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# INDIA SOLAR ROOFTOP MARKET





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# Contents

<b>Executive summary</b>	<b>6</b>
<b>1. Introduction</b>	<b>8</b>
<b>2. Policy and regulatory framework</b>	<b>12</b>
2.1 Capital subsidy	12
2.2 Low cost financing	14
2.3 Net metering	14
2.3.1 Poor policy design	15
2.3.2 Abrupt changes in policy	16
2.3.3 Operational problems	16
2.4 Accelerated depreciation (AD)	17
2.5 Mandates	17
2.6 Quality improvements	18
<b>3. Market segmentation</b>	<b>19</b>
3.1 C&I consumers	20
3.2 Public sector consumers	21
3.3 Residential consumers	23
<b>4. Business models and key players</b>	<b>26</b>
4.1 CAPEX model	26
4.1.1 CAPEX market segmentation and dynamics	27
4.1.2 Leading EPC players	28
4.2 OPEX model	28
4.2.1 OPEX market segmentation and dynamics	29
4.2.2 Leading project developers	29
4.3 Inverter suppliers	30
<b>5. Financing</b>	<b>31</b>
5.1 Equity financing	31
5.2 Debt financing	32
5.2.1 Project developers	32
5.2.2 Consumer financing	33
<b>6. Contracting terms</b>	<b>34</b>
6.1 Tariff	34
6.2 PPA term	34
6.3 Payment security	35
6.4 Roles and responsibilities	35
6.5 Nature of rights over rooftop	35
6.6 Deemed generation	36
6.7 Default and termination	36
6.8 Termination consequences and compensation	36
6.9 Net metering charges, taxes and duties	36

<b>7. Risks for OPEX developers and investors</b>	<b>37</b>
7.1 Offtake risk	37
7.2 Regulatory and policy risk	38
7.3 Lower generation risk	39
7.4 Customer dispute and denial of access risk	39
7.5 Currency volatility risk	40
<b>8. State ratings</b>	<b>41</b>
<b>9. Conclusion</b>	<b>43</b>
<b>Annexure: State profiles</b>	<b>44</b>
<b>List of figures</b>	
Figure 1.1: Total installed solar capacity by 2017, GW	8
Figure 1.2: Rooftop solar capacity addition, MW	8
Figure 1.3: Rooftop solar installed capacity by state	9
Figure 1.4: Grid tariffs by consumer segment in 2017-18, INR/ kWh	10
Figure 1.5: Grid tariffs for C&I consumers and rooftop solar cost, INR/ kWh	10
Figure 1.6: Different consumer segments	11
Figure 1.7: BTI India rooftop solar EPC cost index, INR/ W	11
Figure 2.1: Types of net-metering allowed in various states	15
Figure 3.1: State solar RPO targets, %	20
Figure 4.1: Share of CAPEX and OPEX models	26
Figure 4.2: Market share of EPC contractors, Oct 2017-Sep 2018	28
Figure 4.3: Market share of OPEX players, Oct 2017-Sep 2018	30
Figure 4.4: Market share of inverter suppliers, Oct 2017-Sep 2018	30
Figure 8.1: State rankings for rooftop solar attractiveness	42
Figure 9.1: Rooftop solar capacity addition, GW	
<b>List of tables</b>	
Table 2.1: Top-up subsidies/incentives in states for residential consumers	13
Table 3.1: Rooftop solar consumer segmentation	19
Table 3.2: Rooftop solar demand aggregation targets for PSU	22
Table 4.1: Types of EPC players	27
Table 4.2: Types of OPEX players	29
Table 5.1: Debt financing terms for rooftop solar developers	32
Table 5.2: Lines of funding available for rooftop solar	32
Table 6.1: Typical PPA tariff structures	34
Table 6.2: Types of payment security	35
Table 6.3: Scenarios and types of termination compensation	36
Table 8.1: State ranking parameters	41

## Acronyms

<b>AD</b>	Accelerated Depreciation
<b>ADB</b>	Asian Development Bank
<b>BIS</b>	Bureau of Indian Standards
<b>CAPEX</b>	Capital expenditure
<b>C&amp;I</b>	Commercial & industrial
<b>CEA</b>	Central Electricity Authority
<b>CERC</b>	Central Electricity Regulatory Commission
<b>CSR</b>	Corporate Social Responsibility
<b>DIPP</b>	Department of Industrial Policy and Promotion
<b>DISCOM</b>	Distribution Company
<b>ECBC</b>	Energy Conservation Building Code
<b>EPC</b>	Engineering, Procurement, Construction
<b>GBI</b>	Generation Based Incentives
<b>HT</b>	High Tension
<b>IEA</b>	International Energy Agency
<b>INR</b>	Indian Rupee
<b>IREDA</b>	Indian Renewable Energy Development Agency
<b>KSEB</b>	Kerala State Electricity Board
<b>kWh</b>	Kilowatt Hour
<b>LT</b>	Low Tension
<b>MNRE</b>	Ministry of New and Renewable Energy
<b>MPUVNL</b>	Madhya Pradesh Urja Vikas Nigam Limited
<b>MoUD</b>	Ministry of Urban Development
<b>MSEDCL</b>	Maharashtra State Electricity Distribution Company Ltd.
<b>MW</b>	Megawatt
<b>MWp</b>	Megawatt Peak
<b>NABARD</b>	National Bank for Agriculture and Rural Development
<b>NBFC</b>	Non-Banking Financial Company
<b>OPIC</b>	Overseas Private Investment Corporation
<b>PPA</b>	Power Purchase Agreement RBI Reserve Bank of India
<b>PSU</b>	Public Sector Undertaking
<b>RBI</b>	Reserve Bank of India
<b>REC</b>	Renewable Energy Certificates
<b>RESCO</b>	Renewable Energy Service Company
<b>RPO</b>	Renewable Purchase Obligation
<b>SECI</b>	Solar Energy Corporation of India
<b>SERC</b>	State Electricity Regulatory Commission
<b>SNA</b>	State Nodal Agency
<b>SRISTI</b>	Sustainable Rooftop Implementation for Solar Transfiguration of India
<b>USICEF</b>	US-India Clean Energy Finance
<b>USD</b>	United States Dollar
<b>WB</b>	World Bank

## Executive summary

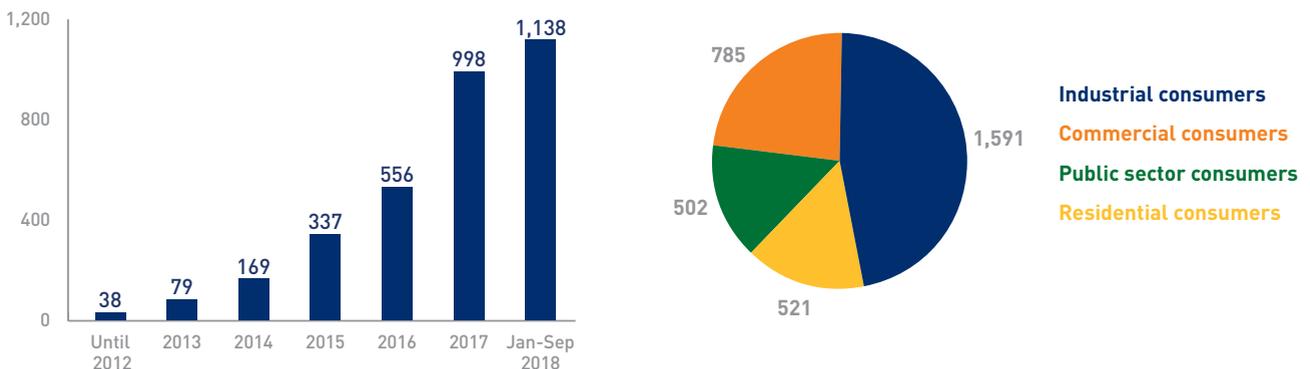
***Policy emphasis has been primarily on reducing cost of rooftop solar through tax and financial incentives but has failed to meet changing needs of the market***

Indian rooftop solar market has grown rapidly at a CAGR of 88% in the last five years. Capacity addition in the 12-month period ending September 2018 is estimated at 1,538 MW. Total installed capacity is estimated to have reached 3,399 MW.

There have been a number of government policy initiatives supporting the rooftop solar market. The emphasis has been primarily on reducing cost of rooftop solar through tax and financial incentives in the form of capital subsidies, cheaper debt, accelerated depreciation and tariff top-ups. Costs have come down dramatically but the policy framework has failed to meet changing needs of the market. Some much needed initiatives for encouraging DISCOM participation ([SRISTI scheme](#)), improving quality standards and consumer awareness are still in draft stages and/ or yet to become effective.

The market growth varies highly across different consumer segments due to differences in grid tariffs, regulatory compulsions and availability of financing. C&I consumers dominate the market with 70% (2,376 MW) share of total installed capacity. These consumers pay higher than average grid tariffs and stand to gain the most financially through rooftop solar. Falling cost means that savings can be as high as 20-60% across India. Carbon emission reduction is also an important driver for many C&I consumers.

**Figure: Rooftop solar capacity addition, MW**



Source: BRIDGE TO INDIA research

Public sector consumers account for 15% of total installed rooftop solar capacity. Such consumers have similar incentives as their private sector counterparts (cost savings, reduction in carbon emissions) for adoption of rooftop solar plus the benefit of 25-60% capital subsidy. A major challenge faced by public sector consumers is poor coordination between different agencies and complex tender-based procurement.

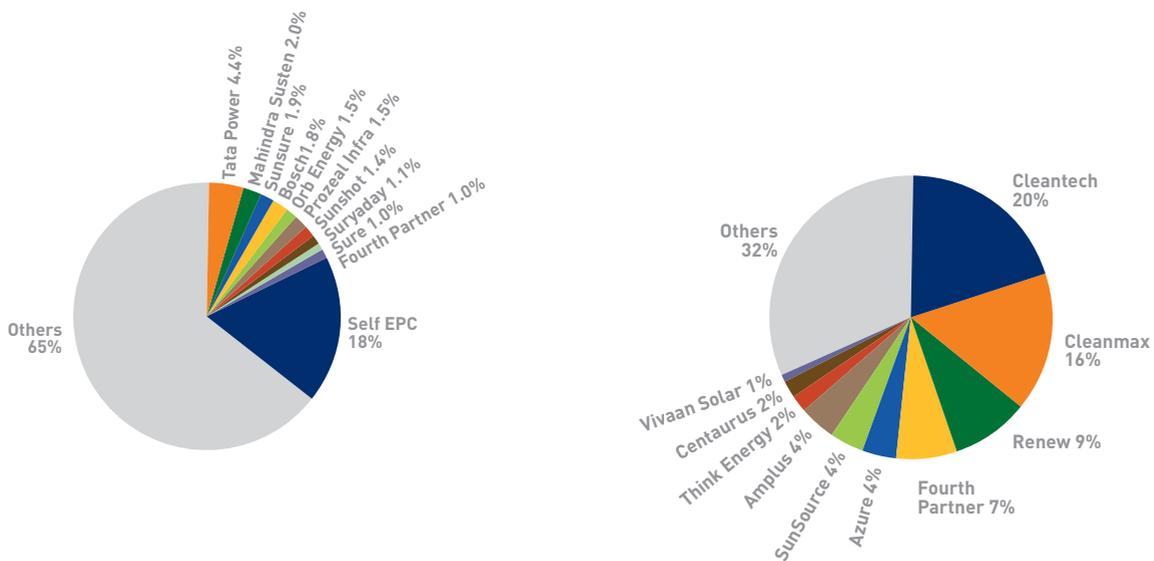
Residential consumers account for the remaining 15% share of the total market. They face formidable financial and operational challenges in installing rooftop solar systems. We expect outlook for the residential segment to remain weak in the next 2-3 years. Continued reduction in capital cost, development of new financing models and improved consumer awareness over time should lead to better growth prospects for this market.

**The OPEX model offers an attractive win-win proposition for both the customer and project developer but faces significant challenges**

CAPEX has been the preferred business model but share of OPEX based installations has risen steadily to 35%. Other hybrid business models and roof leasing model have so far failed to take off. OPEX model offers a very attractive win-win proposition for both the customer and project developer but faces significant challenges in the form of limited number of highly rated C&I consumers, low contract enforceability and consumer reluctance to sign long term PPAs.

The market place for both EPC and OPEX models is extremely dynamic and fast changing. Low entry barriers mean that the market is highly fragmented specially for EPC services.

**Figure: Market share of EPC contractors and OPEX players, Oct 2017-Sep 2018**



Source: BRIDGE TO INDIA research

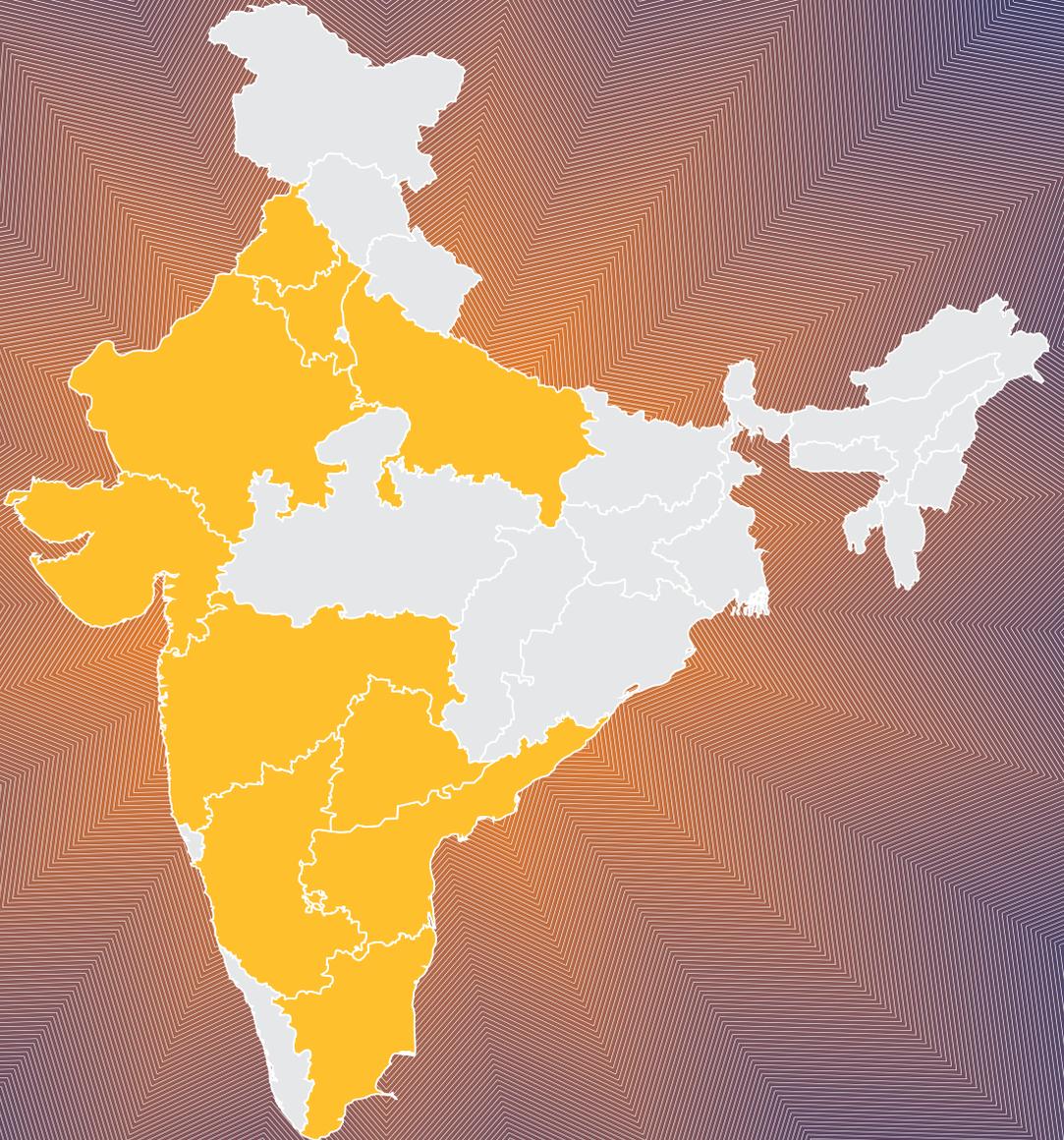
Note: Self EPC denotes projects where EPC work has been done by project developers themselves.

Several leading IPPs, international developers and PE investors are interested in developing OPEX portfolios. There have been some large PE transactions helping to create specialist rooftop IPP platforms including Cleantech Solar, CleanMax, Amplus and Fourth Partner. Meanwhile, for smaller developers and start-ups, it still remains a challenge to raise both equity and debt. Financiers are concerned about execution challenges, high regulatory risk, default risk and poor legal rights.

**Concerns of DISCOMs, who see rooftop solar as a threat, need to be addressed through technical and financial support**

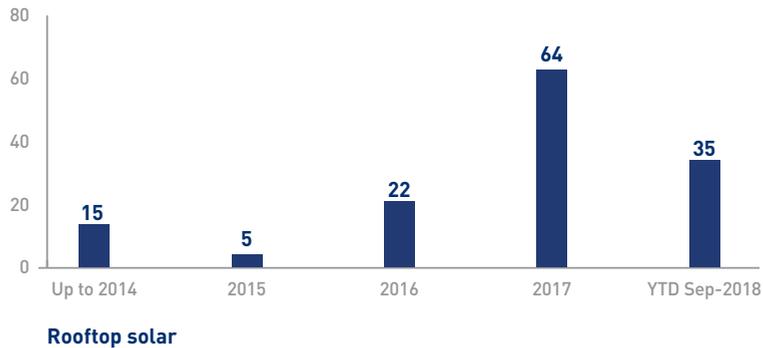
We believe that the rooftop solar market holds huge growth potential. It should be given more policy support particularly when utility scale solar is facing increasingly acute land and transmission connectivity challenges. Concerns of DISCOMs, who see rooftop solar as a threat, need to be addressed through technical and financial support. The net metering policy framework needs an overhaul to accommodate new business models and do away with unnecessary caps on system sizes. Uptake of rooftop solar in residential and SME segments can also be boosted by addressing poor consumer awareness and financing constraints.

# Annexure: State profiles



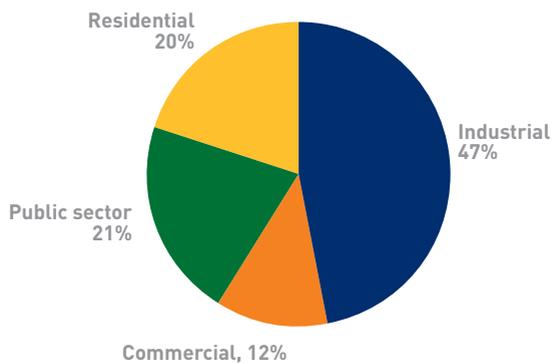
# 1. Delhi

## Solar capacity addition, MW

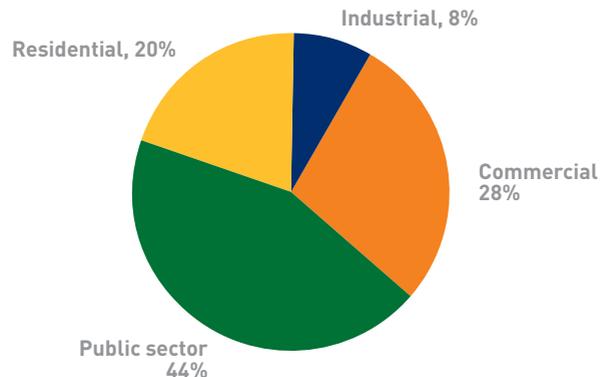


## Consumer segments

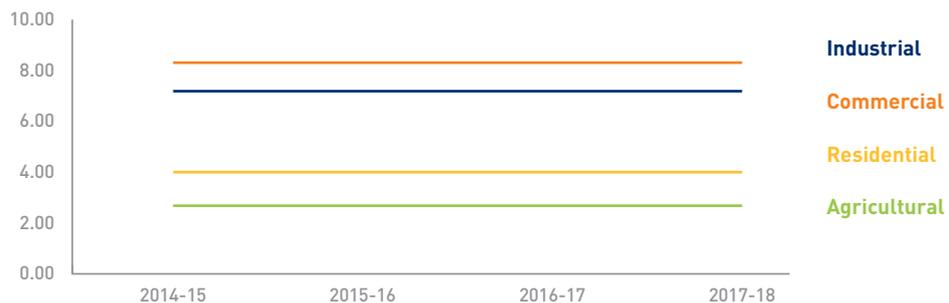
### Power consumption, 2017-18



### Rooftop solar capacity split as on 30 September 2018



## Grid tariffs, INR/ kWh



Source: CEA, BRIDGE TO INDIA research

### Notes:

- Tariffs shown:
  - are 'energy charges' and exclude fixed charges as well as other components including electricity duty, fuel surcharge etc;
  - exclude subsidies by the state government.
- Tariffs for residential consumers are shown for a monthly consumption of 200 kWh.
- Industrial and commercial tariffs are for consumers connected at 33 kV and 11 kV or above respectively.
- Tariffs have remained flat in Delhi over the last four years.

## Net metering policy summary

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Type of metering allowed	<ul style="list-style-type: none"> <li>• Net metering and gross metering</li> </ul>
Size caps	<ul style="list-style-type: none"> <li>• 1 kWp/ 1 MWp system capacity up to 100% of sanctioned load</li> <li>• 20% penetration cap at distribution transformer</li> </ul>
Key features	<ul style="list-style-type: none"> <li>• Cumulative capacity of all solar systems installed to not exceed 20% of local distribution transformer capacity</li> <li>• CAPEX and OPEX models allowed</li> <li>• Virtual and group net metering allowed</li> <li>• Billing cycle: annual; surplus electricity injected in the grid shall be paid at applicable tariff rates for residential consumers notified by DERC</li> </ul>
Incentives	<ul style="list-style-type: none"> <li>• Exemption from wheeling, banking, transmission charges and electricity tax</li> <li>• Residential consumers selling surplus power to the grid not required to pay commercial tax on property</li> <li>• Generation based incentive of INR 2.00/ kWh available for residential consumers until March 2024</li> </ul>
Market experience, comments and outlook	<ul style="list-style-type: none"> <li>• Timelines for net metering are being adhered to in most instances: 30 days for feasibility assessment by DISCOMs and one year to set up plants after registration by customer</li> <li>• There have been some experiences of erroneous billing, but DISCOM representatives have been prompt to rectify such instances</li> <li>• The level of rooftop solar penetration at distribution transformer level is quite low at 20%; the industry is seeking a hike in allowed levels of solar power injection and enhancement of transformer capacity required for the same</li> <li>• Because of high pollution, solar yield in Delhi is about 15-20% lower than in neighbouring regions</li> <li>• Initiatives such as 'Solarise Dwarka' are innovative and are finding some degree of success in the state; future capacity addition is likely to be strong considering good government and DISCOM support</li> </ul>



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