

Grid solar....success hinges on policy implementation... while off-grid at an inflection point....

The story so far

India planned to build up solar capacity through an ambitious national programme Jawaharlal Nehru National Solar Mission (JNNSM) aided by various State Solar polices. The JNNSM phase-I (batch-I & II) was a limited success with only 43% of envisaged capacity getting commissioned on account of delays largely related to Concentrated Solar Power (CSP) projects. While, batch-I was carried out using bundling of solar power with unallocated NTPC power to states, the batch-II projects were allocated using reverse bidding methodology i.e. by cutting Feed-In-Tariff (FiT) in line with a drop in capital costs of solar project. The private Independent Power Producers (IPPs) bid very aggressively as solar PV costs dropped by around 56% (Rs.15 cr/MW to Rs.10 cr/MW) during 2010-2012.

The installed solar capacity reached ~1811MW (1686MW Grid and 124.7 MW off-grid) by March 2013 led by aggressive capacity addition in States like Gujarat (under state policy) and Rajasthan (under JNNSM) due to 1) land availability at cheap rates 2) evacuation infrastructure support i.e. with the help of multilateral agency (ADB) funding and 3) Power Purchase Agreement (PPA) bankability.

The way ahead

CARE Research believes that the drop in solar prices (capital costs/MW) have bottomed out and the success of JNNSM phase-II with 750MW capacity addition tranche would depend upon 1) timely subsidy funding by the government 2) DISCOM restructuring pace and 3) introduction of a penalty enforcement mechanism for RPO. Moreover, the distributed (Rooftop) solar segment looks more lucrative as conventional tariffs are expected to rise faster in the near/medium term. CARE Research opines that high-paying commercial consumers in states such as MP, AP, Karnataka and Kerala are likely to be the first ones to switch to solar power as grid parity for off-grid solar has already reached (even without subsidy) .

✓ JNNSM phase-wise analysis - target v/s installed capacity

JNNSM has the objective of establishing India as a global leader in solar energy, by creating the policy framework for its large-scale diffusion across the country as quickly as possible. JNNSM is divided into three phases as shown in the following table:

| Status and achievement in JNNSM as on 31st March, 2013 | | | | |
|--|-------------------|-----------------|--------------------|-----------------|
| | Target capacity | Actual capacity | Target capacity | Target capacity |
| | Phase-I (2010-12) | | Phase-II (2013-17) | |
| Grid-based (MW) | 1100 | 466 | 10000 | 20000 |
| Off-grid (MW) | 200 | 89 | 1000 | 2000 |
| Total | 1300 | 554 | 11000 | 22000 |

Source: MNRE JNNSM phase-II Policy document; CARE Research

Bundling of Power: - To facilitate grid connected solar power generation under the first phase, without any government subsidy, Government of India (GoI) approved NTPC Vidyut Vyapar Nigam Ltd (NVVN) as the nodal agency to purchase 1,000MW from project developers and sell this

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bundled power to the distribution utilities. Bundling concept was introduced to select projects of 500MW capacity each based on solar thermal and PV technologies.

JNNSM Phase-I was focused on capturing the low hanging options in solar. It was divided into two Batches-I & II over FY11 and FY12, respectively. In Batch-I, grid-connected capacity addition of 150MW solar PV plants and 500MW of solar thermal plants was envisaged. However, in Batch-II the remaining targeted capacity i.e. 350MW was awarded (of which 290 MW has already been installed), while for off-grid, 99MW was allotted. The balance, 100MW was not allotted for grid-based projects, while for off-grid, 101MW was not allotted.

| Status of Batch-I JNNSM (Grid and Off-grid projects) | | | | | | |
|--|-------------------|-----|-----------------------|-----|--------------------------|--------------------------|
| Schemes | Projects allotted | | Projects commissioned | | CERC tariff (Rs/Kwhr) | Lowest tariff discovered |
| | Nos | MW | Nos | MW | | |
| PV projects through NVVN | 30 | 150 | 25 | 125 | PV- 17.91 | PV- 10.95 |
| CSP projects through NVVN | 7 | 470 | CoD by end 2013 | | CSP- 15.31 | CSP -10.49 |
| Migration scheme-PV | 13 | 54 | 11 | 48 | - | - |
| Migration scheme-CSP | 3 | 30 | 1 | 3 | - | - |
| RPSSGP (off-grid) | 78 | 99 | 62 | 77 | - | - |
| Total | 803 | | 252 | | | |

Source: MNRE JNNSM phase-II Policy document; CARE Research

| JNNSM Batch-I bidding summary | | | | | | |
|--|-----------------------------------|-----------------------------------|---|-----------------------------------|-----------------------------------|--|
| Solar PV | | | Solar Thermal | | | |
| CERC Approved tariff for Solar PV (Normal depreciation) Rs. 17.91/Kwh | Max Discount offered (Rs) 6.96 | Min Discount offered (Rs) 5.15 | CERC approved tariff for the Solar Thermal (Normal depreciation) Rs. 15.31/Kwh | Max Discount offered (Rs) 4.82 | Min Discount offered (Rs) 3.07 | |
| CERC Approved tariff for Solar PV (Normal depreciation) Rs. 10.95/Kwh | Rs. 12.76/Kwh | | CERC Approved tariff for Solar PV (Normal depreciation) Rs. 10.49/Kwh | Rs. 12.24/Kwh | | |

| Status of Batch-II JNNSM (Grid and Off-grid projects) | | | | | | |
|---|-------------------|-----|-----------------------|-----|---------------------------|---------------------|
| Schemes | Projects allotted | | Projects commissioned | | Tariff range (Rs/kwhr) | Reduction in tariff |
| | No | MW | No | MW | | |
| Projects through NVVN | 28 | 350 | 24 | 290 | Min 7.49 Max 9.44 | 43% |
| RPSSGP (off-grid) | NA | NA | NA | 12 | | |
| Total | 302 | | | | | |

Source: MNRE JNNSM phase-II Policy document; CARE Research

Key learnings from JNNSM-Phase-I

1. *JNNSM Phase-I was a limited success since only 43% of capacity envisaged actually got commissioned.*
2. *Contrary to as envisaged in the policy (where emphasis was given to solar thermal), implementation of JNNSM Phase-I established Solar PV as the preferred model in India on account of sharp fall in PV prices vis-a-vis Concentrated Solar Power (CSP). CSP business model is yet to gain traction in India.*
3. *Experienced solar players were more interested in solar projects with large size i.e.>50MW due to significant economies of scale.*
4. *Bulk of the capacity addition took place in Rajasthan due to cheap land prices and favourable government policies.*
5. *Evacuation problems are still a major issue. India needs to tackle the renewable power injection into the grid by creating dedicated transmission infrastructure and subsequently through smart grid.*
6. *Assurance for timely payment mechanism has become very important for financial institutions and banks to finance projects.*

Apart from JNNSM, various states are also trying to create conducive environment for solar power capacity addition by incentivizing developers through 1) attractive Feed-in-Tariffs, 2) cheap land and 3) evacuation support. **CARE Research** has analyzed various state solar policies and has mapped the positives and negatives for each state and its attractiveness for setting up grid-based solar power.

✓ **Gujarat State Policy 2009: Pioneering initiative in Solar....**

Gujarat solar policy, laid down in 2009 ahead of the Centre's JNNSM policy, aims to install 1,000MW capacity of solar power-generating capacity in the first phase. The Gujarat government set a tariff of Rs.15/kWh for the first 12 years and Rs.5/Kwh from then to the 25th year for solar PV projects commissioned before February 2012—less than the JNNSM's offer of Rs.12/Kwh for 25 years. The state drew in more than 5,000 proposals from developers for solar projects. Gujarat has attracted investment to the tune of Rs.9,000 cr.

However, anticipating that part of the allocated capacity would not be able to reach completion because of hurdles such as land acquisition, delays in financial closure and lack of grid infrastructure, the state ended up allocating 958.5 MW of solar power projects. Only 14% of the allocated capacity could be commissioned by the completion deadline of December 31, 2011. Subsequently, majority of capacity addition took place in CY12.

The Key features of Gujarat Policy are as follows:

| Gujarat Solar policy 2009 | |
|----------------------------------|---|
| RPO Obligation | RPO have been progressively increased from 0.25% in FY11 to 1.5% in FY14 |
| Land | Responsibility of the developer. However single window clearance by govt. |
| Bankability | Developer to furnish a BG @Rs 50Lakhs/MW at the time of PPA signing with Distribution Licensee.BG to be refunded if the developer commissions the project in time as per PPA. |
| Evacuation | Transmission would be set up by GETCO |
| Open access charges | No cross subsidy charges for open access within the state |
| Wheeling and Transmission losses | As determined by GERC |
| Phase II Tariffs | |
| For MW projects | Tariffs without AD are Rs 9.98/kWh for first 12 years and Rs. 7/kWh for next 13 years for Projects commissioned from 29-1-2012 to 31-3-2013 |
| For KW projects | Rs. 11.14/kWh for Projects commissioned from 29-1-2012 to 31-3-2013 |

Source: GEDA, CARE Research

Gujarat's success and current policy status: CARE Research's assessment of Gujarat Solar Policy highlights the key reasons for its success as 1) Fixed tariffs with no reverse bidding 2) Introduction of solar park as a concept and its successful implementation to optimise resources and facilities for Solar power developers 3) evacuation infrastructure and 4) good financial health of all the DISCOMs. Consequently, Gujarat has emerged as the lead state with 824MW capacity addition as on 9th March, 2013 and commanded 57.2% of total installed solar capacity.

| Installed solar capacity break up in India as on 9th March 2013 | | |
|---|---------------|-----------------------------|
| Projects | Capacity (MW) | % of the installed capacity |
| Projects under JNNSM | 421 | 29.2 |
| Projects under state policy | 824 | 57.2 |
| Projects under RPSSGP scheme | 92 | 6.4 |
| Projects under REC Scheme | 24 | 1.7 |
| Other projects | 79 | 5.5 |
| Total | 1440 | 100 |

Source : MNRE, CARE Research

Charanka Solar Park: - A smart investment

The Solar Park with a power generation capacity of 600 MW covers approximately 3,000 acres of wasteland bordering the Rann of Kutch.

The installed capacity at this solar park is 214 MW of PV (as on March 2012), making it larger than Golmud Solar Park in China that has a capacity of 200 MW. The new Solar Park is unique in having 21 companies involved in its management and development, including four companies from the United States.

In addition to solar energy, the park will also manufacture solar power plant panels and other related equipment. According to the Gujarat Government, the solar project will lead to a reduction in carbon dioxide emissions to the tune of eight million tonnes.

Charanka Solar Park



Source: MNRE; CARE Research

The business case for solar parks: The development of solar projects face a number of issues related to land availability, financing, project development, approval & clearances. Some of these key issues are detailed below:--

1. **Power Evacuation:** The availability & capacity of power evacuation infrastructure in the remote areas can be a major issue for development of solar projects, as it could result in additional burden on solar project developer.
2. **Availability of water:** The availability of water for solar thermal presents a huge challenge for deployment of large-scale generating stations. The water supply network at the proposed site for solar projects needs to be assessed from the perspective of commercial viability of CSP projects.
3. **Land Availability:** Availability of land is a major issue faced for the development of solar power projects. Efforts are needed to identify land for solar power development in the State.

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4. Financing: Legal arrangements like PPA, Transmission agreement & land acquisition etc are pre-requisites to the financing and developers are supposed to utilize equity (for payment of charges/fees etc) till debt disbursements are available. This at times affects the project development as the fees/charges paid by the developers in preparatory steps are quite high. Technical capability of commercial banks in understanding the solar technology and relatively higher risks of solar projects in comparison to conventional power projects act as barrier to financing. Financial institutions perceive solar energy in India as a riskier investment because it is a fledgling industry without a proven track record in meeting commissioning deadlines, performance benchmarks, and delivering power.

5. Project Development: A single-window approach should be adopted to expedite project development process.

Development of Solar Park provides an integrated approach for addressing some of the key issues related to the development of solar projects. This also results in reduced cost related to power evacuation, water availability owing the large-scale solar project development in the solar park.

Impact of policy and capacity addition: Gujarat has become a role model for solar capacity addition in the country. Solar developers have preferred Gujarat due to 1) attractive tariffs Rs.10-11/unit, 2) no cash flow strain due to good financial DISCOM condition and 3) dedicated evacuation infrastructure. The total capacity addition in Gujarat as on 9th March, 2013 was 824MW all of which come under the state solar policy.

✓ Other State Solar Policies... Some hit....some miss...

Recently, eight States have announced their Solar Policies and have received varying response. CARE Research has analyzed each policy on a relative basis as follows:

| Sr.No | State | Policy launch | Target capacity | Various State Solar policies | | | CoD/Target cap. | Positives/negatives |
|-------|------------|---------------|---------------------|---|---|----------------------|-----------------|------------------------------------|
| | | | | Bid received (MW) | Tariff range | | | |
| 1 | Tamil Nadu | Oct-12 | 1000 (104 projects) | 499 (92 applications) | Lowest bid is Rs 5.97/unit (20 year PPA) | | NA | Bankability of PPA is an issue |
| 2 | Kerala | Feb-13 | | Only Draft has released | | | | 500MW by 2017 |
| 3 | AP | Jan-13 | 1000 | 1340 (184 applications) | Lowest bid is Rs6.58/unit (20 year PPA) | Jan-14 | | Incentives for early commissioning |
| 4 | Rajasthan | Feb-13 | 100 | 200 (25 bids) | Lowest bid is Rs6.48/unit (20 year PPA) | | | No separate tariff using AD scheme |
| 5 | UP | Mar-13 | NA | NA | Benchmark tariff is Rs7.0/unit | 500MW by 2017 | | Poor DISCOM health |
| 6 | MP | Jun-12 | 225 | Awarded 225 MW projects | | <25 MW CoD by Jun-13 | | |
| 7 | Punjab | Dec-12 | 1000 | Bids are not closed | Benchmark tariff is Rs8.75/unit | | | Land prices too high |
| 8 | Karnataka | Apr-12 | 80 | Only 20/30 MW applications for CSP, hence 60MW for PV | Benchmark tariff is Rs14.50/unit for PV and Rs11.50 for CSP | Oct-13 | | NA |

Source: State Policy documents; CARE Research.

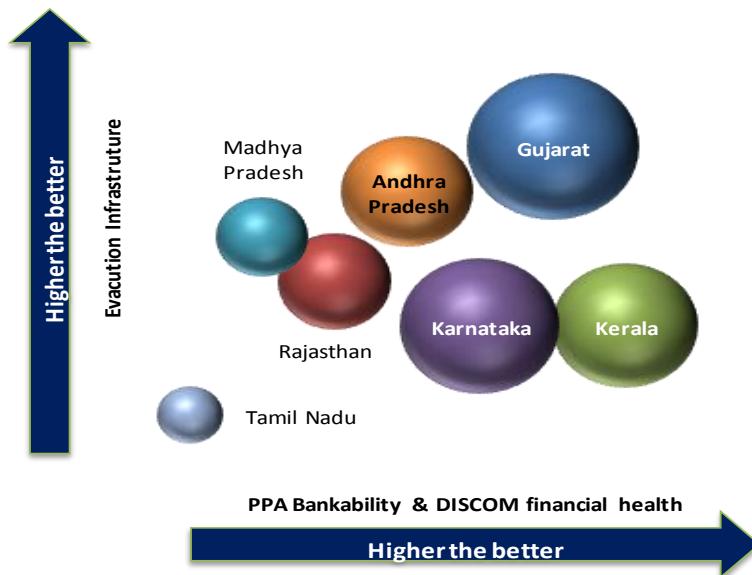
As per the table above, solar developers have clearly given preference to those states with 1) bankable PPAs i.e. AP and 2) cheap land availability i.e. Rajasthan. Furthermore, transmission evacuation infrastructure and DISCOM health are the other major drivers for investment in solar projects.

- ✓ **Grid based Solar Attractiveness score:** CARE Research has created solar attractiveness index after assessing the following parameters and has arrived at the composite scoring model based on these parameters.
 - **Solar FiT:-** Relatively higher weightage given to solar FiT which provides better RoE for developers
 - **Bankability of PPA and DISCOM financial health:** Relatively higher weightage given to lower counterparty risk and better DISCOM health
 - **Evacuation Infrastructure:** Relatively higher weightage given to states making efforts to bring in dedicated evacuation infrastructure
 - **Consumer Profiling:** Relatively higher weightage given where non domestic tariffs are almost at par or higher than solar FiT
 - **RPO compliance:** Relatively higher weightage given to states with proven adherence to RPO compliance
 - **Land Availability:** Relatively higher weightage given to states with lower land prices and ample availability

| States | Parameters and weightage for state ranking | | | | | | |
|--------------------------------|--|--|---------------------------|--------------------|----------------|-------------------|--------------------|
| | Solar FiT | Bankability of PPA and DISCOM financial health | Evacuation infrastructure | Consumer profiling | RPO compliance | Land availability | Comprehensive rank |
| Benchmark (Weights - %) | 10 | 35 | 20 | 15 | 10 | 10 | |
| Gujarat | 1 | 2 | 1 | 7 | 1 | 4 | 1 |
| Rajasthan | 3 | 5 | 4 | 6 | 2 | 1 | 5 |
| Kerala | 7 | 1 | 5 | 1 | 6 | 7 | 3 |
| Karnataka | 5 | 3 | 5 | 2 | 3 | 2 | 2 |
| Madhya Pradesh | 6 | 6 | 3 | 5 | 4 | 5 | 6 |
| Andhra Pradesh | 2 | 4 | 2 | 4 | 7 | 3 | 4 |
| Tamil Nadu | 4 | 7 | 7 | 3 | 5 | 6 | 7 |

Source: CARE Research; We have excluded Punjab and UP on account of lack of clarity post the policy announcement

On grid solar attractiveness rank for states



Source: CARE Research, Size of the bubble represents comprehensive rank

✓ **RPO compliance and fate of REC projects:-**

Indian Renewable Purchase Obligation is a mechanism devised for the states to comply with provisions of Section 86 (1) (e) of the Electricity Act, 2003. State Regulatory Electricity Commissions (SERCs) have to specify solar RPO targets for the states and have to notify RPO regulation for compliance purpose.

RPO target for states during FY13-17

| State | Solar RPO Target (2012-13) | Solar RPO Target (2013-14E) | Solar RPO Target (2014-15E) | Solar RPO Target (2015-16E) | Solar RPO Target (2016-17E) |
|-------------------|----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|
| | % | % | % | % | % |
| Andhra Pradesh | 0.25 | 0.25 | 0.25 | 0.25 | 0.50 |
| Arunachal Pradesh | 0.10 | 0.15 | 0.20 | 0.25 | 0.30 |
| Assam | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 |
| Bihar | 0.75 | 0.50 | 0.50 | 0.75 | 1.00 |
| Chhattisgarh | 0.50 | 0.75 | 0.75 | 0.75 | 0.75 |
| Delhi | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 |
| JERC (Goa & UT) | 0.40 | 0.50 | 0.60 | 0.70 | 0.80 |
| Gujarat | 1.00 | 1.50 | 1.75 | 2.00 | 2.25 |
| Haryana | 0.75 | 0.75 | 0.75 | 0.75 | 1.00 |
| Himachal Pradesh | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Jammu & Kashmir | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Jharkhand | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Karnataka | 0.25 | 0.25 | 0.35 | 0.45 | 0.55 |
| Kerala | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Madhya Pradesh | 0.60 | 0.80 | 0.80 | 1.00 | 1.20 |
| Maharashtra | 0.25 | 0.50 | 0.50 | 0.50 | 0.50 |
| Manipur | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Mizoram | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Meghalaya | 0.40 | 0.50 | 0.50 | 0.50 | 0.50 |
| Nagaland | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| Orissa | 0.15 | 0.20 | 0.25 | 0.30 | 0.35 |
| Punjab | 0.07 | 0.13 | 0.19 | 0.25 | 0.31 |
| Rajasthan | 0.75 | 1.00 | 1.00 | 1.25 | 1.50 |
| Sikkim | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Tamil Nadu | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Tripura | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Uttarakhand | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| Uttar Pradesh | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| West Bengal | 0.00 | 0.25 | 0.25 | 0.40 | 0.50 |

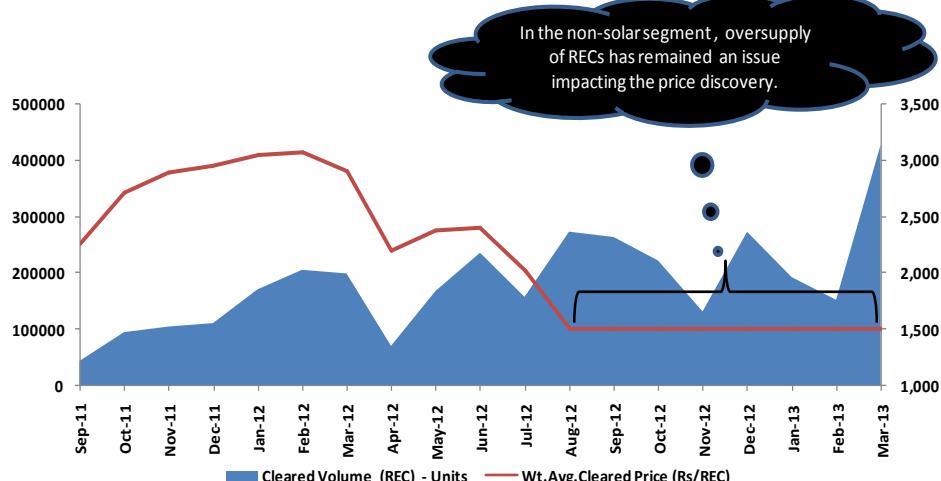
Source: CEA; SERCs; CARE Research

The RPOs are driven by the National Action Plan for Climate Change (NAPCC) aiming to achieve 15% renewable energy in the overall mix of India by 2020. REC is the market mechanism to facilitate compliance of RPOs. They are enforced on three categories of power consumers - distribution licensees, Open Access consumers and captive consumers. There are two types of RPOs- solar and non-solar. States in India are free to set their own RPOs in line with the recommendations of State Regulatory Electricity Commissions (SERCs).

Renewable Energy Certificate (REC): RECs represent the attributes of electricity generated from renewable energy sources. These attributes are unbundled from the physical electricity and the two products - the attributes embodied in the certificates and the commodity electricity—may be sold or traded separately. In other words, one REC represents that 1MWh of energy was generated from renewable sources. RECs can be used by the obligated entities to demonstrate compliance with regulatory requirements, such as Renewable Purchase Obligations.

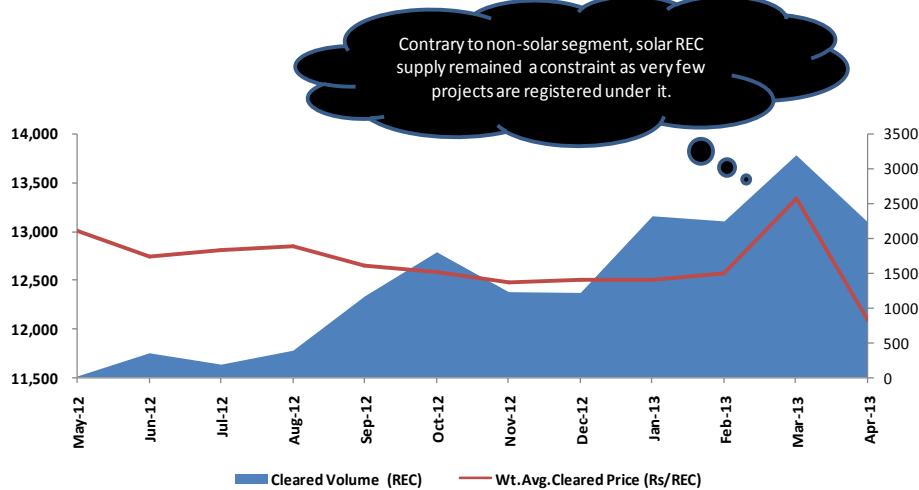
REC-Solar and non-solar market trends

Non-solar REC market trends towards price discovery issues...



Source: IEX,PXIL and CARE Research

While, solar REC segment still remains constraint with supply issues....



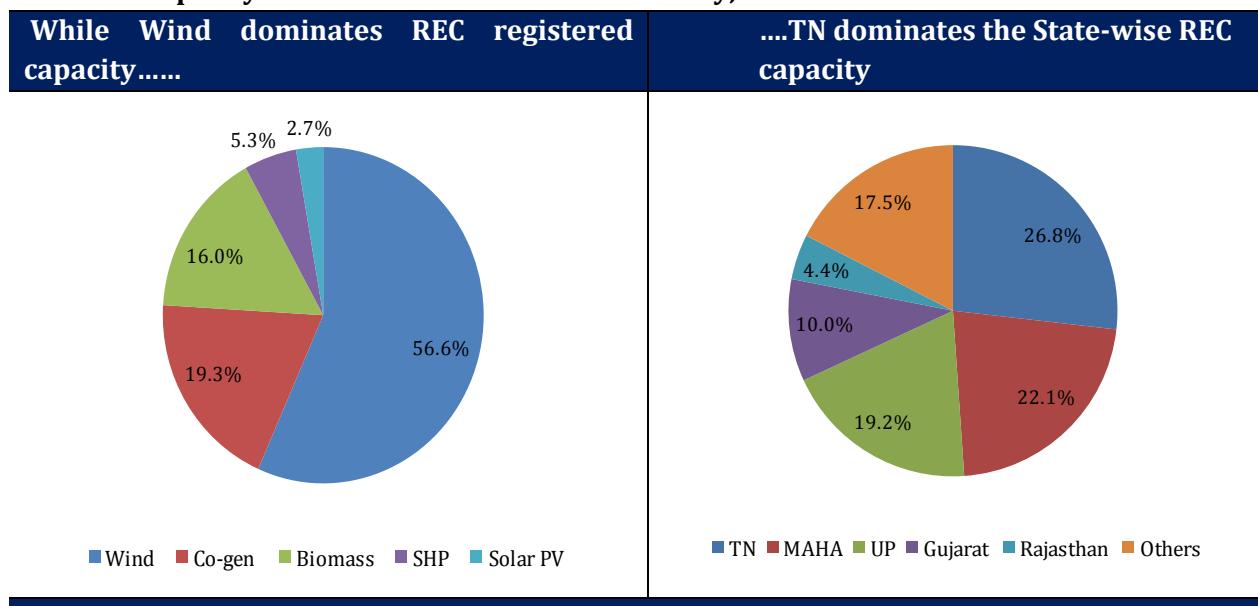
Source: IEX,PXIL and CARE Research

Second amendments of REC regulations: Central Electricity Regulatory Commission (CERC) has suggested amendments in the existing REC regulations. The principal objective of the Amendment Regulations is to provide clarity on applicability of the regulations to eligible entities and bring in certain essential checks and balances in the REC-related process.

The summary of the draft amendments has been given below:-

1. Reverse bidding and Power Trading projects defined as per Electricity Act, 2003.
2. In case of bagasse-based co-generation plants, the connected load capacity as assessed/sanctioned by the concerned distribution licensee, shall be considered as the capacity for captive consumption for the purpose of certificate issuance, irrespective of the capacity of such plants covered under the PPA.
3. For Average Power Pooled Cost (APPC) + REC model, PPA has to be signed at APPC and should not be signed below APPC.
4. Electricity Duty will not be considered as a concessional benefit.
5. IPP will have to forego the benefits applicable to CGP before availing RECs. Whether a benefit is applicable to CGP or IPP will be decided by the Appropriate Commission.
6. The eligible entity shall apply to the Central Agency for certificates within six months of commissioning to be eligible for REC. Application for issuance of certificates may be made on 10th, 20th and the last day of the month.
7. A captive generating plant shall be permitted to retain the certificates for offsetting its renewable purchase obligation as a consumer subject to certification and verification by the concerned State Agency; provided that the captive generating plant shall inform the Central Agency regarding the details of the certificates retained by it for meeting its renewable purchase obligations.
8. REC validity extended to two years.

State-wise Capacity installed under REC as on 10th May, 2013 – 3539MW



Solar REC market is at a nascent stage. CARE Research believes that pick up in solar REC capacity addition primarily hinges on 1) strict enforcement of RPO obligations by states and 2) improving financial health of DISCOMs. The viability of the solar REC market can improve by introducing 1) regulatory mandate for states to buy RECs (for compliance) on quarterly basis 2) off-grid projects to be covered under REC mechanism and 3) Long-term REC price certainty beyond FY17.

✓ **New Solar Policy Status-Phase-II Viability Gap Funding (VGF) and way forward....**

With the unallocated electricity quota under the phase-I of JNNSM no longer available and the fact that NTPC/NVVN is no longer the procurer of solar electricity under the JNNSM, MNRE has established Solar Energy Corporation of India (SECI) for handling the power procurement from the second batch of the JNNSM.

However, in this scenario, SECI (MNRE)'s role would be limited to providing an upfront subsidy known as VGF, which is basically a part payment made by SECI to the project developer in order to make the project viable. The developer opting for the lowest amount of funding to bridge the gap would be chosen first (L1) and so on. This is a new form of reverse bidding wherein the developer would no longer quote the electricity tariff but the quantum of money required to make the project "viable". In view of this, MNRE has released draft guidelines for the first phase of second batch under JNNSM for setting up of 750 MW of solar capacity. Some of the information presented in the draft document is highlighted below.

| Highlights of JNNSM-phase-II | | | | | | |
|-------------------------------|---------|-----------------|---------|------------------|---------------------|------------------|
| Total capacity (MW) | | Tariff (Rs/Kwh) | | Upper limit | Equity contribution | |
| Min cap | Max cap | Total | With AD | Without AD | of VGF | |
| 10 | 50 | 750 | 5.45 | 4.95 | 30% | Atleast 1.5cr/MW |
| Max allocation/bidder = 100MW | | | | PPA for 25 years | i.e.2.5 Cr/MW | |

Source: MNRE; CARE Research

Other salient features of the Phase-II policy are:

- **Timeline for VGF disbursal**
 - 25% at the time of delivery of at least 50% of major equipment (modules, inverters, mounting structures, switchgear and transformer) on site
 - 50% after full commissioning
 - 25% after one year of successful operation
- **Net worth requirement** - Rs.2 crore/MW upto 20 MW, additional Rs.1 crore/MW above 20 MW.
- **Domestic content requirement (DCR)** - it has only been stated that a percentage of the solar capacity would be reserved for projects with domestic content while rest of the projects would be free to procure components globally. The actual capacity allocated has not been specified. DCR would mean that both the solar cells and modules would have to be manufactured in India. The clarity is yet to emerge on the proportion of capacity based on indigenous equipments.
- **Financial closure** - within 180 days of signing PPA (this translates to about 6 months, down from 7 months in the previous batch).
- **Part commissioning** - part commissioning is allowed in multiples of 10 MW. PPA would be enforced from the date of part commissioning for a period of 25 years.

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- **Payment security** - SECI would set up a payment security corpus from the encashment of bank guarantees, interest earned on this fund, incentives for early payment, extra money coming from 10% lower tariff to developers claiming AD and grants from Government/NCEF. This fund would cover three months of payment to the project developer.
- The timeframe for JNNSM phase-II is as follows:

| Timeframe for Solar project in JNNSM phase-II | | |
|---|---|---|
| Sr. No | Event | Date |
| 1 | Proposal approval NECF | Zero date |
| 2 | Request for Selection (RfS) | Zero date + 15 days |
| 3 | Applications submission | Zero date + 45 days |
| 4 | Project shortlisting based on RfS, application and bid evaluation | Zero date + 90 days |
| 5 | Letter of intent Issuance (LoI) | Within 15 days from evaluation of bids |
| 6 | PPA signing | Within 30 days from issuance of LoI |
| 7 | Financing Arrangement | Within 180 days from date of signing PPA |
| 8 | Commissioning CoD | Within 13 months from date of signing PPA |

Source: MNRE; CARE Research

CARE Research believes that *VGF would provide solar developers with upfront capital, resulting in lower capital cost of project (for the developer). Furthermore, it allows the developer to sell electricity to any of the obligated entities in different parts of the country i.e. to open access and captive consumers including the commercial and industrial consumers, who are willing to pay higher tariffs.*

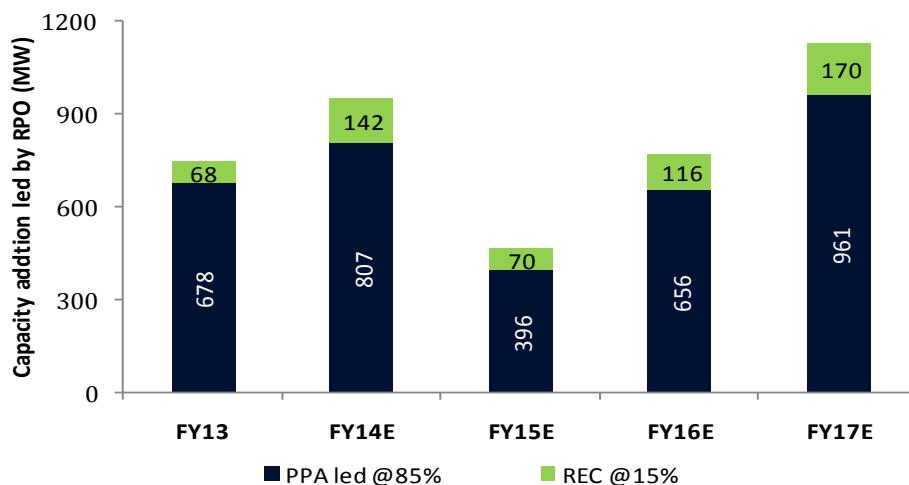
MNRE proposes to finance 2.2GW in JNNSM phase-II projects. CARE Research understands that the total money accumulated in National Clean Energy fund (NECF) is Rs.5000 crs, which is sufficient to fund the above capacity with a maximum subsidy cap of 30%. Additionally, MNRE has already sent a proposal to Ministry of Finance for releasing funds of Rs.15-20 bn from NECF to meet VGF funding requirement for the next 2 years.

However, CARE Research is sceptical about the lack of incentives in the policy for the developer to build and operate power plants in an efficient manner. The payment security mechanism still remains an issue as the financial condition of the electricity DISCOM is well known and PPA bankability with private parties is also an issue.

✓ **12th Plan (2012-17) Solar Policy and expected capacity addition**

CARE Research estimates the total 12th Plan grid based solar capacity addition to be ~4.1GW after taking into consideration of various State RPOs till FY17 (v/s targeted capacity of 10GW). Furthermore, 85% of the above capacity (from FY14 onwards) is expected to be led through PPA route. Though, Gujarat and Rajasthan are expected to remain at forefront in solar capacity addition, the states like Kerala, AP and MP are also likely to catch-up in the next 2-3 years. However, with limited progress on projects under REC, we believe that only 14% of solar capacity addition (566 MW) during the 12th Plan is expected through REC mechanism.

CARE Research estimates of solar capacity addition during the 12th Plan



Source: MNRE and CARE Research estimates

✓ **Is distributed solar ready to pick-up?**

The solar cell and module prices have come down by 50-56% in the last three years on account of 1) lower European renewable demand due to removal of subsidies and 2) subsequent global capacity glut. As a result, the solar power prices have now become affordable for electricity consumers.

Indian electricity consumers are broadly classified into four categories 1) Commercial 2) Industrial 3) Residential and 4) Agricultural. The first two categories heavily cross-subsidize the latter two.

The commercial tariff across the states is as shown in the table:

| Year | Commercial tariff over the years across selected states | | | | | | | | |
|----------------|---|------|------|------|------|------|------|----------------|----------------|
| | FY07 | FY08 | FY09 | FY10 | FY11 | FY12 | FY13 | CAGR (FY07-11) | CAGR (FY12-13) |
| Gujarat | 4.83 | 4.89 | 5.64 | 5.63 | 5.51 | 4.98 | 4.85 | 3.3 | (6.2) |
| Rajasthan | 4.88 | 4.76 | 4.69 | 4.64 | 4.59 | 5.50 | 6.33 | (1.5) | 17.4 |
| Andhra Pradesh | 5.63 | 5.74 | 5.65 | 5.86 | 6.07 | 6.50 | 7.00 | 1.9 | 7.4 |
| Madhya Pradesh | 5.67 | 5.42 | 5.55 | 5.62 | 6.19 | 5.95 | 6.55 | 2.2 | 2.9 |
| Kerala | 6.60 | 6.70 | 7.44 | 7.46 | 7.23 | 9.30 | 9.55 | 2.3 | 14.9 |
| Karnataka | 6.21 | 6.47 | 6.17 | 6.44 | 6.44 | 7.18 | 7.88 | 0.9 | 10.6 |
| Tamil Nadu * | 5.60 | 5.93 | 5.84 | 5.66 | 5.95 | 5.95 | 7.60 | 1.5 | 13.0 |

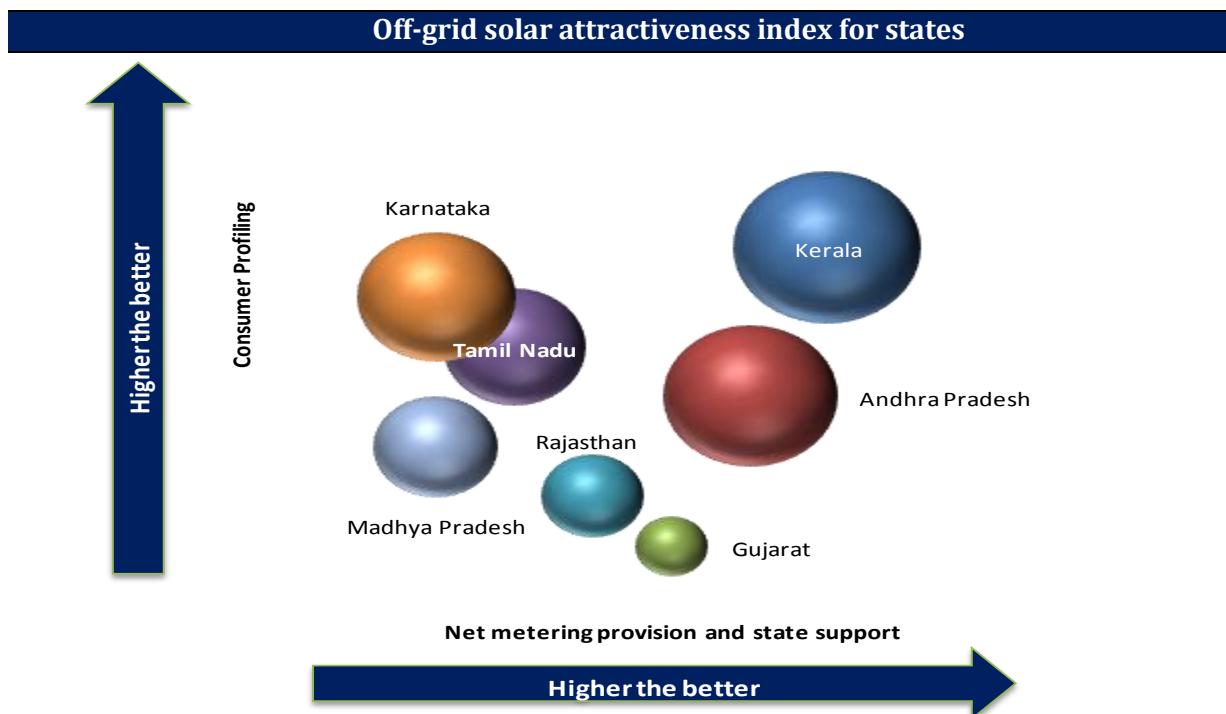
Source: PFC,SERC tariff orders; CARE Research
 * Tamil Nadu FY12 data not available hence we have taken the same figure as FY11
 The tariffs shown are average tariffs. The actual applicable tariffs are in direct proportion to the consumption and are much higher

✓ **Off-grid Solar Attractiveness score:** CARE Research has created off-grid solar attractiveness index after assessing the following parameters and has arrived at the composite scoring model based on these parameters.

- **Solar FiT:** Relative higher weightage given to solar FiT which provides better RoEs for the developers
- **Consumer Profiling:** Relative higher weightage given where non domestic tariffs are almost on par or higher than solar FiT.
- **Net metering provision:** Relative higher weightage given to net metering allowing the consumer to feed in the surplus power to state grid
- **State policy support:** Relative higher weightage given to states making efforts making for policy support like unlimited solar captive consumption and sale of power to third parties, GBI for installing off-grid, provision for additional capital subsidies and the like.

| Parameters and weightage for state ranking | | | | | |
|--|-----------|--------------------|------------------------|----------------------|--------------------|
| States | Solar FiT | Consumer profiling | Net-metering provision | State policy support | Comprehensive Rank |
| Benchmark (Weights -%) | 30 | 30 | 20 | 20 | |
| Kerala | 1 | 1 | 1 | 1 | 1 |
| Andhra Pradesh | 3 | 4 | 1 | 2 | 2 |
| Gujarat | 7 | 7 | 2 | 3 | 7 |
| Tamil Nadu | 5 | 3 | 1 | 7 | 4 |
| Rajasthan | 6 | 6 | 2 | 4 | 6 |
| Karnataka | 2 | 2 | 2 | 7 | 3 |
| Madhya Pradesh | 4 | 5 | 2 | 7 | 5 |

Source: CARE Research



Source : CARE Research, Size of the bubble represents comprehensive rank

CARE Research believes that the inflection point for off-grid solar (even without government subsidy) has arrived, where commercial consumers in states such as Kerala, Andhra Pradesh, TN and MP are paying electricity charges equivalent to or higher than solar FiTs. The commercial power tariffs shown below masks the actual average tariffs paid by commercial consumers (paying on average Rs.10-12/kwhr). We believe that commercial tariff trajectory over the next 2 years is expected to move northward, since DISCOMs are in precarious financial position and their restructuring is delayed, making way for tariff hikes as the only short-term solution. We believe tariff hikes will resume post central/ state elections and are expected to make the case for off-grid solar more compelling.

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