Myth Busters Newsletter

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Editorial Message

The Government of India has set ambitious targets for renewable energy generation, in line with its efforts to provide '24x7 Power to All' as well as a cleaner energy future for all its citizens. As part of these efforts, energy generation from Solar Rooftop Photo-Voltaics (RTPV) is expected to account for 40 GW of installed power capacity by 2022 (India's total installed capacity is appx. 320 GW as of July 2017). Financially, RTPV makes sense for domestic consumers, some of whom have reported up to a 90% reduction in their utility bills after installation. RTPV has many other benefits, including being a decentralised power source, thereby improving the quality of power received by end users as well as leading to a reduction in transmission grid upgrades.

However, the growth of RTPV in India (and worldwide) faces two major challenges: a) uncertainty regarding the costs and returns for owners, and b) The health of the electricity distribution companies (DISCOMs). Reports have touted other challenges such as poor economies of scale in rooftop installation, poor implementation of net metering policies by utilities and high utility distribution transformer failure rates (which are expected to rise further once RTPV becomes more common). In some foreign countries, the push back by utilities is even stronger with utilities arguing that allowing private solar customers to sell excess power back to the electrical grid — a practice known as net metering — can be unfair to homeowners who do not want or cannot afford their own solar installations. Further, utilities are expecting RTPV owners to pay higher tariffs for their access to and use of the electrical grid.

These challenges can be overcome. This will require changes in the current policy and technology landscape. For example, creation of a new business model for utilities wherein they diversify and themselves invest in RTPV systems in large enough quantities to achieve economies of scale and thereby reduce costs. Another option would be to implement an aggregator model. Cities and towns can be divided into zones with cumulative RTPV potential of more than 50 MW and tendered out to one developer who will be responsible for aggregation. This way, the developer also can order PV modules and balance of systems in bulk and reduce the net/gross metering burden on the utilities.

Other interventions for utilities are to invest in planning, training and higher quality distribution technology. Through the use of LIDAR, GIS and Information Technology, utilities can determine the exact quantum of energy coming from each system along each street, each area and so on. This information could be used to plan the resource outlay for strengthening of the distribution network. In addition, training specific people to managing a significant amount of RTPV has already begun in most DISCOMs (the Bangalore ESCOM is a key pioneer in this area). This must be scaled-up and best practises rolled out to in the entire country.

For India, RTPV is no longer a luxury but a necessity. It can provide financial benefits to homeowners, augment power supply through cleaner means, reduce the burden on the grid and provide a pathway to a cleaner tomorrow. Moreover, DISCOMs have an extensive and exclusive reach at the individual consumer level, which allows them to alter their hourly consumption patterns, provide them incentives to install RTPVs, conduct awareness programmes, etc. Hence, it is more important for the DISCOMs to be on board and play the role of a facilitator. They need to clearly understand the challenges and opportunities related to RTPV and accordingly advance its deployment. Providing the necessary financial incentives and technical innovation to the Indian electricity utilities are the key actions to make this a reality.

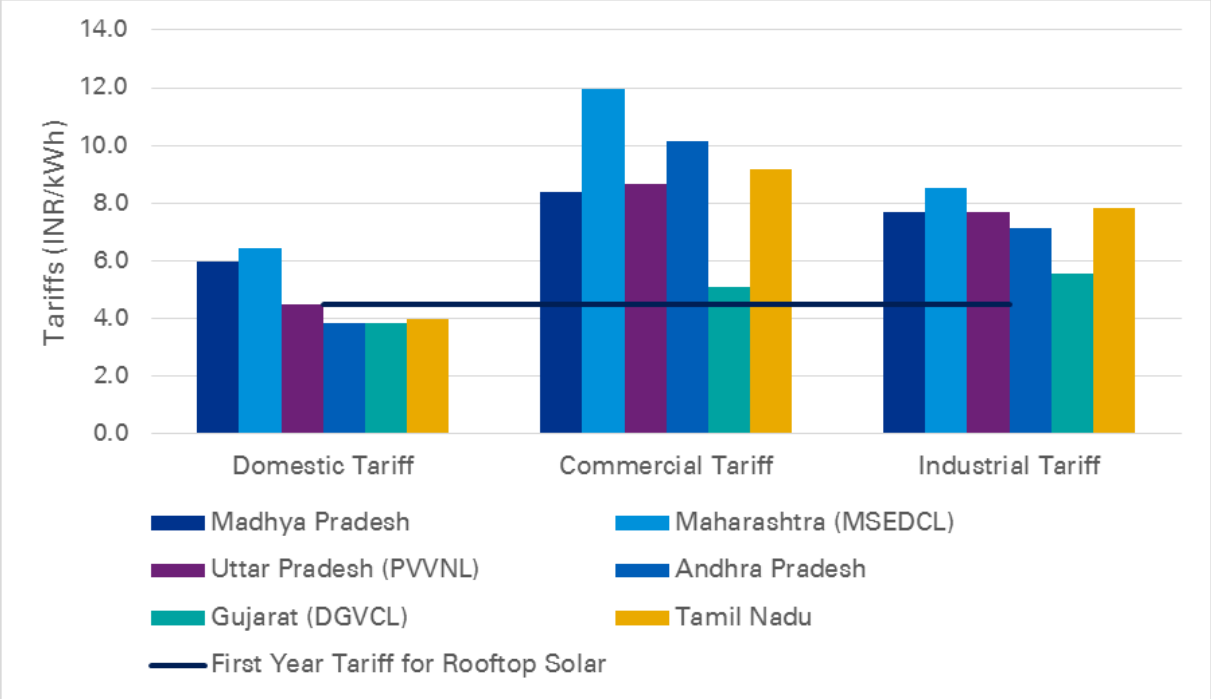
- *CSTEP*

Article

Myth: Rooftop Solar can Severely Impact Utilities

Grid-connected rooftop solar photovoltaic (PV) has a significant share in the development of the solar PV sector in global markets such as Germany, Italy, China, US, Japan, etc. Around 58% of global solar PV installed in the last 4 years cumulatively has been contributed by the rooftop segment, taking the rooftop's share in total solar PV installations to 40%.
Solar capacity additions in India have been driven primarily by utility-scale solar capacity additions over the last 3-4 years. While the solar rooftop segment is expected to contribute 40% to the overall target of 100 GW by FY 2022, the segment has been slow to take off. However, in the last 6 months to 1 year greater traction has been witnessed in this space with improving economics for high tariff paying consumers and continued government support (refer Box 1). In Figure 1 below consumer category-wise weighted average tariffs vis-à-vis the rooftop solar tariff for the first year are indicated for several DISCOMs (distribution Companies).

Figure 1: Grid parity status for different consumer categories



Box – 1: Government support for solar rooftop projects

The central and state governments have undertaken various initiatives, including policy, regulatory, fiscal and financial measures to promote rooftop solar installations. Some of the key central initiatives are:

- Financial subsidy of 30% of the project/benchmark cost for rooftop solar projects in residential, institutional and social sectors
- Incentive-cum-award for rooftop solar projects in government/PSU sector
- Promotion of gross/net metering policies in all states/UTs
- Development of online portal for rooftop solar development programmes
- Empanelment of agencies/channel partners for installation of rooftop solar systems
- Training of 50,000 Surya Mitra and staff of DISCOMs/State Nodal Agencies
- Development of draft performance-based incentive scheme for DISCOMs for expeditious development of grid-connected rooftop solar plants
- Launch of nationwide programmes for training of officials of utilities, nodal agencies, regulatory commissions, banks and entrepreneurs through multilateral assistance
- Development of online portals for registration of partners, approval of proposals and project monitoring
- Organisation of international credit through KfW, World Bank and ADB (to be channelised through IREDA, SBI and Punjab National Bank, respectively) for the rooftop sector

Impact of Solar Rooftop on DISCOMs

DISCOMs have expressed concerns over potential issues that a high penetration of rooftop could imply. The concerns emanate from the following factors:

- Commercial implications of increasing number of solar rooftop installations on utilities
- Impact on the grid/network

A. Commercial implications of rising solar rooftop on utilities

Currently, rooftop solar deployment is being driven by commercial and industrial consumers on account of higher grid tariffs. This entails a loss of cross-subsidising consumption base for the DISCOMs along with under-recovery of network costs putting pressure on DISCOM tariffs. While the situation can potentially result in a vicious cycle incentivising more consumers to move to rooftop, the actual impact would be limited by the actual realisable rooftop potential in a DISCOM area.

Table 1: Impact of rooftop solar on a DISCOM in a metropolitan city (Source: KPMG Analysis)

Parameters	Units	Values
Solar Rooftop Capacity installed by 2021	MW	~500
Loss of Sales due to solar rooftop capacity	MU	-822
Net Sales post loss in 2021	MUs	10,237
Loss of revenues	%	-7.51%
Savings on Power Purchase cost	%	6.40%
Cost to be passed on to remaining consumers	INR	-368 Cr
Impact on tariff	INR/unit	0.3-0.4
Tariff impact as % of base expected tariff (FY 21)	%	3.7%-3.8%

While the theoretical potential for the rooftop segment in a given DISCOM area could be substantial, in reality issues such as shadowing, roof ownership, free roof space, etc. could potentially reduce the actual deployable area, thus limiting impact. High level modelling for a DISCOM operating in a densely populated city with a consumption base of around 10,000 MUs of energy sales, indicated that even with the deployment of 500 MW of solar rooftop under the net metering mechanism, the impact on tariffs remains in a 3-4% range, as shown in the Table 1. The impact on tariffs may vary based on specific DISCOMs, their consumer profile/tariffs and rooftop solar penetration. The illustrative calculation primarily seeks to indicate that DISCOMs need to study the potential impact for their areas; the impact may not always be as high as it is perceived to be.

With emerging dynamics such as downward pressures on tariffs, power cost rationalisation opportunities with rapidly falling RE costs, higher availability of domestic coal and muted expectations on coal price increase, a DISCOM could potentially hedge the impact of solar rooftop with suitable strategies. Such strategies could entail power procurement optimisation, as well as exploring entry strategies in the rooftop business for hedging business risks (this is discussed subsequently).

Further, deployment of rooftop solutions could be an important measure for rationalisation of the costs associated with supplying electricity to the subsidised consumer categories. With decreasing rooftop costs, there could be subsidy savings entailed in situations where supply of power through decentralised rooftop solar is lower than the marginal cost of supply (including network losses) to such consumers through conventional means. Such consumers could be incentivised to adopt rooftop systems with the view to decrease the overall subsidy/cross-subsidy implications for the state. Innovative financing models/business models can be devised in such situations to ensure minimum upfront investments by DISCOMs/consumers.

B. Impact on the grid/network

Rooftop solar-based generation systems supply energy to nearby loads, which reduces the line losses for DISCOMs and eases transmission and distribution capacity constraints. For DISCOMs facing daytime peak shortage, rooftop solar generation could also help with peak shaving during afternoon hours leading to reduction in more expensive marginal procurement.

Grid-connected rooftop solar systems can also provide ancillary benefits such as an improved voltage profile through reactive power support and increased grid supply reliability by decreasing transformer load. But this is possible till the time penetration levels can be accommodated within the existing network. Once the levels are breached, there will be a sudden clash of interests and conflicts among stakeholders. Allocation of costs and benefits, if not well-regulated and defined, can lead to litigations. DISCOMs would also need to invest in automation, which needs to be supported. Four key factors – voltage regulation (higher penetration leading to rising voltage), loading levels of network (after netting of load), protection/safety related concerns and power scheduling to meet the net load – need to be considered during installations of solar rooftop projects.

DISCOM led/supported Rooftop Solar Development

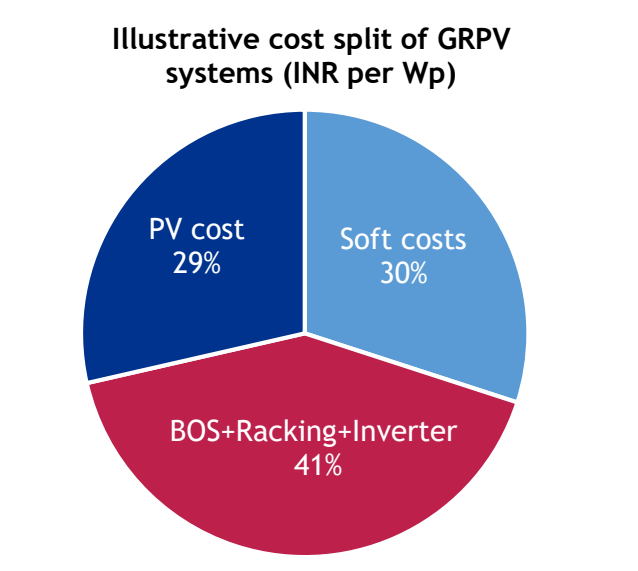


Figure 2: Illustrative cost split of GRPV systems (INR per Wp)

As mentioned before, DISCOMs have the option of hedging their business risks by foraying into the rooftop business which could help them retain their valuable customer relationships as well as provide them with additional revenue streams. Utilities can act as "facilitators" or "aggregators", rendering services such as customer aggregation, billing and collections, O&M, etc., which can be means of earning revenue streams owing to the value addition obtained from such services.

Existing skills and expertise provide significant advantage to DISCOMs in the rooftop business. "Soft costs" contribute around 30% of the total rooftop costs (as shown in Figure 2). As per a preliminary analysis, DISCOMs can help reduce these "soft costs" by 40-50%, thereby reducing the cost of solar power by INR 0.50-0.70 per unit.

DISOCMs thus have several opportunities to diversify into the rooftop solar sector by becoming the least cost provider of rooftop solutions. The key drivers for a DISCOM entering the rooftop sector could be:

Customer retention	• Ability to retain consumer relationships which is an important lever for future services such as storage, energy management, etc.
RPO fulfilment	• Solar energy generation can be used to offset DISCOM's RPO obligations • This is especially a good source of RPO fulfillment for land constrained DISCOMs
Energy management	• Peak demand shaving • Easing of distribution and transmission contraints and capacity enhancement costs • Avoid purchase of expensive short-term power
New business models and revenue streams	• DISCOM led or supported rooftop models • Opportunity to participate in future business innovations (storage, EV, demand response systems) and energy management solutions
Subsidy savings	• Rooftop systems can also be deployed by DICOMs for the subsidised consumer base, especially in a scenario where the marginal cost of supply to such a consumer base can be lowered by providing electricity through rooftop solutions.

Globally, utility-led rooftop models are witnessing growth with utilities across countries such as the USA, Netherlands and Germany leading the development of the rooftop solar sector. In the following sections, we have provided a brief overview of developments in such models globally.

APS Solar Partner Program	TEP Residential Solar Program	CPS Energy Rooftop Solar Program
• APS started the Solar Partner programme in 2015, wherein it would own and install rooftop solar PV systems on consumers' rooftops and the participants would receive monthly credit of USD 30 for use of their rooftop space. • Programme target is 10 MW which is designed for approx. 1,500 consumers. • The energy generated is considered for Arizona's Renewable Energy Standard and Tariff (REST) mandates. • As of mid-2016, the APS Solar Partner programme was over- subscribed with about 1,670 participants. • The APS programme has also been the first in the USA to employ advanced inverters that allow APS to control the solar plant.	• TEP started its Residential Solar programme in 2015 with a target of 3.5 MW to meet the REST mandates. • Participating customers are initially charged a USD 250 enrolment fee after which TEP installs and maintains an appropriately sized rooftop system and charges the consumer a fixed monthly bill that is equivalent to their current average bill. • The fixed monthly bill is subject to change if the consumers' consumption increases or decreases by over 15%.	• The CPS Energy Rooftop Solar programme offers three options for consumers: • SolarHostSA: CPS owns, installs and maintains the rooftop solar plant and consumers are rewarded with USD 0.03/kWh of generation from the solar PV system • Roofless Solar: Participating consumers can buy into the Roofless programme for USD 1.09/W of a common installed facility and receive credits on their monthly bill based on the generation from the bought-in capacity. • Solar Photovoltaics Rebates: Consumers can install ground-mounted or rooftop-based solar PV systems at their own cost and receive solar rebates in their monthly bill.

USA

In the USA, three utilities have made considerable progress in rooftop solar development: Arizona Public Service Corporation (APS), Tucson Electric Power (TEP) and CPS Energy.

United Kingdom

E.ON launched a solar-cum-storage programme for its UK customers wherein it would install standalone rooftop solar or solar and storage systems for typical costs of about £ 4,495 and £ 7,495, respectively. EDF has partnered with Phoenix Works to offer rooftop solar and storage solutions to interested consumers.

Germany

E.ON Germany provides E.ON Aura Solar and storage solutions wherein consumers can buy rooftop solar and storage systems and receive maintenance services from E.ON along with 25 year performance guarantee for solar panels, and 5 year insurance cover for both solar panels and battery.

Innogy SE, a subsidiary of the German utility RWE, offers to install rooftop solar plants with optional storage capabilities. Innogy offers pre-feasibility, risk insurance, documentation services, 50 Euros of credit if annual solar generation falls below 1,500 hours and PV system monitoring. Innogy has partnered with Mercedes-Benz for battery packs and SMA for inverters.

Sweden

E.ON Sweden connects consumers to manufacturers of solar panels for procuring them and has a tie up with Fronius to offer batteries for storage. The average price including installation is about 55,858 SEK.

Czech Republic

E.ON in Czech Republic offers to install solar PV systems along with optional batteries. The newly launched Green Savings scheme offers subsidies on rooftop solar PV, solar heating and storage system installations. Further, a fixed feed-in-tariff (FiT) of 100 CZK per month is offered on the sale of unused electricity from rooftop solar PV systems to the grid. E.ON also offers loans to consumers installing rooftop solar for amounts ranging from 20,000 CZK to 1,000,000 CZK at a fixed interest rate of 7.99% per annum for 6-72 months.

As can be observed from the global context, utilities are actively developing strategies to participate in the growth of the rooftop sector and seeking associated business opportunities. We believe that DISCOM supported business models can be a win-win opportunity for the sector, allowing business diversification opportunities for a DISCOM while leading to an accelerated adoption of rooftop systems. DISCOM involvement in the rooftop sector could help in streamlining implementation issues pertaining to approvals/interconnections, and also reduce the default risk apprehensions for the sector and debottleneck capital flows.

Conclusion

Rooftop solar presents several business and innovation opportunities to utilities rather than being a threat to them. Since the rooftop solar market in India is in a nascent phase, Indian utilities are uniquely positioned to deploy innovative business models and technologies while learning from and improving upon global developments.

It is important that utilities be duly supported through capacity building measures to understand the technical and commercial implications of rooftop systems as well as incentivised to support rooftop growth. The Ministry of New and Renewable Energy (MNRE) has proposed a draft scheme with incentives for DISCOMs to facilitate growth in the solar rooftop sector. Measures such as these need to be finalised and DISCOMs need to be provided with handholding support to gain from such opportunities. Demonstration pilots for utility led/supported models and dissemination of learnings could go a long way in providing encouragement through practical insights and experiences to DISCOMs.

Above all, agility must be encouraged as a cultural and organisational trait in utilities to enable them to convert disruptive challenges into business opportunities. Such an agile approach will enable utilities to not just develop rooftop solar but also move towards providing power infrastructure and supply for a disruptive future filled with electric vehicles, smart homes, and smart grids. This will help build the next generation of utilities.

Interview

Dr Ashvini Kumar
Managing Director, RECI

Q. ***Is net-metering the way forward for RTPV or should there be other schemes for DISCOMs?***

A. DISCOMs are mandated for distribution of power to the users. They are an important element of the eco-system for development of rooftop solar PV in the country. One of the policy framework which is promoting rooftop is net-metering which requires injection of power into the grid when solar generated power is in surplus, whereas consumer keeps drawing power from the grid as per requirement. This all is facilitated through DISCOMs. In my opinion, it is important to allow diversification of business for DISCOMs to solar business, however, business models which can be adapted by them need to be evolved.

Q. ***Should net metering or gross metering rates be revised more frequently based on market prices of modules so that DISCOMs do not have to pay more than what is necessary?***

A. States are to meet the targets for solar capacity additions as a part of solar RPO policy. Solar power from rooftop systems is in the evolution stage and is witnessing constant fall in prices. It is likely that solar power tariffs in almost all the States may breach average pool procurement prices of power. Consumers in higher consumption categories are already attracted towards solar power and States have brought out enabling policy framework. In order to maintain revenue model of DISCOMs, or to say, enhance it, good business models suiting to each of the DISCOMs local conditions are required. This aspect requires immediate attention by the stakeholders.

Q. ***Different states allow different maximum capacity of RTPV per consumer. Should this be standardized? Why or why not?***

A. Standardization is good and should be attempted but not at the cost of overall revenue model of the DISCOMs, or to say, of the States. Standardization synergized with the technical and financial limitations is the need of hour.

Interesting Reading & References

Newspaper/Blog Articles/Links

CSTEM Roof Top Photovoltaics (CSTEM RTPV)tool
http://cstem.cstep.in/cstem/

The Case for Boosting Solar Energy
http://cstep.in/uploads/default/files/pressroom/stuff/CSTEP_The_case_for_boosting_solar_energy_NA_2017.pdf

Rooftop Solar Dims Under Pressure From Utility Lobbyists
https://www.nytimes.com/2017/07/08/climate/rooftop-solar-panels-tax-credits-utility-companies-lobbying.html

Cost of Roof Top Solar
http://www.eai.in/ref/ae/sol/rooftop/cost

Reports

Estimating the rooftop solar potential of greater Mumbai
http://www.ncpre.iitb.ac.in/research/pdf/Estimating_Rooftop_Solar_Potential_Greater_Mumbai.pdf

Mythbusters newsletter series will identify 1 myth per issue and try to dispel the same through analyses, articles, conducting interviews of experts, providing reference to name a few. This is a joint venture of Shakti Sustainable Energy Foundation (SSEF) and Center for Study of Science, Technology and Policy (CSTEP). The issues will also have relevant partners who will help in conducting the various analyses.

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