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POWER

Solar Parks: A new "Sunrise"?

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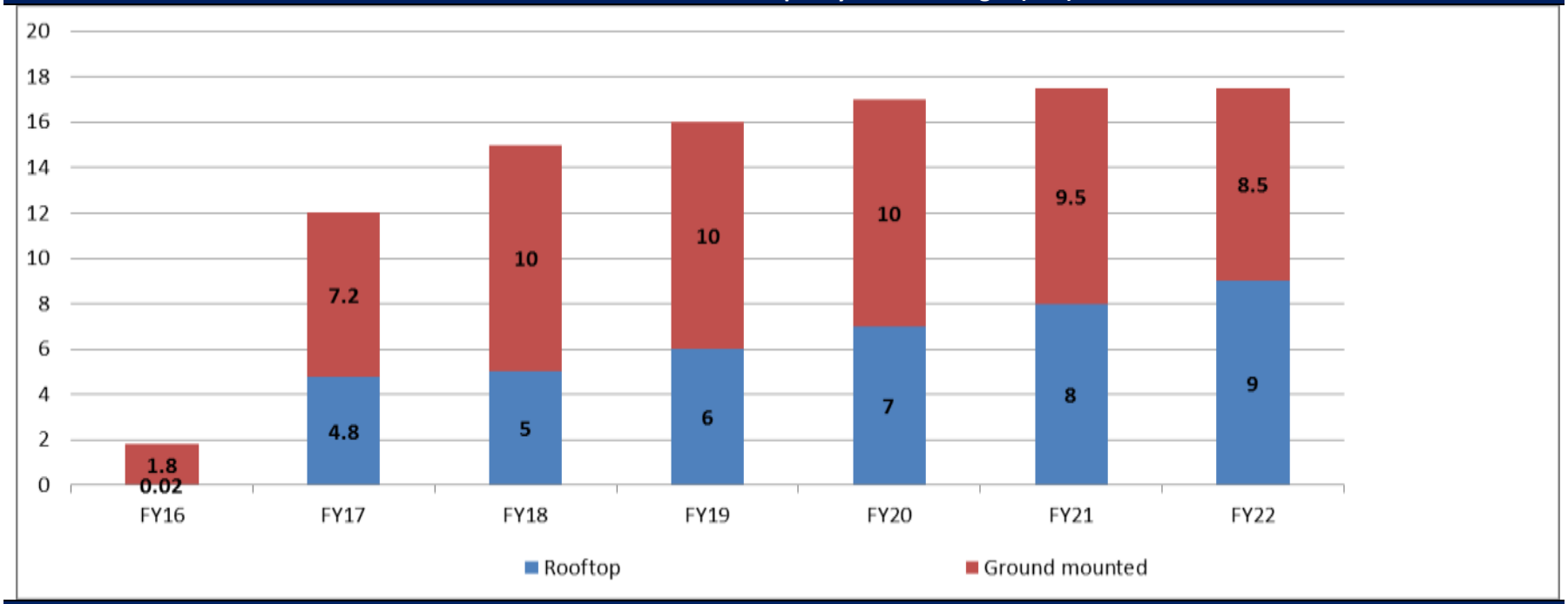
India's Solar Programme has set-up an ambitious capacity addition target of ~100GW of solar capacity addition by 2022. Of this capacity, ~40GW is expected to get installed under solar rooftop segment and balance has come/is expected to come in the form of grid connected solar capacity (with ~3.4GW already installed at time of policy formation as on March 31, 2016). Of the total ~60GW, ~40GW is expected be commissioned under various state policies and rest i.e. 20GW is expected to be added under Solar Park model (refer Annexure-II for details). The recent competitively bid tariffs based on reverse auction in the range of Rs.2.44-3.30/kWh signifies major improvement in cost competitiveness against both alternate renewables as well as conventional sources of power. CARE Ratings believes that the 'Solar Park' model has emerged as the preferred model for Independent Power Producers (IPPs) with key embedded features like 1) desired economies of scale for capacity addition at a single location, 2) upfront land availability, 3) accommodative timelines of 18 months for commissioning of projects (v/s 13-15 months in National Solar Mission programme (NSM)/state policies), 4) Project PPA with features such as state government guarantee for the contracted capacity by state utility 5) "Deemed Generation" compensation mechanism in case of non-availability of grid and 6) evacuation infrastructure with shared power transmission costs and other project related infrastructure, which shall reduce overall cost for the developers. Nonetheless, from credit perspective, the viability of these projects would be critically dependent upon 1) availability of elongated tenure of financing (~17-18 years) from CoD at competitive rates and 2) ability to contain both Photo Voltaic (PV) module and Balance of System (BoS) costs within the budgeted levels. During FY15-FY17, solar tariff bids have reduced by ~46%[1] with the recent lowest bid in the Bhadla Solar Park (250MW) of

[1] *Considering the NTPC tender bids in 100MW UP tender of Rs.5.78/kWh in FY16 and NTPC 250MW Kadapa tender of Rs.3.15/kWh in FY17*

~Rs.2.44/kWh. CARE Ratings believes that the recently bid tariffs below ~Rs.3.0/kWh indicate aggressive bidding by developers who assume sustained availability of low cost of equipments, cheaper and elongated financing options and shorter construction periods (6-8 months). Such assumptions ride on thin margin for error in terms of sustainable returns for the developers. Further, with increasing competitive intensity, the element of aggressive bidding can potentially deter the achievement of financial closure for the bid capacity.

MNRE Year-wise Solar Capacity addition target (GW)

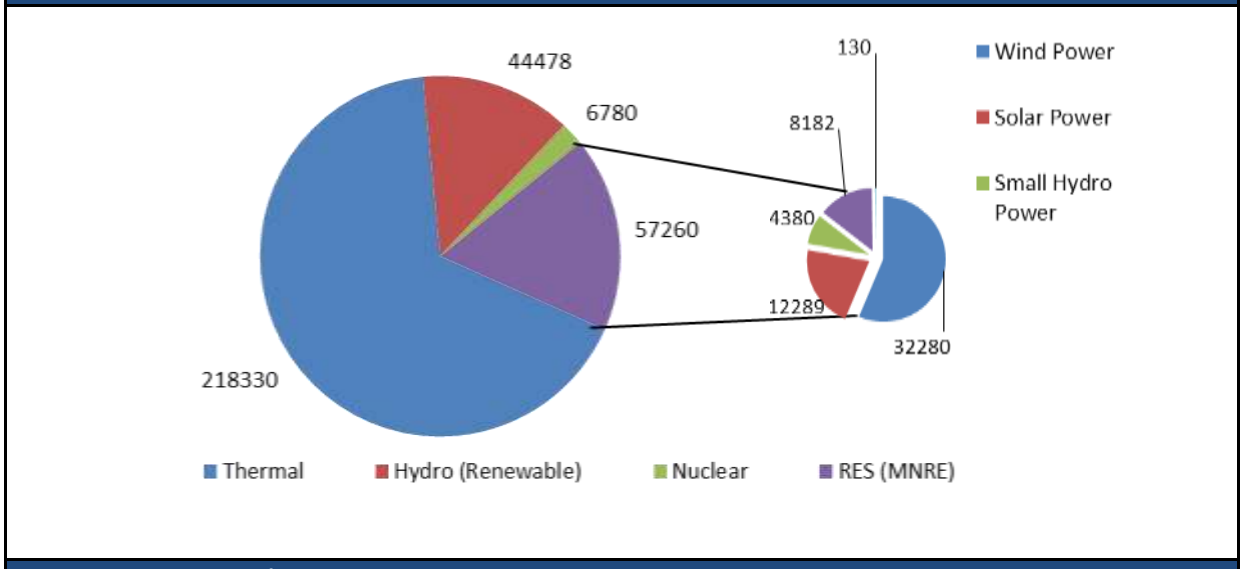


Source: Solar Corporation of India Ltd. (SECI), CARE Ratings

The country added 5.5GW of solar capacity (up 83% over FY16) and 5.4GW of wind capacity (up 63%) in the year 2016-17. While these numbers are impressive, it is worth noting that the solar capacity addition including rooftop solar is almost 50% below the annual target of 12GW. This is attributable to failure of ~5GW planned rooftop capacity addition, in FY17 on account of lack of policy clarity in the various states. In contrast to this, wind capacity addition was +35% over the 4 GW target.

Further, there is clear shift towards capacity addition mix with the total renewable capacity addition 12.5GW v/s 10.2GW conventional capacity addition in FY17. Due to faster capacity addition in the last 5 years, the share of renewables has increased from 14% to 21% at FY17-end in the overall installed capacity.

Share of renewable in the overall installed capacity



Source: CEA; CARE Ratings

India's solar capacity addition target of ~100GW by end of 2022 looks ambitious primarily on account of lack of meaningful power demand pick-up in the next 2-3years (by FY20) due to 1) incremental demand addressed by underutilised thermal capacity (running at 15 year low average annual PLFs of 61%), 2) increasing focus on Demand Side

Management (DSM, i.e. energy efficiency measures) and 3) availability of already signed PPAs with NTPC by DISCOMs for 23GW during FY17-FY20. Further, solar roof capacity is also lagging the target capacity additions and installed only 1GW by Mar-17 (v/s ~40GW target capacity installation target by 2022).

- **Solar park model - why it emerges as the preferred model for developers?**

The solar park is a concentrated zone for developing solar power generation projects, by providing the developers an area that is well characterized, with suitably infra-structured facilitating permitting process thereby minimising the risk of the projects.

Upfront availability of land and power evacuation along with other common infrastructure at lower costs are the prominent reasons that render Solar Park as the preferred model for developers. Further, the recent Rewa Ultra Mega Power Project (UMPP) bid documents have been structured in a manner so as to optimise the construction, operation and off-take related risks thereby aiming to improve bankability of the projects.

The Rewa UMPP (RUMSL) model has incorporated key unique features like 1) accommodative timelines for commissioning of power plants of ~12-18 months from date of signing Power Purchase Agreements (PPAs), 2) State Government guarantee for the contracted capacity by utility in the State of Madhya Pradesh and 3) Compensation for deemed generation in case of non-availability of grid which in turn mitigates counter-party credit risk and hazards of grid back -down to a large extent. Nonetheless, the viability of these projects is critically dependent on funding of long tenure debt (up to 17-18 year post project completion date) at economical rates as well as its ability to keep the cost of PV modules within the budgeted levels.

CARE Ratings has evaluated the PPA of Rewa UMPP in comparison with some of the other PPAs tied up by solar IPPs and the findings are enumerated in the following sections. The details of PPA and financial flow for Rewa UMPP are pictorially depicted in **Annexure 1:**

The key features of Rewa Solar UMPP model are as follows:

1. **Payment Security Mechanism:** This comprises a) The LC equivalent to 1.25 months of billing, b) a payment security fund and c) the guarantee from the State Government of Madhya Pradesh. Consequently, the counter-party credit risk is substantially mitigated by virtue of a) the presence of the State Government guarantee for 78% of counter-party exposure i.e. towards Madhya Pradesh Power Management Company Limited (MPPMCL), b) the balance exposure towards the Delhi Metro Rail Corporation

Ltd. (DMRC), which is a creditworthy counter-party, and c) payment security fund to be maintained by RUMSL on behalf of procurers. In addition, cost competitiveness of bid tariff from the off-taker's perspective provides a strong comfort.

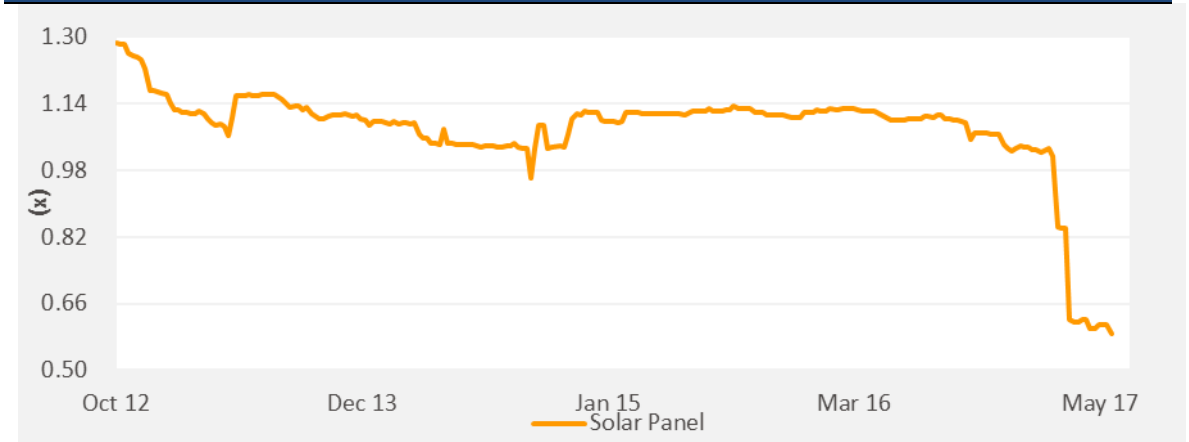
2. **Deemed Generation Clause:** The deemed generation clause availability in PPA further offsets the risk of forced back down/grid non-availability, which has been a concern for solar project developers in a few states as witnessed FY16 and FY17.
3. **Termination Clause:** The PPA comprises the termination clause, which is not present in the existing PPAs tied up by solar IPPs, except those tied up with the utilities in Gujarat.

   Solar Park location: Solar parks offer the project developers a developed plot with associated infrastructure in place, including internal transmission network and connectivity to the inter-state grid. In case of the Rewa Solar Park, the execution progress is satisfactory, on the auction day around 3,715 acres (~97%) out of the proposed 3,830 acres (1,550 hectare) of land has been acquired. Thus, project developer can begin work on the day the PPA is signed. Also, PGCIL is implementing requisite transmission infrastructure for solar power via the Inter-state transmission system (ISTS).

- **CARE's assessment of sustainable IRRs and DSCRs for the solar park model**

According to CARE's assessment, the capital costs of installation or commissioning have reduced to ~Rs.3.78 crore/MW in May 2017 from Rs.5.50 crore/MW in Jan-15 due to sharp correction in solar panel prices on account of global capacity glut. Correspondingly, bid tariffs have reduced by 46% during FY15-FY17 (as per trend shown in the following figure). Since, module costs (~60% of the total project cost/MW) constitute significant proportion of the total fixed costs.

Price trend of Solar panel prices during October 2012 to May 17



Source: Industry sources, CARE Ratings

While the cost/MW and funding options available will vary for developer to developer, the base assumptions for the Solar Park as follows:

Key assumptions for the base case are:

1. *Project Life: 25 years*
2. *Annual panel degradation: 0.6%*
3. *Project cost of Rs.3.78 crore/MW*
4. *Annual CUFs - 20% (at P90 levels)*
5. *Debt : Equity Ratio – 70:30*
6. *O&M expenses at Rs.6 lakhs per annum/MW*
7. *Debt repayment tenor of 17-18 years*

The Scenario analysis is shown below for levelised bids of Rs.3.3/kWh and Rs.2.44/kWh and the DSCRs at various CUF levels and DSCRs are given below:

Case 1: Rewa bid case with above mentioned assumptions with tariff Rs. 3.30/kWh

Interest rate (%)/CUF (%)	20	21	22	23
8.0	1.37	1.44	1.50	1.57
9.0	1.30	*1.36*	1.42	1.48
10.0	1.24	1.29	1.35	1.40

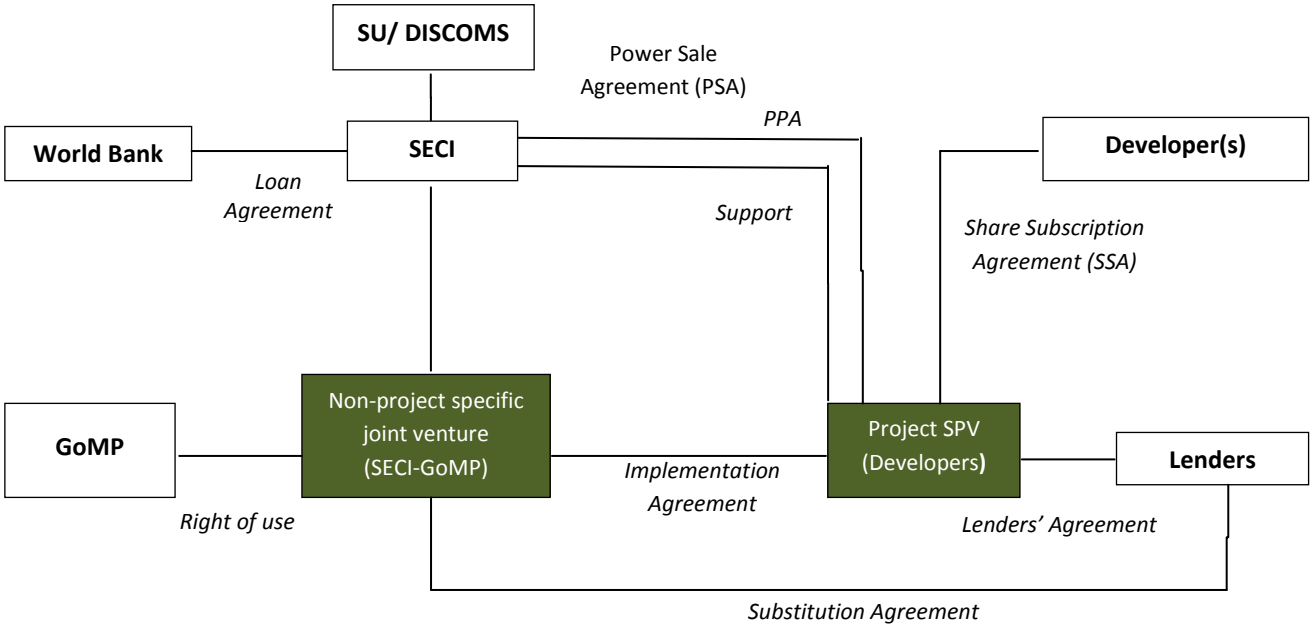
Case 2: DSCRs at Rs.2.44/kWh at various CUFs and various Interest rates

Interest rate (%)/CUF (%)	20	21	22	23
8.0	0.95	1.02	1.09	1.16
9.0	0.89	*0.95*	1.02	1.08
10.0	0.83	0.89	0.95	1.01

Thus, under given PV panel prices, Rewa levelised tariffs at Rs.3.30/kWh, the project IRRs translate to ~10.5% for base case at 21% CUFs and interest rate assumption of 9.0% p.a. Also, at lower tariff of Rs.2.44/kWh, the project would have lower Debt Service Coverage matrices. The Debt Coverage Service Ratio (DSCR) drops to 0.95x in the base case (i.e. at 21% CUF and interest rate of 9.0% p.a.). Thus, unless there are upsides in terms of higher CUFs (i.e. 22-23%) at specific locations (like Rajasthan etc.), the aggressive bidding can be disadvantageous to the developers in terms of overall return over the project life.

Annexure-I

Structure of Solar Park project PPA with State utility (SU)/ DISCOM



Annexure-II

Capacity addition planned under Solar Park (FY17-22)

State	MW planned
Andhra Pradesh	4,000
Chhattisgarh	500
Gujarat	700
Haryana	500
Himanchal Pradesh	1,000
Karnataka	2,000
Kerala	200
MP	2,750
Maharashtra	1,500
Odisha	1,000
Rajasthan	3,351
Tamil Nadu	500
Telangana	500
Uttar Pradesh	600
West Bengal	500
Others	399
Total	**20,000**

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