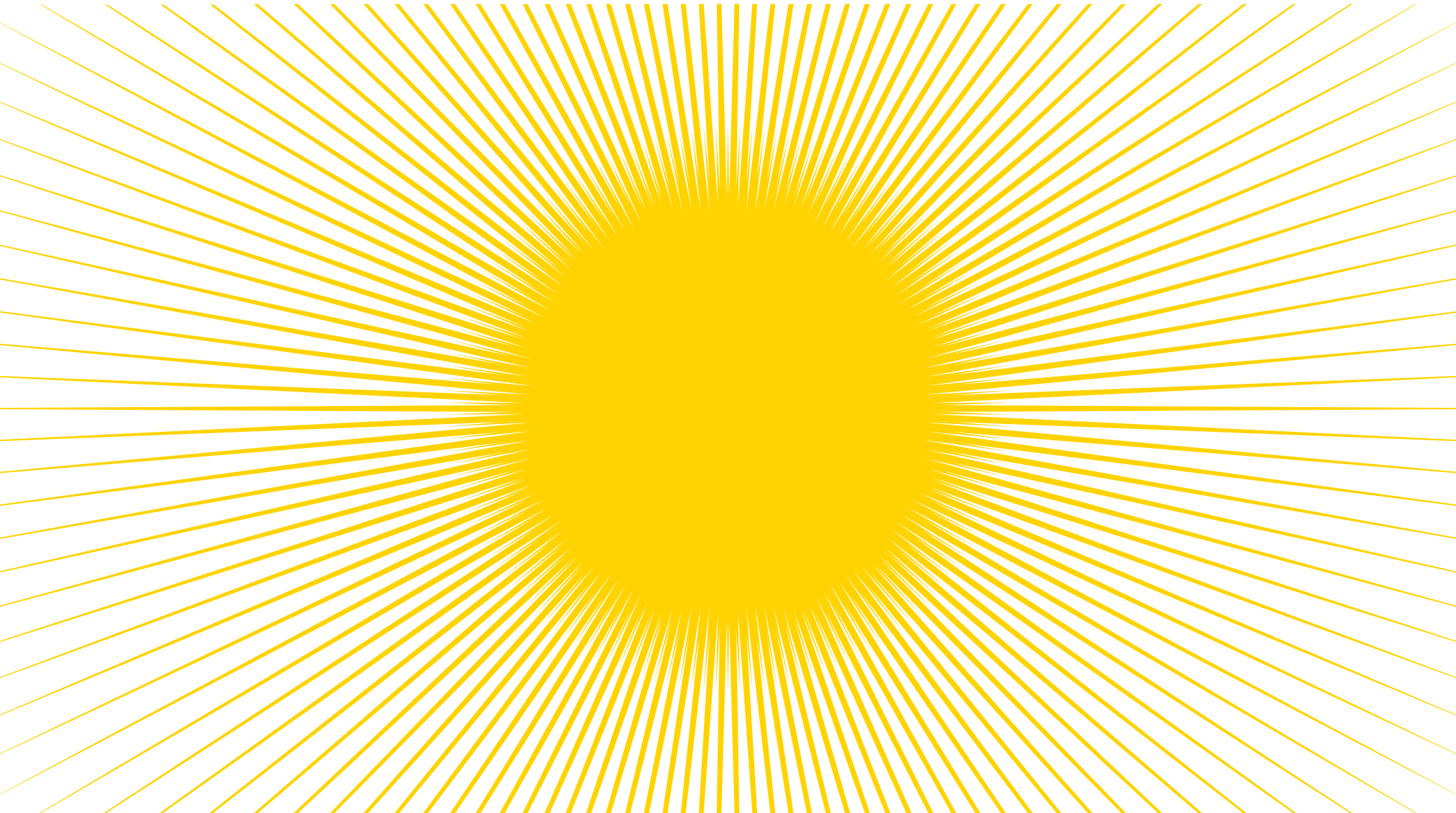


India's Solar Leap:

Financing a Mature Market



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Executive Summary

Solar PV is growing rapidly in India. The country has become the third largest solar market globally. Driven by cost competitiveness, solar is now the preferred choice for new power plants by the federal and most state governments. Access to large amounts of capital is essential for the market to maintain its momentum. Our analysis shows that the financing ecosystem in India is ready to meet the needs of the utility-scale segment that constitutes over 90% of India's solar capacity. The rooftop and off-grid solar markets, however, still face financing challenges. Following are the key trends that support our analysis:

1 India's financing industry has learned to speak 'solar': Based on a cumulative 12 GW of solar projects installed so far in India, market participants have become good at assessing the key risks in the sector: Policy makers are mitigating off-take risks, banks and investors are more accurately assessing and pricing asset and market risks, and developers are decoupling project quality from competitive tariffs. As a result, it is easier for Indian utility-scale solar projects to be financed.

2 There is enough money – for now: A steep rise in liquidity in the Indian banking sector and a relative slowdown in other infrastructure sectors is driving banks to lend more to utility-scale solar projects. Equity financiers too have made major commitments. In the medium term (2+ years), banks' power sector lending limits and a potential rebound in other infrastructure sectors could reduce the available debt.

3 Domestic finance out-competes international finance: Interest rates on Indian loans have fallen sharply since 2015. As a result, after factoring in the cost of hedging against currency volatility, Indian debt financing is now more competitive than USD and Euro sources. Debt at concessional rates from international agenda banks can still match Indian interest rates and international equity financing is more on par with Indian sources. However, the easier approval processes of Indian banks make them the first choice for most project developers.

4 Solar financing is becoming more diverse: Domestic financing has now moved beyond the plain vanilla debt and equity instruments. The use of bonds and mezzanine financing has become more popular for solar projects. These instruments are often tailored to the specific needs of project developers and reduce the overall cost of capital.

5 The secondary market is on the rise: Several recent utility-scale acquisitions of up-and-running solar projects show that a secondary market has taken off in India. This enables developers to unlock their capital from existing projects and re-deploy into new ones. New, long-term-yield oriented players enter the market. This has a likely positive effect on project execution quality as buyers bring state-of-the-art due diligence processes and take a long-term view of plant performance.

6 More needs to be done on rooftop solar debt financing: Rooftop solar is now competitive for commercial and industrial customers across much of India. The OPEX model, which provides customers solar at rates cheaper than grid electricity at no upfront cost, has taken hold. However, the share of debt, let alone non-recourse debt, is still too low. In this segment, there is a need for financial innovation to address customer bankability risks and transaction costs.

7 Off-grid solar sees too little money – and offers too few investment cases: Off-grid solar is often an attractive option as compared to existing low efficiency and unhealthy fossil energy alternatives used by off-grid consumers. However, the market still awaits sizable, scalable business models. Financing is rarely on commercial terms.

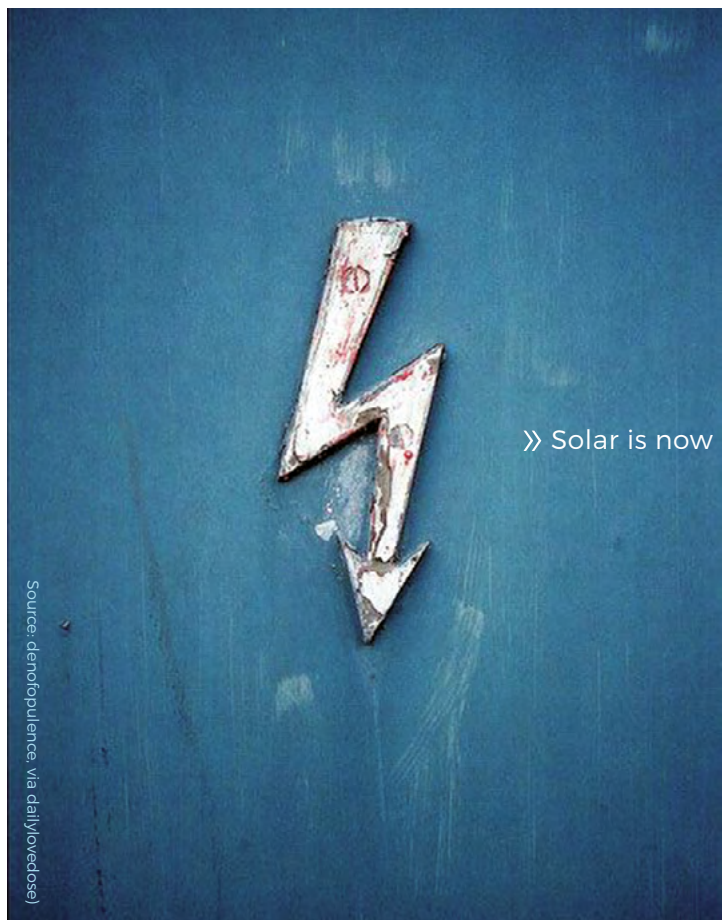
India's healthy solar financing ecosystem and its shift to a high growth phase provides ideas and best practices for countries still in the market initiation phase. They can learn from India's success in mitigating solar risks and deepening the capabilities of the financial sector to support solar growth. India in turn needs to further mature as a market, increasing the participation of more risk averse investors and diversifying the pool of capital available. In the report, we propose a number of acceleration ideas that can help achieve this.

» India's healthy solar financing ecosystem provides ideas and best practices for countries still in the market initiation phase «



Bombay street, Photo: jaume/ shutterstock

1 Introduction: Solar takes center stage in India



Source: demofolence, via dailylivedose)

» Solar is now the most cost competitive electricity source in India «

As the Indian economy has further industrialized and more modern and energy-intensive lifestyles have developed, the country's per capita energy consumption has grown 60% between March 2002 and March 2016 alone and is expected to more than triple by 2030.¹ To meet this demand, India needs to add on average 40 GW of electricity capacity per year (at current electricity mix).

Solar is a smart energy option to meet this demand. Firstly, it is now the most cost competitive electricity source in India. Five

years ago, the lowest solar tariff was INR 7 (Euro 0.10)/kWh. In May this year, at an auction for a 500 MW solar park in Bhadla, Rajasthan, the lowest winning tariff was INR 2.44 (Euro 0.034)/kWh for a 200 MW plant by Acme Solar. At that tariff, solar is now cheaper than coal by 28%, wind by 17% and gas by 62%.²

Another advantage of solar is the short plant construction times: plants of 500-1,000 MW can be constructed in 6-12 months. Other power plants take anywhere from 1 year for wind to more than 20 for nuclear.

Highlights

1. Solar is a smart energy option for India as it is the most cost competitive, has short plant construction times and is abundantly available as a resource locally.
2. The solar sector is on a high growth trajectory expected to grow more than six times in the next five years.
3. The market is now supported by a strong financing ecosystem and commercially driven capital with Indian domestic banks providing the majority of financing

Lastly, solar is abundantly available. India's average solar incidence is 5.39 kWh per square meter per day. If solar panels were installed over even just a thousandth of India's landmass, this would provide around 6,500 TWh of electrical energy per year, more than six times the country's current energy demand. This is important for a country that still imports a significant amount of its energy in the form of fossil fuels. Solar as

a resource is also available throughout the country. This means that energy can be produced close to the points of consumption. In comparison, coal is mined in India's East and consumed in the West, requiring either the costly transportation of coal (today making up 45% of India's railway freight capacity)³ or the distribution of power through expensive and inefficient high voltage transmission lines.⁴

Figure 1:
Solar, Wind, Coal and Natural Gas Tariffs in India, 2014-2017

Source: Central Electricity Regulatory Commission (CERC);
Ministry of New and Renewable Energy; Bridge to India; TFE Consulting

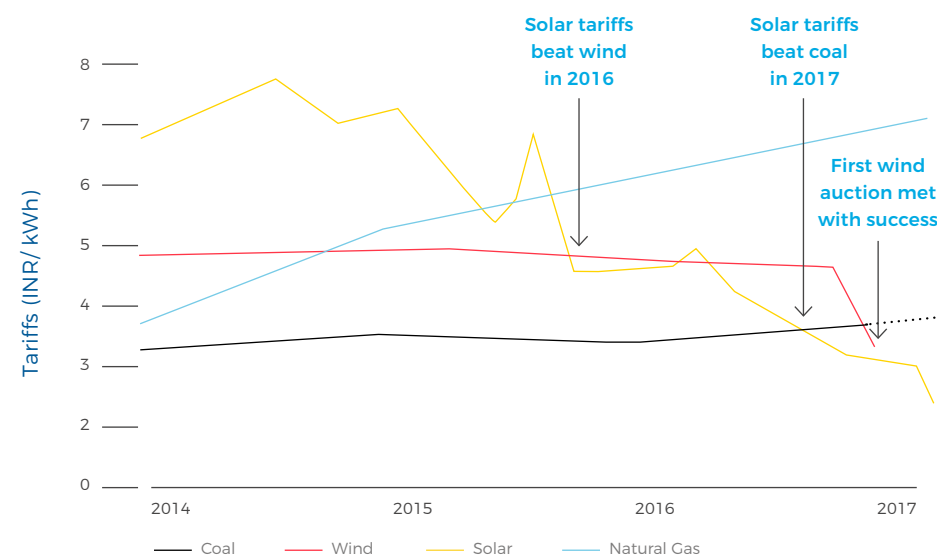
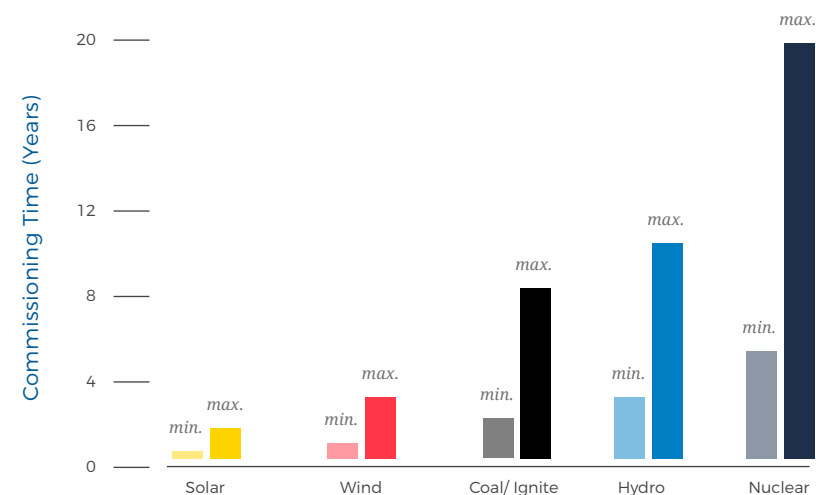


Figure 2:
Project Commissioning Times for Power Plants in India

Data: Central Electricity Regulatory Commission, Global Energy Observatory



Solar PV in India is also growing fast. Between 2010 and 2016, 11 GW were installed. At the current rate of installations and no changes in policies, financing conditions and demand, we estimate that an additional 70 GW could be installed by 2022, more than six times the current total.

» An additional 70 GW of solar PV could be installed by 2022, more than six times the current total «

Utility-scale solar plants are the market's growth engine, representing almost 90% of current installations. This is not surprising as government policies have focused on this segment to leverage economies of scale for lower costs. Larger projects have also reduced transaction costs for developers and banks. In the rooftop segment, over 1 GW has been installed so far and we expect the market to grow by 30% annually between 2017 and 2022. The vast majority of installations are for commercial and industrial (C&I) customers who typically consume the power themselves to replace a share of grid electricity and offset high retail electricity rates. Rooftop solar for residential customers is lagging. Except for high-use consumers in cities like Delhi and Mumbai, it is not yet competitive with retail rates. This may well change in the future as electricity rates rise and solar costs fall further.

» The rooftop solar market could grow by 30% annually between 2017 and 2022 «

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The solar off-grid segment is still a very small part of the market. The absence of a scalable business model is the key barrier to growth. Additionally, the small business and project sizes have made it difficult for off-grid players to attract financing.

Figure 3:
India Solar Capacity Additions 2010-2022E

Source: Past - Bridge To India, Projections - TFE Consulting estimates

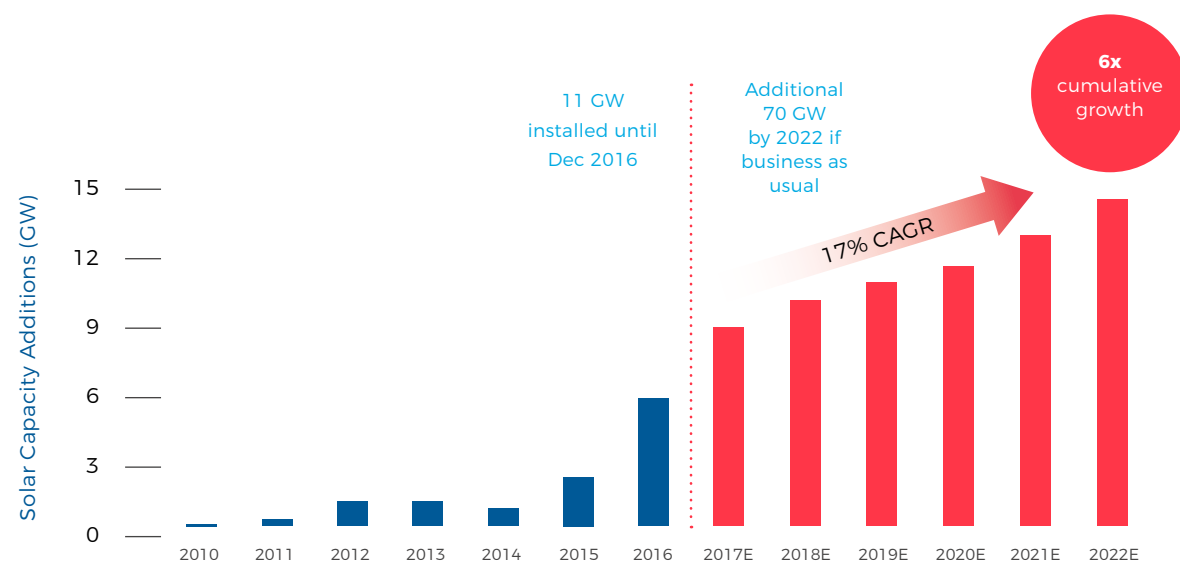
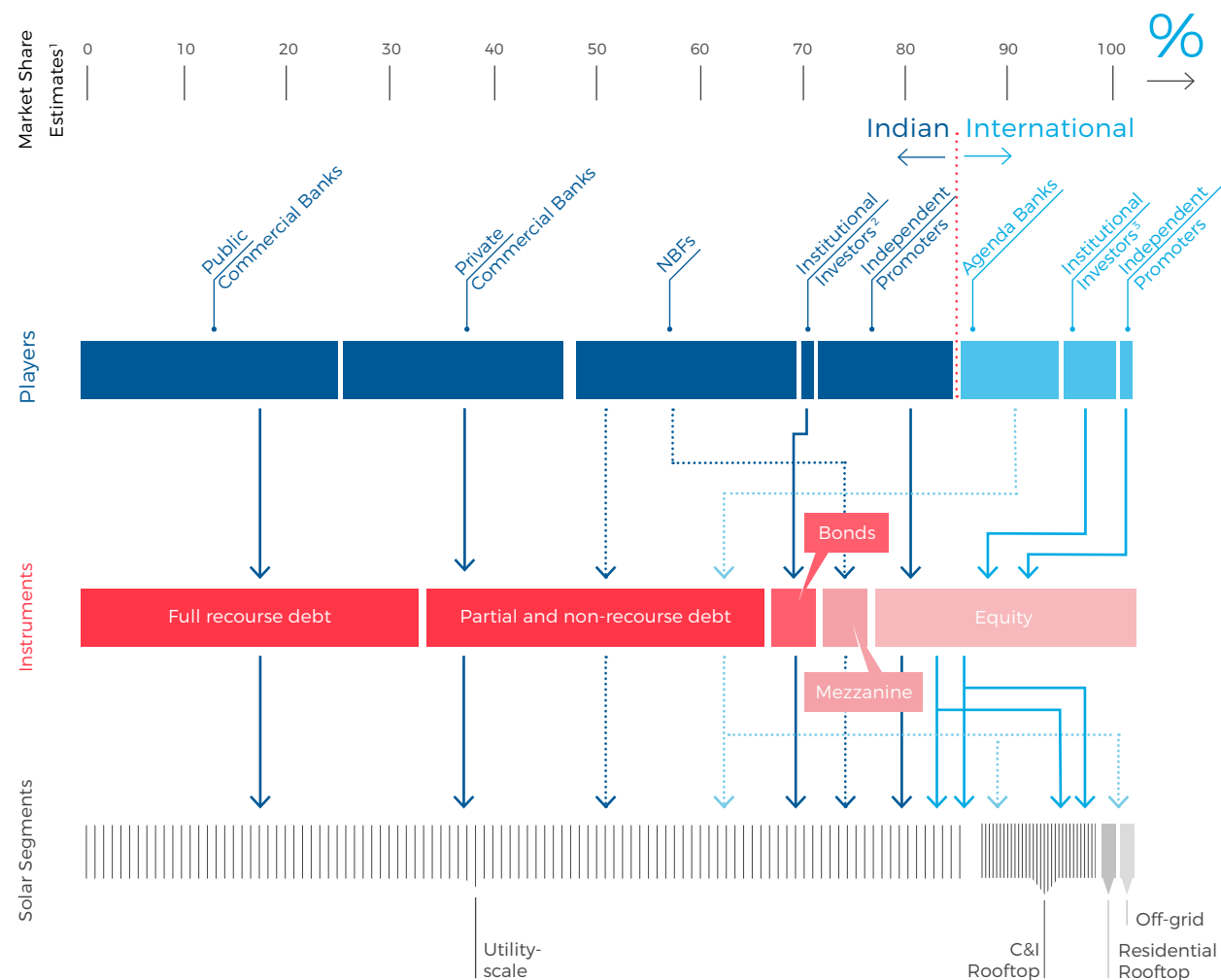


Figure 4:
India Solar Financial Flows (as of December 2016)

Source: TFE Consulting

The market now has a strong domestic financing ecosystem. During the earlier market growth, international financing from agenda banks like The World Bank, International Finance Corporation (IFC), Asian Development Bank and Germany's development bank KfW were important sources of finance. Now, as the solar market has grown, local, commercially-driven capital has stepped up. This has tilted the financing landscape in favor of domestic Indian sources, which in 2016 contributed more than 85% of financing.



1. TFE Consulting estimates based on market interviews and desk research
2. Includes Indian pension funds, mutual funds and equity funds
3. Includes international equity funds; excludes high net individuals, home offices, pension funds, insurance companies, endowments and sovereign wealth funds

Our market interviews with developers and banks show that Indian commercial banks (both public and private) and non-banking financial companies (NBFCs) now recognize solar

» Indian commercial banks and non-banking financial companies now recognize solar as an important and attractive infrastructure asset class «

as an important and attractive infrastructure asset class. In 2016, their debt financing contributed to around 70% of the market's financing volume. Based on our conversations we estimate that over 40% of that debt was on a partial or non-recourse basis.

A note on Research

In order to assess the financing landscape in India, we have compared publically available data and our own market models with the results of over 40 interviews with India's leading developers, investors and banks. We have asked them questions relating to their own financing strategy and experience as well as on their view of the market at large. Our resulting market numbers are an approximation.



Calcutta street, Photo:Radiokafka/ shutterstock

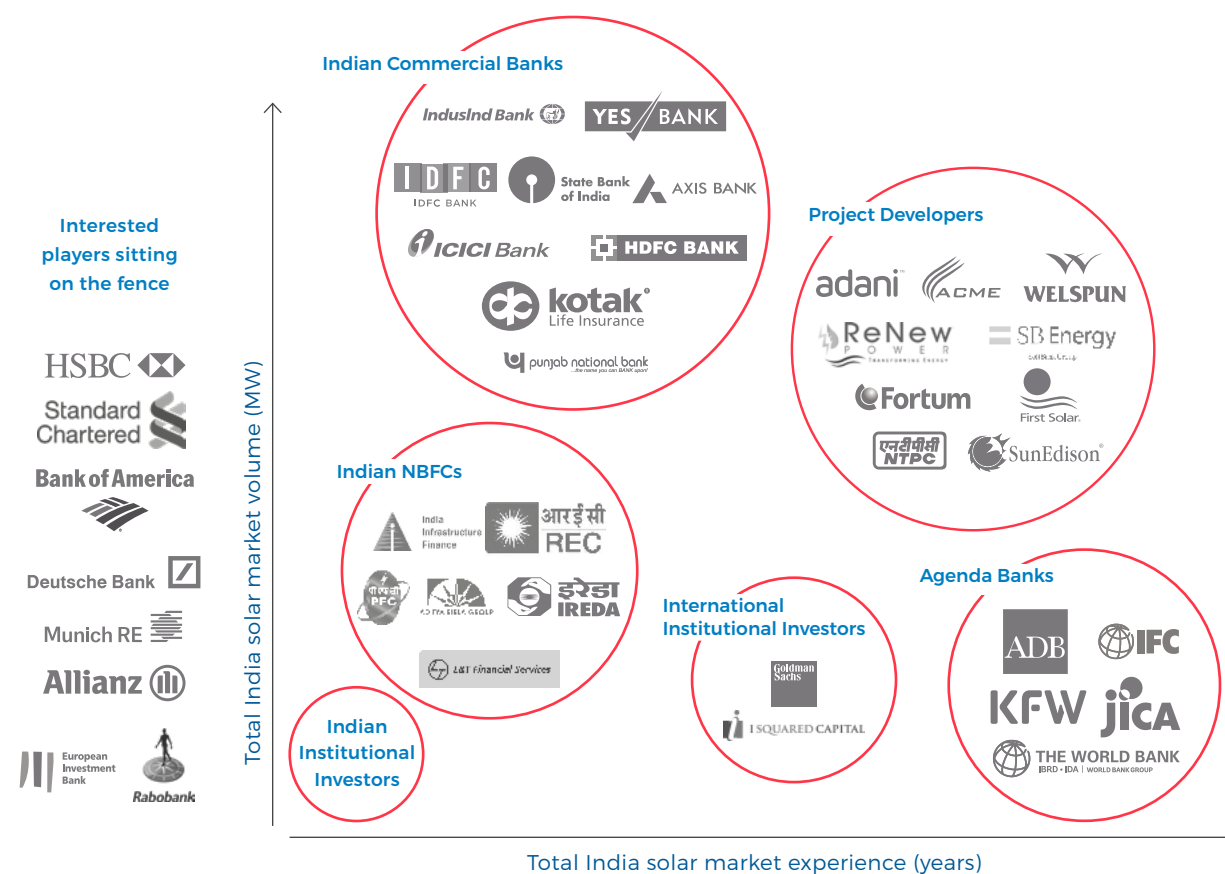
Amongst the most active Indian solar market lenders are State Bank of India (SBI), Yes Bank, and Axis Bank. As the country's largest public sector lender, SBI has deep relationships with the domestic industrial conglomerates that are now developing solar projects. Yes Bank and Axis Bank have gained market share by building specialized solar financing teams (SBI also has had a specialized team). Both banks have over the last years built large portfolios of solar investments and are also the first to issue green bonds tied to solar projects in India.

Indian power sector majors like the National Thermal Power Corporation (NTPC), ACME, Welspun and Tata Power were early equity investors and continue to lead in the market. NTPC is the country's largest power generator and has a high credit rating. It has leveraged both to expand its solar portfolio. ACME, Welspun and Tata Power are each diversified industrial conglomerates that have leveraged their market experience and strong corporate balance sheets to expand into solar. In the past two years, Indian companies like Adani and international players like Fortrum, Engie and Enel have also entered the market and increased investments. Each of them is also able to leverage their broader power sector experience and strong balance sheet for cheaper capital.

Figure 5:
India Financial Players Map

Source: TFE Consulting estimates

Note: Map is only indicative of the market; coverage of players is not exhaustive and their positioning is based on estimates



2 The status of solar financing in India

New policies are lowering off-taker risk

The availability of financing for solar PV projects, especially on a non-recourse basis, was a challenge in India until 2015. The risk that financially weak utility off-takers could default on payments was a major concern. As a cumulative 12 GW of PV has been installed, the government has begun tackling this risk through new policies.

» The government has begun tackling off-taker payment default risk through new policies «

One such policy is the federal government's electricity reform policy Ujwal DISCOM Assurance Yojana (UDAY), launched in



November 2015. This aims to improve the financial health of state-level public utilities. The goal is to improve their cash flows, investment attractiveness and service quality. Better cash flows will improve their payment capacity, reducing the risk that they will delay or default on payments to power projects, including solar. If successful, the policy will tackle a major risk for solar projects that have a Power Purchase Agreement (PPA) with a public utility, making it easier for developers to raise non-recourse debt financing.

The policy has already made an impact: 27 states and union territories have joined the initiative.⁵ State governments have already taken over almost 75% of the debt of DISCOMS, improving their balance sheets.⁶ This past year, DHBVN, one of two DISCOMS in the state of Haryana, registered a profit for the first time in 17 years.⁷ Early action by state governments is a strong signal to banks that payments will not only continue, but also cease to be a major risk for solar projects over the next five years as the financial health of utilities improves. In the short-term, this means that banks will continue to finance projects despite the payment risk, albeit largely with recourse to developer collateral. In the next 2-3 years, banks will likely shift to more non-recourse financing as the financial health of utilities continues to improve.

Highlights

1. New government policies have come up to tackle the risk that financially weak utility off-takers could default on payments for solar projects.
2. As solar has evolved from a fringe infrastructure asset class to a mainstream option for domestic public and private sector banks in India, non-recourse financing has become more common.
3. Experienced project developers are paying greater heed to project quality, leveraging new financing opportunities and improving plant design to lower project risk.

Another initiative that has reduced off-taker risk is the Madhya Pradesh government's policy used for a tender in the state's Rewa district in January 2017 for three solar projects of 250 MW each. The policy offers a multi-tiered, state government backed (sovereign) payment guarantee to provide credible protection against payment defaults by the off-taker. Further, the off-takers mix the highly credit-worthy Delhi Metro Rail Corporation (AA+ credit rating), with the more traditional and financially weak utilities of the state of Madhya Pradesh.⁸

» A policy structure like Rewa's reduces debt financing costs, which can translate into lower solar costs «

A policy structure like Rewa's reduces debt financing costs, which can translate into lower solar costs. This resulted in the lowest tariff under the Rewa tender of INR 2.97 (Euro 0.043)/kWh, which at the time was a record in the Indian market. The policy's structure could now be an example for other states.

Improved due diligence capabilities of banks increase non-recourse financing

With over INR 210 billion (Euro 3 billion) of debt financing lent by Indian banks to solar projects just in 2016 and over INR 650 billion (Euro 9.3 billion) lent in the past five years largely on a recourse basis⁹, solar has evolved from a fringe infrastructure asset class to a mainstream option for both domestic public and

private sector banks. Banks now have a greater understanding of solar technology, relative quality of components of different

» Banks now have a greater understanding of solar technology «

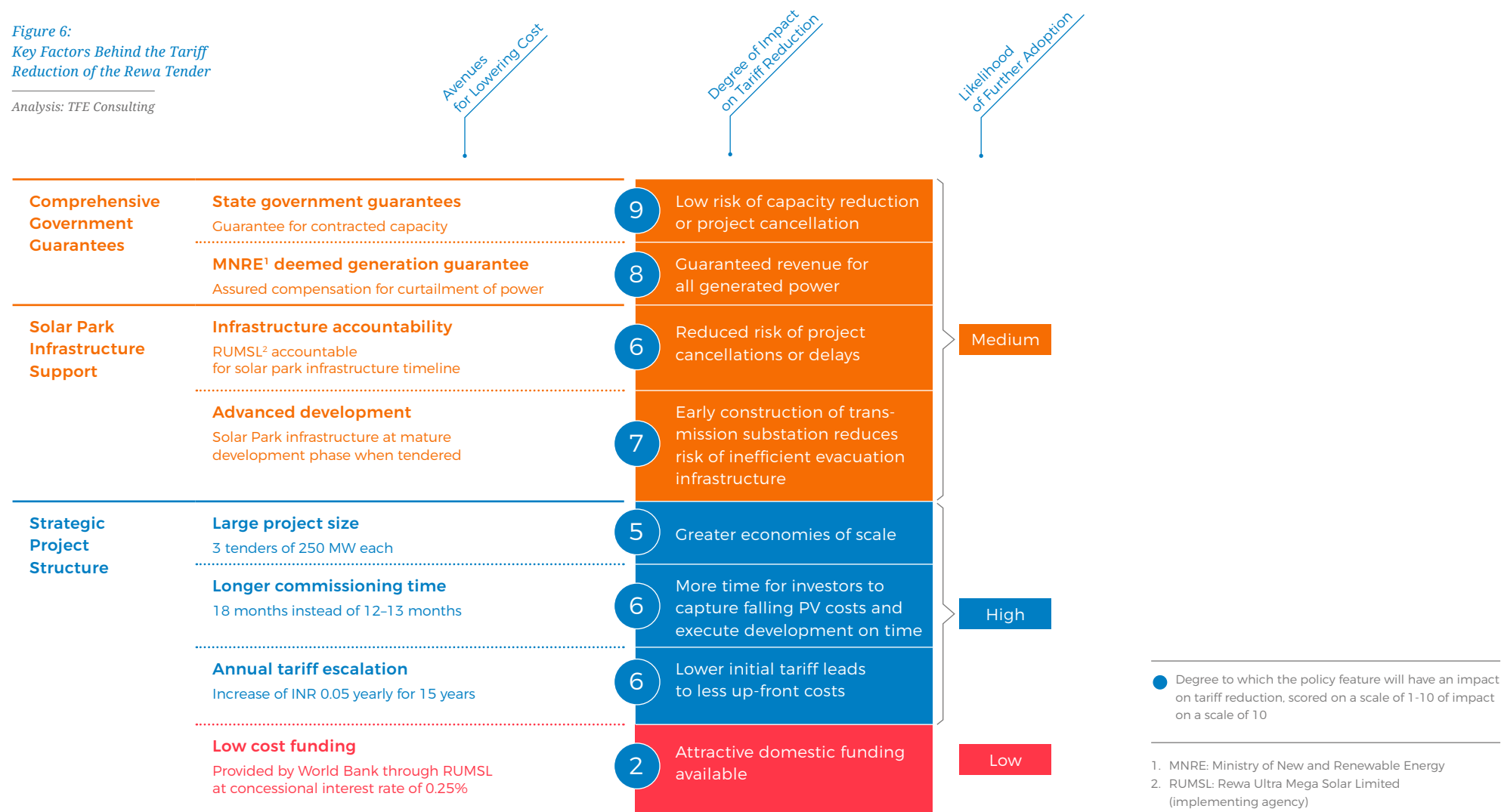
suppliers, project execution capabilities of EPCs and developers and viable tariffs. Technical assistance that international agenda banks like the World Bank, Germany's KfW and the Asian Development Bank have provided, especially to some Indian public sector banks, has also helped in this learning process.



Mumbai metro train, Photo: Tukaram.Karve/shutterstock

Figure 6:
Key Factors Behind the Tariff
Reduction of the Rewa Tender

Analysis: TFE Consulting



Better project execution has lowered project risk

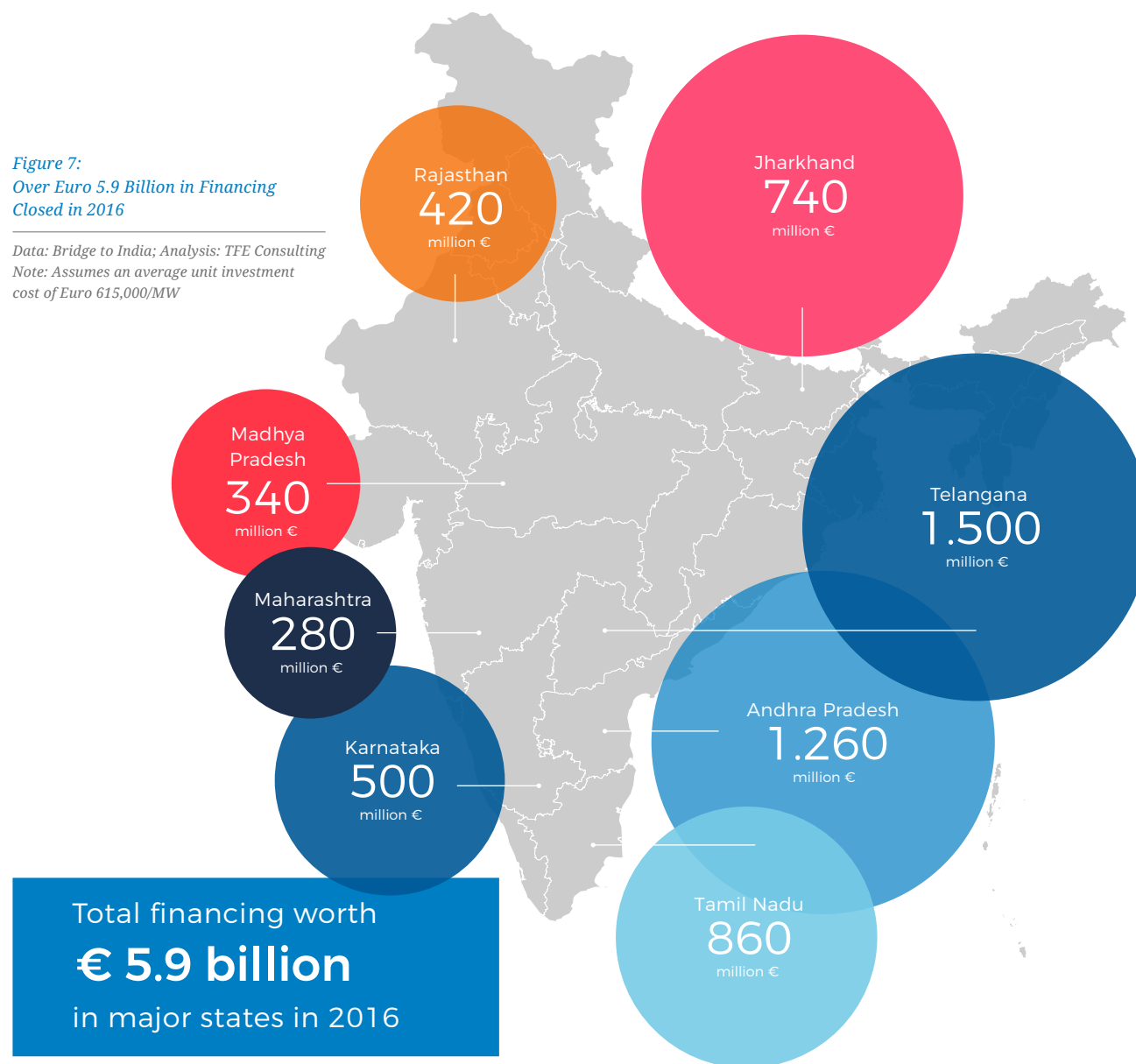
Over the past two years, the market has consolidated around very large, Indian corporate backed project developers, some with experience in the conventional power sector. Other key players are international developers with diversified power sector experience. Most of the developers have installed at least 300-500 MW of PV projects each. This project development experience has taught them how to optimize costs without compromising on quality. It is now common to optimize financing costs by leveraging suppliers' credit and refinancing through cheaper, more risk averse debt financing options upon completing construction. Developers have also improved project design, data analytics and project monitoring result-

» Developers have improved project design, data analytics and project monitoring resulting in greater energy generation «

ing in greater energy generation. Project standards have been improved by using better cabling, racking systems and automated cleaning systems. Our market interviews suggest that the more experienced developers are now acutely aware of execution quality issues, protecting their reputation with lenders to ensure attractive lending conditions.

Figure 7:
Over Euro 5.9 Billion in Financing
Closed in 2016

Data: Bridge to India; Analysis: TFE Consulting
Note: Assumes an average unit investment
cost of Euro 615,000/MW



Sufficient debt is currently available

One reason for the wide availability of debt for solar projects is that banks have surplus capital that they are keen to lend. Liquidity in banks has increased 68% since 2012 driven by macro-economic factors. Additionally, in November 2016, the federal government's demonetization policy pulled INR 14 trillion (Euro 200 billion) in cash out of circulation and into the banks.¹⁰ As a result, as of June 2017, there was excess liquid-

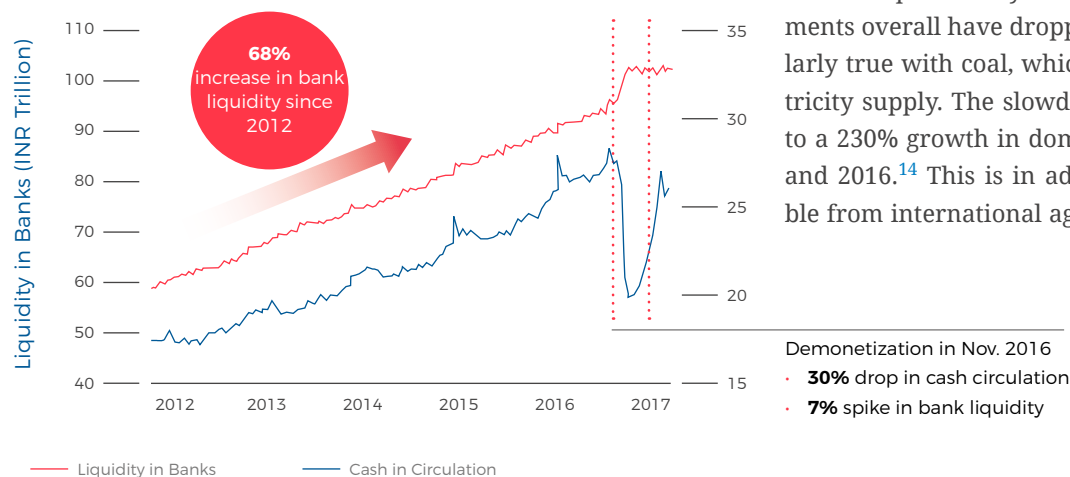
ity of INR 3,600 billion (Euro 51 billion) in the Indian banking system.¹¹ The RBI expects this excess liquidity to persist in 2017.¹²

» A slowdown in other sectors has contributed to a 230% growth in domestic lending for solar between 2014-2016 «

Another reason for the easy availability of capital is that a relative slowdown in other power and infrastructure sectors has limited lending alternatives for banks. Investments into roads, telecommunications and other infrastructure have stagnated over the past five years. Moreover, non-solar power investments overall have dropped 12% just in 2016.¹³ This is particularly true with coal, which makes up over 60% of India's electricity supply. The slowdown in other sectors has contributed to a 230% growth in domestic lending for solar between 2014 and 2016.¹⁴ This is in addition to the funding already available from international agenda banks for Indian solar projects.

Figure 8:
India Money Supply, 2012-2017

Data: Reserve Bank of India; Analysis: TFE Consulting

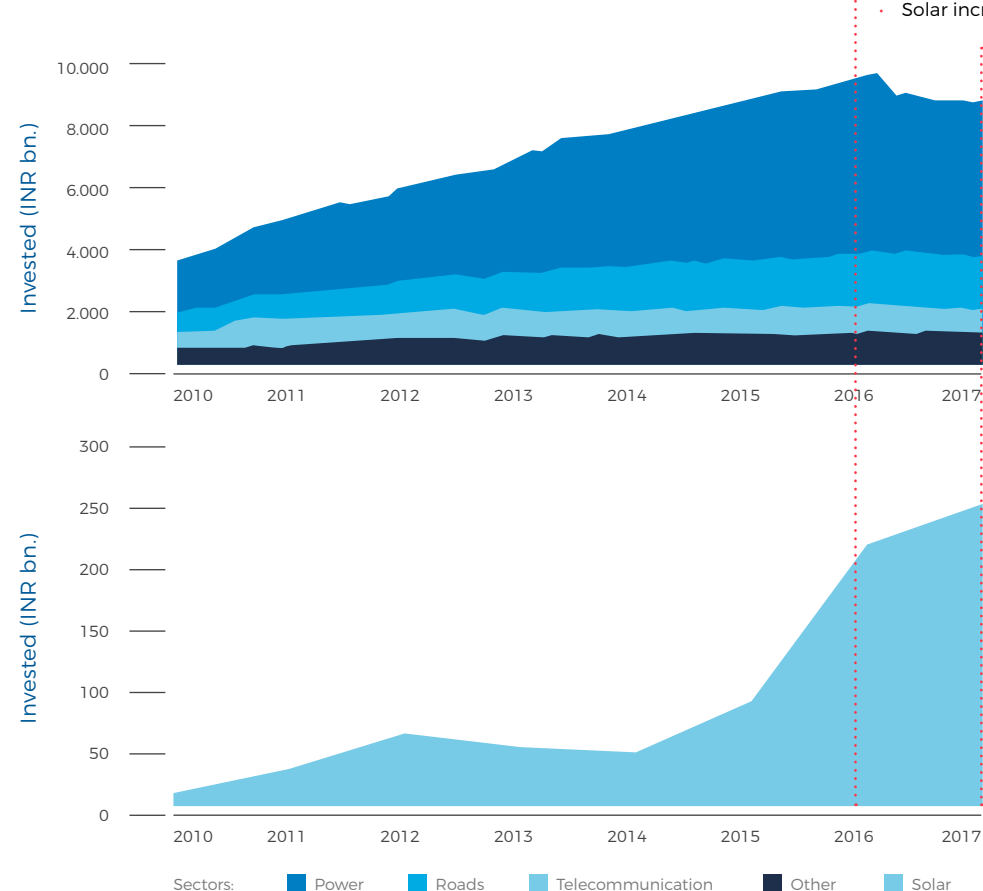


Highlights

1. Banks have surplus capital that they are keen to lend to solar projects.
2. Power sector lending limits could restrict future lending to solar.
3. Private equity interest is high for both utility-scale and rooftop developers.

Figure 9:
Infrastructure Investments Drop as Solar Investments Increase

Data: Reserve Bank of India; MERCOM; Analysis: TFE Consulting

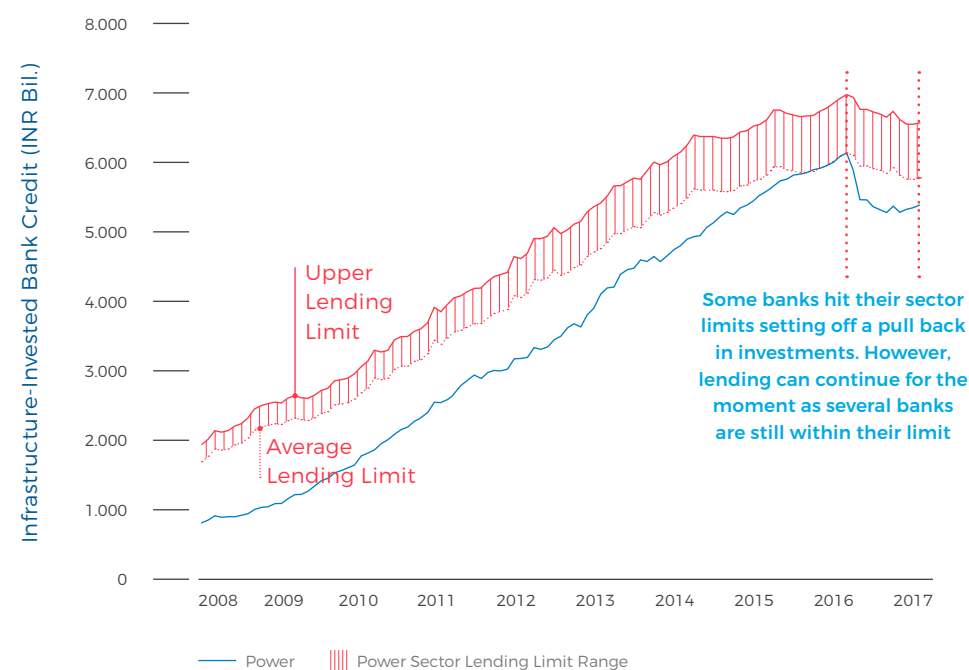


For the rooftop segment, for example, INR 120 billion (Euro 1.7 billion) in debt financing is now available through credit lines from KfW, ADB and the World Bank.¹⁵ This, market interviews suggest, is far more than what can be absorbed by the segment's current project pipeline.

Looking ahead, however, power sector lending limits could potentially restrict future lending to solar. These limits, in place by banks under the advice of the Reserve Bank of India (RBI), vary across banks but lie in the range of 20-25%.¹⁶ According to the data, total bank lending to power projects breached the sector's average limit in 2016. This has since come down likely because of the pull back in lending to non-solar projects. Nonetheless, no two banks have the same sector limits and many banks often lend in excess. Since lending to the sector remains close to the average limit, it is very likely that several banks are at or above their limit and many more are close. As lending to solar projects increases, several more banks could reach their limits creating a systemic squeeze on debt financing for the sector within the next two years.

Figure 10:
Power Sector Investments with Lending Limit Range, 2008-2017

Data: Reserve Bank of India; Analysis: TFE Consulting



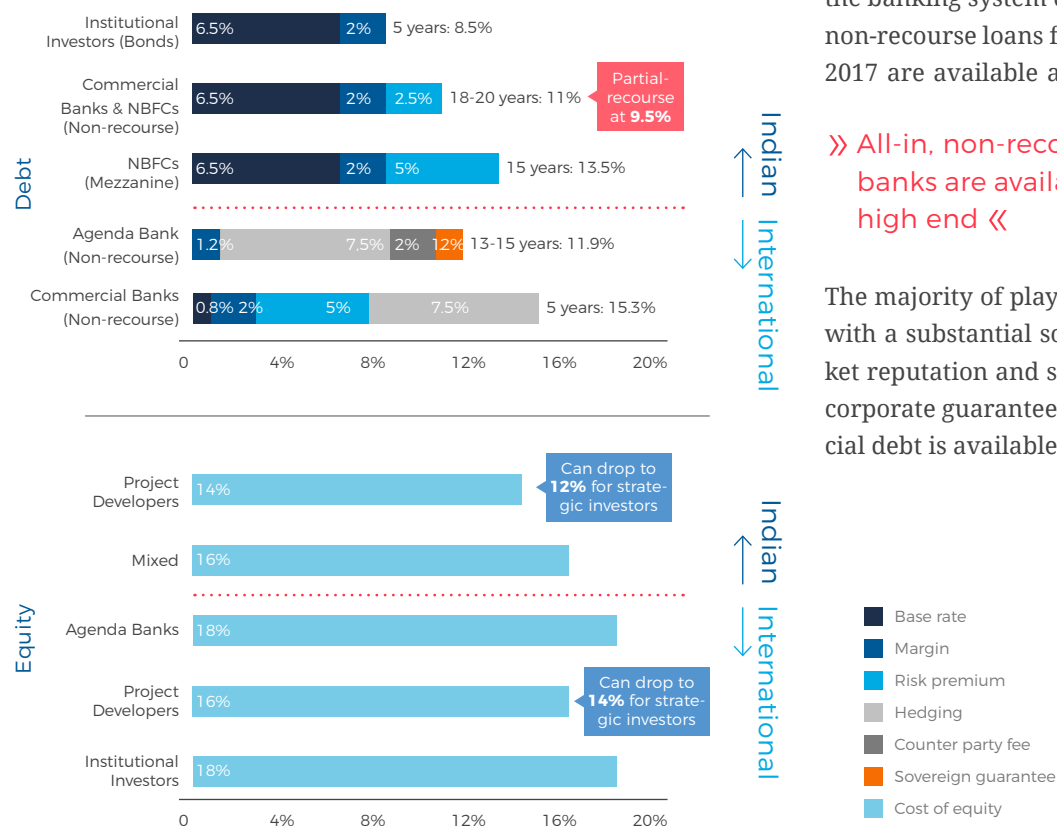
Large amount of equity has been committed

On the equity side too, capital is readily available for solar projects. Domestic corporations like Tata Power, Adani, Acme, Shapoorji Pallonji and Hero Future Energies are increasing their investments. In addition, investment is growing from international players like Fortum of Norway, SoftBank of Japan, Engie and EDF of France, Enel of Italy and FRV of Spain.

Private equity players have invested into both utility-scale and rooftop Indian developers to help them scale. In the utility scale segment, for example, Goldman Sachs has backed Renew Power with over INR 22.2 billion (Euro 317 million), with the latest INR 12 billion (Euro 170 million) round closed in 2016. Renew Power is also backed by the Abu Dhabi Investment Authority, the Global Environment Fund and Japan's JERA. Singapore's sovereign wealth fund GIC along with the Abu Dhabi Investment Authority has invested INR 23 billion (Euro 328 million) into Greenko Energy Holdings over the past three years, with the latest round of INR 9.3 billion (Euro 132 million) invested in March 2017. In the rooftop segment, I Squared Capital has backed Amplus Solar with INR 9 billion (Euro 128 million).¹⁷

Figure 11:
Indian Solar Cost of Debt (Left)
and Equity (Right) as of March 2016

Source: TFE Consulting estimates based on market interviews



Indian debt is cheaper than international sources

Indian interest rates have fallen 22% since 2015 driven by a fall in inflation and, more recently, by a surge in liquidity in the banking system due to demonetization.¹⁸ As a result, all-in, non-recourse loans from Indian commercial banks as of March 2017 are available at an interest rate of 11% at the high end.

» All-in, non-recourse loans from Indian commercial banks are available at an interest rate of 11% at the high end «

The majority of players in the market - large corporate houses with a substantial solar track record - can leverage their market reputation and strong balance sheet to provide an implicit corporate guarantee for their loans. For such players, commercial debt is available for as low as 8.5%.

Highlights

1. Non-recourse loans from Indian commercial banks are 500-600 basis points cheaper than loans from international commercial and agenda banks.

2. Debt from international agenda banks can be competitive with Indian loans in individual cases but shorter loan tenures and onerous compliance and quality requirements make them unattractive to developers.

3. Indian equity investors are willing to accept returns that are 200-400 basis points lower than international investor expectations.

Market voices

Gaurav Sood

CEO, Sprng Energy



What is the state of utility-scale solar financing in India today?

Sood: The situation is good overall. There is enough liquidity in the market on the project financing side, from various NBFC's, private and public sector banks and internal financial institutions. Financing is largely limited recourse, which means there is recourse during the construction phase up to commissioning and thereafter the recourse is dropped.

What are the financing terms for projects in the market at the moment?

Sood: Banks are now offering good debt financing terms: 18-20 year tenors, 9 - 9.5% interest rates, 75% of project cost as debt and capital repatriation in cases where the developer's investors are overseas. However, the track record of project developers makes a lot of difference in getting good terms. Those with a long track record and having a good sponsor can give high comfort to lenders and get better terms.

Is there a difference between public and private sector banks when it comes to financing structures and approach?

Sood: Public banks can be relatively lenient with execution benchmarks and deadlines as long as the debt is serviced on time. They are also more rigid about financing terms and less willing to accept customized structures. Private banks and NBFC's are more willing to work with developers with a good track record even if ownership structures are customized. They are also more stringent about execution benchmarks and deadlines and charge penalties for delays.

What role is international financing playing in the market?

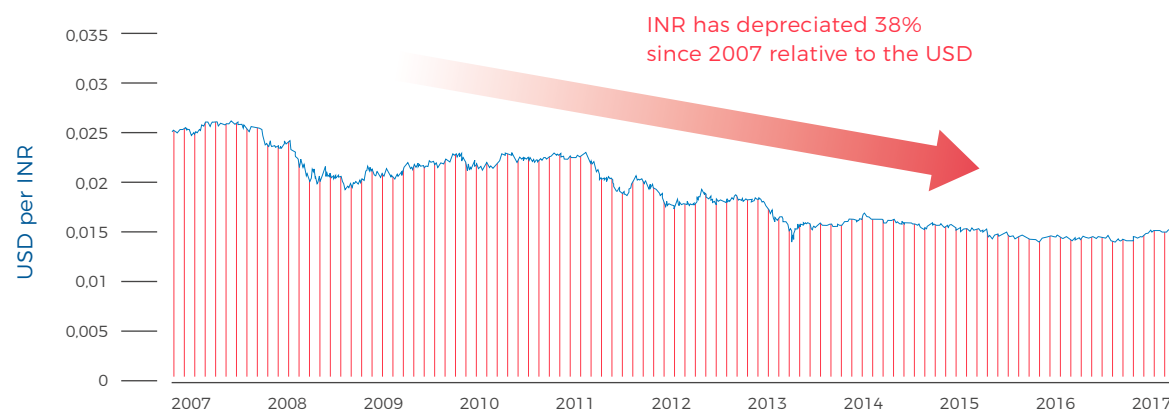
Sood: Several international credit lines are offered through SBI and IREDA. But, such financing carries strict compliance requirements that are onerous to meet and often more costly than domestic compliance standards. The longer tenures of 20 years make the hedging costs high. Overall the landed debt cost becomes similar to Indian debt. Financial institutions that we have worked with are IFC, OPIC, AIB, Standard Chartered, HSBC etc. They have tenure-based hedging and hedge their funds themselves to offer developers Rupee loans.

Interest rates in dollar terms are low internationally too. In the case of international commercial banks, interest rates on dollar-denominated loans can be at 7.8% for solar projects. The case is even stronger when it comes to international agenda banks. Through them, dollar-denominated loans can be as low as 4% (including a counterparty fee and a sovereign guarantee to lend through an Indian bank).

If international debt financiers, however, cover their exposure to the exchange rate risk, they face hedging costs of up to 7.5% to lend in Indian Rupees. Many financiers prefer to cover their exposure through a hedge due to the Rupee's long-term depreciation trend against major international currencies like the USD and high volatility.

Figure 12:
Long-term USD Vs INR Exchange Rate Trend

Data: Investing.com; Analysis: TFE Consulting



In the current market environment, this makes their rates uncompetitive as compared to Indian Rupee loans. For international commercial banks, this sets their effective interest rate at over 15%, far above the rates of Indian Rupee loans. International agenda banks, in addition to hedging costs, incur a counterparty fee as they go through a domestic bank to reach

» In the current market environment, interest rates for international debt financing are uncompetitive compared to Indian Rupee loans «

projects and also, in many cases, need to factor in the cost of a sovereign guarantee (the German development bank KfW is one of the few not required to do so) taking their rates up to 12%.

International agenda banks' lending requirements are burdensome

Rupee loans from agenda banks could be competitive on a case-to-case basis with Indian loans. This is especially the case for a bank like KfW that, without a sovereign guarantee requirement, can lend at 10-11%. However, their shorter tenor (15 years compared to the 18-20 years that some Indian banks offer) makes them less attractive. Additionally, loans from international agenda banks often come with a long list of compliance and quality requirements that make Indian developers

hesitant. These can range from tougher environmental impact assessments for projects to higher quality and testing standards for plant components.

» Another disadvantage for international agenda financiers is that they often place loan repayment restrictions on project developers «

Another disadvantage for international agenda financiers is that, unlike most Indian banks, they often place loan repayment restrictions on project developers. For example, loans by some international agenda financiers can only be repaid over a ten-year period. Developers instead prefer taking advantage of the drop in the risk profile of their projects once they have been up and running for some time. They are able to use this to refinance their debt at lower interest rates and also leverage their project to increase the debt portion from 75% to 85%.

Indian equity return expectations are lower than international sources

Most international project developers expect equity returns of at least 16%. The return expectations of Indian equity investors are lower: most are willing to accept 14% and many are willing to accept returns of 12% for strategic reasons.

Indian developers are competitive because they are investing with a view on the long-term potential for solar sector growth in India. Many have already developed solar or conventional

power plants and have a good understanding of project execution and regulatory risks in India. Returns of 12-14% are financially viable if the risks can be managed effectively. Indian investors are willing to manage the risks to get an early foothold in the market and build a portfolio of projects that gives them a strong track record. This then provides a foundation for their growth across other value added services like storage and energy management, which are expected to be upcoming growth markets in India.

Some international project developers are willing to accept returns of 14% to gain a strategic foothold in the market. This places them on par with Indian developers. Such developers, however, are an exception. Most international investors

consider current market returns too low to cover country and project risks. They have a lower risk appetite and little room to manage risks at the project level. They need returns of 18% and above for their investment to be viable. Due to their higher expectations, they have stayed out of the market.

» Some international project developers are willing to accept equity returns of 14% to gain a strategic foothold in the market «





There is an increase in the use of bonds

Domestic commercial banks are using bonds to on-sell their solar loans to infrastructure debt funds, insurance companies, mutual funds and public sector banks that until 2016 have had limited exposure to solar. This is opening up capital for banks and providing an opportunity to potentially avoid individual borrower limits and power sector limits as they increase lending to solar projects. Experienced project developers are also issuing bonds themselves to raise capital. This is allowing them to refinance existing loans at a lower cost.

» New structures are emerging where institutions enhance the ratings of a bond issuance by giving a partial credit guarantee «

Not every developer can access the bond market – one requires at least an A+ or AA- credit rating. Due to this, new structures are emerging where institutions like India Infrastructure Finance Company Ltd (IIFCL) enhance the ratings of a bond issuance by giving a partial credit guarantee. In such cases, for example, IIFCL's AAA rating takes an A- rated issuer to A+ or AA-, making its bond attractive to investors. Up to early 2016, capital on the bond market could be accessed for 8.5-9%, which was at the time 50-100 basis points cheaper than collateralized commercial loans. Current bond rates could be as low as 8% when accessed by a subsidiary of one of the larger industrial conglomerates.

Highlights

1. There is a marked increase in the use of bonds by Indian commercial banks and project developers, making them a significant source of debt financing for solar projects.
2. It is common for project developers to use mezzanine financing to improve project returns.
3. Half of all debt financing for solar projects is now on a non-recourse or partial recourse basis.

SPOTLIGHT

The Rise of Green Bonds in India

As of August 2017, the Indian green bonds market had grown to INR 210 billion (Euro 2.75 billion) from INR 98 billion (Euro 1.28 billion) in 2016. Though still nascent, the growth in green issuances is responding to certain advantages, which include:



1 Investor diversification: Green bond issuances attract investors looking for environmentally sound projects. Indian public sector issuers like NTPC, REC, EXIM Bank, IREDA have already used green bonds to raise capital for clean energy projects and are likely to continue. Private sector players such as Yes Bank, Axis Bank, Azure Power, and Greenko have also issued green bonds for solar projects. Estimates suggest that offshore green funds have contributed 16-22% of the capital raised through Indian green bonds.

2 Pricing advantage: Most bond issuers estimate that the pricing advantage derived from investor diversification varies between 7 to 14 basis points. Experience of the European Investment Bank shows that its green bonds trade much tighter than an equivalent non-green bond, suggesting a 'green' pricing advantage.

3 Over subscription: Several green bond issuances have been over subscribed. This is also true for green bonds issued by Indian entities. It reflects high demand and provides an opportunity to adjust the price of the bond as well as the issuance size upward. A notable example of a USD denominated issuance is by EXIM bank that upsized from INR 16.2 billion (Euro 212 million) to INR 32.5 billion (Euro 425 million). On the other hand, NTPC was able to revise its price upward in its issuance in August 2016, and executed its transaction intraday at the tighter end of the final price guidance of 7.48% for INR 20 billion (Euro 261 million).

4 Diverse currencies: Indian entities are exploring green bonds in different currencies: Indian Rupee (Masala), USD, and Euro. The RBI has recently exempted masala bonds from the Foreign Portfolio Investment limit, which will help large high investment grade issuers seeking tenures of five years or more to access this market. In September 2017, within a week of the RBI easing the norms, IREDA raised USD 300 million (Euro 255 million) through a masala bond to finance renewable energy projects across India.

The Climate Bonds Initiative extensively tracks global green bond markets including detailed coverage of the Indian market as provided here. By sizing such markets, developing standards, providing policy models and advice, and reporting on climate bonds developments, the Climate Bonds Initiative is working to mobilize the USD 100 trillion bond market for climate change solutions.

Mezzanine financing is popular

Mezzanine financing has a 5% share of the investment volume in the market, which is low compared to other sources. However, close to 60% of developers have used it, primarily for bridge financing, i.e. when a developer is able to access an amount of debt that is lower than what is needed for the project. Such financing is senior to equity and subordinate to debt i.e. it has to be repaid before equity and after debt.¹⁹

Project developers have also frequently used mezzanine financing to improve their financial returns. With 75% of a project's cost financed through debt and a typical debt to equity ratio of 75:25, the use of mezzanine financing to cover 20% of the cost allows equity participation by the developer to fall to 5%. In such a structure, 14-16% returns at the project level translate to equity IRR (internal rate of return) of 30-40%. This is substantially higher than the 15-16% returns that developers would otherwise earn when their equity contribution is 25% of project costs. In addition to increasing developer returns, this also enables scale as a developer can use a small pool of capital across several projects.



Bombay Stock Exchange, Photo: Niyantha Shekhar/ flickr

Market voices

Nikunj Kathuria

Corporate Finance,
ReNew Power Ventures Pvt. Ltd.



What is the best financing structure for solar projects to be successful in India?

Kathuria: What can certainly be successful is bringing in a large equity infusion at the corporate level from a credible domestic or international financier for a specific pipeline or portfolio of projects. This gives significant comfort to lenders then on and can lead to good debt financing terms. Another strength can be maintaining a razor-sharp focus on the internal rate of rate (IRR) of projects when selecting them and building a pipeline. This too can lead to greater access to equity and debt capital at good terms.

Why is mezzanine financing an increasingly popular financing instrument for solar projects in India?

Kathuria: Mezzanine financing carries a higher risk appetite than regular debt but lower than typical equity capital. Tied to that, it is also senior to equity and subordinate to debt: has to be repaid before equity and after debt. For solar projects in India, such an instrument typically makes up 20% of the project cost, allowing equity to fall to 5%, thereby reducing the financing burden on the project promoter. When combined with debt, mezzanine financing leaves over 90% of the project leveraged when typically not more than 75% should be leveraged. This allows promoters to use a small pool of capital across several projects, driving scalability for them.

Are bonds set to become the primary debt instrument for solar projects?

Kathuria: The use of bonds for debt financing of solar projects is on the rise with a number of banks underselling loans to infrastructure debt funds, public sector banks, insurance companies and mutual funds. Such a process frees up capital that banks can then allocate to promoters because otherwise they have individual borrower limits. Despite these advantages, the bond market is not very deep. Any one project developer cannot access more than INR 35 billion (Euro 485 million) across entire portfolio.

Non-recourse financing is becoming more common

Half of all debt financing in India is now on a non-recourse or partial recourse basis. One reason is that banks now have a better understanding of the business model, risks, and return expectations of solar projects in India. Additionally, non-recourse financing has increased for developers with a long track record because banks perceive their risk of delaying or failing project execution to be low. Projects with tariffs at the medium to top end of the distribution of solar auctions also find it easier as banks feel confident that returns are adequate, reducing the chance of the developer compromising on component and/or project execution quality. Lastly, for projects with PPAs with some of the financially profitable off-takers, banks provide non-recourse debt as payment issues are unlikely.

In cases where the project off-taker is strong but the developer has a relatively shorter track record, banks are willing to engage in a structure where they have recourse during the construction phase and drop the requirement once the project

» Non-recourse financing has increased for developers with a long track record because banks perceive their risk of delaying or failing project execution to be low «

is up and running. This allows them to mitigate project execution risk tied to the limited track record of the developer. This structure is referred to as partial-recourse financing which is common in the market and often a precursor to non-recourse financing.

A secondary financing market is on the rise

As 12 GW of solar has already been installed, developers are looking to resell 4-5 GW to investors on the secondary market. Such players follow a business model of carrying the construction risk of projects during the development phase and selling them off to secondary investors at a premium, upon project completion. This enables them to unlock their capital from

» Reselling projects enables developers to unlock capital from existing projects and re-deploy it, thereby also driving scale in the market «

existing projects and re-deploy it for new projects, thereby also driving scale in the market. Their ability to find buyers and successfully execute secondary transactions will determine whether such a business model is sustainable and therefore if the market has the capacity to drive scale. Several project acquisitions have taken place, which is a sign that a secondary market is on the rise.

Most recently, Italy-based renewable energy firm Amaranto Group launched an investment vehicle dedicated to acquiring PV projects in India and has secured exclusive rights to purchase a 110 MW solar project (name undisclosed) in the West of India for approximately INR 4.8 billion (Euro 69 million).²⁰ The off-taker for the 110 MW project is the Solar Energy Corporation of India (SECI). The company's high credit rating makes

the project highly bankable and was likely a key reason for Amaranto to acquire the project.

Another acquisition of note is by Greenko Energy Holdings (GEH) that bought the Indian assets of SunEdison in October 2016. The acquisition was valued at INR 23.5 billion (Euro 336 million).²¹ Given SunEdison's distressed financial situation (the company filed for bankruptcy in April 2016), GEH also received SunEdison's pipeline of solar projects in India at no additional cost. Greenko is an IPP with a strategy to hold solar assets. It likely acquired the projects to strengthen its portfolio and take advantage of the low price of SunEdison's assets due to its financial distress.

Also, in June 2016, Tata Power acquired Welspun's 1.1 GW renewable energy portfolio for INR 100 billion (Euro 1.42 billion), which included 990 MW of solar PV. The deal at the time was the largest acquisition of solar projects in India. Though Tata Power won the deal, it was also pursued by a consortium of IDFC Private Equity and Fortum, and by the Greenko Group (which later in the year bought the SunEdison projects), signaling a wide interest in the market.²² A key draw for Tata Power to make the acquisition was that it avoided the construction and grid connection risks. The company could also optimize the financial structure of the project and drive operational efficiency to create upside.



Highlights

Developers are looking to sell 4-5 GW of operational projects to investors and several project acquisitions have already taken place.

Rooftop solar financing is still slow

Over 1 GW of rooftop solar has been installed in India. Growth could be fast – our analysis shows that with adequate financing, an additional 11 GW could be added between 2017-2022. This is because rooftop PV for the commercial and industrial (C&I) segment is now competitive against grid retail rates in 13 states. Combined with the value proposition of improving electricity supply security, rooftop PV is an attractive solution for customers. Cash rich companies are keen to invest in solar directly (CAPEX model) to enjoy accelerated depreciation benefits in addition to savings on their electricity bills. Others are keen to procure solar as a service, with an Energy Service Company (ESCO) investing in the PV system and the consumer only paying for the energy they consume (OPEX model).

» The number of inquiries for OPEX-based installations are now twice those for CAPEX «

The OPEX model is on the rise in India. Based on market interviews, we estimate that the number of inquiries for OPEX-based installations are now twice those for CAPEX. A key reason is that the value proposition of ‘zero down’ solar - no upfront cost for the customer while enjoying the savings from solar - makes the model highly scalable.

Though scalable, the OPEX model has several risks. A lack of contractual security makes PPAs with companies less bankable.

It would be less risky to have a company purchase a system upfront rather than have a chance of non-payment by the customer for a system owned by the developer. Another major risk is roof ownership: often, the consumer or a third party landlord owns the roof on which an ESCO's PV plant is located. In both cases, there is a risk that the ESCO is denied access to the plant for maintenance or for repurposing the plant in case of contractual default by the customer.

A major challenge for rooftop solar is a lack of interest from debt financiers due to small deal sizes. Debt financing for C&I

» A major challenge for rooftop solar is a lack of interest from debt financiers due to small deal sizes «

rooftop solar has been done only for CAPEX projects. In those cases, with the customer investing in the plant, banks have lent to them as part of a broader corporate loan. For the OPEX model, debt financing has been very difficult. Rooftop C&I projects can go up to a maximum of 10 MW in size with most projects between 250 kW and 1 MW. The deal sizes of these projects are too small for banks to justify the transaction costs. This has also been a constraint for developers trying to access debt financing from the credit lines exclusively for rooftop projects set up by international agenda banks with Indian public sector banks. Projects typically need to be aggregated to upwards of 20 MW for banks to consider them for funding.

Highlights

Debt financing for C&I rooftop solar has been done only for CAPEX projects where banks have lent to large commercial customers as part of a broader corporate loan.





Market voices

Santosh Khatelsal

Managing Director, Enerparc Energy Pvt. Ltd.

What is the financing situation for rooftop solar in India today?

Khatelsal: Debt financing is difficult in the C&I segment for individual projects. This is because small project sizes make the segment unattractive to commercial banks. In the absence of collateralized debt instruments or securitization mechanisms, it has been difficult to aggregate projects up to sizes that make the transaction cost of debt financing worth it for banks. Additionally, there's a systemic bottleneck, as investors want to see the enforceability of customer PPA contracts, which is difficult because contractual security is poor in India.

Is there any good news for rooftop solar?

Khatelsal: A big breakthrough for the segment is that customer awareness of the benefits of rooftop solar, especially in the C&I segment, is now quite high. Customers are aware that solar electricity costs less than utility supplied power. As a result, while lead times for project acquisition used to be six months until a year ago, it is now down to just two months. This is drastically reducing customer acquisition costs, which is a big lever. The other good thing is that the market is now increasingly shifting towards the OPEX model away from CAPEX. This helps unlock a far broader range of customers that are keen to go solar to get savings on their electricity bills but might not have the capital to invest in a system.

What can be done to further accelerate the segment?

Khatelsal: A leasing/asset finance model for C&I rooftop solar could help overcome the contractual security bottleneck to some extent. In this case, a non-banking institution (e.g. a large corporate) could take ownership of a large portfolio of smaller C&I projects and lease them out to end customers who pay 'rent' rather than pay for the energy consumed. The rental price of course can account for the energy consumed. With leasing, an investor could hold the rooftop assets directly rather than invest into something that is held by an end customer who then may or may not honor a PPA.



Solar panel installation in Indian village, Photo: greenaperture/ shutterstock

Off-grid solar financing is yet to take off

Another barrier is the inability of players to quantify the risks tied to customer payments, the underlying revenue source in these off-grid business models.

With less than 1% of solar PV financing in India invested in the off-grid segment, it has a very small share of the total market. Current financing for the segment is a patchwork of international donor grants, debt from international development finance institutions and owner equity. These sources are at best able to provide early stage funding for players. Off balance sheet debt financing critical to financing scale is difficult. Indian commercial banks rarely lend to the segment despite readily financing utility-scale solar. Furthermore, international commercial banks are uncompetitive due to high currency hedging costs.

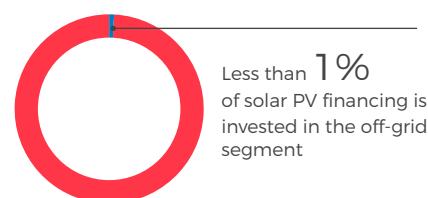
» Of the few attractive investment options, low margins have left investors unconvinced about the sustainability of players' business models «

A fragmented player landscape and viability concerns are holding financing back. The market has over 100 recognized players and potentially hundreds more in the informal sector (particularly for the sale of solar appliances). However, most are highly localized with operations only at the village level. They have

a small customer base and revenues of under Euro 100,000 a year.²³ There are few sizable and scalable businesses because of which investors have struggled to find attractive investment opportunities. Additionally, due to high distribution and customer acquisition costs and the weak payment capacity of off-grid customers, margins for players across the segment are typically very low at less than 5%, with many failing to breakeven.²⁴ Of the few attractive investment options, low margins have left investors unconvinced about the sustainability of players' business models.

Figure 13:
Percentage of Financing Invested in Off-grid Solar

Source: TFE Consulting estimate based on market interviews



Highlights

A fragmented player landscape, viability concerns and the absence of sizable and scalable businesses has made financing challenging for off-grid solar.

Another barrier is the inability of players to quantify the risks tied to customer payments, the underlying revenue source in these off-grid business models. With no payment history of end-customers, banks have very low visibility on players' projected cash flows. Small investment sizes are also a barrier. Individual player volumes are too small for financial institutions to commit the transaction costs of due diligence. Additionally, solar off-grid investments do not fit standardized investment assessment metrics. As a result, banks are unable to compare these investments with alternative investment options in India and abroad and, therefore, are unable to assess their relative attractiveness.

» A major risk specific to the microgrid market is 'grid creep' «

A major risk specific to the microgrid market is 'grid creep'. This is the risk that the national grid could unexpectedly expand into areas where microgrids are already operating. In this case, microgrid players face the risk that their customers would shift their electricity consumption to the grid, threatening their business model.

Market voices

Dr. Klaus Hachmeier

Federal Ministry for Economic Affairs and Energy



Where do you see the value contribution from international banks?

Hachmeier: India has a very strong and resilient domestic banking ecosystem that is able to finance a large part of solar infrastructure investments, as this report shows. German lenders can still support, however. I see a value contribution through two main channels. The first, you could call a 'model function' - they can add knowledge and experience from the German as well as from other international markets. The second, you could call the 'pioneer function' - they can help initiate and accelerate new markets and new market segments, such as the distributed solar and energy access markets, the storage market or the smart grid market.

What are business opportunities for international companies in India's solar sector?

Hachmeier: The Indian solar market is large and fast growing - but also highly competitive. There are strong local players in e.g. EPC services. Panels usually come from China. German companies have so far been most successful in niches. In the future, I think the Indian market will become more 'smart', around the grid, around combining energy sources, around demand management and around a more integrated, cross-sectoral energy system including mobility, supply chains or buildings. That will allow for more differentiation for technology leaders, many of whom are German. Opportunities are in hardware such as metering, in software such as modelling, or in services such as operations.

What are the main tasks for the Indo-German Energy cooperation in the field of renewables in the future?

Hachmeier: Germany is a pioneer in creating a modern, flexible, resilient and renewables-heavy energy system for a highly industrialised economy. As India is industrialising rapidly and is building out its own energy system, there are specific aspects of the German experience and know-how that can be usefully applied. We follow a partnership model, based on political dialogue. In this ongoing dialogue, the two countries jointly set and fine-tune the areas where cooperation is most fruitful and the need highest. Possible topics of deeper cooperation could be in pollution control, grid stability and cross-sectoral energy opportunities. This can accelerate the market.

3 International perspective

Globally, utility scale solar plants have become a well-known asset class for banks and investors alike, especially in mature markets such as Germany, the UK, Japan or the US. This is true for the entire spectrum of finance from construction finance to refinancing and the secondary market, where long-term, stable-yield-oriented investors, such as pension funds, ultimately hold many of the assets. At the same time, solar projects in more challenging markets have also overcome initial difficulties to grow into well-understood and liquid assets for banks and investors. This category includes India and also markets

» Solar projects in more challenging markets have overcome initial difficulties to grow into well-understood and liquid assets for banks and investors «

such as China, Chile or Mexico. The key lesson from their success is that financiers feel comfortable with solar market risks because solar is now competitive, subsidy-independent and well understood.

Transferring the success of these countries to other developing countries where solar can now take off is possible but requires differentiation. On the one hand, future growth markets in, for example, the African continent or in Southeast Asia, benefit from the fact that solar has become a very attractive option economically because of low costs and politically because of

the rapid construction times and potential for modular sizing. A key differentiator, however, is the strength of the local financing ecosystem. Countries such as India or China possess a strong and sophisticated domestic financing ecosystem, capable of shouldering much of their vast investment requirements. Other countries such as Kenya or Myanmar do not have such a strong domestic ecosystem. They rely much more on international financing (initially developmental, later commercial) in scaling up their solar industries. In attracting international

Highlights

India's strong domestic financial ecosystem is a key differentiator amongst developing countries with bankable policy frameworks and credible payment guarantees.



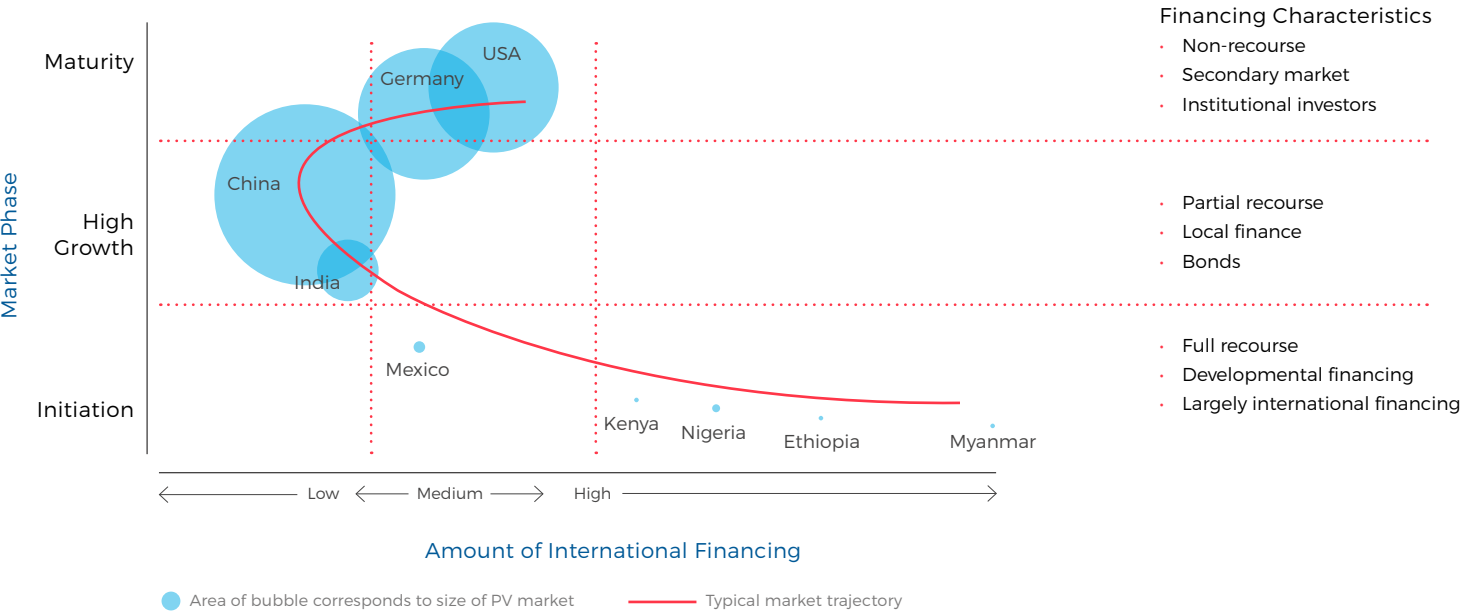
commercial investment, there will be some hurdles to overcome. Their smaller overall market potential as compared to India reduces the strategic interest of some international investors or banks.

Figure 14 shows possible solar financing development paths for different markets. Whereas Germany, the USA and China

relied on domestic financing, India has shifted across from international to predominantly domestic financing. In Mexico, a large part of the equity financing is from international developers but domestic commercial banks provide most of the debt to both utility-scale and rooftop solar projects. Countries such as Kenya, Nigeria, Ethiopia and Myanmar might mature based on a higher share of international finance – both on the equity and debt side.

Figure 14:
Solar Markets' Financing Trajectory

Source: TFE Consulting estimates



Solar panels in Kenya, Photo: Sam Duby

As markets mature, they tend to shift from full recourse to partial recourse and eventually non-recourse project financing.

» As markets mature, they tend to shift from full recourse to partial recourse and eventually non-recourse project financing «

This could be accelerated in developing markets by the fact that solar itself is continually better-understood asset class. More likely, however, a less mature and less liquid financing ecosystem will slow it down.

Countries in the market initiation phase will have to focus on developing bankable policy frameworks for utility-scale solar. Some best practices can be found in India, for example the Rewa tender in Madhya Pradesh. Credible payment guarantees will be key. On the off-grid side, these markets can focus on making business models viable and developing specific technology solutions that can help aggregate investment opportunities and quantify their risks.

India, in turn, now needs to further mature as a market. This means systematically accessing institutional investors, who have moderate return expectations but are very risk averse. Their involvement would further reduce the long-term cost of solar in the country and offer initial builders of plants a reliable and attractive exit. Involving international institutional



Photo: Kunal Mehta/ shutterstock

investors will be more difficult than Indian ones, because of macro-economic hurdles such as India's comparatively low investment rating. The market also needs to address currency-hedging costs to enable international capital to compete with domestic capital. This would diversify the pool of available capital and hedge against possible liquidity shortfalls in the Indian banking sector.

4 Recommendations for accelerating financing in India

India's solar growth trajectory is steep, but the market can do more. During our interviews, several utility-scale developers expressed the capability and keenness to install two to three times more than their current project pipeline. Cheaper debt

» Several utility-scale developers have the capability and keenness to install two to three times more than their current project pipeline «

can help utility-scale developers drive down solar costs further. They believe this will increase government procurement of solar and will likely also open markets for large-scale direct purchase by independent consumers through 'open access'



regulations. This can enable private power sales while using the grid. Many could even sell more to their parent corporate entities. Moreover, easier non-recourse financing would lift pressure on their balance sheets, improve their credit rating and free up more investment capital.

The rooftop segment needs new financing solutions to help mitigate PPA risk tied to tier-2 customers. High transaction costs for banks due to the small size of rooftop projects remains a key barrier for developers to access debt. For the continued growth of the OPEX model or leasing models, equity backed developers need to transition to cheaper financing either through better

» For the continued growth of the OPEX model or leasing models, equity backed developers need to transition to cheaper financing «

access to traditional infrastructure debt or through new financial instruments that lower the risk at an aggregate level.

In our research, we have identified ideas to accelerate financing and therefore the growth of the Indian solar market. These are at an early stage and do not yet cover questions around legal, tax or financial regulations. Further work is required to answer such questions and to further develop the ideas.

Highlights

1. An online project-sourcing platform could aggregate rooftop projects and package them together into larger deal sizes.

2. Securitization can help rooftop solar and energy access companies refinance their existing portfolio at a lower cost.

3. Solar specific InvITs can become a good source of low cost capital as they bundle operational projects into liquid assets.

4. A partial subsidy to cover hedging costs can open a vast pool of debt from countries such as the US, EU member states or Japan.

5. A first loss protection guarantee can help partially insulate banks from utility payment default risk in India.

4.1 Project aggregation marketplace

Target segment: Rooftop solar

An online project-sourcing platform could aggregate rooftop projects, typically under 1 MW each, from multiple developers and package them together into larger deal sizes, for example of 10 MW and above, to access traditional debt financing from banks and other financing institutions. The platform can also create standards for the collection of project documentation, making them more easily comparable and assessable. This would include, off-taker information, project component, construction and performance documentation, and contracts (power purchase agreements, EPC contracts, utility contracts). The documentation should closely align with the due diligence requirements of major debt financing institutions. That will significantly reduce transaction costs for financiers.

» A market aggregation platform will significantly reduce transaction costs for financiers «

The platform would also help the market overall by clarifying to project developers the standards that they need to follow to get their projects accepted on the platform and eventually funded. As more projects get funded through the platform, it could set a market norm that will push developers to improve their standards.

India can learn from project marketplaces for utility-scale projects in Europe. One such example is Megawatt-X. It connects investors with a large pool of investible wind farms and solar parks in Europe and other regions. Another example is Milk The Sun. It matches verified investors and sellers of utility-scale PV projects. These and other similar platforms, however, typically focus on improving the flow of information between equity investors and projects and matching them rather than on aggregation and standardization for access to debt finance. The examples show that the platform itself could be a business model, receiving a fee for conducting the standardization, helping the transaction and perhaps conducting an initial due-diligence of projects and project developers.



4.2 Solar securitization

Target segments: Rooftop solar and energy access

Securitization is a process by which a number of assets that have fixed, predictable cash flows are bundled together into a financial product called a security and sold to investors who then have a portfolio risk instead of a single project risk. The assets' cash flows generate investor returns. For this reason, such products are also known as Asset Backed Securities (ABS). For solar PV, a pool of commercial and industrial rooftop systems or solar home systems for residential or energy access consumers could be grouped into a security. In such cases, the payment streams from a PPA, lease, or loan agreement for the PV system form the cash flows underlying the security.

Securitization can help rooftop solar and energy access companies refinance their existing portfolio at a lower capital cost by reducing the risk through a portfolio of diverse assets. These could be different projects of the same type, such as rooftop PV projects, or they could be projects of different types. For instance, bundling utility scale with rooftop projects would mix public with private PPA risk, grid with off-grid risk and large with small project execution risks. Securitization could allow solar asset owners to reach a broader base of investors. This is

» Securitization can help rooftop solar and energy access companies refinance their existing portfolio at a lower capital cost by reducing the risk through a portfolio of diverse assets «



because securities are tradable at unit sizes much smaller than entire projects, thereby creating a more liquid market in solar asset ownership. Furthermore, rating agencies may assess (rate) the pooled assets according to the probability of payment default. Assets can then be categorized to match the risk/return expectations of different types of investors. It is also possible to issue different tranches of securities for a single pool of assets. For example, senior and junior tranches could be issued, where the former has a right to payments before the latter and for the lower risk, offers a lower interest rate. This could make solar attractive for financiers with a lower risk or a high return appetite.

India can learn from the securitization of rooftop C&I and residential projects in the US. There, SolarCity's securitization of some of its PV portfolio in late 2013 was the first such solar deal globally. Since

then, many more have followed. A key ingredient for the success of solar

» A key ingredient for the success of solar securitization is the proper assessment and pricing of the risk associated with a particular pool of assets «

securitization is the proper assessment and pricing of the risk associated with a particular pool of assets. In the case of India, this can be difficult because the risks in the rooftop C&I and energy access segments are not entirely understood (there is insufficient track-record and data availability) and there are few clear metrics yet to evaluate them. Credit rating agencies do not understand and have not rated these assets yet.

A potential solution is the kind of risk assessment and securitization platform pioneered by Lendable in East Africa. Lendable aggregates outstanding solar consumer loans or leases. It has developed a risk assessment algorithm that it uses in combination with data gathered from installers to predict end-consumer cash flows and validate them. This allows it to assess consumer payment risk and price investments. With reliable risk assessment and a large enough pool of assets, it develops securities that are then offered to international institutional investors. Lendable has used this model to raise financing for PAYGO solar businesses as well as for micro-lenders and motorcycle leasing businesses in East Africa.



4.3 Solar Investment Trusts or YieldCos

Target segments: Utility-scale and rooftop solar

Infrastructure investment trusts or InvITs are much like YieldCos in that they are legal entities into which developers bundle together and hold operational solar projects. Such entities are managed independently and may be publically listed. Their shares are tradable – privately or on the stock exchange. Investors in the company earn returns through the dividends from their shares. Dividends typically arise out of the cash flows from energy sales of the operational projects.

Solar specific InvITs have the potential to become a good source of low cost capital for Indian developers. Operational projects

» Solar specific InvITs have the potential to become a good source of low cost capital for Indian developers «

carry a lower risk than projects that are yet to be constructed. Therefore, by offering shares in its operational projects, a developer can attract investors with a lower rate of return. By then reusing the capital freed from the sale of shares, the developer can pass on the benefit to the new project. Refinancing a project after construction and a period of operation, both with new equity or debt, is a fairly standard procedure. However, with an InvIT, as in the case of securitization, developers can easily bundle together a large, diverse pool of projects to reduce the risk at the portfolio level and further reduce the cost of capital.

Another key advantage of InvITs is that their easily tradable shares offer liquidity and convenient sizing of investments to fixed assets such as large-scale solar plants. Much like securities, this opens solar up to a broader set of investors such as retail and institutional investors.

YieldCos have been used in Canada, the US and Europe. Their history offers valuable lessons for solar InvITs in India. On the one hand, YieldCos have successfully unlocked billions of dollars in capital for utility-scale solar projects and contributed to the growth of the sector. On the other hand, the bankruptcy of the power major SunEdison that had two YieldCos and the underperformance of several others has brought into question the financial viability of the instrument. For solar InvITs

to be successful, strong measures must be in place to keep them independent of the parent developer. This is important to ensure that they perform performs in the best interests of the investors rather than

the developer; purchasing new projects at fair market value (not overpaying) and independently assessing risks. In the case of India, the Securities and Exchange Board of India (SEBI) has had regulations in place for InvITs more broadly since 2014. They address some of the shortcomings of the YieldCo model followed abroad. The country's first InvIT was launched in May 2017 and the instrument should now also be explored for solar.

» For solar InvITs to be successful, strong measures must be in place to keep them independent of the parent developer «

4.4 Currency risk hedging facility

Target segments: Utility-scale and rooftop solar

This is a facility to provide a low-cost hedge against currency devaluation for loans denominated in a foreign currency. Interest rates for USD and Euro denominated loans abroad are currently lower than Rupee loans in India. To be used locally, however, these loans need to hedge against the risk of currency devaluation. Commercial instruments for currency risk hedging are available in the market. These instruments cost on average 7.5%, which renders international debt uncompetitive in India. An alternative facility with a lower hedging cost could change this.

» The opening of additional sources of finance is a good hedge against any possible contraction in domestic lending due to power sector lending limits «

A lower hedging cost would allow Indian solar developers to tap into a vast pool of debt in countries such as the US, EU member states or Japan. Solar projects would benefit if greater competition from international financing were to nudge Indian banks to lower their interest rates. For the market overall, the opening of additional sources of finance is also a good hedge against any possible contraction in domestic lending due to power sector lending limits or a rise in lending to other infrastructure sectors. Moreover, many internationally active banks have high due diligence standards, which they would likely

apply on Indian projects. This could raise the bar on project execution standards and quality in the market.

One approach to lowering the hedging cost is for government or a development agency to provide a direct subsidy to cover it entirely. This is unlikely to happen because of the demand this would place on public finances and because of the unpredictability of the overall cost as it is nearly impossible to plan a fixed-size fund.

An alternative is to have a partial subsidy that covers only the

» A partial subsidy could be used to cover only the most predictable parts of the cost of a currency hedge «

most predictable parts of the cost of a currency hedge. Hedging cost can be split into different tranches, which include the cost of the actual currency risk and additional costs for counterparty credit risk, liquidity risk, and transaction/deal facilitation. The currency risk is the most unpredictable part of the cost due to the high historical and expected fluctuations of INR against the USD and the Euro. The remaining costs are more predictable and a subsidy could cover them within a limited and predictable amount.²⁵ Additionally, even within currency risk, the probability of devaluation is higher up a small initial deviation range and then drops significantly for wider ranges (the latter known as the ‘tail’).²⁶ A subsidy can also cover currency risk in a cost effective manner if it only covers this tail.

The Climate Policy Initiative’s (CPI) India Lab has developed a blueprint for such an affordable currency hedging facility. The facility’s structure incorporates a direct subsidy for tail risk and eliminates the counterparty credit risk and liquidity risk. Importantly, the facility also has a mechanism to return to the hedging facility user or subsidy agency those benefits that are accrued if currency depreciation is lower than expected. Open questions remain about the viability of the facility in the context of the Indian solar market and the options of subsidy sponsors.

4.5 First loss protection guarantee

Target segments: Utility-scale and rooftop solar

This is a financial instrument that protects a certain percentage of capital against a financial loss due to default on an outstanding financial obligation. Such instruments can take the form

- » A first loss protection guarantee can take the form of insurance that can be purchased either by the financier or the asset holder «

of insurance that can be purchased either by the financier or the asset holder. It can also be a guarantee fund sponsored by a third party (the government or a development agency) that financiers can access at no cost to cover potential losses. Such an instrument directly takes over a portion of the potential loss to the financier from a default. In this way, it protects them from a predetermined amount of financial losses, thereby enhancing the credit worthiness of projects.

Such a guarantee can help partially insulate banks from the utility payment default risk faced by solar projects in India. In cases where banks are willing to finance on a non-recourse basis, the risk coverage offered by the guarantee will help reduce the interest rate on loans to such projects. In the case of recourse loans, it could help reduce the amount of collateral required from developers. In the case of rooftop solar projects, such a guarantee can improve the risk profile of projects with tier-2 C&I customers that developers need to access as they run out of more credit worthy tier-1 customers.



Photo: Cods_Kings/shutterstock

A first loss protection guarantee is not ideal because it induces a moral hazard among financiers and developers. They are incentivized to act in riskier ways since the downside of their actions is protected by the guarantee. As a result, such an

» A first loss protection guarantee only works if its coverage is limited and available to projects under very specific conditions «

instrument only works if its coverage is limited and available to projects under very specific conditions. Additionally, there is the issue of who bears the cost of providing such a guarantee. In the case of a guarantee fund, it could be the government or a development agency that has the mandate or political will to support the growth of solar energy in India. In the case of an insurance, the project developer would typically bear the cost. For utility-scale projects, this only works if the cost of insurance is lower than the marginal cost of financing without it. For rooftop projects, the cost of insurance might matter less. The marginal gain of getting any debt financing in place of more expensive equity will likely outweigh the costs. Indeed, in our interviews with rooftop project developers, several expressed a strong willingness to pay for such insurance if one was available.

Such a guarantee has been tried for solar projects in India in the past. The Asian Development Bank offered a partial credit

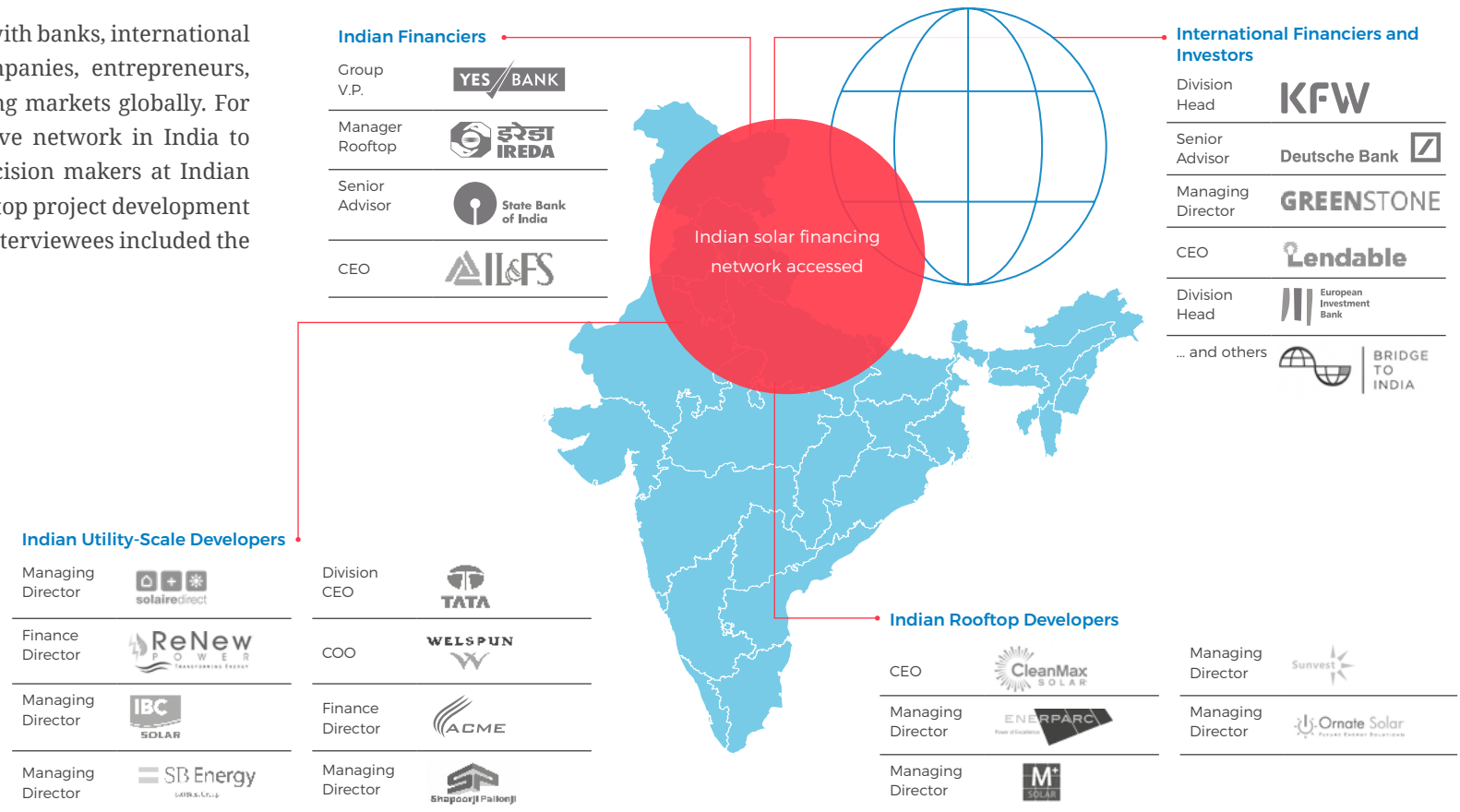
guarantee in 2011 for projects under the National Solar Mission. As part of this, it partnered with Indian commercial banks for a risk-sharing facility that guaranteed up to 50% of the present value of a project's loan. The guarantee, however, had limited success as it charged participating banks a fee that proved to be too expensive. Such a facility could work differently if the fee was charged to developers, especially in the rooftop sector, given their willingness to pay for such a facility. A non-Indian example of such a facility is the Aviva Investors Hadrian Capital Fund 1 (AIHCF1). It is an infrastructure fund that provides a

credit enhancement structure for renewable energy investments on a purely commercial basis. Managed by Hadrian's Wall Capital and backed by Aviva Investors, the European Investment Bank, and the Development Bank of Japan (DBJ), the fund follows a structure that relies on the market to determine the price of its credit enhancement product, making it more financially viable.



Market Interviews

TFE consulting specializes in working with banks, international financial institutions, technology companies, entrepreneurs, investors and governments in emerging markets globally. For this report, we leveraged our extensive network in India to carry out over 40 interviews with decision makers at Indian and international utility-scale and rooftop project development companies, financiers and investors. Interviewees included the following:



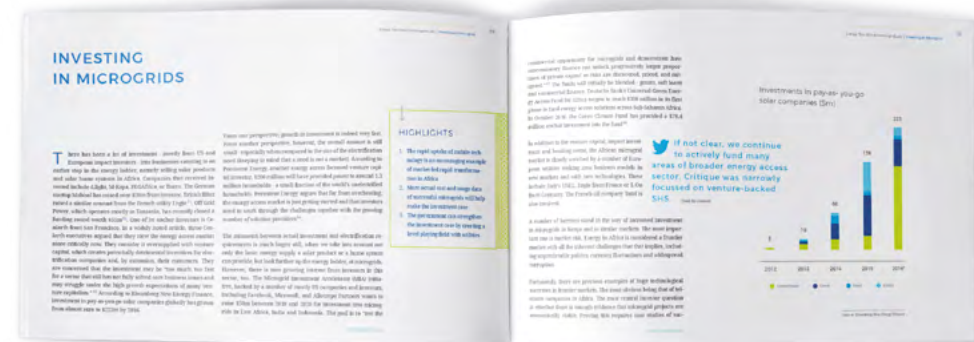
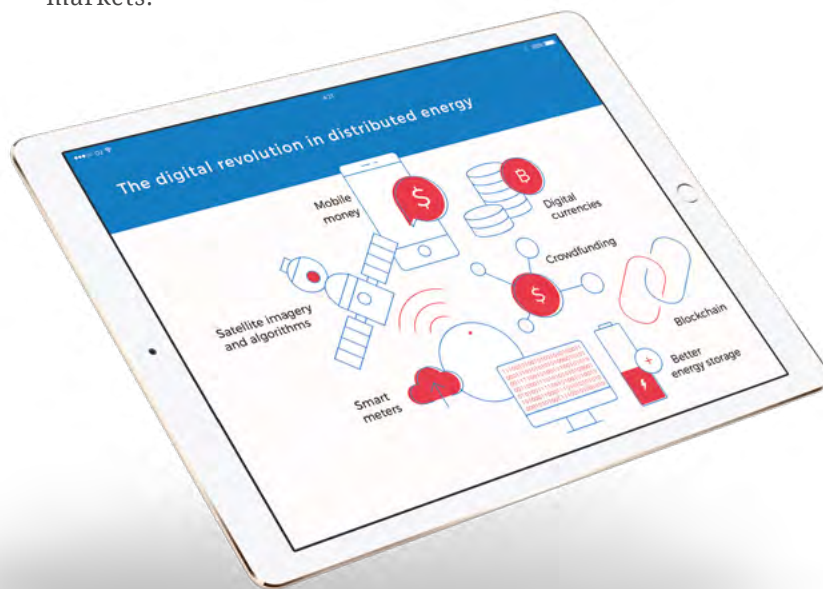
End Notes

1. Source: TFE Consulting estimate based on Indian Ministry of Power and United Nations Population Fund data.
2. Source: Bridge to India
3. Source: Engineering News, Falling coal demand hurts Indian Railways accessed at <http://bit.ly/2iMwdxK>
4. At more than 20%, India has some of the highest transmission and distribution losses in the world. This compares to approximately 5% in the US.
5. Ministry of Power
6. Source: Livemint, Discoms starting to show improvement under UDAY accessed at <http://bit.ly/2hnOZId>
7. Source: Ministry of Power, UDAY Newsletter accessed at <http://bit.ly/2gO1Nae>
8. Projects, although located in Madhya Pradesh, are able to sell 25% of their power to DMRC by leveraging inter-state open access regulations that allow the sale of power from a project on the open market across state lines.
9. Source: TFE Consulting estimate based on MERCOT, GTM Research and Reserve Bank of India data.
10. Source: The Indian Express, Demonetisation: Rs 14 lakh crore in old notes are back, only Rs 75,000 crore out accessed at <http://bit.ly/2jj40tt>
11. Source: Bloomberg, India's \$60 billion in surplus liquidity signals RBI on hold accessed at <https://bloom.bg/2sLWqwd>
12. Source: Livemint, RBI may focus on squeezing excess liquidity in the system accessed at <http://bit.ly/2zQK1uy>
13. Source: Reserve Bank of India data accessed at <http://bit.ly/2nwu0aI>
14. Source: TFE Consulting estimate
15. Source: TFE Consulting market interviews
16. For better risk management and avoidance of concentration of credit risks, the Reserve Bank of India has advised banks to fix limits on their exposure to specific sectors. Banks are free to set these limits, but under the guidance of the Reserve Bank, must follow limits of between 20-25% across infrastructure sectors, including power; Source: Reserve Bank of India accessed at <http://bit.ly/2iN7XMd>
17. Source: TFE Consulting market interviews with mentioned developers
18. Source: TFE Consulting analysis based on Reserve Bank of India data
19. Source: Market interviews
20. Source: PV Tech, Amaranto sets up Indian solar investment arm, acquires 110MW project accessed at <http://bit.ly/2yXK0YT>
21. Source: Business Standard, Greenko buys SunEdison's Indian assets for \$392 mn accessed at <http://bit.ly/2zRigC0>
22. Source: Economics Times, Tata Power acquires Welspun Energy's renewable assets for Rs 10,000 crore accessed at <http://bit.ly/2zUdjZb>
23. TFE Consulting market interviews
24. TFE Consulting market interviews
25. Details on currency hedging costs accessed from India Innovation Lab for Green Finance; FX Hedging Facility Instrument Design and Analysis, Oct. 2016
26. Currency risk can be broken into two ranges. The lower range of FX depreciation (p.a.) from 0% to 4.5% and an upper range (extreme depreciation) from 4.5% to P99.7 (Source: India Innovation Lab for Green Finance; FX Hedging Facility Instrument Design and Analysis, Oct. 2016)

Other TFE Reports

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In 2016, he founded TFE Consulting to provide consulting services on industries that are undergoing rapid transformation.

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About TFE Consulting

TFE Consulting is a strategy consulting firm focusing on accelerating the clean energy transition in emerging markets. The company is headquartered in Munich with teams in India and South Africa. Our strength is in our analytical and financial models, first hand project development experience and deep understanding of the interplay of government and markets. We utilize this to provide market assessment, risk analysis, business model adaptation and policy advisory to our clients.



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