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What needs to be done: Achieving 40 GW target for rooftop solar

10 January 2017

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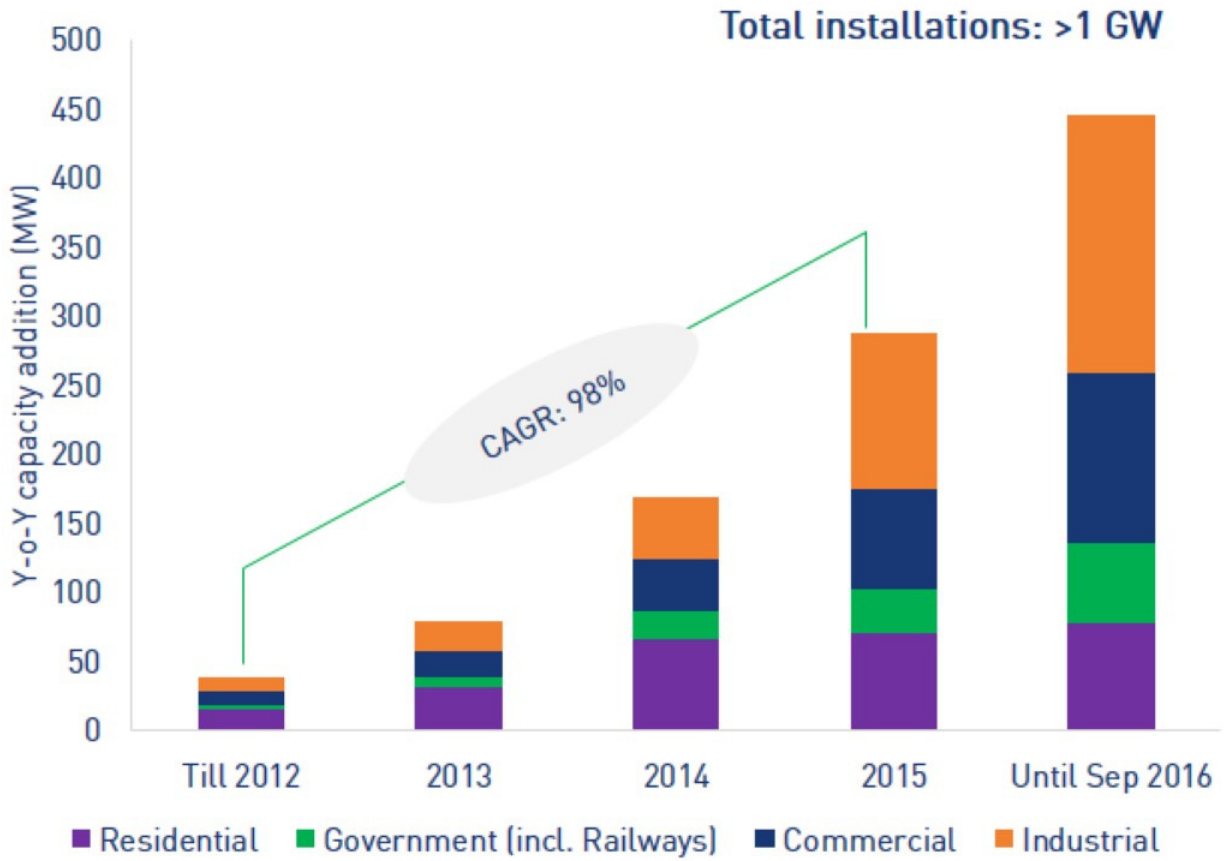
Historical capacity addition

Rooftop solar capacity addition in India has grown at 98% CAGR between 2012 and 2015

Highlights

- India's cumulative installed rooftop solar capacity stands at over 1,000 MW at present
- Economic viability has been the primary driver for market growth, especially for commercial and industrial consumers
- Residential market has been driven by both 'need for power' in areas where the grid is unreliable and individual green initiatives

Y-o-Y on site solar installations



Source: BRIDGE TO INDIA analysis

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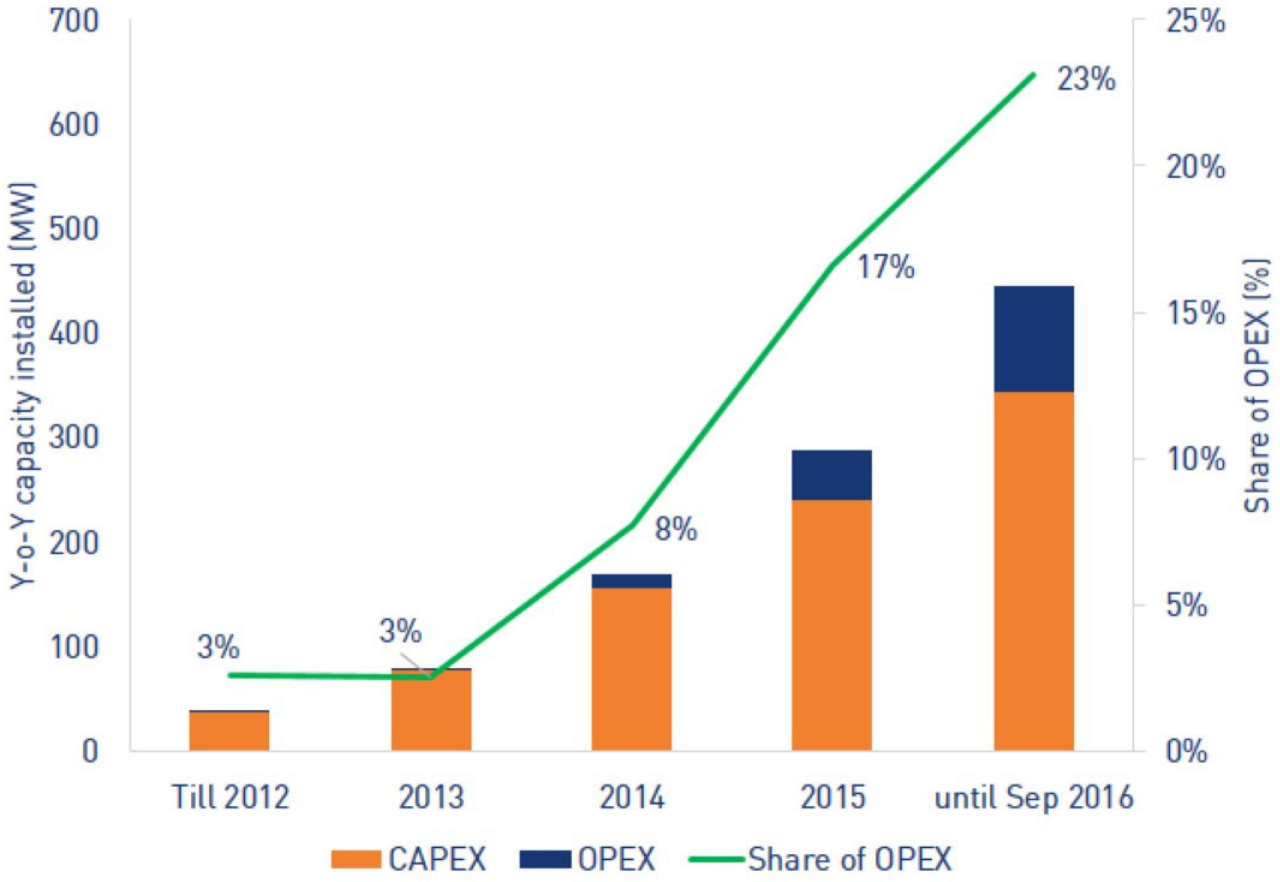
Historical capacity addition

OPEX model has been gaining traction - YoY share has increased from 3% in 2012 to 23% in 2016

Highlights

- YoY share of OPEX model has increased from barely 3% in 2012 to 23% in 2016
- In 3 quarters of 2016, OPEX market grew by 114% whereas CAPEX market grew by 42% from 2015

Y-o-Y on site solar installations segregated by OPEX and CAPEX



Source: BRIDGE TO INDIA analysis

Key market driver - Parity

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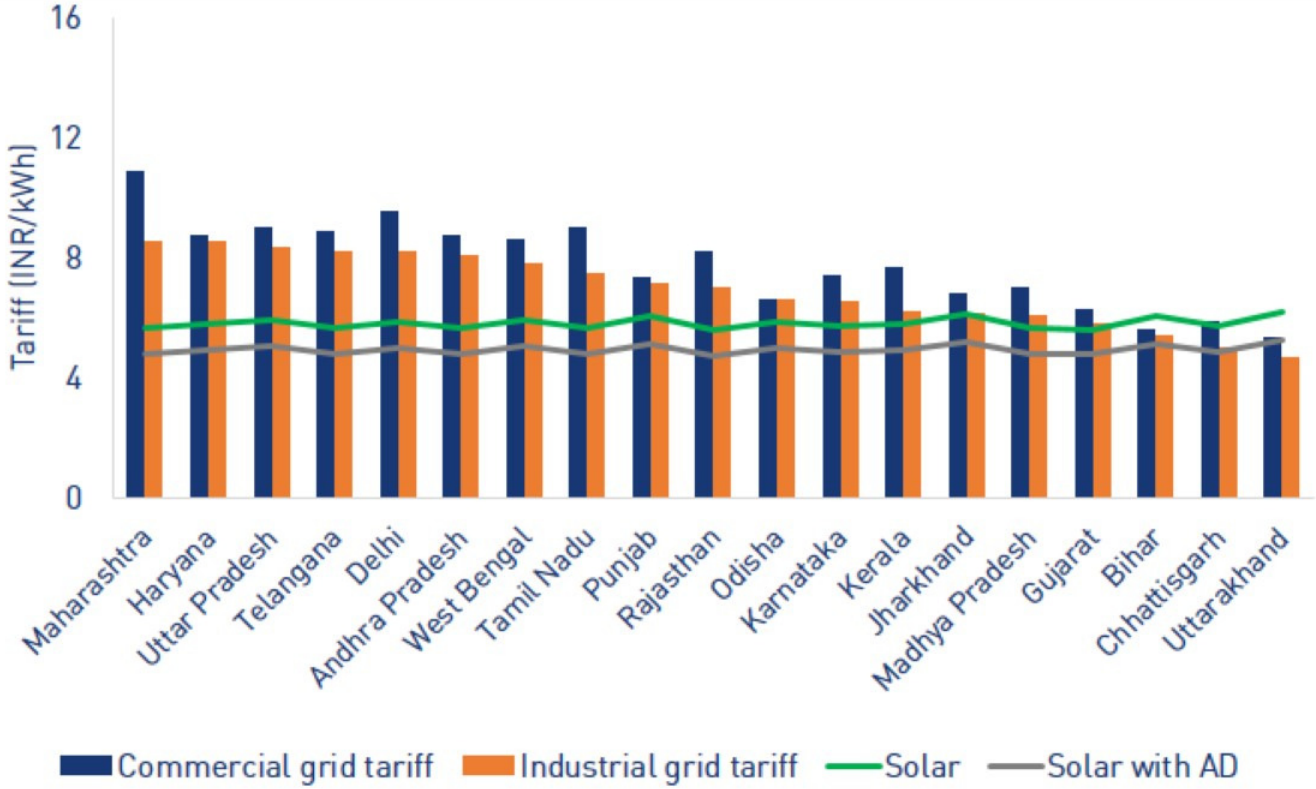
On site viability trends

In 2016, it is now economically viable for C&I consumers across almost all Indian states

Highlights

- In almost all large power consuming state, solar is already economically viable for commercial and industrial consumers
- If accelerated depreciation benefits are availed, the viability improves further

Viability of on site solar for commercial and industrial customers



Assumptions:

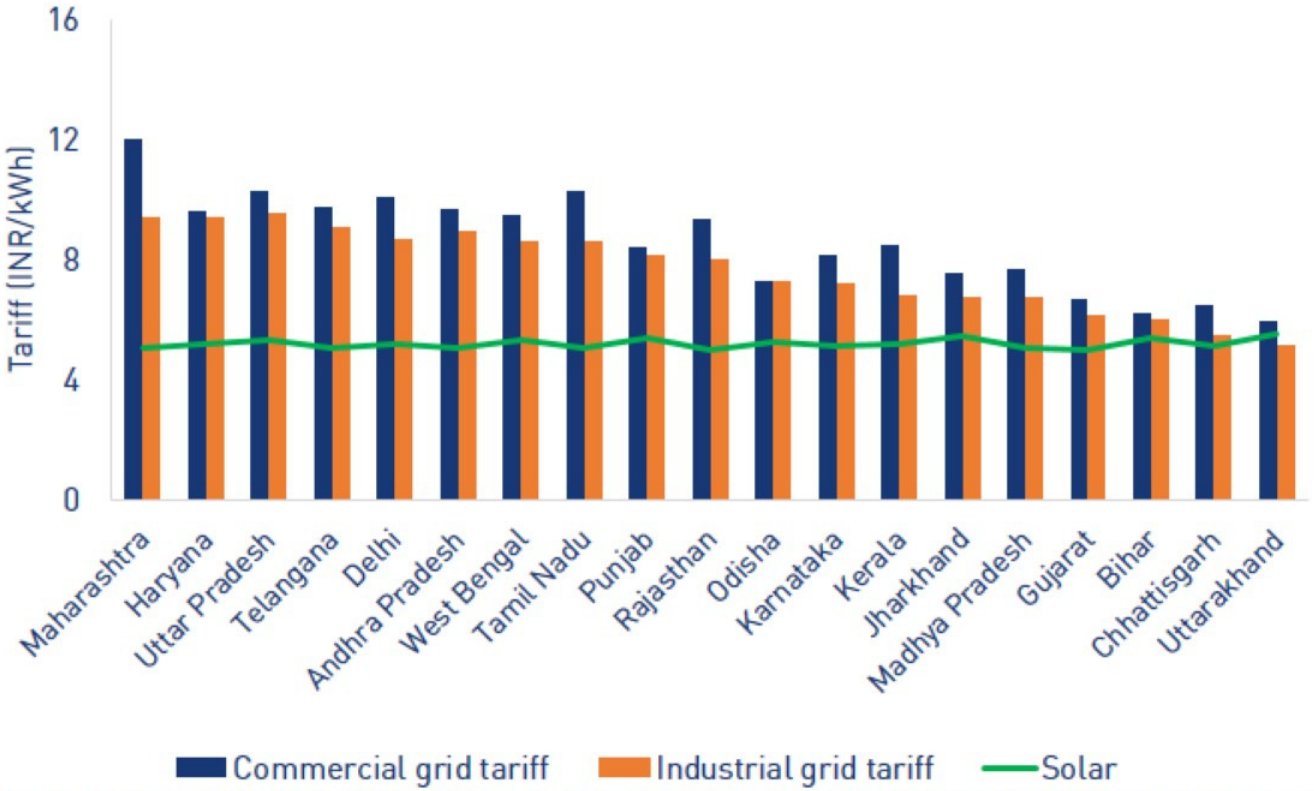
Tariff escalation	2% per annum
EIRR	16%
Project capacity	100 kW
EPC cost	INR 50/Wp

Source: BRIDGE TO INDIA analysis

On site viability trends

By 2018, solar will be very attractive in all states for C&I consumers even without AD

Viability of on site solar for commercial and industrial customers, 2018



Note: Grid tariffs have been assumed to be increasing by 3-7% for different states based on the technical and financial performance of the Discoms. Please refer to the annexure for details.

Assumptions:

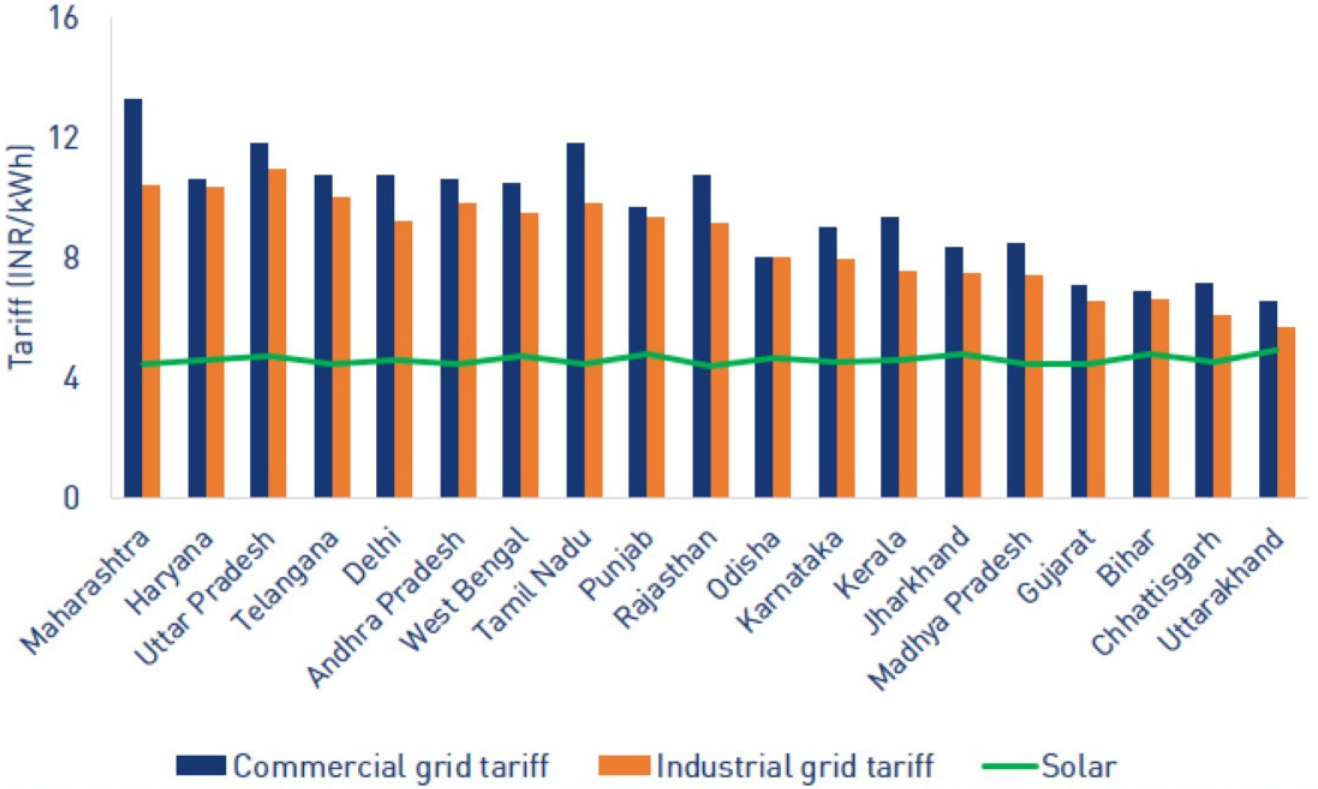
Tariff escalation	2% per annum
EIRR	16%
Project capacity	100 kW
EPC cost	INR 43.9/Wp

Source: BRIDGE TO INDIA analysis

On site viability trends

By 2020, on site solar is expected to be an extremely attractive proposition for all C&I consumers in India

Viability of on site solar for commercial and industrial customers, 2020



Note: Grid tariffs have been assumed to be increasing by 3-7% for different states based on the technical and financial performance of the Discoms. Please refer to the annexure for details.

Assumptions:

Tariff escalation	2% per annum
EIRR	16%
Project capacity	100 kW
EPC cost	INR 38/Wp

Source: BRIDGE TO INDIA analysis

Policy/regulatory landscape

Central government incentives for consumers

Government provides subsidy to drive installations in the residential segment and public buildings

Key characteristics of policies

MNRE subsidy

- MNRE offers subsidy of 30% for residential and institutional consumers
- This subsidy is not applicable for government buildings, commercial and industrial setups
- However, MNRE has already announced that cold storage facilities shall also be able to avail subsidies soon
- Disbursement of subsidies is channeled through state nodal agencies, DISCOMs and selected PSU's
- For availing the subsidy, the module has to be made in India. However, there is no such restriction on solar cells
- Funds have been made available to the tune of INR 50 billion until 2019
- MNRE hasn't published any data recently on disbursements, but the scheme has started working in select states after being dysfunctional for last three years

SECI grid-connected rooftop scheme

- In the past, capital subsidy for a bundle of projects in select cities has been allocated through SECI using a bidding mechanism
- Four phases of allocation have already taken place and 76 MW has been allocated. However, only 55 MW has been installed
- 500 MW tender for residential and institutional customers has been completed

Source: BRIDGE TO INDIA analysis

Incentives for government departments

MNRE subsidy for government buildings can add significant rooftop capacity

Key characteristics of policies

MNRE subsidy for government buildings

- Estimate of total solar capacity of 6 GW for government buildings
- The subsidy amount is linked with the target met by the government departments
- For meeting less than 50% of the sanctioned target, subsidy amount is INR 7,500/kW. The subsidy amount is INR 11,250 for meeting sanctioned target of between 50% to 80%. For meeting over 80% of the sanctioned target, subsidy is INR 18,750/kW
- Responsibility of implementation of rooftop projects lies with government's PSUs such as SECI, REIL, PEC and CEL
- SECI has released a tender for to allocate 1,000 MW of capacity
- PEC has launched a tender for empanelment of channel partners and subsequently released a tender for project execution
- REIL has appointed consultants for tender document preparation and project execution
- NVVN has released RFS for selection of consultants of feasibility study

Source: BRIDGE TO INDIA analysis

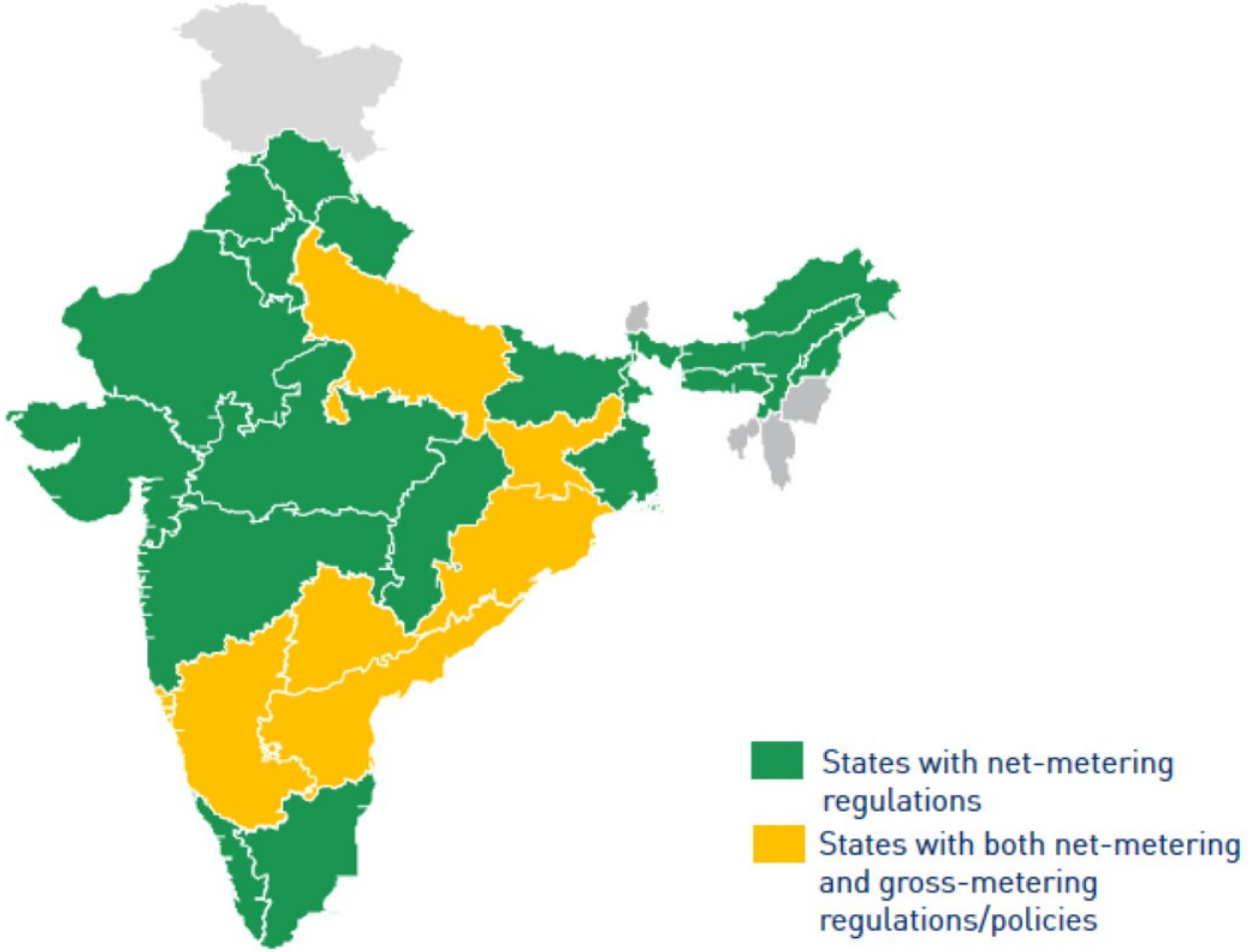
Regulatory driver

Status of net-metering regulations across Indian states

Highlights

- Most states have announced net and/or gross metering regulations
- The first set of regulations in India were announced in 2013
- Almost half of the states have released their regulations between 2015 and 2016

Status of announcement of net and gross metering regulations across India



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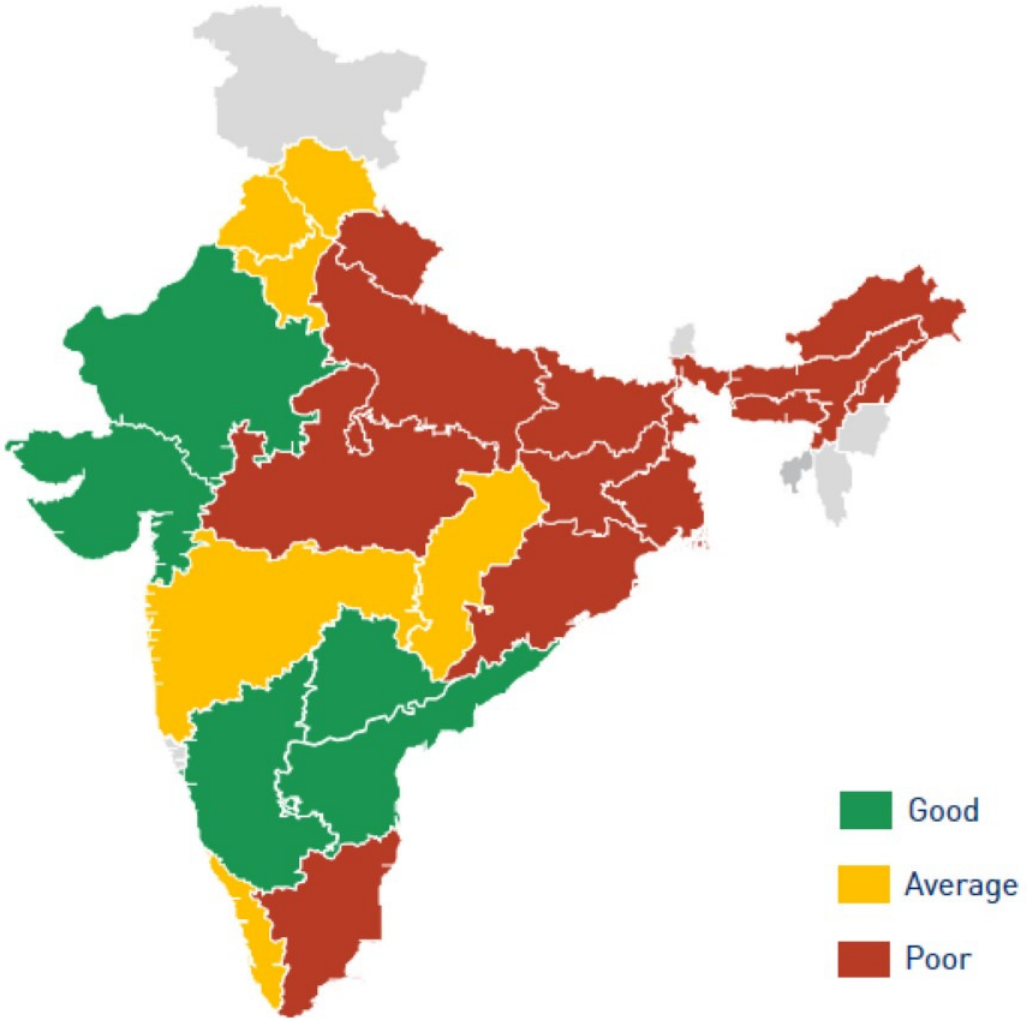
Regulatory driver

Favourable net-metering implementation at the state level will be a huge help for on site solar market growth

Highlights

- Quality of net metering implementation is likely to have a significant impact on rooftop solar adoption. We estimate adoption rates to increase by up to 50% in states with effective implementation
- BRIDGE TO INDIA carried out a survey to understand the status of net-metering implementation across India

Status of implementation of net-metering across states



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Key priorities to grow the private rooftop solar market in India

1. Improve net-metering implementation
2. Support new business models
3. Offer flexibility and more options to customers
4. Bring Discoms on board

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Improving operational implementation

1.1

Issues

- Application processes vary across states and are not well defined.
- Delays in approval (waiting period of many months in Haryana, most states).
- Lack of transparency and unavailability of information.
- Undefined responsibilities and accountability (no guidelines or an escalation matrix to resolve issues/delays).

Recommendations

- The entire process should be objective and precisely defined. All timelines, procedures and relevant forms should be transparent. Andhra Pradesh is a good example to follow.
- **Applications tracking should be online**. For example, this is available in Karnataka and AP.
- **Timeline for approval process and implementation should be fixed** with deemed permissions and/or penalties for delays. For example, Andhra Pradesh has deemed permission for some aspects of the process.

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Improving operational implementation

	Issues	Recommendations
1.2	Most states do not define a clear checklist for inspection. This provides discretionary power to the inspector and leads to delays.	The process should allow for **self certification based on an inspection checklist**. The role of Discom inspector should be limited to verification.
1.3	Anyone constructing a new building needs to apply for a regular connection and subsequently apply for net-metering, if required.	New electricity connection applications should have the provision to apply for net-metering directly. No state has provided clarity on this aspect.
1.4	DTR limits vary widely across states. For example, Madhya Pradesh has set it at 15% and Karnataka has defined it at 80%.	Scientifically, a secure DTR penetration limit can be determined based on the base load on a particular transformers. States should be maintaining this data and should be encouraged to update and publish this regularly.

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Key priorities

1. Improve implementation
2. Support new business models
3. Offer flexibility and more options to customers
4. Bring Discoms on board

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Supporting new business models

	Issues	Recommendations
2.1	Only roof owners are allowed to enter into a contractual agreement with the Discoms (with an exception of BESCOM). This means that any third-party investor installing a rooftop solar plant has no recourse for transfer/sale of power if the rooftop owner defaults.	There should be a **provision for a tri-partite agreement between the customer, third-party investor and Discom** which allows sale of power to the Discom or transfer of power to another site.
2.2	There is ambiguity over applicability of open access charges on rooftop based sale of power. Most states have not yet stated an explicit exemption.	All states should **explicitly waive off all charges** for a certain timeframe. For example, Punjab and UTs waive off all open access charges for rooftop solar.

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Key priorities

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Offer flexibility and more options to customers

	Issues	Recommendations
3.1	Many buildings such as warehouses have large rooftop space but limited load and the customer may want to install a rooftop solar plant on their rooftop and transfer it to another location to sell it to the Discom at a regulated rate.	Allowing gross metering, virtual net-metering or open access sale for rooftop projects should be encouraged along with standard net-metering. For example, Delhi allows virtual net-metering. Andhra Pradesh, Karnataka, Odisha and UTs allow gross metering.
3.2	Most states limit the maximum system size for net-metering, this limits the addressable market size. For example, Madhya Pradesh allows up to 250 kWp, Gujarat allows up to 50% of the connected load.	**All such limits should be removed** as long as critical technical and grid safety criteria are met.

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Offer flexibility and more options to customers

	Issues	Recommendations
3.3	The rules on interconnection of battery backed systems are inconsistent. For example, several states provide a schematic on how to connect battery backed systems but don't allow for interconnection during on-ground implementation. For example, Haryana.	Battery backup systems should be allowed to opt for net-metering with necessary islanding and other safety features. Inverters that allow such features are available. For example, Rajasthan, Punjab and UTs have the relevant provisions in the regulations.
3.4	Where both net and gross metering are available (eg. AP and UP), switching is not allowed. This restricts flexibility in business models.	Switching should be allowed by paying regulated charges/administrative cost.
3.5	There is a very narrow definition of "rooftop" solar.	All on-site systems including ground mounted and car ports should be allowed (eg Punjab).

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Key priorities

1. Improve implementation
2. Support new business models
3. Offer flexibility and more options to customers
4. Bring Discoms on board

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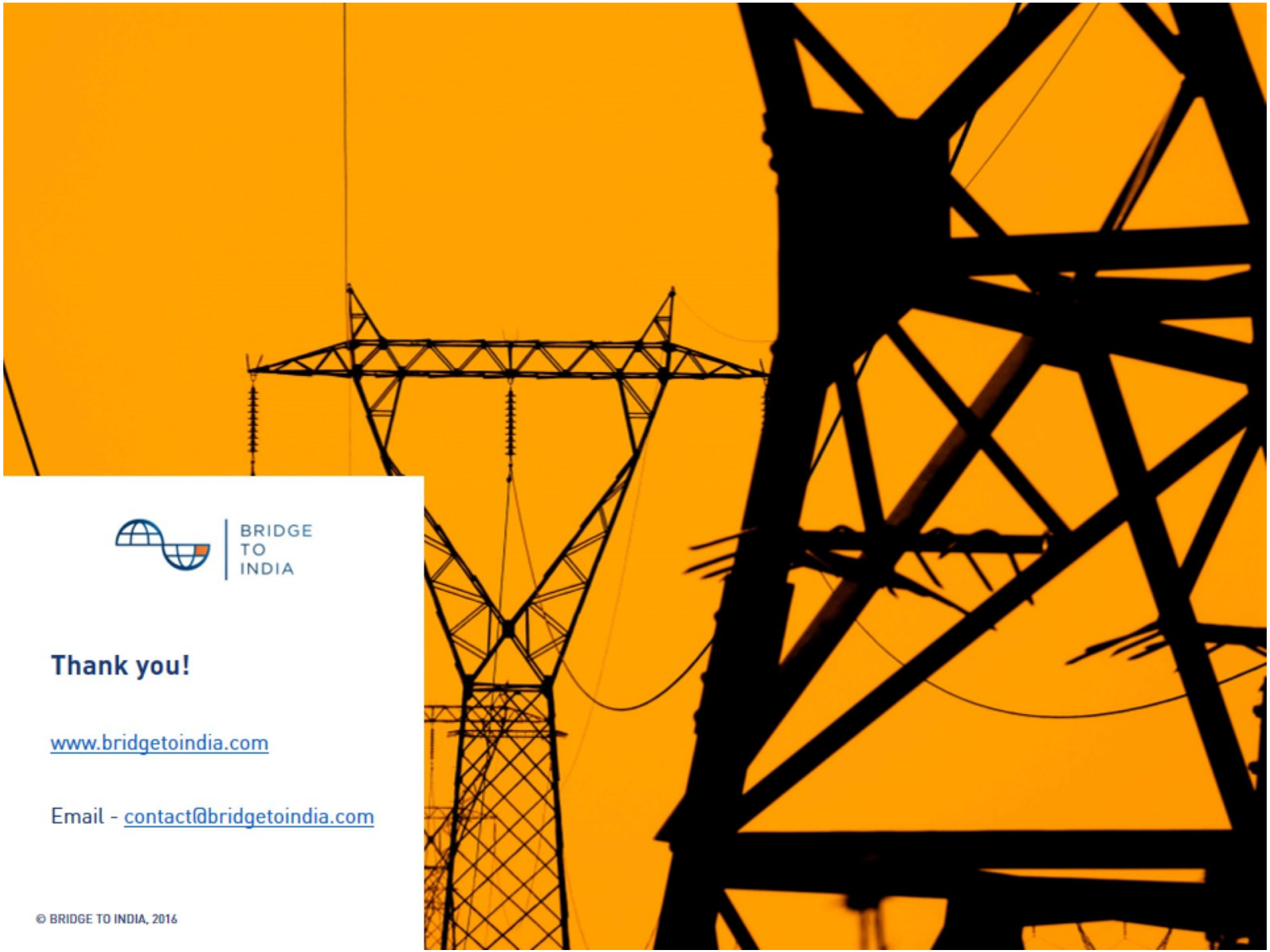
Bring Discoms on board

	Issues	Recommendations
4.1	Discoms see little reason to fully support the mechanism as they lose their share of power supply to the highest paying customers and face higher cost burden for net metering framework.	A **clear roadmap should be provided for transition to a sustainable business model for Discoms** (eg a fixed service fee per kWh). A roadmap can introduce regulated banking charges in the future. This will provide visibility to Discoms, end-customers and businesses.
4.2	Discoms view net-metering as a increasingly loss making proposition as the differential between grid tariffs and solar LCOE will continue to increase.	The government can consider a **Discom incentive** to promote net or gross metering



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