

With the support of the PV Market Alliance

The PV Market Alliance



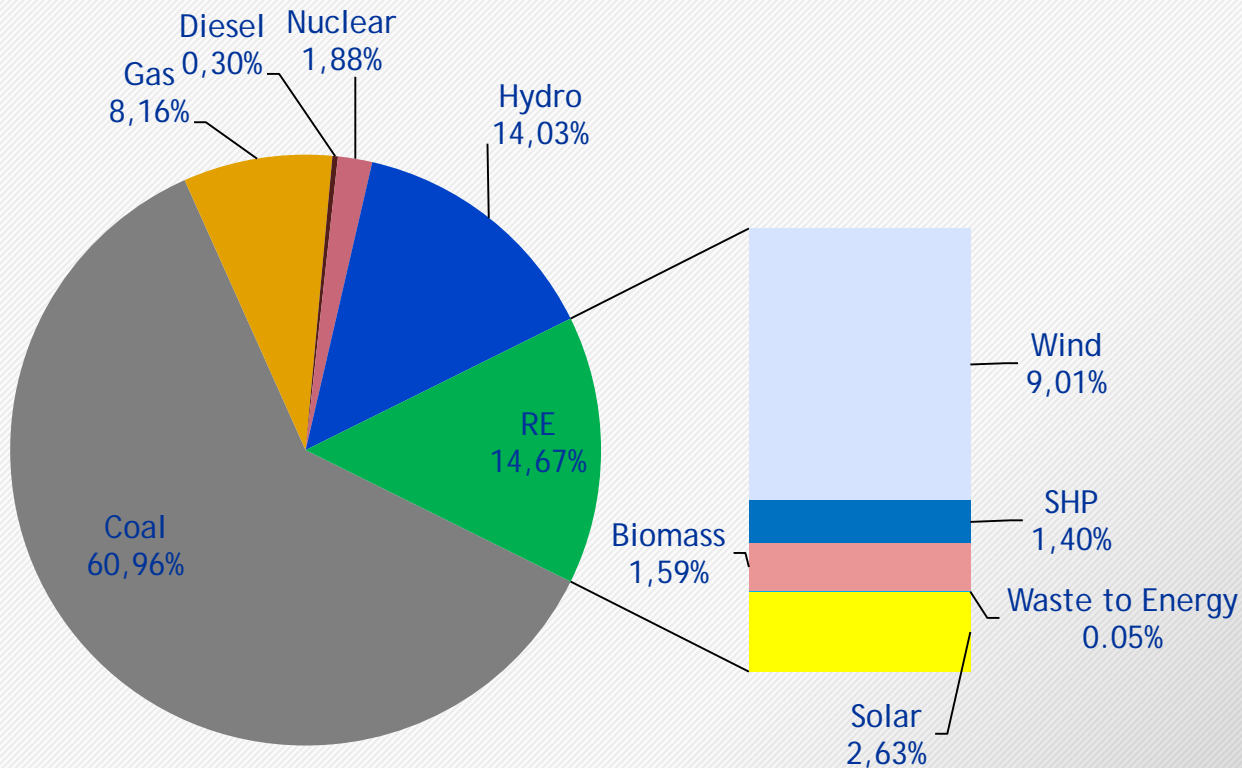
APVIA Q2 2017 Market Report



Introduction

- Launched in 2017, this 2nd edition of APVIA's quarterly PV market report focus on 'India', anticipated to witness the strongest growth in terms of additionally added solar PV power generation capacity throughout 2017
- This report focuses on India's power sector, the importance of renewable energy in its energy mix in general as well highlights and trends regarding solar PV in particular
- This report has been prepared with information provided by the PV Market Alliance and especially Asia Europe Clean Energy (Solar) Advisory Co. Ltd. (AECEA)
- All information collected are valid at the time of publication. The data published do not engage the responsibility of APVIA or AECEA and should be considered with all due caution and are for informational purposes only.





















India's Power Market Status



- Total Installed Power Generation Capacity amounts to 315 GW (as of 03/2017)
- Share of Renewable Energy Capacity 50 GW
- 2017 (fiscal year) cumulatively installed 12,2 GW solar PV and 5,5 GW added annually
- 2018 (fiscal year) cumulative installed solar PV capacity expected to exceed 20 GW
- As of 09/16 - Wind leads with 9% share
- As of 09/16 - Solar is 2nd with 2.63% share

India's Solar Market in Global Context

TABLE 1: TOP 10 COUNTRIES FOR INSTALLATIONS AND TOTAL INSTALLED CAPACITY IN 2016

TOP 10 COUNTRIES IN 2016 FOR ANNUAL INSTALLED CAPACITY				TOP 10 COUNTRIES IN 2016 FOR CUMULATIVE INSTALLED CAPACITY			
1		China	34,5 GW	1		China	78,1 GW
2		USA	14,7 GW	2		Japan	42,8 GW
3		Japan	8,6 GW	3		Germany	41,2 GW
4		India	4 GW	4		USA	40,3 GW
5		UK	2 GW	5		Italy	19,3 GW
6		Germany	1,5 GW	6		UK	11,6 GW
7		Korea	0,9 GW	7		India	9 GW
8		Australia	0,8 GW	8		France	7,1 GW
9		Philippines	0,8 GW	9		Australia	5,9 GW
10		Chile	0,7 GW	10		Spain	5,5 GW

Source: IEA-PVPS Snapshot of Global PV Markets April 2017

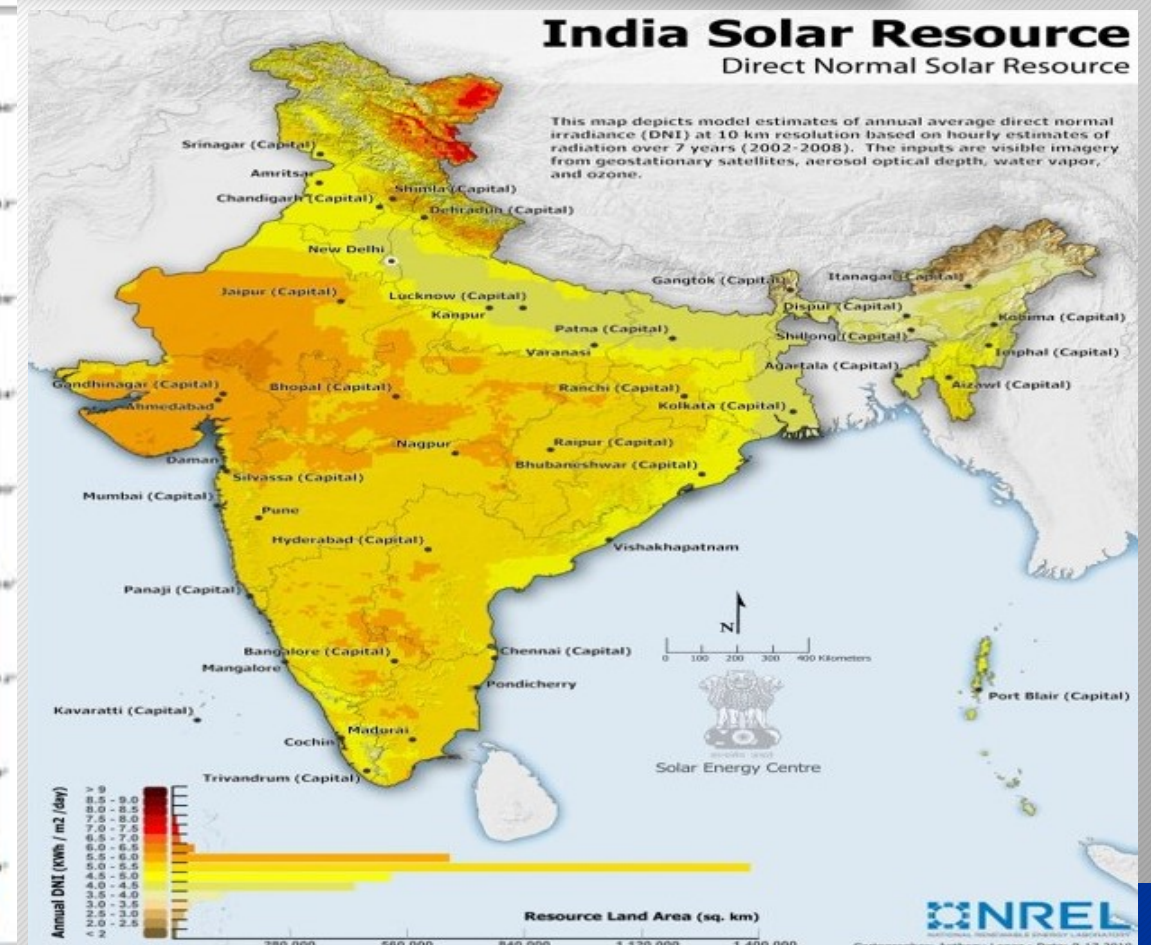
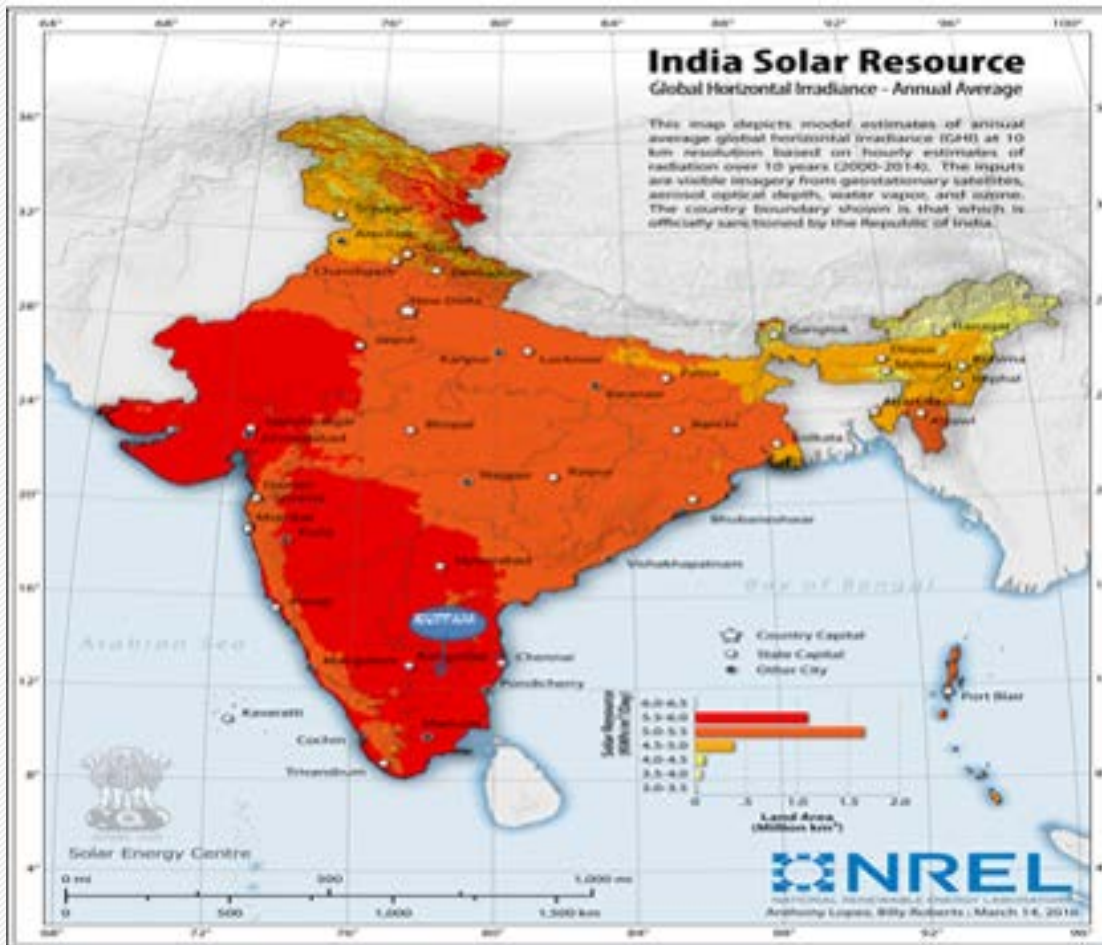
- 2016 (calendar) India moved to 4th rank in annually installed PV capacity YoY
- 2016 (calendar) India moved to 7th rank in terms of cumulatively installed solar PV capacity YoY
- 2017 (calendar) India most likely will replace Japan as the 3rd largest market
- 2017 (calendar) India may move up to the 5th spot in terms of cumulatively installed PV capacity

India's Renewable Energy Potentials & Targets

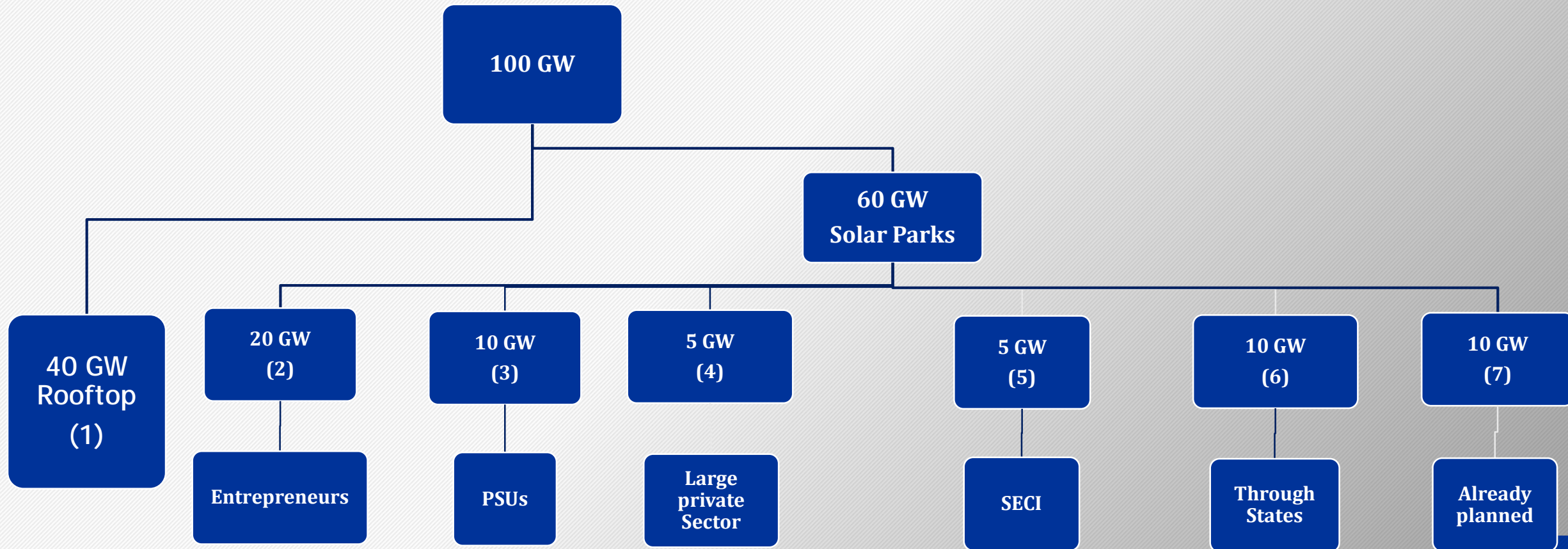
Sector	Potential (GW)
Solar	750
Wind	302*
Biomass incl. Bagasse Cogeneration	23
Small Hydro	20
Total	1095

2022 Renewable Energy Targets	
Solar	100 GW
Wind	60 GW
Bio Energy	10 GW
Small Hydro	5 GW
Total	175 GW

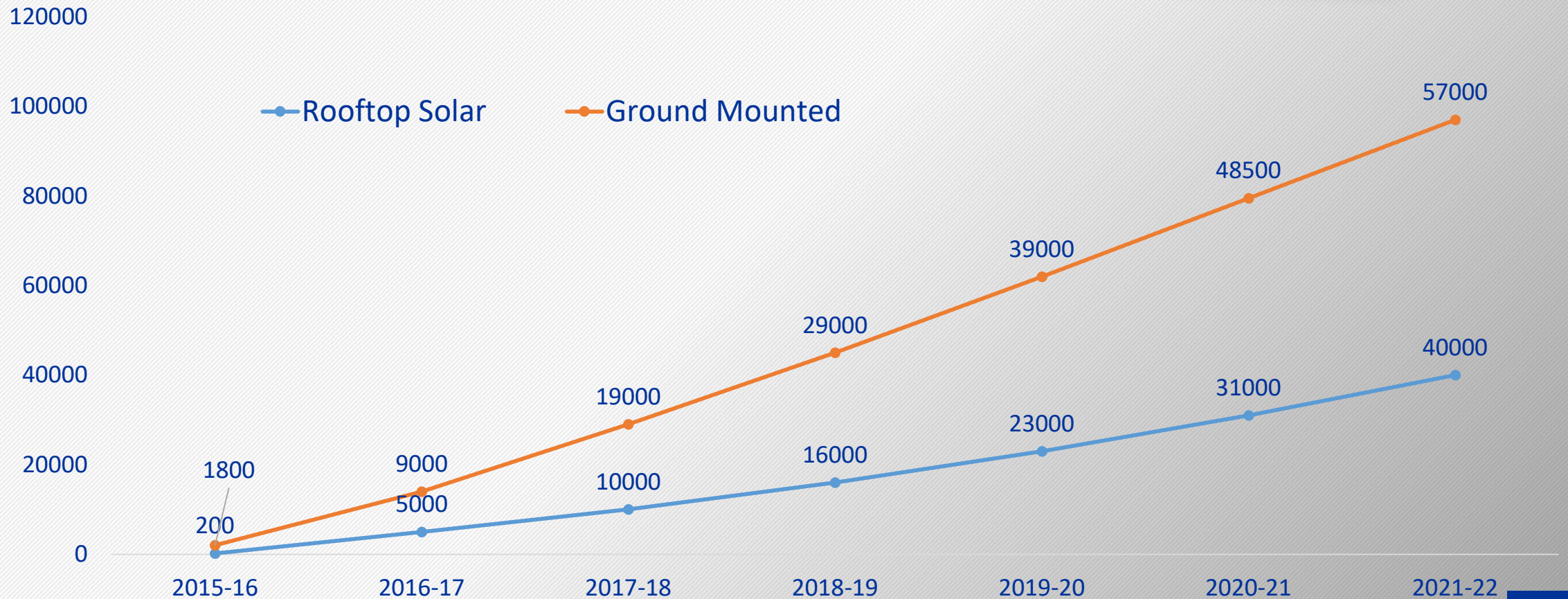
India's Solar Resource Maps



India's Solar Energy Targets by 2022

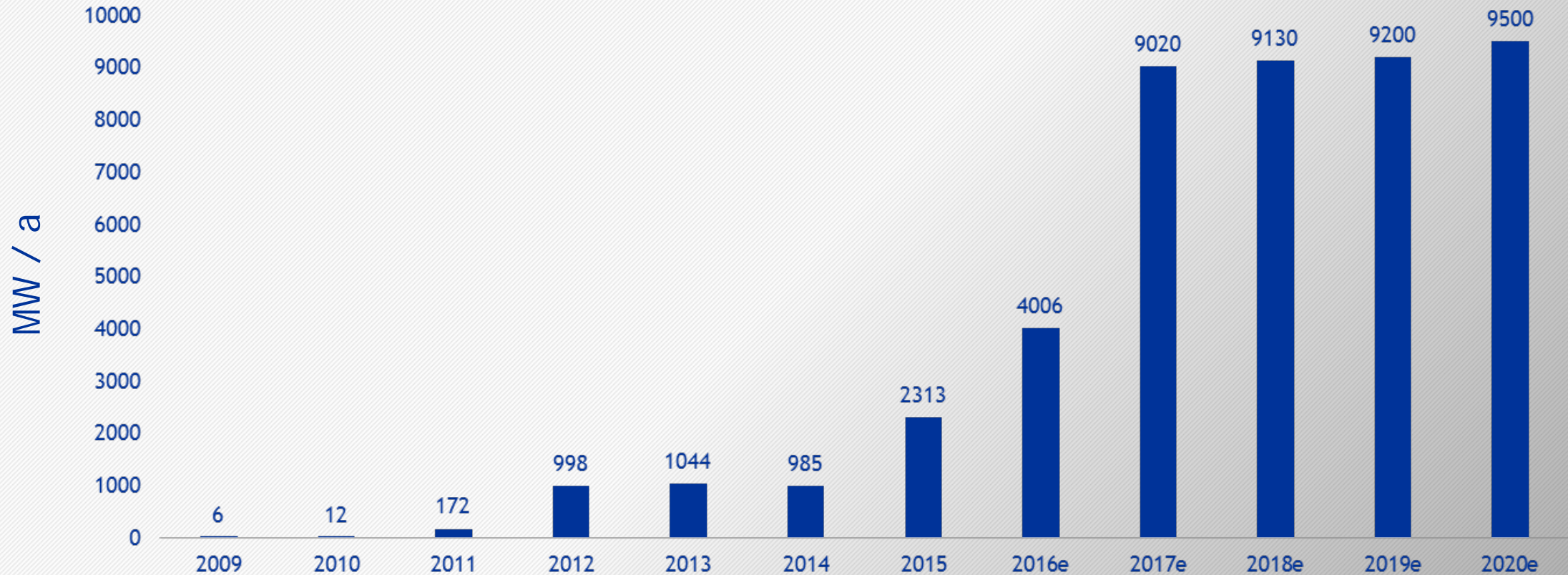


India's Cumulative Solar Targets till 2022



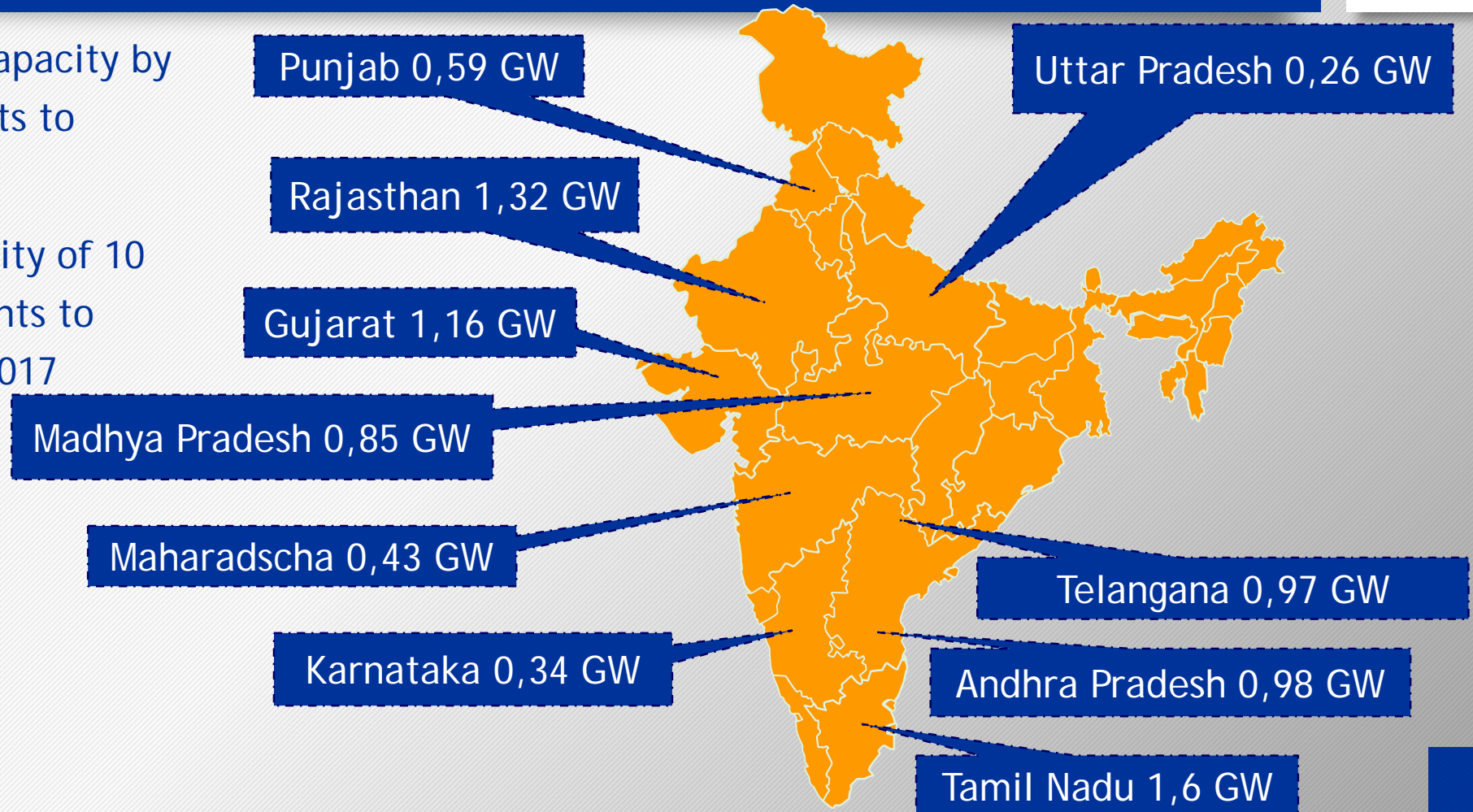
Source: MNRE

India's Solar PV Market Development

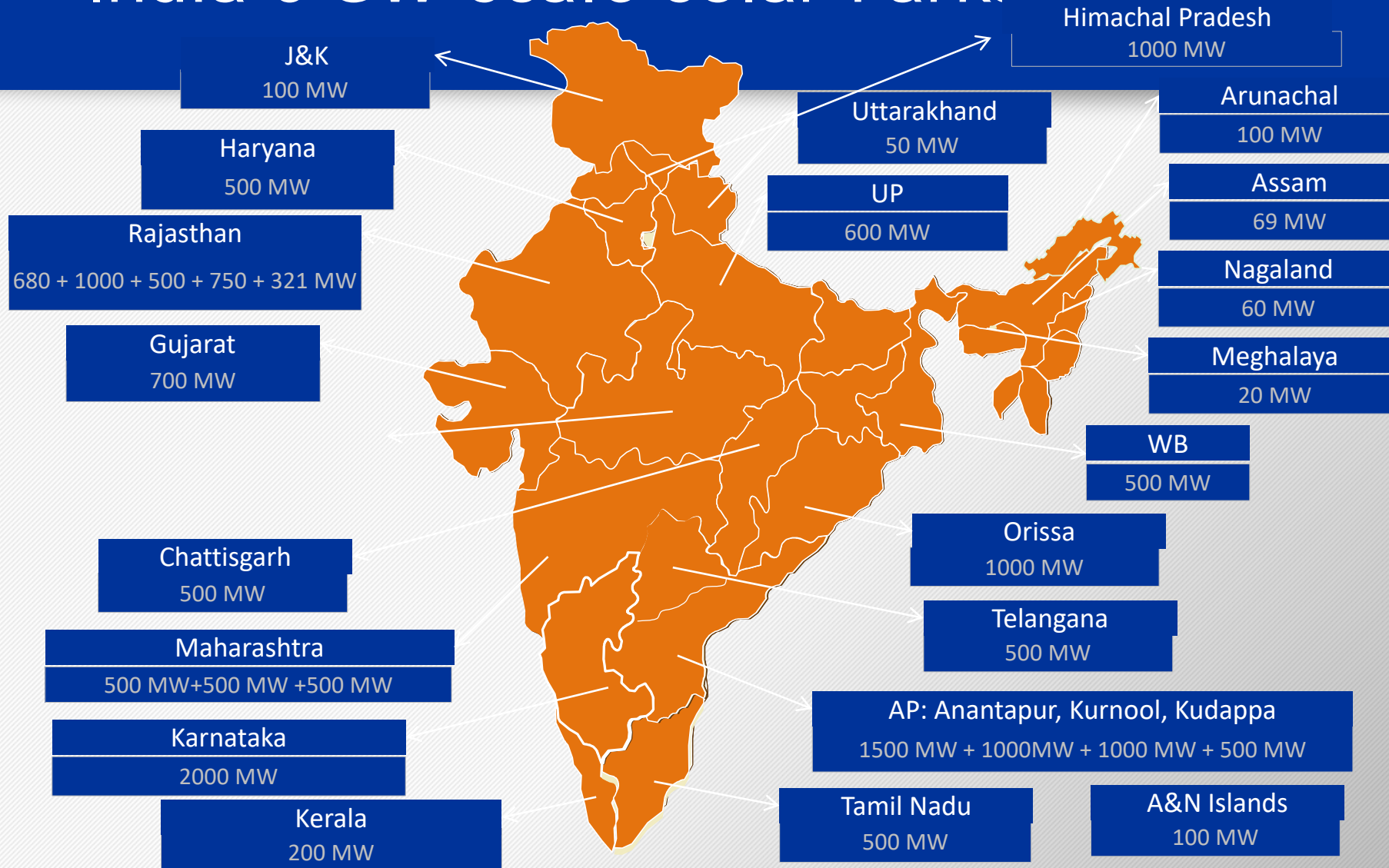


India's Solar PV Market Development

- Total installed capacity by Jan 2017 amounts to 9.2 GW
- Combined capacity of 10 top states amounts to 8.5 GW by Jan 2017

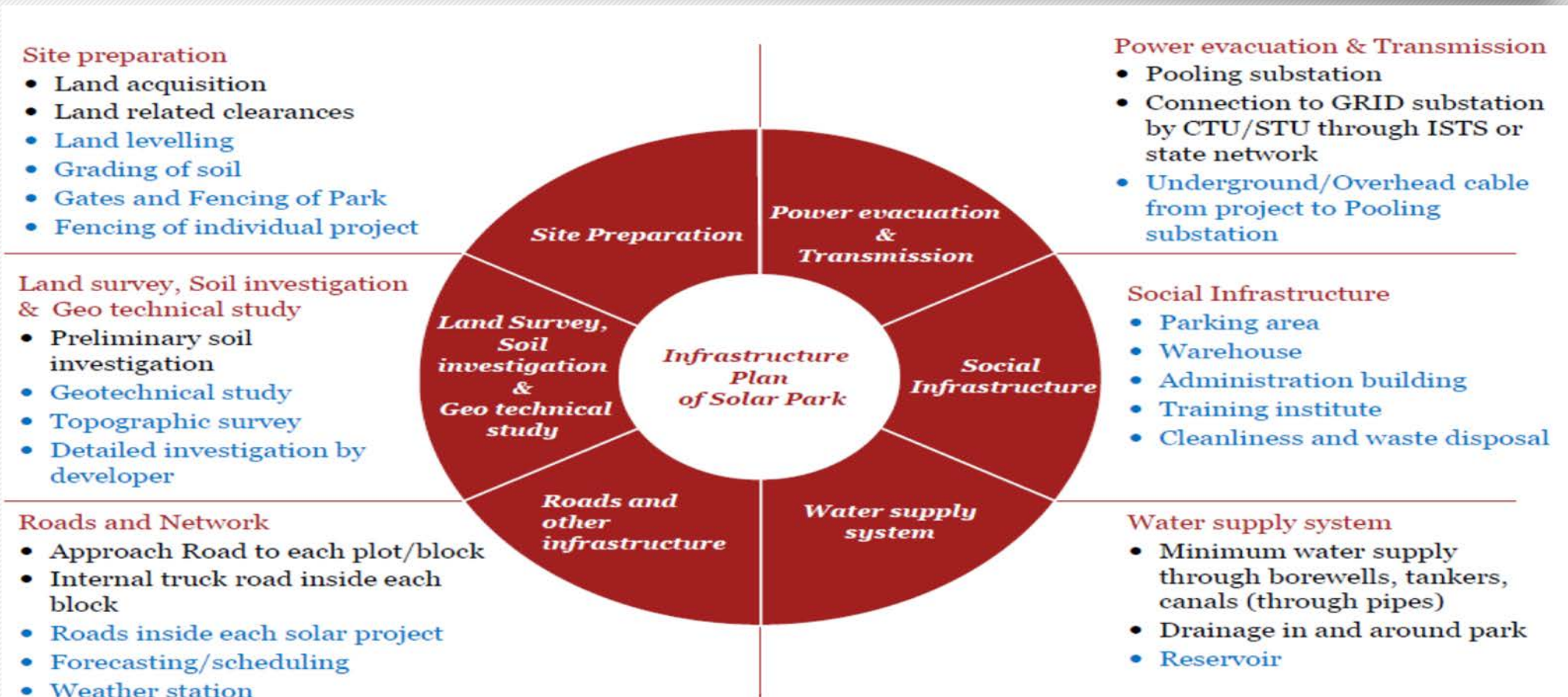


India's GW-Scale Solar Parks



- 34 Parks across 22 states with a combined capacity of 20 GW were approved
- 8 Parks (7,4 GW) work started
- 20 Parks (10,4 GW) work will start in 3 months
- 6 Parks (2,1 GW) works may start in 3 months

Infrastructure Plan for GW-Scale Solar Parks



Source: PWC Sept 2016, Black = necessary ; Blue = optional infrastructure

India's GW-Scale Solar Parks - Challenges

Charanka / Bhadla Solar Park - Rajasthan

- Installation in Remote Location cause High Transmission / Distribution Losses
- Local Labour and Employability
- Non Availability of Single Piece of Land
- Road Connectivity
- Storage
- Water Availability
- Power Evacuation
- Harsh Weather Conditions

Ground Mounted Solar Project Tenders in 2015 - 2016 for Commissioning in 2016/17 and 2017/18

	Name of Organisation	Tendered Capacity (GW)
1	SECI / VGF	4,6
2	SECI : PMC/Own	0,91
3	Canal bank/Top	0,06
4	NTPC Ltd / Bundling	3
5	NTPC Ltd / Own Projects	2,5
6	State Scheme	9,7
	Total	20,9 GW

India's Solar Rooftop Targets

Total Rooftop Target 40 GW by 2022

Institutional (Govt Bldgs., Hospitals, Warehouses, Schools etc.)	Industrial & Commercial Sector	Housing Sector
7,5 GW	20 GW	12,5 GW

India's Solar Rooftop Targets

SECI: 1000 MW Solar Rooftop Tender Details (For Govt. Buildings in various States/Union Territories of India)

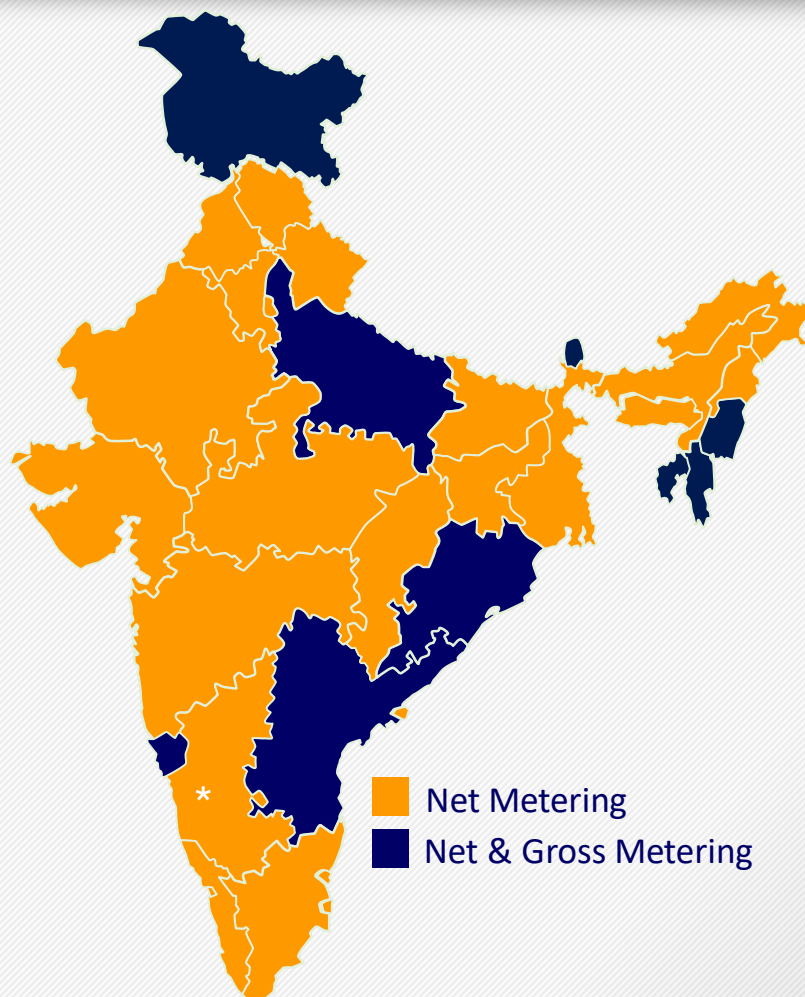
Part A		Part B	
CAPEX Model (300 MW)		RESCO Model (700 MW)	
Min. aggregate capacity - 500 kW Max. aggregate capacity - 50 MW		Min. aggregate capacity - 2 MW Max. aggregate capacity - 100 MW	
		Incentives	Levelized Ceiling Tariff
Ceiling Project Cost INR 75,000 (~US\$ 1,11/kW)	Special Category States & Islands	INR 45,000 (~US\$667/kW)	INR 4,82 (~US\$0.07/kWh)
	Other States	INR 18,750 (~US\$278/kW)	INR 7 (~US\$0,10/kWh)

This represents SECI's 2nd largest solar rooftop tender after a 500 MW tender in April 2016

India's Net-Metering Policy / Tax & Financial Incentives – A Snapshot

- Net-Metering regulations notified in 27 states, nine are pending ...
(Arunchal Pradesh, Jammu & Kashmir, Mizoram, Manipur, Meghalya, Nagaland, Tripura, Jharkhand, Telangana)
- Capital Subsidies – 30% subsidy for Residential / Institutional (INR 50 bln) – but no subsidies for commercial and industrial buildings
- Accelerated Depreciation – 80% depreciation for business consumers
- Tax Holiday – 10 year corporate tax holiday (till 03/2017)
- Duty Exemption – Waiver/reduction on customs duty and excise duty for eqp.
- Low-Cost Debt Financing – approx. USD 1,5 bln (WB, kfw, ADB, etc.)
- Business Models – are being developed, put into practice and improved like the “Do-it-Yourself, Equipment Lease, PPA Model, Rooftop Leasing”

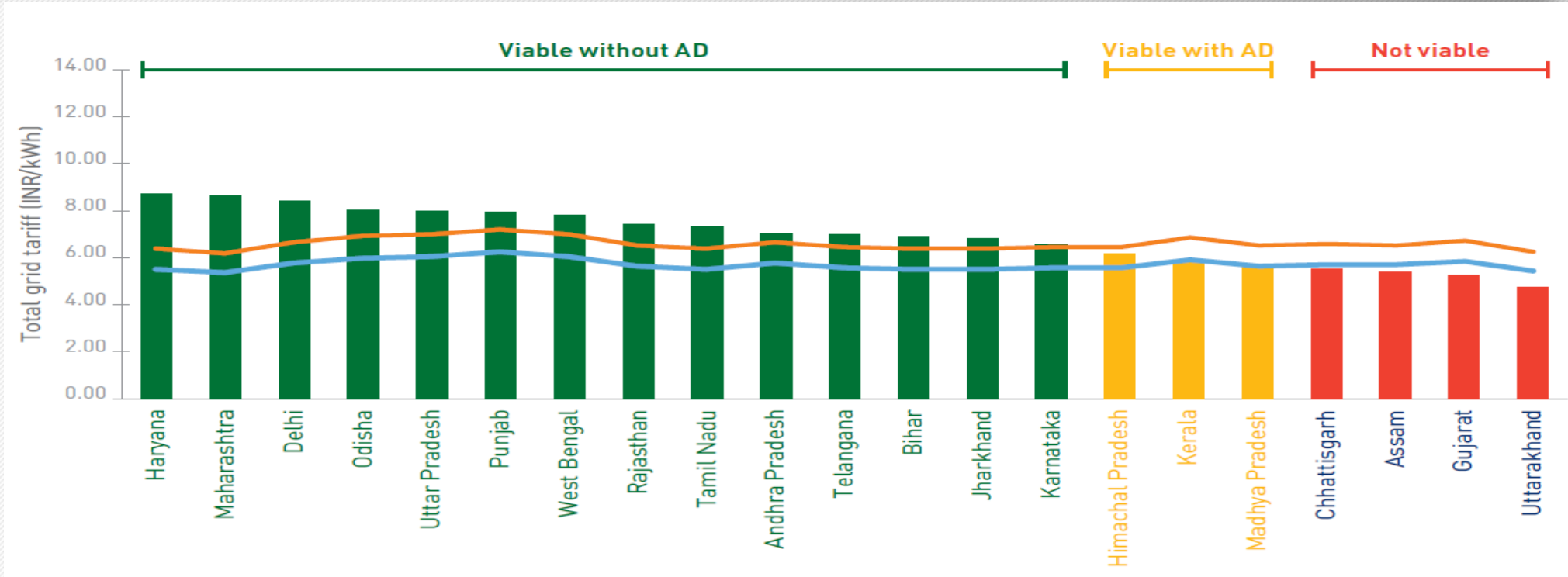
India's Net-Metering Landscape



Tariff Scheme Solar Rooftop Plants / State of Karnataka*

Capacity of solar rooftop and small photovoltaic power plants	Approved tariff in Rs/unit (without capital subsidy)	Approved tariff in Rs/unit (with capital subsidy)
1 to 10kW	7,08	6,03
Above 10kW & up to 50kW	6,61	5,63
Above 50kW & up to 100kW	6,14	5,23
Above 100kW & up to 500kW	5,67	4,83
Above 500kW & up to 1000kW	5,20	4,43

India's Solar Rooftop Competitiveness



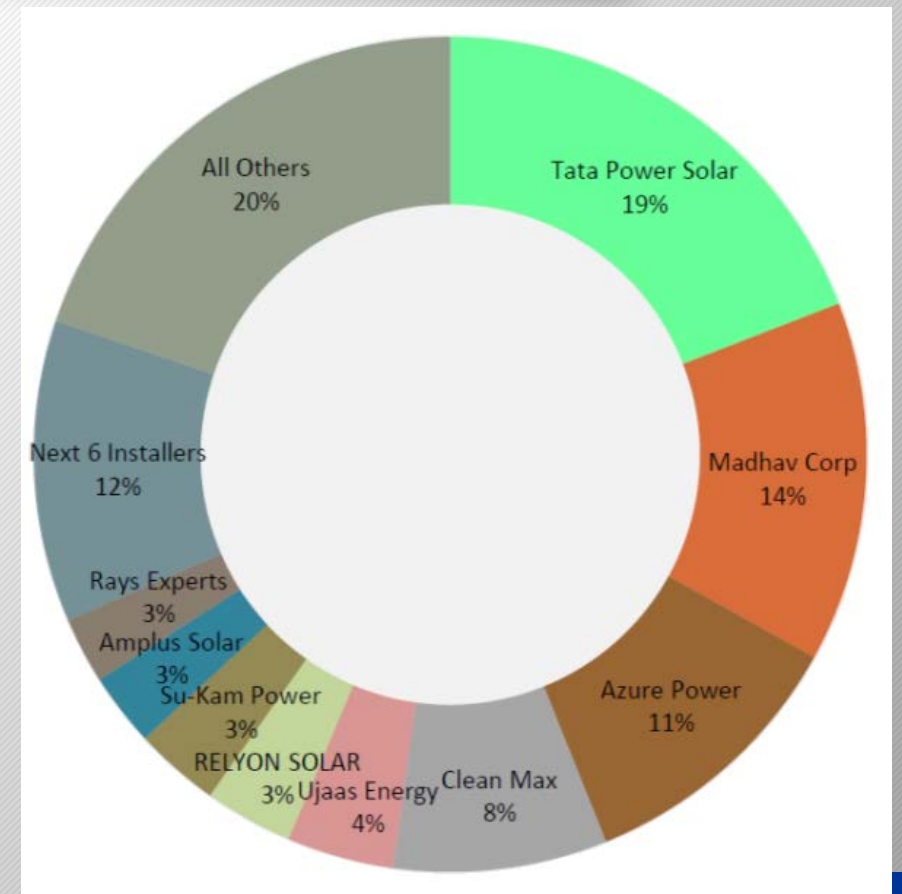
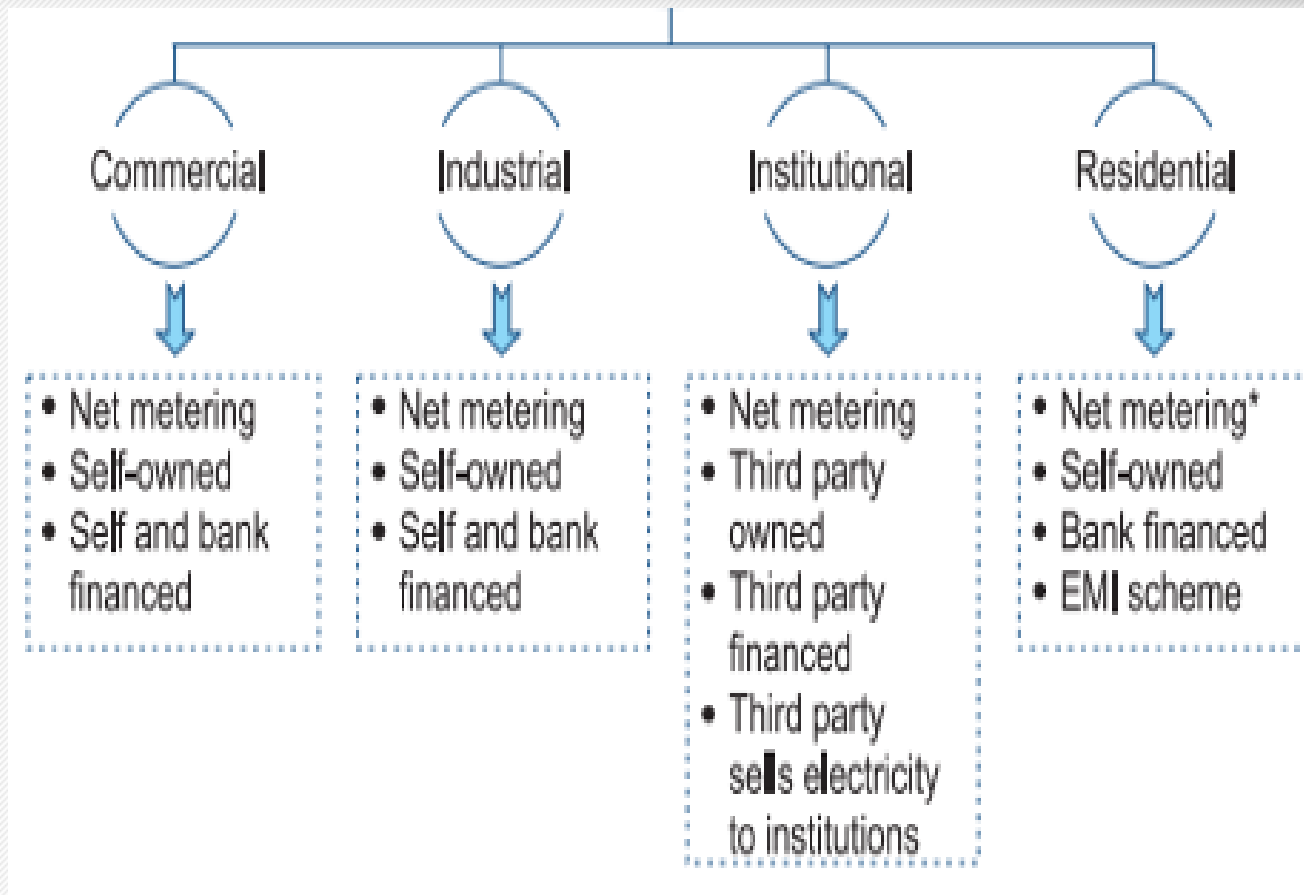
Commercial & Industrial electricity consumption accounts for approx. 47% of total electricity consumption in India → C&I systems especially attractive

India's Solar Rooftop Market Dynamics

Cost economics in the State of Maharashtra

Tariff (typical) (Rs.)	Monthly consumption (kWh)	Sys. Cap. (kWp)	System investment (Rs.)	Saved units per year (kWh)	Savings per year (Rs.)	Payback time (years)
7,50	250	2	170,000	3,000	22,500	7,56
10,50	500	4	320,000	6,000	63,000	5,08
11,50	1000	8	600,000	12,000	138,000	4,35
12,80	1000	8	600,000	12,000	153,600	3,91
13,50	1000	8	600,000	12,000	162,000	3,70

India's Solar Rooftop Business Models & Players



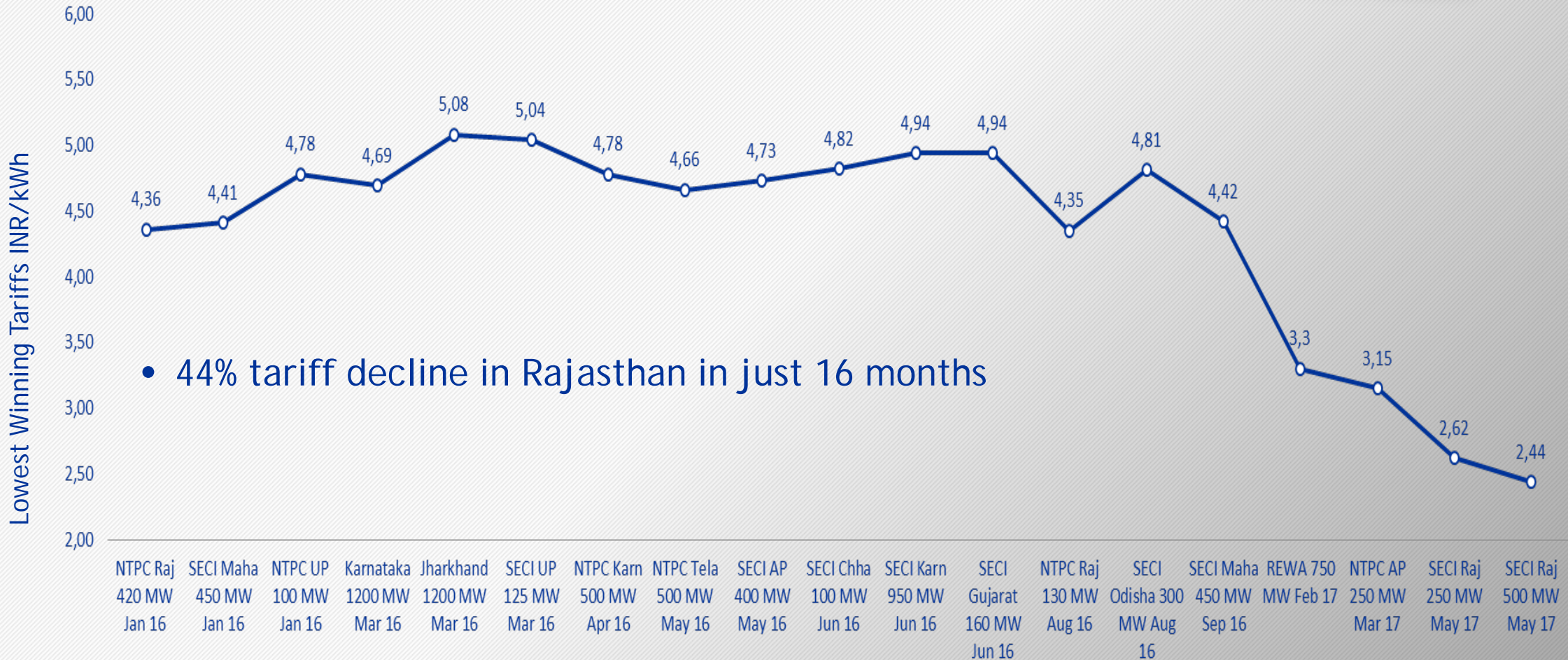
Source: Mercom Capital 2016

India's Player Landscape

Project developers				Module suppliers				Inverter suppliers				EPC contractors			
Current rank	Company Name	Previous year rank	Increase/Decrease	Company Name	Previous year rank	Increase/Decrease		Company Name	Previous year rank	Increase/Decrease		Company Name	Previous year rank	Increase/Decrease	
1	Adani	-	▲	Canadian Solar	2	▲		ABB	1	◀▶		Mahindra Susten	-	▲	
2	Acme	2	◀▶	Trina	3	▲		TMEIC	3	▲		S&W	2	◀▶	
3	Welspun	5	▲	First Solar	1	▼		Hitachi	4	▲		L&T	1	▼	
4	SunEdison	4	◀▶	Hanwha	-	▲		SMA	2	▼		Tata	-	▲	
5	ReNew	-	▲	JA Solar	-	▲		Schneider	5	◀▶		Gamesa Solar	-	▲	
6	First Solar	-	▲	GCL	-	▲		TBEA	9	▲		Premier Solar	-	▲	
7	NTPC	-	▲	Reyesola	4	▼		Delta	10	▲		BHEL	7	◀▶	
8	Azure	1	▼	Chint	-	▲		Sungrow	8	◀▶		Waaree	-	▲	
9	Shapoorji Pallonji	-	▲	Talesun	-	▲		Gamesa Solar	-	▲		Ujaas	-	▲	
10	Torrent Power	6	▼	Waaree	5	▼		Huawei	-	▲		Rays Power Infra	3	▼	

Source: Bridge to India Sept 2016

India's Auction Tariffs Development



India's Auction Tariffs Development



POWER TRAIL

Tariff in ₹ per unit (range of price)

2010 **17.91** Rooftop & small-scale solar price

2011 **17-12** JNNSM launched, Gujarat issues large-scale projects

2012 **9.3-8.4** Solar modules price come down

2013 **8.3-7** State tenders catch up, MP, Rajasthan & AP stride ahead

2014 **6.9-6.5** Noted foreign players bid low

Source for tariffs: MNRE & SECI

2015 **6-5.05** (2015) Bulk tenders by MP & Telangana and aggressive bids bringing tariff further down

2016 **4.63** SunEdison in AP 500 Mw & SoftBank in AP for 350 Mw

2017 **4.3** States such as Rajasthan, MP, AP, etc, issue tenders for +500-Mw solar parks. Mega size tenders, low-cost capital, foreign funding pull down tariffs to record low
Feb **3.3**
Mar **3.15**
Apr **2.62**
May **2.44**

- Reasons for significant tariffs reduction are:
- Reduction of both equipment and EPC costs
- Slowdown of new tender announcements
- Increased competition
- Large-Scale projects benefit from economy of scale
- Payment security with NTPC and SECI
- Due to a greater willingness to accept risks, Indian developers are winning the majority of projects

Investor Perspectives – Challenges

Approvals

- Difficulty identifying appropriate land for large solar PV plants as one single plot
- Establishing ownership of land is a time consuming and cumbersome process
- Change of land use in some states can be a long and tedious process
- Clearances for evacuation facility and approach road etc.
- Risk for FIs for funding projects with private lease land
- Some states have high registration fees for registering lease land
- Large projects may face additional environmental and social challenges

Investor Perspectives – Challenges

Technology

- Reverse bidding causes compromise in quality, in order to cut costs
- Delay in evacuation and transmission facility, grid connectivity issues, particularly for smaller projects
- Lack of best practices in Operation & Maintenance contracts
- Challenges in PV plant design & engineering activity
- Inadequate substation capacities to support large size projects

Investor Perspectives – Challenges

Financing

- Achieving financial closure on time
- Bankability of solar projects under tariff based reverse bidding mechanism
- Timely payments due to adverse health of DISCOMs
- Land acquisition and/or change of location
- Uncertainties in winning the bids - has lead to non participation of experienced developers

Investor Perspectives – Challenges

Other Issues and Concerns

- Timely allocation / infusion of equity
- Ensuring quality of EPC / O&M and the Availability of skilled manpower
- Ensuring quality of equipment in regime of low tariffs
- Non availability of experiences/ consultants for independent monitoring
- High dependency of supply of equipment from limited sources
- Guarantee of on site performance of solar cells / modules over a period of 20 years as the repayment of loans are in the range of 15-20 years
- Uncertainty / Delayed payments of DISCOM's / Utilities
- Third party inspection and quality control

India's Solar PV Outlook

- Government commitment on Central and State Level will continue driving demand
- Future annual market demand could push India to the 3rd or eventually 2nd spot globally
- Ground-mounted utility-scale will remain the dominant segment in future
- Further fine-tuning of roof-top policies will stimulate demand in future
- Existing grid infrastructure could set limitations to an increasing share of RE
- Access to sufficiently attractive domestic financing anticipated to remain a major hurdle
- Long-term build-up of significant domestic production capacities & capabilities could prove to be an ongoing uphill battle
- Ensuring high quality of installations requires the establishment of a sound system consisting of an independent 3rd party inspection, acceptance & verification scheme

Courtesy



- Market data have been collected and analyzed by members of the PV Market Alliance.
- More information: info@pvmarketalliance.com
- www.pvmarketalliance.com

The **PV** Market Alliance

