in decreased requirement of collateral by FIs. A CGS along with a payment security mechanism can provide a wholesome protection to FIs and SMEs.

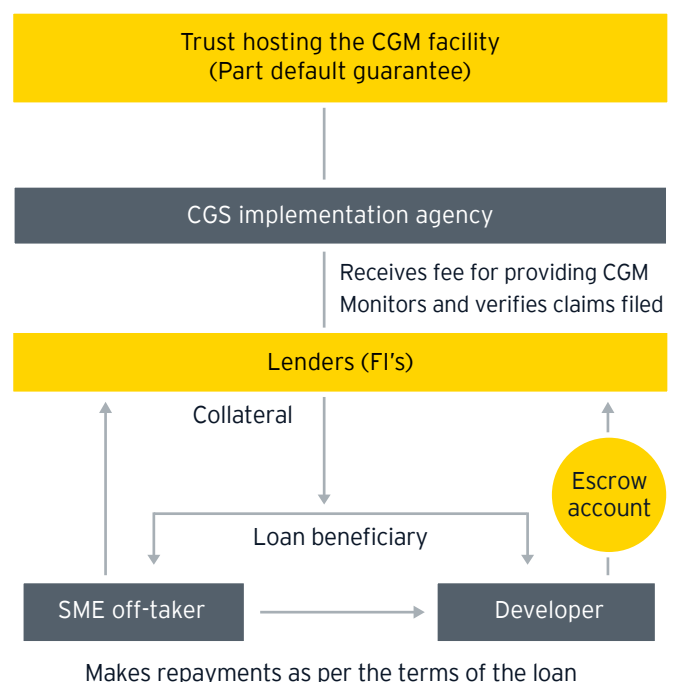
A successful scheme needs to be able to help riskier SMEs obtain financing by reducing the risk of a loan extended to them, limiting transaction costs and guaranteeing payment in case of default.

Key characteristics that a CGS mechanism should have:

- ▶ **Loan to an individual or portfolio:** The guarantees offered can cover either loan applications on an individual basis, or a portfolio of the eligible loans. In the case of individual guarantees, a part of the exposure for each loan is covered separately by the guarantor. In case of a portfolio guarantee, the guarantor covers a part of exposure for a specified number of loans from a pre-defined portfolio of loans (first loss), usually up to a specified total amount (cap).
- ▶ **Mechanism to cover the delay in payments:** The CGS in the current form covers only the default in payments and does not account for loss due to delay in payments.

- ▶ **Incentive to pursue timely recovery:** The bank needs to retain the incentive to pursue recovery efforts, e.g., by delaying guarantee pay-outs until the bank initiates recovery actions. Lacking such mechanisms, there is a higher risk of credit guarantees crowding out collateral, as a quicker, easier option for loss recovery. In such a case, the higher the share of the exposure covered by the guarantee, the smaller the incentive for the lender to require other collateral, since the lender can thus limit the total cost of execution.
- ▶ **Performance and impact evaluation:** Appropriate mechanisms need to be put in place to measure the tangible benefits of CGS and to ascertain whether CGSs has been able to achieve its assigned policy objectives.
- ▶ **Adverse selection:** Financial institutions have incentives to select loans at the lower end of their credit assessments for guarantee programs. As a result, the programs may be supporting projects that are more likely to default than non-guaranteed projects.
- ▶ **Moral hazard:** By protecting financial institutions against losses, guarantees may encourage them to reduce their enforcement of lending criteria, supervision and loan repayment, which can lead to higher default rates. Moral hazard can be reduced by ensuring that coverage levels are low and collateral is high to incentivize both financial institutions and creditors to perform.

Figure 44. Broad framework of credit guarantee scheme



Source: EY analysis based on secondary research

6.3.3 Supply chain financing (SCF)

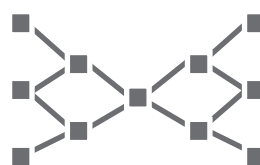
Definition

Supply chain finance also known as supplier finance/reverse factoring is one of the ways for companies to finance their working capital position. The key concept behind SCF is to provide suppliers with access to advantageous financing facilities by leveraging the buyer's stronger credit rating. SCF requires the involvement of a SCF platform and an external finance provider who settles supplier invoices in advance of the invoice maturity date, for a financing cost lower than the suppliers' own source of funds. This benefit is then shared among all the involved parties. After the order is placed with the supplier, the supplier fulfils the order and invoices the buyer. The buyer then approves the supplier's invoices and confirms that it will pay the financial institution for these at invoice maturity. The supplier sells (discounts) the invoices to the financial institution at a predetermined discount rate and receives the funds straight away. The buyer pays the financial institution as agreed at maturity of the invoice. In parallel to the SCF facility, the buyer is typically able to negotiate better payment terms and/or prices with the supplier.

The success of supply chain financing/reverse factoring depends on the discipline amongst the big corporates with respect to the honoring of repayment date and not seeking an extension of the credit period.

Use of supply chain financing in rooftop solar financing for MSMEs: In case of rooftop solar, supply chain financing has not been used till now. The key reason being the short-term nature of the invoices raised. Using supply chain financing would encompass the buyer of business goods

of the off-taker (MSME) getting involved in the process of repayment for the loan taken for financing rooftop solar. This method can be explored in the automotive industry, given the strong supply chain network which auto manufacturers typically have. In this case, in the event that the large auto component buyers get involved, they can help provide much-needed payment security to the financial institutions regarding MSMEs. The financial institution/lender will sign a joint contract with the seller (MSME) and buyer (larger auto component player) stating that the seller will hold a running account with the FI. The buyer at the time of payment of the invoice will transfer the funds to that very account. Lender/FI will have the first right on the funds received and will deduct the timely instalment and will leave the remaining amount for the seller of goods/MSME/off-taker of power. In simple words, the funds from the buyer of goods will come to an escrow account on which the FI/lender will have the first right and only post settling the installment claim can the seller/MSME/off-taker of power have access to the account. This way the MSME/off-taker will be able to access funds from the FI for financing the rooftop solar project and the FI/lender will have an additional confidence as it is getting involved with a firm with higher credit rating.

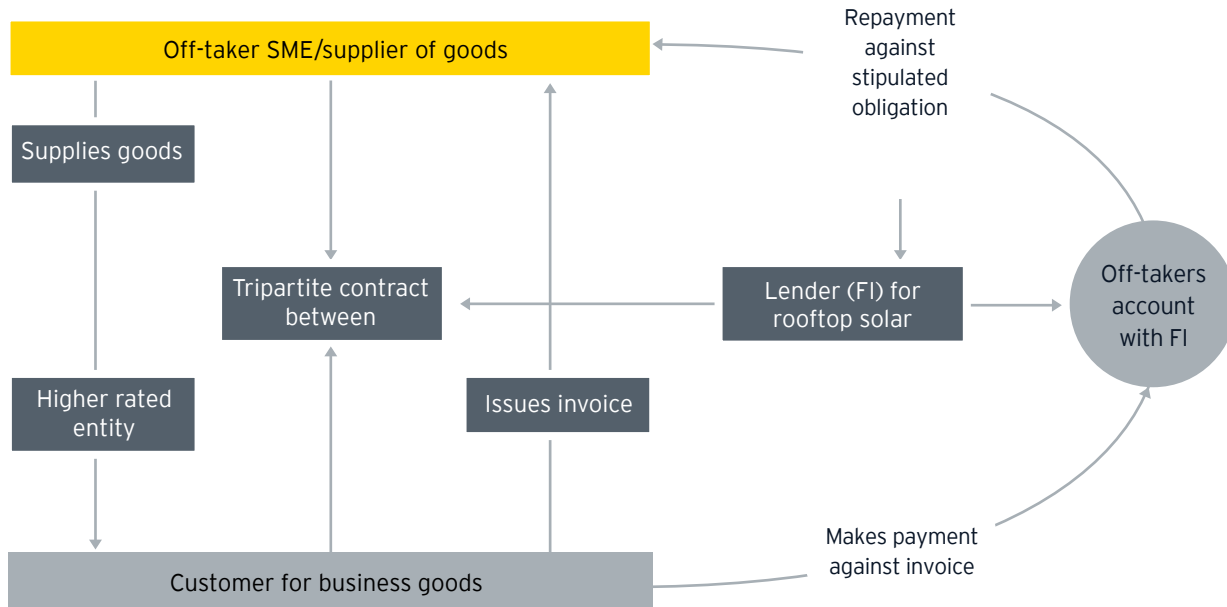


This method of financing is more relevant to automobile manufacturing sector than to cold chain as it has higher business-to-business (B2B) dealings

which are fewer in numbers and higher in value.

Issues with supply chain financing/reverse factoring

- ▶ **Complex onboarding mechanism:** The larger auto component buyers may be reluctant to get onboard such a scheme and become party to such a tri-partite agreement.
- ▶ **Possibility of MSMEs having longer credit terms and conditions between buyer and seller:** In the context of rooftop solar, long credit terms and conditions may be a hindrance to the factor to accept such a financing model as there is lack of discipline among bigger corporates with regards to credit period to settle the bill. For example, a RESCO would not approve of an invoice having a credit period of more than 90 days.

Figure 45. Broad framework of supply chain financing

Source: EY analysis

6.3.4 Asset backed securitization (ABS)

Definition and characteristics

Asset securitization is a structured process whereby interests in loans and other receivables are packaged, underwritten and sold in the form of asset-backed securities. In the case of SME loan securitization, a bank (the originator) extends loans to its SME customers (the primary market), bundles them in a pool (the portfolio) and sells the portfolio to capital market investors through the issuance of notes, by a special purpose vehicle (SPV) backed by the loan portfolio (asset-backed securities or ABS). These asset-backed notes, rated by agencies, are placed with capital market investors, but can also be retained, at least in parts, by the originator banks. From the perspective of credit originators, ABS market enables them to transfer some of the risks of ownership to parties more willing or able to manage them. By doing so, originators can access the funding markets at debt ratings higher than their overall corporate ratings, which generally gives them an access to broader funding sources at more favorable rates.

Use of asset-based securitization in rooftop solar financing for MSMEs

ABS transactions help issuers to get funding, transfer risk and extend maturity of financing. Solar ABS uses a standard legal structure, a special purpose entity to combine

thousands of rooftop solar systems generating monthly cash flows. A pool of commercial and industrial rooftop systems could be grouped into a security. In such cases, the payment streams from a PPA, lease, or loan agreement for the Photo Voltaic system form the cash flows underlying the security. The special purpose entity then issues new debt securities based on the cash flows from the solar leases/PPAs or loan payments.



Securitization could allow solar asset owners to reach a broader base of investors, creating a more liquid market in solar asset ownership.

Furthermore, rating agencies may assess (rate) the pooled assets according to the probability of payment default. Assets can then be categorized to match the risk/return expectations of different types of investors. This could make rooftop solar attractive to financiers with a lower risk or high-return appetite. Asset-backed securities are generally used for refinancing projects that generate positive cash flows, although they can also be issued in the form of project bonds ahead of construction.

However, the ABS market in India is relatively untested for rooftop solar and is overall rather thin outside of mortgages. The study covers how realistic this option is, without having precedents in the market.

The challenge in securitizing assets in the commercial market lies in the one-off nature of the PPA contracts signed between off-takers (system hosts) and developers. The risks associated with assessing a range of off-takers in a single pool, each with various unique requirements and power purchase terms and several without credit ratings, are too high for most investors. Thus, the commercial solar market would benefit highly from standardized PPAs, which could allow it to more readily access the capital markets³¹.

Benefits of securitization

- ▶ Securitization helps in risk mitigation as the assets are removed from their originator's balance sheet and are thus insulated from the parent's corporate risk.
- ▶ By providing investors with rated investments to choose from, it offers the benefits of being able to parse levels of risk to serve different investors, i.e., senior tranches target institutional risk-adverse investors, junior tranches target investors that can assume more risk (including development institutions) and developers.
- ▶ It provides access to broader capital pool as securitization can open up businesses and industries to investors that might otherwise be out of reach, by standardizing assets, introducing them into the capital markets, and affording them liquidity.
- ▶ Securitization allows banks to transform SME loans in their balance sheets into liquidity assets, which can be used to increase lending itself.

Issues with securitization

- ▶ Requires proper assessment and pricing of risks: Solar securitization requires a proper assessment and pricing of the risk associated with a particular pool of assets. This may be difficult in case of India because the risks in the rooftop C&I and energy access segments are not entirely understood (there is an insufficient track-record and data availability) and there are a few clear metrics that are yet to be evaluated. Credit rating agencies have not rated these assets yet.
- ▶ A large chunk of C&I segment is unrated which makes it difficult.
- ▶ Sophisticated markets are required to be able to analyze and price the risk associated with this type of security.
- ▶ Lack of homogeneity between the MSME loan portfolios owing to different/opaque credit profile makes the securitization of MSME portfolios more complicated.
- ▶ The cost of securitization can be high.

6.3.5 Credit insurance

Definition

Insurance is a two-way relationship between the insurer and the insured (typically the entity providing finance). The financier would expect to receive the proceeds of any insurance payout to provide them with the necessary protection against the performance of the financed entity. Insurance procedure necessitates applying financial tools to move certain risks away from the project sponsors and financial institutions to insurers and/or other parties who would be well again capable to guarantee or deal with the risk exposure. There are insurance products in the market which cover risks related to non-physical damage, such as insufficient amount of sunshine and its impact on the performance of the project. They also provide protection against a system being installed incorrectly in a way that was not intended in the design phase and thus has an impact on the revenue models.



Credit insurance enhances credit towards rooftop solar. However insurance premium taken for this increases the cost of financing.

Use of credit insurance in rooftop solar financing for MSMEs

A credit insurance product for rooftop solar financing to MSMEs will essentially provide protection to loans made by banks for rooftop solar financing. Post lending, the banks will insure or ask the borrower to take insurance cover, which can cover the loan in case of default. In case the banks take credit insurance cover, they would add the premium to the total loan amount. In the event of default, the banks will recover the stipulated obligation from the insurance company.

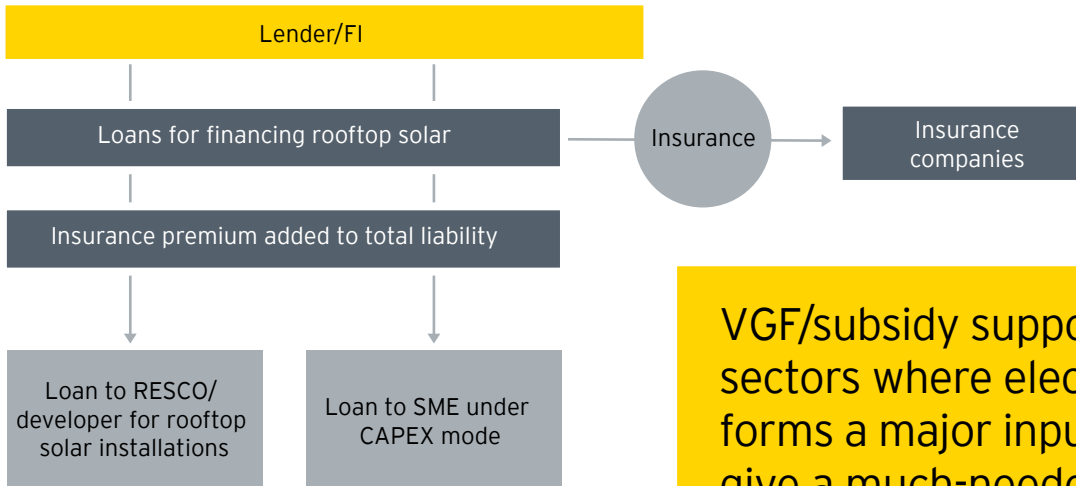
Issues with credit insurance

- ▶ In India, credit insurance is not permitted for usage by banks/financiers/lender or where they are a beneficiary of the claim or where the proceeds to the claim are assigned to them.³²
- ▶ The premium required to be paid to take the insurance cover will add to the cost of financing and this will impinge on the growth of rooftop solar financing for SMEs.
- ▶ The credit insurance company will compensate the lender for its losses but it does not in any way reduces the liability of the borrower.

31 NREL: The Potential of Securitization in Solar PV Finance

32 IRDA: Trade Credit Insurance press release dated 13 December 2010

Figure 46. Broad framework of credit insurance



Source: EY analysis

VGF/subsidy support to sectors where electricity forms a major input cost can give a much-needed fillip to rooftop solar installation for SMEs catering to the particular segment.

6.3.6 Subsidy/viability gap funding (VGF)

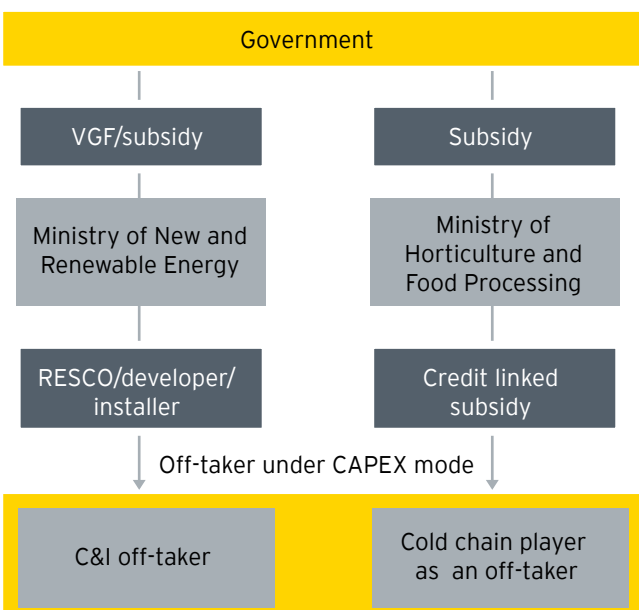
VGF reduces the capital costs of private infrastructure investments by providing a grant funding. The subsidy/VGF can be provided at the beginning or during the project operationalization phase. The VGF “gap” is between the revenues needed to make a project commercially viable and the revenues likely to be generated by user fees paid by customers. A VGF is designed to make projects both economically and commercially viable over the long term

for investors. It helps mobilize private sector investment for development projects, while ensuring that the private sector continues sharing the risks of infrastructure delivery and operation.

Use of VGF/subsidy in financing rooftop solar for SMEs

Currently rooftop solar capital subsidy is provided to residential and institutional sectors in India. The subsidy is released directly to the vendor installing the rooftop solar system for the consumer through the tendering agency. The consumer pays only the balance amount, after excluding subsidy portion, to the vendor. The vendors used to be MNRE-approved channel partners, however this requirement has been removed by MNRE recently³³. The commercial and industrial segment is not eligible to receive subsidy from MNRE. But there are other schemes by other ministries which provide subsidy to support the construction/expansion/modernization of the industry in the SME sector. One such scheme is Capital Investment Subsidy scheme for construction/expansion/modernization of cold storage and storages for horticulture products. The scheme covers installation of solar PV under modernization (alternate technology) and the cold storage applicant is eligible to receive the subsidy as credit-linked back-ended at 35% of the capital cost. The subsidy in this case is disbursed to cold chain owners post installation of rooftop solar.

Figure 47. Broad framework of VGF/subsidy



Source: EY analysis

³³ <https://mnre.gov.in/file-manager/UserFiles/discont-empanelment-241117.pdf>

Issues with VGF/capital subsidy

- ▶ Delay in disbursement of subsidy: In order to alleviate the obstacle of high upfront costs, subsidies were put in place, but their disbursements are often delayed, putting the developers and engineering, procurement and construction (EPC) contractors in a tough spot.
- ▶ Upfront release of subsidy may not be a good practice as it does not take into cognizance the rooftop solar plant performance and installers have no incentive to guarantee the optimum plant performance.
- ▶ In certain situations, VGF/subsidy may not be sufficient to make the project viable due to its inherent shortcomings.

6.3.7 Concessional financing/soft loans

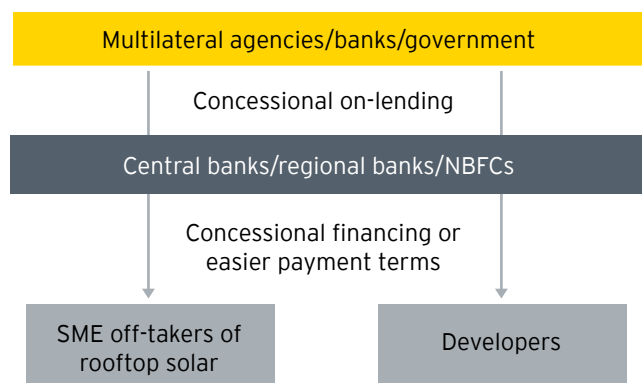
Definition

Concessional financing or soft loan is a loan on comparatively lenient terms and conditions as compared to the other loans available in the market. These easier conditions may be in the form of low interest rates, prolonged repayment duration, etc. Soft loans are usually provided by governments to projects they think are worthwhile. The World Bank and other development institutions provide soft loans to developing countries.

Use of concessional financing in financing rooftop solar for MSMEs

Various multilaterals and financial institutions provide concessional loans for uptake of rooftop solar in the country. The multilateral funds can come in the form of on-lending to the financial institution in the specific country for further disbursement or they can be extended by banks under priority sector lending, e.g., World Bank provides low cost financing to roof-top solar developers under a US\$625 million program being routed through the State Bank of India. The support from World Bank is expected to lower the interest rate by 3%-3.5% from the 11%-12% lending rate for a medium-sized solar roof top project.

Figure 48. Broad framework of concessional financing



Source: EY analysis

Benefits

Soft loans, if clubbed effectively with other credit enhancement instruments and if directed towards the rightful parties, can lead to uptake of rooftop solar installations in the country.

A matrix has been prepared to address the risks emanating from financing the rooftop solar for MSMEs. The matrix presents the risks along with a brief definition and risk mitigation strategy adopted.

Table 5. Risk mitigation matrix

S.no	Type of risk	Explanation	Risk mitigation strategy
1			
Technical risk			
1.1	Generation risk	Risk emanating from lower yields due to faulty, substandard equipment quality	<ul style="list-style-type: none"> ▶ Selection of credible equipment supplier based on his financial and historical performance analysis of equipment produced ▶ Strict performance guarantees of equipment installed ▶ Criteria laid out for the equipment standards and quality installation standards to be used to ensure quality equipment is used along with the proper installation methods. ▶ Validation from an independent engineer regarding the installation quality and equipment ▶ Guarantees on the availability of spares
1.2	Equipment defect		
1.3	Reduced yield due to dusty panels	Risk emanating from inadequate O&M	Performance contracts for O&M, defining desired frequency of maintenance, and penalties for unscheduled outages
1.4	Financial strength of the manufacturer		Tier 1 equipment suppliers only to be considered
2			
Energy resource			
2.1	Variability of irradiation data	Risk from unreliable solar resource data	<ul style="list-style-type: none"> ▶ Eligibility criteria to be set for the agency providing irradiation data ▶ Insurance cover on generation
2.2	Quality of irradiation data		
3			
Force majeure			
3.1	Climate and weather risk		Insurance cover to cover force majeure
4			
Construction risk			
4.1	Inadequate roof strength		<ul style="list-style-type: none"> ▶ Prior assessment of rooftop strength and shade free area from a reputed agency with prior experience in carrying out such assessments.
4.2	Inadequate roof area receiving sunshine		<ul style="list-style-type: none"> ▶ Independent engineer to certify the construction as per the norms and compliance with building norms and fire safety norms.
5			
Regulatory risk			
5.1	Change in net metering policies		
5.2	Issues in connecting to the grid because of no willingness from DISCOM	Risks from the regulatory uncertainty and unwillingness of DISCOMs towards installation of rooftop solar	Policy level intervention is required at the top to mitigate this risk. The policy intervention for rooftop solar is being addressed under the SUPRABHA technical assistance program

S.no	Type of risk	Explanation	Risk mitigation strategy
6 RESCO/ Developer risk			
6.1	Less financially sound developer/ RESCO	Risk from selecting less capable- financially and technically RESCO for installing rooftop solar	Eligibility criteria to be laid out for selection of developers/ RESCO which will include financial standing, past installation track record, numbers of years of existence in the area, performance of the existing plants and bank history
7 Credit risk			
7.1	In Capex mode: lower ability of off-taker to repay loan, higher default risk of the MSME	Risk of default / repayment under Capex and RESCO mode	<ul style="list-style-type: none"> ▶ Evaluation of the borrower based on his credit history, CIBIL and personal credit records with banks. ▶ Further support from the World Bank in the form of credit guarantee to cover for the risk of lower collateral availability. and lower than optimum credit worthiness of the final off-taker.
7.2	In RESCO mode: lower ability of RESCO player to absorb risk and probability of increased default		
7.3	Inadequate data to evaluate the credit worthiness of the MSME		
8 Portfolio risk			
8.1	Inherent risks associated with components of portfolio	Risk of combining loans together and making a portfolio and gets financing for it	<ul style="list-style-type: none"> ▶ Key parameters considered while creating the portfolio. ▶ Standardization of PPA and term sheets signed with final off-taker and RESCO players. ▶ Rigorous scenario analysis to estimate defaults and RESCO's risk absorbing ability in each case.

Source: EY analysis



7

International
experience
on credit
guarantee

7.1 International experience on credit guarantee schemes

In this section, we have studied credit guarantee schemes that have been implemented in various countries globally, and have analyzed the rules governing them to gain insights while building the proposed financial framework.

7.1.1 Introduction

Credit guarantee schemes (CGS) facilitate access to finance by providing comfort to lenders to provide loans to firms/business owners who have the business potential but are regarded as risky and therefore may not have been lent to in the normal course of business by the lender due to lack of/lower collateral or low credit worthiness. A CG acts as a protection cover and gives confidence to the lender to take calculated risk of lending as it covers up for the loss to the lender in case of default. The structure of CG scheme varies across countries and also across types of lending.

Table 6. Eligibility criteria of credit guarantee schemes

Country	Start-ups	Firm size limit	Loan size limit (US\$ million)	Sectors	Working capital
Canada	Yes	Sales: US\$5 million	0.5	All (except agriculture)	No
Colombia	Yes	Assets: US\$7.3 million	0.97	All (except agriculture)	Yes
France	Yes	Sales: 50 million euros; Employees: 250	3.5	All (except for most agriculture firms)	Yes
Korea	Yes	All	3	All	Yes
Taiwan, China	Yes	Services: US\$3 million and 100 employees; Manufacturing: 200 employees	3	All	Yes
US	Yes	Sales: US\$7 million	2	All	Yes
Egypt	Yes	Max 50 employees	0.35	All	Yes

Source: A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

7.1.2 Rules governing the scheme

Eligibility criteria

The “eligibility criteria”, refers to the criteria for selecting the firms for whom CG coverage will be provided. Eligibility criteria across various countries has been defined on the basis of financial parameters like turnover and asset base or number of employees employed along with the limit on the loan size amount. Most of the existing guarantee schemes throughout the world target MSMEs in a broad sense and generally do not restrict sectors or types of loans (long term or working capital). There is some uniformity regarding maximum loan maturity in MENA and North Africa, with most schemes setting the maximum maturity at seven-eight years.

Table 4 below shows the eligibility criteria of credit guarantee schemes in different countries:

Coverage ratios

“Coverage ratio” refers to the percentage cover, up to which the CG will cover the loss of the lender in the event of default. Coverage ratios act as incentives for lenders and provide protection against the risk of default. In their study on “The Typology of Partial Credit Guarantee Funds around the World”, Beck et al (2008) show that the median coverage ratio in a large sample of PCGs is 80%. The study of PCG scheme of Chile³⁴ shows that banks demand a coverage ratio of about 70% to extend long-term loans to riskier borrowers.

Several PCGs provide higher coverage ratios to riskier types of borrowers. Banks will require higher coverage to extend loans to riskier borrowers. Many PCGs extend such higher coverage while also charging a higher fee. In France and the Netherlands, the coverage ratio is higher for innovative firms and start-up loans. In Korea, risky firms with low credit scores get higher coverage. In Chile, the maximum coverage ratio for small firms is 80%, compared to 50% for medium firms. Setting a higher coverage ratio for riskier types of borrowers is a way to enhance additionality while providing some flexibility (less risky borrowers can use the benefit from the guarantee but with a lower coverage ratio, and by paying a lower fee).

The table below shows coverage ratio of credit guarantee schemes in different countries:

Table 7. Coverage ratio of credit guarantee schemes across various countries

Country	Coverage ratio			Link to risk exposure
	Min	Median	Max	
Canada	85%	85%	85%	No scalability
Colombia	40%	60%	80%	According to type of loan/firm
France	40%	55%	70%	40%-50% in general, 60% innovation and 70% start-ups
Korea	50%	70%	90%	Depending on firms credit score: eligible firms with the lowest credit score: 90%, Firms with the highest credit score: 50%
Taiwan	50%	65%	80%	According to type of loan/firm
US	75%	80%	85%	75 % on loans >US\$150,000 85 % on loans <= US\$150,000
Egypt	50%	60%	70%	Medium firms 50% (>10 employees); Small firms 75% (< 10 employees)

Source: A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

Fees/pricing of PCG scheme

PCG schemes generate revenues through guarantee fees and administrative fees. Pricing is a crucial part of the guarantee design, as it affects the behavior and incentive of the borrowers. There are two types of fee arrangements: up-front fees and annual fees. The CG schemes also determine the bearers of the guarantee fee, which can either be the borrower or lender. In addition, CG schemes can charge administrative fees to cover the administrative costs associated with the guarantee activities.

34 A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

The table below shows fees charged by credit guarantee schemes in different countries.

Table 8. Fees charged across various countries

Fees		Link to risk	
	Official definition	Basic standardized rate (% p.a.)	
Canada	2% of the loan amount + 1.25% p.a. calculated on the loan balance	2.3%	No scalability
Colombia	0.95%-3.85% p.a.		Fees is a link to the product and coverage ratio
France	0.6% to 0.9% p.a. of the loan value	1.3%	Fees is linked to the coverage ratio: 0.6% (40% coverage ratio) and 0.9% (70% coverage ratio)
Korea	0.5 % to 3% p.a.	1.2%	Higher fees for low credit rating along with higher coverage ratio
Taiwan	0.75% to 1.5% per annum	0.8%	Fees is linked to risk profile
US	2%-3.5% of the loan amount + annual rate of 0.55% of the outstanding guarantee balance	1.9%	Higher fees for larger loan amounts
Egypt	2% per annum	2%	Lower fees for health care

Source: A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

Credit guarantee scheme in United Kingdom

In the UK, in return for a guarantee, the borrower was initially required to pay a premium of 3% of the guaranteed amount, quarterly in advance, on the outstanding balance. This premium was designed to make the UK scheme self-financing. However, the failure rate proved to be larger than anticipated, and as a result, it was decided to raise the guarantee fee initially to 3% and subsequently to 4%. The proportion of the guarantee was also reduced from 80% to 70% of the loans. Interest in the scheme dropped appreciably when the premium was raised to 4% and the proportion guaranteed also reduced. Thereafter, the fee was lowered to 2.5%.

In practice, fees should be related to the risk exposure and contribute to the financial sustainability of the guarantee scheme. Generally, the level of fees ranges from 0.8% to 2.3% p.a., with an average fee of 1.5% p.a. In addition to the guarantee fee, borrowers had to pay a 1% loan arrangement fee to the banks.



Source: World bank Technical Paper on "Credit Guarantee Schemes for Small and Medium Enterprises", Jacob Levitsky and Ranga N. Prasad

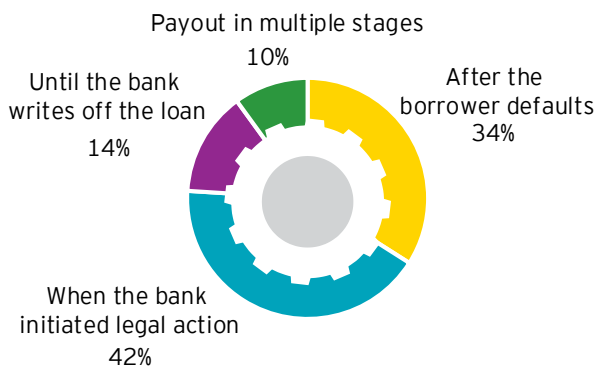
Payment rules

There are generally four types of payment rules for credit guarantee disbursement that can be considered:

- ▶ A single payment after default is validated
- ▶ A single payment after legal actions are initiated
- ▶ Partial payment at the time of default, followed by the remaining payment when judicial procedures are exhausted; and
- ▶ Single payment when judicial procedures are exhausted

In their study on “The Typology of Partial Credit Guarantee Funds around the World”, Beck et al (2008) show the timing of payouts in case of defaults. The study also suggests that the choice of a payment rule should take into account the efficiency of the judicial system while selecting options where the reimbursement is dependent on judicial outcome.

Figure 49. Payout time



Source: A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

Collateral rules

The key role of guarantee schemes is precisely to compensate for the lack of collateral, hindering MSMEs' access to finance. However, the complete absence of collateral may generate adverse selection and ultimately result in large losses for the scheme.

To mitigate this risk, the scheme should consider and incorporate provision for collateral up to certain limits, wherever it is possible and available. For example, in France and in Canada, the schemes are allowed to require personal guarantees but these guarantees are capped respectively at 50% and 25% of the loan value³⁵. Most Middle East and North Africa (MENA) guarantee schemes allow banks to take collateral but they do not impose ceiling on collateral.

7.1.3 Management of the scheme

Operational mechanisms

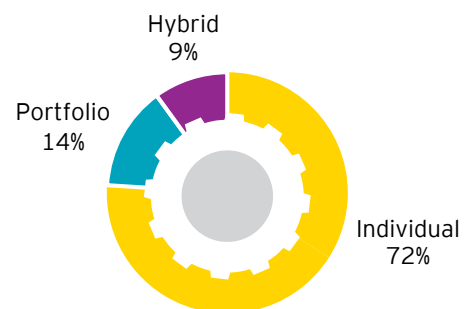
Operating mechanisms refer to the approach and methodology adopted to operate the scheme.

Guarantees can be delivered through individual, portfolio or hybrid approaches.

- ▶ Under individual approach, every loan application is assessed and approved by the guarantee scheme.
- ▶ Portfolio approach is more flexible and allows banks to extend guarantees without consulting the guarantee scheme. Each bank receives a guarantee allocation which can be used for eligible firms.
- ▶ Hybrid approach mixes elements of individual and portfolio approaches and certified lenders can extend guarantees without referring to the guarantee scheme up to a limit; above the specified threshold, the guarantee scheme adopts an individual approach and appraises the loan application before extending the guarantee.

In their study on “The Typology of Partial Credit Guarantee Funds around the World”, Beck et al (2008) report that the schemes in Canada, the Netherlands, the UK, and Chile adopt the portfolio approach, and France, the US, Taiwan, Hungary, and Korea adopt the hybrid approach. The result of this study was:

Figure 50. Loan assessment approach



Source: A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

³⁵ A Review of Credit Guarantee Schemes in the Middle East and North Africa Region, The World Bank, March 2011

The table below shows operational mechanism of credit guarantee schemes in different countries:

Table 9. CG operational mechanisms world-wide

Countries	Operational mechanism
Canada	Portfolio
Colombia	Hybrid
France	Hybrid: individual in general, delegation of guarantee decision to banks for loans < US\$140,000 (only for certified lenders)
Korea	Hybrid: 95% of guarantees are issued under the direct approach (borrowers get a guarantee certificate directly from the KODIT)
Taiwan	Hybrid: Authorized approach (delegation) or direct guarantee
US	Hybrid: individual in general. Faster process for "certified lenders". Delegation of guarantee decision to "preferred lenders".
Egypt	Individual (portfolio only for micro-loans)

Source: The Typology of Partial Credit Guarantee Funds around the World

7.1.4 Capacity building to participating institutions

Many PCG schemes provide technical assistance to participating banks and borrowers, and this contributes significantly to the effectiveness of the scheme and better risk management, resulting in improved outreach, additionality and sustainability.

For example, under France's OSEO scheme, the risk management tools are shared with participating institutions and trains bank staff in this area. Many schemes such as Korea's credit guarantee fund KODIT and Taiwan's small and medium enterprise credit guarantee fund MSMEG also provide assistance to MSMEs in the areas of accounting, business plan preparation, management and marketing.

Capacity building for financial institutions in the areas of credit evaluation and risk management are especially important in countries where MSME lending is limited and banks have inadequate expertise in this business line.

7.1.5 Preliminary assessment of outcomes

The outcomes of a guarantee scheme can be assessed along three main dimensions: **outreach, additionality and financial sustainability**.

Outreach of a guarantee scheme refers to the capacity of the scheme to meet the potential demand for guarantees from eligible MSMEs. Outreach is commonly assessed using basic indicators such as the number of guarantees issued or the amounts of outstanding guarantees scaled by GDP.

Training program by the European Palestinian Credit Guarantee Fund (EPCGF)

EPCGF provided an extensive training program to its partner banks to strengthen financial institutions' capacity in MSME lending.

As part of its training program, the EPCGF awarded diplomas in credit officer, marketing officer and credit management. It also offered train-the-trainers capacity building programs.

EPCGF considered its training program as one of the scheme's key success factors in expanding outreach and the high quality of its portfolio. These training programs played an important role in building up banks' capacity in various areas of MSME lending, in risk management.

Source: The Typology of Partial Credit Guarantee Funds around the World

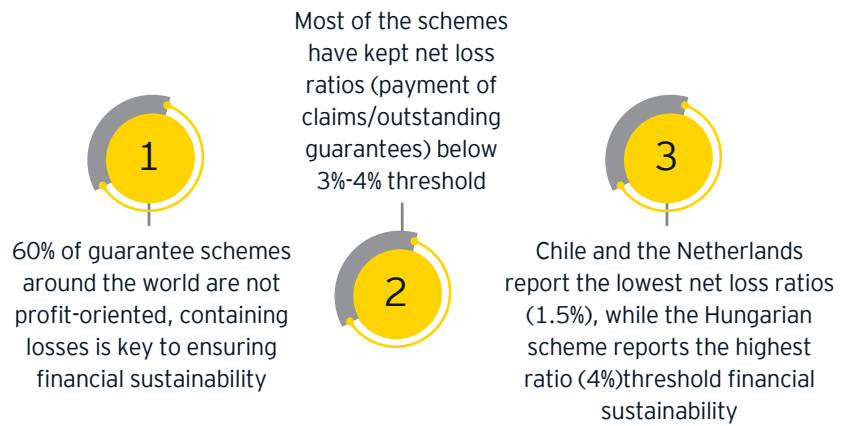
Additionality is one the primary objectives of guarantee schemes. It refers to the capacity of a guarantee scheme to provide access to finance to MSMEs which are effectively credit constrained. It also refers to the developmental impact of the scheme, including the survival rate of firms, investment, growth and job creation.

Financial sustainability of a guarantee scheme refers to its capacity to contain losses and maintain an adequate equity base vis-a-vis its expected liabilities. One of the basic indicators used to assess the financial sustainability of a guarantee scheme is the equity ratio (the ratio of equity to outstanding guarantees) or inversely the multiplier (the ratio of outstanding guarantees to equity).

The optimal balance between these three objectives will depend to a good extent on country conditions. For example, in countries with less-developed financial infrastructure and limited MSME financing, high outreach and high additionality may be achieved simultaneously, while more advanced countries may only increase outreach at the expense of additionality.

To further spread the risk of default, all loans are automatically insured by the Japan Finance Corporation (JFC) every time CGC approves a credit guarantee. It serves as the credit insurance function of the credit guarantee scheme and is maintained by public funds. CGC pays a credit insurance premium to JFC and gets a subrogated amount from JFC if it makes payments on the behalf of an MSME under the guarantee scheme.

Figure 51. Key aspects of financial side of credit guarantee schemes



Source: The Typology of Partial Credit Guarantee Funds around the World, Beck et al

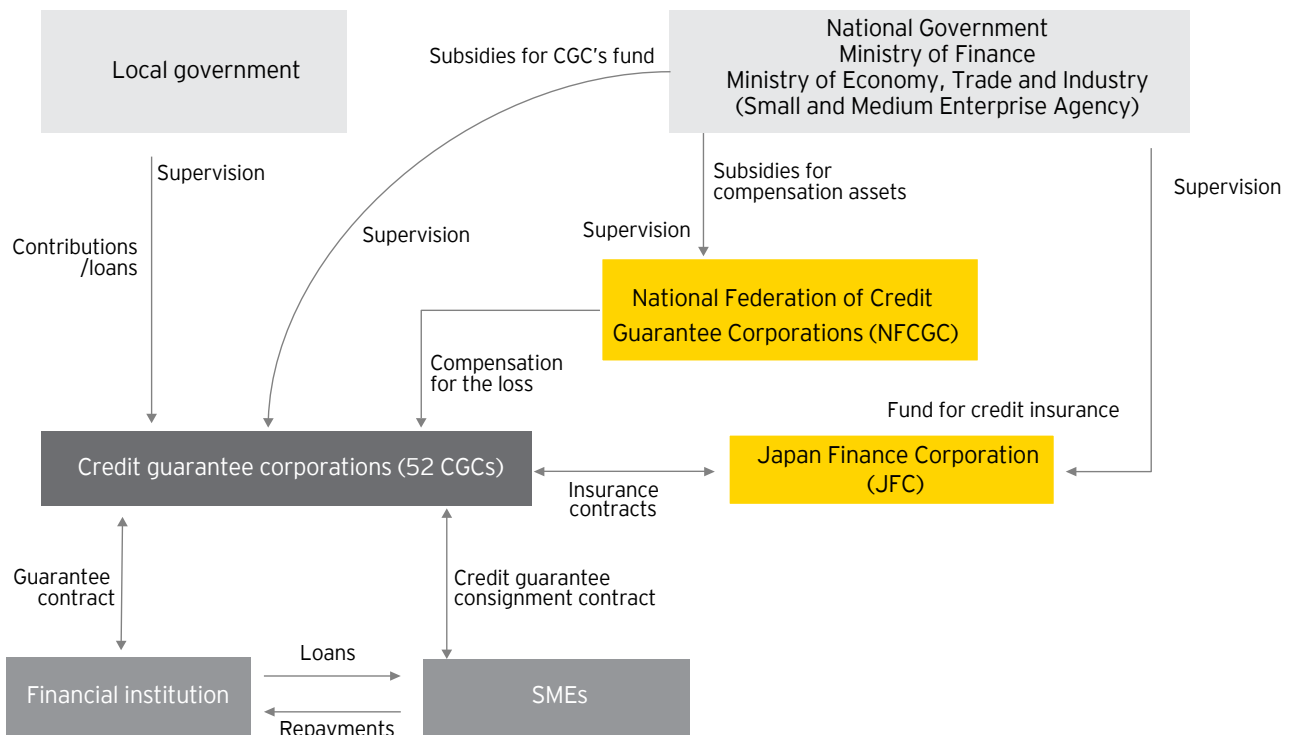


Case study: Implementation of CG scheme in Japan

Credit Guarantee Corporation (CGC) of Japan was established in 1937 with the aim of helping MSMEs raise funds from financial institutions by providing credit guarantees on commercial loans. The National Federation of Credit Guarantee Corporations comprises of 52 local credit guarantee companies (CGCs), with at least one in each of the 47 prefectures of Japan. Japan's credit guarantee scheme is characterized by two key components: (a) a credit guarantee function; and (b) a credit insurance function.



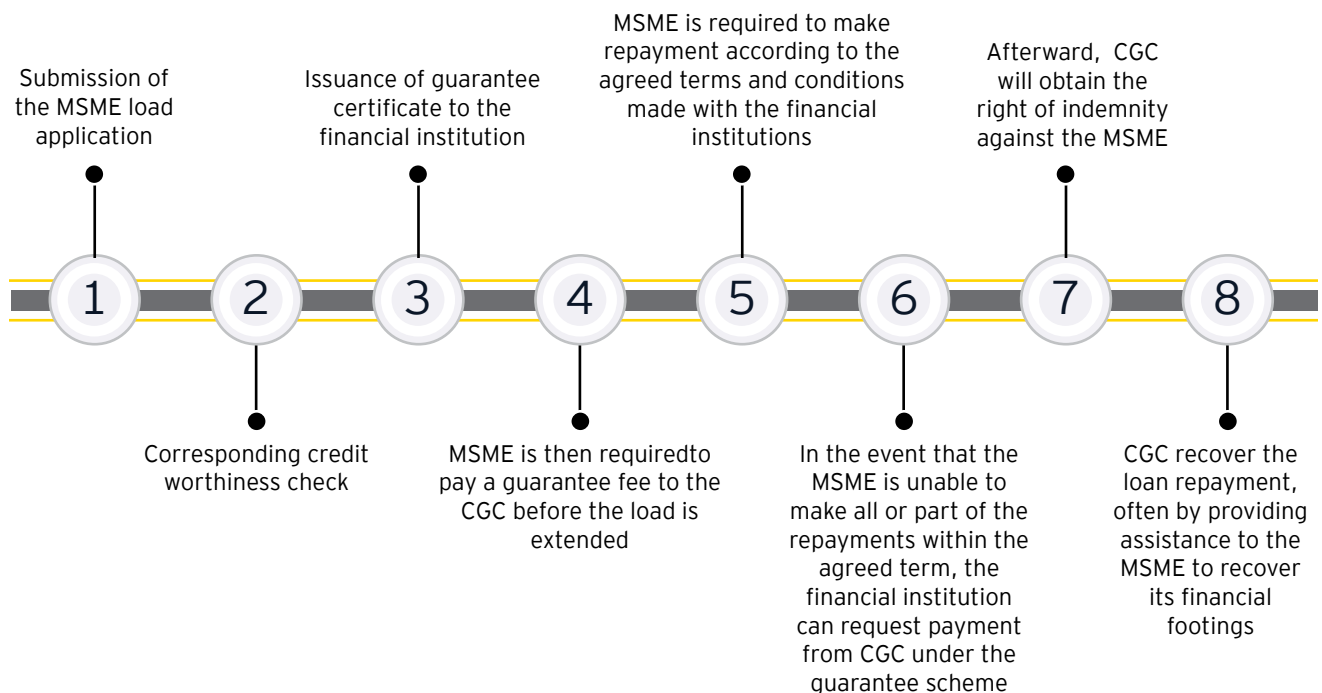
Figure 52. Institutional framework of Japan's credit guarantee scheme



Source: UNESCAP Financing Small and Medium Sized Enterprises for Sustainable Development: A view of the Asia-Pacific Region



Figure 53. The credit guarantee function consists of eight individual steps



Source: UNESCAP Financing Small and Medium Sized Enterprises for Sustainable Development: A view of the Asia-Pacific Region

While the operations of CGCs are financed primarily by the guarantee fee, and the capital gains on CGCs' assets, the national and local governments also provide financial support to the National Federation of Credit Guarantee Corporations and CGCs, to promote their operations and enhance the management base. The national and local governments as well as JFC provide credit insurance funds, various subsidies, deposits and compensation for losses.

Inference from credit guarantee scheme in Japan

Spread of risk among multiple entities, along with efficient governance makes Japanese credit guarantee scheme one of the longest running and effective schemes. One of the reasons that guarantee schemes fail is that recovery is placed on the lender after the guarantee claim has been settled. There is usually much less incentive for lending institutions to pursue debt recovery after a guarantee claim has been settled. However, the lender may be motivated to do so if the institutions own share of the loss for which there is no guarantee is substantial, or if failure to take steps to pursue a defaulter may result in being barred from further participation in the guarantee scheme. Also, charging upfront and annual fee charge will lead to less defaults.

8

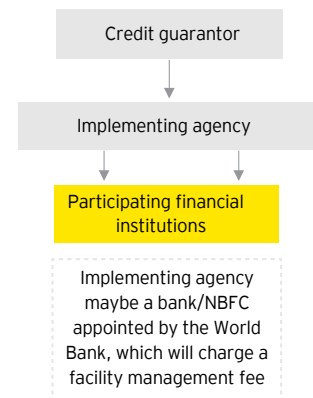
Proposed
options
for credit
guarantee
cover



Drawing on the insights received from the research conducted on credit guarantee mechanism practices worldwide with a view to mitigate the issues projected during the stakeholder consultations, a few credit guarantee mechanism (CGM) structures have been conceptualized, which will be explored in detail in the following section. An attempt has also been made to compute the leverage generated by an assumed CGM corpus in raising the additional funding and the additional rooftop solar installations, thereon.

8.1.1 Management of credit guarantee mechanism

Figure 54. Management of CG mechanisms



Source: EY analysis

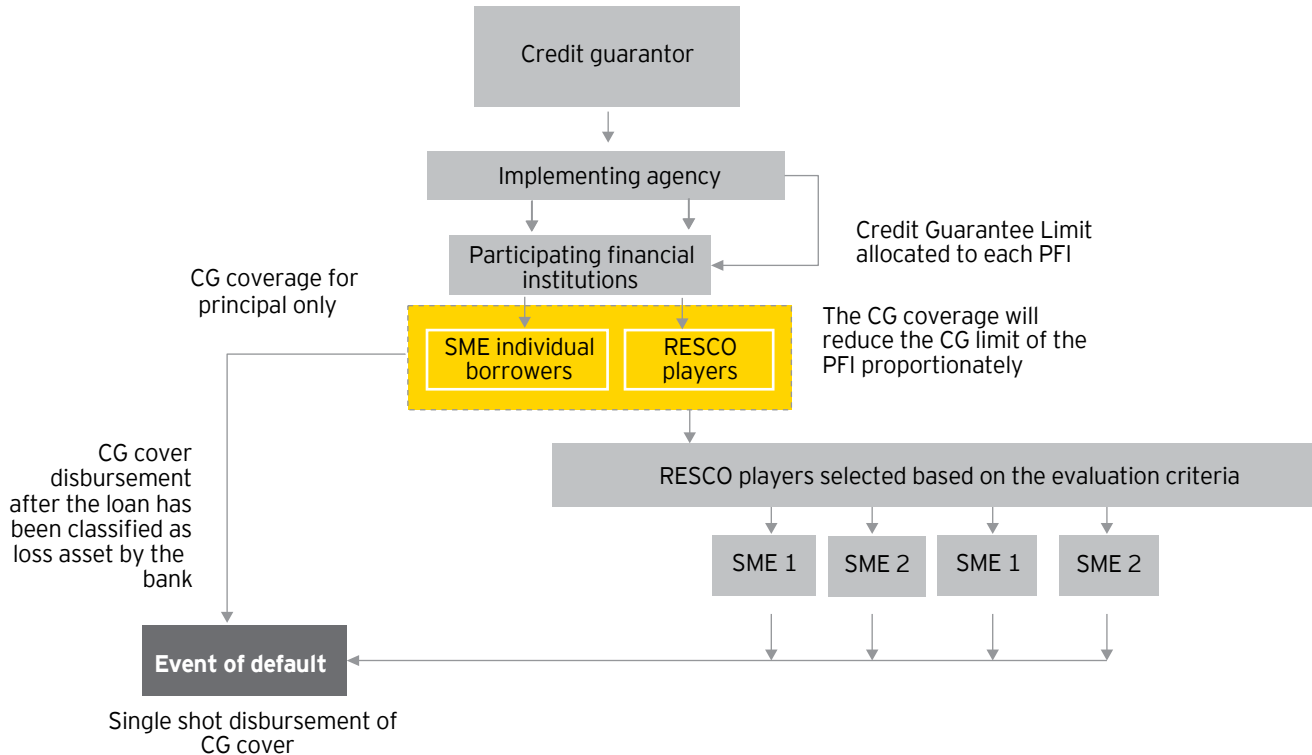
A total of four options have been presented. Under the first three options presented below, the CG scheme will be managed by an implementing agency which will be selected/appointed by the credit guarantor. The implementing agency may be a bank/bank/agency/NBFC who will have the responsibility of administering the scheme implementation. The implementing agency will charge a pre-decided percentage of fee. To extend the CG coverage, various financial institutions, called as participating financial institutions (PFIs) will be selected basis their financial strength and network of branches to ensure a wide spread outreach. These PFIs will be allocated a CG limit which will be calculated based on the total amount of rooftop solar loans provided. The implementing agency may also develop a criterion or an evaluation metric for empanelment of developers/RESCO players who will then be eligible to submit the loan proposals to PFIs. This will help in reducing the time taken to evaluate the loan proposal submitted in the RESCO mode, as PFI's will not re-evaluate the developer/RESCO repeatedly.

8.1.2 Option 1: Fixed Percentage Credit Guarantee Cover (CGC)

Under option 1, the PFIs will be extended a CG coverage for rooftop solar loans where the underlying borrowers can be the end users implementing the project under the self-financing (CAPEX) mode or the project developers implementing these projects for the end users under energy sale (RESCO) mode. The CG cover extended will be a fixed percentage across the borrowers, and with cover only for the principal amount. The CG coverage percentage may be decided considering the default rates of the SME sector. The evaluation of both set of borrowers and final power off takers will be the responsibility of the financial institutions. The CG cover will get activated and disbursement takes place once the loan gets classified as loss asset by the bank. The

disbursement will be a single bullet payment to the lender calculated as percentage of the loan post debt service reserve account deduction. Another version of this option can be the inclusion of a clause which provides for a step-down CG coverage or reduced coverage to a new set of loans after the scheme has run for two/four/eight years. In this case, there can be a step-up guarantee mechanism in which the guarantee fee would increase after three to four years to encourage banks to take more risk on a loan. The CG schemes can cover up to 50% of the loan value in the initial few years.

Figure 55. Fixed percentage CG coverage



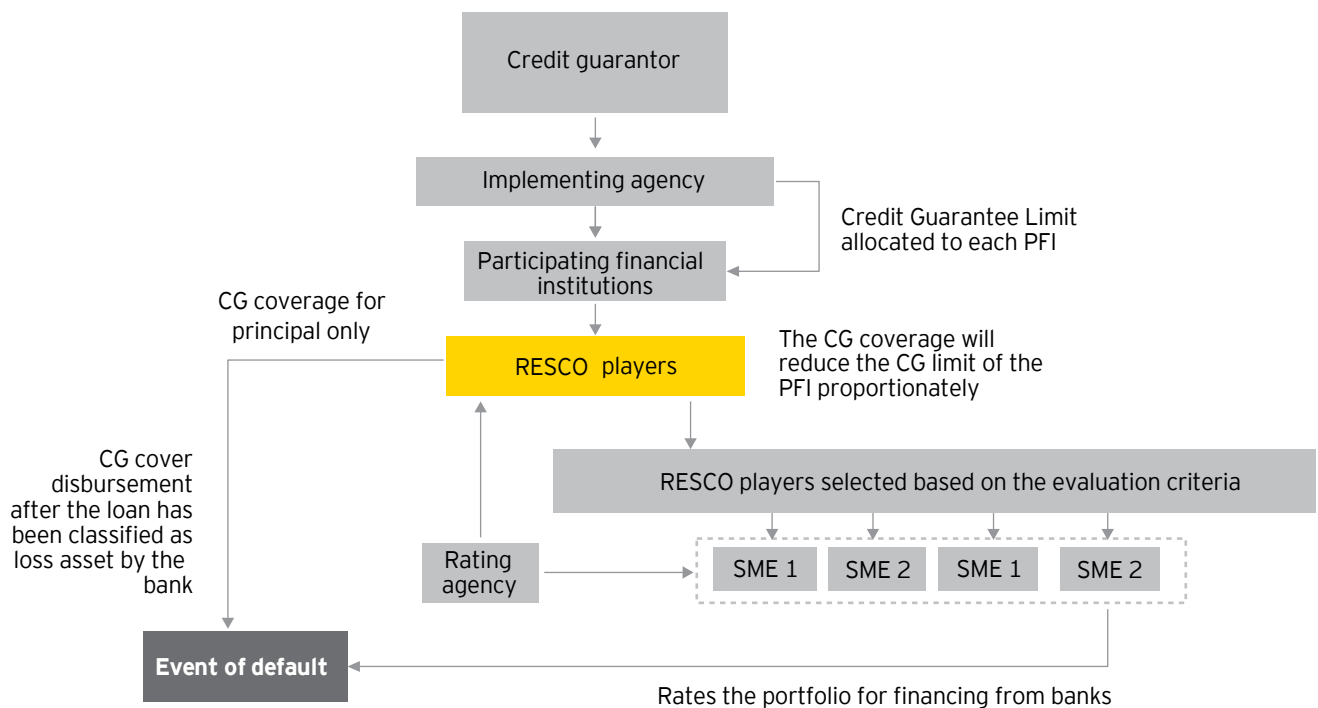
Source: EY analysis

8.1.3 Option 2: Fixed percentage CG coverage with portfolio lending approach

Under option 2, while financing the RESCO players, PFIs may adopt the portfolio lending approach. Portfolio lending approach refers to the evaluation of the complete portfolio of loans not on an individual basis but as a one single loan. This method of loan evaluation helps in reducing the time taken to evaluate each and every loan in the portfolio. This method also gives more flexibility to RESCOs in designing innovative structures which helps in managing risk, reaching out to more MSME players, and also generating revenues. Under this method, a rating agency acquires increased importance as it lends more credibility to the portfolio's credit worthiness. CG cover to the financial institutions in case of loans to RESCOs under portfolio approach gets triggered only when the entire portfolio defaults and not when one loan in the portfolio defaults. Though some bankers are of the opinion that the CG cover should trigger right when the first loan defaults in the portfolio, but to

implement the portfolio lending approach in its true sense, it is suggested that the CG cover gets triggered when the portfolio defaults, as this approach gives more freedom to RESCO player to create a portfolio on the basis of its risk appetite, probability of cash flows and excess spread charged to the risky consumers so as to cover the default up to a certain range internally from the portfolio cash flows. The success of this approach depends on the accuracy with which the portfolio is rated by the rating agency, as the same determines the rate of interest and also the other loan covenants. From the perspective of the financial institutions, this option might be riskier than the previous option (i.e., option 1). Therefore, to promote the portfolio lending mechanism, an incentive mechanism may need to be developed wherein a higher CG coverage cover than under option 1 may be provided to the lender.

Figure 56. Option 2: fixed percentage CG coverage with portfolio lending approach



Source: EY analysis

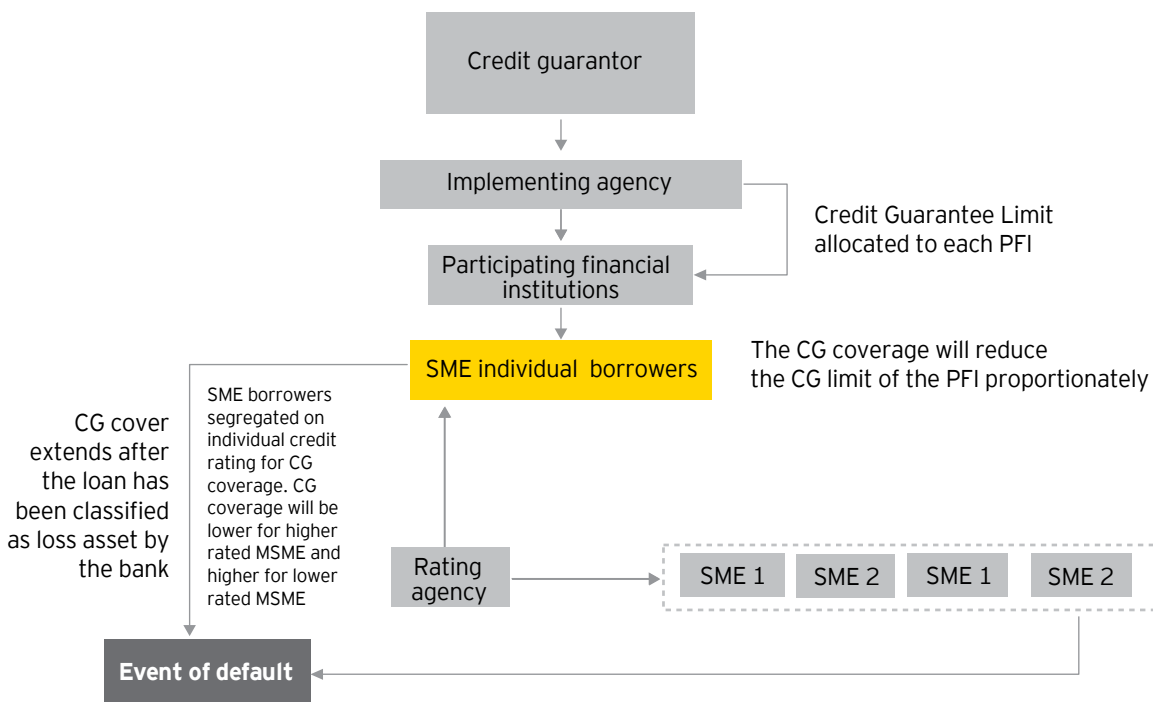
8.1.4 Option 3: variable CG coverage percentage basis credit rating of MSMEs in case of CAPEX model

In option 3, as a criterion for arriving at the CG coverage percentage for the borrower, a matrix can be developed based on the credit rating of the individual MSMEs. Higher the rating, lower maybe the CG coverage percentage. The guarantor along with the PFIs can decide what percentage of the total CG cover will be allocated to each of the AAA, AA, A, BBB, BB and B rated loans. For example, in the table, the A and above category of loans can constitute 10% of the total loans and they can be given a CG coverage of 10% as they are less risky in nature and the probability of default is also lower. In case of MSMEs, several firms are unrated, in that case the banks can develop their internal scoring sheet which accounts for the credit history of the MSME, outstanding loans and credit worthiness. Based on the points scored, it can categorize the CG coverage percentage. The guarantor may also develop its own CG coverage evaluation template which will be provided to banks to evaluate the loan for the CG applicability. An alternative methodology can be deciding CG coverage on the basis of size of MSME or loan

size. This insight has been drawn from the observations made from the international study of CG mechanisms as mentioned above, where it has been seen that across various countries the extent of CG coverage is decided on the various parameters such as type of firms (normal or innovative or startup firms), credit scores of the firms, number of employees. For example, in case of Lebanon coverage is based on loan size, 75% coverage for small-sized loans (less than US\$200,000); 85% for , medium-sized loans (less than US\$400,000); and 90% for innovative loans.

Rating	Percentage of total	Coverage
A and above	10%	10%
BBB and BB	60%	35%
Below BB	30%	95%

Figure 57. Option 3: variable CG coverage percentage basis credit rating of MSMEs

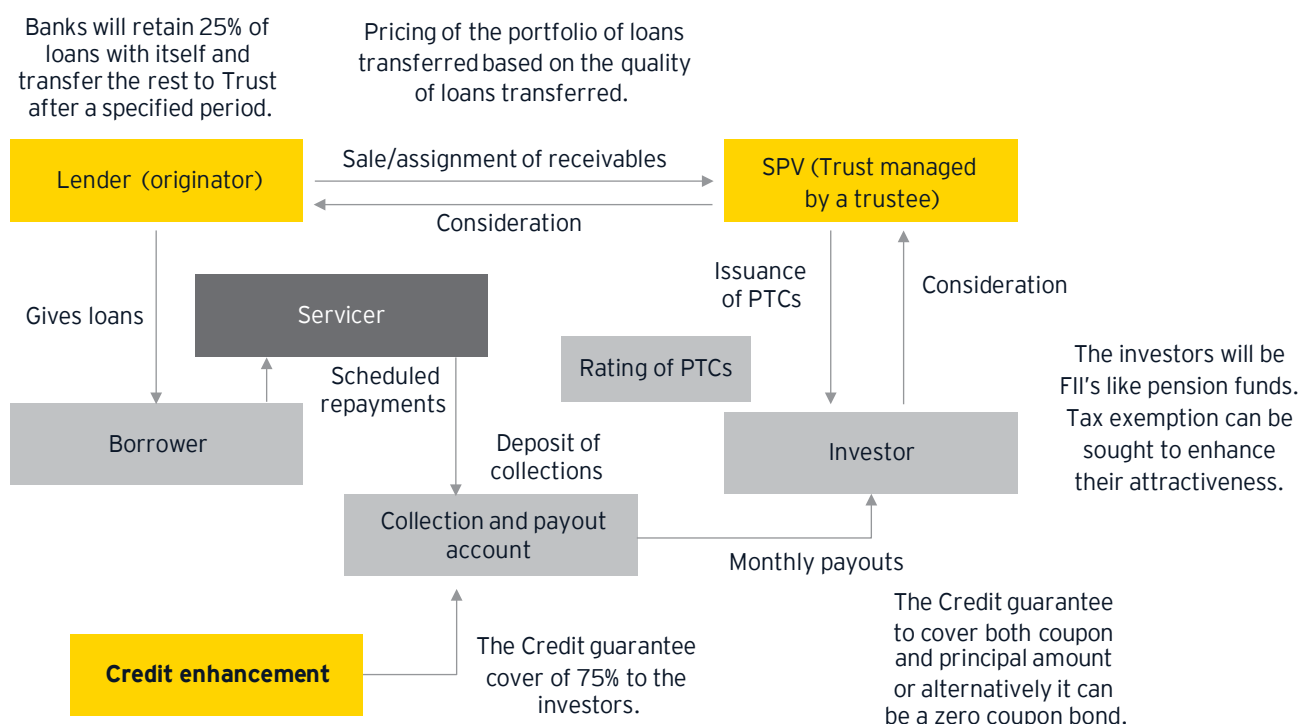


8.1.5 Option 4: CG coverage to support asset-based securitization

Option 4 is different in structure from the rest of the options and is a long-term market-making model, which can be implemented once the rooftop solar market reaches a certain scale. Asset-based Securitization (ABS) model for rooftop solar will initially require credit enhancement support which thereafter can be removed once the market for rooftop solar loans develops significantly and the investors start trusting the viability of rooftop solar segment. To start with, a certain portion of credit guarantee can be earmarked for the ABS mechanism. Under this model, the lenders known as originators, will provide loans to the borrowers called obligors, which can be both SMEs and RESCO players. After keeping the loans on its books for a period as required by the RBI regulations, the lender can sell off the loans to a third party. For this purpose, a special purpose vehicle (SPV) gets created in the form of trust. The lender will keep a portion of loans on its books as per the RBI regulations and then transfer the remaining loans to the SPV. The pricing of the portfolio of loans transferred

will be based on the quality of loans, quality of originator and obligor, nature of assets backing the underlying loans. The SPV created will then bundle the loans under different categories with varied coupon rates and covenants, and get them rated by the rating agency. At this stage, the addition of credit enhancement to the structure will lead to an increase in the credit rating given by the rating agency, which in turn will lead to better placement/sale of the pass through certificates (PTCs). The guarantor will decide upon the CG coverage to be provided to the PTCs issued. This model is a market making model as it can create/identify new set of investors such as pension funds, FIIs and others, who would like to invest in the segment knowing the risks and return. The PTCs can be regular coupon paying or a zero-coupon instrument with the pre-decided CGC. In the event of default by the obligor, the CG mechanism will cover a part of repayment to the investor.

Figure 58. Option 4: CG coverage to support asset-based securitization



8.2 Leverage generated by credit guarantee mechanism

As mentioned above the intent of the CG mechanism is to drive the uptake of rooftop solar in the MSME sector by leveraging CGM corpus to mobilize debt. This section presents the impact of CG in driving up the rooftop solar uptake in terms of installations and debt.

8.2.1 Scheme dynamics

The proposed CG mechanism is expected to improve banks' exposure to rooftop solar lending in MSME sector. The suggested mechanism takes into consideration banks' requirements for credit guarantees to cover losses in case of defaults, and would act as a loss-sharing agreement between the banks and the scheme-implementing agency.

CG cover will be extended to the participating banks. This will partially reimburse the losses faced by them, hence they will be partial credit guarantees (PCGs). Banks will maintain three months of loan payment balance in Debt Service Reserve Account (DSRA), and in case of delayed payment from borrower, banks would utilize the funds available in the DSRA. In case of left over loan balance post utilization of the funds in DSRA, the bank will file a claim with the implementation agency to recover the guaranteed portion of the uncovered outstanding debt.

8.2.2 Scheme assumptions and workings

We have considered two options for calculating CG cover. These are:

- Fixed percentage CG coverage (25%/40%/50%)
- Variable percentage coverage (based on the weighted average of default rate of different category of borrowers)

Loan tenure: Maximum tenure of guarantee issued under PCG scheme will be 10 years, and it will be co-terminus with the tenor of the loan. With loans being disbursed over a five-year period, the CGM facility would be active for 15 years.

Leverage: Debt to equity ratio of the eligible projects is proposed to be capped at 70:30.

Interest rate: 9% p.a.

To enhance the comfort level of lenders, the loan disbursement in Year 1 has been assumed at 10%. Thereafter, loans are expected to gradually increase over the next four years.

Year	1	2	3	4	5
Loan disbursed	10%	15%	20%	25%	30%

8.2.3 Fixed percentage CG coverage

Assumed default rate: 10%, calculated as average default rate of micro and SME enterprises (MSME Pulse Report, CIBIL)³⁶.

(a) 25% CG coverage

Based on the assumptions as mentioned above, a PCG corpus of US\$200 million with 25% CG coverage can mobilize:

Table 10. Fixed percentage CG coverage: 25% CG cover

Parameter	Impact
Total CGM pool (a) US\$ millions	200
Debt facilitated (b) US\$ millions	1450
Capital facilitated (c) = (b/0.70)*	2057
Rooftop solar installation (MW)**(c/0.67)	3070
Leverage of CGM corpus to debt mobilized (d)= (b/a) times	7.1

* For debt/equity of 70:30

**At INR 50 mn per MW (USD 0.67mn per MW)

Source: EY analysis

³⁶ <https://www.transunioncibil.com/resources/tucibil/doc/insights/reports/report-msme-pulse-june-2018.pdf>, MSME Pulse, TransUnion CIBIL, June 2018

(b) 40% CG coverage

Based on the assumptions as mentioned above, a PCG corpus of US\$200 million with 40% CG coverage can mobilize:

Table 12. Leverage computed under fixed percentage CG coverage: 40% CG cover

Parameter	Impact
Total CGM pool (a) US\$ millions	200
Debt facilitated (b) US\$ millions	900
Capital facilitated (c) = (b/0.70)*	1286
RTS installation (MW)**(c/0.67)	1919
Leverage of CGM corpus to debt mobilized (d)= (b/a) times	4.43

* For debt/equity of 70:30

**At INR 50 mn per MW (USD 0.67mn per MW)

Source: EY analysis

c) 50% CG coverage

Based on the assumptions as mentioned above, a PCG corpus of US\$200 million with 50% CG coverage can mobilize:

Table 13. Leverage computed under fixed percentage CG coverage: 50% CG cover

Parameter	Impact
Total CGM pool (a) US\$ millions	200
Debt facilitated (b) US\$ millions	720
Capital facilitated (c) = (b/0.70)*	1029
RTS installation (MW)**(c/0.67)	1535
Leverage of CGM corpus to debt mobilized (d) = (b/a) times	3.54

* For debt/equity of 70:30

**At INR 50 mn per MW (USD 0.67mn per MW)

Source: EY analysis

8.2.4 Variable percentage coverage

Assumed default rate: Weighted average default rate of 9.87%, calculated on basis of CRISIL's two-year average CDRs for long-term ratings ³⁷.

Table 14. CG coverage under different credit ratings

Off-taker mix	BBB	BB	B	C
Loan disbursed	30%	40%	20%	10%
Default rate	2.1%	7.4%	15.3%	32.1%
CG Cover*	6.3%	22.3%	45.8%	96.4%

*CG cover is calculated as a 3x multiple of default rate

CG coverage: 29.61%, calculated as weighted average of category-wise loan disbursed and CG cover offered.

Based on the assumptions as mentioned above, a PCG corpus of US\$200 million with CG coverage of 29.61% can mobilize:

Table 15. Leverage computed with weighted average CG cover based on credit rating

Parameter	Impact
Total CGM pool (a) US\$ millions	200.0
Debt facilitated (b) US\$ millions	1200.0
Capital facilitated (c) = (b/0.70)*	1757
RTS installation (MW)**(c/0.67)	2623
Leverage of CGM corpus to debt mobilized (d)= (b/a) times	6.0

* For debt/equity of 70:30

**At INR 50 mn per MW (USD 0.67mn per MW)

Source: EY analysis

³⁷ <https://www.crisil.com/content/dam/crisil/our-analysis/publications/default-study/CRISIL-Default-Study-2017.pdf>, CRISIL default study, Default and rating transitions

8.3 Stakeholder feedback on the proposed CG options

With a view to validate the proposed credit guarantee (CG) options, a few stakeholders were consulted regarding their opinion on the feasibility and their preference amongst the four prescribed options. Lenders such as SBI, SBI Capital Markets, Yes Bank, Standard Chartered, NABARD, SIDBI, Tata Cleantech and developers such as Cleanmax, Fourth Partner etc. were consulted. A few MSMEs were also touched base with in this process. The following section presents the feedback received from the three sets of stakeholders consulted during this study, namely the lenders, developers and MSMEs. A summary of the feedback received from the stakeholders is being captured in tabular form below:

Table 16. Summary of stakeholder feedback on CG options

CG option/ Stakeholder category	Lender	Developer	MSME
Plain vanilla CG (Option 1)	Simple and decent option		
Portfolio- based CG (Option 2)	Suitable from the perspective of large pipeline	Most suitable	Any of the options that enhance liquidity in the market
Variable coverage CG (Option 3)	Concerns about admin issues	Secondary alternative to Option 2	
ABS-credit enhancing CG (Option 4)	Market not mature enough for this	Market not mature enough for this	

8.3.1 Lenders' feedback

Credit guarantee as a whole has been well received by lenders as an essential means to protect the lenders while lending to relatively weaker entities such as MSMEs. The lenders were enquired about their preference between a funded and an unfunded facility. The sore point for lenders in a funded facility is that they would be charged a sovereign and a commitment fee, which was not the case in an unfunded facility. Some lenders raised the issue of the tenor of such a credit guarantee facility, as PPA terms were usually on the higher side of 15-25 years. The guarantee facility can be set up to match the tenure of PPA, so that the lenders are protected for the entire PA term. A mention was also made of the trust managing the guarantee facility, which necessarily should be a separate entity and free from any conflict of interest.

- ▶ Lenders say a CG is essential while lending to MSMEs.
- ▶ The preference is for an unfunded CG
- ▶ The tenure of the facility to be equivalent to the PPA term

One issue that most of the financial institutions were peppered with for their comments during discussions was their opinion on lending to RESCOs in portfolio mode. From the point of view of market making, this is essential because RESCOs have more flexibility to aggregate demand on the basis of their risk appetites, probability of cash flows and excess spread charged to the risky consumers so as to cover the default up to a certain range internally from the portfolio cash flows.

As per one of the financial institutions contacted, lending to a RESCO can happen in the following two cases:

- ▶ When the RESCO as well as the off taker is weak - In this case, credit enhancement would be required to reduce the risk
- ▶ When the RESCO is weak but the off taker is relatively strong - This case is good enough for lending as the payments are expected to be on time

Lenders assess individual off takers too in a portfolio. The second option proposes extra coverage for the lender to mitigate the issue of the CG getting triggered only when the entire portfolio fails.

However, the financial institutions are in unison in quoting that while assessing a portfolio constructed by a RESCO, the FI does not limit itself to assessing only the RESCO. An assessment is also done on the off takers too who form part of the portfolio. This leads to additional due diligence costs and time.

The 2nd option proposed in this study tries to mitigate this hassle by proposing that the credit guarantee will be triggered only when the portfolio as a whole defaults. Of course, FIs have expressed their concern that this will entail greater risks for them and that the guarantee should be triggered when even one off-taker defaults. Hence, this option has been proposed with a rider that it will incorporate greater protection or an incentive mechanism to mitigate the extra risk of the guarantee being triggered only when the entire portfolio defaults.

The role of rating agencies assumes high importance here. Most of the financial institutions who have been consulted have quoted that the involvement of an independent rating agency will be crucial to the success of this mechanism.

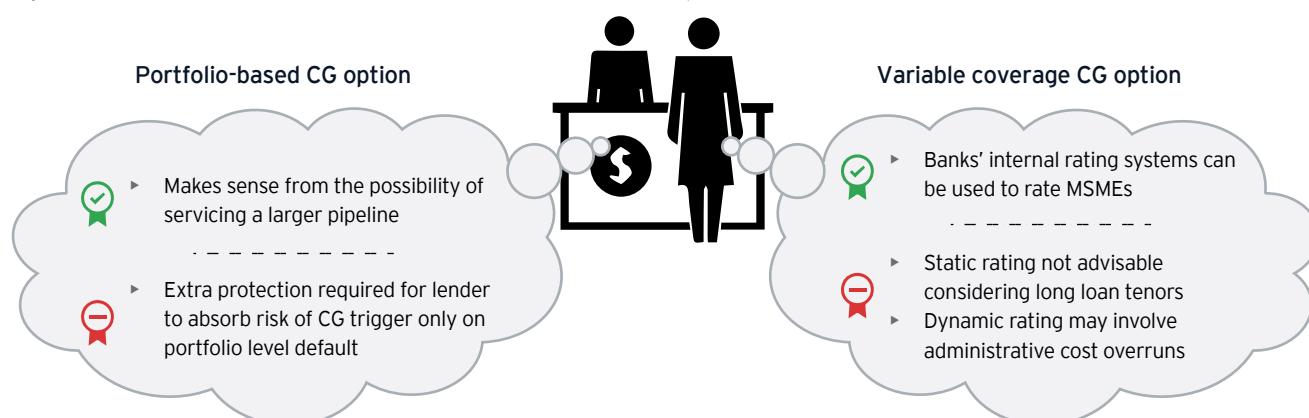
The 3rd option proposed in the study, namely the guarantee option with variable coverage was also discussed with financial institutions. Some financial institutions are of the view that maximum coverage tending to 100% should be provided in case of lending to relatively weak entities like MSMEs. Hence the principle followed in this option of offering a higher percentage of coverage for lower-rated MSMEs strikes a chord with the philosophy of FIs.

The third option treats borrowers as per their credit rating, which is in sync with the philosophy of lenders desiring for greater protection to lend to lower-rated borrowers

Moreover, many of them also informed that they have their own credit rating systems to rate borrowers. For example, SBI has its SB scale of ratings from SB-1 to SB-15, SB-1 being the highest rated borrowers and for whom the most favourable rates of borrowing apply and SB-15 being the lowest rated. These rating systems can also be utilized while categorizing borrowers, and accordingly credit guarantee cover can be designed to adequately cover the risk of the borrowers in each category, while at the same time not subjecting the lenders to undue risk.

However, lenders are concerned that a static rating system may not have any significance, taking into consideration the long tenors of solar loans. On the other hand, lenders are concerned that adopting a dynamic rating system will lead to a lot of administrative cost overruns.



Figure 59. Lenders' recommendations and concerns on CG option

The motive behind the 4th option proposed under this study on credit guarantee enhancement to support asset-backed securitization has been a long-term market-making or market-expanding endeavour. Keeping in mind the fact that the secondary market in rooftop solar has not matured yet, developers and financiers are of the view that this is more of a long-term shot, which will take time to come to fruition.

8.3.2 Developers' feedback

Developers feel that high-rated clients are getting exhausted and a move will have to be made towards lower-rated clients in the coming future. The main issue with such a client set is of course their low credit rating or lack of credit rating due to which developers feel that some support or incentive is required to be offered to financial institutions for lending to MSMEs. Moreover, since many financial institutions are not very comfortable lending to many developers too for solar, credit guarantee support to lenders can be an important step in improving the rooftop solar lending sentiment.

When enquired about the CG options proposed under this study, developers evinced greater interest in the option which promotes a portfolio approach to lending for rooftop solar, because they feel aggregation can help in mitigating the high transactional costs of serving the MSME market which is relatively smaller in individual capacities and scattered.

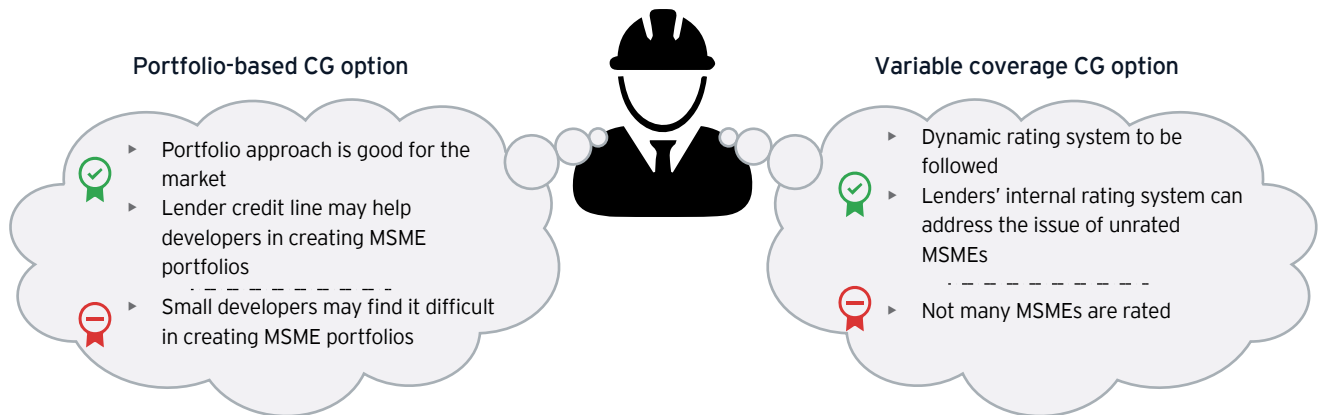
When the issue was highlighted regarding the difficulty that may be encountered in aggregating small and scattered MSMEs, the feedback received from the developers was that creating a 2MW-3MW portfolio is not a big ask nowadays since customers have become aware of rooftop solar and have embraced it well. A market data that was mentioned

was that clients with turnover in the range of INR8m-INR9m are going for projects of 2 MW scale. Aggregation of demand through a portfolio approach on the part of the lender coupled with a cluster approach on the part of the developer can lead to good results. However, aggregation of scattered MSMEs may not be a walk in the park for new and upcoming developers.

Regarding the modalities of operating the portfolio-based CG, the feedback received was that the trigger level in a portfolio for CG to be activated should not be too late. For instance, if a portfolio with 10 clients (6 A-rated and 4 B-rated) is considered, trigger can be activated when say three A-rated clients default or when 1 B-rated client defaults. The CG will continue to operate once the guarantee for the pre-decided mix of defaulters is paid out. Penalties can be incorporated so that developers construct the portfolio with a proper mix of high-rated and low-rated clients.

Apart from the portfolio-based model, developers also evinced interest in the variable CG coverage model as a second alternative to the portfolio-based model. When enquired about the conundrum of a dynamic rating model (where current rating of the MSME will be considered) versus a static rating model (where the rating of the MSME during the initiation of the CG will be considered), the developers were of the opinion that dynamic rating should be applied to the CG mechanism. When enquired about the administrative difficulties a dynamic rating will encapsulate, a static rating that will be applicable for short periods, say for 6 months, was suggested. Even in fields such as insurance, insurability depends on the current health of one's asset. Moreover, an insight provided by the developers was that in PPAs, clauses are being inserted nowadays where the off-taker is asked to maintain his credit rating, failing which there may be increasing tariff etc. Similarly, dynamic rating should apply in a CG scenario too.

Developers feel that aggregation of demand through a portfolio approach on the part of the lender coupled with a cluster approach will help in scaling up demand

Figure 60. Developers' recommendations and concerns on CG options

Developers also emphasized on the need of a secondary market as risk mitigation factor in the case of default by the off taker, thereby highlighting the need of asset appraisal as an important parameter in the rooftop solar sector. This is a step which is a prerequisite for solar asset backed securitization to take off, and if it is enhanced with credit guarantee from highly rated organizations like the World Bank, as mentioned in the 4th option, this can help in market making for rooftop solar in the future. Overall, developers quipped that any mechanism that enables the market to grow is a welcome step.

Developers feel that development of the secondary market along with the credit enhancement of solar assets can help in securitisation and expansion of markets in the future

8.3.3 MSMEs' feedback

When a few MSMEs were enquired about the options proposed under this study for supporting lenders to lend to MSMEs, they were of the opinion that if these mechanisms led to more liquidity in the market and eased out the criteria and requirements to obtain loans, they would be more than welcome. However, they were not very categorical about any particular option that we popped at them.

Overall, it can be concluded from the feedback received from the stakeholders consulted that credit guarantee is an essential mechanism to support the market for rooftop solar for MSMEs. Portfolio approach is the option preferred by developers considering the market-expanding possibilities underlying it, whereas lenders have shown greater affinity to both the portfolio-based option as well as the MSME rating-based variable coverage option, taking into consideration both market-making as well as adequate protection for the lenders. The asset-backed securitization option has been earmarked by the stakeholders as a futuristic option.

The portfolio-based CG option along with the option comprising variable CG as per the credit rating of MSMEs have been well received by the stakeholders

9

Concluding thoughts from the study



Over the course of this study, the potential of rooftop solar in MSMEs has been estimated and this has been found to be significant, two sectors namely the auto component manufacturing MSMEs and cold chain MSMEs have been selected for analysis, the issues hampering the growth of rooftop solar in MSMEs have been identified through extensive consultations with various stakeholders, and on the basis of these inputs, a framework which seeks to address the concerns of these stakeholders has been proposed, which includes the three pillars of standardization, insurance cover and a few variations of credit risk mitigation mechanism.

So far insurance products covering rooftop solar performance have been limited to utility-scale projects due to high transaction costs related to small-scale rooftop projects, multilateral developmental agencies are suggested to work with insurance agencies to analyze whether support can be provided for an extra loading that may be required to mitigate the high transaction costs associated with small-scale rooftop projects.

Source: EY analysis

Standardization can go a long way in creating a favorable business scenario by setting the benchmark parameters, on the back of which any offering available in the market is compared, be it on equipment, selection of service companies or after-purchase services.. For this to happen, initially a set

A matrix of standardization norms with respect to equipment quality, service companies and O&M could be conceptualized and adherence to the same might be made mandatory by the multilateral developmental agencies so that an entity gets the option to avail loans from the particular facilities run by these agencies.

Source: EY analysis

list of parameters for standardization can be conceptualized, which will define the minimum requirements that the market offerings need to have, and will thus act as a quality control screen which the purchase of goods or services can rely on. This matrix of standardization parameters could be made a part of the selection criteria for any entity which seeks to avail any lending facility put in place by the World Bank or other multilateral developmental organizations. The standardization matrix can henceforth be institutionalized, so as to enhance the comfort factor of both lender and borrower regarding the entire rooftop solar ecosystem. In case the service provider approaches a financial institution for a loan, the adherence to these standards could be made a part of the overall assessment of the borrower, apart from the checks on financial prudence that the lender will conduct. For equipment, the list can have parameters which define the manufacturing quality of the equipment (this includes parameters like the material used for

The standardization matrix is likely to be made mandatory to avail lending facilities put in place by multilateral developmental agencies like the World Bank, and with passage of time, these should be institutionalized, so as to make them a part of the overall rooftop solar lending ecosystem.

Source: EY analysis

manufacture, testing subjected to for ensuring that the item has gone through proper manufacturing processes, storage conditions, etc). Installation standards can be defined by the safety standards adhered to, the skillsets of manpower employed to carry out the activities and also warranties against faulty installation of equipment. The quality of operations and maintenance regime can be ensured by a stringent contract, such as an annual maintenance contract (AMC), which can include aspects such as monitoring the

Table 17. Suggestive list of standardization parameters

Quality of EPC contractor	Equipment quality	Quality of installation	Quality of O&M contractor
Prior installation of equipment in X number of projects	International electrotechnical commission (IEC) solar PV equipment quality standards	General safety standards such as protective clothing, fire protection and special care during rain as well as windy conditions	Monitoring of equipment every X days/months (can be a part of an annual maintenance Contract -AMC)
Should have a service center in the city/state or a tie up with any local O&M entity	Manufacturer warranties on modules, inverter and mounts against failure due to manufacturing defects and premature material degradation	Licensing and certification of solar installers	Cleaning of modules every X days (can be a part of an AMC)
References from prominent suppliers	Insurance coverage of equipment	Hiring of a licensed or master electrician	Availability of standard parts within X days (can be a part of an AMC)
References from prominent clients		Workmanship warranties against faulty installation	Availability of service center
			Availability of service helpline
			Availability of safety standard SOPs applicable during servicing and maintenance
			Adherence to standards applicable for monitoring equipment

Source: EY analysis

The support of multilateral developmental agencies in credit risk mitigation can be a huge enabler in making the market of rooftop solar through futuristic mechanisms such as asset-backed securitization.

Source: EY analysis

frequency of equipment, frequency of maintenance of equipment and standard operating procedures (SOPs) for servicing of spares through the availability of service centers ensuring prompt servicing. A list of prospective parameters has been mentioned below that can form part of the standardization matrix.

The study also mentions protection of project yields through incorporation of insurance cover. Insurance can contribute significantly in allaying the concerns of lenders regarding unpredictable yields that is an inherent characteristic of rooftop solar projects or solar projects in general. However, insurance products catering to the unpredictability of rooftop solar project generation are still quite new to the Indian market. Moreover, the few products that are available in the market today have been restricted to providing cover to utility-scale projects only. This is due to the high transaction costs associated with small-scale rooftop solar projects compared to the large-scale utility projects. This is where the support of multilateral developmental agencies such as the World Bank, Asian Development Bank, etc. can be leveraged. A study may be commissioned in conjunction with insurance companies, which might look into aspects such as whether the insurance companies will be willing to take up smaller scale projects, if adequate loading factor is applied to the premium that is required to be paid for availing an insurance cover. Subsequently, a methodology to determine the quantum of loading can be arrived at in relation to projects of various sizes and risks. Thus, a ballpark figure can be

arrived at which will be required to support projects of a cumulative target capacity. The quantum of support for the amount required for the extra loading can be discussed by the insurance agencies with the multilateral developmental agencies. Thus, the limit of 10 MW or higher which some insurance companies follow at the moment for providing insurance cover to solar projects, can be significantly brought down if such an arrangement can be conceptualized and operationalized.

The study has mentioned credit risk mitigation as the third pillar of the framework. A few options have also been mentioned regarding the operationalization of the credit guarantee mechanisms. The impact that can be generated by the operationalization of such a risk mitigation mechanism has also been estimated. Apart from the near-term benefits that has been mentioned earlier in the guarantee impact section, credit risk mitigation has the potential to create a self-sustainable market for rooftop solar in the long-term. As the market grows in maturity and the demand for rooftop solar increases, the value of rooftop solar assets will also increase. However, till the time the rooftop solar sector in India reaches the desired level of maturity, the World Bank and other similar agencies can support the process of market-making by providing the requisite support for credit enhancement, so as to make the assets more credit-worthy. This can increase the interests among investors, and ultimately lead to flourishing of the rooftop solar market, in the high-potential MSME segment and also in general.





Annexure I - Shortlisting of sectors

Working sheet I: Ranking of sectors based on “Electricity cost as % of Total production cost(TPC)”

Parameter: electricity cost as% of TPC

Industry	Electricity % of TPC	Industry score	Weightage	Industry score (scale of 5)
Paper	3.00%	1.22	25%	0.31
Food processing (rice mills)	10.44%	2.40	25%	0.60
Cold chain/warehousing	26.86%	5.00	25%	1.25
Foundry	5.14%	1.56	25%	0.39
Pharma	8.00%	2.01	25%	0.50
Chemicals	1.68%	1.01	25%	0.25
Plastic	7.59%	1.95	25%	0.49
Textiles	2.03%	1.07	25%	0.27
Leather	8.12%	2.03	25%	0.51
Auto and engineering products	1.60%	1.00	25%	0.25

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology

Maximum	27%	y(max)	5	M	15.83
Minimum	1.6%	y(min)	1	C	0.75

Working sheet II: ranking of sectors based on “Contribution to GDP”

Parameter: contribution to GDP

Industry	GDP	Industry score	Weightage	Industry score (scale of 5)
Paper	0.3%	1.00	5%	0.05
Food processing (rice mills)	1.4%	1.66	5%	0.08
Cold chain/warehousing	0.5%	1.12	5%	0.06
Foundry	0.6%	1.18	5%	0.06
Pharma	2.0%	2.01	5%	0.10
Chemicals	2.1%	2.08	5%	0.10
Plastic	0.5%	1.12	5%	0.06
Textiles	4.0%	3.21	5%	0.16
Leather	0.9%	1.36	5%	0.07
Auto and engineering products	7.0%	5.00	5%	0.25

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology

Maximum	7.0%	y(max)	5	M	59.70
Minimum	0.3%	y(min)	1	C	0.82

Working sheet III: Ranking of sectors based on “sectoral growth rate”

Parameter: sector growth rate

Industry	CAGR	Industry score	Weightage	Industry score (scale of 5)
Paper	7.0%	1.57	15%	0.24
Food processing (rice mills)	3.5%	1.00	15%	0.15
Cold chain/warehousing	28.0%	5.00	15%	0.75
Foundry	10.1%	2.07	15%	0.31
Pharma	12.9%	2.53	15%	0.38
Chemicals	8.0%	1.73	15%	0.26
Plastic	11.0%	2.22	15%	0.33
Textiles	8.7%	1.85	15%	0.28
Leather	9.0%	1.90	15%	0.28
Auto and engineering products	24.0%	4.35	15%	0.65

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology					
Maximum	28.0%	y(max)	5	M	16.33
Minimum	3.5%	y(min)	1	C	0.43

Working sheet IV: ranking of sectors based on “sector employment”

Parameter: sector employment

Industry	Sector employment (in million)	Industry score	Weightage	Industry score (scale of 5)
Paper	0.5	1.00	0.050	0.05
Food processing (rice mills)	13.5	2.17	0.050	0.11
Cold chain/warehousing	13.5	2.17	0.050	0.11
Foundry	2.5	1.18	0.050	0.06
Pharma	0.5	1.00	0.050	0.05
Chemicals	1	1.04	0.050	0.05
Plastic	4	1.31	0.050	0.07
Textiles	45	5.00	0.050	0.25
Leather	2.5	1.18	0.050	0.06
Auto and engineering products	25	3.20	0.050	0.16

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology					
Maximum	45	y(max)	5	M	0.09
Minimum	0.5	y(min)	1	C	0.96

Working sheet V: ranking of sectors based on “rooftop solar suitability”

Parameter: rooftop solar suitability

Industry	Rooftop suitability (1-3-5 score)	Industry score	Weightage	Industry (score scale of 5)
Paper	5	5	15%	0.75
Food processing (rice mills)	3	1	15%	0.15
Cold chain/warehousing	3	1	15%	0.15
Foundry	5	5	15%	0.75
Pharma	3	1	15%	0.15
Chemicals	3	1	15%	0.15
Plastic	3	1	15%	0.15
Textiles	3	1	15%	0.15
Leather	3	1	15%	0.15
Auto and engineering products	5	5	15%	0.75

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology

Maximum	5	y(max)	5	M	2
Minimum	3	y(min)	1	C	-5

Rooftop suitability study

Industry	Rooftop availability	Structure strong enough to support rooftop installation	Remarks
Paper	Yes	Yes	
Food processing (rice mills)	Yes	Yes/No	Asbestos sheet roofs should be avoided*
Cold chain/warehousing	Yes	Yes/No	Structure strength depends on how old the plant is. It cannot be generalized. Additional support is required if the structure is old
Foundry	Yes	Yes	Speculative on the basis of auto and engineering products
Pharma	Yes	Yes/No	Asbestos sheet roofs should be avoided* and some areas have piping network on their roof
Chemicals	Yes	Yes/No	Speculative on the basis of pharma
Plastic	Yes	Yes/No	Speculative on the basis of pharma
Textiles	Yes	Yes/No	Asbestos sheet roofs should be avoided*
Leather	Yes	Yes/No	Asbestos sheet roofs should be avoided*
Auto and engineering products	Yes	Yes	

Source: Refer Sources for the working sheets at the end of annexure 1

Working sheet VI: ranking of sectors based on “credit growth”

Parameter: credit growth

Industry	Credit growth 2016-2018 (%)	Industry score	Weightage	Industry score (scale of 5)
Paper	-13.0%	1.00	18%	0.18
Food processing (rice mills)	-6.0%	1.93	18%	0.34
Cold chain/warehousing	-6.0%	1.93	18%	0.34
Foundry	5.5%	3.47	18%	0.61
Pharma	-6.0%	1.93	18%	0.34
Chemicals	4.0%	3.27	18%	0.57
Plastic	17.0%	5.00	18%	0.88
Textiles	1.0%	2.87	18%	0.50
Leather	11.0%	4.20	18%	0.74
Auto and engineering products	9.0%	3.93	18%	0.69

Source: Refer Sources for the working sheets at the end of annexure 1

Scoring methodology					
Maximum	17.0%	y(max)	5	M	13.33
Minimum	-13%	y(min)	1	C	2.73

Working sheet VII: Ranking of sectors based on “NPA rate”

PARAMETER: NPA rate

Industry	NPA rate %	Industry score	Weightage	Industry score (scale of 5)
Paper	12.0%	3.00	18%	0.53
Food processing (rice mills)	13.0%	2.33	18%	0.41
Cold chain/warehousing	13.0%	2.33	18%	0.41
Foundry	15.0%	1.00	18%	0.18
Pharma	12.0%	3.00	18%	0.53
Chemicals	12.0%	3.00	18%	0.53
Plastic	12.0%	3.00	18%	0.53
Textiles	12.5%	2.67	18%	0.47
Leather	9.0%	5.00	18%	0.88
Auto and engineering products	11.0%	3.67	18%	0.64

Source: Refer Sources for the working sheets at the end of annexure 1

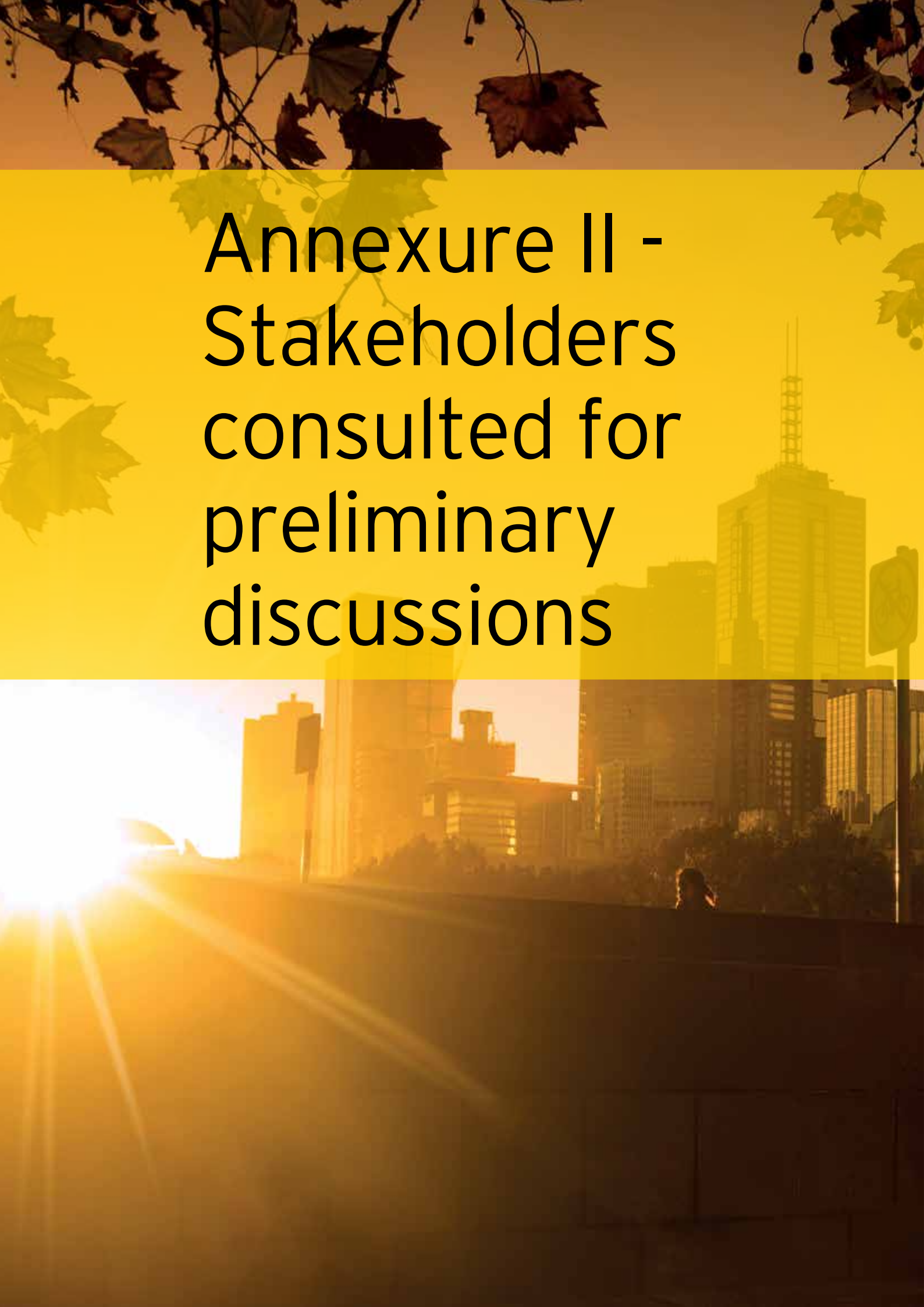
Scoring methodology					
Maximum	15.0%	y(max)	1	M	-66.67
Minimum	9%	y(min)	5	C	11

Sources for the working sheets

Industry	Parameter	Data Source for links
Paper	Electricity cost % of TPC	http://www.sameeeksha.org/pdf/dpr/Muzaffarnagar_Paper.pdf
Food Processing (Rice Mills)		web.inflibnet.ac.in/ojs/index.php/KJAS/article/download/730/677
Cold Chain/ Warehousing		http://mnre.gov.in/file-manager/akshay-urja/january-february-2016/EN/37-39.pdf
Foundry		http://sameeeksha.org/pdf/clusterprofile/Belgaum_Foundries_Karnataka.pdf
Pharma		http://sameeeksha.org/pdf/clusterprofile/Ankleshwar_chemical_cluster.pdf
Chemicals		http://sameeeksha.org/pdf/dpr/Ahmedabad_Chemical.pdf
Plastic		http://www.icpe.in/crisil/Indian_Plastics_Industry_Vision_2012_CRISIL_Report.pdf
Textiles		https://link.springer.com/article/10.1007/s40031-013-0040-5
Leather		http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_leath0203.pdf
Auto & Eng Products		https://www.ibef.org/download/Auto_Component_171109.pdf
Paper	Industries contribution to GDP	http://ipma.co.in/paper-industry/overview/
Food Processing (Rice Mills)		https://smallb.sidbi.in/%20sectors%20food-processing%20rice-mill-industry
Cold Chain/ Warehousing		http://indiacoldchainshow.com/Cold-Chain-Industry-in-India-A-Report.pdf
Foundry		http://www.financialexpress.com/budget/budget-2018-foundry-industry-seeks-modi-govt-support-in-manufacturing-heres-what-does-mother-of-all-industries-expect/1036227/
Pharma		http://www.iosrjournals.org/iosr-jhss/papers/Vol13-issue3/H01335166.pdf
Chemicals		https://www.ibef.org/download/Chemicals-April-2017.pdf
Plastic		http://www.indianmirror.com/indian-industries/plastic.html
Textiles		https://www.ibef.org/industry/textiles.aspx
Leather		http://www.cii.in/Sectors.aspx?enc=prvePUj2bdMtgTmvPwwisYH+5EnGjyGXO9hLECvTuNsTq2tvIjcsn+JcGE1qoYAq
Auto & Eng Products		https://www.ibef.org/industry/autocomponents-india.aspx
Paper	Industry CAGR	http://www.careratings.com/upload/NewsFiles/SplAnalysis/Indian%20Paper%20Industry%20-%20Out%20of%20the%20woods.pdf
Food Processing (Rice Mills)		http://heraldkeeper.com/featured/rice-milling-2017-india-market-expected-grow-cagr-3-51-percent-forecast-2022-38554.html
Cold Chain/ Warehousing		http://www.cppr.in/wp-content/uploads/2016/12/Government's-Role-in-India's-Ailing-Cold-Storage-Sector.pdf
Foundry		https://www.prnewswire.com/news-releases/india-foundry-market-in-2017-2021-market-to-grow-by-more-than-10-with-electrosteel-castings-hinduja-foundries-nelcast-rail-wheel-factory-dominating---research-and-markets-300371547.html
Pharma		https://www.ibef.org/download/Pharmaceutical-July-2017.pdf
Chemicals		http://ficci.in/spdocument/20441/Knowledge-Paper-chem.pdf
Plastic		http://ficci.in/spdocument/20872/report-Plastic-infrastructure-2017-ficci.pdf
Textiles		https://www.ibef.org/industry/textiles.aspx

Leather	Industry CAGR	https://www.thedollarbusiness.com/magazine/leather-industry---yet-to-put-the-best-foot-forward/32843
Auto & Eng Products		https://www.ibef.org/industry/autocomponents-india.aspx
Paper	Industry Employment	http://www.capitalmarket.com/prebudget/2017-2018/Memorandum/Indian-Paper-Industry.pdf
Food Processing (Rice Mills)		http://mofpi.nic.in/sites/default/files/english_annual_report_final-ilovepdf-compressed_1.pdf
Cold Chain/Warehousing		
Foundry		http://knnindia.co.in/news/newsdetails/sectors/indias-foundry-industry-has-potential-to-increase-exports-employment-ifo
Pharma		https://economictimes.indiatimes.com/industry/healthcare/biotech/pharmaceuticals/pharma-sector-hiring-expected-to-see-20-growth-in-2016-report/articleshow/50909667.cms
Chemicals		http://www.careersatcore.com/chemical-jobs.php
Plastic		https://www.ibef.org/EEPC/Plastics/2013/files/assets/downloads/files/Plastics.pdf
Textiles		https://www.ibef.org/industry/textiles.aspx
Leather		http://data.conferenceworld.in/ICRTEsm2/P560-564.pdf
Auto & Eng Products		https://www.ibef.org/industry/autocomponents-india.aspx
Paper	Industry Rooftop Solar Suitability	GIZ Report
Food Processing (Rice Mills)		GIZ Report
Cold Chain/Warehousing		GIZ Report
Foundry		GIZ Report
Pharma		GIZ Report
Chemicals		GIZ Report
Plastic		GIZ Report
Textiles		GIZ Report
Leather		GIZ Report
Auto & Eng Products		GIZ Report

Paper		RBI- Sectoral deployment of bank credit	
Food Processing (Rice Mills)		RBI- Sectoral deployment of bank credit	
Cold Chain/ Warehousing		RBI- Sectoral deployment of bank credit	
Foundry		RBI- Sectoral deployment of bank credit	
Pharma	Industry Credit Growth %	RBI- Sectoral deployment of bank credit	
Chemicals		RBI- Sectoral deployment of bank credit	
Plastic		RBI- Sectoral deployment of bank credit	
Textiles		RBI- Sectoral deployment of bank credit	
Leather		RBI- Sectoral deployment of bank credit	
Auto & Eng Products		RBI- Sectoral deployment of bank credit	
Paper			MSME-SIDBI Pulse report
Food Processing (Rice Mills)			MSME-SIDBI Pulse report
Cold Chain/ Warehousing		MSME-SIDBI Pulse report	
Foundry		MSME-SIDBI Pulse report	
Pharma	Industry NPA Rate	MSME-SIDBI Pulse report	
Chemicals		MSME-SIDBI Pulse report	
Plastic		MSME-SIDBI Pulse report	
Textiles		MSME-SIDBI Pulse report	
Leather		MSME-SIDBI Pulse report	
Auto & Eng Products		MSME-SIDBI Pulse report	



Annexure II - Stakeholders consulted for preliminary discussions

Stakeholders	S. No.	Name of the company	Location
Financial institutions	1	State Bank of India	Maharashtra
	2	Tata Clean Tech Capital	Maharashtra
	3	Standard Chartered Bank	Maharashtra
	4	NABARD	Maharashtra
	5	YES Bank	Delhi
	6	State Bank of India Capital Market	Maharashtra
	7	SIDBI	Delhi
	8	Loans4SME	Mumbai
	9	State Bank of India 22 SME and RMs consulted	Haryana
Developers	1	Amplus Energy Solutions Pvt. Ltd	Haryana
	2	Oakridge Energy	New Delhi
	3	Fourth Partners	Telangana
	4	Rays Future Energy	Haryana
Cold chain MSMEs	1	R P Cold Storage	Haryana
	2	Lawrance Agro Storage P Ltd.	Haryana
	3	Ashirwaad Cold Store	Punjab
	4	Golden Cold Storage	Rajasthan
	5	GT cold Storage P Ltd.	Uttar Pradesh
	6	Vasantha Cold Storage	Andhra Pradesh
	7	Sri Ayyanar Cold Storage	Tamil Nadu
	8	Ecofresh cold storage & warehousing	Maharashtra
	9	Sham Cold storage	Odisha
	10	Jindal Ice and Cold storage	Uttarakhand
	11	Beas Cold storage	Punjab
	12	NA	Bihar
	13	NA	West Bengal

Stakeholders	S. No.	Name of the company	Location
Auto component MSMEs	1	Modern Hi-Tech	Haryana
	2	Neolight	Haryana
	3	Immense Auto Pvt. Ltd.	Haryana
	4	Kiran Udyog	Haryana
	5	Asian Wire Forming & Springs Private Limited	Haryana
	6	Standard Elastomers.,	Karnataka
	7	Avanti Components	Karnataka
	8	Chopra Autotech P Ltd	Uttarakhand
	9	Jaycee Castalloys Pvt. Ltd	Haryana
	10	Aar Cee Engineering Works	Haryana
	11	Suri Auto Pvt.Ltd	Haryana
	12	Paranjape Autocast Pvt. Ltd	Maharashtra
	13	Roots Cast Private Limited	Tamil Nadu
	14	Rohtas Fastners	Haryana
	15	Marshal Casting Ltd	Haryana
	16	Simmonds Marshall Ltd	Maharashtra
	17	Singla Forging Pvt. Ltd	Haryana
	18	Sterling Tools Limited	Haryana

Participants list from workshop at India Habitat Centre

Sr. No.	Name	Designation	Organization	Organization type
1	Sai Siddhartha	Bridge To India	Manager	Think tank
2	Biswajit Dutta	Trina Solar	Head-Business Development	RESCO
3	Pankaj Thakkar	Sun Source Energy	VP-Business Development	RESCO
4	Ankit Agrawal	YES Bank	Manager	Financial institution
5	R.S Sehrawat	SBI	Asst. General Manager	Financial institution
6	N.S Prasad	TERI	Senior. Fellow	Think tank
7	Cecil Augustine	RAYS	AVP-Business Development	RESCO
8	Parminder Singh	I Am SME Of India	EVP	SME
9	Rahula Kashyap	Renew Power	AVP	RESCO
10	Naresh Sehgal	Azure Power	Senior. GM (Finance)	RESCO
11	Shailendra Sharma	SBI	AGM	Financial institution
12	Kajal Kiran	Amplus	Senior Manager	RESCO
13	Rajesh Cherayil	Nereus Capital	Nereus Capital	Financial institution
14	Mr. Khekiho Yeptho	IREDA	Dy. General Manager (PTS)	Financial institution
15	Bibek Bandhopadhyay	EY	Senior Advisor, USAID-PACE-D	Consultancy
16	Piyush Bhatheya	SKSS	AVP	RESCO
17	Vijay Nirmal	CPI	Program Manager	Think tank
18	Ayush Khandelwal	IREDA	ET (IREDA)	Financial institution
19	Shreyansh Raj	IREDA	ET (IREDA)	Financial institution
20	Umakant Shende	CleanMax Solar	COO	RESCO
21	Shivang Agarwal	Agarwal's and Consulting	Partner	SME
22	Neeraj Kuldeep	CEEW	Program Associate	Think tank
23	Akash Sharma	Fourth Partner	Assistant Manager	RESCO
24	Nimish Vishnoi	SECURICO	Product and energy Manager	Solution provider
25	Onkar Kapoor	PV EV Renewable	CEO	RESCO
26	Samant Jha	PTC Financial	Manager	Financial institution
27	Vivek Mishra	JS Industries	Sales	SME
28	A.D. Arshdas	SunSource Energy	CEO	RESCO
29	Sishir Goel	SolarSmiths	Director	RESCO
30	Divyam nagpal	IRENA	Associate Programmer	Think tank
31	Rajan Trehan	MySun	A.V.P	RESCO
32	Vikas Bansal	Yes Bank Ltd.	Executive Vice President	Financial institution
33	Shravan S.	Oakridge	CEO	RESCO
34	Vivek	J.S. Industries	Representative	SME

A photograph of a city skyline at sunset, with a yellow banner overlay. The sun is low on the left, creating a bright glow and lens flare. The city buildings are silhouetted against the orange and yellow sky. In the foreground, there are dark silhouettes of trees and a person walking. A yellow banner is positioned across the top of the image, containing the text "Annexure III - Questionnaires".

Annexure III - Questionnaires

Financial institutions

Loan sanction and disbursement process

- ▶ How much of the total solar rooftop projects has your firm funded so far to the MSMEs?
 - ▶ What is your loan application process when catering to MSMEs?
 - ▶ Is the loan application process of yours same to all sectors/clusters?
 - ▶ What is the evaluation matrix/methodology employed for evaluating bankability of a particular MSME?
 - ▶ Would you give a loan to a low rated/unrated MSME without any collateral? What are the factors you would look into?

Priority sector lending

- ▶ Have you employed any method to enhance credit to an identified priority sector? If yes, please share your experience/comments.

Barriers to lending

- ▶ What are the issues that prevent you from accepting some loan applications from MSMEs? What is your risk mitigation strategy?

Rooftop solar

- ▶ How has the experience been so far lending to solar rooftop sector?
- ▶ Your outlook regarding rooftop solar segment and key issues faced in lending under CAPEX and RESCO model.
- ▶ In case of the RESCO model, do you check the credit worthiness of the RESCO only or also the MSMEs (the RESCO signs a PPA with)?
- ▶ How do you assess long-term viability of loans for rooftop solar projects on one end and the seasonality of business of an MSME on the other end?
- ▶ What is the minimum size of rooftop solar project you consider when financing to an MSME?
- ▶ Do you lend under RESCO model to a RESCO who might have a portfolio of PPAs with MSME? How would you evaluate the RESCOs financial strength?
- ▶ What are the key bottlenecks according to you, which if addressed, can increase the flow of funds to the MSMEs in employing rooftop solar?
- ▶ Any suitable financing mechanism that can help?

Credit guarantee mechanism

- ▶ Would a credit guarantee mechanism for rooftop solar help in increasing lending to MSMEs?
- ▶ What should the CGM mechanism cover to provide lender concerns?
- ▶ How will developers' concerns be addressed?

Open ended

- ▶ Any other scheme has the lender come across which has addressed the payment delay or default risk issues?

Survey question to MSMEs

Awareness: How aware are you about the benefits of rooftop solar for cold storages?

- ▶ 3: I am completely aware of the benefits of rooftop solar for cold storage
- ▶ 2: I am somewhat aware about the benefits of rooftop solar for my cold storage
- ▶ 1: I am completely unaware about the benefits of rooftop solar for my cold storage

Awareness: Have you ever seen print/soft copy advertisement of rooftop solar

- ▶ Yes
- ▶ No

Have you installed rooftop solar for your business?

- ▶ Yes
- ▶ No

What is the reason you would opt for rooftop solar?

- ▶ Reducing bills
- ▶ Progressive image will help business
- ▶ Word-of-mouth about the benefits
- ▶ Any other reason (record)

If "no", any particular reason for not installing it?

- ▶ Not aware of rooftop benefits
- ▶ Lack of funds
- ▶ Rooftop space not available
- ▶ Process is too cumbersome, difficult/no expertise
- ▶ Don't think it is worthwhile to have rooftop solar

Satisfaction: How satisfied are you with the rooftop solar installed for your business

- ▶ Very satisfied
- ▶ Moderately satisfied
- ▶ Slightly satisfied
- ▶ Neutral
- ▶ Very dissatisfied
- ▶ Moderately dissatisfied
- ▶ Slightly dissatisfied

If not satisfied, why?

- ▶ Not producing desired units of power
- ▶ Requires lot of maintenance
- ▶ Lack of manpower for maintenance
- ▶ High cost of maintenance
- ▶ Any other results (record)
- ▶ How did you fund this solar rooftop installation?
- ▶ Completely self-funded,
- ▶ Equity + loan from bank,
- ▶ Loan from NBFC
- ▶ RESCO model
- ▶ Other sources (record)

If self-funded, any particular reason why you did not apply for loan?

- ▶ I had own funds
- ▶ Accessing bank funds has hassles
- ▶ Bank won't give a loan (bad credit history, low rating)
- ▶ Any other reason(s) (record)

Satisfaction: (Bank funding question) If funded by banks, how difficult was it to get the loans processed?

- ▶ 1- very easy
- ▶ 2- easy
- ▶ 3- moderate
- ▶ 4- difficult
- ▶ 5- very difficult

(Bank funding question) What do you think is the major hurdle in getting loans for rooftop solar or in general?

- ▶ Low credit rating
- ▶ Unavailability of collateral
- ▶ Lengthy application process
- ▶ Inability to produce some required documents (ASK which documents)
- ▶ Anything else (record)

Would you be interested if a separate company sets up solar plant on your roof at its own expenses and supplies electricity to you at a pre-agreed rate?

- ▶ Very probably
- ▶ Probably
- ▶ Possibly
- ▶ Probably not
- ▶ Definitely not

How likely are you to provide collateral for rooftop solar installation?

- ▶ Not likely
- ▶ Somewhat likely
- ▶ Very likely

Overall, which process would you rate the highest in difficulty in you experience with rooftop solar? (rank them)

- ▶ Collecting or finding information about rooftop solar
- ▶ Application process: approvals for DISCOM
- ▶ Funding (applying for loan, etc.)
- ▶ Installation
- ▶ O&M

Satisfaction: On a scale of 1-5, how highly will you recommend a rooftop installation for an industry, taking into account the entire process, from applying to financing to installation to operations? 1 being high and 5 being low.

- ▶ 1- very high
- ▶ 2- high
- ▶ 3- moderate
- ▶ 4- low
- ▶ 5- very low

Please rate the factors based on how important they are for the uptake of rooftop solar for your industry.

- ▶ Availability of cheap financing (extremely important, important, neutral and unimportant)
- ▶ More awareness about rooftop solar (extremely important, important, neutral and unimportant)
- ▶ Simpler application process (extremely important, important, neutral and unimportant)
- ▶ Cheaper O&M (extremely important, important, neutral and unimportant)



Annexure IV - Existing financing instruments for rooftop solar and MSMEs

To cater to the high-potential MSME segment, financial enablers need to be put in place in the segment. This includes willing financial institutions as well as financial instruments specifically tailored towards meeting the MSME requirement in their offtake for rooftop solar.

On doing a market scan of the existing instruments available in the market, it has been observed that there are lack of instruments specifically designed towards helping the offtake of rooftop solar. Apart from the schemes by State Bank of India and Punjab National Bank, there are no existing schemes dedicated towards the uptake of rooftop solar. There are quite a few instruments in the market targeted towards meeting MSME demands, but they only cater to the areas such as improving energy efficiency in MSMEs and for infrastructure building.

However, there needs to be more instruments on the horizon that can meet the huge potential of rooftop solar offtake in MSMEs. Some proposed schemes such as CPI's Payment Security mechanism and credit guarantee scheme and IFC's Rooftop Solar Private Financing Facility are being discussed among key stakeholders, but they are yet to be operationalized.

SBI GRPV scheme: SBI has availed of a line of credit of US\$625 million from The World Bank to finance rooftop solar projects in India undertaken by PV developers/ aggregators and end-users, for installation of rooftop solar systems on the rooftops of commercial, institutional and industrial buildings. A customized financial product has been designed and benchmark parameters have been charted down.

Already loans worth INR4b have been disbursed to various private developers, which will add to the tune of 100 MW of rooftop solar³⁸. SBI has also sanctioned loans to the tune of INR23.17b to JSW Energy, Hinduja Renewables, Tata Renewable Energy, Adani Group, Azure Power, Cleantech Solar and Hero Solar Energy, which has the potential to create 575 MW of solar capacity³⁹.

Some of the salient features of this scheme are:

- ▶ Loan amount - it covers maximum 75% of the project cost
- ▶ Loan repayment period - door to door 15 years
- ▶ Interest rate - MCLR + (20 to 50 bps)
- ▶ Primary security - exclusive first charge on assets, current as well as future related to the project
- ▶ Collateral - bank may ask for collateral if FACR<1.25⁴⁰

However, the key aspects here is that out of the total loan of INR23.17b sanctioned, only 5% has been sanctioned to MSMEs.³⁶

PNB Scheme for rooftop solar: PNB has been sanctioned a line of credit of US\$500m from Asian Development Bank for financing rooftop photovoltaic solar power projects. A customized scheme has been formulated by the bank.

Some of the salient features of this scheme are:

- ▶ Loan amount - it covers maximum 70% of the project cost
- ▶ Loan repayment period - door to door 15 years
- ▶ Interest rate - MCLR + (20 to 50 bps)
- ▶ Primary security - exclusive first charge on assets, current as well as future related to the project
- ▶ Collateral - loan for rooftop solar project to MSME up to INR1m shall be without collateral security as per government guidelines⁴¹.

Other schemes for MSMEs: Apart from the above mentioned two schemes, which are backed by multilateral lending organizations like the World Bank and ADB, and have been conceptualized with a specific focus on rooftop solar, there are some other schemes available in the market targeting MSMEs. But these instruments are mainly focused on lending support to MSMEs in areas of infrastructure build up or in carrying out energy efficiency measures in MSME units. However, these schemes have the potential to be tweaked to cater to rooftop solar offtake, but it would require detailed consultations with stakeholders such as MSMEs, developers and lending agencies.

Some of the other schemes that are available in the market, which in some cases may have been used to finance rooftop projects include:

- ▶ **SBI's Project Uptech for Energy Savings**, through which loan can be availed for up to 90% of project costs, with a minimum amount of INR0.1m. Subsidy is available up to INR50,000, out of which 50% of this is reimbursed by IREDA⁴².
- ▶ **Bank of Baroda's scheme for financing energy efficiency projects**, through which loan can be availed for up to 75% of project costs, with a minimum amount of INR0.5m. IREDA, at present, provides a grant of INR25,000 for projects costing INR10m or below to meet the partial cost of energy audit⁴³.

38 <http://www.worldbank.org/en/news/press-release/2017/06/02/state-bank-of-india-approves-100mw-grid-connected-rooftop-solar-projects-under-word-bank-program>

39 <https://www.thehindubusinessline.com/money-and-banking/sbi-sanctions-2317-crore-for-financing-solar-power-projects/article9932710.ece>

40 https://www.sbi.co.in/webfiles/uploads/files/SBI_WORLD_BANK.pdf

41 <https://www.pnbIndia.in/Rooftop-Solar-Power.html>

42 <https://sbiforsme.bank.sbi/SME/ProjectUptechActivities.htm?execution=e1s1>

43 <https://www.bankofbaroda.com/scheme-for-financing-energy-efficiency-projects.htm>

- ▶ **JICA-SIDBI MSME Financing Scheme**, through which a minimum assistance of INR1m per project can be accessed (minimum promoter contribution of 25% for existing units and 33% for new units), at an interest rate of 0.75% below normal lending rate⁴⁴.
- ▶ **SIDBI's 4E (End to End Energy Efficiency) Scheme**, through which 90% of project cost can be accessed with minimum loan amount of INR1m. Repayment period is a maximum of three years for a loan up to INR10m and a maximum of five years for loans beyond INR10m⁴⁵.
- ▶ **SIDBI's Credit Guarantee fund Trust for Micro and Small Enterprises (CGTMSE)**: This scheme provides CGC for both term loans and working capital facility for SMEs up to INR20m per borrowing unit, without any collateral security or third-party guarantee to small and medium enterprise. The guarantee cover under the scheme is to an extent of 75% of the sanctioned amount of the credit facility. In case of default, the trust settles the claim up to 75% (in two tranches of 37.5% each) of the amount in default of the credit facility extended by the lending institutions. However, CGTMSE will have an equal footing on the primary security as well as on the collateral security provided by the borrower for credit facility. The guarantee cover is for the agreed tenure of the term loan. For working capital facility, the guarantee cover is of five years and the fee payable to the trust is one-time guarantee fee of 1.5% and annual service fee of 0.75% on the credit facilitates sanctioned.

Proposed scheme for rooftop solar: A scheme specifically targeted towards addressing the barriers in offtake of rooftop solar is being conceptualized by CPI. A brief of the CPI scheme is laid out below:

- ▶ **Credit guarantee mechanism:** This instrument is being developed to facilitate access of credit for RESCOs in the rooftop solar segment. Financial institutions are unwilling to take exposure on RESCOs who sign PPAs with MSME entities, due to the potential risk of loan default resulting from the non-payment of dues by the off-takers. Despite RESCOs having an investment grade credit rating, access to debt financing is constrained due to the default risk arising from off-taker's financial performance. It mainly attempts to solve the issues of payment delays and payment defaults from the RESCO side, due to the offtake risk. Moreover, in case of RESCOs with below-investment-grade-rating (typically the MSME RESCOs), access to debt financing is also constrained due to financial institutions' concerns on payment delay and payment default arising due to factors specific to the RESCO (i.e., technology failure, lack of appropriate operations, maintenance, etc.).

These factors could have an adverse impact on the generation, and may result in lower-than-estimated revenues for the RESCO. This could, in turn, constrain the RESCO's ability to service the debt obligations. Therefore, financial institutions are more comfortable funding RESCOs with a higher credit rating, and are less likely to fund the MSME RESCOs. A credit guarantee mechanism (CGM) is a structure where the credit risk is shared between the participants and the guaranteeing agency. A CGM is widely considered to be risk mitigation facility to improve access to financing. Under the CGM facility, the lending institution is protected partially against the losses, on account of delays or default by the loan beneficiary. This enables the lending institutions to lend to a sector considered to be of a higher risk, and thus remains underserved. This mechanism attempts to mitigate the risks faced by banks/NBFCs lending to RESCOs with offtake arrangements with low/unrated MSMEs. The unique proposition in this instrument is that it makes a distinction in the support for payment delay (first loss support) and payment default.

This mechanism aims at covering 50% of the uncovered losses in a loan. This support is envisaged to be covered in two steps:

- ▶ **Loan Risk Reserve Pool (LRRP):** The first loss support as part of CGM serves the purpose of addressing lender's concern on payment delay arising due to factors specific to the RESCO or the off-taker. The lender draws on LRRP prior to the loan being categorized as a non-performing asset. This facility prevents the loan from being classified as an NPA, which does not reflect well on the banker's books. LRRP coverage would be up to 5% of the uncovered losses or 10% of CGM fund.
- ▶ **Partial Loss Guarantee Pool (PLGP):** This is to address lender's concern on payment defaults arising due to factors specific to the RESCO or the off-taker. In case of defaults in payments resulting in the account being classified as non-performing, lender would draw on the PLGP to recover the guarantee portion of outstanding loan. PLGP coverage would be up to 45% of the uncovered losses or 90% of the CGM fund. PLGP utilization is subject to the lender initiating the recovery proceedings for the loan.

The fund size required for this credit guarantee mechanism is calculated on the basis of considerations taken on overall expected losses, excluding the debt service reserve amount parked by the lender. This is in turn termed as uncovered losses, and the fund aims to cover 50% of these uncovered losses.

44 <http://www.foundryinfo-india.org/pdf/JICA%20%E2%80%933%20SIDBI%20Financing%20Scheme%20.pdf>

45 https://www.sidbi.in/files/SIDBI_Ebrochure_4E_Financing.pdf

Annexure V – Snapshots from workshops conducted





Abbreviations used

ABS	asset based securitization
ADB	Asian Development Bank
BEE	Bureau of Energy Efficiency
BU	billion units or billion kWh
C&I	commercial and industrial
CAGR	Compound Annual Growth Rate
CAPEX	Capital expenditure
CGM	credit guarantee mechanism
CGS	Credit Guarantee Scheme
CGTMSE	Credit Guarantee Fund Trust for Micro and Small Enterprises
CPI	Climate Policy Initiative
CUF	Capacity Utilization Factor
DG	diesel generator
DSCR	Debt Service Coverage Ratio
FACR	Fixed Asset Coverage Ratio
FIs	financial institutions
FICCI	Federation of Indian Chambers of Commerce and Industry
FURM	Framework for Uptake of RTS in MSMEs
GDP	Gross Domestic Product
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH
GoI	Government of India
GRPV	grid connected rooftop photo voltaic
GW	Gigawatts
GWh	Gigawatt Hours
IBEF	India Brand Equity Foundation
IFC	International Finance Corporation
IREDA	Indian Renewable Energy Development Agency
kW	Kilowatt
kWh	Kilowatt Hours

LC	Letter of Credit
MCLR	marginal cost of funds based lending rate
MDB	multilateral developmental banks
MNRE	Ministry of New and Renewable Energy
MSME	Micro, Small and Medium Enterprises
MU	million units or million kWh
MW	Megawatts
MWh	Megawatt Hours
NABARD	National Bank for Agriculture and Rural Development
NBFC	Non-Banking Financial Company
NGO	Non-Governmental Organizations
NPA	non-performing assets
PCG	Partial Credit Guarantee
PNB	Punjab National Bank
PSM	Payment Security Mechanism
PSU	public sector undertakings
PV	Photovoltaic
RBI	Reserve Bank of India
RE	renewable energy
RESCO	Renewable Energy Service Company
RM	relationship manager
RTS	roof top solar
SBI	State Bank of India
SCF	supply chain financing
SECI	Solar Energy Corporation of India
SIDBI	Small Industries Development Bank of India
SNA	state nodal agencies
SUPRABHA	Sustainable Partnership for Rooftop Acceleration in Bharat
TWh	TerraWatt Hours
VGF	viability gap funding
WB	World Bank

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Electricity cost % of TPC	http://www.sameeksha.org/pdf/dpr/Muzaffarnagar_Paper.pdf web.inflibnet.ac.in/ojs/index.php/KJAS/article/download/730/677 http://mnre.gov.in/file-manager/akshay-urja/january-february-2016/EN/37-39.pdf http://sameeksha.org/pdf/clusterprofile/Belgaum_Foundries_Karnataka.pdf http://sameeksha.org/pdf/clusterprofile/Ankleshwar_chemical_cluster.pdf http://sameeksha.org/pdf/dpr/Ahmedabad_Chemical.pdf http://www.icpe.in/crisil/Indian_Plastics_Industry_Vision_2012_CRISIL_Report.pdf https://link.springer.com/article/10.1007/s40031-013-0040-5 http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_leath0203.pdf https://www.ibef.org/download/Auto_Component_171109.pdf
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Industry rooftop solar suitability	https://www.giz.de/en/.../giz2011-commercialisation-solar-energy-india-en.pdf
industry credit growth %	RBI- Sectoral Deployment of Bank Credit
industry NPA rate	https://www.sidbi.in/MSME_Pulse.php



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About SUPRABHA

The Sustainable Partnership for Rooftop Solar Acceleration in Bharat (SUPRABHA) is a USD 13 million technical assistance program which is led by The World Bank and SBI and implemented in partnership with the Ministry of New and Renewable Energy (MNRE). SUPRABHA is offering Technical Assistance to 17 Partner States (Assam, Haryana, Andhra Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Bihar, Jharkhand, Odisha, Madhya Pradesh, Chhattisgarh, Rajasthan, Chandigarh and Delhi) towards establishing an enabling ecosystem for accelerated deployment of grid connected Rooftop Solar.

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