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# Dissertation Report

**On**

## Analysis of Funding Mechanisms for Solar Power Projects in India

## And

## Study of Innovative Financing Techniques

**Under the Guidance of**

Mr. Pankaj Joshi, Dy. Manager (Projects). M/s Jaguar Overseas Ltd. New Delhi,

At

**Jaguar Overseas Ltd, New Delhi**

JAGUAR

**Prepared By**

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MBA (Power Management)

**A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR**

**MBA IN POWER MANAGEMENT**

**OF**

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# Declaration by the Guide

This is to certify that the Mr. Keshab Kumar Sahoo, a student of **Power Management (MBA), SAP ID 500049165, Oct-2015 Batch of** UPES has successfully completed this dissertation report on "**Analysis of Funding Mechanism for Solar Power Projects in India and Study of Innovative Financial Techniques**" under my supervision.

Further, I certify that the work is an original work and the same has not been submitted to any other institute for the award of any other degree & is totally based on the investigation made, data collected and analyzed by him.

In my opinion it is fully adequate, in scope and utility, as a dissertation towards partial fulfillment for the award of degree of MBA.

**Pankaj Joshi**
**Dy Manager**
**Projects, JOL**

Date: 08.08.2019
Place: New Delhi

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# DISSERTATION COVER PAGE

**DISSERTATION for the Degree of MBA in POWER MANAGEMENT**

**DISSERTATION TOPIC "Analysis of Funding Mechanism for Solar Power Projects in India and Study of Innovative Financial Techniques".**


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Academic Year: Oct 2015 onwards

# SYNOPSIS

## 1. Title of the Dissertation/Topic:

Analysis of Funding Mechanisms for Solar Power Projects in India and Study of Innovative Financing Techniques.

## 2. Introduction including back ground of Proposed Study:

India is endowed with vast solar energy potential. About 5,000 trillion kWh per year energy is incident over India's land area with most parts receiving 4-7 kWh per sq. m per day. Over the past few years, both the central and the state governments have developed favourable policy frameworks to facilitate development of solar projects in the country. These include mechanisms such as feed-in-tariffs (FiTs), capital subsidies, and tax benefits. These mechanisms have been successful in attracting significant investments and adding solar capacity. New policy instruments such as Generation-Based Incentives (GBIs), Renewable Purchase Obligations (RPOs), RE certificates (RECs) and open access (wheeling and banking) have provided further stimulus to the sector in the last few years.

In the area of grid-connected solar power, private financing instruments, such as debt, equity, mezzanine, and partial risk guarantees are being used in India. Despite the need to scale up, several gaps are emerging. For example, a number of large financing sources are not investing yet in solar power projects; tax benefits are not uniformly accessible; capital market access has been limited; and private equity is tapering off as there are limited exit opportunities. Banks are facing an asset liability mismatch, because long tenure debt is required for lending to solar projects. Banks are also reaching their lending limits, which are considered a part of the power sector.

There are some innovative financing mechanisms have been introduced in this report

- **Fiscal Instruments**

**Tax Efficient Trusts**: Tax efficient trusts provide pass-through tax benefits for investors in solar power projects, and can be traded publicly. They enhance capital market liquidity and provide access to individual, retail and institutional investors.

**Tradable Tax Credits**: These are tradable tax-saving certificates that can be used by solar power projects. For example they can be used by IPPs to avail the benefit of accelerated depreciation. Such credits can help raise additional project finance and can reduce the burden of payments for GBI on the government.

- **Policy Instruments**

**REC Market Maker**: The establishment of an "REC Market Maker" would address the current lack of "bankability" of RECs. It would be a government-sponsored body that would act as a buyer and seller of last resort, in case of either over supply or shortage of RECs in the market.

- **Financial Instruments**

**Infrastructure Debt Funds**: It allows tapping of long-term, low-cost debt from insurance and pension funds (both domestic and foreign) to refinance bank debt of infrastructure solar power projects. This structure, introduced in India in 2011, has so far not been used for solar power projects.

**Green Bonds**: Green bonds, or climate bonds, are asset-backed bonds that allow refinancing of solar power projects and thus increase liquidity. While they are popular in developed markets, especially Europe, the U.S. and China, they have not yet been used in India.

**Off-Grid Fund**: An off-grid fund financed by high-net-worth individuals (HNIs) and corporate social responsibility (CSR) sources could be used to support competent RESCOs for the development of commercial and rural off-grid projects, with a dual focus on financial returns and social impact.

**Risk Insurance Instruments**: Insurance instruments can be designed to cover the various risks faced by solar power projects, such as resource, technology, and off-taker, power purchase agreement, and project development risks. These instruments can attract large-scale, risk adverse, investors and lenders to the sector.

**Currency Hedging**: It is the act of entering into a financial contract in order to protect against unexpected, expected or anticipated changes in currency exchange rates. Currency hedging is used by financial investors and businesses to eliminate risks they encounter when conducting business internationally. Hedging can be likened to an insurance policy that limits the impact of foreign exchange risk.

**Synthetic PPA**: A synthetic PPA is basically a form of hedge. In one form of synthetic PPA, the project sells its electricity on a merchant basis, but enters into a contract with a third party that provides a floor under the electricity price. A hedge works both ways. The project pays the counterparty if electricity prices are above a benchmark price. The counterparty pays the project the difference if they fall below the benchmark.

These several financial mechanisms can spur solar power project investment by catalysing new sources of financing such as pension funds, sovereign wealth funds, insurance companies, CSR and HNI funds. They can also facilitate refinancing of debt with longer tenure and lower-cost funds; provide wider access to tax benefits, thereby expanding the pool of investors; and reduce project risks through insurance products. This report describes in more detail how each of these instruments operate and how they can be adapted and implemented in order to help address the current barriers to RE (Solar) finance in India.

## 3. Review of literature:

Renewable Energy Sector has been gaining attention of scholars due to various reasons. Most of these studies have been conducted abroad in International context although many of these studies have been India centric also. Of late Indian Scholars have also conducted studies exploring the Renewable Energy Sector and its dynamics. Literature related to the topic in hand includes books, thesis, research articles and various reports published by academicians, researchers and various government and nongovernmental agencies worldwide.

Study related to the topic can be divided into two categories:

1. Study conducted in International context/Global Context
2. Studies conducted in Indian Context.

Marsh Ltd. (2006) 14 prepared a comprehensive list of associated risks in case of RE projects especially in developing countries were prepared. The study was conducted in nine countries which includes India as well. From the list so prepared the risks which could be managed by FRM instruments were identified. A survey was also conducted of FRM instruments including both insurance and non-insurance with the aim of studying the instruments currently available in developing countries.

Luethi, S.; Wuestenhagen, R. (2012) have suggested that investors while taking a decision of PV investment in different countries weigh returns induced by Feed in Tariff against a set of policy risk and then choose the country which has most favourable risk return profile. Authors empirically tested this on the basis of preference survey conducted of European PV project developers. The finding of the study confirmed the significance of non-economic barriers such as political instability and length of administrative process when it comes to deployment of RE. Their analysis shows that project developers consider the duration of Administrative Process followed by Feed in Tariff as the significant attribute when deciding about investment in Solar Project in any given country. They showed that price tag can be attached to any given specific policy risk. For any given policy risk, their study provided of the evidence for the level of risk premium that can be demanded by project developers. The paper also states that there is very little empirical evidence as to how policies and risks are perceived actually by project developers and investors.

Wustengen, R; Menichetti, E. (2012) have concluded that for investment decisions risk and returns are important drivers. Hence policy makers when aiming at increasing the share of renewable energy should do everything, they can for reducing risk and providing adequate return. In this world of bounded rationality, perception matters. Thus surveying investor's attitude and preference can help in identifying those risks which are perceived as more relevant in particular. This paper clearly states that the investor/ project developer perspective need to be taken into consideration. Author also suggests that seeing the heterogeneous nature of Renewable Energy investors, there has to be a segmentation of policies. It also states that investment in RE has grown significantly in past decade and this is to a greater extent due to support of policy. But this support is creating opportunities but at the same time also posed risk for investors.

Griffith Jones; S, Ocampo , J.A. and Spratt, S. (2012) have reviewed the financing instruments currently used in developing countries and tried to analyse the reasons as to why the flow of investment in RE sector is not to the extent required. They have identified following three obstacles in the way of RE private projects:

**1. RE Economics:** Economics of RE which is not generally competitive that is cost of production per unit of energy is generally higher than that for conventional energy.

**2. Inadequate Investment:** Though RE investment has increased (total of Private and Public), from US$41 billion in 2004 to US$ 268 billion in 2010, it is still much below the desirable level due to variety of factors, some global and some local.

**3. Uncertainty and Risk:** Following are important points regarding this

a. Investors are most bothered with the apparent mismatch between nature of capital commitment which is long term (20-50 years) and of time frame of climate change regulations which is mostly short term.
b. There is a severe Risk Reward imbalance. Investors consider risk to be severely high.

Paper also recommends various alternatives for the above mentioned barriers like raising the cost of fossil fuels, lowering the cost of Renewable, ways to boost the return from renewable and also various mechanisms for increasing the supply of suitable financing for RE projects like Green Bonds and also various options for public finance mechanisms like Corner stone Funds, Challenge Funds etc. They have also recommended various mechanisms for reducing risk and uncertainty like guarantees, insurance etc.
Paper concludes that for motivating private investors to substantially increase their investment in risky and relatively unprofitable activities like RE, attractiveness of these RE investments should be increased by suitably changing the underlying economics.

IRENA (2012) in Renewable Energy Technologies: Cost Analysis Series have stated that the relative cost disadvantage can be expected to reduce due to rising demand for power and also due to increasing trend in increase of fuel price. As calculated by IRENA, due to economies of scale in production and increasing deployment results in lowering of international PV module cost by 22% with every doubling of production capacity. Thus there is a rationale in promoting solar technology and attempt should be to reach grid parity as soon as possible.

Kaminker, C.H; Stewart, F. (2012) have stated that there is a limited institutional investment in clean energy projects. Reasons identified for these includes lack of information, expertise and lack of appropriate investment vehicles providing appropriate risk return profile needed by institutional investors for managing specific risks of RE projects. It is estimated that not even 1% of pension fund's assets are allocated globally to infrastructure projects. Following are some of the reasons identified as acting as barriers for institutional investment in clean energy:

**1. Inappropriate risk/ return profile**
**2. Special species of risk**
**3. Lack of appropriate investment vehicle.**

Paper also cites Technology risk and buyer risk as the main barrier coming in the ways of institutional investors financing clean energy projects.

Mendelsohn, M. et al (2012) in the NREL Report have stated that financial structure having project level debt generally tend to have lower cost of capital and also power cost. Study which is based on interview with RE industry financing experts in US also concluded that selection of a financial structure is more often based on various non-cost considerations or risk parameters which are project specific.

As per BNEF Report (2013), Sound risk management is extremely important for attracting capital. Financial Risk Transfer Mechanism will compliment several other risk management measures in a significant way. This study was conducted in a six leading market for RE, Australia, China, France, Germany, UK and US. Report also states that solar sector has seen maximum insurance activity. With a focus on Wind and Solar Projects, they have listed a complete set of risks which needs to be managed along with the various possible options of managing them.

**II. Review of Studies conducted in Indian Context: -**

Jain (1986) estimated while forecasting the demand for non-conventional source of energy that approximately after every fifteen year the demand of energy doubles its present consumption rate.

Devdas (1988) stated that plenty of sunshine is available in India for approx. 8 months in a year. It comes out to be around 3000 hour of sunshine per annum. Thus India has significant chance of producing solar energy.

Moorthy R.C (1990) has discussed the technological development in India in the various nonconventional sources of energy such as Solar, Wind, Ocean, Thermal, Biogas etc.

Peter, R. and Dickie, L. (2004), in their empirical study have tried to identify and empirically examine the barriers coming in the way of adoption of RE Technology especially Solar Based. Grouping of Barriers can be done into three different categories:

1. Financial Barriers
2. Lack of Awareness
3. Technical Barriers

They have clearly stated that the high initial cost of PV system is a major financial barrier. This clearly highlights the necessity of availability of sufficient finance through soft loans and that too at low interest rates.

Study also showed that lack of awareness and insufficient promotion support are also barriers in the way of commercialization of PV systems. Other noticeable barriers are related to apprehensions related to reliability of PV systems, high maintenance costs and also as to lack of performance standards.

They have clearly concluded that in Indian scenario, where there is chronic power shortage, PV systems are viable options and that there is an urgent need to remove the barriers coming in the way of adoption of PV systems.

Shah (2010) have clearly stated that , "Banks have expressed concerns about lending to this new sector, including worries that solar equipment may not perform as expected under Indian climatic conditions, which would affect projects ability to produce enough power to pay back loans".

In article, "Switching in India's Solar Future" published in Indian Express (2010), it is clearly stated that for improving the success rate of solar, Government of India should create a clear and very consistent regulatory environment.

G. Sargsyan et al (2011) in World Bank Study have clearly stated that India has about 150 GW of RE potential and developing this source of energy can go a long way in increasing the energy security, reducing the adverse impact on the environment as well as reducing the carbon emissions and can also contribute towards regional development as well as development of high tech industries. This study which is based on the data from approx. 180 Renewable Energy Developers across 20 Indian States are has tried to analyse the relevance of RE development in Indian Context and also as to the economic feasibility of RE development and steps needed to realize the RE potential.

Study clearly concludes that there are significant financial as well as non-financial barriers to RE development in India. They grouped the barriers into three categories: -
1. Financial Viability
2. Support Infrastructure
3. Regulatory approval.
Based on discussions with various stakeholders, study clearly concludes that Recognition and Management of Risk is Crucial for RE development.

As per Engelmeier, T.et al. (2011), an estimate suggests that only even if 1% of India's land mass is used for installing solar capacity, the solar capacity in India would reach 800 GW. However solar power prices yet cannot compete when it comes to conventional source of energy. In July, 2011 cost of solar power from utility scale system was three times more as compared to that of coal power.

As per WISE Report (2011), it is clearly stated that:

1. High untapped solar potential is extremely important from the energy security angle.
2. Report also states that banks are reluctant to lend to RE sector due to some real, some imagined risk perceptions.
3. Lenders are also not willing and very reluctant to provide non-recourse project financing for RE projects.
4. To improve lenders perception, risk mitigation measures are essential
5. Prevailing interest rate in debt are prohibitive and is the single most important factor making the Renewable Energy Projects not viable. Interest rate should be brought down.

Sharma, N.K. et al (2012)62 have stated that:

1. India is facing severe problem of electricity shortage. Various Renewable Energy Sources have potential to provide solution for various kinds of energy problems of developing countries like India.
2. Solar Energy can be genuinely considered to be an important part in capacity addition as well as for increasing the energy security.
3. Development of solar energy can also be an important tool for regional economic development in India as there are many underdeveloped Indian states which are having very high potential for solar power generation.
4. Western Rajasthan has the maximum irradiance whereas North Eastern region of country have the least.

Authors concluded that photovoltaic power system will have important share in future electricity in India as well as all over the world.

## 4. Problem Statement:

Despite of India having cost advantage in renewable energy in terms of cheap labor and construction cost, cost of Renewable Energy is as high in India as in US or even higher and that is due to higher financing cost. High cost of debt is the most significant problems in the field of Renewable Energy Financing. We may conclude that the high interest rate and relatively short term durations amounts to additional 24-32% increase in cost of renewable energy here in India as compared to the projects of similar nature in US or Europe.

It is also categorically may be stated that domestic banks generally restrict the funds to be lend to RE power projects. Less than 1/3 of Public Sector Banks and less than 1/5 of private sector banks lend to RE projects. Banks have cited unfamiliarity with the RE sectors and perceived riskiness of RE project as the reasons for the dismal performance of the sector. It is also stated that there is a clear distinction between lenders and equity providers when it comes to RE finance. Debt financiers are more conservative as compared to equity investors.

"Recovery of debt and legal enforceability of non-recourse debt in India is a key risk to the lenders."

Following are the significant finding of the study:

1. Solar Projects in India are still struggling to get debt finance.
2. Non availability of non-recourse finance is a key hurdle.
3. It has been recognized that conventional bank financing is not sufficient and various innovative finance mechanisms needs to be worked out.
4. Indian banks, NBFCs are charging close to 13% and more for financing solar projects. This escalates the solar power costs.
5. It is the lender who assesses risk of the project and decides whether to lend or not. Thus project developer along with other stake holders must work towards mitigating all risks which are considered to be critical at project level in order to secure financing at suitable terms.
6. They have classified project risks into three categories from lenders perspectives and also mentioned the steps which could be taken to mitigate them.

**Financing plays an important role in making the proper realisation of a project being meant for the national interest.**

## 5. Need for the research: What prompts me to do the research?

From review of the above work done in the field of Renewable Energy, it is very clear that RE sector is gaining attention from the scholars all over the world. There is a unanimous opinion that within the RE sector, solar is a viable option.

In Global context significant work has been done in the area of Renewable Energy in general and Solar in Particular. Approach of finance sector is same when it comes to RE investment or any other investment and that is the concept of risk and return. Thus Effective research on Risk Management is key for deployment of fund in this sector. Existing literature also points out that in public debates and political disclosures; return provided to the investors is being highlighted whereas risks tend to be less prominent Existing research also concludes in no uncertain term that lowering cost is extremely important for growth of RE sector. Cost of power from projects utilizing RE technology is extremely sensitive to financing terms. Lowering risk or in other words managing risk is extremely important because of its impact on the financing cost. Survey of existing literature also highlights that for developing countries in general, application of Financial Risk Management is limited. A generic list of various risks affecting the financing of RE projects has been prepared.

From the review of India centric studies, there is a unanimous agreement among the scholars that RE is a viable option for the country seeing its huge potential and within RE, solar is undoubtedly very promising source. Survey of the existing study also reveals that private investment has been the key driver of growth of renewable and it needs to be increased in order to achieve the set targets and as it is already mentioned that private sector believes in the concept of risk and return. Existing literature also reveals that there are financing issues in solar power sector like reluctance of lender in providing funds and also the high cost of funds where available. This is a clear indication of need of appropriate financial risk management in this sector. Research need to be carried out over the following risks featuring in most of the existing studies conducted:

1. Regulatory Risk
2. Construction Risk
a. Time Over run
b. Cost Over run
3. Counter Party Risk
a. Construction Contractor
b. O&M Contractor
4. Finance and Economic Risk
5. Power Off Taker Risk
6. Resource assessment Risk
7. Force Majeure Risk

## 6. Objectives:

The main objective of the report is to find out the various financing mechanisms which are presently available in India to fund Solar Power Projects. This report covers the detailed analysis of the various financing mechanisms highlighting the benefits and limitations of each of the financial instrument.

Another objective of the report is to highlight various other financing techniques which are quite different from the traditional sources of fund. These financing instruments are becoming popular in some developed and developing countries. Developers and lenders have also shown interest in these contemporary financial techniques by giving them a successful start.

These techniques have not yet been introduced in India but talks are going on between government and the private players which show that soon India will find a way to introduce these financing instruments.

## 7. Research Methodology: -

The review of financing for research and development, demonstration, and early commercialization was supported by a detailed literature search, interviews, and discussions. For the commercialization stage, a few case studies were undertaken covering projects that present a sustainable and replicable model of financing. The cases were selected on the basis of their capacity to promote financing by end users themselves as well as on their contribution to the development of a system of operation and maintenance at the community level.

## Case Studies-I

**a. Solar PV mini-grids, a combination of government and community financing---- Sunderbans, West Bengal.**

The case study of solar PV-based mini-grids in Sunderbans describes a model of combining government and community financing to promote renewable energy in India. Since PV technology is very expensive, it is often beyond the reach of poor people even if credit facilities are available. On the other hand, PV is also the most user-friendly and field-matured technology to be used in remote locations for developmental applications such as for the provision of electricity for the basic needs of lighting, communication, clean water supply, education, primary health services, and a few commercial activities. Since village electrification is primarily considered to be a social responsibility of the Government, funding for such projects mainly comes in the form of government subsidies. This presents yet another dilemma, as the unfavourable cost-economics of PV technology do not always justify their use. The funding pattern of Sunderbans mini-grid projects is an attempt to overcome this problem in a unique manner based on a fee-for-service approach that matches the paying capacity of the user to the level of services provided, and an effective use of varied developmental funding for setting up the utility.

West Bengal Renewable Energy Development Agency (WBREDA), the state agency for executing offgrid electrification projects, has leveraged an MNES subsidy (central funding) to take care of the initial cost of the generating unit, while WBREDA's own resources (state funding) and local developmental funds were mobilized to lay the distribution networks. Revenue collection from the sale of electricity, which is done through the account of the co-operative society in the rural bank, provides for the lifetime costs of the operation and maintenance of the facility. The combination of the central subsidy for renewables, state subsidy, and local area development funds is in the ratio of 70:20:10. Each consumer invests about US$45 towards application fees for receiving the connection and internal wiring. The monthly fixed tariff is about US$2.50 for consuming 18–20 kWh of electricity. The financing arrangement is complemented by a unique institutional structure involving the technology provider, local entrepreneurs, and the community for operation and maintenance, sale of electricity, billing, and revenue collection. Transparency in transactions, involvement of multiple stakeholders in planning and managing the scheme, and consumer satisfaction are the backbone of this institutional structure.

## Case Studies-II.

**Developing a market-oriented institutional and financial model for decentralized solar systems—Rajasthan, Uttaranchal**

This case study addresses the limitations of delivery mechanisms currently practiced in conventional government subsidy-driven programs. A unique institution called the Energy Service Network (ESN) has been the focus of Uttam Urja, a project for implementation of renewable energy technology systems in rural areas through NGOs. The ESN is an entrepreneurial model conceived by The Energy and Resources Institute (TERI) and funded by the India-Canada Environment Facility. The project focuses on developing a grassroots ESN comprising local NGOs, dealers, and retailers of commonly used electronic gadgets. These local enterprises offer custom-made products and services in remote rural areas. Currently, the setting up of the ESN is being facilitated and co-ordinated by TERI, which is focusing on enhancing the capacity of the network's members.

Once the ESN has been established, it will consolidate its network with existing financial intermediaries and manufacturers of solar home lighting systems. The project addresses the limitations of the subsidy regime, particularly with respect to technology customization and innovative delivery mechanisms. It presents a package of energy products and services to rural people rather than providing just the technology, as has been the case in various other initiatives undertaken by the Government. The delivery of such a package has necessarily involved the provision of easy credit; customized products; and quality repair, maintenance, and advisory services through building and engaging local capacity and local economies.

**Case Studies-III.**
**Financing solar PV systems through rural finance institutions—Karnataka, Kerala, and Andhra Pradesh.**

The business model of SELCO-India, a solar energy service company (ESCO) operating in southern India since 1995, aims to develop an innovative consumer finance scheme through rural credit institutions, with loans available from local banks and co-operatives, along with a sales, installation, and maintenance network in the villages. Since most end-users in rural areas cannot afford to buy a solar PV system up-front, this business model allows staggered payments over a three to five-year period, with loans provided by rural financial institutions.

SELCO offers a lease-to-own scheme wherein the consumer pays one-quarter of the system cost up-front, while the rest is given to him or her by the financial institution as a loan at 12.5 % interest per annum. An important and effective part of SELCO's strategy has been to form tie-ups with financial institutions like the Syndicate Bank to provide loans for solar PV systems. One such partner is the Malaprabha Grameen Bank (MGB), a rural development bank with 200 branches in Dharwad and Belgaum districts of Karnataka, known for its innovative micro-credit schemes. Where no other type of financing is available, SELCO has set up its own financing arm offering loans at a low interest rate, with IREDA re-financing 2.5 % per annum using low-cost World Bank funds available through the photovoltaic lending program of IREDA. As rural customers are at the lowest level of the financing ladder, doorstep financing through rural financial institutions (registered farmers' cooperative societies or cooperative banks) contributes to reducing the borrowing transaction costs, thus increasing affordability for rural customers. The SELCO financing scheme has succeeded in responding to consumer willingness to pay for better lighting services by providing financing adapted to the repayment capability of rural people. Central to the approach has been the successful partnership developed with rural financing institutions and local solar entrepreneurs and technicians. This builds confidence, on the side of both lenders and borrowers, in the viability of the technology and its business profitability.

**Case Studies-IV.**

**Consumer financing for solar PV systems through low-interest bank lending—UNEP Solar Power Initiative.**

This $7.6 million initiative was launched in March 2003 between the United Nations environment Programme (UNEP) and two of India's largest banking groups to help 18,000 southern Indian households finance clean and reliable electricity from solar power. The UNEP program is made possible with support from the United Nations Foundation (UNF) and the Shell Foundation. Under the UNEP program, households are able to purchase SHS at an interest rate of approximately 5 percent per annum, compared with the normal consumer lending rates of 11–12 percent.

The Syndicate Bank and Canara Bank offer new low-interest loans under the program, which is aimed at buying down the financing cost of SHS. These two banks are credited with introducing many of the most innovative rural financial products through an extensive network of rural branches and though linkages with self-help groups in Karnataka and Kerala.

## 8. Sources of data –

The report has been compiled on the basis of secondary data sources. The research initiative aims at providing comprehensive and structured data and providing recommendations with alternatives in the purview of funding mechanisms for solar power projects in India. For this purpose, data sourcing from diverse sources like national international reports presented by various global agencies, news-pa per articles, journals have been undertaken.

The study is qualitative in nature and not much primary data is there. So no analytical tools have been used in the preparation. The report has been prepared after doing a qualitative analysis of the data collected. Some bar charts, graphs are used to make the data more understandable to the reader.

## 9. Sampling-

Random Sampling Technique was used to collect the data. Various interview/review/seminar/judgments/analysis/opinion of experts has been referred from various sources on online mode for preparation of the dissertation report.

## 10. Expected outcome of the study-

The findings of this research to date indicate that government finance, international funding mechanisms, private-sector finance, and community-based finance all play different roles at different stages of the renewable energy development cycle, not only individually but also in various combinations. The research also shows that the role of these four financing mechanisms is technology specific and varies depending on whether wind or solar applications are considered. The authors would like to alert readers to the fact that this research note only aims to identify the role of the various financing instruments at the different stages of the cycle. It is hoped that a quantification of the share of financing from the respective financial instruments, as well as drawing of policy conclusions on what category of finance best addresses specific barriers at each stage of the cycle, will be provided when the research is completed. Informed by the Indian experience, an innovative financing mix could then be envisioned for other countries that are initiating policies for a sustainable and demand-driven renewable energy development strategy.

**Government financing:-**

Government financing has been crucial at all phases of development of both off-grid solar and wind power, except for the full commercialization of wind power. For solar energy, the technology is still beyond the reach of many potential customers and many new market segments are constantly opening where government support is required. In fact, the solar power sector is currently going through two parallel stages: demand-driven commercialization and a subsidy-driven, socially-oriented rural electrification market for which Government support is crucial. Removal of subsidy can only be envisaged in terms of gradual policy change.

As a result, the innovation that can be observed with respect to government finance is in the area of modes of delivery. This involves innovative combinations of central government subsidy with local development funds and end-user fees, as in the **Sunderbans** solar PV mini-grids case; or a combination of subsidies with loan-ownership models. A parallel study being undertaken in China reveals a new mode of delivery relying on competitive bidding among potential suppliers of solar systems in seven western provinces (Xinjiang, Qinghai, Gansu, Inner Mongolia, Shaanxi, Sichuan, and Tibet), with the objective of finding the optimal use of government subsidy. Bidding among potential suppliers of PV systems there has led to a reduction in the price of village power systems from about US$20/Wp to about US$15/Wp.

**International funding mechanisms, including the Global Environment Facility and CDM:-**

For solar power applications, international funding mechanisms have been involved in demonstration, early commercialization, and full commercialization, but not in research and development and product/technology development phases. One of the possible reasons is that the goals of research and development at macro level are common irrespective of where it is taking place. To elaborate further, the focus of global research and development is on new materials, improved processing, and fabrication techniques and on new solar cell designs to reduce the cost of the technology. Such investment-oriented research and development usually takes place in industrialized countries only. Foreign aid and investment are received either for the demonstration of a product, with a hidden agenda of technology push, or for the commercialization stage, where a certain level of return is assured.

The same arguments hold good for the wind power sector, except for the fact that the Government of India took the lead in the demonstration stage of wind power development and hence foreign aid has not been so significant. It is noteworthy that while international funding mechanisms such as the Global Environment Facility have initially focused on financing demonstration projects, recent initiatives such as the UNEP Solar Power Initiative have come to be involved on the side of consumer financing, with the objective of facilitating access to commercial lending from banks.

**Private finance, including energy service companies:-**

Private finance, including from energy service companies, only comes at the stages of early or demand-driven commercialization for both solar and wind power sectors. Private-sector finance has been most prominent in the solar power sector, where consumer financing schemes are being developed for various applications. For a large share of the market in rural areas, private sector finance comes in the form of lease-to-own models wherein the consumer pays part of the system cost as an up-front payment and the rest is covered through loans by financial institutions, or through financing schemes designed by energy service companies themselves. Direct consumer access to lending by financial institutions appears to be limited. Manufacturers and distributors generally serve as go-between institutions between end-users and financial institutions in facilitating access to loans. In the wind power sector, private financers have been involved in large-scale projects both by Indian project developers and through joint ventures. Once the private sector is involved, it invests in product customization as it sees the direct linkage between growth of a particular market and development of suitable products for that market. The wind power sector has already witnessed this phenomenon; it is also starting to be seen in some small pilot projects in the solar power sector.

**Micro-credit and community-based finance:-**

Micro-credit and community-based finance have not played any role in the development of wind power applications. This is understandable, because communities only invest once they are the owners of a scheme. Since this study has only looked at grid-connected wind power projects, there have been no instances where a community has directly benefited by these projects. Unlike decentralized solar PV, grid-connected power projects are owned by the state, utility, or project developer and their investments are considered as either government or as private sector. As for decentralized solar applications, community-based financing comes into play in various forms—in combination with government subsidy, as in the Sunderbans PV mini-grids case, or through loans from banks and rural finance institutions. Since the high up-front costs still make solar power systems unaffordable for low-income communities that can only rely on micro-credit and community financing schemes, leveraging local finance would still have to be considered as part of a financing package involving some form of public or international financing. Alternatives would include staggered financing schemes through lease-toown models.

As stated in section 3, this research has not reached a stage where strategic policy options can be introduced. At the present stage, it has examined the existing financing options with respect to the various stages of the production–commercialization life-cycle. The research should now attempt to analyse the implications of policy instruments such as the liberalization of the energy market for these financing mechanisms. **The interactions of these two streams should point at strategic policy options that would facilitate innovative financing mechanisms for the development of the renewable energy sector.**

Given that a similar study is also being undertaken in China, it is hoped that the final comparative analysis will provide insights into specific policy measures and country-specific circumstances that explain achievements in removing the financial barriers for the development of renewable energy.

Various existing studies have mentioned a comprehensive list of various risks affecting the financing of RE sector in general and solar sector in specific and also the risks concerning lenders is also highlighted but there is no study which includes the perception of various stakeholders like developers, lenders as to various risks affecting debt financing. Similarly though there is a comprehensive list of risk management options and instruments but there is no study which refers to the extent of usage of actual tools employed to manage risks and also about the effectiveness of various risk mitigating measures available and employed. This study is a humble and maiden attempt to study the process of Risk Management of risks specifically affecting debt financing in Renewable Energy Sector with reference to Solar Power Projects (PV) exclusively in India.

**The inputs from the descriptive research were factored to derive the necessary conclusions to enhance the use of Solar Energy Financing Techniques to endorse Use of Solar energy in India to meet the expected Target i.e. 175 GW by 2022.**

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----------End of Report----------
Thank You

## List of Abbreviations

| | |
|---|---|
| AD | Accelerated Depreciation |
| ADB | Asian Development Bank |
| CDM | Clean Development Mechanism |
| CERC | Central Electricity Regulatory Commission |
| CUF | Capacity Utilization Factor |
| DSCR | Debt Service Coverage Ratio |
| DISCOM | Distribution Company |
| DFI | Development Finance Institution |
| EPC | Engineering Procurement Construction |
| EBITDA | Earnings before Interest Tax Depreciation & Amortisation |
| ECB | External Commercial Borrowing |
| FIT | Feed-in- Tariff |
| FI | Financial Institution |
| IDF | Infrastructure Development Fund |
| IREDA | Indian Renewable Energy Development Agency |
| IFC | International Finance Corporation |
| IPP | Independent Power Producer |
| JNNSM | Jawaharlal Nehru National Solar Mission |
| LCOE | Levelized Cost of Electricity |
| LOC | Lines of Credit |
| LIBOR | London Inter-Bank Offered Rate |
| MNRE | Ministry of New and Renewable Energy |
| MLP | Master Limited Partnership |
| NVVN | NTPC Vidyut Vyapar Nigam |
| NTP | National Tariff Policy |
| NBFC | Non-Banking Finance Companies |
| NAPCC | National Action Plan on Climate Change |
| OPIC | Overseas Private Investment Corporation |
| PPA | Power Purchase Agreement |
| PFC | Power Finance Corporation |
| RPO | Renewable Purchase Obligation |
| REC | Renewable Energy Certificate |
| REID | Renewable Energy Infrastructure Development Fund |
| RESCO | Renewable Energy Service Company |
| RMM | REC Market Maker |
| SECI | Solar Energy Corporation of India |
| SERC | State Electricity Regulatory Commission |
| SPV | Special Purpose Vehicle |
| VGF | Viability Gap Funding |

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# CHAPTER-1

# INTRODUCTION

## 1.1 OVERVIEW OF INDIAN SOLAR FINANCING SYSTEM

Solar projects in India still struggle to raise debt finance. So far, only a small percentage of projects have attained non-recourse financing. Most have worked with either limited recourse or full recourse finance. Banks that have in the past provided non-recourse financing are either Indian commercial banks or international lenders with a development mandate. There are difficulties in obtaining non-recourse finance in India due to several reasons:

- On the macro level, lenders have concerns with debt recovery and the legal enforceability of claims in India. This is a concern that extends to any project related finance in India. The best way for a project promoter to reduce this concern is through a strong company reputation and banking relationship as well as through the actual track record of debt repayment and future plans and debt requirements.
- On the intermediate level, with respect to the Indian solar market, banks have two main concerns:
  - The first is the limited availability of irradiation data, which forms the basis for projecting future revenues.
  - The second is the strength of public PPAs due to the weak financial health of public utilities.

On the project level, there can be projects that are simply not well developed. A well-developed project usually starts from the perspective of the debt provider by identifying and mitigating risks.

Currently, a dynamic, early stage, uncertain and regionally diverse regulatory environment also negatively impacts project bankability by keeping the transaction costs for lenders high. The nature of solar power projects with their high upfront capital requirements and low operational costs, typical of infrastructure power projects further emphasis the bankability challenge. Apart from that, interest rates in India have been at an all-time high. Solar project is financed by Indian Banks, NBFCs and infrastructure funds end up paying an interest rate of over 13% per annum.

Unavailability of non-recourse financing is a critical hurdle in the expansion plans of developers as they cannot continue to accumulate recourse on their balance sheets. Till the time non-recourse financing becomes more readily available in the Indian market, access to the right financing options will remain the key differentiator across different developers and their projects.

## 1.2 COST OF FINANCING

The majority of solar power project costs occur at the beginning of the project with the initial capital investment. As Figure 1 illustrates, the initial capital cost of solar photovoltaic, often comprise nearly 90% of total project costs. In contrast, the initial investment of thermal projects represent only one-third of the total discounted lifetime costs. The ratio of initial capital investment to operating costs varies from plant to plant. In the case of coal and gas, the exact proportions depend in large degree on fuel expenses, which can drive operating costs.

However, by this simple measure, initial capital costs and therefore financing are roughly 60% more important for renewable energy. Most renewable energy projects use debt – either directly at the project level or on the balance sheet of the corporate owner – to reduce the cost of financing. Therefore, the availability of low-cost debt is a critical driver of renewable energy costs.

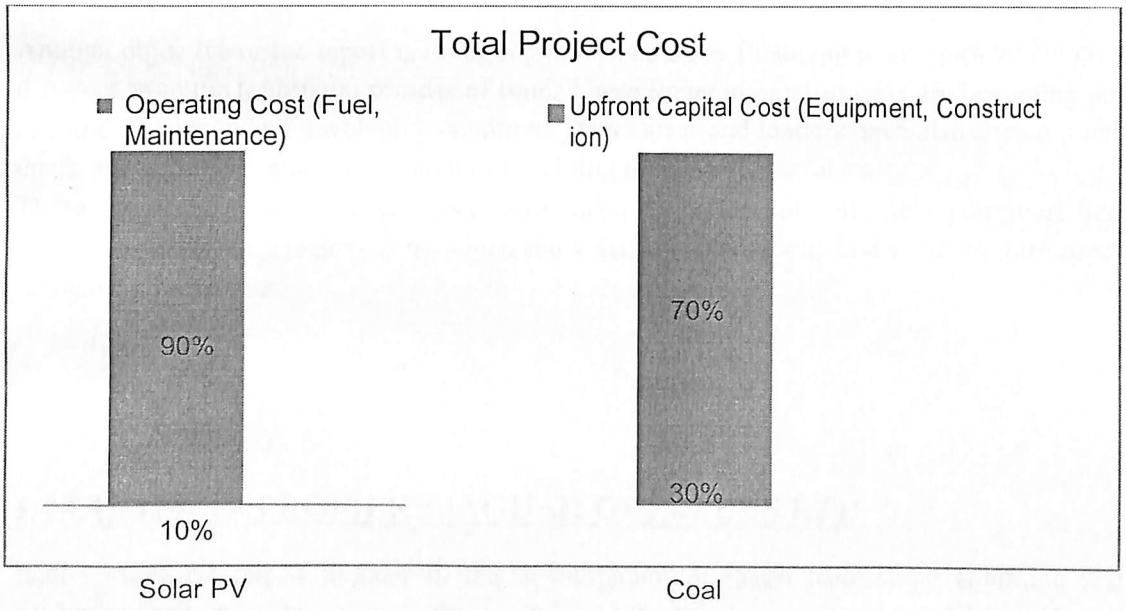


Figure-1: Distribution of Total Project Cost

Based on data published by the EIA, the percent of total project costs consumed by upfront capital costs varies from 66-69% for coal, and 84-93% for wind, PV, and hydropower. This figure illustrates the high proportion of renewable energy project costs spent on up-front capital.

In many rapidly developing countries, debt is less available and significantly more expensive than in developed markets. Developing countries have many competing needs for capital. As the economy grows, countries build infrastructure and their businesses expand their offerings, all of which increases the demand for debt. However, immature financial markets, higher risks, inflation, and the lower saving rates of young populations limit the supply of capital available for long-term investment. These dynamics lead to debt that is more expensive and less available.

## 1.3 OBJECTIVE OF THE PROJECT

The main objective of the report is to find out the various financing mechanisms which are presently available in India to fund Solar Power Projects. This report covers the detailed analysis of the various financing mechanisms highlighting the benefits and limitations of each of the financial instrument.

Another objective of the report is to highlight various other financing techniques which are quite different from the traditional sources of fund. These financing instruments are becoming popular in some developed and developing countries. Developers and lenders have also shown interest in these contemporary financial techniques by giving them a successful start.
These techniques have not yet been introduced in India but talks are going on between government and the private players which show that soon India will find a way to introduce these financing instruments.

## 1.4 COMPANY PROFILE : JAGUAR OVERSEAS LTD

Jaguar Overseas Ltd is pioneer in the development of green technology solutions that are environmentally friendly, energy efficient & cost effective and are capable of delivering a quick return on investment.

JOL is one of the most competitive solar companies in India providing Consulting-Engineering-Contracting-Commissioning services with extensive experience and expertise in the industry dedicated only to development of solar power plants.

We provide our services for both grid-connected and off grid solar projects on pure turnkey basis i.e. we take care of everything from designing of the plant to its commissioning; and take it even further through operations and maintenance. We also cover typical service s like regulatory matters, getting statutory approvals, land identification and acquisition etc. To put it in a nutshell, we are a one stop shop for all your solar needs.

**Projects:**
**ON GOING 10 MW SOLAR PROJECTS AT KANDAHAR, AFGHANISTAN**

Apart from this JAGUAR OVERSEAS has their own T&D Projects in the region of Western African Countries like Benin and TOGO being funded by Exim Bank & various Domestic Projects across INDIA.

## 1.5 REVIEW OF CURRENT SCENARIO OF SOLAR POWER IN INDIA

India lies in the sunny belt of the world. India is endowed with vast solar energy potential. Most parts of India get 300 days of sunshine a year. About 5,000 trillion kWh per year energy is incident over Indian land area with most area receiving 4-7 kWh per sq. meter per day. Hence, both technology solar thermal and solar photovoltaic can effectively provide huge capability for solar in India. Solar also provides the ability to generate power on a distributed basis.

India is ranked 5th in solar power generation in the world as on 2019. India is at the cusp of a solar revolution, the government has already set an ambitious target to achieve 100 gigawatt (GW) by 2022. Keeping the target in mind, Indian states have already started ramping up their installed solar and wind powered capacity In India.

Renewable energy, especially solar power, has been garnering a lot of interest from governments, international development organizations, civil society, and the private sector for the last few years. There has been a huge surge in the popularity of this important energy source from various stakeholders in India as well. With the creation of the Jawaharlal Nehru National Solar Mission (the Mission) in 2010, India declared its interest in becoming a global leader in solar power development.

# CHAPTER-2

# HIGHLIGHTS OF NATIONAL SOLAR MISSION

## 2.1 INTRODUCTION

The National Solar Mission is a major initiative of the Government of India and State Governments to promote ecologically sustainable growth while addressing India's energy security challenge. It will also constitute a major contribution by India to the global effort to meet the challenges of climate change.

### 2.1.1 JNNSM Phase-I

In order to facilitate grid connected solar power generation under the first phase, without any direct funding by the Government, Cabinet had approved NTPC Vidyut Vyapar Nigam (NVVN) as the nodal agency to purchase 1000 MW of solar power from the project developers, bundle it with the unallocated power available from the NTPC coal-based stations and sell this "bundled" power to the distribution utilities.

In the Phase 1 of the Jawaharlal Nehru National Solar Mission (JNNSM), 950 MW solar power projects were selected in two batches (batch-I during 2010-11 and batch-II during 2011-12) through a process of reverse bidding. Additionally, 84 MW projects were selected under the migration scheme.

- **Batch-I (2010-11):** The resulting tariffs in Batch-I for SPV projects ranged between Rs.10.95 and Rs.12.76 per unit, with average of Rs.12.12 per unit and for solar thermal projects the tariff ranged between Rs.10.49 and Rs.12.24 per unit, with average tariff being Rs.11.48 per unit.

- **Batch-II (2011-12):** In Batch-II, for solar PV projects, the tariff ranged between Rs.7.49 and Rs.9.44 per unit, with average tariff being Rs.8.77 per unit.

| Application Segment | Targets for Phase-I (2010-13) | Achievements for Phase-I |
|---|---|---|
| Grid solar power (large plants, roof top & distribution grid plants) | 1100 MW | 1,684.4355 MW (including those under state initiative) |
| Off-grid solar applications Allotment | 200MW | 252.5MW |
| Solar Thermal Collectors (SWHs, solar cooking, solar cooling, Industrial process heat applications, etc.) | 7 million sq.m | 7.001million sq.m |

Table-1: JNNSM Phase-1 Achievements

### 2.1.2 JNNSM Phase 2, Batch 1 Highlights

Under this batch, a total of 750 MW of solar PV projects will be allotted to interested developers through a competitive bidding process. In the Phase 1 of the JNNSM, the projects were allotted through a reverse bidding process wherein the bidders had to offer a discount on the reference tariff (Rs./kWh). However, in the Phase 2, Batch 1 allocation process, a new process called Viability Gap Funding (VGF) has been introduced.

Under the VGF based process, all the selected projects will enter into a 25 years Power Purchase Agreement (PPA) with the SEC I at the rate of Rs. 5.45 per kWh. The PPA tariff for projects availing the Accelerated Depreciation (AD) tax benefits will be Rs. 4.75/kWh. In addition to the PPA, the winning projects will also be given the "Viability Gap Funding", which has been requested by the Project Developer at the time of bidding. The maximum VGF a bidder can request is 30% of the project cost or Rs.2.5 Crore/MW/project, whichever is the lower.

There will be two categories of projects – one with Domestic Content Requirement (DCR) and non-DCR. The total target of 75 0 MW of capacity has been equally divided between these two categories.

The capacity of each project should be at least 10 MW and at the most 50 MW. The project size should be in multiples of 10 (10 MW, 20 MW, 30 MW, 40 MW and 50 MW). The maximum total capacity that will be allotted to one company will be 100 MW and the total projects that can

Allocated to one company will be 5 even though they can bid for 200MW spread over 10 projects in the two categories (DCR and non-DCR).

SECI has released the official list of winners for JNNSM phase-II Batch-1. The 750 MW of projects were split between 22 projects in Part A (DCR) and between 25 projects in Part B (Open). The average size per project in Part A and Part B are 17 MW and 15 MW respectively. The total VGF outgo for the Government of India is Rs. 1,200Crores. It may be recalled that Rs. 1,875Crores were earmarked by the Government towards the 750 MW of projects, and the actual amount required to be disbursed is now more than 30% less than the earmarked amount.

## 2.2 FUND REQUIREMENTS FOR NATIONAL SOLAR MISSION

Investments worth approximately INR 10020 billion were deployed for Phase I of JNNSM and Phase II would require approximately INR 700 billion (US$11.67 billion). These requirements are likely to increase as the program is expected to expand exponentially over the subsequent phases. As public funding is limited, large amounts of private investments need to be mobilized to meet the mission targets; the private-led model adopted under JNNSM is thus appropriate and efficient.

As per World Bank, the total requirement of funds for phase-II is of the order of INR 800 billion ($13 billion) of which, as high as Rs 54,000Crore ($9 billion) will be debt base d on a 70:30 debt equity ratio.

## 2.3 PHASE I FINANCIAL MECHANISMS

- ***Mechanisms Employed by the National Solar Mission:***

➢ ***Feed-in Tariffs (FiTs)***: Both batches of Phase I of the Mission employed a reverse auction bidding process managed by NVVN. Outside of the Mission, the State Electricity Regulatory Commissions (SERCs) declare FiTs for state projects.

➢ ***Long-Term Power Purchase Agreement (PPAs):*** Under Phase I of the Mission, solar power developers received long-term (often 25 years) PPAs at preferential tariffs. This provided a strong incentive for developers, but a heavy burden to energy distribution companies (DISCOMs) that were obligated to purchase power at the FiT rate but sell at much lower government-mandated retail rates.

- ***Power bundling*** of renewable with conventional power: During Phase 1, generators sold electricity generated from both solar and conventional resources at a 1:1 ration at a blended rate. This bundling reduced the average LCOE compared to a LCOE based solely on solar generation. Under this program, NVVN purchased 1 GW of solar power, bundled it with electricity generated from NVVN's own coal-fired plants, and sold the bundled power at a rate below Rs. 5per kWh.
- ***Multilateral and Bilateral Funding:*** Low cost international financing was a major funding source for Phase I projects, particularly from German-based KfW, and American-based Export-Import Bank (EXIM) and the Overseas Private Investment Corporation (OPIC). OPIC funding, for example, supports investment from U.S. companies in the Indian market by insuring up to $250M in total solar project value. Many of these international funding sources' portfolios limit how much financing will be available for Phase II projects, however.

- ***Clean Development Mechanism (CDM):*** India ranks second in the world in the number of CDM projects hosted (2,252 total) and credits generated. CDM is a scheme under the Kyoto Protocol to the United Nations Framework Convention on Climate Change under which a country with a commitment to reduce its emissions may implement a project in a developing or newly-industrialized country that reduces emissions there and receive credit (CER, measured in quantity of abated CO2 emissions) for the emissions reduction against the country's own reduction commitment. Project developers can register their projects with the Ministry of Environment and Forests to participate in the credits markets.

- ***Renewable Purchase Obligations (RPOs):*** Renewable purchase obligations (RPOs) mandate clean energy targets that utilities must need. A critical challenge in India's RPO framework is a lack of enforcement. This means not only ensuring that the State Electricity Regulatory Commissions (SERCs) adopt the RPO standards mandated by the NTP, but also ensuring that the SERCs have the power and will to see that the RPO standards are met. Additionally commitments to RPO targets over longer time periods would increase investor confidence that the REC market will exist in the longer term.

- ***Renewable Energy Credits (RECs):*** India created its REC market in 2011 as an attempt to provide an incentive to those areas with higher potential for renewable power generation, such as Gujarat, to generate renewable. Renewable power developers may choose to utilize the FiT or REC for a project, but not both. The market for solar RECs suffers from insufficient demand, with bids to sell priced 3-4 times higher than bids to buy RECs in June 2013. In response to sluggish demand for RECs, CERC doubled the lifetime of RECs from one year to two years, but whether this change will have a significant positive effect on the REC market is unclear.

- ***Self-financing:*** By big industry players helped buoy many Phase I projects that could not access affordable financing from other sources. Relying on the company equity will not be enough for Phase II to achieve its scaled up targets, however.

- ***Key Financing Mechanisms Employed at the State Level during Phase I:***

- ***Feed-in Tariffs*:** State Electricity Regulatory Commissions (SERCs) of individual Indian states designate their own FiTs for solar power projects outside of the mission. For example, Gujarat's preferential tariffs supported about two-thirds of the total solar photovoltaic systems in India till 2012.

- ***Accelerated Depreciation (AD):*** Under an AD scheme, a solar power generator may depreciate its capital asset (the solar project) earlier than would otherwise be permitted, providing a tax benefit of offsetting profits in earlier tax periods. In Gujarat, project developers have the option of depreciating percent in the first year. However, a shortcoming of AD schemes for renewable energy is that the company often has low taxable profits in early years of the project anyway, which limits the value of the AD. One solution is to provide generating companies with certificates that carry rights to AD benefits, rather than the benefits themselves, and allow the certificates to be traded.

- ***Bank Guarantees:*** Some states require solar project developers to obtain bank guarantees in connection with their project financing. In Gujarat, the developer of a solar project must provide a bank guarantee of Rs. 50 lakh per MW. In Madhya Pradesh, the developer must provide a bank guarantee of Rs. 5lakh per MW.

- ***Net Metering:*** Tamil Nadu is developing a net metering scheme whereby commercial and residential customers may earn "power credits" for energy provided to the grid by solar power systems.

- ***Renewable Energy Infrastructure Development Fund (REID):*** Rajasthan developed a REID Fund that will provide financing for transmission lines and other infrastructure related to renewable energy deployment.

- ***Charge Exemptions:*** In Andhra Pradesh, solar power generators are exempt from wheeling and transmission charges on electricity sold within the state. Similarly, Tamil Nadu exempts solar power projects from wheeling and banking charges.

- ***Subsidies:*** Chhattisgarh provides to solar energy developers subsidies on interest and capital investment as well as exemptions from electricity and stamp duties through March 2017.

## 2.4 FINANCIAL MECHANISMS PROPOSED OR ADOPTED FOR PHASE II

The following financial mechanisms have been adopted in the Phase II guideline s, or proposed to coincide with the Mission's second phase:

- ***Viability Gap Funding***: The viability gap funding (VGF) scheme described in the previous section is intended to support infrastructure investments through public-private partnerships (PPPs). The VGF target capital grants to facilitate cert ain infrastructure projects that the government determined were necessary but were not commercially viable without government intervention to "meet the funding gap. Reverse auctions will be held during Phase II to select the lowest VGF bids needed to fund potential projects.

- ***Feed-in Tariffs (FiTs):*** Government support of FiTs is critical to the success of solar power in India. Approximately 67 percent of the levelized cost of energy (LCOE) for solar power in India is supported by FiTs. In Phase II, CERC will issue FiTs for solar power for each fiscal year.

- ***Credit Guarantees:*** The Ministry of Finance recently approved a program that would provide a guarantee of u p to 20 percent of the debt financing of projects in the power sector, including projects in renewable energy. The guarantees allow projects to attain a higher credit rating, thus broadening the investor pool to include pension funds and insurance companies and lower rates.

- ***Priority Sector Lending***: Including renewable energy in priority sector lending has been widely discussed as a means to increase the amount of funding available for solar power projects. The recent prioritization of off-grid solar by the Reserve Bank of India and of solar water heaters by several major banks' loan programs are working example of this mechanism's deployment to spur clean energy expansion.

- ***Infrastructure Debt Fund (IDF)***: In 2011, the Reserve Bank of India issued guidelines for the operation of new IDFs, structured either as mutual funds or companies, which would provide a conduit for debt financing into infrastructure projects. Although IDFs may be used for any type of infrastructure asset, they have not yet been used for renewable energy projects.

- ***Social Venture Capital Funds***: Non-profit venture capital funds, such as Acumen, that evaluate businesses based on their social or environmental performance in addition to financial performance and invest charitable donations have had some early success in India's energy market.

# CHAPTER-3

# CHALLENGES AND RI SK FOR SOLAR POWER PROJECT S IN INDIA

## 3.1 PRESENT CHALLEN GES

- ***Cost and T&D Losses*:** Solar PV is some years away from true cost competitiveness and from being able to compete on the same scale as other energy generation technologies. Adding to the cost are T&D losses that at approximately 40 percent make generation through solar energy sources highly unfeasible. However, the government is supporting R&D activities by establishing research centres and funding such initiatives. The government has tied up with world-renowned universities to bring down the installation cost of solar power sources and is focusing on up-gradation of substations and T&D lines to reduce T&D losses.

- ***Land Scarcity*:** Per capita land availability is very low in India, and land is a scarce resource. Dedication of land area near substations for exclusive installation of solar cells might have to compete with other necessities that require land.

- ***Funding*** of initiatives like National Solar Mission is a constraint given India's inadequate financing capabilities. The finance ministry has explicitly raised concerns about funding an ambitious scheme like NSM.

- Manufacturers are mostly focused on export markets that buy Solar PV cells and modules at higher prices thereby increasing their profits. Many new suppliers have tie-ups with foreign players in Europe and United States thereby prioritizing export demand. This could result in reduced supplies for the fast-growing local market.

- The lack of closer industry-government cooperation for the technology to achieve scale.

- The need for focused, collaborative and goals driven R&D to help India attain technology leadership in PV.

- The need for a better financing infrastructure, models and arrangements to spur the PV industry and consumption of PV products.

- Training and development of human resources to drive industry growth and PV adoption.

- The need for intra-industry cooperation in expanding the PV supply chain, in technical information sharing through conferences and workshops, in collaborating with BOS (Balance of Systems) manufacturers and in gathering and publishing accurate market data, trends and projections.

- The need to build consumer awareness about the technology, its economics and right usage.
- Complexity of subsidy structure & involvement of too many agencies like MNRE, IREDA, SNA, and electricity board and electricity regulatory commission makes the development of solar PV projects difficult.
- Land allotment & PPA signing is a long procedure under the Generation Based Incentive scheme.

## 3.2 FINANCIAL CHALL ENGES UNDER NSM

- **The cost of financing:** Solar power projects are highly sensitive to the cost of debt. India's interest rates, at nearly 13%, make the domestic cost of borrowing high and can put significant pressure on deal economics. As a side effect of the successful tariff bidding that is being implemented in the NSM Phase, the margin between financing costs (which are sensitive to interest rates) and tariffs is far smaller than in other solar power producing geographies like Germany and Spain, thus significantly reducing project return to levels which may not be sustainable.

- **The availability of appropriate financing instruments:** The solar industry in India is young and the perception of political and regulatory risk means that bespoke financial Products (insurance, guarantees etc) are required by most international and a significant number of domestic) investors to mitigate risk and provide sufficient comfort to provide both equity and debt funding.

- **Limited experience with limited or non-recourse debt financing (project financing).** Unlike European and US markets where project financing models are established the Indian financial sector's capacity to structure non -recourse deals is limited and solar project developers have historically financed projects on-balance sheet. This is to some extent due to the negligible past experience in solar energy in India, and consequently, the financial institutions lack the technical experience to evaluate projects that approach them for financing. At the same time, this lack of experience also hampers the ability of Indian project developers to present a comprehensive risk allocation and funding proposal to the financial institutions.

- **Sector limits** on financial institutions' investment in the power sector can create challenges. A number of lending institutions face a 5% cap on investments in the power sector and renewable are part of this allocation and so investment in renewable comes at the expense of finite investments in conventional power which may offer more attractive risk-adjusted return profiles under current market conditions. In addition, lenders' exposure is calculated over a four-year term (i.e., if a renewable project is on the books in year one, it stays there till year four, even if it is divested in year two).

  There have been recent positive developments. Fit-for-purpose financial instruments targeted at India solar (such as partial credit or risk guarantees) are now under development and a number of institutions have expressed their intention to revisit sector limits on renewable power. Capacity building for domestic banks is also underway through initiatives being run by the Asian Development Bank and the expansion of expertise in project financing is, although not widespread at present, likely to expand as leading institutions demonstrate case studies of project viability. However despite this progress financiers continue to see a series of significant policy and regulatory challenges which may be outside their direct control.

## 3.3 LENDER'S VIEW- RI SK AND MITIGATION STRATEGIE S

A lender's role is to assess the risk of a project and based on these, decide whether to lend and if so, at what terms. Project developers, sponsors, EPC companies and other stake holders must work towards mitigating all critical risks to be able to secure financing at reasonable terms. Lender's eligibility criterion refer to the PPA type, strength of power off-taker, long-term cash-flows, EBITDA, DSCR, environmental and social impact. Sponsors and developers should work towards meeting these criteria right from the outset to their project activities.

Debt recovery and the legal enforceability of claims for any type of non -recourse debt in India remains a key risk for the lenders.

In a non-recourse project financing structure, the plant assets themselves serve as a basis for the repayment of the loan. Thus, a proper and predictable forecast of the power production is of utmost importance. Other influencing parameters can be a sound technical planning, the experience and track record of the EPC contractor, reliable irradiation measurements, conservative financial modelling and availability of operational data from a plant close to the chosen location of the project at hand.

### 3.3.1 Power Off-taker Risk

The power off-taker risk is the most crucial from the perspective of long term payment security. A payment delay or default can make a project unviable and possibly eliminate a project owner's ability to structure the debt.

Currently, most off-taker and payment risks are still directly associated with the various solar polices in place in India. For most FiT-based projects, a government entity is the off-taker. As an example, NTPC Vidyut Vyapar Nigam (NVVN), a government-owned power trading company, has been the off- taker for projects allocated under the National Solar Mission (NSM).

Apart from the bankability of the PPA signing authority, the exact terms under the PPA itself are equally crucial. The government-entity-backed PPAs are slowly giving way to private third-party PPAs. These PPAs are partially driven by the increasing commercial viability of solar power in India and may avail additional benefits under mechanisms such as the REC mechanism or Viability Gap Funding (VGF).

For private PPAs, each off-taker will have to be judged on a case-to-case basis. This will initially push up the transaction costs. If power is sold on site (captive model) rather than through the grid, the dependency on the buyer will be very high.

**Mitigation Strategy**

A public PPA should have the following features to be bankable:

- The term of the PPA should be longer than the debt repayment period (debt repayment period for rupee term loans is usually 8-12 years).

- The off-taker should commit to buying all the solar power produced. The total power production should be governed by Capacity Utilization Factor (CUF) or Performance Ratio (PR) limits.

- Payment security should be ensured through a revolving monthly letter of credit (LOC). However, such a LOC is only useful for ensuring short term payment security and the overall PPA structure should preferably be backed by a dedicated fund, especially if the PPA signing authority is a loss making entity.

- The tariff mentioned in the PPA, should be approved by the state electricity regulatory commission (SERC).

- A course of action for a default by either the power producer or the off-taker should be clearly outlined.

- The litigating authority to resolve any issues should be fixed for cases where the SERC may not be the litigating authority.

- During any litigation, payment should typically not be held up. The power producer or the procurer can be asked to submit bank guarantees in lieu of payments being made during the litigation period. The procedure for this should be specified in the PPA itself.

### 3.3.2 Regulatory Risks

The regulatory environment in India with respect to solar power is still in flux and is expected to remain so for at least a couple of years. Policy initiatives are not all equally transparent, financially sound and implementable.
All evidence currently suggests that the implementation of obligations is nowhere near the aimed-for levels. Moreover, the floor price of the RECs, i.e., ` 9,300(€ 143/$ 186)/MWh till 2017, is significantly higher than the generation cost of solar power in almost all parts of the country. This casts doubt on the future demand for RECs. Lenders are very wary of lending to projects that require REC revenue to achieve viability.
Projects that are looking for the third-party sale of power also have to deal with charges for interconnection, wheeling, transmission and cross subsidy that also vary by factors such as voltage levels, location and off-taker. The financial impact of these charges can vary from 0.50 (€0.007/$0.01)/kWh to 2.00 (€0.03/$ 0.04)/kWh, depending on the project. Ascertaining the exact quantum of these charges can be a challenge as most regulations regarding them are framed with large conventional power plants in mind.

### Mitigation Strategy

Project selection should be based on an in-depth understanding of the market conditions and clarity on policy or regulation. An investor should understand the following issues before making an investment decision:

- ✓ There is uncertainty regarding the long term demand for solar RECs as it depends largely upon the enforcement of RPOs.

- ✓ State DISCOMS that are the primary source of demand have huge losses on their balance sheets and without any penalties, have little reason to buy the more expensive solar power or RECs.

- ✓ Currently, it is much more economical for any obligated entity to set up a plant or buy solar power through a private PPA, rather than buying RECs even at the floor price. The floor price is only valid until 2017, post which it will likely fall significantly, whereas plant lifetime and most PPA periods are upwards of 15 years.

- ✓ Many developers are convinced that the REC mechanism can provide considerable upside to their projects, thereby, making them viable. However, lenders are not comfortable with lending to such projects. Due to this, a large number of projects have not been able to come out of their planning stage.

For any projects under the REC, developers should try to maximize the realization of revenue through the tariff in the PPA. Ideally, the revenues from the PPA should be able to serve interests and repayment of the loan. Lenders might be comfortable with a bankable private PPA at a viable tariff using additional revenues from the REC mechanism only as an upside.

### 3.3.3 Resource Data Risk

Irradiation data from most sources available in India is based almost entirely only on satellite data. According to industry sources, the margin of error for specific locations could be as high as 10% for some commonly used global satellite based data traditional sources such as NASA-SSE and WRDC. Meteonorm is a combination of satellite and ground based data. In places where irradiation measurement is not available for an area of 200km around the selected location, it uses satellite information. If the nearest site is more than 30km away, a mixture of ground and satellite information is used.

Most satellite data available only covers 10 years as compared to the 20+ years in mature markets. Also, traditional Satellite based data usually has a low resolution, i.e., the data will appear constant over large areas. This can be as high as 30-40 km for some sources. In fact, the error margin in direct normal irradiation (DNI) data considered at the time of planning has been cited as one of the key reason by some developers who have cancelled their concentrated solar power (CSP) projects under phase one of the NSM.

A network of 51 Solar Radiation Resource Assessment (SRRA) stations have been installed in the first phase and the real-time data is now available from these stations. However, the timeframe for historical data collection till date is still very short.

**Mitigation Strategy**

It is important to quantify the uncertainty in performance prediction models. For solar projects, irradiation can be a key source of uncertainty. Majority of financial institutions require a solar resource risk assessment report by an independent consultant.

Ideally, irradiation data for more than 10 years should be considered for accurate prediction models. For India, such data is available from Solar GIS and 3TIER. As the data from Solar GIS and 3TIER is available in real- time, it can be combined with ground-measured data. Such a

process results in a 10+ years dataset with accuracy of a ground sensor. This is the best way to mitigate risk in solar resource assessment.

### 3.3.4 Technology Risk

Indian lenders in particular are wary about technology risks as funding solar projects is new for them and many are still uncomfortable with the technology. Many player s in the module industry, especially those in newer thin film technologies such as CdTe and CIGS, have lesser on-ground experience than a typical module and plant lifecycle (25+ years). Hence, project developers often cannot refer to long-term generation data of their chosen module. Field data on module failure rates and performance degradation rates in India is also limited. Under such circumstances, a selection of modules, inverters, BOS components and construction practices that do not meet adequate internationally prevalent quality standards such as IEC 60364, IEC 61557 and IEC 61730, would put the bankability of a project at risk.

**Mitigation strategy**

Most of the technical risks can be mitigated through selection of the right EPC partner or, if the contract is split, by sound technology selection at the time of project planning. Identifying a capable O&M contractor (sometimes the EPC) during the plant operation is also essential. Lenders usually have a preferred-suppliers-list that is used to determine the bankability of the projects. Globally, c-Si cell/module technology has a market share of about 85% as it is the most mature technology and has a proven track record. Purely from a technology point of view, lenders are more comfortable with c-Si as the risk profile for the technology is lower. However, in India, more than half of the installed PV projects have used thin-film modules. There have been several regulatory, commercial and technical factors such as domestic content requirement, export finance and presumably better power production in hot climates, which have influenced this shift. This has given Indian lenders significant exposure to thin-film technology.

It is preferable to select EPC contractors with significant experience of executing projects in India and internationally. Technical aspects of the plan and designs provided by the EPC contractors should be carefully reviewed by experts at the developer's end or by third party technical consultants such as Lahmeyer International, SGS and TUV Rheinland.

# CHAPTER-4

# SOLAR PROJECT FINANCING STRUCTURE IN INDIA

## 4.1 INTRODUCTION

The project financing structure revolves around the creation of the project company. For all policy-based projects in India, t his company needs to be set up under the Companies Act, 1956. It serves as a special purpose vehicle (SPV) that holds all of the project's funds, assets, contracts and obligations. Typically, the sponsor puts in 30-40% equity and the lender puts in 60-70% debt. All the cash-ins and cash-outs of the project are then managed from the SPV's cash reserve and revenue. The project cash flow needs to service construction and O&M cost, principal and debt repayment, debt service reserve account (DSRA) and dividends to the sponsors.

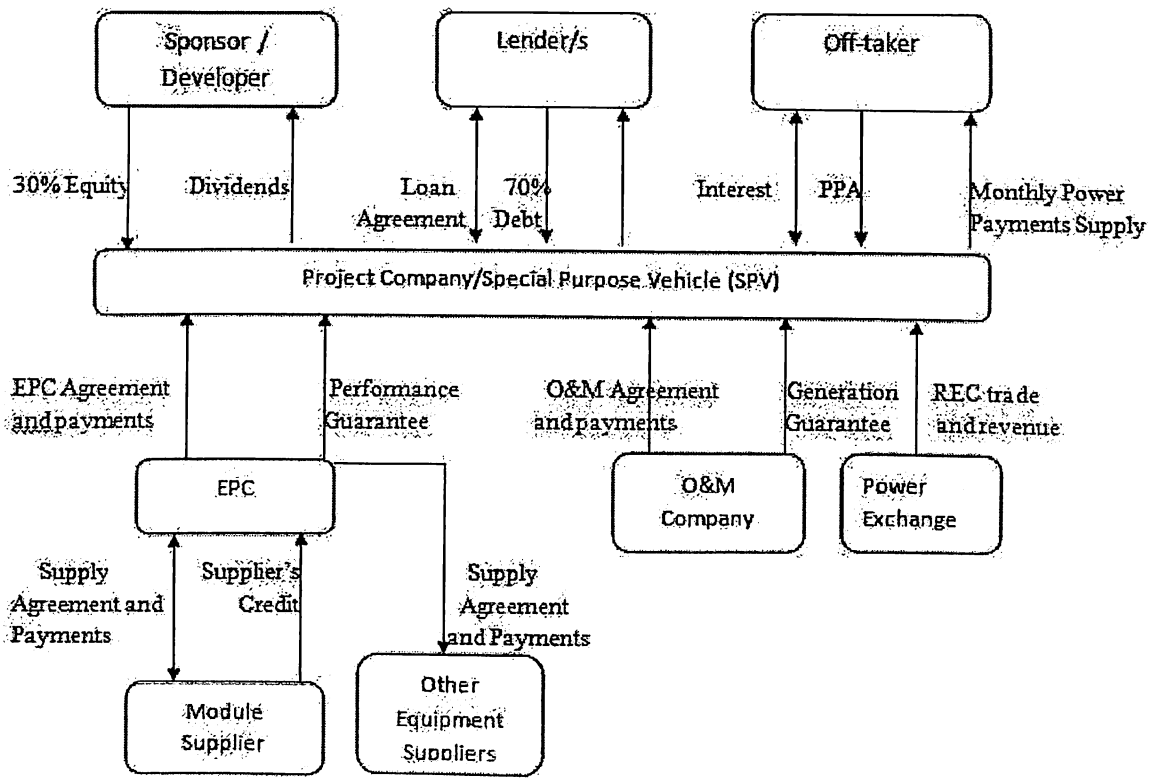


Figure-2: Typical Financing Structure in India

## 4.2 COMMERCIAL FINANCING INSTRUMENTS- DEBT INSTRUMENTS

Debt is an important means to reduce cost of capital as the cost of debt is lower than equity. In India, generally 70 percent of project costs are funded through conventional term loans. Domestic banks and Non-Banking Finance Companies (NBFCs) are the major sources of debt in India. International development banks fund RE in India but mostly through credit lines to banks and NBFCs. Several Solar power projects are funded by foreign currency loans which aim to promote specific technologies. This section identifies and describes some of the most common debt instruments used for renewable energy financing in India.

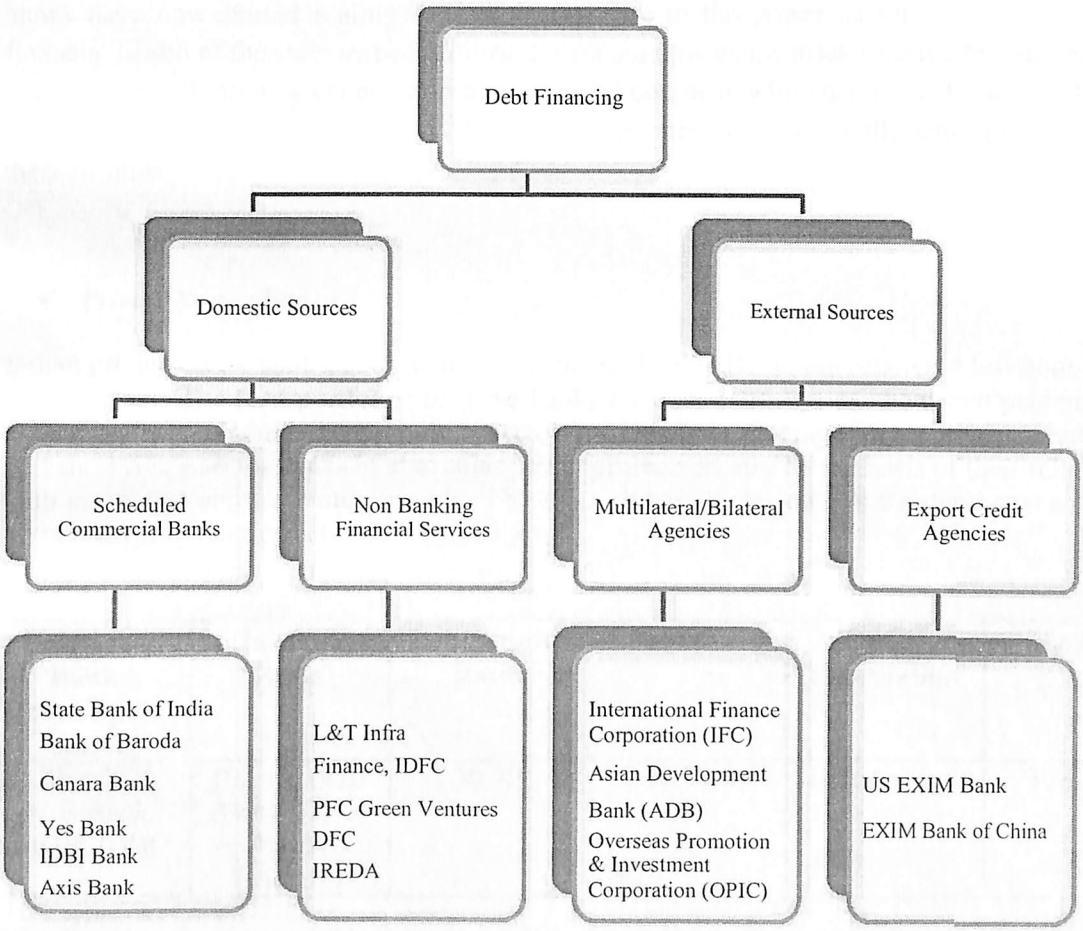


Figure-3: Various Debt Instruments

### 4.2.1 Commercial Banks

✓ *Public Sector Banks*

Infrastructure financing for private sector projects in India has been led by commercial banks. Commercial banks have also been at the forefront of lending to the power sector with a compounded annual growth of 42 percent over a six year period from FY 2008 to FY 2013. While public sector banks dominate commercial lending in India, their presence in the power sector, under which lending to Solar power projects classified, is limited. The exposure of public sector banks to the power sector varies from bank to bank, based on sector limits defined by each bank. For instance, Canara Bank has 13 percent of its loan portfolio exposed to the power sector; while for the exposure for Bank of Baroda is only 2.6 percent. However, most public sector banks have now started scaling back their exposure to the power sector due to deteriorating financial health of the state owned utilities. Banks are now using stricter norms for lending to the sector, especially to projects entering into financial contracts with state owned utilities. This has impacted the availability of debt to RE project developers as they usually enter into PPAs with these utilities.

✓ *Private Sector Banks*

Indian private sector banks, such as ICICI Bank and HDFC Bank, are relatively less active in the power sector. The loan portfolios of these banks have an exposure of about one percent to the power sector, as compared to public sector banks whose average exposure is about seven percent. Private sector banks lend to solar power projects mostly on the basis of their relationship with promoters and guarantees provided by them. Interest rates on loans range between 13 and 15 percent with tenures between 5 and 10 years.

| Prominent Banks financing the sector | Interest Rates | Debt-Equity Ratio | Loan tenure | DSCR Expectation | Timeline |
|---|---|---|---|---|---|
| SBI, ICICI, Axis Bank, BOB, IDBI | 10.25% (RBI Base) + 2.75-4.25% (Margin) | 30:70 | 9-12 Years | 1.40 Approx. | 3 Months |

Table-2: Financing Details of Indian Commercial Banks

✓ *Private NBFCs*

Private NBFCs such as L&T Infrastructure Finance and Tata Capital are m ore receptive to financing Solar power projects and have been active in the solar and wind energy space. These NBFCs process loans faster (in one to two months, as compared to three to four months by public sector banks), and charge higher interest rates (ranging between 13 an d 15 percent) but provide longer tenures (between 10 and 15 years). Most private NBFCs provide loans on a non-recourse or limited recourse bas is without substantial guarantees from the parent company, with lien on the assets being financed.

Although local debt financing provides a majority of the lending to RE, the sector still suffers from a number of limitations which further constrain the flow of funds.

| Prominent NBFCs financing the sector | Interest Rates | Debt-Equity Ratio | Loan Tenure | DSCR Expectation | Timeline |
|---|---|---|---|---|---|
| L&T Infra, PFC, SBICAPS, IL&FS, | 10.25%(RBI Base)+ 2.00-2.75% (Margin) | 30:70 | 9-15 Years | 1.35 Approx | 2-3 Months |

Table-3: Financing Details of NBFCs

### 4.2.2 Types of Debt Finance

✓ *Local Currency Loans*

Debt financing for solar power projects in India is predominantly provided through local currency term loans by FIs. Developers typically approach banks for debt financing during the development stage of the project after which PPAs are signed. A majority of these loans are with recourse to the borrower (i.e., the borrowers guarantee the loan repayments by providing a full or partial guarantee from their existing asset base). FIs also use other assets like property and fixed deposits as collateral if a sufficiently strong balance sheet is not available.

✓ *Government-backed NBFCs*

IREDA and Power Finance Corporation (PFC), two GOI-backed NBFCs, lead debt financing of solar power projects in India. As of March, 2012, IREDA and PFC have financed over 4 GW, which represents roughly 13 percent of the total 31.8 GW RE capacity installed in the country. Also PTC India has approved loan of Rs.540crore for solar projects in this year.

| Government backed NBFC | Public Sector Banks | Private Sector Banks | Private NBFCs |
|---|---|---|---|
| Indian Renewable Energy Development Agency (IREDA) | SBI | ICICI | L&T Infrastructure Finance |
| Power Finance Corp. | Canara Bank | Axis Bank | TATA Capital |
| Power Trading Corp. | PNB | IDFC Bank | |
| India Infrastructure Finance Company Ltd. | Andhra Bank | Standard Chartered Bank | |

Table-4: Few Prominent FIs Providing Rupee Term Loans to Solar power projects

**Limitations of Debt Financing with Local Currency Loans**

- ✓ The high interest rates (interest rates between 12 and15 percent) in India have led to an increase in the cost of debt for solar power projects.
- ✓ Long tenure debt of over 10 to 15 years is usually unavailable for rupee term loans, thus stressing the cash flows from the projects in the initial years and impacting their financial attractiveness.
- ✓ Fixed interest rate debt for rupee term loans is quite rare, with most FIs providing floating interest rates. This reduces the predictability of cash flows and exposes the projects to interest rate fluctuations.
- ✓ Debt funding of solar power projects by FIs in India needs to be guaranteed partially or fully by the parent entity; only a few private FIs provide debt to projects without a guarantee from the parent entity.
- ✓ Banks internally define sector limits and RE is covered under the power sector limits. As most banks are approaching their power sector limits, they are often not able to provide financing to solar power projects.
- ✓ Some banks do not lend to solar power projects due to unfamiliarity with RETs, markets and related government policies.
- ✓ State level policies, along with the poor financial condition of state utilities, restrict lending to only a few states.

✓ *Government Bonds*

The central government can have maximum direct impact by lending to renewable project developers as it can borrow and lend at cheaper rates than commercial banks One of the ways that the government can provide concessional finance to renewable power projects is to raise money through a domestic issue of bonds and directly on-lend the proceeds to project developers. Since the government holds the highest credit rating in the domestic market, it can raise money at the lowest possible rate of interest. The government can pass on the benefit of its ability to borrow at the lowest rate possible to the borrowers by lending at the same rate or at a minimum required margin. In addition, through this mechanism, the government can provide a fixed interest rate loan to renewable project developers as the government itself raises money at a fixed rate.

A direct government borrowing and lending program has the potential to reduce the cost of debt by up to 4.5 percentage points and increase the tenor by up to 10 years.

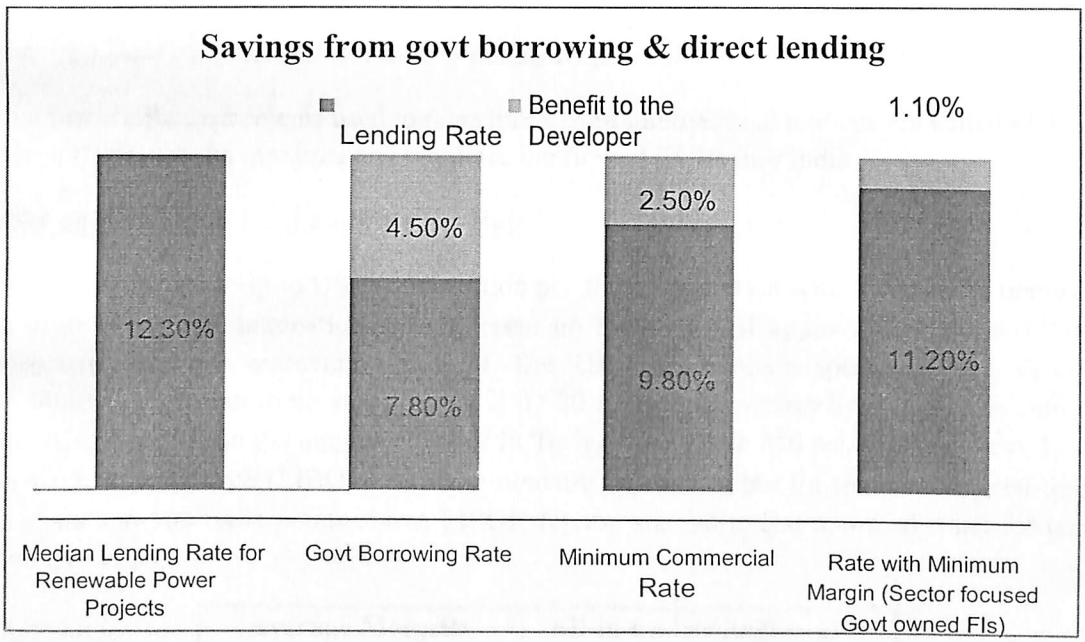


Figure-4: Savings from government borrowing and direct lending

The above figure is taken from the report published by Climate Policy Initiative (CPI). The analysis shows that the Reduction in cost of debt of developers would be the highest (up to 4.5 percentage points compared with the baseline of a typical domestic loan) when the government lends at its borrowing rate of 7.8 % without adding any margin to cover its expenses and account for a project risk premium.

If the government charges for administrative/transaction costs as well as project risk premium, but is able to keep these costs below 2%, it can still lend at the best commercial rate – i.e., State Bank of India's base rate of 9.8%. The benefit to the borrower is now up to 2.5 percentage points compared with the baseline of 12 .3%.

✓ ***Foreign Currency Loans***

These are provided to solar power projects by development banks, EXIM banks and international banks. These loans carry low interest rates ranging between 3% and 6% with tenure between 10 and 18 years. However, all foreign currency loans carry an exchange rate fluctuation risk.

✓ ***External Commercial Borrowing (ECB) Regulations***

A number of debt instruments used to raise funds from international markets are called ECB. The Reserve Bank of India monitors and regulates the flow of ECBs into India.

**Limits on Amount of ECB and Interest Rate**

RBI regulations allow up to US D 750 million per ECB transaction with a minimum maturity of five years under the automatic route (wherein no separate RBI approval is required). Higher amounts require prior approval by the RBI. The RBI also permits suppliers and buyer's credits with tenure lower than three years, up to USD 20 million per transaction under the automatic route. Also a ceiling on the interest rates for ECBs has been set to 350 basis points above London Inter-bank Offered Rate (LIBOR) for the automatic approval route for tenures between three to five years and 500 basis points above LIBOR for the automatic and approval route for tenures above five years.

| Average Maturity Period | All-in-cost ceilings over 6 months LIBOR |
|---|---|
| 3 years and up to 5 years | 350 Basis Points |
| More than 5 years | 500 Basis points |

Table-5: RBI Ceiling Rate

✓ ***Project Finance from Development Banks***

Development finance institutions, such as the International Finance Corporation (IFC), Deutsche Investitions-und Entwicklungsgesellschaft (DEG), and Asian Development Bank (ADB) have

been funding Solar power projects in India through foreign currency loans either in U.S. Dollars or Euros. The interest rate for such loans ranges between 4% and 6%, with tenure between 10-15 years with limited or no recourse.

- ✓ ***EXIM Finance/Export Credit Agencies***

EXIM Banks are credit agencies set up by governments to support export of locally manufactured goods to international markets through working capital finance (pre-export financing), post shipment credits (short term), long term supplier finance, export credit insurance, loan guarantees, and direct loans (buyer financing). The EXIM Banks of U.S., and China, and the Japan Bank for International Cooperation (JBIC) are a few examples.

For long term financing, EXIM banks provide loan guarantees and direct loans to the developers. These loans and guarantees can be based either on the entire project cost or just restricted to the cost of the imports and associated local costs from the EXIM bank's country. The interest rate for EXIM long-term finance ranges between three and five percent (without currency hedge) with tenures above 15 years.
ECAs use three methods to provide funds to an importing entity:

- ✓ ***Direct lending***: This is the simplest structure, whereby the loan is conditional upon the purchase of goods or services from businesses in the country of the ECA.
- ✓ ***Financial intermediary loans***: The export–import bank lends funds to a financial intermediary, such as a commercial bank, that in turn loans the funds to the importing entity.
- ✓ ***Interest rate equalization:*** A commercial lender provides a loan to the importing entity at below market interest rates, and in turn receives compensation from the export–import bank for the difference between the below-market rate and the commercial rate.

**Limitations of Debt Financing with Foreign Currency Loans in India**

These can be local currency or foreign currency denominated, and may or may not carry interest. For foreign currency loans, the interest and debt repayment have to be made in foreign currency whereas the revenue from solar power projects in India is generated in Indian Rupees. The required foreign currency payments carry a risk of exchange rate fluctuations. Further, some lenders mandate partial or full hedging of the debt component. Hedging costs add another 3% to 6% the cost of the loan. Debt from international commercial banks is more expensive (as compared to EXIM), as it is adjusted for country risk. Even with the sovereign risk and hedging cost, foreign currency loans may cost about 2% lower than domestic loans. However, their major attractiveness lies in longer tenures. The challenge is in being able to get long-term hedges for the currency risk.

RBI has set interest rate ceilings for ECBs. This limits the lender's flexibility to price -in applicable risk in interest rates. Some lenders may be unwilling to provide finance to Indian Solar power projects because of these restrictions.

✓ ***Development Finance Institutions***

Development Funding Institutions (DFIs) are multilateral or unilateral funding agencies, which provide credit in the form of higher risk loans and loan guarantees in developing countries. DFIs have a mandate to provide finance to the private sector for investments that promote development and many DFIs actively provide financing for solar energy. DFIs sometimes use the same tools as ECAs to carry out their loan disbursement, i.e., through direct lending, financial intermediary loans and interest rate equalization. The main DFIs active in the Indian solar market are the Asian Development Bank (ADB), the International Finance Corporation (IFC), Overseas Private Investment Corporation (OPIC), Germany's KreditanstaltfuerWiederaufbau (KfW) and DEG and the Indian Renewable Energy Development Agency (IREDA).

IFC, a member of the World Bank Group, is one of the most actively involved DFIs in India. Apart from providing advisory services to state governments and investing in companies at a corporate level, IFC has been actively involved in providing debt to solar projects and project development companies. It has done so for projects by developers such as Green Infra, Mahindra Solar, Azure Power and SunEdison India.

ADB is also actively involved in financing solar in India. It provides financing support under the India Solar Generation Guarantee Facility (ISGGF), under its Asia Solar Energy Initiative (ASEI) to promote the development of solar energy in developing member countries.

The Overseas Private Investment Corporation (OPIC) is the U.S. government's development finance institution. OPIC aims to support solar in India by providing investors with financing, guarantees, political risk insurance, and support for private equity investment funds. OPIC claims that it has committed ` 55 billion (€ 0.8 billion/ $ 1.1 billion) to the renewable sector globally last year and nearly one-quarter of it had been earmarked for India.

Germany's KfW and DEG are also looking at the Indian solar market. In their respective first deals, KfW is involved in lending to a 125 MW project by Mahagenco in Maharashtra and DEG has provided ` 680m (€ 11m/$ 13.6m) risk capital in the form of Compulsory Convertible Debentures (CCDs) to Azure Power.

The Indian Renewable Energy Development Agency (IREDA) is a development funding institution but operates as a NBFC under the administrative control of MNRE for providing term loans for renewable energy and energy efficiency projects. IREDA has received a 13 billion (€ 200m/$ 260m) line of credit from KfW for a broad mandate of promoting renewable power in India but has not been particularly active in financing utility scale solar projects till date. IREDA also provides loans to other banks at interest rates as low as 2-5% so as to incentivize them to finance renewable projects.

✓ *Supplier Credit*

Some suppliers extend credit to solar power projects, limited to the value of the material supplied by them depending on the negotiation between the borrower and the supplier. Supplier credit is extended for a period of one to three years normally the construction period. On commissioning the project, developers substitute the supplier credit with a term loan. Suppliers normally require a letter of credit from the project owner for the value and term of the credit.

✓ *Construction Finance/Bridge Finance*

The construction phase of a project is associated with the highest risk in the entire lifecycle of the project. Therefore, term loans raised during pre-construction phase entail higher interest rates reflecting the higher risks. Term loans raised post commissioning are raised on a lower risk profile. Project developers use short term loans to fund projects during the construction period, and then refinance the loans with cheaper term loans post commissioning. They can help smaller developers solve liquidity issues. The available liquidity can be used to negotiate better terms of purchase. Bridge financing is especially relevant, if there is a shortage of liquidity for the procurement of components or construction and the lender providing the term loan is expected to take a long time to conclude the due diligence and/or disburse the complete amount of the project debt. These loans are provided by private NBFCs and commercial banks in India. In some cases, construction loans convert into term loans once the project achieves commercial operations.

Projects availing international financing typically require bridge financing as the disbursement of the debt amount can take as long as nine months in some cases. For Indian projects, this has mostly been available through suppliers' credit, backed by a letter of credit/bill of exchange or through short-term construction finance from a financing institution.

✓ *Take-out Finance/Refinance*

Take-out finance or refinance is a common method of financing operating assets. The majority of FIs provide take-out financing for infrastructure projects. When the project commences operations and cash flows become stable, the operational risk is reduced considerably. Hence, developers refinance these loans to get better terms, such as higher debt-equity ratio, lower interest rate, and longer loan tenure. With refinancing, part of the cash invested by the developer can also be released making it possible to develop more borrowing capacity.

Refinancing a loan can have the following benefits:

- ✓ To take advantage of a better interest rate.
- ✓ To consolidate multiple loans into one loan.
- ✓ To switch from recourse based debt to a non-recourse based debt.
- ✓ To reduce the monthly repayment amount by increasing the term of loan.
- ✓ To reduce or alter risk. (Switching from a variable rate of interest loan to a fixed-rate of interest loan)

➢ *Take-out Finance through ECBs*

RBI allows infrastructure projects, including renewable energy projects, to refinance rupee debt using ECBs, but with prior RBI approval. Eligibility criteria for ECB refinancing include: (I) Take-out finance must be within the first three years of commercial operation; (ii) Loans provided through ECBs must have a minimum maturity of seven years; and (iii) Other conditions on end user, loan amount and interest are applicable.

However, take-out finance through ECBs has limitations. For instance, according to RBI guidelines, such mechanisms require a tripartite agreement between the developer, the domestic bank and the foreign bank. This can be challenging as both foreign and domestic banks are often uncomfortable with their counterpart's jurisdiction.

➢ *Lease Financing*

Lease financing is a commercial arrangement between an FI and the project developer, where the former purchases the generating equipment and other components (usually equivalent to 70 to 80 percent of the project cost) and leases them to the latter. Project developers traditionally hold power projects in SPVs and are thus unable to claim accelerated depreciation on such projects. A capital lease allows the project to benefit from accelerated depreciation and is mutually beneficial to both the FI and the project developer while working as a proxy for debt in the capital structure of the project.

Table-6: Some loan providers to Solar PV Projects in India

| Company | Financial Institution | Project Size | Amount received in (Million) |
|---|---|---|---|
| Moserbaer (Solar Projects) | IDBI | 5 MW | 500 (INR) |
| Astonfield | SBI, PFC, EXIM India | 16 MW | 1500 (INR) |
| Welspun | HDFC, ICICI, AXIS BANK, Central Bank of India, Union Bank of India, IIFCL, Vijaya Bank | 50MW | 3550 (INR) |
| SUN Group | L&T Infra | 6MW | 600 (INR) |
| Sun Edison | OPIC, L&T Infra, IDFC | 50MW | 110 (USD) |
| Azure Power | US EXIM | 35MW | 70 (USD) |
| Kiran Energy | US EXIM | 50MW | 57 (USD) |
| Tatith Energies | US EXIM | 5MW | 19 (USD) |

## 4.3 EQUITY FINANCING

Equity typically comprises 30 to 40 percent of the total project cost, while the rest is financed through debt. Strategic investors, venture capital, private equity, tax equity investors are the key providers of equity to solar power projects. In India, the hurdle rates for direct equity investment range between 16 and 20%, and are dependent on factors, such as the size of the project, background of sponsor, the technology risk, the stage of maturity, and geographic and policy risks.

The key focus of developers and equity investors is on commercial scale solar power projects especially large scale wind and solar projects. Private equity funds have dominated the equity investment scene. Most investments are in Indian Rupees and the funds stay invested for a period of five to seven years in the companies. Recently, some equity investments have been made in companies developing small-scale RE applications and projects.

### 4.3.1 Structure of Private Equity Investments

Private equity funds have been actively investing in renewable energy projects in India since 2008. They have supported IPP s. In many cases, these funds invested in majority-owned RE aggregation vehicles. Such vehicles include Green Infra Private Limited (99 percent owned by IDFC Private Equity), Renew Power Ventures Private Ltd. (99 percent owned by Goldman Sachs Private Equity), and Continuum Wind Energy (majority owned by Morgan Stanley Infrastructure Partners). Most equity investments in Indian RE companies have been made at the parent company level, and not at the project level. This approach provides various exit options, such as initial public offering route, or sale to a strategic investor.

Due to the nascent stage of the Indian RE sector, most IPPs do not have significant implementation and operational experience. In order to limit their risk, private equity investors structure transactions with low upfront valuations for projects under development with "earn - outs" which are provided to, the promoters based on meeting pre-agreed milestones and asset performance. An example is the Goldman Sachs' USD 200 million funding for Renew Power Ventures.

## 4.4 MEZZANINE FINANCE

Mezzanine finance is a structured debt-like instrument which often bridges the financing gap in a company's capital structure, and occupies a place between senior debt and equity, both in security and total returns. It offers flexibility to meet both the investor's and the company's requirements, and also provides medium term capital without significant ownership dilution. Mezzanine finance is mostly provided in the form of convertible debentures, bonds or preference shares.

Mezzanine finance is less risky than equity for investors, as it provides fixed interest along with principal repayment and minimum guaranteed returns to investors. It is used in situations where the company is generating adequate cash flows to service coupon payments; the promoters are unwilling to dilute their equity stake in the company; the short term conversion options are valuable (e.g. when the company is close to initial public offering or there is a clear exit path); or where the investors deem equity investment risky.

There are three noteworthy transactions in which mezzanine finance instruments were used to fund RE companies in India. In the first case, the Alternate Investment Market (AIM) listed wind IPP, Mytrah Energy, raised USD 78.5 million from IDFC Project Equity. This was followed by USD 19 million from PTC Financial Services. And, lastly, solar IPP Azure Power raised USD 13.6 million from Germany's DEG.

Mezzanine finance instruments work like debt instruments with fixed coupon payments that last until a liquidity event, at which point these coupons are converted into equity; thereby providing the investor an upside. Base returns (minimum guaranteed returns) range between 16 and 18 percent on capital invested and coupon rates are between 4% and 6% for finance provided by Indian investors. The Indian RE market has seen very few mezzanine finance transactions because of several hurdles.

### 4.4.1 Limitations of Mezzanine Finance

There are regulatory restrictions on international finance using these instruments:

- ✓ Changes in the FDI policy, introduced in 2011, prohibit the use of associated put options (options to sell to the promoters in certain pre-defined scenarios) that normally form an inherent part of the mezzanine structures to secure payment.

- ✓ Pledging of promoter shares to foreign mezzanine investors categorizes such instruments as ECB, thus, posing restrictions on the use of mezzanine instruments.

## 4.5 PARTIAL RISK GUARANTEE FACILITIES

It assumes the lender's default risk on a part amount of the debt provided to the project. Such facilities are usually provided for a fee charged by the organization providing the guarantee and this fee is borne by the lender. Partial risk guarantees improve a project's credit rating and reduce the perceived investment risk. They are used to encourage lending to projects that otherwise would not have been funded by FIs due to various reasons, such as the use of new technologies, counterparty risk, or a lack of understanding among lenders regarding a new sector. As banks increase exposure to such projects, they gain more confidence and slowly reduce their dependence on the partial risk guarantee program.

Guarantee providers can be government bodies, development banks and government backed FIs. The decision of lenders to finance projects that are backed by partial risk guarantees is determined by the:

- ✓ Creditworthiness of the guarantee provider for the part of the loan guaranteed.
- ✓ Creditworthiness of the developer/ project for the portion of loan not guaranteed.

Partial risk guarantees also act as tools for credit enhancement. The enhanced creditworthiness improves the ability of the project/developer to raise debt, improves terms of lending, such longer tenure, lower interest rate, and/or less collateral.

While partial risk guarantees can be effective tools to incentivize large scale deployment and financing of RE, very few such programs are available to developers in India.

### 4.5.1 Structure of Partial Risk Guarantee Facilities

Under partial risk guarantee program, the project developer borrows funds from FI to construct the project. The organization providing the partial risk guarantee gives a guarantee to the FI for repayment of a portion or full amount of the debt. It charges a fee on the amount guaranteed. In case the project developer is unable to service the interest and principal repayment, the guarantee is invoked and the obligation to t he FI is fulfilled by the guaranteeing organization.

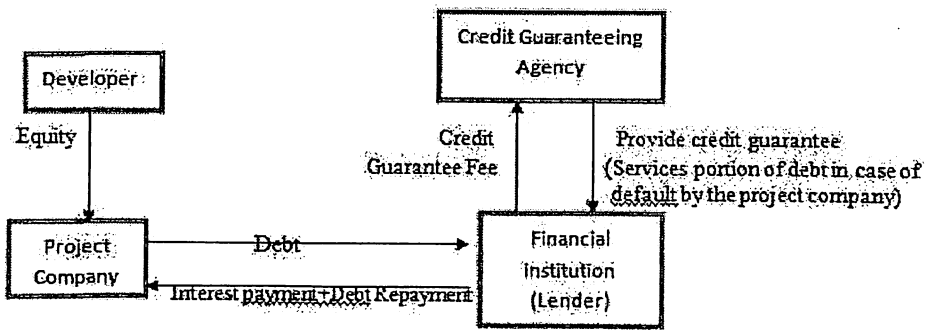


Figure-5: Structure of PRG

### 4.5.2 Partial Risk Guarantee and Foreign Lenders

Partial risk guarantees attract foreign funds by mitigating political risks such as breach of contract by the state, expropriation and currency inconvertibility, thereby reducing the cost of financing. A partial risk guarantee typically covers the entire debt amount as well as interest payments.

While partial credit guarantees cover defaults arising from all risks subject to a pre-determined maximum amount, partial risk guarantees cover all defaults arising from a specific risk.

Furthermore, partial risk guarantees may be structured to protect either the bondholders or project developers, while partial credit guarantees protect bondholders.

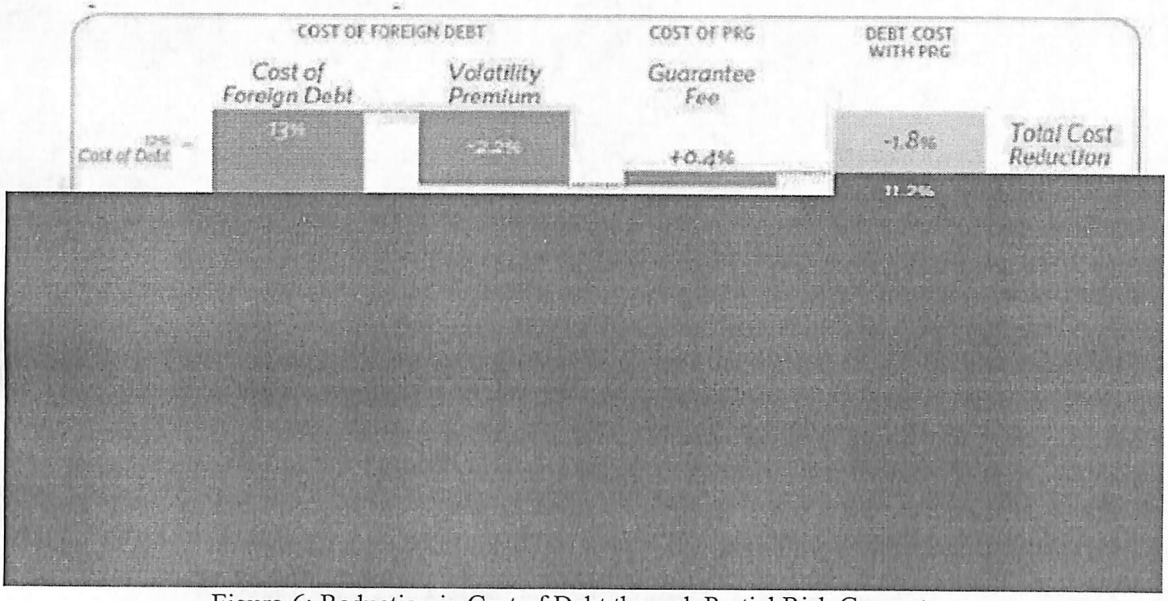


Figure-6: Reduction in Cost of Debt through Partial Risk Guarantee

Based on the World Bank's fee structure for a partial risk guarantee, with a 10-year tenor, the cost of the guarantee as a proportion of total financing cost is estimated to be 0.4%. The net reduction in the cost of debt depends on the structure of the guarantee and the extent of risk coverage. The cost of foreign debt for renewable energy in India is approximately 13%, which includes a premium of 2.2% for liquidity, volatility and political risk.

By facilitating the mobilization of private foreign capital, partial risk guarantees provide access to longer tenor financing. The instrument would most likely extend the tenor up to 18 years from the usual 10 years as it reduces the risk involved for foreign lenders. The developer has also the option of fixing the cost of debt through an interest rate swap.

### 4.5.3 Some of the Partial Risk Guarantee Program in India

- *ADB's India Solar Generation Guarantee Facility*

ADB has a USD 150 million partial risk guarantee program for solar projects with government backed PPAs. Under this facility, ADB provides risk guarantees under these two options:

• 50 percent of the payment default risk for entire tenure of loan.

• Zero percent of payment default risk for the first seven years, and 95 percent to 100 percent of default risk during the remaining tenure of the loan.

ADB has partnered with L&T Infrastructure Finance (L&T Infra) and Singapore-based Norddeutsche Landesbank (NO RD/LB) to fund solar projects with capacities below 25 MW in India. Under this arrangement, L&T Infra and NORD/LB will provide loans to solar projects, and ADB will provide a partial risk guarantee to L&T Infra and NORD/LB. ADB in turn collects a guarantee fee (ranges between 1.5 and 2.5 percent) from L&T Infra and NORD /LB.

As of June 2012, two solar projects with capacities of 25 MW and 10 MW have been funded using ADB's guarantee facility. The facility has had limited success and has been constrained by the lack of partner FIs.

➢ ***World Bank Group's Partial Risk Sharing Program***

The World Bank Group (WBG) provides partial risk and credit guarantee products to support projects taken up by governments and private investors in developing countries. The objective of these products is to promote capital inflow into infrastructure development. WBG has also provided support internationally for clean energy projects through these guarantee instruments. However, this facility has not been used by Indian FIs.

➢ ***EXIM Banks***

In some cases, EXIM banks provide loan guarantees for projects using equipment manufactured in their country. The guarantees cover commercial and political risk; the extent of risk coverage depends on the particular agency. For example, 100 percent of the commercial and political risks are covered by U.S. EXIM, whereas Garanti-instituttet for eksportkreditt (G IEK) covers 90 percent of the commercial risk and 100 percent of the political risk. The extent of guarantee is mostly restricted to the value of exported material. However, in some cases where the value of the exported material forms a major part (over 60 percent) of the project, these banks may provide the guarantee on the full debt component of the project. Such guarantees are usually provided to domestic banks (in the country of the EXIM bank), or international banks with presence in the EXIM bank's country

### 4.5.4 Limitations of Partial Risk Guarantee Programs in India

While partial risk guarantee programs cover (in part or full) the risk associated with a developer defaulting on part or full of the outstanding loan to FIs, RBI guidelines classify such defaults as

non-performing assets of banks. This reflects negatively on the performance of the banks as well as the credit managers.

## 4.6 PARTIAL CREDIT GUARANTEE FACILITIES

Partial credit guarantees reduce the cost of debt by enhancing the credit rating of a project. The guarantor agency (usually a multilateral agency or a private financial institution) leverages its higher credit rating to reduce the risk associated with the project by guaranteeing a specific proportion of the borrowing. It enables the leverage of resources by attracting domestic or foreign private investment with relatively low capital outlay. Since it assumes that funds are raised through a bond issue, the cost of funds remains fixed.

For bonds with a lower credit rating, the cost of debt is higher since the expected risk premium is higher. The cost of borrowing for an AA rated bond is up to 3.48% lower than a BBB rated bond.

Depending on the structure of the guarantee, the potential reduction in the cost of debt is up to 1.9 percentage points and the estimated increase in tenor is by up to 5 years.

### 4.6.1 Feasibility of Partial Credit Guarantee in India

Partial credit guarantees have been successful in attracting private investment in other developing nations. In India, the institutional framework for offering such guarantees is already available in the form of IIFCL under ADB's pilot project, which lowers the implementation cost. However, partial credit guarantees require coordination among the lender, the multilateral agency (which offers counter- guarantees), the project developer and the guarantor, which can be complex to manage.

Although partial credit guarantees are effective in mobilizing debt even in the absence of large corporate debt markets, the impact is likely to be higher when bond markets are well-developed, which is not the case in India.

# CHAPTER-5

# BARRIERS TO RE (SOLAR) FINANCE IN INDIA

India has set ambitious solar power targets of adding 20GW to the existing 2.7 GW capacity by 2022. Substantial amount of investments are required to meet these targets. To get these investments there is a need to create enabling framework that can attract substantial foreign and domestic capital to the sector.

## 5.1 POLICY LEVELS BARRIERS

This section identifies the key policy- related barriers that have constrained the development of the solar market in India. These barriers have emerged either as a result of the absence of appropriate policies and regulations or the limited impact of existing ones.

- ***Feed-in Tariffs***

FiTs are one of the most successful and effective policy instruments globally for promoting solar power generation. However, FiTs have to be designed carefully, keeping in view the prevailing market conditions, state of technology development and availability of resources. If the FiT is too high, it leads to unwarranted profits for developers, while if set too low, the FiT can lead to very low financial returns leading to low investment in the sector.

Experience shows that the FiTs designed by certain SERCs have been unable to attract investments. There is a need for adoption of more robust processes and methodologies for determining FiTs that include detailed due diligence on cost and performance parameters of various technologies so as to make these attractive for both debt and equity investors.

- ***Reverse Bidding***

Reverse bidding led to a significant decline in solar power procurement prices. However, this also led to concerns about the long-term viability of projects that actually qualified. Almost half of the projects that needed project financing from FIs were not able to get such financing. As a result, these projects had to utilize either equity financing or balance-sheet financing. For example FIs were extremely concerned about the bid out tariffs on several of the projects and were unwilling to finance as they felt that they were unviable for commercial finance. Reverse bidding lead to competition in an environment where capital cost, technology performance and

access to financing was still infancy. Besides the issues around unviable bids, reverse bidding suffers from some other disadvantages too:

- ✓ Capacity addition becomes episodic, dependent on government auctions, and as a result developers are unable to create project pipelines and leverage economies of scale.

- ✓ Reverse bidding also reduces the interest of private equity investors, as ability to scale up appears to be uncertain.

A number of states have been negotiating with the developers to match their tariffs with the lowest tariff discovered through the reverse bidding process. This process has delayed the project allocation and also made projects unviable for few developers.

- ➢ ***Renewable Purchase Obligations and Renewable Energy Certificates***

The RPO and REC regime were designed to provide market-based instrument to stimulate RE investments. However lack of RPO enforcement has led to weak markets for RECs and a loss of credibility for similar market-based mechanisms. The key limitations of the RPO and REC schemes have been poor enforcement, uneven cash-flows for generators, irrational floor prices for solar RECs, lack of price certainty post 2017 and constraints in trading and managing liquidity for RECs to encourage investments of RPOs and assure consistent demand and stable prices for RECs.

- ➢ ***Accelerated Depreciation***

Given that AD can only be utilized by profit-making entities with appreciable tax liabilities and cannot be transferred, it effectively excludes most IPPs and investors who plan on using a SPV route for project development. This limits the impact of the instrument and constrains the level of investment entering the sector.

- ➢ ***Development Approvals and Risks***

Solar, wind and biomass projects typically require fewer approvals than conventional energy projects.

- ***Indian Electricity Grid Code (IEGC) 2010***

Under the IEGC 2010, RE projects will be required to forecast and schedule their power supply to the grid and are subjected to pay additional charges in case of slippage. Since RE is infirm in nature except for technologies such as biomass, significant capacity building and investments will be required for forecasting and scheduling by developers and DISCOMs.

- ***Open Access***

Third party power sales by solar power projects are charged an open access levy, which includes a cross-subsidy surcharge and an electricity duty (except in states where these have been exempted). The levy of these charges makes third party sales more expensive.

## 5.2 MARKET BASED BARRIERS

RE technologies face a number of markets based barriers. These include off-taker risks, technology and resource risk, barriers in accessing evacuation infrastructure and acceptance by local communities where the projects are sited. Some of these have been described below:

- ***Off-taker Risk***

The creditworthiness of the off-taker (the state distribution companies in the case of sales to the state) plays a key role in determining the bankability of PPA. Very few DISCOMs such as those in Gujrat and Maharashtra are in good financial health. In other states, DISCOMs have poor financial health. The risk of off-taker default and delayed payments is high (for example, developers have receivables of up to 12 months in state like Rajasthan and Tamilnadu).

- ***Technology Risk***

Banks consider relatively newer technologies riskier, especially those with high technology design requirements. The perception of risk is due to their unfamiliarity with the technology and poor performance of earlier projects.

- ***Evacuation Risk***

Evacuation is a generic problem afflicting wind, solar and the small hydro sector. Lack of adequate evacuation facilities has led to scaling back the commissioning and partial commissioning of new generation and the reduction of generation during peak periods. This issue is constraining the solar development in the remote areas of Rajasthan and wind in Tamil Nadu. Banks and FI are more cautious lending to solar power projects given the poor state of the evacuation capacity such as Tamil Nadu and Rajasthan while the risk is low in states such as Gujarat.

- ***Community Risk***

Land acquisition is increasingly becoming a challenge for renewable energy project capacities. Land is typically procured after the permitting process which can take significant time. By this time, local communities get aw are that a project requires their land and can drive up its price, and delay land acquisition.

- ***Lack of Tax Efficient Structures for Solar power projects***

A substantial portion of private equity investments in the Indian RE space is approaching five years, the normal time for making exits. Investors have not been able to find exits due to the limited opportunities in the capital market. Raising new funds is proving difficult for these organizations as they have not been able to provide exits and thus, returns on existing investments to their organizations. This limits the ability of such investors to scale and fund new projects.

- ***Lack of Exit Options for Existing Investors***

A large portion of private equity investments in the Indian solar market space are more than five years old as investors have not been able to find exits due to the dull state of the capital markets. Raising new funds is providing to be difficult for these investors as they have not been able to provide exits.

## 5.3 GAPS AND NEEDS IN RE FINANCING

The following key gaps in RE financing have been identified:

- Growth of IPPs is an important development as IPPs can scale up RE investments. However IPPs need new financial constructs to scale up New sources of funds:
  - ✓ Large investors such as pension funds, insurance companies, sovereign wealth funds, large family funds and Islamic finance.
  - ✓ Access to capital markets
  - ✓ Participation by individual investors
  - ✓ Participation by international investors to meet larger investments needs of the future.
  - ✓ Main stream debt financing options which allow longer term, low cost debt to be available at higher leverage.
- Availability of finance products suitable to the stage of the project development (e.g. pre-construction, construction, post commissioning). This eases migration from one type of financing to the next as risks come down and improve the attractiveness of RE investments as an asset class.
- Appropriate policies so that all classes of investors can benefit from incentives such as AD, tax holidays, RECs and subsidies.
- Institutional arrangements and policies to help scale up of RESCOs

  - ➢ Access to equity
  - ➢ Access to debt

- Mechanisms and products to reduce risks of RE investments.

The table below shows the need and related measures:

| New Sources | Wider Access To Tax Benefits | Reduce Risks | Infra Financing |
|---|---|---|---|
| • Pension Funds<br>• HNIs, CSR funds<br>• International Capital for sustainability | • Transferable benefits<br>• Pass through tax structure | • Risk insurance<br>• Re-financing for existing debts<br>• Supportive policy instruments | • Tenure-15years+<br>• Lower interest rate<br>• Higher D:E |

Figure-7: Need & Suggested Measures for Financing

# CHAPTER-6

# INNOVATIVE FINANCING MECHANISM

## 6.1 INTRODUCTION

To scale up its RE capacity, India will need significant financial investments. A number of large financing sources still need to be tapped for RE. However, access to finance has been constrained by a number of barriers such as tax benefit not uniformly accessible to potential investors; limited access to capital markets; constrained private equity inflows; asset liability mismatch, etc. Overcoming these barriers has the potential to facilitate the required inflow of investments to scale up RE sector in India.

There are several innovative financing mechanisms that can be adapted for implementation in India to support scaling up of RE investments. The mechanisms can be classified as fiscal, policy or financial mechanism.

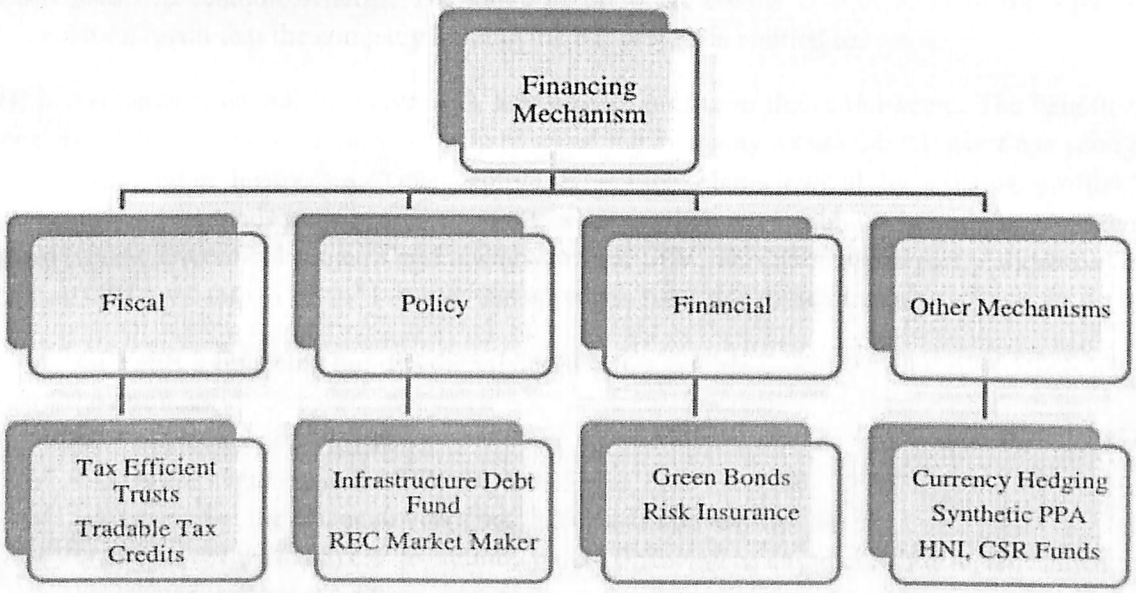


Figure-8: Alternative Financing Mechanisms

## 6.2 FISCAL MECHANISMS

➢ *Tax efficient trusts for RE*

Trusts and Master Limited Partnership (MLPs) have been successfully used across the globe to enhance and attract investments in specific classes of assets. Trusts and MLPs are tax efficient structure that can be traded publicly and thus have access to more capital market liquidity through individual, retail and institutional investors. The use of such structures for RE financing can be a very effective for attracting capital into the Indian RE market. A number of examples of international tax efficient structures exist.

➢ *Tradable Tax Credits*

These are tax saving certificates available to Solar power projects, which are eligible for accelerated depreciation benefits. The value of these tax credits is equivalent to the value of depreciation credit that the company holding the RE project is entitled to.

RE investments is capital intensive with low taxable profits in the initial years. The benefit of accelerated depreciation can only be utilized when the company owing the RE asset has enough profits from other businesses. Thus captive generation plants owned by existing profitable businesses can take advantage of this benefit, whereas IPPs are unable to benefit because they invest in new Greenfield projects and always through SPV. This anomaly is partly addressed by making GBI available to IPPs. However this approach has some disadvantages:

- ✓ GBI puts a financing bur den directly on the government
- ✓ GBI payments get delayed
- ✓ GBI is not available to all IPPs projects
- ✓ GBI is paid at the financial year end; this causes uneven cash-flows
- ✓ GBI's can't be used to create additional debt financing as any securitization cuts down into the overall debt limit.

**Proposed structure**

- Tradable accelerated depreciation tax credits will be certificates available to generators eligible for AD.
- The certificates will be freely tradable and could be used by entities to offset their income-tax liabilities using the depreciation equivalent available from the certificate.
- The selling price of these certificates will be market determined, but will mostly be at a 5 to 10 percent discount to the tax saving value of the certificate, so that there is an incentive for the buyer of these certificates.

India has experience with the trading of tax certificates. Exporters entitled to duty exempt imports used to have the option of selling their entitlement to importers who needed duty free imports.

**Benefits of Tradable Tax Credits**

Credits will bring down the need for making investments, when the benefit of AD is pursued. Such investors can buy the credit instead.

Qualified developers and operators can raise part of the project finance capital (equity) using the trading of such credits. This can be very useful in accelerating investments Government can withdraw GBI and save on the budget burden.

Credits will also bring all investors at par and take away differential advantages available to captive capacities. Since IPPs drive the bulk of investments, this benefit will remove a crucial disadvantage for them and will be useful for scaling up RE investments Overall such instruments will improve capital efficiency.

**Challenges**

AD benefits have been criticized by many as it leads to poor investment decisions. This perception may be applicable to this scheme as well, although it is designed to take care of the same issues by supporting qualified developers.

## 6.3 POLICY MECHANISMS

- ***REC Market Maker***

RECs are not factored-in by banks and other FIs in their evaluation of projects due to the risk of unsold RECs. A market making organization can provide a lot of confidence to both investors and lenders and can significantly improve the financial attractiveness of Solar power projects availing these benefits. The REC Market Maker (RMM) will ensure liquidity in the market for RECs.

**Structure of REC Market Maker**

- The RMM will be a government sponsored body that will act as a buyer and seller of last resort in case of either unsold RECs in the market or a supply shortage in the market.
- The purchase price and sale price of RMM will be pre-established. While RMM will purchase RECs at the floor price, the sale price will be at a marginal discount to the forbearance price.

- The spread in the sale and purchase price of RECs will enable the RMM to generate profits and reduce its reliance on government funds for meeting its administrative expenses and fund requirements.
- Entities eligible to sell or buy from RMM should submit valid un-cleared sale/purchase bids in the REC trading session.
- RECs possessed by RMM may have an extended life.

**Other supportive roles for RMM**

- RMM may be authorized to buy RECs in forward transactions or develop other products to improve liquidity.

- RMM may also play a role in bringing increased discipline and compliance in the market:

✓ Help state nodal agencies in setting up effective monitoring mechanisms for RPO compliance.
✓ Develop linkages with other credits such as EE certificates.
✓ As a part of its independent role for strengthening RPO mechanism, use legal means such as appeals in APTEL for ensuring compliance by obligated entities.
✓ It may work with CERC and FOR to improve the regulations relating to RPO including processes for reviewing RPO targets and REC floors and forbearance level.
✓ Help develop schemes for weighted REC entitlements for new RE technologies or RPO compliance weights for REC vintages to help initial investments in a new technology.

**Benefits of RMM**

RECs are market based mechanism that can help finance solar power projects if there is greater confidence on liquidity and pricing of RECs. RMM will help create this confidence and may also help in:

✓ Strengthening the compliance mechanisms as an independent player.
✓ Build markets for other environmental credits such ECERTs. Such market instruments can help minimize or eliminate direct subsidies from the government in a number of areas.

**Challenges**

✓ Ensuring compliance with RPO and non-uniform RPO targets across states are two of the most important challenges.

✓ It is difficult to impose strict penalties on obligated entities (specifically state DISCOMs) because they are state governed and are not financially sound.

**Suggestions**

- ✓ Develop details of government sponsorship with CEC and MNRE, with which RMM can be launched.

- ✓ Explore development of RMM in partnerships with development financial institutions such as the World Bank and ADB.

➢ ***Infrastructure Debt fund for RE***

NBFCs and commercial banks are the main source of debt in India. However, they typically face difficulties in providing long-term funding for infrastructure solar power projects due to an asset-liability mismatch. In addition to this, banks also have to deal with internally set sector limits.

IDFs allow tapping of long-term, low-cost debt from insurance, pension funds and other long-term investors (both domestic and foreign) to refinance bank debt for infrastructure projects. By refinancing the IDFs can release a large capacity of banks to finance Greenfield projects, which seem to be constrained at present.

In 2011-12, the GOI allowed IDFs to be set to ease and accelerate the flow of funds into infrastructure project development in the country.

Such funds act as pass through vehicles, with no tax applicable on the income generated by IDF. To attract offshore funds into IDFs, the Finance Minister has announced a reduction in the withholding tax on interest payments on the borrowings by IDFs from 20% to 5 %.

IDFs can operate either as a trust or a company. An IDF can be set up under two models – a Mutual Fund (MF) or a Non-Banking Financial Company (NBFC). An IDF- MF is allowed to invest at any stage of the project lifecycle, but an IDF-NBFC can use funds only to re-finance a project's debt. Once formed, IDFs can raise funds from potential investors.

***IDF-MF Model***

An IDF-MF functions like a typical mutual fund, which issues units to raise money and invests the proceeds in debt securities / bonds issued by companies and projects, with an exclusive focus on the infrastructure sector. The investment objective of an IDF-MF is the capital appreciation of its units, which are tradable on t he stock exchange. IDF-MFs are also intended to provide much-needed liquidity to the corporate bond market in India.

Investing in the units issued by an IDF-MF is similar to investing in securitized debt instruments, with the underlying assets being the bonds issued by infrastructure companies and projects. An IDF-MF diversifies the risk of in vesting in infrastructure since the units derive their value from a

basket of bonds rather than an individual bond. The value of the units issued is also influenced by the strength of the IDF sponsor company, the reputation of the fund manager, and the quality of the portfolio. Investors may also find more liquidity in these units as they are traded on the stock exchange, providing the investors an easier exit option.

As there are no present examples of renewable project developers issuing bonds in India, the possible cost savings could be estimated from a recent bond issuance by a power generation company. For example, National Thermal Power Corporation (NTPC) — a largely government-owned enterprise with an AAA rating and therefore, bringing the lowest possible cost of funds issued a 10-year corporate bond in 2012 with a coupon rate of 9.26%. Hence, depending on the rating, a renewable project developer could issue bonds at 9.3-12.3%, with a possible saving of up to 3 percentage points.

***IDF-NBFC Model***

IDF-NBFCs were established to provide long-term finance to infrastructure projects, but have not been expanded to renewable energy. IDFs formed as NBFCs are predominantly established to re-finance infrastructure projects developed under a Public Private Partners hip (PPP) model. The IDF-NBFCs would likely tap resources from wide variety of investors compared to IDF-MFs as they can raise money through issue of either INR or USD denominated bonds.

In addition, IDF-NBFCs are less risky for investors compared to IDF-MFs due to the in-built credit enhancement mechanism, which stems from the tripartite agreement between the Concessionaire (project developer), Concessionary Authority (Government of India or GoI's agency such as the National Highways Authority of India), and the IDF. This agreement would allow the IDF to be compensated by the Concessionary Authority in case of a default by the Concessionaire. A rating equivalent to AA or above would allow the fund to raise money at lower rates and from long-term sources such as insurance and pension funds.

IDF-NBFCs may not be able to fund power/renewable projects as the current design requires them to re-finance only projects developed under PPP model. An alternate way that IDF-NBFCs can aid renewable energy development is by re-financing some of the transmission projects that are currently being developed under PPP model.

## 6.4 FINANCIAL MECHANISM

- ***Green Bonds***

Equity investors, as well as lenders with exposure to infrastructure assets, including RE, consistently try to "churn" their funds (exit existing assets and invest in new ones). NBFCs and commercial banks in India are already facing difficulties in providing long term funding for infrastructure solar power projects due to an asset-liability mismatch. Moreover, banks also have to deal with internally set sector limits. Most private equity funds are struggling to raise new funds due to their inability to exit from existing investments, on account of the lacklustre capital markets.

Green bonds can be effectively used to solve this problem. Green bonds or climate bonds are bonds issued for financing projects or programs that directly contribute towards climate change mitigation, adaptation, environmental protection, and related issues. However, in this section of the report, green bonds are referred to as asset backed bonds that refinance operational cash flow from low carbon infrastructure.

Green bonds can provide 'exits' to private equity investors as well as lenders in India by transferring funds from green bond investors. This will provide fresh capital infusion to lenders for re-deployment and will enable private equities to raise fresh funds from investors. These bonds would also work as a means of gaining access to international capital pools to finance Indian Solar power projects and assets.

Globally, two main types of structures can be used for re-financing through green bond issuance:
(i) corporate bonds; and (ii) portfolio bonds.

**Corporate Bonds**

Corporate bonds are issued by the issuer, but verifiably linked to assets that qualify as green investments. The key features of corporate bonds include:

- ✓ Bonds are issued against issuer's credit rating.
- ✓ Issuer may get a certification (e.g. from Climate Bond Standards Board) that the bond proceeds are used for refinancing green infrastructure.
- ✓ At the time of issuance, the asset portfolio has to have a market value greater than bond issuance value, so that there is enough incentive for buyers to purchase the bonds (the same way as IPO issues are usually underpriced).

- ✓ As the coupon is paid by underlying projects, the issuers may issue bonds with a payout lower than can generation from underlying projects to improve the credit quality of the bonds.

- ✓ The asset related risks are still carried by the issuer and are not passed on to the bond holders.

**Portfolio Bond**

Under the portfolio bonds mechanism, a portfolio of assets is put into a special purpose vehicle (SPV) and ring fenced. Bonds are issued on the loan portfolio. The cash flows from projects are used to service the bond.

- The credit quality of the loan portfolio can be enhanced through risk mitigation measures such as:
- ✓ Sector/technology diversification.

- ✓ Insurance against policy risks, exchange risk covers, country/political risk covers, and operational risk.

- ✓ Credit risk enhancements (partial/full risk guarantees) organizations like ADB, World Bank, IFC, and OPIC can provide.
- ✓ Cash flows from underlying assets being higher than those required to meet the cash flow requirements of bond holders.

- Portfolio bonds need to be credit rated.

**Green Bonds in India**

India's 12th five-year plan has an overarching theme of low carbon growth. The main initiative under this theme is the National Action Plan on Climate Change (NAPCC) that aims to reduce greenhouse gas (GHG) emissions by 20-25 percent by 2020 with respect to 2005 levels. Eight focused national missions in the areas of solar energy, enhanced energy efficiency, sustainable agriculture, sustainable habitat, water, Himalayan eco-system, increasing the forest cover and strategic knowledge for climate change form the core of NAPCC. Besides, there are several initiatives envisaged in the sectors pertaining to energy generation, transport, renewable, disaster management and capacity building that tie in with India's overall development strategy.

According to the Finance Ministry, India spends over 2.6 per cent of its GDP to deal with challenges of climate change. However, despite the Government's commitment towards climate change policies, resource scarcity and other competing priorities make it a challenge to find matching financial resources for mitigating climate change. The Expert Group on Low Carbon

strategies have also stated that mitigation cannot be achieved without significant international financial support. There are two main ways in which Green Bonds have the potential to significantly change the climate of India.

*First*, Green Bonds issued by multilateral organizations like the World Bank and the IFC can use the proceeds from issuance towards investing in new and existing renewable energy projects in India. India's abundant renewable energy potential and relatively low labour costs are offset by its prohibiting financial environment, and specifically the high cost of debt. A joint Climate Policy Initiative-Indian School of Business study found that high interest rates and relatively short-term loans for renewable energy projects in India add 24-32 percent to the cost of financing renewable energy in India compared with similar projects in the US and Europe. By providing an additional avenue of direct financial access and by ensuring the funded projects adhere to the internationally standardized regulations and guidelines, investment from Green Bonds would ensure the long-term viability of such projects in India.

*Second*, the successful launch of Green Bonds by corporations around the world can incentivize larger Indian companies to offer such market instruments to improve the environmental impact of their own products and services, enhance their brand image as well as to offer a chance to participate in India's long term growth strategy.

## Issues in the adoption of Green Bonds in India

The adoption of Green Bonds in India is unlikely to be smooth sailing. For private sector banks and corporate, Green Bond issues involve specific undertakings that need to be clearly understood by all parties in the transaction. For example, the GBP recommend disclosures like the use and management of proceeds, the investment decision making process, project evaluation and reporting in order to understand characteristics of a Green Bond. A number of key issuers and intermediaries are thus waiting for further guidance on good practice and standardization. The Government agencies will have to step-into provide these requisite assurances and ensure transparency.

Lack of a vibrant corporate bond market itself is likely to pose the biggest obstacle in assimilating Green Bonds in India. Although the primary market for corporate bonds has increased 7.6 times in the last 10 years, India's corporate debt market is just 14 percent of total GDP compared with a range of 40-70 percent for developed countries. Private placements account for 95 percent of overall issuances, largely because of the ease, efficiency and lower cost compared to public issuances. This limits participation by retail investors and FIIs, resulting in a less liquid market. Moreover, due to differential provisioning norms, corporate have predominantly favoured bank loans versus bonds.

The Government has been implementing several measures to improve India's corporate debt market. The cap on foreign investments in corporate bond markets was raised from US$40 billion to 51 billion in June 2013. Other steps include simplification of issuance procedures, an enabling regulatory environment and innovative products such as infrastructure debt funds and inflation-indexed bonds. Public issuances grew 11 times from 2009 to 2013, primarily due to tax incentives on infrastructure bonds. Similar incentives for Green Bonds can create a crucial new stream of finance for climate change initiatives and move climate finance from traditional fossil fuel investments into the projects that can mould India's low -carbon growth.

The state-run Indian Renewable Energy Development Agency (IREDA) Ltd. raised about 7.2 billion rupees ($117.8 million) last month selling 10-, 15- and 20-year tax-free bonds to help finance clean-energy projects.

**Benefits of Green Bonds**

- ✓ Funding renewable projects with Indian government-backed green bonds could lower the cost of clean power by as much as 25 percent, according to a study.

- ✓ Green bonds can effectively tap new international sources of funds such as pension funds, insurance companies, and sovereign wealth funds. These types of investors are used to investing in green bonds globally. Almost 10 percent of the capital base of large investors is being allocated to green and sustainable investing. Such capital can be attracted to a green bond issuance.

- ✓ Green bonds will help improve the tenure and reduce the cost of funds. Green bonds will be targeted towards refinancing of operating projects; thus they will help release capital for fresh green field projects.

- ✓ Bonds may be listed on specialized exchanges including AIM, London or Luxembourg to improve liquidity.

**Challenges**

Risks such as long term currency risk or political or regulatory risks may be difficult to cover. Bonds will require strong risk covers. It is important to identify anchor institutions or corporate who have a good operating asset portfolio and who may benefit from green bond issuance. There are established guidelines on ECBs. Regulatory hurdles are expected to be less, although this issue will be assessed in detail when a pilot issuance is being conceptualized.

In addition to above there is a need to develop a method for obtaining long term hedge for INR to USD transactions. RBI has recently announced a hedge for INR to USD at 3.5 percent per annum for attracting FCNR deposits.

- ***Risk Insurance Scheme***

Solar projects face from various risks including those associated with irradiation, technology, policy, and off-takers. The combination of one or more of these risks leads to default risk on the loans provided to solar projects. While ADB and the World Bank have partial risk guarantee schemes available for Indian renewable projects, these have either not been used or have not been implemented effectively. Also, RE focused bodies like IREDA, which has substantial exposure to the sector, does not have any risk guarantee programs. As such, there is a need to work with insurers to develop products that mitigate some of these risks.

The risks depicted in Figure-8 below are not yet well covered in the Indian market, although they are used in most developed markets such as the U.S., EU, and Japan and provide significant comfort to investors and lenders.

It is important to work with insurers, FIs, IREDA, and multilateral agencies like the World Bank and ADB to develop risk insurance instruments for renewable energy projects which are acceptable to lenders and developers in India.


Figure-9: Insurable Risks

**Benefits of Risk Insurance**

- It reduces risks for a specific project, although at a cost (cost of insurance). Since solar power projects are capital intensive and can have significant components of resource, technology, political and financial risks, this raises the cost of finance for projects, reduces flow of finance and effectively excludes bulk investors as they are risk averse.

- Insurance covers require careful design of a project, use of high quality resources and high quality vendors. Therefore availability of risk covers signals high quality of a project and expedites lending and investing.

- Proper risk covers can help projects migrate from one stage of financing (e.g. construction finance) to the other (re-finance through long term bonds). Any large scale investment program would therefore critically depend on well-designed insurance products.

**Challenges**

One of the challenges in using risk insurance for renewable energy projects in India is that insurance companies perceive the Indian RE market to be small and not worth their attention. However, some national insurance players like New India Insurance have shown interest in developing these insurance products for the RE market.

## 6.5 OTHER MECHANISMS

- ***Currency Hedging***

From a borrower's perspective, the key concern while looking for debt finance is the interest rate. Difference in total interest paid per MW during the course of a 10 year loan due to 1% decrease in interest rate can be as large as 3.5m ($ 70,000/€ 54,000). They can look at the lending sources in two broad categories: Rupee term loan (RTL) and external commercial borrowing (ECB). A rupee term loan will have a base rate as determined by the RBI and the margin charged by the lender. ECBs can have varying base rates as determine d under LIBOR, EURIBOR, US Treasury or other country specific base rates. These are typically lower than the RTL interest rates.

Investors and economists often blame country risk for the higher investment returns – or higher interest rates in the case of loans – that are demanded in one country compared to another. The generic term country risk actually covers a number of risks including inflation, government policy including deficits and borrowing, and the economy, including exposure to commodity prices. However, on closer inspection, the truth is that most of this country risk premium is expressed in the cost of converting the currency over the life of the project, or the currency hedge. Inflation, government borrowing, and economic growth all affect the supply and demand for a currency and therefore the exchange rate. In other words, for an investor, most of country risk is often currency risk.

If a project itself is solid, perhaps the biggest risk an investor faces is the potent al devaluation of the currency in which the investment has been made. Unfortunately, long term currency hedges can be expensive, as uncertainty and risks become greater and less clear over time and, crucially, as markets become thinner (few investors with dollars have set requirements for rupees in 15 years' time). Figure 4 compares the cost of finance of a typical project using domestic emerging market debt and foreign debt. In this example, locally sourced debt costs 13.6%, consisting of the local risk-free rate, a project premium, and a term swap to convert the variable risk-free rate into a 15 year fixed interest rate loan. In this example, before accounting for currency risks, the foreign-sourced debt costs 6.0%, consisting of the lower risk-free rate, and a similarly priced project premium and term swap. Thus, before accounting for currency risk and withholding taxes, the foreign-sourced debt is 7.6% cheaper. However, in this case the cost of the currency swap used as a hedge to mitigate currency risk was 5.5% per year, or 72% of the difference between foreign sourced debt and domestic debt. In other words, most of the advantage of using foreign debt is consumed by the currency hedge, even before accounting for transaction costs and other perceived risks.

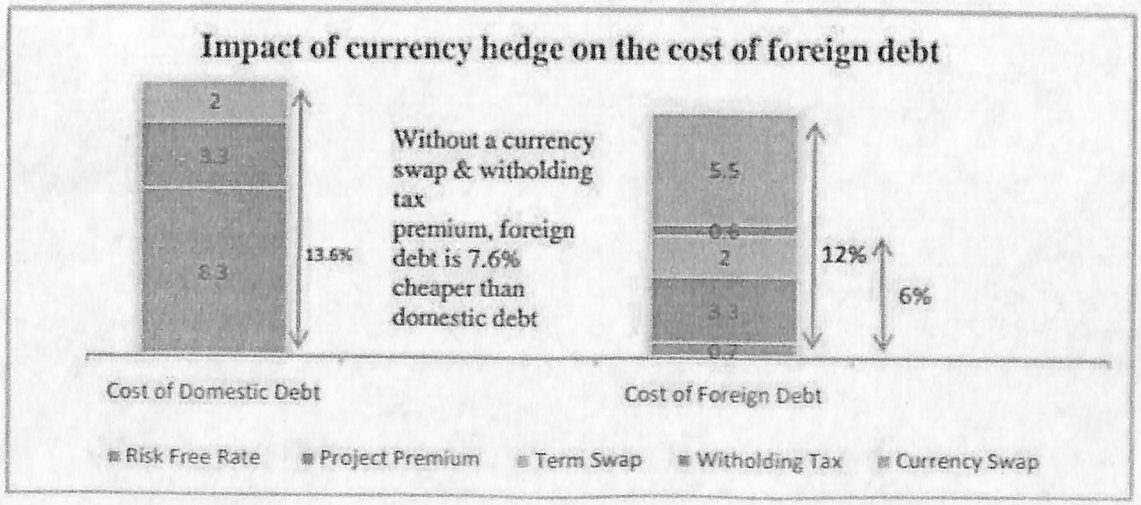


Figure-10: Impact of Currency Hedge on the Cost of Foreign Debt

➢ *Synthetic PPA*

Renewable energy projects traditionally attract financing only after securing a long-term contract to sell the electricity to a creditworthy off-taker at a relatively fixed price. The project development is hard enough, but in today's market, finding a power contract is becoming exceedingly difficult. A developer can ordinarily expect a financier to lend or invest only against "contracted revenues."

At the same time, developers are sometimes reluctant to sign PPAs if it means locking in a price for power for the next 20 years that may be below projected electricity prices. A synthetic power contract may provide an answer.

A synthetic PPA is basically a form of hedge. In one form of synthetic PPA, the project sells its electricity on a merchant basis, but enters into a contract with a third party that provides a floor under the electricity price.

A hedge works both ways. The project pays the counterparty if electricity prices are above a benchmark price. The counter party pays the project the difference if they fall below the benchmark.

The payments may be calculated around a notional quantity of electricity regardless of what the project actually produces or they may be paid based on actual output.

In some cases, the benchmark prices are the same for each side of the arrangement. In others, there is a range between the two targets in which neither party pays. Essentially, there is a zone of indifference. The hedge provides insurance against declines in electricity prices and, depending on how it is structured; it may also allow the project owner to earn more if electricity prices rise.

On a spectrum measured by cash flow certainty, a synthetic PPA falls somewhere between the relative predictability of traditional PPAs and the less certain (and in the eyes of financiers, risky) method of selling power on the open market.

Synthetic PPAs are generally limited to locations where hedging counterparties can be found — therefore, areas that are deregulated and that have liquid spot markets for energy sales that permit the sale of the electricity output into a day-ahead or real-time market. These markets include the New England Power Pool (NEPOOL), New York Independent System Operator (NYISO), the Electric Reliability Council of Texas (ERCOT), the PJM Interconnection (PJM) and the Southwest Power Pool (SPP), among others.

Also, synthetic PPAs may be appropriate under certain circumstances in which projects that have been fully permitted and are ready for operation before the PPA starts, a synthetic PPA may let

the project generate revenue in the meantime with a floor under the interim revenue so that the project can be financed.

Synthetic PPAs may provide a useful stopgap for project companies that do not want to be locked into current power prices for the long term.

**Financing Issues**

Due to the large value at risk created by the amount of the settlement exposure, the hedging counterparty will generally seek to share rights in the collateral package, which are traditionally held by lenders in a project financing. This is the most significant area of tension in negotiating a synthetic PPA because the project owner is likely to have already pledged its assets such as project revenues, contractual rights, physical assets and equity to lenders. Therefore, the pool of collateral available to secure the hedge agreement may not be large enough to protect the counterparty without creating overlapping claims between the counterparty and existing lenders.

Termination rights are another issue of focus in negotiating a synthetic PPA. In order to ensure that the project owner is not subject to differing standards, lenders will want to see the termination rights, as well as termination events under the hedge, as closely aligned as possible with the events of default under the loan and inter-creditor agreements. Also, lenders may ask for a brief cure period after an event of default under the hedge agreement in order to give the lenders a chance to cure any default and thus preserve the value of the hedge.

## 6.6 INTERNATIONAL FI NANCIAL MECHANISMS

- ***Brazil***

Brazil has demonstrated a vast potential for renewable energy growth, and utilizes a specialized tax regimes, national climate change targets, and public bidding through auctions to foster investment and market growth. With its similar growth and financing environment, including high interest rates, Brazil offers a strong example of an institution that could be implemented in India to address the renewable financing gap. The Brazil National Development Bank (BNDES) is a major financier for clean energy projects, including wind energy, and supports renewable, transport, building and industrial energy efficiency, waste-to-energy, preventing desertification, and reduced deforestation. The BNDES provides low-cost long-term financing at a large scale, cutting renewable energy costs by one-fifth while encouraging investment. It acts as the main source of credit for both private and public companies across Brazil.

➢ *United States*

As in India, many individual American states promote solar energy through innovative financing mechanisms in addition to national programs.

- **Loan guarantees** for early projects without capital have been very successful at lowering interest rates in the United States. However, the failure of one program invested in by the government doomed the portfolio of programs in U.S. (i.e., collapse of the Solyndra company), offering a cautionary tale.

- ***Private sector solar leasing model***- Instead of buying the solar equipment for a house, the homeowner leases it. The leasing company gets a loan from a bank and uses the capital as line of credit for the homeowners who pay leasing fee. However, homeowners seeking the federal tax credits (up to 30%) that come with buying a solar system can now take out direct loans for the purchase.

- ***Renewable portfolio standards (state-level)*** - In California, for example, utilities procure solar to meet mandated targets. Due to strong enforcement of the RPS, this has proven to be a very effective policy.

- *Net energy metering*- On state level has been very popular in the U.S. Many states have adopted net metering policies, spurring solar expansion.

- ***Master Limited Partnerships (MLPs) and Real Estate Investment Trusts (REITs)*** - It could improve the efficiency of a solar project by converting tax credits into actual capital. MLPS and REITs can raise money on public exchanges but do not pay income tax at the corporate level (pass-through entities), leading to a much lower cost of capital. MLPs are only allowed for certain types of businesses at this time, and an act of Congress is required to include renewable energy. Solar REITs on the other hand would require a ruling from the Internal Revenue Service (IRS) due to the tax ramifications of forming this type of investment trust.

- *Green bonds*- Green bonds function like any other type of bond, with the added requirement that the financing must be used for "green" projects such as renewable energy deployment. Issuers of green bonds may include governments (including state governments and export -import banks), inter-governmental organizations such as the World Bank or regional development banks, financial institutions, and other corporations. In total, they issued mo re than Rs. 3lakh crore (approximately $55 Million) worth of climate-themed bonds in 2012 alone. The advantages of green bonds in the Indian context could include access to domestic and foreign capital as well as relatively low cost interest

rates because renewable energy projects should be expected to have stable cash flows and low risk.

➢ *Germany*

The German renewable energy market is among the most successful, expansive, and innovative in the world. A combination of national-level policies and investment protection has allowed for tremendous growth since the German Renewable Energy Act (Erneuerbare-Energien-Gesetz, EEG in German) was enacted in 2000. Climate protection targets, long-term strategies for future energy supply, and market-oriented innovation and cost reduction have allowed for the expansion of renewable energies in Germany. However, the lowered FiTs that lessened demand and led to a massive over-supply of solar panels in Germany are lessons about the need for careful planning for the emerging solar market in India.

- ***Investment protection through FiTs-*** In Germany, generated electricity from renewable energy facilities received a fixed FiT rate, which was lowered every year depending on project size. These rates are technology specific and guaranteed for 20 years. The long-term fixed price allowed facilities, particularly small and medium-sized enterprises, equal accessibility to the energy production market and fueled rapid scaling of the renewable energy market.

- ***Remuneration rates-*** The price of fossil fuel and renewable-generated electricity is passed on and paid for by the consumer, not government-established subsidies so that individuals, who use more, pay more. Thus, the market growth of renewable energy is spurred by consumption and generation, not taxes on the German public.

- ***Encouraging innovation through lowered FiT rates-*** The feed-in tariff prices are periodically lowered for new power plants. This creates an innovation incentive as firms are determined to research and implement technologies that are more efficient and less costly.

➢ *China*

China continues to lead the world in energy consumption and in investments in renewable energy. Renewable energy investment has risen considerably in the world's leading emerging market and Chinese fiscal and governmental policies foster the resulting market development.

- ***Feed-in tariffs-*** FiTs for electricity rates such that renewable electricity generators received a subsidy at market rates.

- ***Renewable Power Quotas***- The Chinese government agencies set and modify quotas annually for the proportion of power purchased that must be from a renewable energy source. This is directed at and enforced by the grid companies, as opposed to the consumer.
- ***Priority Dispatch***- Government agencies develop regulations that require grid companies to give priority electricity dispatch to renewable energy generators over power plants fueled by coal or other high emission plants.
- ***Central Development Fund***- Renewable energy surcharges are now allocated to a central renewable energy development fund. The central government manages the fund, instead of provincial grid companies, and may spur further financial investment and development.

# CONCLUSION

A sustained participation from commercial lenders is seen as critical for achieving the scale of capacity addition envisaged under subsequent phases of the National Solar Mission. The role of "facilitating public funding" in enabling implementation of risk-reducing instruments as well as innovations in financing is significant and comes across as an imperative for moving solar development to a largely nonrecourse financing mode in India. The efficacy of direct public funding in "buying down" the cost of electricity for the bulk of the commercial program under solar PV needs to be carefully evaluated by the government in relation to other forms of facilitating public financing. Subordinated public finance to prolong tenor of debt as well as credit guarantee enhancement schemes ought to be structured and pursued over subsequent phases of JNNSM.

Reduction in the cost of debt is a more cost-effective solution for solving this challenge compared with existing solutions. There are financial instruments, tried and tested in other emerging economies, which can effectively reduce the cost of debt, and thus help solve the renewable energy (Solar Financing) financing challenge in India.

Some instruments, such as the infrastructure debt funds and partial credit guarantees, have been recently introduced in India, while some others haven't been used in the country yet. The purview of a few other instruments needs to be expanded to cover solar energy projects. Further, a single instrument alone cannot solve the problems in debt financing for solar projects. In addition, private players would find it difficult to introduce concessional financing instruments due to various structural issues. The government should therefore prepare the groundwork to introduce a set of instruments that can, together, effectively reduce the cost of debt in a way that also encourages private investment.

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