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A white paper on India solar and wind energy by CRISIL & PHD Chamber

Innovative financing key to growth and credit issues

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India solar and wind energy

Innovative financing key to growth and credit issues

Section 1

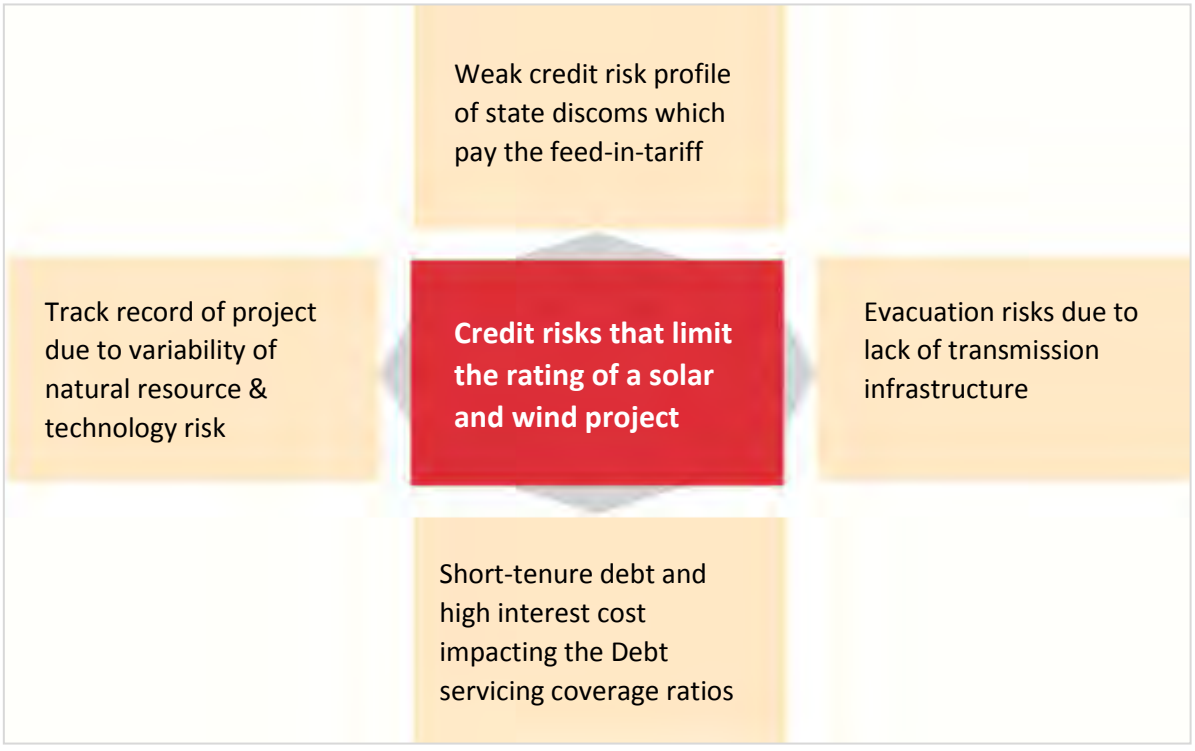
Innovative finance will widen funding avenues and reduce cost

By 2020, India's solar and wind power sectors are expected to at least double[1] their capacity from the current 24 gigawatt (gw). This, however, involves high capital cost so lower interest rates and longer-tenure funding are an imperative if India's renewable energy sector has to compete with traditional energy sources. While banks have been supportive, their ability to provide longer-tenure debt and lower interest rates is limited. Hence, CRISIL believes alternative sources of financing that fulfil the needs are critical to their development of solar and wind power sectors.

Solar and wind power require debt funding of Rs. 2 trillion over next five years

According to CRISIL, the wind and solar sectors will need ~Rs. 3 trillion in the next five years to double capacity. Of this, about 70 percent (Rs. 2 trillion) will have to be funded through debt. But the ability of banks to cough up monies is limited given low appetite for renewable projects and crowding-out by conventional power sources. The ability of banks to fund longer-tenure debt with attractive interest rates is also constrained because of asset-liability mismatch risks.

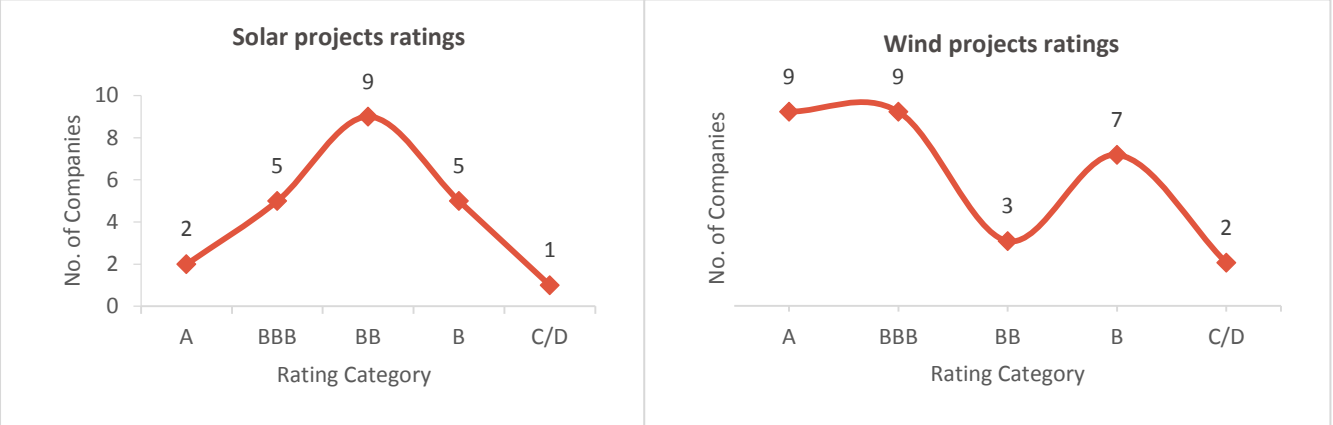
Chart 1: Typical credit risks faced by the renewable sector



[1] *Assuming wind energy will grow from 21 gw as of March 31, 2014, to 40 gw by March 31, 2020, and solar energy will grow from 2.6 gw to 20 gw in the same period*

CRISIL rates over 52 companies in the wind and solar sector. *Chart 2* highlights the rating distribution of the solar and wind sector in its portfolio. The ratings are restrained to 'A category' or lower because of one or more of the credit risks highlighted above.

Chart 2: Rating distribution of CRISIL-rated solar and wind power projects



Credit enhancements key to making bond market attractive for investors in the renewable sector

Large investors such as pension funds, provident funds and insurance companies have significant corpuses but regulations allow them to invest only in high-rated debt. There is, therefore, a need to bridge the gap between low risk appetite of institutional investors and relatively high credit-risk profile of renewable energy projects. There are various credit enhancements available, which can be deployed to match the needs, such as:

- Partial guarantee
- Securitisation of renewable project cash flows
- Infrastructure debt funds (IDFs), and
- Partial credit enhancement facility for renewable energy bonds

A) Partial guarantee

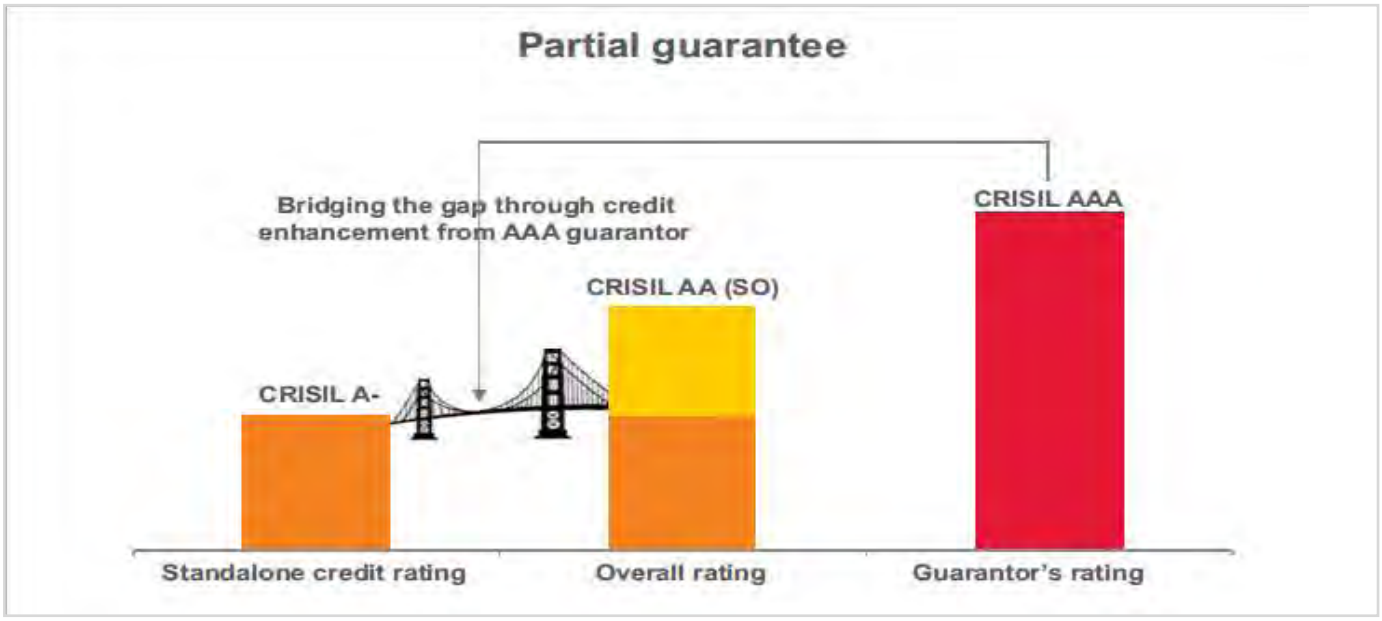
Partial guarantee helps in raising the credit quality of debt issued by project special-purpose vehicles (SPVs) to levels where bond market investors become comfortable. India Infrastructure Finance Company Limited (IIFCL), a government-owned enterprise set up to provide long-term finance for infrastructure projects, offers partial guarantee to enhance the ratings of bonds issued by infrastructure companies.

Key features of the scheme

- The project should be in the post-commissioning phase, and its standalone credit rating should be at least 'BBB'. This ensures guarantees are available only for viable and creditworthy projects, and investors do not take exposure to development risks in the pre-commissioning phase.
- On project cash flows, IIFCL will have a subordinated charge to bond investors and *pari passu* charge with other senior debt holders to the extent of the invoked guarantee, after the bond investors are paid in full.
- IIFCL will provide unconditional and irrevocable credit guarantee to enhance the rating up to a maximum of 'AA' on the issuer's bonds.
- The guarantee/credit enhancement by IIFCL for the project bonds shall not exceed 40 per cent of the total project cost and 50 per cent of the aggregate bonds issued.

Partial guarantee thus de facto elevates the rating on an instrument from the issuer's rating to that of the guarantor's. The level of enhancement depends on factors such as coverage, timing and nature of the guarantee, the extent of cash flow recoveries that can be expected on delay or default by the issuer, and the legal and payment structure.

Chart 3: Partial guarantee structure



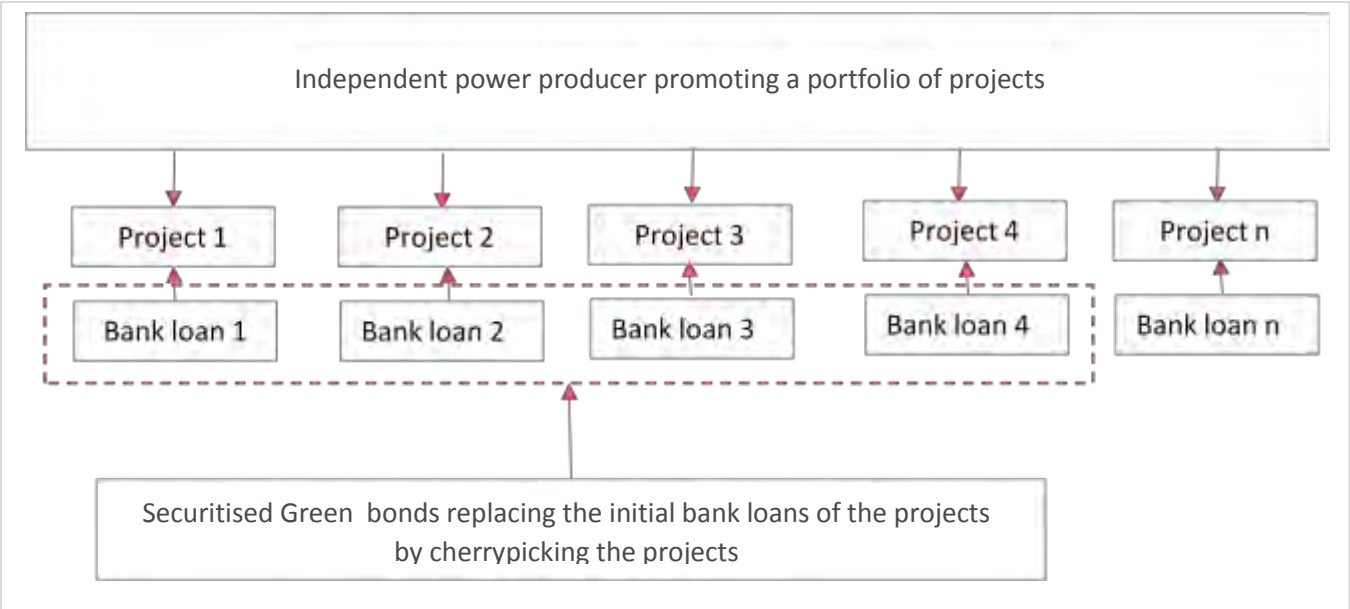
B) Securitisation of cash flows of renewable projects pooled from multiple projects

Securitisation of cash flows from renewable projects is akin to a typical future-flow securitisation transaction that relies on receivables. Securitisation along with structural features such as a trustee-monitored escrow mechanism, well-documented payment priorities (waterfall mechanism), creation of liquidity reserve, etc., elevate the credit quality of the instrument. Further, securitisation can help renewable projects get additional debt based on the strength of operational cash flows to fund other business investments or other under-construction projects.

In these transactions, the project SPV issues bonds by securitising the project cash flows and the proceeds from bonds are used to refinance existing bank debt. The securitisation process can also be used to aggregate cash flows from a portfolio of high-quality operating projects from single or multiple developers. This diversifies counterparty, geography and technology risks. The cash flows can be also be in tranches with priority on debt servicing and debt servicing coverage ratios set according to investor's risk appetite. Payments to investor (bond holder) will be met through future cash flows from the receivables of the renewable project.

CRISIL believes that operational projects with a reasonable track record after commissioning can securitise their receivables. An established track record of revenues will provide greater comfort in the process. And the securitised paper can target green energy investors.

Chart 4: Securitisation of multiple projects



Infrastructure debt funds (IDF), a novel vehicle to finance infrastructure

The Ministry of Finance incubated the idea of an infrastructure debt fund that can supplement bank finance in infrastructure by taking over a substantial share of outstanding loans.

IDFs can be set up as a trust through the mutual fund route and regulated by the Securities and Exchange Board of India (SEBI) or as a company through the non-banking finance company route and regulated by the Reserve Bank of India (IDF-NBFC). Currently, two IDF-NBFCs (L&T Infra Debt Fund Ltd and India Infradebt Ltd, both rated CRISIL AAA/Stable) are operational.

Key features of IDF-NBFCs

- Investment allowed only in public private partnership (PPP) projects with a minimum operating track record of one year, which ensures elimination of construction risks.
- Mandatory tripartite agreement between the project authority, project company and the IDF-NBFC provides credit enhancement in the event of a financial default -- with the right to terminate the concession agreement, priority access to termination payment from project authority, and well-defined timelines for completion of the termination process.
- Buyout guarantee from project authority, which require the project authority to take over the project and repay the lender in the event of default. However, there is a need for a central body for the renewable sector to provide such guarantees as project authorities for most renewables projects will be state distribution companies which, in turn, have weak credit profiles.

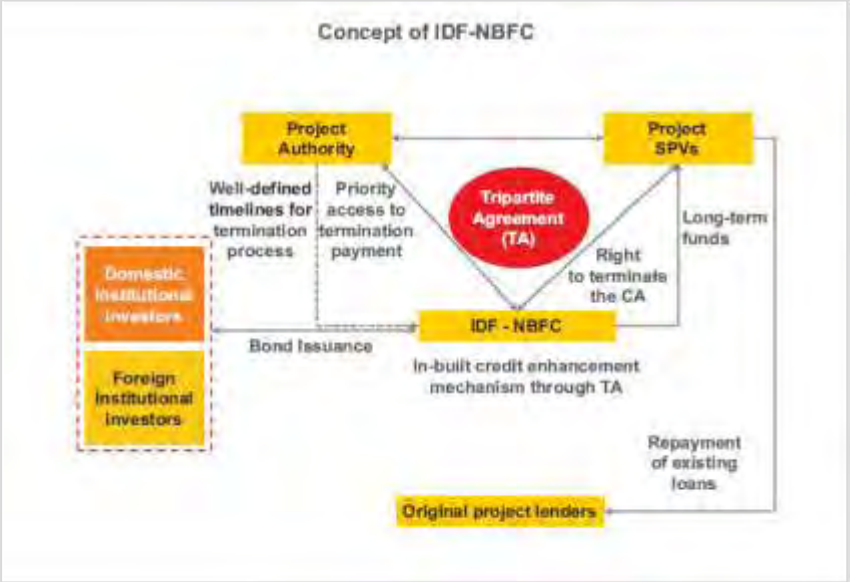
Benefits

Robust credit-enhancement mechanism provided by the tripartite agreement significantly strengthens the IDF-NBFC's asset quality by ensuring that the termination payment is always adequate to cover dues. Some other benefits of this are:

- Facilitating the flow of low-cost, long-term funds from both domestic and global debt investors to capital-intensive renewable projects.
- Bridging the gap between the low-risk appetite of long-term debt investors and the relatively higher risks associated with renewable projects.
- Improving equity returns for infrastructure developers because of access to long-tenure funds at lower costs.
- Releasing of bank resources to fund new renewable projects after refinancing by IDF-NBFCs
- Facilitating the development of corporate bond market by providing a good investment opportunity to long-term green energy investors to invest in high-quality papers aligned with their risk appetite and time horizon.

To incentivise overseas investments in these funds, the government has lowered the withholding tax on interest payments by IDF from 20 per cent to 5 per cent and exempted income of IDFs from tax.

Chart 5: Concept of an IDF-NBFC



Partial credit-enhancement facility for corporate bonds

The Reserve Bank of India (RBI) is considering allowing banks to provide credit enhancement to corporate bonds either as a subordinated loan facility or as a non-funded contingent line of credit. The subordinated credit / loan facility is similar to mezzanine finance and ranks below senior bond but ahead of equity in terms of repayment priority.

If allowed, banks can also provide credit enhancement as a non-funded facility in the form of an irrevocable and revolving contingent credit line, which may be drawn on the occurrence of a credit event such as cash shortfall during construction or debt service shortfall after project completion. In the event the project runs into difficulties and the credit line is drawn, the bank will inject funds to create a mezzanine instrument similar to the funded credit facility. Partial credit enhancement provided by banks will, however, be limited to improving the credit rating of bonds by two notches, or 20 per cent of the entire bond issue, whichever is lower.

Section 2

Solar energy growth outlook and credit issues

Strong support from the central government is crucial to achieving the growth objectives of the solar energy sector. CRISIL rates 22 single-asset solar special purpose vehicles (SPVs) installed under the central government's Jawaharlal Nehru National Solar Mission (JNNSM) Phase I and other state level schemes with capacities totaling more than 150 megawatt (mw).

In this section, we analyse the critical factors that will drive the growth of the solar energy sector. This includes the role of government, pre-commission and operational risks in solar power projects, counterparty credit risks, and emerging large-scale players.

1. What has kept solar capacity growing and what will drive future growth?

Solar power in India has witnessed impressive growth in a short span of time – from just 35 mw as of March 2011 to a 3,002 mw as of December 2014. The steep growth in these three years has come on the back of a favourable policy environment, particularly JNNSM, and Gujarat's solar policy.

JNNSM has opted for the bid-based tariff route in Phase I and bid-based viability gap funding in Phase II (Batch 1). This is further aided by government support in the form of infrastructure such as land, accessibility via roads and grid connectivity. Gujarat, for instance, has provided a solar park with all infrastructure in one place where multiple projects can be commissioned. Indeed, Gujarat has become an attractive destination for solar power projects thanks to its policy of attractive long-term preferential tariffs, creditworthiness of its state distribution company (discom) and high level of solar radiation or insolation.

Around 296 mw of capacity under the Renewable Energy Certificates (REC) mechanism has come up during 2012-13, mainly in Rajasthan, Madhya Pradesh and Andhra Pradesh. However, the attractiveness of this route has decreased due to a failure on the governments' part to enforce the Renewable Power Obligations (RPO) mechanism, which creates demand for REC. Limited pricing visibility (CERC has fixed prices for these certificates only till 2017) of the mechanism has further eroded its attractiveness.

CRISIL believes the future of the REC mechanism is uncertain unless the RPO is strictly enforced by the government. The capacity addition though this route is expected to come down.

Chart 1: Solar capacity growth in India (mw)

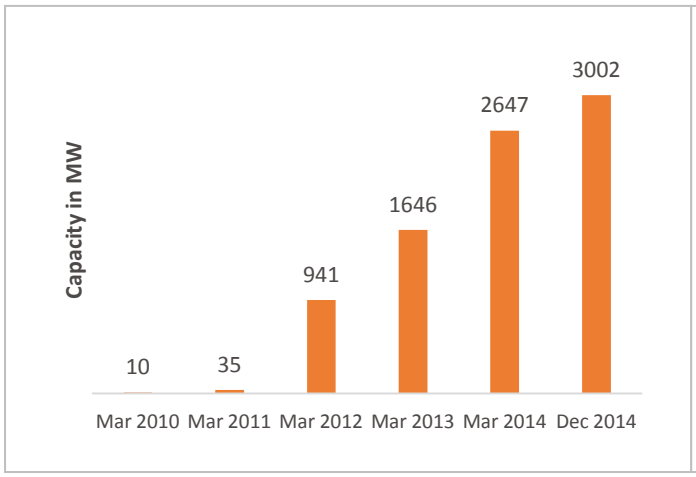
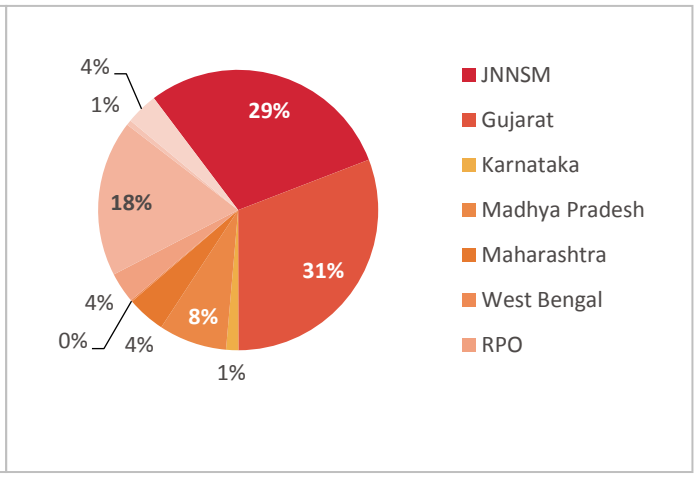


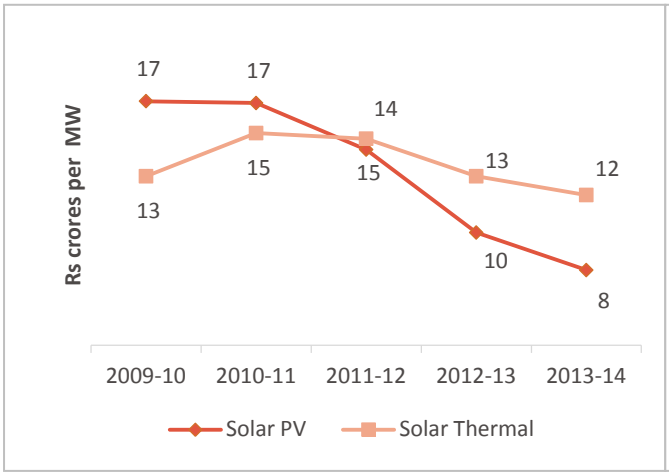
Chart 2: Policy-wise break-up of 3,002 mw as on December 31, 2014



Source: MNRE website

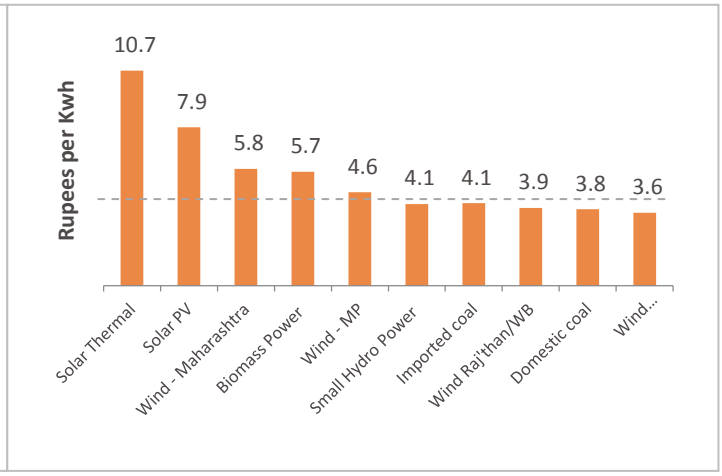
Further, the technology curve for solar power is evolving. In the last two years, capital cost per mw has fallen from Rs.14 crore per mw to less than Rs. 8 crore. Consequently, average solar tariff rates have declined from Rs. 15 per kWh to Rs. 8 per kWh. CRISIL believes for solar power projects to achieve grid parity with traditional sources, capital cost needs to fall below Rs. 5 crore per mw. And until that is achieved, government support through preferential tariff or viability gap funding will be critical.

Chart 3: Trend in solar project capital cost/mw



Source: CERC

Chart 4: Solar power yet to achieve grid parity

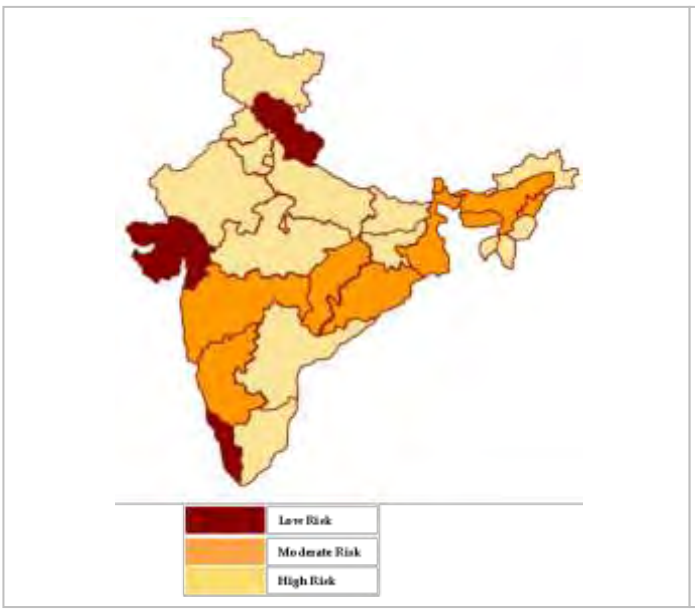


Soucre : CRISIL Rating

2. Given the credit risk profile of state discoms, what will drive growth?

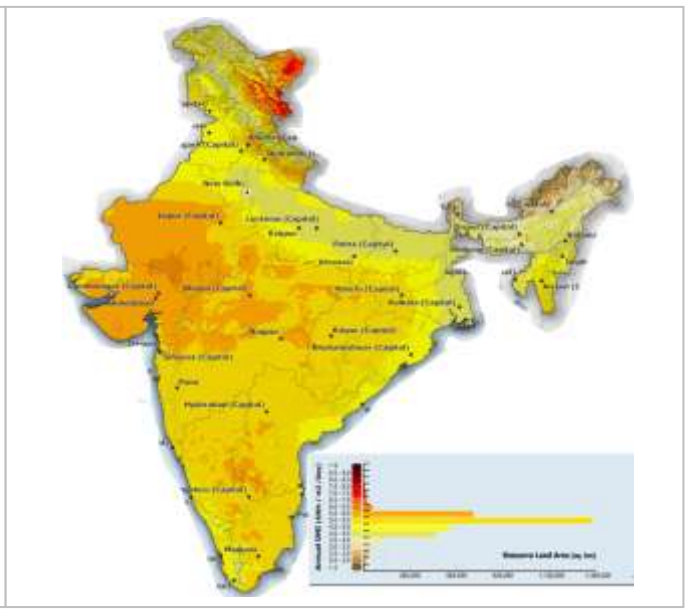
For a state to be attractive to solar power developers, the level of solar radiation and credit profile of the counterparty are crucial. For instance, Gujarat, which has high capacity of 860 mw under its solar policy, represents a good combination of abundant radiation leading to healthy plant load factors (PLFs) and a creditworthy counter-party in Gujarat Urja Vikas Nigam Ltd (GUVNL). By contrast, in Rajasthan, of the 667 mw of installed solar capacity, none is under state policy due to creditworthiness of its state distribution company (discom) (*Charts 5, 6*).

Chart 5: Credit profile of state discoms



Source: CRISIL Ratings

Chart 6: Annualised average solar radiation -- or insolation -- map of India



Source: MNRE website

For states with high solar radiation but relatively high risk in terms of creditworthiness, the majority of the capacity addition will come under the central government's JNNSM scheme. The creditworthiness of the Solar Energy Corporation of India (SECI)[2] provides comfort to investors. But developers are finding it difficult to bid for larger projects as JNNSM has a cap on the maximum capacity that can be awarded, which leads to aggressive bidding

Hence, CRISIL believes the recent introduction of ultra-mega power projects (UMPPs) in the solar sector will play a crucial role in providing scale and a creditworthy counterparty (SECI). The Ministry of New and Renewable Energy has rolled out four UMPP projects with cumulative capacity of 15,000 mw in Rajasthan (4000 mw), Gujarat (4000 mw), Ladakh (5000 mw) and Kargil (2000 mw).

3. Who are the players bidding for solar projects?

Competitive bidding and a sharp drop in tariffs of late have led to the emergence of serious solar players with massive growth plans. Groups like Welspun Energy, Acme Group, Moser Baer Solar, SunEdison Energy India, Azure Power, Essel Infra, Green Infra and Lanco Solar are aiming at huge capacities and a portfolio of solar projects in the medium term. They have consistently bid for new projects across JNNSM and state schemes. These projects have a combined portfolio (operational and under development) of ~1400 mw, accounting for close to 30% of the domestic capacity. Many large companies are building their own EPC/O&M arms for competitive advantage, which are run by professionals with vast experience in the solar industry.

Given the increasing competition and aggressive bidding in JNNSM Phase II, the ability of the developers to manage interest rate and forex risk will be crucial to returns from projects. Development institutions such as the International Finance Corporation, the US Exim Overseas Private Investment Corporation, and Germany's DEG have provided foreign currency loans of Rs. 20 billion to large players. The companies are also backed by private equity monies – estimated at ~ Rs. 45 billion, of which more than 60% -- or ~ Rs. 28 billion -- has gone to the large groups.

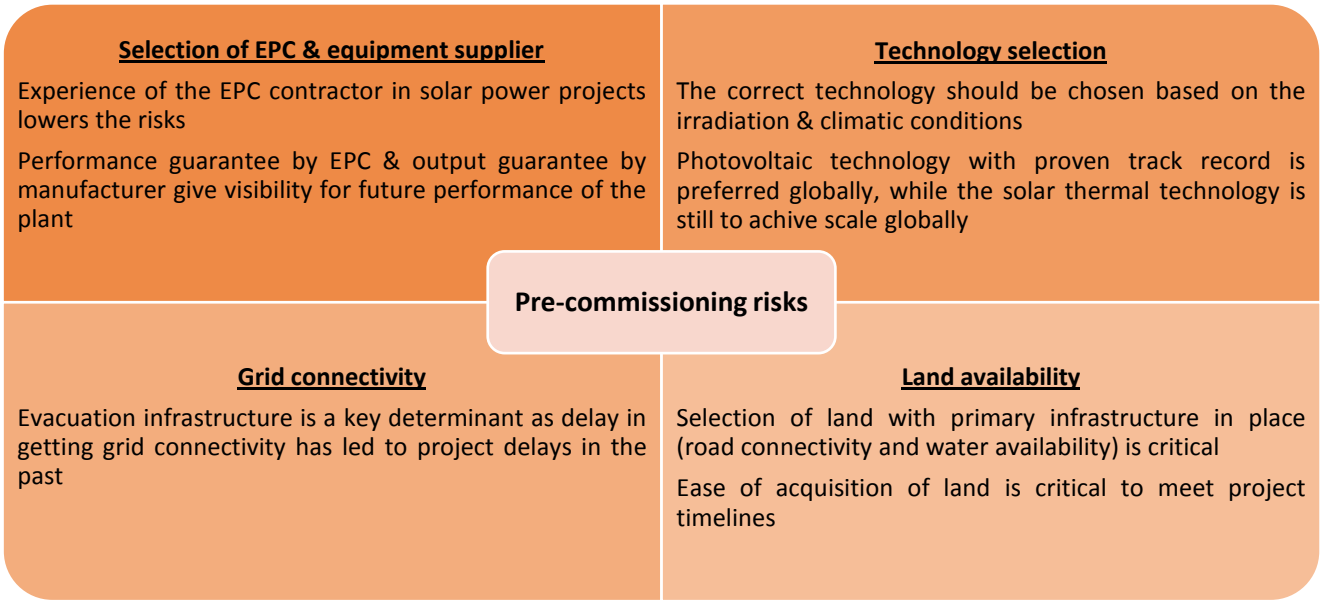
CRISIL believes that as the industry matures, serious players will keep adding capacities and build a significant portfolio of assets. This will help them look at pooling and securitisation of cash flows from projects or refinancing through bonds.

5. What are the pre-commissioning risks to look out for in a solar project?

Like any power project, construction is a key risk in solar power projects. In CRISIL's experience, most of the solar power projects have witnessed low to moderate pre-commissioning risks. In general, construction complexity for solar PV projects is significantly lower than for thermal power projects. There are no moving parts like turbines and fuel conveyers and high pressure parts, which significantly reduce risk levels. Modularity of construction and ability to start generating power in phases also reduces pre-commission risks. Because the complexity is lower, even smaller construction firms can design and execute solar PV plants. However, for large plants, ability to manage delays and cost overruns remains critical. A comprehensive EPC contract that provides a fixed price, timeline based commitment helps in managing completion risk. Ease of availability of land, technology and evacuation infrastructure is also critical. For the CRISIL-rated portfolio, the technology risk has been low as more than 90% of the projects have opted for the established PV technology and all the PV projects rated by CRISIL are operational except for a 25 MW concentrated solar power (CSP) project. Developers prefer PV over CSP because of the latter's complexity of technology.

[2] 2 MNRE has established SECI as the executing agency under Phase 2 (batch 1) of JNNSM. SECI will sign power purchase agreements (PPA) for 25 years with the project developers.

Chart 7: Key pre-commissioning risks observed in the CRISIL-rated portfolio



For the CRISIL rated portfolio, close to two-thirds of the projects were commissioned within the scheduled execution period, ranging from 8 to 12 months. Delays were only a few -- and mainly due to land clearance issues or evacuation infrastructure.

While three out of 15 projects were delayed because grid evacuation wasn't tied up on time, two were delayed because of land availability. Compared with conventional projects, overall delays in solar projects have been minimal at 2-4 months. CRISIL has observed longer delays in road projects due to right-of-way issues and thermal projects due to fuel availability and linkage issues.

CRISIL believes that as the industry matures, the risks associated with technology, radiation data, and experience of the EPC contractor will be mitigated to a great extent. However, uncertainties over land availability and grid connectivity will remain a concern in the medium term and will continue to require government support. CRISIL believes facilitation by the government will boost investor confidence.

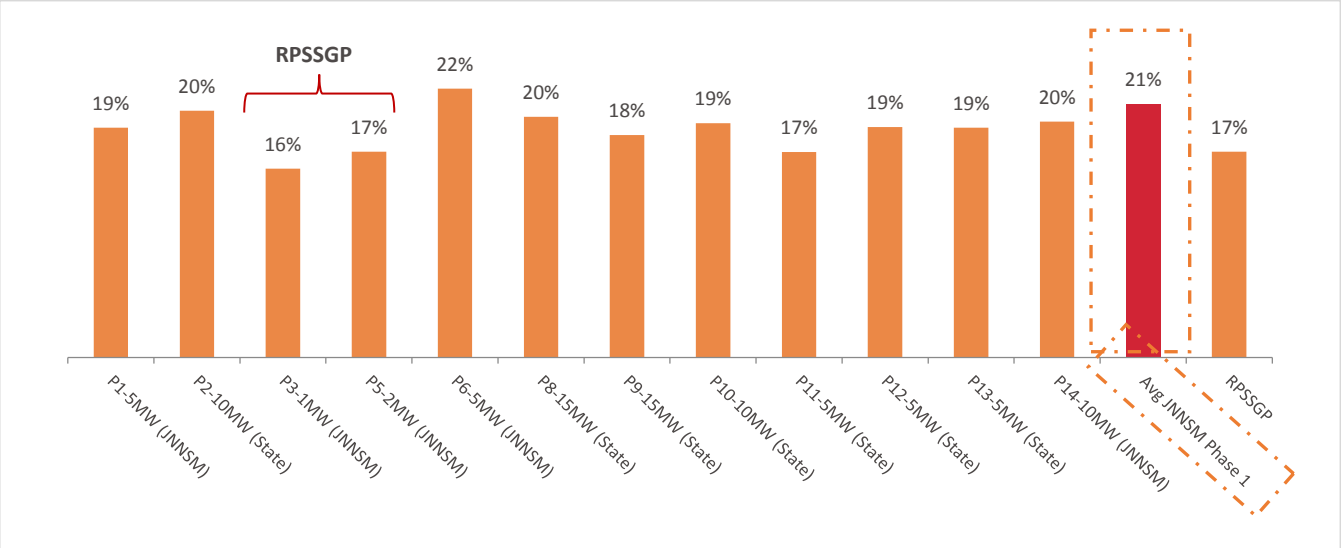
Chart 8: Pre-commissioning and operational risks of solar versus other projects

Risks	Solar	Wind	Conventional energy
Project execution risks *Project construction duration*	**Relatively low** *Short (8-12 months)*	**Relatively low** *Short (4 -6 months)*	**Relatively high** *Longer time lines (36-48 months)*
Resource data risk *Data availability* *Margin of error*	**Moderate to high** *Operational data for last 2-3 years only;* *Reasonable accuracy attained*	**Moderate** *Data for more than 10 years;* *Reasonable accuracy attained*	**Not applicable** *Risk linked to availability of raw material viz. coal, gas etc.*
Technology risk	Moderately evolving in nature	Already evolved and tested	Proven and tested
PLF risk	Low variability & seasonality in solar irradiance	High variability & seasonality	Depends on availability and quality of fossil fuels

6. What challenges do operational projects face?

The viability of a commissioned project depends on its ability to maintain a healthy capacity utilisation factor (CUF). This, in turn, is a function of the technology chosen, quality of module and equipment design, radiation levels, and plant maintenance. In general, unlike wind power, solar radiation is fairly stable through years with a low annual standard deviation (3% to 5%). CRISIL-rated projects have witnessed CUF in the range of 18-20%[3] *(Chart 9)* because nearly 80% of them are located in either Gujarat or Rajasthan, where the radiation level is relatively high compared with other states.

Chart 9: CRISIL rated projects maintained healthy CUF in line with average CUF for JNNSM Phase I projects



Source: MNRE and SLDC websites

In terms of maintenance risks, solar PV projects have no moving parts, which greatly reduce outage risks. Modularity also makes maintenance easier. However, in India, dust accumulation on the fascia of the PV module reduces radiation intensity.

Close to 50% of the CRISIL-rated solar power developers have mitigated technology and operational risks through long-term performance guarantees with module manufactures, along with operation and maintenance contracts (fixed price with annual escalation). Hence, creditworthiness and structure of performance contract are crucial to surmounting performance and technology risks. With the sector evolving, its track record around module degradation and performance failure of equipment will be an important factor. However, for a well-structured PV project with established technology, lack of moving parts reduces operational risks.

7. How has counterparty credit risk panned out for solar projects?

CRISIL-rated solar projects are healthy on this count, driven by creditworthiness of the counterparty and robust debtor policy. All projects have signed power purchase agreements (PPAs) for 25 years. Nearly 80% of these are either with GUVNL or NTPC Vidyut Vyapar Nigam Ltd (NVVN; rated CRISIL AA+/Stable/CRISIL A1+). These counterparties have a track record of timely payment, which supports the credit quality of solar projects.

The PPAs also have adequate covenants for timely payment and penalties, thus ensuring high probability of timely realisation of receivables. The track record of payments from GUVNL and NVVN has been good so far – they've mostly been on time or earlier. The risk is further lowered by the presence of a payment security mechanism in the case of solar power plants under both JNNSM and the state solar policy (*Chart 10*). CRISIL believes this security mechanism leads to efficient and structured flow of funds, which strengthens the liquidity profile.

[3] *The average CUF for projects based in Gujarat and Rajasthan had been around 18% and 20%, respectively, over the past year. Solar irradiance in these states has shown less variability over the years.*

Chart 10: Typical payment security mechanism in solar power projects ensures cash trapping

LC mechanism	PPAs are supported by unconditional, revolving and irrevocable letter of credit (LC) given by counterparty. Projects have a LC extended by the off-taker valid for 1 year and equivalent to estimated average monthly bill of the year.
DSRA Account	About two-thirds of the rated projects have their term debt secured by Debt Service Reserve Account (DSRA) equivalent to at least 3 months of interest and principal payment, ensuring adequate and timely debt servicing.
TRA/Escrow account	In 60% of rated projects, the payments are routed through escrow/ TRA account, which ensures efficient cash-flow structure.
Clauses under PPA	For better receivables management, the PPA provides for pre-payment options to the off-taker in exchange of discounts (1-5%). Also, in case of any delay, the counterparty will have to pay late payment surcharge (the SBI base rate + 7% in the case of GUVNL). Unless the developer flouts the agreement terms regarding maintaining minimum shareholding, or any other material clauses such as bankruptcy, the off-taker will have to purchase power at the agreed rate for 25 years.

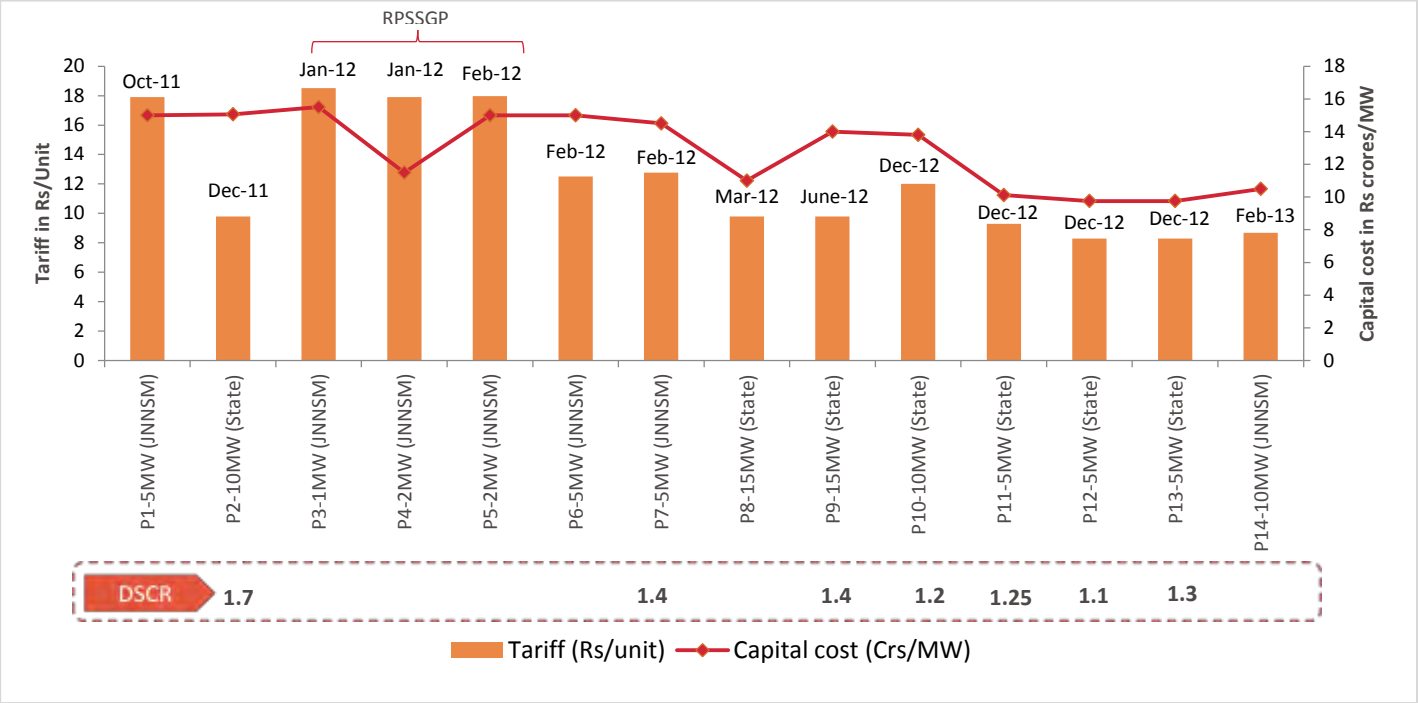
8. To what extent does the tariff structure impact returns?

All projects rated by CRISIL have signed long-term PPAs so strong revenue visibility is strong. CRISIL has observed that solar power tariffs have been coming down gradually, driven by lower PV module prices.

Additionally, competitive intensity in the sector has increased, leading to aggressive bidding by companies. But they have mitigated the risk of this to some extent by structuring debt such that DSCRs remains healthy. Most of the CRISIL-rated projects have availed of long-term debt with tenures ranging from 10 to 13 years. Some projects have also availed of buyer's credit in foreign currency, which tends to be cheaper and helps reduce costs in the construction phase. Around 15% of CRISIL-rated debt in solar projects is foreign currency debt. In recent times, many solar projects are looking to partial guarantees from financial institutions to reduce the interest costs.

Going forward, with competition in tariff bidding increasing, the ability to reduce capital and interest costs, improve CUF, and elongate debt profile will influence the credit-risk profiles of projects.

Chart 11: Trend in projects tariff (with COD) and DSCR in CRISIL-rated portfolio



Source: CRISIL Ratings; Dates represent commercial operations date (COD) of the projects

9. What other credit-related issues were observed in CRISIL-rated projects?

Funding mix, extent of investor interest in solar power projects, and support from promoters are some of the other factors analysed by CRISIL. On the equity front, promoters have arranged funds from private equity in some cases. For instance, Eoxis, a private equity fund specialising in wind and solar energy projects, has invested Rs.362 million in SunBorne Energy Gujarat One Pvt Ltd (rated CRISIL BBB+/Stable).

To improve bankability, in some cases, the promoters provided corporate guarantees. To manage costs during construction, some projects have received unsecured loans from promoters or took low-cost foreign currency debts.

Many big companies are also looking at a portfolio approach, housing solar projects at various SPVs but controlling them centrally through a holding company backed by private equity investment. A diversified portfolio of solar assets, spread geographically with varying counterparty credit risks, will enable developers to support their credit profile.

Projects with longer debt tenure registering decent CUF at higher tariffs and good counterparty have a healthier credit profile, while presence of payment security mechanism such as DSRA and TRA account provide additional liquidity comfort.

Section 3

Wind energy growth outlook and credit issues

Over the last five years, wind sector has whipped up 17 per cent annualised growth in installed capacities owing to favourable policies. CRISIL Ratings believes the party will continue a good five more years: India's wind energy sector could see investments of Rs.650 billion in three years enabling capacity additions to surpass the Twelfth Plan goal. Some of the factors driving investments in the sector are:

- Availability of generation-based incentives (GBI) of 50 paise/kWh subject to a maximum of Rs.1 crore per mw over 10 years
- Attractive internal rate of return (IRR) in the range of 16.5-18.5% (including 150 bps from GBI) because of promising state government policies, including a favourable feed-in tariff
- Wind power close to attaining grid parity, and a flattening of the technology curve which stabilises wind-turbine cost

Further, in the Union Budget for fiscal 2015, the NDA government had reintroduced accelerated depreciation (AD) benefits for the sector after it was discontinued in fiscal 2013. CRISIL believes this will revive capacity additions by AD beneficiaries after a gap of two years. We believe the reintroduction of AD and the continuation of GBI till 2017 will mean wind-power capacity additions will surpass the Twelfth Five Year Plan and grow by 10 gw between 2015 and 2017. That will translate into investments of Rs.650 billion of which Rs.450 billion will be in the form of debt.

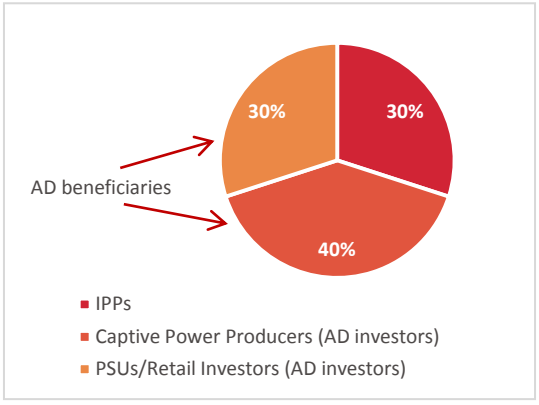
Capacity additions have been policy-elastic

Investments in the wind power sector are typically sensitive to changes in policy.

Between 2003 and 2010, India added more than 10 gw of wind power capacities, and nearly 70% of this was to leverage benefits under AD *(Chart 1 & Chart 2).* Under this scheme, developers could avail of tax benefits by depreciating 80% of their assets in the first year itself. As a result, captive power producers, large corporates (including public sector undertakings) and even retail investors set up projects.

GBI was introduced in 2010, which opened up the wind-power sector to a new investor – independent power producers (IPP). The purpose was to incentivise generation instead of just setting up capacities to avail tax benefits.

Chart 1: Break-up of installed wind power capacity (21 gw)



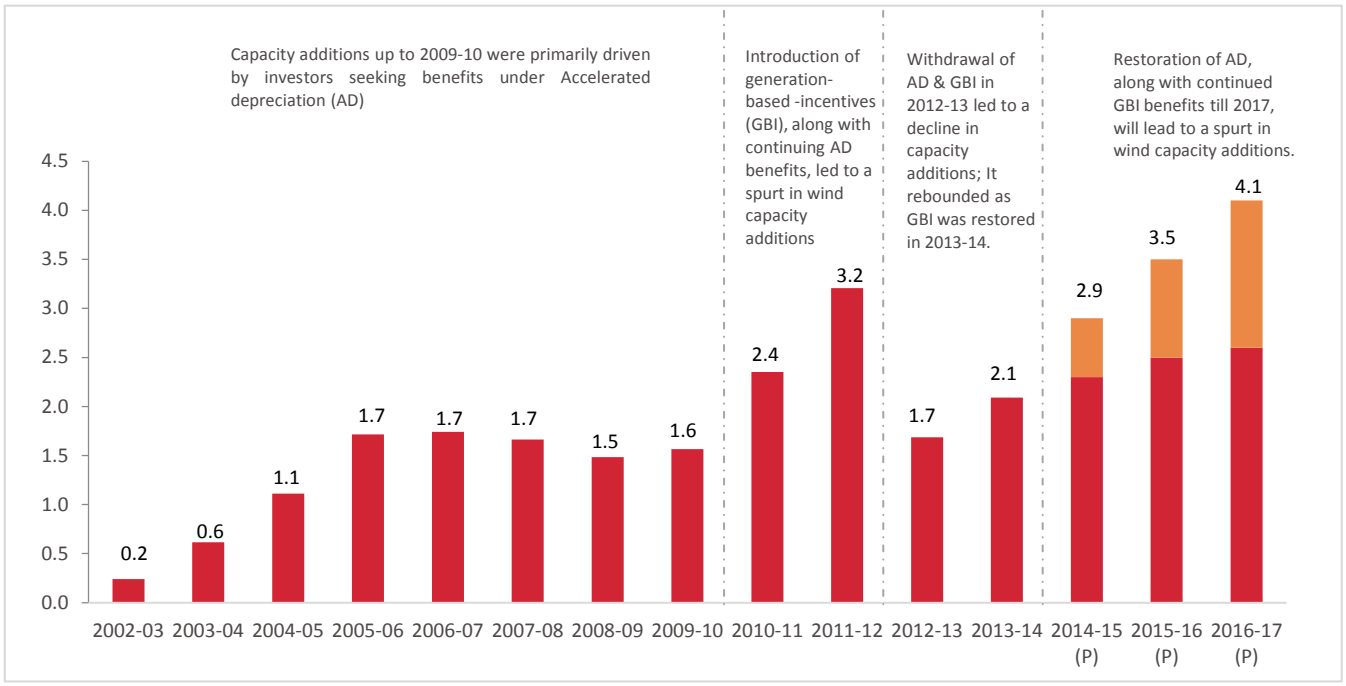
Source: Indian Wind Turbine Manufacturers Association, CRISIL

Driven by both AD and GBI, the wind capacity additions in India were the highest in fiscal 2012 at around 3,200 mw. However, in fiscal 2013, the government withdrew the AD benefit[4] given the maturity of the wind sector (reasonable scale achieved by wind capacities). It was also withdrawn because, while players were setting up capacities to avail tax benefits, these capacities were not being utilised optimally. GBI also expired at the end of fiscal 2012. As a result, capacity additions nearly halved to 1,700 mw in fiscal 2013.

But with the restoration of GBI in fiscal 2014, capacity additions picked up again to 2,100 mw, despite the AD benefit not being available. Not surprisingly, most of the capacities were added by IPPs availing of GBI benefits. CRISIL believes that the reintroduction of AD, coupled with projects by IPPs (to avail of GBI benefits), will result in wind capacity additions of more than 10 gw between 2015 and 2017.

[4] *Reduced from 80% to 35% depreciation in the first year*

Chart 2: Trend in wind-capacity additions (gw)



Source: National Institute of Wind Energy, CRISIL

IPPs will power the sector in the next five years

Of late, there has been a surge in interest among IPPs, which increases the probability of achieving India's Twelfth Plan wind-energy installation target. Prominent IPPs with a sizeable portfolio of assets are expected to contribute more than 75 per cent of the new installations. Because of this, the ownership pattern of wind farms in India is changing, shifting away from 'depreciation seekers/tax savers' to serious, long-term IPPs. This has also meant the size and scale of single-location wind farms are increasing. CRISIL sees an emerging trend of first-generation entrepreneurs backed by private-equity investors entering the fray. While IPPs owned by established groups with a presence in power or other sectors will contribute to half of incremental capacities, first-generation entrepreneurs with funding support from private equity players are likely to set up the balance. This will mean a capital requirement of Rs 500 billion and debt of Rs 350 billion.

What's luring entrepreneurs?

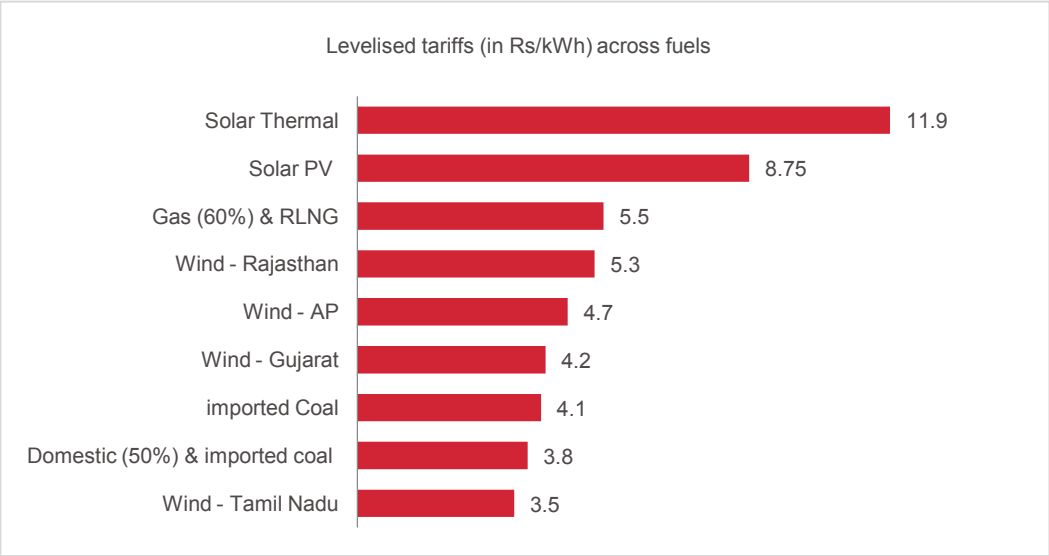
A host of factors beginning with government policy. Today, instead of accelerated depreciation, wind-power producers get a generation-based incentive (GBI) of 50 paise/kWh subject to a maximum of Rs.1 crore per mw over a period of 10 years – a move that has encouraged IPP participation and also increased the economic size of projects enhancing scalability of renewable power through this source. While GBI makes wind sector attractive to large IPPs, CRISIL believes GBI is also a credit positive as it increases project IRR by 150 bps, thus strengthening the project risk profile. From a debt-servicing point of view, GBI benefits also improve project DSCR by approximately 0.1.

The adoption of feed-in tariffs by the Central Electricity Regulatory Commission (CERC) has made the sector even more attractive for investors. The zone-based generic guidelines laid out by the CERC offer a 20 per cent return on equity (RoE) under a controlled plant load factor scenario. Even though states are free to adopt their own feed-in tariffs, they are broadly guided by the principles of the CERC guidelines for determination of tariff from renewable sources. As a result, wind energy projects now offer an internal rate of return (IRR) of 16.5% to 18.5% (including 150 basis points from generation-based incentive).

Other positives include sops in grid code (schedule can change until half an hour before supply, etc) and Section 80-IA benefits (tax holiday for 10 years). Yet, adherence to renewable purchase obligations has not been ensured thus far because of the lack of a penal and/or incentive mechanism. And weak financials of discoms will keep them from meeting commitments anytime soon. It is for these reasons that renewable energy certificates (REC) haven't found many takers. Most recently, the State Electricity Regulatory Commission of Uttarakhand had imposed a penalty on its discom for missing its renewable power obligation (RPO) target. CRISIL believes stricter enforceability of RPO will offer tailwind to the certificates market and demand.

Flattening technology curve has stabilised wind turbine costs. Today, capital cost is in the Rs 6-6.5 crore per mw range. Simultaneously, the cost of generation from conventional sources such as coal- and gas-based plants has inched up due to increasing fuel cost. Wind power is therefore moving closer to grid parity *(Chart 3)*, while other renewable sources such as solar thermal and photovoltaic require bundling with lower-cost conventional power to make them affordable – and have scalability constraints, too. This has made wind power attractive to both discoms and open-access consumers, thereby opening the avenue for captive third-party model.

Chart 3: Wind power en route to grid parity



Business models in wind energy

The introduction of feed-in or preferential tariffs has added an element of certainty to tariff structures over the life of wind energy assets, while providing reasonably attractive returns adjusted for the wind resource of each state. The preferential tariff model has drawn maximum investments -- nearly 70 per cent of installed capacity -- and will remain the favoured option of wind-based IPPs.

The REC model was introduced by the government to help states not well endowed with renewable resources to meet their RPO targets. However, after the initial euphoria where superior returns were made by trading renewable energy certificates, interest completely vanished leaving a heap of unsold inventory.

The model that has now caught the developers' fancy is the captive third-party consumer model. Sales here are done to third-party consumers who pick up a nominal stake in wind farms, thereby averting open-access charges. The tariffs are linked to commercial or industrial rates paid by consumers to discoms, and are usually higher than feed-in tariffs of states, thereby offering higher, PLF-risk-adjusted returns *(Chart 4)*.

Chart 4: Better returns for Captive 3rd party consumer model - Tariffs (Rs/kWh) *Indicative tariff (Rs/kWh)*

State	CERC guidelines	State - feed in tariff	Tariff - Industrial (2014-15)	Tariff - Commercial (2014-15)
AP	5	4.7	6.1	9.1
Gujarat	5	4.2	5.5	5.5
Karnataka	5	4.2	6.0	7.5
MP	6.3	5.9	7.0	6.7
Maharashtra	4.2-6.3	3.9-5.7	8.2	11.7
Rajasthan	5.8	5.6-5.9	5.5	6.3
TN	3.9-4.2	3.5	6.4	8

Note: Industrial and Commercial tariffs pertain to High-Tension customer category based on latest tariff orders
Source: State electricity regulatory commission, CRISIL Ratings

Re-introduction of AD to revive the growth from captive power producers and tax beneficiaries

CRISIL believes the reintroduction of AD will spawn sharp growth in the near-to-medium term as beneficiaries queue up to take advantage. Captive power producers and pure play tax beneficiaries benefit from AD as it helps them avail tax benefits through 80% depreciation of the wind assets in the first year itself. This helps in improving cash flows from their existing business operations. As these tax benefits are front ended (available in the first year itself), the effective IRR for the wind projects increases by around 500 bps (on factoring the gains from tax savings).

Who are the key consumers, and what will drive future demand for AD?

- **Captive power producers:** Companies from capital-intensive industries such as mining, cement and textiles will be interested in setting up wind projects for two reasons: tax deduction available against existing businesses; and captive power, which reduces their costs.
- **Pure-play tax beneficiaries:** Real estate, financial institutions, and individuals were setting up wind projects purely to leverage tax benefits. But as the AD sop ended, new projects nearly dried up 2013 and 2014, with some of them even gravitating towards solar energy. Now the restoration of the AD benefit is expected to renew interests in wind power.
- **Public sector undertakings:** While PSUs are not big on wind capacities, they could join the fray soon even as the central government pushes renewable energy. Another catalyst is the corporate social responsibility (CSR) mandate where a portion of corporate profits has to be spent on socially beneficial activities. As investments in wind power classify as CSR spending (besides, the tax benefits), PSUs are also expected to join the fray.

Key credit drivers for wind players

Wind projects are comparatively less risky

As such, risk-adjusted returns on wind power projects – which typically have shorter gestation periods and are modular in nature – are higher than those on thermal projects. While post-commissioning risks in conventional power projects (fuel shortage, higher operating risk, wind variability, regulatory and counterparty risk, to name some) are comparable with the risk of wind variability, the pre-commissioning risks (land acquisition, clearances, gestation period, financial closure etc) are way lower for wind farms.

Wind variability and weak credit quality of counter-parties the primary risks

At the time of commissioning and in the early years of operation, wind variability risk manifests in the form of estimation error and/or sharp deviation in actual energy output compared with estimates in wind velocity studies. The error could arise due to technical shortcomings such as measuring wind velocity at an incorrect mast height, sample bias because data used to estimate average energy output is of relatively small periods, faulty estimation of power curve of a wind turbine, etc.

Chart 5: Wind variability risk: High sensitivity of DSCR to PLF

Tariff/PLF	17%	19%	21%	23%	24%	26%
Rs 3.5	0.64	0.72	0.79	0.87	0.95	**1.02**
Rs 4	0.74	0.82	0.91	**1**	**1.07**	1.15
Rs 4.5	0.83	0.92	**1.02**	1.11	1.19	1.26
Rs 5	0.93	**1.03**	1.12	1.21	1.29	1.39
Rs 5.5	**1.02**	1.12	1.22	1.31	1.4	1.49

Thus, the inherent risk of wind variability year-on-year is characteristic of the wind energy sector and could impact cash flows and credit qualities of wind-based IPPs. Among the key assumptions in modelling debt service coverage ratio (DSCR) for projects, none has more bearing on viability than PLF (*Chart 5*). *Ceteris paribus*, sensitivity of DSCR is the highest to changing PLF.

Chart 6: PLF performance of select CRISIL-rated projects

Project	Year of commissioning	Location	Summary of actual PLF in Year 1 and 2 from commissioning
A	2010	Tamil Nadu	Actual PLF between P50-P90
B	2011	Karnataka	Actual PLF between P50-P90
C	2011	Gujarat	Actual PLF between P50-P90
D	2011	Karnataka	Actual > P50
E	2011	Maharashtra	Actual PLF between P50-P90

Thus, to factor estimation error and wind variability risk, CRISIL uses the P90 level of annual energy output when calculating DSCRs. Only in exceptional cases where the variance between P90 and P75 is not too wide is the latter used. Given the practice of lenders to adopt P50 and P75, CRISIL's assumptions may look conservative. But in international experience the actual performance of wind farms has mostly been underwhelming and has consequently led to tightening of assumption parameters. For CRISIL's own portfolio, the performance of projects monitored over the last four years has more often than not ranged between P75 and P90 *(Chart 6)*.

Seasonality in wind flow and therefore intra-year variability in energy output can be planned for in a much better manner by crafting debt repayment to match cash flows and building additional liquidity through mechanisms such as debt service reserve accounts, etc.

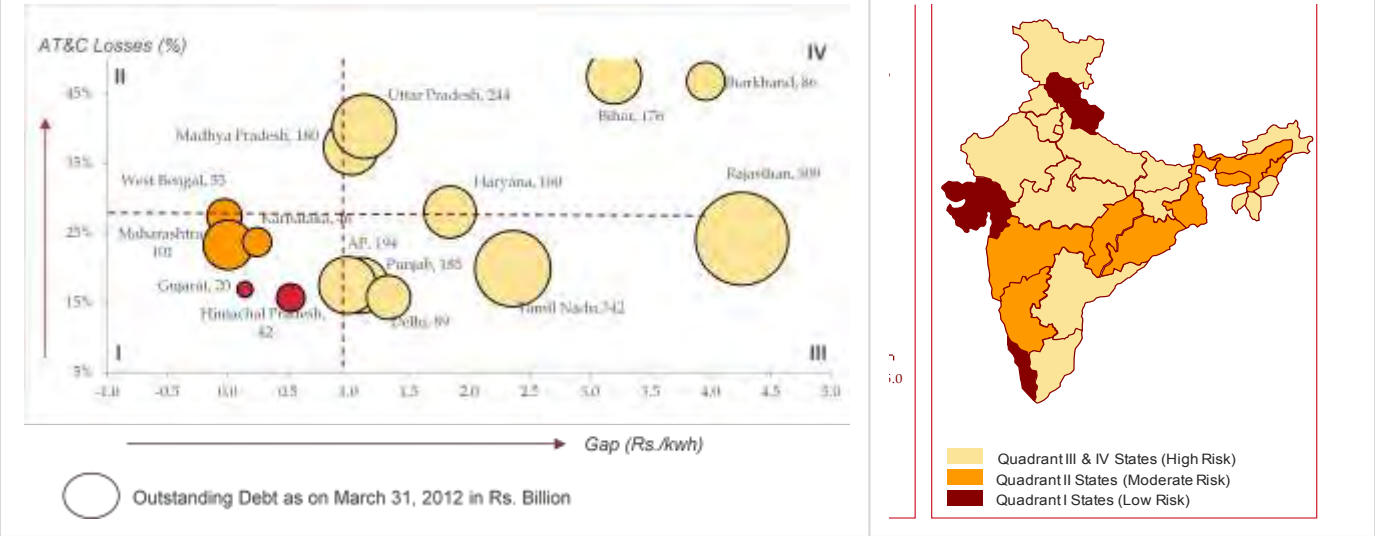
Counter-party risk profile

The dichotomy of the wind power sector in India is that states with the richest wind resource have the weakest financial profile, such as Tamil Nadu and Rajasthan *(Chart 7)*. CRISIL uses its framework of classifying financial risk profile of states based on three parameters -- AT&C losses, revenue gap per unit, and gross indebtedness[5].

[5] *Please refer to CRISIL's Opinion Piece dated titled 'Power Distribution Utilities – current issues and what lies ahead' for details*

Chart 7: Top 15 states by discom debt

Discom's profile of states

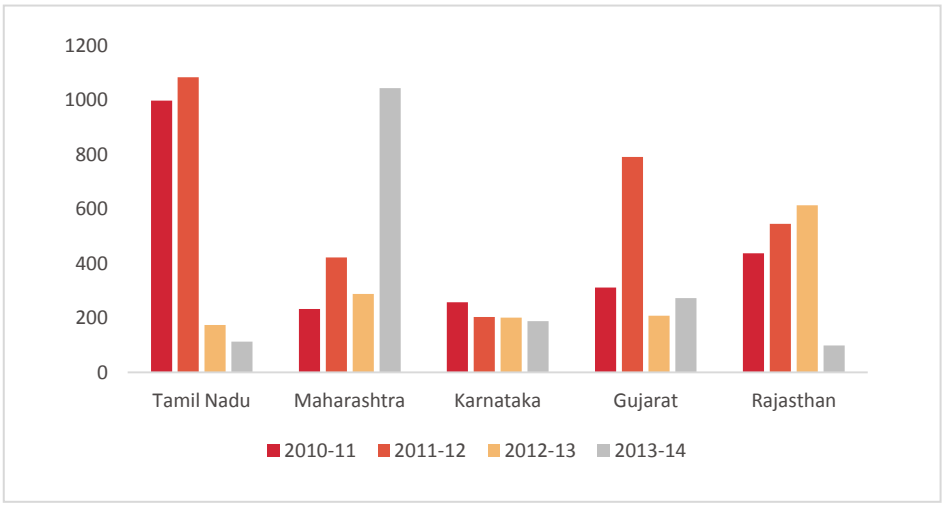


Stable performance of CRISIL-rated IPPs will support medium-term growth plans

CRISIL's existing portfolio includes wind power developers with portfolio of assets as well as single asset companies. CRISIL-rated IPPs have exhibited stable performance over the last three years driven by healthy risk-management practices. There are five ways in which they have done so:

1. **Focus on states with low counterparty risk:** One of the key counterparty risks that IPPs face arises from the weak financials of state distribution companies or discoms. In the past, there have been significant payment delays by some discoms, such as in the high-wind potential states of Tamil Nadu (significant delays in fiscal 2012) and Rajasthan (delays observed in fiscal 2013). To mitigate this, IPPs have focused on setting up capacities in states which have a good payment record such as Maharashtra, which saw a sharp increase in capacity addition, even as it declined in Tamil Nadu *(Chart 8)*[6].

Chart 8: State-wise capacity additions (mw)



[6] *It may be noted that besides issues pertaining to counterparty risks, state-wise capacity additions have also varied due to differences in policy and regulatory regimes -- such as low preferential tariffs and evacuation constraints in Tamil Nadu, and multi-year tariff framework in Maharashtra.*

2. **Geographical diversification at an SPV level and at a group level:** To address counterparty risk, IPPs have focused on diversifying their portfolio across states both at the special purpose vehicle (SPV) and group levels. When different projects get executed under one SPV, cash flows between SPVs ease the pressure on receivables to some extent.

3. **Longer tenures and innovative structuring of debt to partially offset wind variability risks:** CRISIL-rated IPPs have been exploring longer-tenure debt of 12-13 years with one or two-year moratoriums, apart from bespoke repayment structures with higher repayment in the months of high wind speeds. Some of the IPPs have also resorted to pooling of cash flows of several projects to raise debt, instead of linking cash flows of a single project to debt repayments. As a part of loan structuring, projects also maintain cash in the form of debt service reserve account. As a prudent measure, IPPs also maintain cash at the group level for contingencies.

4. **Strategies to offset pre-construction risks:** In the last three years, there had been strong growth in renewable energy projects, especially wind and solar. However, this was not supported by adequate infrastructure in many states. Hence, despite their must-run status, many projects had to reduce production, especially in Tamil Nadu. Wary of this, IPPs now plan their evacuation infrastructure before investing in projects.

5. **Others:** To mitigate design and construction risks, IPPs have diversified their procurement across various wind turbine equipment manufacturers.

Need to address key challenges to reach self-sustaining growth

Although wind power is close to achieving grid parity and the AD and GBI incentives have encouraged investments, CRISIL believes that for it to be self-sustaining, and for long-term growth, the challenges outlined in *Chart 9* need to be addressed*:*

Chart 9: Key challenges and outlook

Stability in Policy Regime	Frequent changes in policies have resulted in sharp fluctuations in capacity addition in the past. Hence, a stable policy regime is critical for sustained growth.
Evacuation Infrastructure	States with high wind potential do not have adequate intra-state transmission systems to evacuate power. But the successful establishment of a green corridor by PowerGrid Corporation of India is expected to provide long-term respite.
Land acquisition	Land acquisition policies differ from state to state, so has deterred some projects. Favourable land-acquisition policies are important to attract investments in the wind energy market.
Weak financial health of discoms	Weak financial profile of discoms such as in Rajasthan, Tamil Nadu and Madhya Pradesh have resulted in delayed payments to wind IPPs. The health of discoms is expected to improve after the implementation of their financial restructuring plan.
Non enforcement of RPO	Stricter enforcement of renewable purchase obligations – or RPOs – will provide a leg up to the renewable energy certificate – or REC – market even as it improves wind-power demand

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