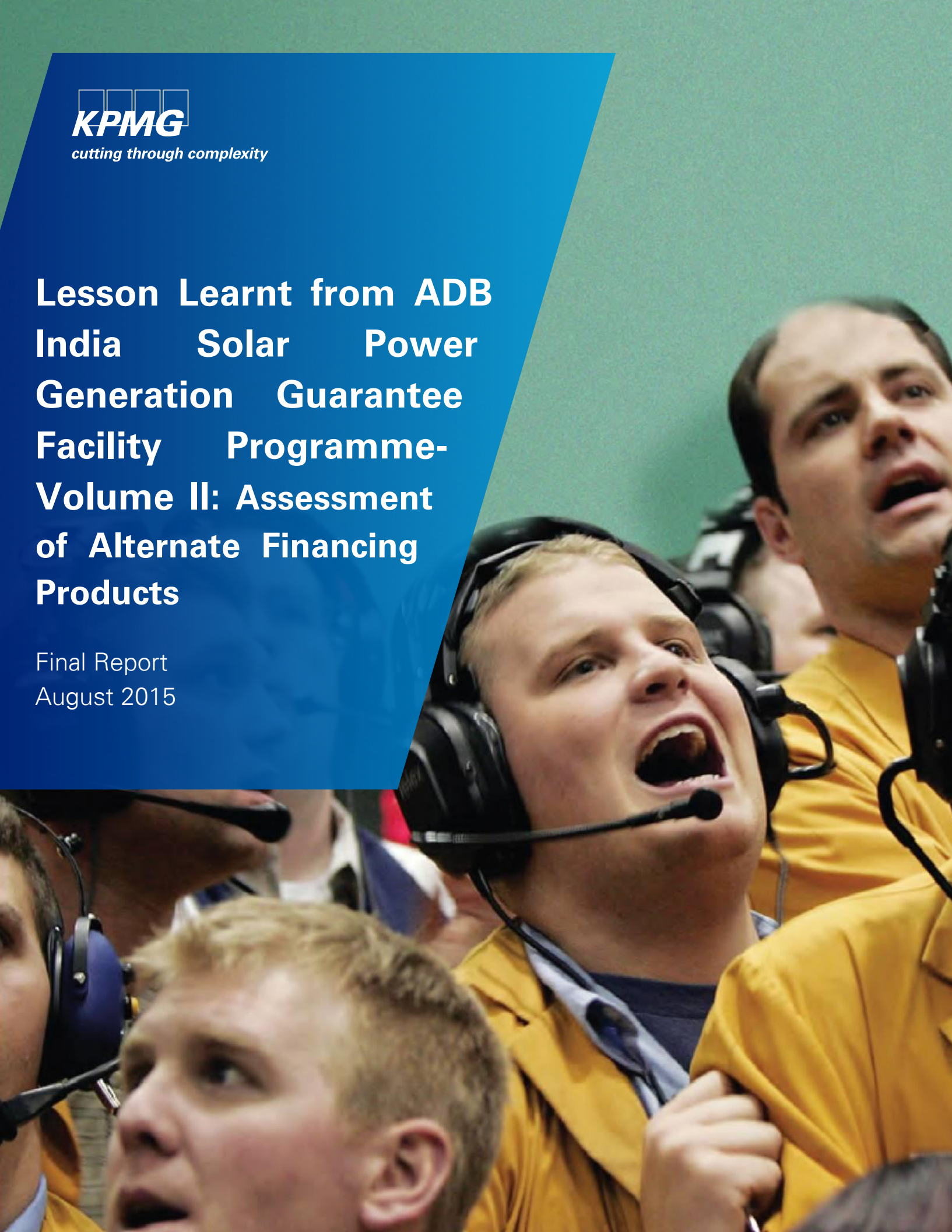
KPMG
cutting through complexity

Lesson Learnt from ADB India Solar Power Generation Guarantee Facility Programme- Volume II: Assessment of Alternate Financing Products

Final Report
August 2015



Disclaimer

This document is being submitted to Department of International Development (DfID) as the Final Report Volume II for our engagement on "Lesson Learning from ADB India Solar Power Generation Guarantee Facility Programme" (dated 20th October 2014),

The report contains KPMG's analysis of secondary sources of published information and incorporates the inputs gathered through interactions with industry sources, which for reasons of confidentiality, cannot be quoted in this document. While information obtained from the public domain has not been verified for authenticity, we have obtained information, as far as possible, from sources generally considered to be reliable.

Our report makes reference to 'KPMG Analysis'; this indicates only that we have (where specified) undertaken certain analytical activities on the underlying data to arrive at the information presented; we do not accept responsibility for the underlying data.

In performing this engagement and preparing this Report (as per the Letter of engagement), KPMG has:

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- neither conducted an audit, due diligence, nor validated the financial statements and projections provided by any of the quoted companies.

Collection of data for market assessment has been limited to such information as can be collected from resources on the published public domain and meetings with market participants.

Wherever information was not available in the public domain, suitable assumptions were made to extrapolate values for the same. We must emphasise that the realisation of the prospective financial information set out within our report (based on secondary sources, as well as our internal analysis), is dependent on the continuing validity of the assumptions on which it is based. The assumptions will need to be reviewed and revised to reflect such changes in business trends, cost structures or the direction of the business as further clarity emerges. We accept no responsibility for the realisation of the prospective financial information. Our inferences therefore will not and cannot be directed to provide any assurance about the achievability of the projections. Any advice, opinion and/ or recommendation indicated in this document shall not amount to any form of guarantee that KPMG has determined and/ or predicted future events or circumstances.

Glossary

ADB	Asian Development Bank
Bn	Billion
BOT	Build, Own and Operate
DBO	Design, Build and Operate
DfID	Department for International Development
DFIs	Development Finance Institutions
DISCOM	Distribution Companies
ECB	External Commercial Borrowing
EPC	Engineering, Procurement and Construction
FI	Financial Institution
FiT	Feed-in Tariff
FY	Financial Year
GoG	Government of Gujarat
GoI	Government of India
GoR	Government of Rajasthan
GW	Gigawatt
IDR	Indian Depository Receipt
IFC	International Finance Corporation
IFIs	International Financial Institutions
IIFCL	India Infrastructure Finance Company Limited
IRR	Internal Rate of Return
JNNSM or NSM	Jawaharlal Nehru National Solar Mission or National Solar Mission
JV	Joint Venture
MNRE	Ministry of New and Renewable Energy
MW	Megawatt
NCEF	National Clean Energy Fund
NGO	Non-Government Organization
NBFC	Non-Banking Financial Company

O&M	Operations and Maintenance
PCG	Partial Credit Guarantee
PE	Private Equity
PFC	Power Finance Corporation
PPA	Power Purchase Agreement
PV	Photovoltaic
RBI	Reserve Bank of India
RE	Renewable Energy
REC	Rural Electrification Corporation
RPO	Renewable Purchase Obligation
SBI	State Bank of India
SECI	Solar Energy Corporation of India
SME	Small and Medium Enterprise
SNA	State Nodal Agency
SPV	Special Purpose Vehicle
UMPP	Ultra Mega Power Project
USD	United States Dollar

Contents

1 Introduction

The India solar sector has been developing at a fast pace. In the last four years, solar capacity has increased from less than 2 MW to the current installed capacity of about 4145 MW[1] (Figure 1). Going forward, the Government of India has taken on an ambitious target of a fivefold increase in the original target to 100 GW by 2022. While the benefits that will accrue to the country with the achievement of the target are well known - improved power supply position, job creation, support to domestic manufacturing capacity and improved energy access; the financing challenges emerging from such ambitious target are significant.

The first volume of the report presented a detailed assessment of the Partial Credit Guarantee (the Facility or PCG) administered by ADB and supported by DfID. This second part of the report is a forward-looking volume discussing possible financing approaches that can be considered for addressing the financing challenges emanating from the GoI targets and the rapidly evolving solar landscape with emerging development formats.

The financing approaches have been designed taking into cognizance imperative of the International Climate Fund (ICF) to promote private investment in the solar sector. During discussions with DECC and DfiD, it was highlighted that through ICF they were keen to explore returnable capital structures to promote private investment in the solar sector. Another key imperative for ICF is the ability of the financing structure to create a transformative impact on the segment targeted. Along with these, other key objectives that have been considered while presenting the financing structures[2]are:

- Reduce costs/raise returns for investors
- Reduce risks of investment
- Help build capacity of local financiers or project developers

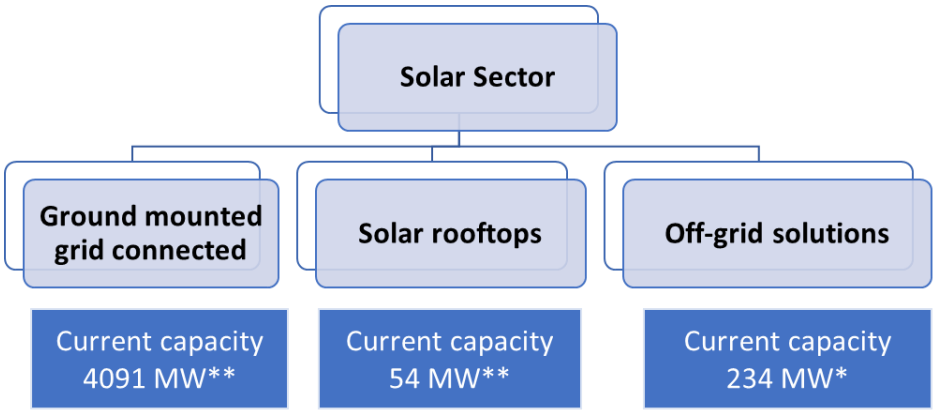
1.1 The Financing Challenge

It is expected that the total investment required for the achievement of the 100 GW target is about USD 120 billion (table below) or an annual investment of about USD 17 billion. This is an enormous task, given that in the last four years the solar sector has attracted aggregate investments only worth ~ USD 4.2 billion.

[1] This number does not include the off grid solar capacity

[2] These are the objectives of the International Climate Fund for promoting private investment, supported by the DECC, DfID and DEFRA (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48409/5539-uk-international-climate-fund-cmci.pdf) accessed on 23rd March 2015

Figure 1: Current capacities in the Indian Solar Market



*Note: * as on 30th June 2015; **as on 15th July 2015*

(Source: MNRE)

Table 1: Investment requirements for solar power development

Particulars	Grid Connected Solar Projects	Large solar Projects (UMPPs/Solar Parks)	Rooftop Projects	Total
Targets (GW)[3]	40	20	40	100
Investment Requirement (indicative) (Bn $)[4]	**46**	**22**	**53**	**120**
Equity Funding (Bn $)[5]	13	7	16	36
Debt Funding (Bn $)[6]	33	15	37	84

(Source: GoI Solar Targets, KPMG Analysis)

Apart from the above planned investments for the solar sector, assuming that ~2 GW of mini-grid projects are set up to provide energy access to rural population, an investment of ~USD 3 billion would be needed - considering the project cost of ~USD 1.64 Mn/MW.

[3] As announced by targets announced by GoI

[4] Considering the exchange rate as 1 USD= INR 61 and Capital cost of INR 65 Million for grid connected project and about 80 million for solar rooftops

[5] Considering a Debt-Equity ratio of 70:30

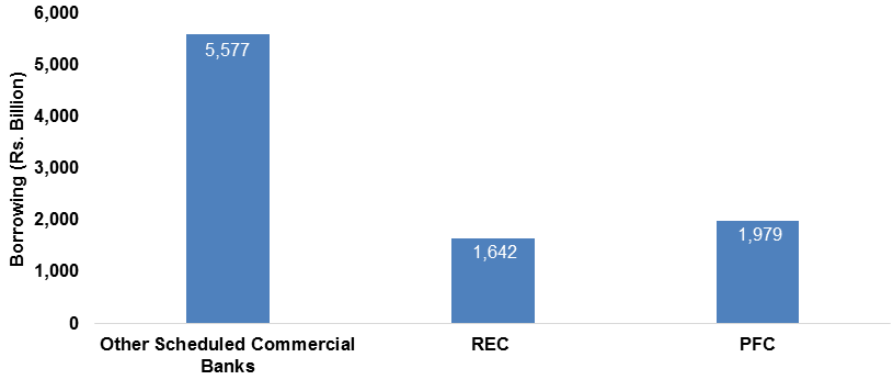
[6] Considering a Debt-Equity ratio of 70:30

1.1.1 Financing challenges – Grid Connected Solar Segment

1. ***High exposure of lenders to the Power sector (no separate exposure limits for renewable energy)***

While Rural Electricity Corporation (REC) and Power Finance Corporation (PFC) account for nearly two third of the total exposure to the power sector, scheduled commercial banks also have a substantial contribution of 38%. Thus, the power sector exposure is well spread across the banking sector.

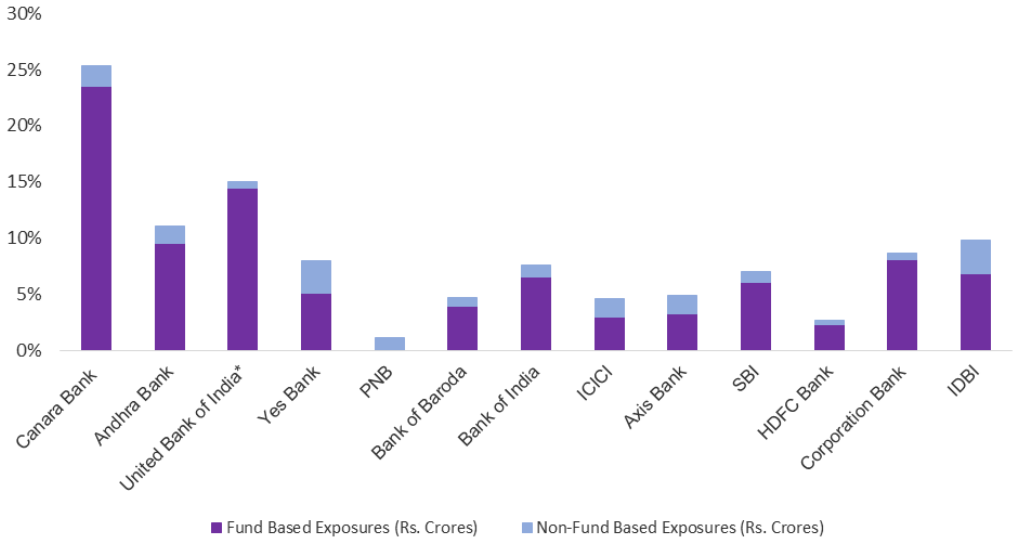
Figure 2: Break – up of power sector exposure for banks for FY 15



(Source: RBI Database, Industry-wise Deployment of Bank Credit as on 20th March 2015, Audited accounts for PFC and REC for FY15)

Further, on an average banks have lent 8-10% of their total loan book to power sector as shown below.

Figure 3: Fund and non-fund based power sector exposure as a percentage of total exposure (as on 31st March 2015)



(Source: Data for entire Power sector including Private players, Source: Basel-II Disclosures by Banks for FY 15)

The above highlights the limited room existing players have in providing investments to the solar sector, which under the current definition is considered as part of the power sector. Renewable energy has been recently identified as a priority sector for lending[7]. The eligible loans would be loans up to Rs 150 mn to generators and loans of upto Rs 1 mn to individual households. The primary benefit of this move is likely to devolve upon the distributed or the off-grid space where projects are of a smaller scale and which in fact have been struggling with issues in access to finance. However, challenges on financing large projects remain an issue.

2. *Tapping domestic conventional debt sources alone may not be sufficient*

While the solar sector primarily accesses bank loans for setting up capacities, the magnitude of the debt support required to meet the 100 GW target, indicates that simply looking at conventional domestic bank loans may not be sufficient. Out of the investment requirement of approximately USD 120 billion, at least USD 84 billion will need to be financed by banks as debt. This again is an unprecedented investment requirement. As on March 2015, the total exposure of the banking sector to the power sector was approximately USD 90 billion. The **100 GW solar target implies that the debt requirement for the solar sector itself of USD 84 bn till 2022, is almost equal to the current aggregate exposure of banks to the power sector.** This underlines the imperative for accessing other sources such as domestic bond market and international capital to meet the investment target. Even as subsequent consultations in a brainstorming session have indicated that the availability of domestic funds may not be an insurmountable challenge, the ability to channelize international funds on better terms could indeed provide a substantial impetus to solar project development, especially considering that the financing costs are the principal costs in solar power. This is elaborated upon below.

3. *Need to address debt cost and tenor*

The present domestic cost of debt for the renewable energy sector is still high at around 12% to 12.5%. Even in the case of foreign capital, the cost of funding increases on account of hedging costs which are typically in the range of 5% to 6 %. This needs to be addressed to allow richer IRRs for developers hence enticing investments in the space. Similarly, the existing tenor of loans offered is typically less than 15 years (recently a few aggressive domestic lenders and some international lenders have started offering longer tenors). However, given the long life of solar assets, developers require longer tenor of funds, closer to the life of the project which is 25 years.

4. *Limited avenues for raising equity capital*

While private equity ("PE") activity has gained pace in the RE segment, the solar segment has still seen very few investments. Further, public markets are still largely untested for RE stocks with only a couple of RE stocks currently listed on Indian stock exchanges.

*[7] Priority sector refers to those sectors of the economy which may not get timely and adequate credit in the absence of this special dispensation. Renewable Energy is now classified as a priority sector and comes within the overall priority sector lending target of 40% of net credit for banks (which would need to be necessarily met). Eligible categories are bank loans up to a limit of **Rs** 150 mn to borrowers for purposes like solar based power generators, biomass based power generators, wind mills, micro- hydro plants and for non-conventional energy based public utilities Viz. Street lighting systems, and remote village electrification. For individual households, the loan limit is Rs 1 mn per borrower.*

The key reasons for the lack of depth on the equity side is the **lack of scale in projects** and **low equity IRRs**. The IRRs at which solar developers are currently operating are lower than those seen in other infrastructure sectors. Most of the developers are operating at IRRs of around 15%-16%.

1.1.2 Financing challenges – Distributed Segment

The distributed segment has evolved differently from the grid connected solar segment owing to unique aspects such as small size, sponsor profile, infrastructure availability, operational challenges, regulatory and policy issues, etc., which impact the bankability of these projects. Key financing challenges that the segment faces are described below:

1. ***High Upfront Investment Requirement***

The high investment requirement to setup an off grid system coupled with poor availability of low cost debt financing limits large scale investments in off-grid applications. Moreover, most of the off-grid projects are set up by infusing 100% equity capital and then avail debt post commissioning. This results in stagnation of investments in the sector. Due to the limited scale of operation the risks attributed to the sponsors backing such projects is also high.

2. ***Uncertainty in Revenues***

Low creditworthiness of consumers in rural regions along with thefts is also a major concern with developers. There is a lack of proper infrastructure and workforce to take care of O&M in rural areas, which results in reduced performance of the system.

3. ***Lack of availability of funds on both the debt and equity front***

Off-grid sector is struggling with the challenge of access to finance both on debt and equity side. Domestic Commercial Banks want limited exposure as risks are perceived to be high (including sponsor risks) and because of the uncertainty of revenues over the long-run. Private equity investors are also reluctant to invest because of scale issues.

1.2 Role that International Financial Institutions/ Development Finance Institutions can play to ease capital constraints

International Financial Institutions (IFIs)/ Development Finance Institutions (DFIs) can play an important enabling role in the solar financing space going forward by helping increase the availability of funds as well as decrease cost of funds. However, it is imperative that such a role is essayed taking into account the following:

- **Adopt programmatic approach/ platform based dissemination:** The dissemination has to follow a programmatic/platform based approach rather than a project funding approach in order to achieve scale as well as enable participation by multiple agencies which are able to bring their core strengths in handling myriad issues associated with financing of projects;
- **Create access to alternate sources of capital** such as international funds or the USD 1 trillion deep domestic bond market, at lower cost;

- **Provide support on the equity side** to help developers with the high upfront capital requirements of solar. Also assist by seeding ventures along with large developers/ other agencies to demonstrate success in areas which are still nascent on the off-grid side and could benefit immensely from demystification;
- **Devise different products for grid/ off grid space:** Given that the challenges and risks associated with each segment differ, a '*one size fits all*' approach cannot be adopted for the solar sector. Requirements of each of the segments will have to be looked at individually and the financing interventions may need to be suitably designed.

One intervention of IFIs/ DFIs in improving availability of capital was the ADB Solar Loan Guarantee that has been assessed in detail in the Part I of the Report. Based on lessons learnt from the experience with the ADB guarantee programme, the subsequent section presents some of the criteria that can be kept in view while designing such guarantee products for the solar segment.

1.2.1 Partial Credit Guarantee Schemes

Facilities such as a PCG are always relevant for any sector as a transformational catalyst. This especially holds true for smaller developing countries, where the domestic financial ecosystem may not be large or strong enough to respond to the market requirements. Such products are also relevant for India, which is in a rapid growth phase, where, financing challenges are constantly thrown up with evolving design of solar programmes (revenue models, development modes (solar parks, rooftop, off grid, etc.), changing incentive schemes and risk sharing arrangements, etc. Further, projects have increased in scale from ~5 MW in 2011 to 150 MW (single largest operational installation), and ultra-mega power projects of 750 MW are planned. Such factors emphasize the relevance of guarantee products to assist lenders in managing risks and to lend on a non-recourse basis.

However, in designing any such product, it is important to keep the following considerations in view:

- **Flexibility**

It is important that the product is flexible and the design includes the ability to address transformational change in the sector and its associated impact on market requirements. During the design phase itself, interim review check points need to be created to ensure re-orientation of the product to address changing market dynamics. Flexibility is also important to address the diverse requirements of various target solar segments (solar rooftop, large ground mounted installations such as solar parks, off grid segment, etc.).

- **Improve availability of funds and enable access to new sources of capital**
  - The 100 GW solar target brings back the original objective of the earlier Facility emphatically, which was to improve availability of funds. However, with the stretched domestic conventional lending market, it is important that the PCG facilitates access to new, large, cheaper and long tenor capital sources such as domestic bond market and international capital sources.
  - In case of the distributed segment, it would be important for a PCG to address the unique risks perceived for this segment, and address the availability of funds for this sector, juxtaposed with innovative financing avenues such as channel financing, asset financing, etc.

- **Appropriate Risk Coverage** The design of a partial credit guarantee needs to consider the following.
  - It is imperative to gain an understanding of the evolving risks and design the PCG in a manner which ensures that only pertinent risks are covered and priced accordingly. For e.g., the guarantee facility could cover risks which are perceived high, such as generation risk, currency risk, off-take risk, etc.

- Additionally, while designing PCG, flexibility has to be incorporated to enable the product to cater to the unique requirement of different stakeholders which could imply having a flexible product that addresses different risks based on the needs of the stakeholder.
- The design of the PCG would also need to take into account the divergent risk perceptions for the segment (grid/ distributed) for which the support is intended.

  Appropriate risk coverage could rationalize the costs of the PCG and at the same provide clarity on the benefits that are expected to accrue consequent to the Facility being availed. However, there is a trade-off between pricing of PCG addressing pertinent risk and the administrative costs of identifying the risk, structuring and administering the PCG. This trade-off will need to be considered while determining the risk coverage of a PCG.

Pricing of the Guarantee Facility

- Cost will remain as a critical factor in determining the uptake of any guarantee facility. A deeper understanding needs to be developed regarding the extent of guarantee fees that lenders would be willing to bear so that adequate margins are left on the table. To undertake such an analysis, a risk appetite assessment of the lenders, how they price risks, current exposure levels, etc. would need to be analysed. This analysis would need to be done at the country level before introducing a guarantee facility at the design stage. To undertake such an analysis, a risk appetite assessment of the lenders, how they price risks, current exposure levels, etc. would need to be analysed.
- Guarantee can be designed to cover specific risks to reduce costs. Here it also important to ensure capacity strengthening of lenders so that they have capability to price risks adequately, especially in nascent markets.

Tenor

The tenor of the partial credit guarantee needs to be closely tied with the risk it aims to address. For instance, if the facility is covering credit risk during the construction phase; then the expected duration of the facility has to be concomitant to the risk time period.

First loss provision

It is important to incorporate a 'first loss' provision in any PCG to increase its attractiveness, especially for the Indian lender community. However, we understand that while first loss provision is necessary for lenders to safeguard the risk of NPA, it would also come with a reasonably higher cost, which would further cut down the margins for the lenders. Hence, this aspect would need to be evaluated in detail while designing the PCG, possibly in consultation with lenders. Further, there can be flexibility built-in while designing PCGs, wherein, lenders have an option of a 'first loss' provision and the PCG can be priced accordingly if the option is availed.

Simplified Process & Eligibility Criteria

The eligibility criteria should be simplified to enable higher participation in the facility. The number of procedures to avail the facility and the time required to complete these procedure should be kept to the minimum. A programmatic approach for implementing such a facility shall be one step in simplifying the process. Alternatively, guarantors should consider co-engaging with developers. They can create a platform, which enables developers to be pre-approved, who can then avail low cost loan on the basis of guarantor support. This would cut down the time frame as well as transaction costs.

Transparent Documentation

In most of the international case studies examined, there is an agreement between guarantor, the lender and the beneficiary. The agreement lays down the cost and benefit sharing framework between the three parties. It is recognized that such an agreement is a complex document and needs to be framed carefully, it is also an essential document to ensure transparency between the engaging parties and binds them together. Such a document is also imperative for credit enhancement since amongst other things, the loan needs to devolve upon the guarantor on default and hence cannot be dispensed with. However, potential terms could be discussed with stakeholders during design stage itself and terms considered onerous should be reviewed and alternatives considered.

Exchange Management Issues

Prior clarifications/ approval should be sought from the central bank[8], at the time of design of the facility for the exchange management issues arising from the conversion of the defaulted portion of loan into foreign currency loan, on default. Alternatively, avenues should be explored to make funds available on default from a pre-funded facility or consider alternate avenues of credit enhancement (discussed later in the report).

Need to effectively market the product

In case of any innovative financing structure, it is important that a wider spectrum of stakeholders covering lenders and end user community should be targeted. Small and medium scale banks should also be allowed to participate in the facility. This would enhance the probability of making the facility/product successful.

Time to market and increasing reach

Given the rapidly evolving nature of the solar sector, the time to market for any product needs to be shortened considerably. Further, any product designed should aim to follow the market in terms of market requirements and not lead the market.

In order to increase participation in a planned guarantee scheme, interventions are required at two levels (a) increasing the number of sectors to be covered in the scheme and (b) planning eligibility criteria of the scheme in such a way that most financial institutions are included in it. Based on an international review of guarantee schemes it has been seen that schemes with a wider scope in terms of sector coverage helps increase footprint of the scheme. For instance, some of the successful credit guarantee schemes in Latin America covers all three aspects of clean energy – renewable energy, energy efficiency and biofuels. Within the renewable energy space all technologies are covered solar thermal and photovoltaic, wind, small hydro, cogeneration etc. Increasing participation of the financial institutions is a call that would need to be taken based on the objectives of the guarantee product. Also an active pre- planning exercise, road shows with the lender community would help in designing suitable eligibility criteria. These measures will ensure that there is wider participation from both borrowers and lender community without having adverse implication on costs of the facility.

[8] Reserve Bank of India in case of India

Participative Approach

A credit guarantee scheme is a product aimed for risk transfer and diversification. Thus, it is essential that a participative approach is adopted by the guarantor and lender while designing the product. There needs to be an agreement on risk that is being covered by the scheme and the extent of the coverage.

A Partial Credit Guarantee can be structured so as to meet the requirements of different segments in the solar sector. Guarantees such as PCG may need to be made available to support alternative sources of capital such as the domestic bond market or international capital, especially in the wake of the large capital requirements for meeting 100 GW target. However, it would be important for the uptake of the product that PCG enables the cost of funds to be lowered. Further, on the off-grid side where challenges are unique and where even availability of funds itself is a challenge, PCG would need to support innovative mechanisms (asset/ channel financing, etc.) that would be necessitated by emerging development models.

In the following sections, we discuss each of the segments - ground mounted grid connected solar projects, solar parks, solar rooftops, and off-grid segments separately. For each of these segments, level of market maturity, financing gaps, possible financing instruments and areas in which ICF could support are discussed. These are based on stakeholder consultations as well as KPMG assessment of financing needs and possible avenues.

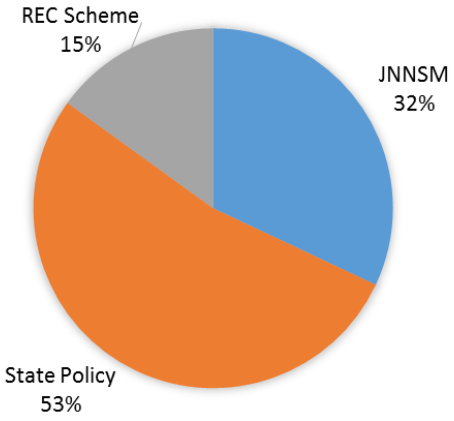
2 Target Solution Areas for Financing Interventions

2.1 Ground Mounted Grid Connected Solar Projects

The grid connected solar PV segment is one of the largest segments in the India solar sector. It accounts for almost all capacity and thus bulk of the investments seen in the solar space. The segment has grown at the back of suitable policy support from central and state governments' initiatives.

Current Capacity: The current installed capacity of grid-connected solar projects is 4091 MW as on 15th July 2015. The break-up of the capacities under various business models is as follows:

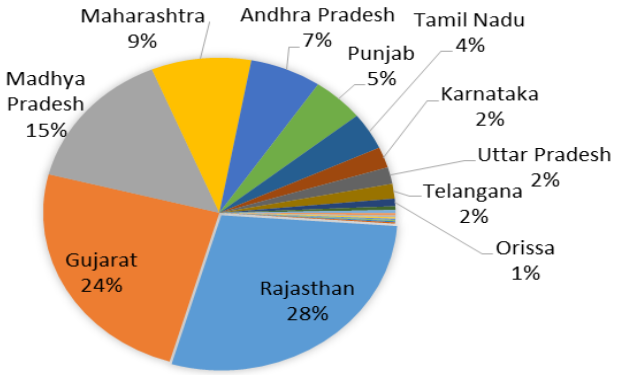
Figure 4: Capacity Break-up under various business models



(Source: MNRE as on 29th May 2015 (3883.5 MW))

As can be seen from the above, central and state policy have driven bulk of the installations. Having said that, there is a concentration of solar application in select states in India (Figure below). The key reasons for that are (a) resource endowment of the state and (b) suitable policy and regulatory framework.

Figure 5: State- wise solar capacity (July 2015)



(Source: MNRE as on 15th July 2015)

1. **Target:** Government of India has set a target of 40 GW for Grid Connected Solar Projects by 2022. This is part of the revised Government of India target under the National Solar Mission. Over and above this, select states have also set targets for ground mounted grid connected solar power projects.

Table 2: State wise solar targets

State	Target (MW)	Time period
Andhra Pradesh	5000	2015-2022
Chhattisgarh	500-1000	2012-2017
Haryana	100	2014-2017
Jharkhand	500 by 2017 and 1000 by 2022	2013-2018
Karnataka	2000	2014-2021
Kerala	500 by 2017 and 2500 by 2030	2013-Till superseded
Madhya Pradesh	PPAs with DISCOMs: As per RPO trajectory Other models: Unlimited	2012-Till superseded
Punjab	4280 MW	2022
Rajasthan	25,000	2014-Till superseded
Uttarakhand	500 by 2017	2013-Till superseded
Uttar Pradesh	500	2013-2017
Tamil Nadu	3000 by 2015	2012-2015
Telangana	5000	2019

(Source: Various State Solar Policies)

2. **Market Maturity Level[9]:**

HIGH

The ground mounted segment has moved along the learning curve in the last half decade and is currently at a high market maturity level. In the initial bidding rounds under the National Solar Mission, the segment attracted smaller inexperienced business houses driven by tax benefits including accelerated depreciation. The segment has seen a compounded annual growth rate of more than 250%between 2009 and 2015. Now the players in the market are matured and non-serious players have been weeded out. The fall in international panel prices also provided stabilization to the segment in the past 2 years.

[9] Market Maturity level is a relative assessment of the maturity level achieved by the select solution segment. Maturity can be considered as the position in learning curve or quantitative in terms of the current installed capacity; growth seen in the recent past as well as the future plans for the specific sector.

Financiers have gained experience across projects under various business models including competitive bidding, feed-in tariff, viability gap funding, open access and third party sale.

3. **Financing gaps and associated risks:**

Being a fairly mature segment, for grid connected ground mounted solar projects, availability of debt is currently not a concern. Presently, the **key stakeholder concerns that need to be addressed in the grid connected ground mounted segment are:**

- Lean equity IRRs for the investors/ developers.
- Upfront 25% to 30% equity investment, which not only results in blocking of funds for the investor but also impacts IRRs adversely.
- Further, going forward, given the ambitious development targets, there will be a deep financing bottleneck that is likely to emerge. In order to attract more sources of capital including cheaper international capital, risks perceived by such sources will need to be examined and addressed appropriately. As discussed in Part I of this report, following risks are still considered pertinent by stakeholders in varying degrees:
- **Offtake Risk:** Bankability of PPA's and the ability of the DISCOMs to honour their dues is a persistent concern for investors. While the domestic lenders do not consider offtake risk as major concern, for foreign financiers this is a major area of concern.
- **Construction Risk:** Land acquisition is a cumbersome process, involving delays including those related to conversion of land and obtaining multiple clearances. Under the existing contractual regime, delays in construction can lead to encashment of performance guarantees of the developers. In case of projects to be developed in FiT regime, developers need to ensure that projects are commissioned at that particular date to get the desired tariff. A single day's delay can have implications on the revenue flows of the project.
- **Generation Risk:** Lack of historic irradiation and performance data has been a major issue, perceived by the lenders. The drop in generation consequent to the degradation in the solar panels soon after the installation can also result in loss of generation. This risk is now gradually getting mitigated for locations where irradiance and generation is demonstrated through operational projects.
- **Foreign Exchange Risk:** For access to international financial markets, foreign exchange risk is a key risk which needs to be addressed. Hedging costs could typically be in the range of 5% to 6%, which limits the attraction of international capital.

2.1.1 Examples of Avenues for Facilitating Access to Debt Capital

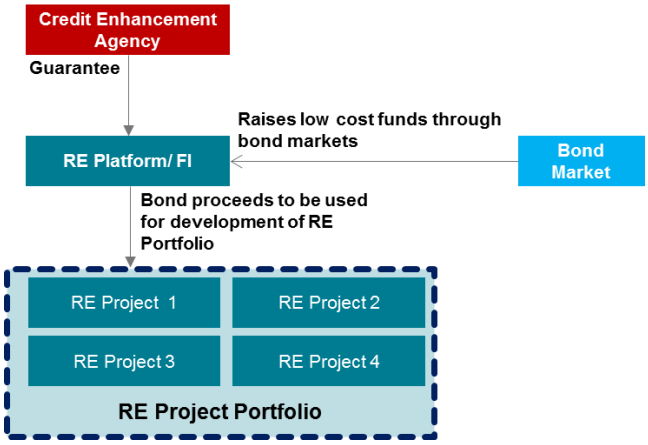
2.1.1.1 Green Bonds (Externally Credit Enhanced)

By definition green bonds are bonds that are earmarked for renewable energy/ green projects. Typically, bonds issued on operating renewable energy projects have a BBB rating. In order to improve their rating for better market access and to enable flow of large pools of low cost long-tenor capital with institutions such as pension funds, insurance companies, etc., it is suggested that these bonds be credit enhanced.

Structure

The following figure illustrates a possible structure of the credit enhanced bonds, wherein a portfolio of assets under a renewable energy platform are credit enhanced through support of a credit enhancement agency. Various instruments can be explored for credit enhancement such as a line of credit, guarantees, etc.

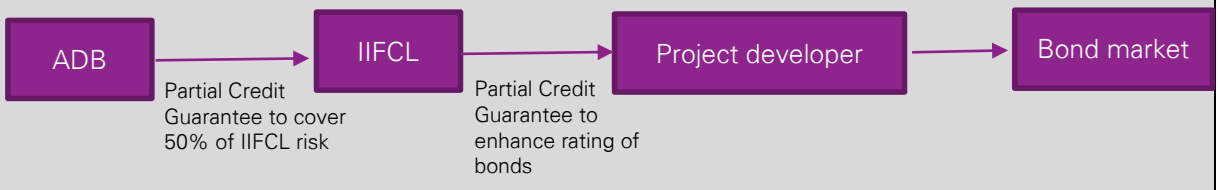
Figure 6: Credit Enhancement Green Bonds



While in the above structure the credit enhancement is provided to an RE platform, this instrument can be utilized effectively for bonds issued by FIs, which is credit enhanced and the proceeds of the same are used in the renewable/ solar space. Credit enhancement is not a new concept for the Indian financial sector. IIFCL has a pilot of credit enhanced bonds, specifically focused on infrastructure sector (**Refer Box 1**).

Box 1: Indian & International experience for credit enhanced bonds

Under the pilot for credit enhanced bonds being implemented by IIFCL, IIFCL provides partial credit guarantee to enhance the ratings of the project bond dedicated to infrastructure sector. The ADB is providing backstop credit guarantee up to 50% of IIFCL's underlying risk. Consequent to the credit enhanced bonds, the project developers are expected to be able to raise funds at a reasonable rate from the bond market.



In case of Ciputra Residence in Indonesia, IFC provided a 20% guarantee to the Ciputra Residence's IDR 505 billion bond issue. The proceeds of the bond were to be utilized for constructing green buildings

and ensuring that they meet defined environmental standard. The IFC's partial guarantee improved the rating of the bond to single – A.[10]

Efficacy for Solar Sector

Such a product could help to:

1. Decrease the cost of debt, which is one of the biggest cost components for a solar project.
2. Access long term funds from currently untapped sources such as insurance companies and pension funds etc.
3. Increase tenor of the debt facility available since the liability profile of the investors allows assets to be created with a longer tenure.
4. A mixture of green field and brown field projects could be supported through the structure.

Role of ICF

ICF can play an important role in credit enhancing the rating of green bonds. Similar to the cases discussed above, like ADB and IFC, ICF can provide partial credit guarantees that can help improve the credit rating of identified green bonds. Alternative means of credit enhancement, such as letters of credit, can also be explored.[11]

While designing a credit enhancement structure one key issue that needs to be adequately addressed is the concern around foreign exchange risk. As discussed earlier, this an important risk that needs to be addressed especially if international capital is to be sourced into the country. Structures addressing the foreign exchange risk, need to be in-built while designing a credit enhancement instrument. The second issue is around offering guarantee products which, as was experienced in the case of ADB Solar Loan Guarantee Facility, could attract RBI's ECB[12] guidelines.

An internal credit enhancement can also be achieved as indicated below.

2.1.1.2 Credit Enhancement through Tranching of Bonds

Credit enhancement can be either external to a financing structure or internal. The advantage of an internal credit enhancement structure over the external guarantee based one is that the pitfalls of the guarantee structure, such as exchange management issues, are avoided. An internal credit enhancement can be created through tranching of bonds whereby senior/ subordinate securities are created. Each security is differentiated in terms of risk profile, tenor, cost of funds etc. and has different credit rating and yield. DFIs can support the structuring by buying into the lower tranche securities.

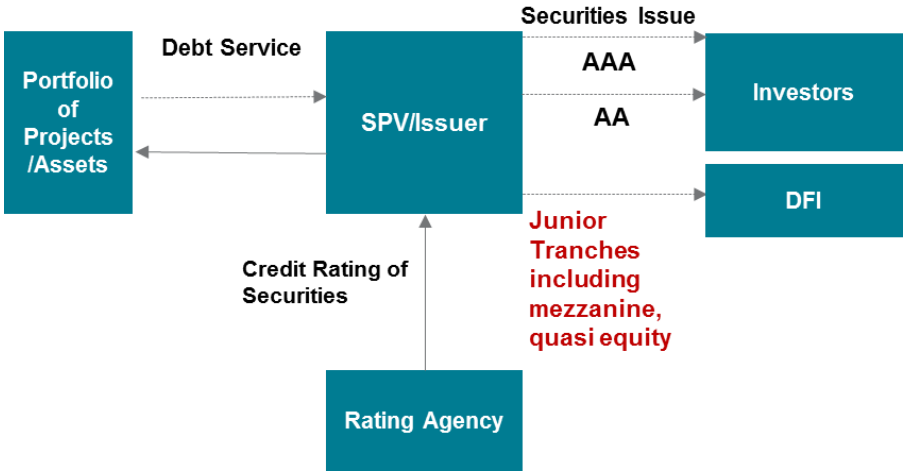
[10] Next Season's Green Bond Harvest – Innovations in Green Credit Markets (June 2014) – Joint publication pf IFC & Kellogg School of Management

[11] The financing structure as well as the manner in which the UK government would provide credit enhancement needs to be studied in detail keeping regulatory implications/ commercial considerations in perspective.

[12] External Commercial Borrowings

In terms of servicing/ repayment priority, cash flows generated by the projects are allocated first to the senior tranches. Hence, from the perspective of senior investors, the junior tranche subscribed by DFIs will in effect act as a "first loss piece" which enables the improvement of the credit quality of Senior Bond.

Figure 7: Tranching of bonds – internal method for credit enhancement



(Source: IFC)

Through this credit enhancement structure, the market access of the higher tranches of the underlying assets is improved by the DFI. The above structure is also currently under consideration by IFC in India.

The European Commission also has a similar product that provides credit enhancement so as to cover credit risk of infrastructure projects. The details of the project is presented in the box below.

Box 2: European investment Bank Project Bond Initiative

The European Commission's European Investment Bank Project Initiative has the mandate to improve credit rating of individual infrastructure projects by covering the credit risk. It can provide such support through a subordinated debt tranche (a direct loan to the project to be paid after the Senior Debt has been paid out), or through a contingent credit line, that can be later converted into a subordinated debt. The facility improves the credit rating of the project, thus supporting it in getting better access to fund. The facility is useful for projects that are currently under construction or also for projects seeking refinance of capital.

Source: Risk Gaps: First-Loss Protection Mechanism, Climate Policy Initiative, January 2013

Role for ICF

ICF can potentially buy into the junior securities in order to support the higher tranches. For both the credit enhancement structures discussed above one limitation is that both these structures can be implemented for raising finance for primarily brownfield/ operating assets. An additional concern that needs consideration is related to the credit worthiness of the underlying asset which has been credit enhanced. At times the structure of credit enhancement is so complex that the investor losses the sight of the

underlying asset. This concern stems from the 2008 sub-prime crisis of the United States. Thus, while designing the product, the credit worthiness of the underlying asset need to be duly considered.

2.2 Possible Avenues for Facilitating Access to Equity Capital

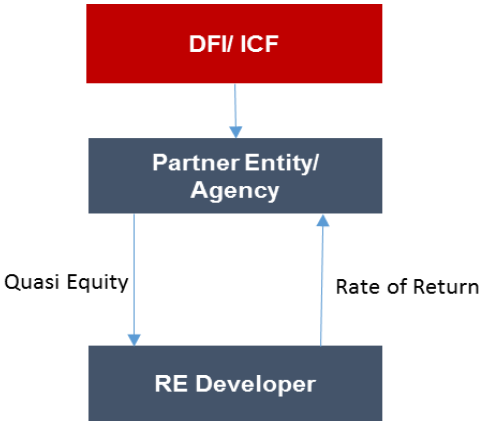
This section presents structures that can be considered in improving access to equity for solar project developers in grid connected solar projects and/ or helping them secure better equity IRRs.

2.2.1 Quasi Equity/Mezzanine Finance

One of the alternative sources for infusing equity into the capital structure is through Quasi Equity (e.g., subordinated debt, mezzanine finance). Quasi equity is a category of debt that has some traits of equity, such as having flexible repayment options or being unsecured/ ranking after senior debt.

Quasi Equity has been used extensively in India and abroad to provide a flexible capital option to infrastructure developers and to improve equity returns. Following figure presents a typical structure of a quasi – equity financing structure.

Figure 8: Structure of Quasi- equity



Box 3: Suntech Power Holding – Capital restructuring to lower solar costs

Suntech power Holding Co Ltd is a Chinese Firm, which is also one of world's leading solar companies. The firm is engaged in design, develop, manufacture, and marketing of solar products for electric power applications in the residential, commercial, industrial, and public utility sectors. While the company grew more than twenty times between 2004 and 2008; it hit a hurdle post the 2008 financial crisis.

In order to support Suntech, and address the liquidity crunch faced by the firm, **IFC provided a convertible loan of up to $100 million to support Suntech's 2009-2013 capital expenditure plans and debt refinancing requirements**. Suntech also engaged with other lenders and was able to restructure its capital structure, which ensured that the Company continued to grow even in financially difficult times.

Source: IFC website

Efficacy for solar sector

Following are the expected benefits for the Indian solar sector through introduction of quasi- equity by a reputed organization in its capital structure:

- Flexible instrument that can help improve returns to equity investors/ developers by reducing the upfront equity requirements as well as replacing higher cost (equity) funds with lower cost finance;
- Enhances the project capability to raise debt finance as the project is perceived as being backed by a creditable agency.

Role for ICF

- Collaboration with the entity/agency to provide quasi equity for greenfield projects.

2.2.2 YieldCo

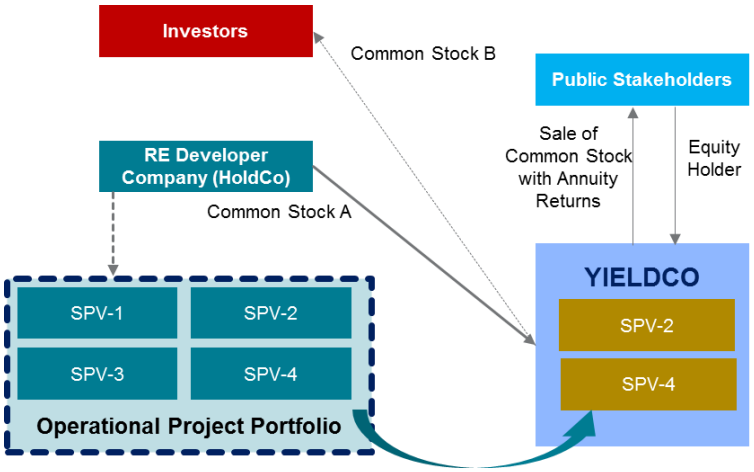
YieldCo is a comparatively new concept that has been introduced in the US renewable energy market. By definition a YieldCo is a dividend oriented public company, created by a parent company with invested operating assets in renewable energy sector in order to generate predictable cash flows and create a portfolio of low risk assets with long term annuity like payment streams. Such a company can have assets located beyond the geographical limit of one country which helps in diversifying related risks.

YieldCos are increasingly being considered by Indian RE companies as an attractive option for raising funds from mature markets such as the US where the cost of capital is lower and supply of capital is abundant.

Structure

A simplified structure of a YieldCo is presented in the Figure below. This has been adapted from the Form S-1 (Registration Statement under the Securities Act of 1993) of TerraForm Power, Inc. This is a YieldCo formed by SunEdison in 2014 (Box 3)

Figure 9: Simplified Structure of a YieldCo



***(Source*: Adapted from Form S-1 (Registration Statement under the Securities Act of 1993) of TerraForm Power, Inc.)**

Box 4: TerraForm YieldCo – experience from USA

TerraForm Power, subsidiary of SunEdison US, floated a Yieldco for listing of its US based operational asset portfolio and raise funds. TerraForm Power has a portfolio of 524 megawatts of solar farms in the U.S., Canada, the U.K. and Chile. Proceeds of its offerings will be used for expenses and also to buy projects from SunEdison and other companies.

Efficacy for Solar Sector

- Allows access to public markets by creating a scalable platform which can aggregate assets.
- Allows monetization of assets for existing project investors.

Role of ICF

1. YieldCo is a comparatively new concept. Indian developers are aware of the product and are keen to understand it further. However, there is a significant learning that still needs to be achieved for the product. Participants of the brainstorming session were of the opinion that DFIs can play a role in creating more awareness about YieldCos.
2. ICF could partner with an agency in creating a large platform that aggregates assets across geographies and have the same listed as a YieldCo in a mature market. Funds raised by accessing capital markets could be invested in near operational solar projects or brownfield projects. Such a vehicle could allow partial exits to existing investors in the underlying assets thus creating financial bandwidth for them, aside from demonstrating the success of such a vehicle in the Indian context.

3. In order to address risks perceived with the assets owned by the YieldCo, ICF could introduce a partial risk guarantee scheme to cover specific risks.

2.3 Solar Parks

Solar parks are currently actively being considered for large scale development of solar energy. The Rajasthan Solar Policy 2015 defines solar park as *group of solar power plants in the same location used for generation of electric power*.

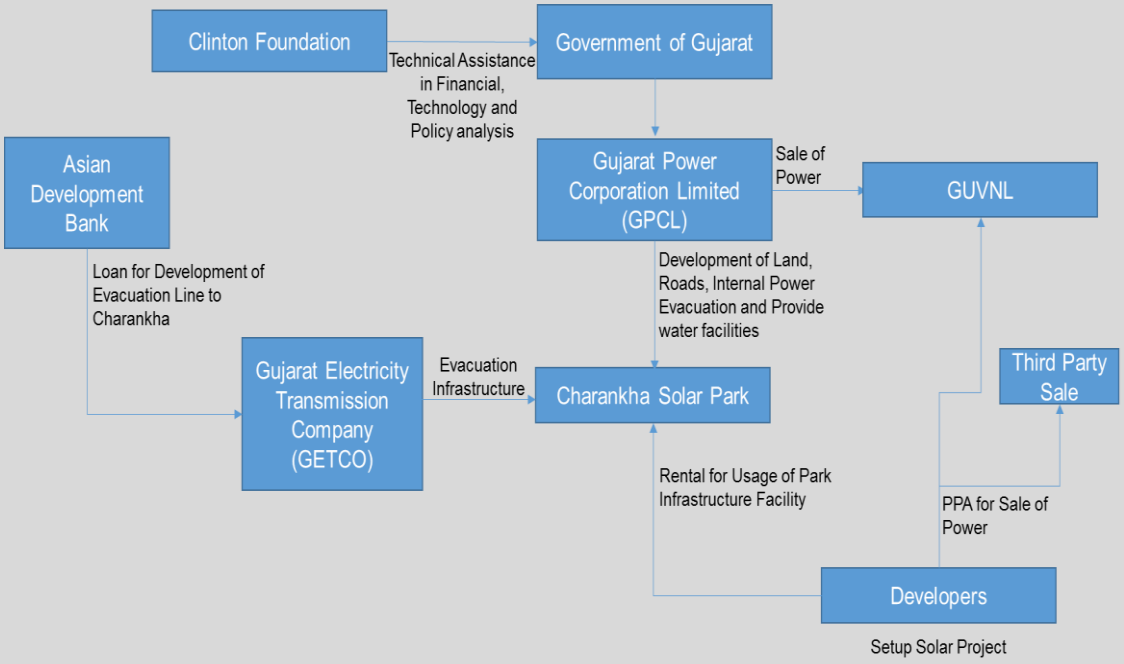
1. **Current Capacity:** The current installed capacity of large solar parks in India is around 326 MW (as on 31st December, 2014). There are two solar parks that have operating assets installed within their boundaries. Different business models have been used for both the solar parks, these are discussed in the following boxes.

Box 5: Business model for Charanka Solar Park

Charanka Solar Park, Gujarat - 375 MW commissioned

The Charanka Solar Park is the world's first multi developer, multi facility, multi technology and multi beneficiary solar park located in 2,000-hectare plot of land near Charanka village in Patan district, northern Gujarat. It is Asia's largest solar park hub that hosts about 17 different projects owned by different developers. When fully built out, the Charanka Solar Park will host 500 MW of solar power systems using state-of-the-art thin film and crystalline technology. Following is the business model adopted for implementation of the solar park.

Figure 10: Business model adopted for implementation of the Gujarat Solar Park



(Source: ADB)

As can be seen from above, the park has been developed primarily through a public and private funding. The Park received grant from the Clinton Climate initiative to undertake a pre-feasibility of the park. The Asian Development Bank provided loan to the State Transmission Utility to build the

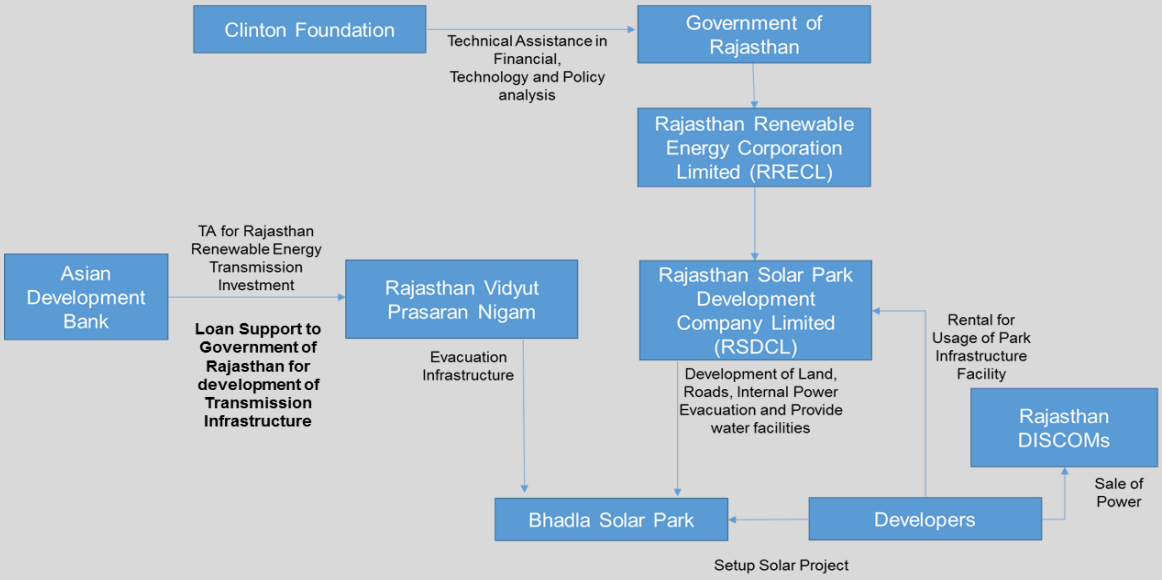
required evacuation capacity. Gujarat Power Corporation Limited (GPCL), the state power generating utility, was designated as the Solar Park Developer, which was responsible for developing the common infrastructure for the park. GPCL was engaged in transparently allotting land to the developers, who in return pay rental for the land and facilities utilized. There are some projects that have been commissioned under the NSM framework that are located at the park. Other projects commissioned in the Park were under the Gujarat Solar Policy.

Box 6: Business Model for Bhadla Solar Park

Bhadla Solar Park, Rajasthan – 75 MW commissioned

Bhadla Solar park is the first solar park to be commissioned in Rajasthan. Both Clinton Climate Initiative and the Asian Development Bank supported development of the Bhadla Solar Park. Here again the Clinton Foundation provided grant support for development of the solar park. Loan support has been provided by the Asian Development Bank to support development of required transmission structure to for renewable energy sector in the State. A key differentiator between the Charankha and Bhadla is the role played by the State Nodal Agency (SNA) – Rajasthan Renewable Energy Corporation Limited.

Figure 11: Business model of Bhadla Solar Park



(Source: ADB)

The RRECL formed an SPV – Rajasthan Solar park Development Company Limited (RSDCL). This is the solar park developer responsible for development of the common infrastructure for the solar park and allotment of land to developers. For sale of power, the developers have a long term PPA with the Rajasthan DISCOMs and are under the Rajasthan Solar Policy.

2. **Target:** In line with the revised NSM target of 100 GW, under the Solar Parks and Ultra Mega Solar Power Projects Policy. MNRE has set a target of at least 25 solar parks with an aggregate capacity of

20,000 MW. Along with that states such as Rajasthan and Telangana have recognized solar park as a separate development format for solar grid connected projects.

3. **Market Maturity Level:**

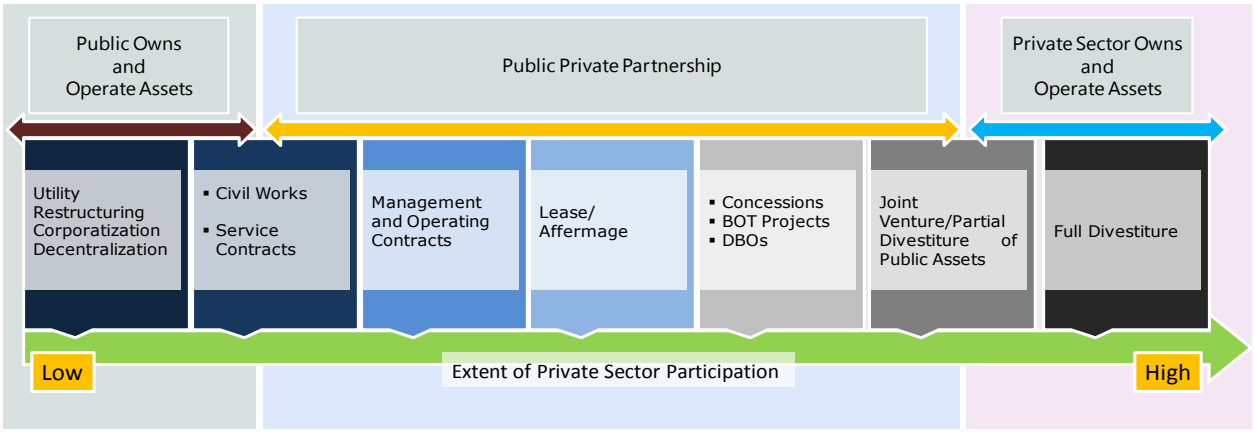
LOW

The solar park segment is currently at a nascent stage. The solar parks mentioned above are the only two operational assets in the country. However, this segment has now found traction with both the Government of India and the MNRE bringing out a detailed policy for solar parks. Further, private developers are also actively looking at this space, for e.g. IL&FS Energy Development Company has entered into a JV with Rajasthan Renewable Energy Corporation Limited to set up 5000 MW of solar park facility in Rajasthan. Business conglomerates such as Adani and Essel have given commitments to set up solar parks with an aggregate capacity of 10,000 MW and 5,000 MW respectively.

4. **Financing gaps and risks to be addressed**

Solar park development requires substantial investments to be made by the solar park developer. Land is one of the most important resource that is required in this segment. Securing large tracts of land through private means, remains a challenge. Given the public nature of the resource, involvement of government in land procurement could facilitate the process. Simultaneously, private sector efficiencies are desired while developing the proposed solar parks. Thus, clarity is required, on what could be the most suitable PPP structure for promoting solar parks. The figure below presents the varying degree of public private engagement possible for solar park development.

Figure 12: Different Public Private Partnership Models



Following are some of the risks/ challenges that need to be addressed for promoting development of solar parks.

- **Operational Risk:**
  - *Risk of underutilization of park infrastructure facilities* due to lack of project developer interest leading to cash flow constraints for solar park developer. Underutilization may result in high cost of lease for usage of common infrastructure for individual solar project developer.

- *Evacuation capacity:* The solar park developer needs to ensure that the required evacuation capacity is in place so that there is no bottling of electricity generated. At the same time, because of staggered development of solar assets, the utilization of evacuation capacity may also be staggered.

- **Revenue Risk:** While the solar park developer makes bulk of its investment before commencing operations of the park, the revenue may be delayed as solar developers may commission their projects in a staggered manner.
- **Lack of financial capacity of partnering institutions:** Under the investment models suggested in the MNRE policy, the State Nodal Agency (SNA) is expected to play a major role. However, the limited capital strength of the SNA could impact the creditworthiness of the parks which may hamper the ability of the solar park developer to raise funds.
- **Limited on-ground experience:** Access to funding from lenders is a challenge considering the limited experience of solar park sponsors, i.e. SECI[13] and SNA.
- **Offtake Risk:** In case a model similar to the Bhadla solar park model (where all power sale is to state utilities) is implemented, it could expose the solar park to possible offtake risk. Developers may be provided with an option to sell power under different business models (as in the case of Charankha solar park) so as to mitigate this risk.

2.3.1 Examples of Avenues for Facilitating Access to Capital

The size of investment required for solar parks is much higher as compared to grid connected projects. **The two financing structures discussed above under credit enhanced green bonds are equally applicable for the solar park segment, especially as these options allow access to large pools of capital.** However, given that such funding is typically feasible once the park is operational, in the interim, products such as guarantees given to lenders for short term financing during construction period could be considered. Such lenders can be taken out once the green bonds are issued.

Apart from that, on the equity side, support to the capital structure through provision of quasi – equity instruments could also be considered for the solar park developer.

Role for ICF

- ICF can play the role as has been played by the ADB or the Climate Foundation in promoting solar parks in the country. It can support in conducting detailed prefeasibility study for target state(s) as has been supported by Climate Foundation.
- ICF can also create access to low cost loan (backed by guarantees) for infrastructure development for the solar park during the construction phase, which can later be replaced by funds raised through other financial instruments once the park is operational and cash flows are stable.

[13] SECI – Solar Energy Corporation of India

- ICF could also establish a platform with a credible domestic agency, which acts as a solar park developer in select states. DfiD could support such a platform with equity as well as provide guarantees on the debt side.

2.4 Decentralized Solar Generation - Solar Rooftop Projects

Solar generation has multitude applications and is an effective source for meeting distributed energy requirements. One of the key applications in the distributed space is solar rooftop. Solar rooftop can be implemented in both grid connected and off-grid systems.

1. **Installed capacity**: The current installed capacity of grid-connected solar rooftop projects is about 54 MW (15th July 2015).
2. **Target:** Under the revised NSM target, of the 100 GW solar target, solar rooftop target has been set at 40 GW by 2022. Apart from GoI push, select states also have targets for solar rooftop development. States such as Kerala, Tamil Nadu, Gujarat and Karnataka have significant allocation to rooftop projects directed at commercial, industrial and residential consumers.
3. **Market Maturity:**

   MEDIUM

   Given that land acquisition issues can limit implementation of large-scale solar projects, small-scale rooftop solar projects can possibly fill a large gap in harnessing solar energy to fulfil domestic energy requirements.

   However, the solar rooftop market has been underachieving and is less attractive owing to the complexities associated with rooftop project development and lack of strong policies. Currently, few states have taken initiatives to develop the rooftop solar markets. Solar Energy Corporation of India (SECI) has conducted four rounds of bidding for allotting rooftop projects. MNRE launched a pilot scheme for promotion of large area grid-connected roof top solar PV projects in cities. It is primarily targeted at cutting the dependence on diesel generators for backup in commercial establishments. A 30% subsidy on the system cost was provided through MNRE till November 2014, however post reduction in equipment costs, the subsidy level has been reduced to 15%. In August 2015, MNRE restricted the 15% subsidy to only residential, institutional, government and social sector consumers. There is a domestic content requirement applicable on installations that use the MNRE subsidy provision. A handful of project developers have rooftop solar projects on their business agenda. Due to limited size, the costs of rooftop projects are yet to become competitive with residential tariffs in states, however, it is competitive vis-à-vis commercial and industrial tariffs.

   In the current scenario, development models need to focus on a wider participation by engaging the consumer and local communities/ entrepreneurs. An expansion of the service network, large scale visibility/ publicity and provision of information to customers, as mentioned in the NSM Phase II policy document, is required.

4. **Financing gaps and associated risks:**

   Given the unique challenges of solar roof top, we believe that in this segment, financing strategy needs to be inherently intertwined with unique development models, which are able to (a) increase the

penetration; (b) engage large scale developer (c) engage consumers and local community/ entrepreneurs and (d) bring in standardization & quality assurance in the business. Following are also some associated challenges/ risks that need to be addressed while looking at the financing structures.

- **Non timely disbursal of capital subsidies:** Under the MNRE capital subsidy scheme, the disbursal of funds in a timely manner has been an area of concern. This creates financial strain on the smaller rooftop solar project developers.
- **Offtake risk:** Bankability of PPA's and the ability of the DISCOMs to honour their dues is a persistent concern for investors.
- **Development of suitable grid infrastructure:** For wide-scale adoption of distributed rooftop based systems, especially in areas with net-metering, the grid infrastructure needs to augmented and strengthened in order to absorb the variable energy generation from these installations.
- **Low electricity tariffs:** The large scale penetration of solar rooftop systems is contingent upon the electricity tariffs for the identified consumer categories to be high enough to create an incentive for the consumer to shift to solar rooftop system. While this may be true for commercial and industrial consumer tariffs, the residential electricity tariffs in a number of cities are still subsidized.
- **Site stability:** Site stability is one of the greatest challenges for rooftop projects. Typically a project is planned for 25 years from the date of operations however, there is high uncertainty in terms of strength of the building structures and risk of shadowing in future.
- **Content and carriage separation:** The proposed separation of distribution and supply (carriage and content) shall have significant implications on the development of the solar rooftop sector. While under the current regime, rooftop developer has only one entity to deal with for connecting the rooftop infrastructure to the grid as well as to settle claims related to supply of electricity (for both gross and net metering). However, with the separation, entities could increase as well as the role of present entities would need to be redefined. For e.g., rooftop developer can become a supplier of electricity itself using the distribution network of the incumbent.
- **Availability of roof space:** Availability of suitable roof space is also concern, with sale and redevelopment risk over the life of the installation. Along with physical availability of roof space, a related concern is that of roof rights. For instance, in case of rented accommodation, there is a risk of the title of the rooftop. Risk is also attached to rooftop ownership in case there is a conflict with the mortgage provider. In case of a leased property, the tenure of the lease needs to match with the duration of the PPA for the rooftop solar.
- **Limited offtake of net metering regulations/ policies:** Typically, utilities are not forthcoming for implementation of net metering provisions as these imply negative cash-flows for an already financially constrained utility.
- **Contract enforceability:** A concern of the key rooftop developers is continued contract enforceability. Credit worthiness of commercial and industrial consumers as well as honouring of the contract over the tenure of the PPA are the key related concerns.

In the following section we present a possible structure that can be considered for the solar rooftop segment and can help increase the penetration of the system by addressing some of the risks mentioned above.

2.4.1 Examples of Avenues for Facilitating Access to Capital: Platform approach to solar rooftop

Large scale solar rooftop projects in India have not yet gained momentum. There is lack of clarity on identifying a suitable business model for rooftop programmes. A viewpoint received during the brainstorming session suggested that financing is not going to be a challenge for the rooftop segment in India, however, the challenges that remains is to identify ways to reach out to the market.

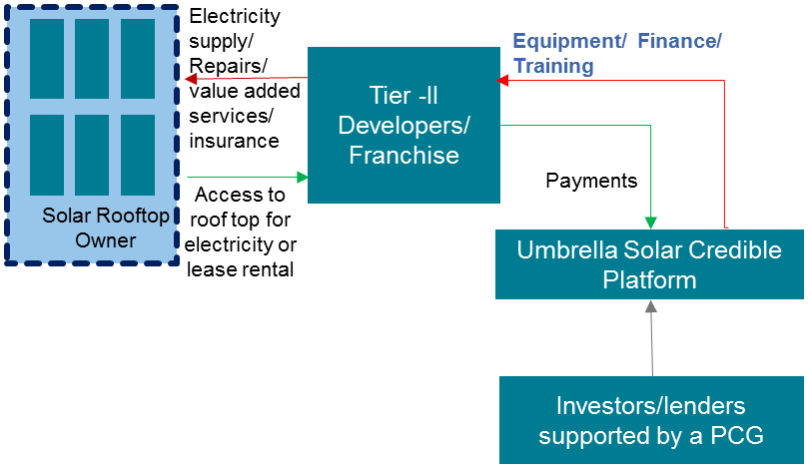
Currently, large credible EPC players have been able to reach out to commercial and industrial consumers who find value in solar rooftop installations. The EPC companies typically fund the project on their own balance sheets and post commissioning get it refinanced. However, this may not help in reaching the solar rooftop target, and limits market penetration. A fragmented approach to tapping the market may not work since it would lead to tapping only high end consumers.

Platform model to solar rooftop segment addresses the requirement of a robust development model juxtaposed with a financing strategy, which may prove ideal for developing rooftop solar, given its unique challenges.

Structure

In order to bring scale to the business model and ensure that quality product is delivered to the end consumer, we believe that implementation of a platform solar rooftop model may be more effective through an umbrella franchiser and Tier II franchisees model. The umbrella franchiser would be a large credible player, (existing module manufacturer, an EPC company or a solar developer), who has a well-established brand, scale and thus credibility in the market. The platform develops a network of Tier II developers/ franchisees entailing participation from the local community/ entrepreneurs and can offer services to roof top owners under feasible revenue models. The following Figure presents such a structure of the solar platform model.

Figure 13: Model structure for solar rooftop platform model (self-consumption/third party sale/ PPA sale)



Roles of various stakeholders under the Solar Lease Model:

1. **Umbrella Franchisor**: The role would be to create and support a credible leasing platform through i) development of the Tier II network ii) supply of hardware to the rooftop installers iii) financial assistance iv) training and iv) supply of quality assured solar products.
2. **Tier II developers/ franchises:** These would be responsible for i) tying up with rooftop owners to set up solar rooftop installations ii) sale of electricity and collections iii) after sales O&M and repairs iv) value added services such as insurance.

Role for ICF

- ICF can support the development of such a business model through a technical assistance programme and also take equity positions in pilot projects with large Indian players, which helps to demonstrate the efficacy of such a model.
- ICF can provide credit guarantees to the umbrella developer to help him raise cheaper debt.

Efficacy for Renewable Energy Sector

The solar rooftop platform model can help in promoting wider penetration of solar rooftop in India. Through the suggested model, non-roof owners (consumers in rented accommodation) can also reap the benefits of solar rooftops. A relevant feedback that we have received during the brainstorming session is that solar rooftop installation can be re-deployed and this can aid in addressing some of the offtake risks perceived in installing on rented roof spaces.

Solar rooftop platform model for self-consumption has been widely implemented in rest of the world (for instance United States of America/ United Kingdom), especially in residential sector. The utility model has been implemented in India in the state of Karnataka for development for rooftop solar in selected cities.

Box 7: Case Study of SolarCity USA

SolarCity is an integrated solar provider in USA. The company functions through a set of installer located across the country. These installers are trained by the company which ensures quality of the installations.

Consumers can get the solar rooftop solar installer on the roofs and have three options (a) PPA with SolarCity (b) Lease rental or (c) own the system. Depending on the requirement of the consumer the final commercial arrangement between the company and the consumer is decided.

SolarCity is one of the umbrella platforms that have been created in the solar rooftop industry in the country. There are a number of players such as SolarUniverse, Comoco Energy that offer similar services to the consumers. This highlights the potential this structure holds in taking forward solar rooftop business.

2.5 Off-grid Solar Projects

Another distributed solar generation segment is the off-grid segment. Though a small segment, it has large scale development impact attached to it. This makes this segment of particular relevance to DFIs and DFI supported funds such as ICF.

1. **Current Capacity:** The off-grid solar capacity pan-India is about 234 MW (as on 30th June 2015). There are other community level applications also in the off-grid space, however, consolidated data on the same is not available, highlighting the need for consolidation of the segment and the concerted focus the segment requires.

2. **Target:** ~2 GW[14] and solar lightning for 20 Million households by 2022

3. **Market Maturity:**

   LOW

   Several initiatives by private sector players and NGOs have been undertaken in this market space. With organizations such as Mera Gaon Power, Simpa Networks, Gram Power etc. off grid solutions have been successfully established in some places in the country. A key concern that exists in the distributed generation segment is the lack of scalable business models. This was a concern that was raised during the brainstorming session, i.e. there is a need to develop replicable scalable model for scale implementation of distributed generation options.

4. **Financing challenges and the associated risks:**

   The off-grid segment is at a nascent stage and thus lack of scalable/ replicable models limits ability to raise finance. Further, due to the lack of adequate experience in the segment, the perceived risks for the segment are higher, which also impact the financing options for the segment. Such risks are:

   - **Financing risk:** The high capex requirement to setup off grid systems coupled with poor availability of debt financing remains a concern for most private developers preventing large scale investments in off-grid applications.
   - **Sponsor risk:** Due to the limited scale of operation the risks attributed to the sponsors backing such projects is also high.
   - **Offtake risk:** Low creditworthiness of consumers in rural regions along with thefts is also a major concern.
   - **Operations and maintenance risks:** There is a lack of proper infrastructure and workforce to take care of O&M in rural areas.
   - **Construction period risks:** For the domestic consumer, a tedious approval process to obtain subsidy, and the presence of multiple partners (MNRE, state implementation agency, project developer) makes installation a cumbersome task.

[14] KPMG assumption based on market sounding

- **Long term visibility of investment:** Extension of grid to solar electrified rural areas would tend to shift the consumers to grid connected power.

A related concern that stems from the limited availability of capital for the segment is the lack of appreciation of the risks that are experienced by the segment. According to one of the key players in the distributed segment, financiers need to be sensitized to the risks and requirements of the distributed generation segment so as to facilitate access of finance to the segment.

2.5.1 Example of Avenues which can help in access to capital

2.5.1.1 Need to develop scalable business models

While energy access in remote areas is a developmental requirement, there is a lack of a scalable business model in this area. The issues stated above are stifling the potential of distributed generation to provide electricity access to rural India on a large scale.

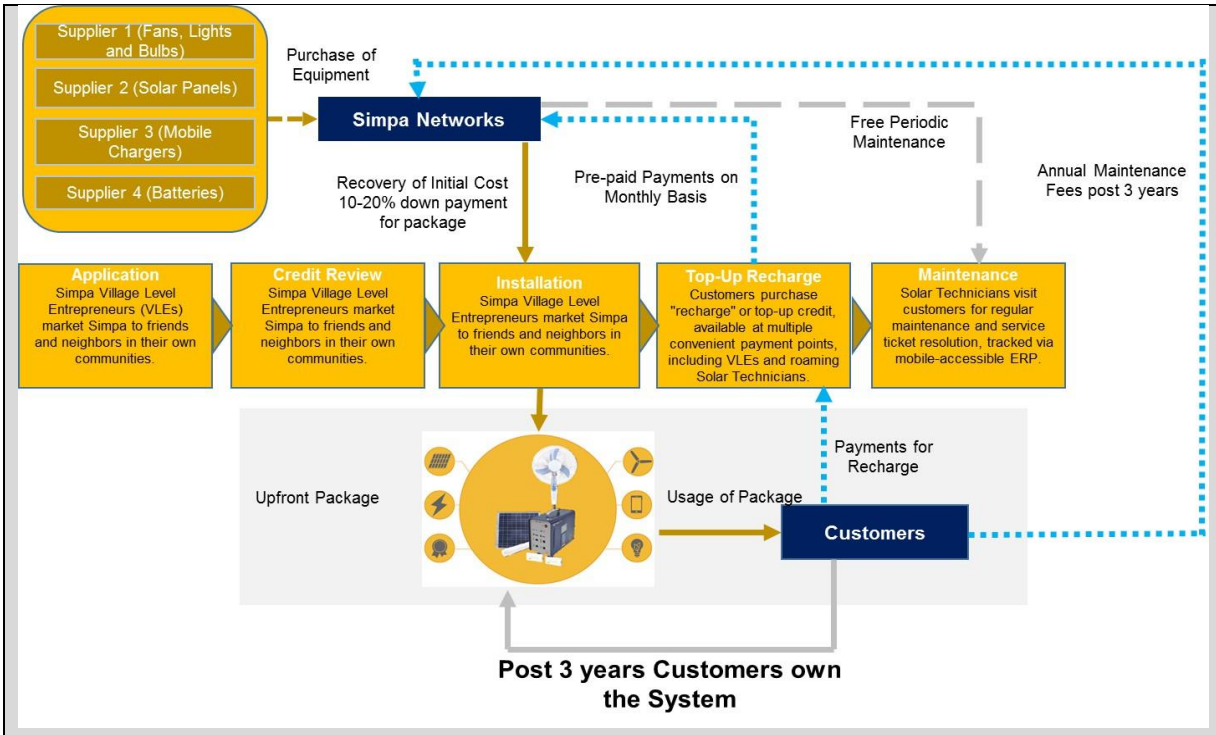
Technology can be a facilitator in developing business models that can be scaled up to improve access of energy in remote areas. One of the pioneers in this field is Simpa Networks, which has successfully employed technology based solar solutions by implementing a pre-paid model. Box below present details of the model adopted by Simpa Networks and also mentions the interventions that are required to scale and replicate the model.

Box 8: Simpa Networks: "Innovative Progressive Purchase" Model

The lack of access to end-user financing is one of the key barriers in large scale penetration of off-grid applications such as solar home systems. These consumers spend a large portion of their incomes on energy sources such as kerosene, and have limited access to organized banking system.

To address this problem, Simpa Networks invented a ***pay-as-you-go pricing model*** for such households. This pricing solution is called ***"Progressive Purchase"*** and it combines hardware that is embedded into a solar system, with software that enables a consumer to buy prepaid energy credits. Prepaid credit limits the offtake risk for Simpa to a large extent. This model is currently being implemented in 9 districts of Uttar Pradesh, where the company is expected to achieve break even by year end in two districts. The figure below shows the business of Simpa Networks.

Figure 14: Business Model of Simpa Networks



(Source: Simpa Networks)

Progressive Purchase System

The prepaid metering technology allows regulation of usage of an electronic device, and has the following components:

- ***A Regulator***: a tamper-proof, system-integrated microcontroller and user interface that regulates the function of an electronic device based on proof of payments.
- ***A Revenue Management System***: A centralized software solution in the "cloud", accessible via SMS gateway and over the internet, for payment processing and accounts settlement

Benefits

- *Payment default risk through IT-enabled systems*
- *Full transparency for customers, agents, transactions and payments histories. Links service to payments*
- *Building trust amongst consumers.*

Issues to be addressed for scaling-up the model

- *Build trust in rural population to cover a larger market:* This can be done through operating lease model that allows the consumers to pay as they use.
- *Dealing with mindset issues*: The typical mind set of need for ownership of assets needs to be duly considered. This has been done through an ownership model where the consumer becomes the ultimate owner of the system. This creates a sense of responsibility among the users.
- *Utility backed pilot* models needs to be undertaken.
- *Capacity building* of the population to create awareness among the users and wider dissemination of benefits. The rural population should be engaged on continuous basis.

2.5.1.2 Financing options

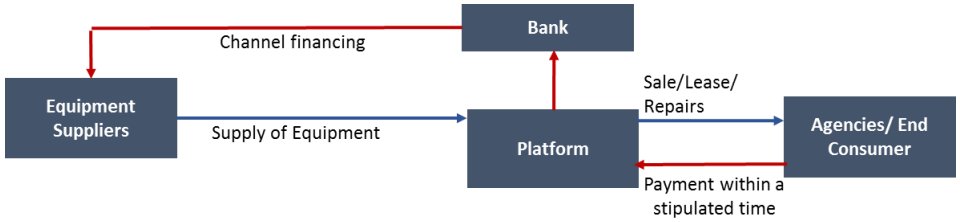
The ability to raise finance remains a key challenge in this space. To address the same financing measures such as channel financing could be explored as shown below. A combination of the channel financing model along with suitable technology intervention can be a suitable business model that can be developed. It is noteworthy to mention here that channel financing is not a new concept and is widely used in the consumer durable segment.

Structure

Channel financing conceptually implies access to finance by the supply chain stakeholders/ participants of large corporates in order to support seamless business flow over the entire value chain. This is of relevance to the distributed segment as there is commoditization of solar applications in the distributed segment.

A programmatic approach in channel financing could be adopted to bring scale in the off grid solar segment. A platform could be established to provide solar solutions through local agencies and intermediaries in the rural areas. The platform may in turn source equipment from one or more suppliers. Lenders could provide financing assistance to such a platform such as working capital facilities, short to medium term loans which further enables the platform to extend deferred payment facilities to agencies/ end consumer.

Figure 15: Simplified Structure for Channel Funding



Role for ICF

- Partial credit guarantee to lenders to enable low cost financing and build confidence of the lenders in supporting innovative business models.
- Equity can be provided to implementing agencies in the off-grid segment to enable them to provide solar solutions. DFIs prominent in this space are of the view that funding agency may need to have 'skin' in the game to ensure acceptance of the business models.
- Engage closely with some developers to establish a workable, scalable and replicable business model for the distributed segment.

To conclude, it can be seen that there are a number of financing options that exist to address financing challenges faced by the solar sector. However, it must be highlighted here that the structures mentioned above are at a conceptual stage. These will need to be detailed further with a review of policy, regulatory, tax implications, economic viability, commercial arrangements required, etc.

3 Financing Priorities for DfID, DECC & ICF

3.1 Setting the Priorities

In this section, we present our recommendations for DfID/DECC and ICF to develop its strategy for providing funding support to the solar sector. Our recommendations have been made keeping in view the following key questions that DfiD/ICF/DECC seeks to address in determining the areas for their future financial interventions in the Indian Solar market:

1. Is the PCG relevant at this juncture?
2. What are the options for investing returnable capital while keeping in view ICF investment objectives? [15]

We believe that the rapidly evolving environment throws up a multitude of financing challenges which underline the relevance of enablers such as a PCG for improving access to capital as well as reducing the cost of funds through a desired risk sharing mechanism. However, the stretched domestic conventional lending market, necessitates that PCG or other guarantee products be used to create access to new, large, cheaper and long tenor capital sources, especially in the grid connected ground mounted segment. Further, given the emerging business models, especially on the distributed side, it would be important for the PCG to be used concomitantly with innovative financing avenues such as channel financing, asset financing, etc. to address the unique risks perceived with the models.

The financing avenues discussed in the previous section (along with the roles suggested for ICF) were based on KPMG analysis of some of the emerging financing trends and options in the solar segment. These were further developed with the help of feedback from various stakeholders during the consultation process undertaken for analysing failure of the PCG facility and exploring future interventions. A formal brainstorming meeting was also organized with participants from the stakeholder community[16] to discuss some of these financial strategies and the corresponding role for DFIs. The minutes of the meeting are enclosed as **Annexure 1**.

In order to assess suitability of the suggested structures, these have been mapped below against ICF investment objectives.

[15] The objectives for investments under the ICF have been mentioned in the Section 1 of the volume

[16] Including developers, equipment manufacturers, PE funds, lenders, Governmental agencies, DFIs, think tank, etc.

Table 3: Macro level assessment of suitable financing options for ICF[17]

DFID Objectives/ Illustrative Instruments	Possible ICF Role	Segments	Improve private sector investment/ participation	Transformation Potential	Reduction of Cost*	Reduce Risk	Increase availability of funds	Total
Conventional Loans backed by PCGs	- PCG	- All Segments	**2**	**1**	**3**	**2**	**1**	**09**
Credit Enhanced Green Bonds	- PCG	- Grid Connected Solar Projects	**3**	**1**	**3**	****2**	**3**	**12**
		- Solar Parks						
Credit Enhancement through tranching	- Investment in junior tranches	- Grid Connected Solar Projects	**3**	**1**	**3**	****2**	**3**	**12**
		- Solar Parks						
Quasi Equity	- Quasi equity position	- Grid Connected Solar Projects	**1**	**1**	**1**	**1**	**1**	**05**
		- Solar Parks						
YieldCo	- Equity position	- Grid Connected Solar Projects	**3**	**2**	**2**	**2**	**3**	**12**
		- Solar Parks						
	- PCG	- -Do-	**3**	**2**	**3**	**3**	**3**	**14**
Solar Lease	- Seeding a platform	- Solar Rooftops	**3**	**3**	**2**	**2**	**3**	**13**
	- PCG		**3**	**3**	**3**	**3**	**3**	**15**
Channel Funding	- Seeding a platform	- Distributed Generation	**3**	**3**	**2**	**2**	**3**	**13**
	- PCG		**3**	**3**	**3**	**3**	**3**	**15**

(Note: Key: 1=Low, 2=Medium, 3=High

*Assuming the guarantees are priced in a manner that benefits of risk reduction are tangibly perceived

**Assuming that international capital is accessed which would require foreign exchange risk mitigation)

As can be seen from the table above, possible investment objectives are best met on the distributed side especially when an instrument such as a PCG is used concomitantly with innovative financing models. Additionally, the fund requirement of the segment is much lower as compared to the grid connected segment and concerns of availability of funds can be more effectively addressed by ICF through the pool of capital available.

[17] This is a macro level assessment. An in depth study is required to understand the efficacy of the instruments as well as the economics involved in extending financial support. Additionally, the regulatory, legal, tax, etc. implications in implementation also need to be studied.

On the grid connected side, instruments which help access the domestic and international bond market have a high relevance especially with large and mega sized projects, requiring access to new and cheaper capital sources, soon becoming a norm. However, various complexities associated with such financial instruments need to be studied in detail before a decision may be made on this front. Some of these issues have been discussed before viz. foreign exchange fluctuations risks on accessing international capital, exchange management implications related to guarantees, regulatory processes/ approvals, etc.

Another pertinent issue would be the need to track and anticipate interest rate and bond yield movements which would determine the attractiveness of the bond market. Additionally, US rate hikes (in a scenario of falling interest rates in India) could lower the demand for Indian bonds by foreign institutional investors due to narrowing interest rate differentials and preference for a more stable currency. In such a fluid environment, any strategy for accessing the bond market would need to have a short lead time for introducing such a product in market.

On the equity side, Indian developers as well as investors are keen to explore the role that YieldCos can play as means for sourcing additional equity capital as well as creating avenues for monetization of existing holdings. While there is definitely interest in the developer and investor community, there is limited understanding on the process, regulatory, tax aspects of the financing structure.

3.2 Adopting a phased approach

Along with the prioritization discussed above, it is proposed that ICF may adopt a **phased approach for its financing interventions**.

During brainstorming, a key point that was put forth was that the step up in capacity addition is likely to be gradual since there are several bottlenecks to be addressed including that of manufacturing capacities, policy issues, need for a detailed blue print from the Government for achieving the target, including avenues for financial support, etc. This implies that over the next 1 or 2 years, perhaps financing requirements can be met by domestic sources, without the need to resort to international capital.

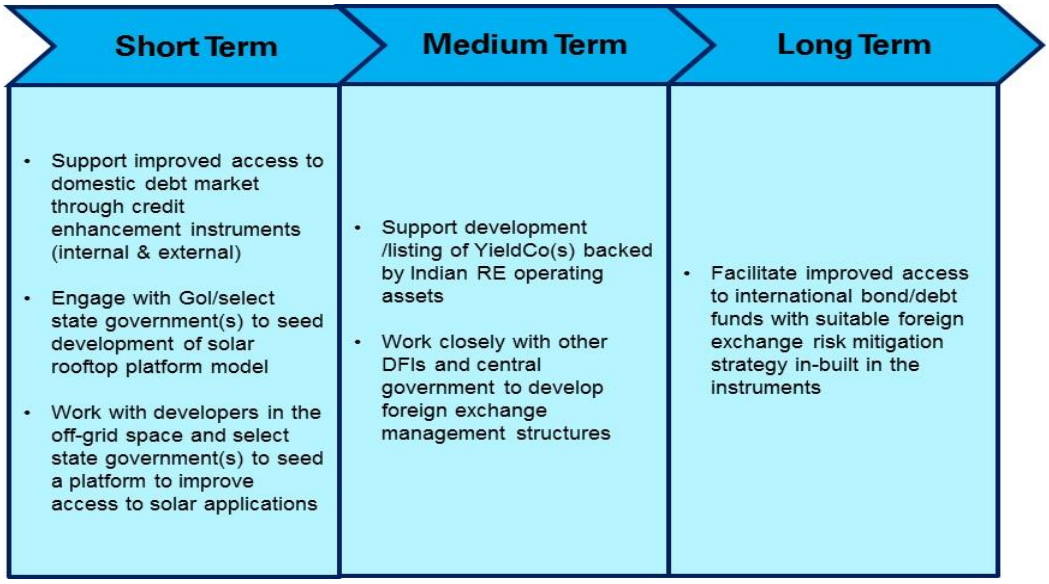
In such a scenario, the **immediate** imperatives for the sector, which ICF can support are laid out below:

- The near to short term finance requirements can primarily be met through domestic sources of finance and for this purpose, aside from the conventional loans segment, the Indian bond market, which is currently at a market size of about USD 1 trillion can be accessed. Support can be provided for such fund raising through credit enhancement products to allow funds to be available at lower costs. While designing credit enhancement products, learnings from the failure of the PCG need to be taken into account.
- ICF could work with other DFIs and Government of India to develop foreign exchange fluctuation risk mitigation strategies since accessing international funds may be an eventual imperative.
- ICF could also provide support through technical assistance for development of a suitable index to develop a "go to state" strategy, by identifying the most suitable state(s) for investment.
- For interventions on the equity side, ICF can help investors gain insights into Yield Co structure through a technical assistance programme.

- On the distributed generation side, ICF can commission technical assistance to support development of suitable business models and financing structures. For instance, ICF can commission technical assistance to examine the solar rooftop platform model in detail and undertake an in depth analysis of commercial, financial, regulatory and other implications of such a structure. Along with developing the structure, ICF can also facilitate pilots of the identified business model through taking up an equity position along with large credit worthy player which can act as a master franchisor. Alternatively, ICF could support access to low cost debt for any such platform to demonstrate the case for investments in the sector.

In the **long term**, as the market matures, there may be a dire need to access international capital sources, which ICF could facilitate through credit enhanced bond instruments. In the brainstorming session participants opined that there is a "Me Too" syndrome in the international community; thus, as the domestic financing market deepens for the solar sector, international funds may start to flow in. However, in the interim it is imperative that suitable hedging strategies are adopted to address foreign exchange fluctuation risks entailed in accessing such funding sources. The figure below summaries our suggested strategy as well as options for ICF to engage in the Indian renewable energy sector with timelines of the various interventions planned. The timelines can also be a basis for the fund to plan the prioritization.

Figure 16: Suggested timelines for engagement for ICF



3.3 Conclusion

From the above discussion it clearly emerges that the potential for investments in the solar sector is immense. There are options for returnable investment structures present across segments and ICF can prioritize its engagement based on the transformational impact the interventions bring in.

The analysis presented here is a first level analysis and a detailed examination of each structure needs to be undertaken before concluding on the priority areas. These financing structures will need to examined rigorously from various vantage points, including, 1) relevance for meeting financing challenges for various segments 2) simplicity and ease of implementation 3) allowing short lead time 4) achieving balance between developmental objectives and the need to devise returnable capital interventions 5) facilitating

achievement of scale through a programmatic intervention, etc. A well designed product which promotes access to cheap funds while addressing the most pertinent risks shall go a long way in achieving the desired transformational impact.

Appendix 1 Minutes of the Meeting - Brainstorming Session on Alternate Financing Options for achieving the 100 GW target

Minutes of the Brainstorming Session

Venue: Senate Hall, Hyatt Regency, New Delhi
Date: 17 March 2015
Time: 3.00 PM - 5.30 PM
Attendees:

1. ***Department for International Department:***
   A. *Udit Mathur*
   B. *Gaurav Kapoor*
   C. *Adritha Subbiah*
2. ***ADB***
   A. *Siddhartha Shah*
3. ***Bridge to India***
   A. *Vinay Rustagi*
4. ***Climate Policy Initiative***
   A. *Dr. Gireesh Shirmali*
5. ***CLP Wind Farms (India) Private Limited***
   A. *Mahesh Makhija*
6. ***First Solar***
   A. *Subrat Das*
7. ***Hero Future Group***
   A. *Sunil Jain*
8. ***Hindustan Power Projects Private Limited***
   A. *Dr. Harish K. Ahuja*
9. ***IDFC PE***
   A. *Mayank Bansal*
10. ***IFC***
    A. *Gaetan Tiberghien*
11. ***L&T Infra***
    A. *Sanjeev Mishra*
12. ***Shakti Sustainable Energy Foundation***
    A. *Deepak Gupta*
13. ***Simpa Networks***
    A. *Piyush Mathur*
14. ***Welspun Energy Private Limited***
    A. *Nitin Mittal*
    B. *Jagdish Prakash Agarwal*
    C. *Rajesh Verma*
15. ***Yes Bank***
    A. *Pawan Agarwal*

B. *Sandeep Arora*

16. ***KPMG India***
    A. *Anish De*
    B. *Anvesha Paresh Thakkar*
    C. *Ruchika Chawla*
    D. *Harsh Kanani*
    E. *Ratnottama Sengupta*

Purpose:
Brainstorming Session on the Alternate Financing Structures for achieving the 100 GW target.

Grid Connected

- To achieve the 100 GW, the sector needs stand on its own without the support of subsidies.
- There are few companies in India who have issued bonds in the foreign markets, however they have hedged themselves for only 50% of the total amount in order to keep the hedging costs low.
- Attracting foreign funds could be a challenge given the moderate investor appetite for India currently. The need of the hour is to focus on improving domestic funding in the solar sector. The foreign funding agencies have the tendency to work on the principle of "me too" which would mean if domestic funds starts flowing into the solar sector, a parallel platform will be established for overseas funds to flow in. For IFIs, it is difficult to invest in small transactions.
- The risk pricing in India will always be different than what is perceived by DFIs/ IFIs. Indian solar market cannot attract foreign investment due to the lack of scale. The arbitrage between dollar based loans and rupee lending in India needs to remain attractive for accessing international funds. However, the arbitrage gets covered due to high costs of hedging
- Banks can access foreign currency based funds since they have a capacity to bear some amount of forex fluctuation risks owing to their balance sheets. Yes Bank has recently raised funds for supporting the renewable energy sector from the domestic market and they have got a good response for this.
- Government of India/ DFI/ IFIs/ Non-Banking Financial Companies should work together to create a sinking fund for hedging foreign currency. Here the money from NCEF can be utilized.
- ADB along with other funding agencies was pursuing the Government of India to establish a facility to manage foreign exchange fluctuation risk. Under the facility, protection was provided for foreign exchange fluctuation beyond a pre-defined level. However, GoI was not keen as it did not want to take a position on the expected trajectory of currency movement. It was suggested that funding agencies may approach the new government to see traction for the suggested facility.
- The generation risk has come down and developers perceive it to be moderate. Lenders still have a perception of high generation risk. Lenders evaluate the projects at P50 levels and normally the generation comes out to be lesser than the P50 estimates by ~20%. If the projects are evaluated at P90 levels, the viability gets affected.
- Construction period risk is not high since most of the developers are able to construct the project in 3 months post procurement process starts. The lenders might still be looking at this as a risk due to project delays which affects project economics through penalties such as tariff reduction or Bank Guarantee encashment. Construction period risk is relevant in the state of Andhra

Pradesh and Tamil Nadu since the Power Purchase Agreement (PPA) signing got delayed. However, the construction would get delayed only by 1-2 months.

- The typical financial closure time for a project seeking funds from a foreign lender is 6-7 months which would delay the commissioning of the project. With Indian lenders, the time is less, maximum of 3 months.
- Indian developers understand the financial position of the state utilities and always take the receivable period to be on the higher side. However, no developer has faced issues due to the default in payments. It was further highlighted that for utilities of Uttar Pradesh and Bihar, there have been major issue in terms of delay in payments. The off-taker risk is only due to the delay in the construction of ISTS facility for projects under the National Solar Mission.
- It was suggested that India needs simple financing solutions. Currently, foreign banks and IFIs have little appetite to support the huge programme of GoI to achieve 100 GW target. There are four factors that should be worked on:
    - Create Liquidity
    - Reduce Cost of RE through concessional loans
    - Create domestic pool of capital
    - Engage insurance, pension funds, and money from NCEF to support the financial sector in terms of RE

  Moreover, Government of India (GoI) should directly intervene in supporting this sector. For e.g. instead to providing AD benefits to consumers, the GoI should collect the taxes and divert that money to fund RE/Solar Projects at lower interest rates.
- Indian developers should not aim at getting foreign funding during the construction phase. Foreign lending should be done post stabilization to reduce the risk of default.
- The budget for 2014-15 has highlighted REITs and Infrastructure Trusts. Further work is required to see how best this area can be tapped.
- YieldCo as a concept should be propagated amongst the investor community. IFIs and DFIs can help in developing programs or guidelines for Indian companies to list project companies in overseas economies.
- India has formed NCEF to support clean technology however only 20% of the corpus is used for renewable energy. About 80% of the corpus money is diverted to support other government programmes.
- IFC has been issuing bonds in INR terms and they have been successful in the same.
- DFIs/IFIs can help in developing a corporate bond market in India, this will allow corporates to raise funds directly from the market by issuance of securities. Corporates cannot raise funds while keeping the exposure on their books
- ADB has backed IIFCL with a Partial Credit Guarantee (PCG) to the extent of 50%, which has helped IIFCL to raise money at better prices. As per ADB, better pricing is the key factor.
- If cost of financing is an issue, it has to be handled at sectoral level rather than at the macro level.

Rooftop & Distributed Segment

- It was suggested that intervention by DfID in the distributed segment will have a higher impact rather than investing in grid connected segment.
- Rooftop market need to demonstrate viable scaling models for investments to flow in. Investable business case and optimal financing options need to be demonstrated.
- Rooftop is an EPC play and majority of the capacity addition is going to come from retail customers.

- Banks should look at rooftop solar as asset financing. The $34 million investment highlighted in the presentation can come through consumer finance.
- IREDA is looking at funding rooftop projects on non-recourse basis.
- Even at distributed level, the cost of financing should be comparable/competitive with the grid connected projects.
- Being environmentally aware is not enough to make solar rooftops attractive. There is a need for value addition through improvement in scale, reduction of cost and coverage in the market.
- For rooftop players, commercial & industrial segment are worth tapping. There is need to give access to low cost funds and to look at alternative business models such as RESCOs and IPPs. Borrowers with good credit profile can set up projects on EPC basis.
- Companies like Amazon and Solar City in US have seen multiple rounds of investment in past few years even after running into loses. Therefore, it is necessary to develop business models suitable in the market such that investment would flow and scalability can be seen. There can be an e-commerce play in the solar rooftop market. Solar City in USA has not been making profits still have higher valuations.
- GoI can provide tax breaks for rooftop solar installations to the end consumer.
- Net Metering should be pushed by GoI. Utilities have not been supporting the net metering policies since this would result into loss of revenues for them. It would further add on costs for the distribution companies as they would needs to take additional measures to strengthen the system.
- It was highlighted by a developer in the distributed generation segment that most challenging task for availing finance for the segment is to explain risks to the lenders. Once that is done efficiently it is not difficult to scale up.
- DFIs/ IFIs should specifically cover certain companies through guarantees in the off-grid space
- Asset finance, leasing models are preferred if Banks take an exposure. Perhaps channel financing should be an area to look at for DfID.

Summary

- Reduction in cost of finance is a key – Today the market needs funding at low cost in order to improve IRRs. An improvement in IRRs would in turn attract further, investments in various segments of solar power. For projects to scale up to the next level, cost of funding would play an important role.
- Domestic market needs to be tapped rather than waiting for the foreign funds to come in – There is limited appetite for foreign funding agencies to invest in India due to lack of scale. Most of the foreign agencies would needs ~USD 500 million investment opportunity in a single transaction and such opportunities are currently not available in India.
- Currency related matters should be handled by GoI – Sinking Fund developed by through a joint participation from GoI, IFIs, DFIs and NBFC can be developed to cover the foreign currency risk. Other means to address currency risk also need to be explored
- For distributed generation –Any intervention can carry a very significant impact. Investor confidence and understanding of the sector needs to be built.

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