JMK Research & Analytics

Q4 2019

RE UPDATE

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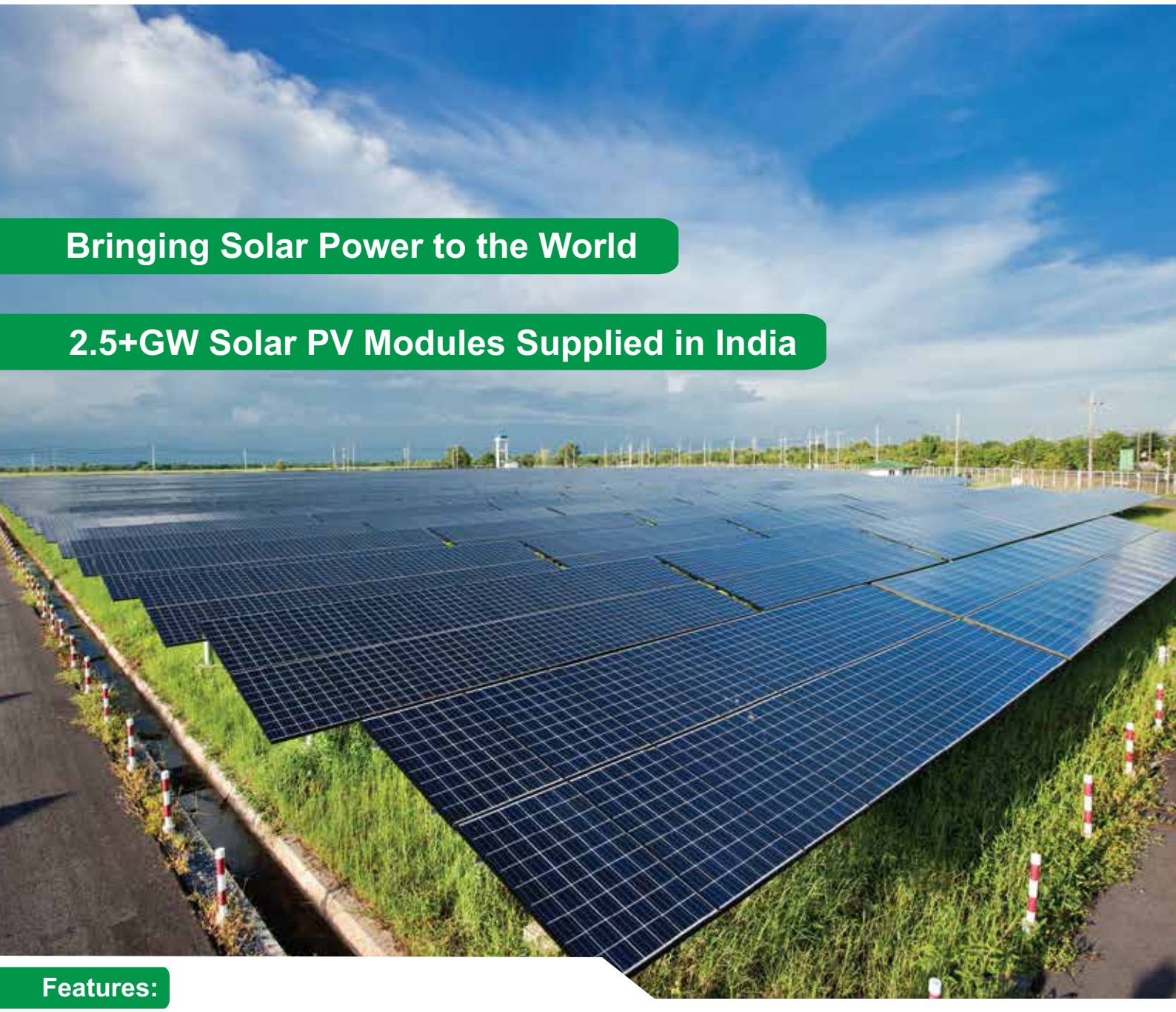

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REPORTS CALENDAR 2020

RENEWABLE ENERGY		ELECTRIC VEHICLES
Monthly RE Update Q4 2019 RE Update Solar+BatteryStorage:Assessing Viability	JAN	Monthly EV Update
Monthly RE Update Solar: 2019 Report Card	FEB	Monthly EV Update
Monthly RE Update	MAR	Monthly EV Update Future of 2-Wheeler EVs in India
Monthly RE Update Q1 2020 RE Update	APR	Monthly EV Update
Monthly RE Update **Annual series**: PV Modules Technology Trends	MAY	Monthly EV Update
Monthly RE Update **Annual series**: Inverter Technology Trends	JUN	Monthly EV Update Future of 3-Wheeler EVs in India
Monthly RE Update Q2 2020 RE Update	JUL	Monthly EV Update
Monthly RE Update	AUG	Monthly EV Update
Monthly RE Update Solar: Annual Report Card	SEP	Monthly EV Update Future of 4-Wheeler EVs in India
Monthly RE Update Q3 2020 RE Update	OCT	Monthly EV Update
Monthly RE Update Annual series: Solar+Storage Adoption in India	NOV	Monthly EV Update
Monthly RE Update	DEC	Monthly EV Update Evolving Charging Infrastructure Landscape in India

Report Circulation

- Our reports are emailed to more than 10,000+ online subscribers.
- 300+ Print copies of Solar: Annual report card would be couriered to CEOs and MDs of RE companies and government agencies.
- Print copies would be circulated in key RE events such as REI expo, Solar GenX, and InterSolar.

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Abbreviations

APDCL	Assam Power Distribution Company Limited
BHEL	Bharat Heavy Electricals Limited
CAPEX	Capital Expenditure
CFA	Central Financial Assistance
COD	Commercial Operation Date
CPSU	Central Public Sector Undertaking
CUF	Capacity Utilization Factor
DISCOMs	Distribution Companies
DMRC	Delhi Metro Rail Corporation
DSM	Deviation Settlement Mechanism
DRC	Dispute Resolution Committee
EMD	Earnest Money Deposit
GRIDCO	Grid Corporation of Odisha
GSECL	Gujarat State Electricity Corporation Limited
GUVNL	Gujarat Urja Vikas Nigam Limited
GW	Gigawatt
GSC	Grid Support Charges
IPO	Initial Public Offering
IWTMA	Indian Wind Turbine Manufacturer Association
JREDA	Jharkhand Renewable Energy Development Agency
KREDL	Karnataka Renewable Energy Development Limited
LC	Letter of Credit
LTOA	Long Term Open Access
M&A	Mergers and acquisitions
MAHAGENCO	Maharashtra State Power Generation Company Limited
MNRE	Ministry of New and Renewable Energy
MPUVNL	Madhya Pradesh Urja Vikas Nigam Limited
MSEDCL	Maharashtra State Electricity Distribution Company Limited
MTOA	Medium Term Open Access
MW	Megawatt
NTPC	National Thermal Power Corporation
OREDA	Odisha Renewable Energy Development Agency
PBG	Performance Bank Guarantee
PPA	Power Purchase Agreement
PSA	Power Sale Agreement
RE	Renewable Energy
RESCO	Renewable Energy Service Company
RPO	Renewable Purchase Obligation
RRECL	Rajasthan Renewable Energy Corporation Limited
RSRTC	Rajasthan State Road Transport Corporation
SECI	Solar Energy Corporation of India
STOA	Short Term Open Access
TANGEDCO	Tamil Nadu Generation and Distribution Corporation
TOD	Time of Day
TSREDCL	Telangana State Renewable Energy Development Corporation Limited
UPERC	Uttar Pradesh Electricity Regulatory Commission
UPNEDA	Uttar Pradesh Non-conventional Energy Development Agency
VGF	Viability Gap Funding

1. Introduction

The fourth quarter of 2019 (Oct-Dec), saw a significant increase in installed capacity across the RE industry (wind and solar) which clocked an overall 40% growth over the previous quarter. The steep rise in RE capacity from the solar and wind is in itself indicative of the pace at which India is endorsing the green energy and reducing its dependency on fossil fuels.

In this quarter, the Government issued about 4.5 GW of solar, wind and hybrid tenders. The period witnessed commissioning of 2,308 MW of solar and 817 MW of wind projects. Lot of scheduled solar and wind projects got delayed in this quarter and are now expected to commission in first half of 2020.

The quarterly report analyses the trends in tender issuance, capacity allocation across RE sector in Q4 2019. The report lists down the leading project developers and equipment suppliers in RE industry along with their capacity contributions. Most important of all, the report provides brief highlights and the impact of new policies and regulations introduced during this quarter. Last but not the least, the section on market trends discusses the key developments that are shaping up the RE sector in India.

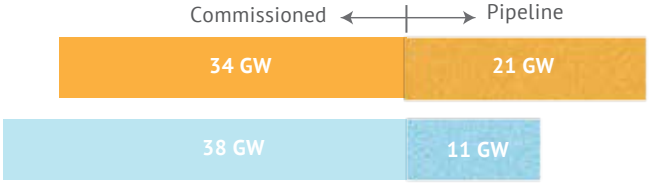
2. Installation trends

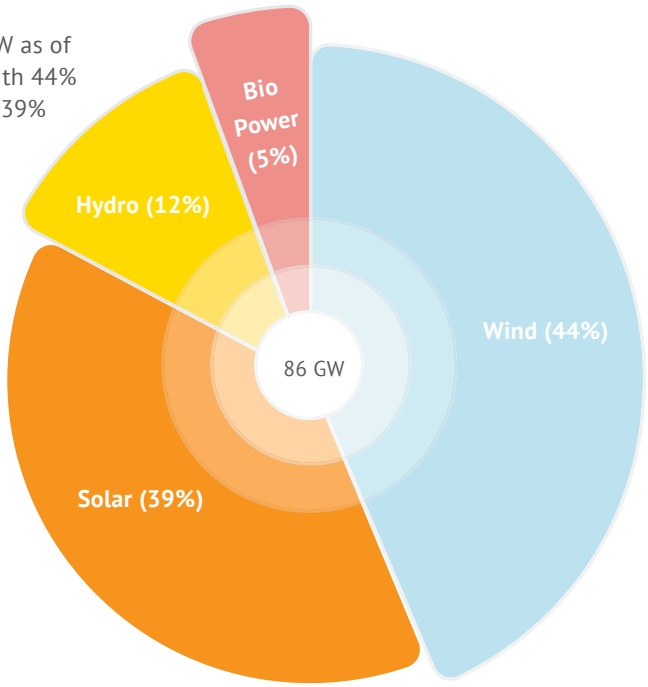
2.1 Cumulative installation trends

India's renewable capacity installation reached 86 GW as of December 31, 2019. Wind is the major contributor with 44% share in total renewable mix, followed by solar with 39% share. In the last one year, the share of solar rose from 34% to about 39%.

Current pipeline of solar and wind projects stands at 32 GW which is likely to be commissioned in the next 2-3 years.

Figure 2.1: RE installation trends, as of December 31 2019





Source: MNRE, JMK Research
Note: Solar includes both utility scale solar as well as rooftop solar installations

2.2 Yearly installation trends and projections

Solar

In CY2019, about 7.5 GW of new utility scale solar capacity was added, which is about 14% increase over the previous year. Karnataka was the front-runner with the highest capacity addition of about 2 GW followed by Rajasthan (1.7 GW), Tamil Nadu (1.5 GW), Gujarat (1 GW), Andhra Pradesh (0.9 GW) and Madhya Pradesh (0.6 MW).
Among the project developers NLC, ReNew, Azure, Acme and SB Energy were the torchbearers of India's race to clean solar energy with maximum installations done in 2019.

Along with the large capacity additions in utility scale solar, rooftop installations too contributed about 1 GW to the total capacity.

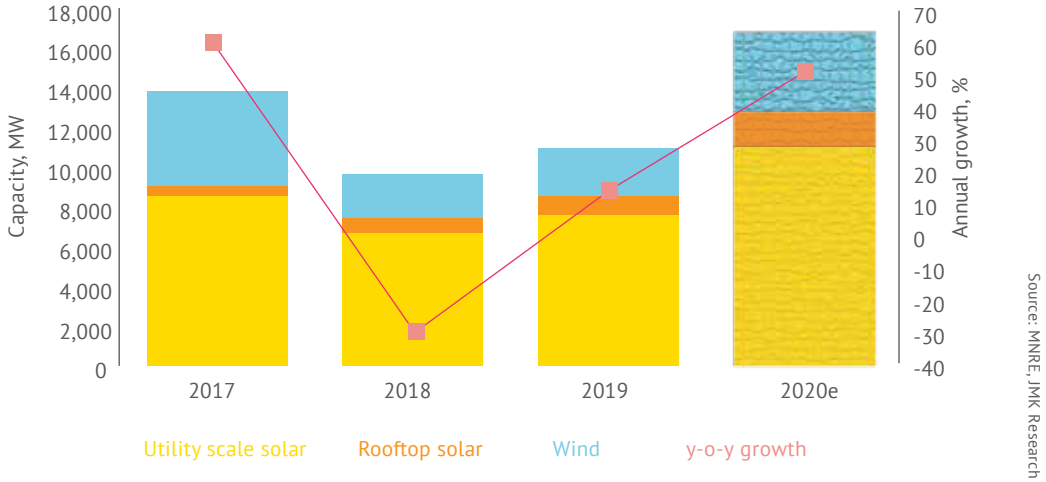
The total solar capacity added in CY2019 fell short of the projections made by **JMK Research & Analytics**. We estimated about 8.5 GW of new solar capacity based on the project allotment schedule under various state and central tenders in 2017-18. A lot of projects which got delayed are now likely to get commissioned in first half of 2020. These delays were primarily due to land acquisition obstacles, execution challenges, delays by DISCOMs (secondary power off taker) in submitting approvals to SERCs for tariff adoption, policy uncertainty because of regressive net metering guidelines, withdrawal of open access benefits, re-tendering etc.

Wind

The addition of 2.7 GW of new installations in CY2019 marked a cumulative capacity rise of 23% over CY2018. Gujarat commissioned over 2 GW of new wind projects followed by Tamil Nadu (0.65 GW) and Maharashtra (0.2 GW). Most of the wind projects allocated in 2018 and scheduled to commission in 2019 got delayed and are now likely to be commissioned in 2020. This delay in wind projects is primarily attributed to various land availability and grid transmission concerns.

SembCorp, Mytrah, ReNew and Greenko are the key players which added maximum wind capacity in 2019.

Figure 2.2: Year-wise RE installation trends in India



Source: MNRE, JMK Research

CY2020 Projections

2020 is likely the year of growth for RE installations. The reduction in safeguard duty, fair price discovery in recent tenders and introduction of new measures by the Government to safeguard project developers' interest would bring in the desired push for the industry. Some of these measures include the directives for DISCOMs to issue Letter of Credit (LC) in case of payments delay, and to compensate IPPs for power backdown or grid curtailment.

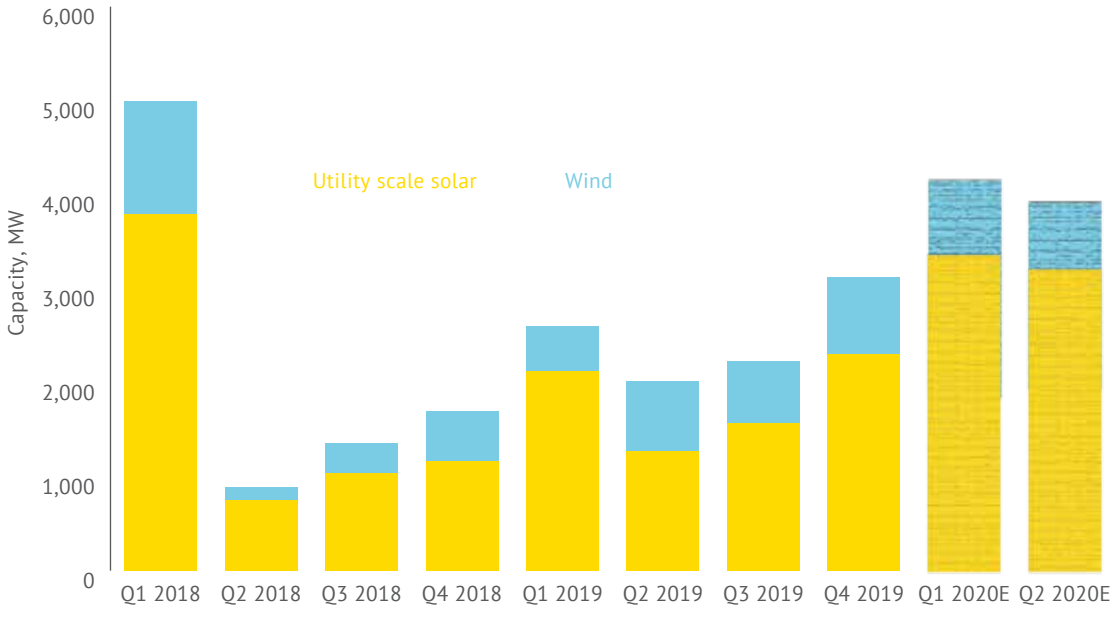
As per JMK Research estimates, the year 2020 is expected to witness over 45% growth with addition of another 11 GW of capacity. Central tenders (SECI/ NTPC) would cover over 50% of this estimated capacity. About 1 GW of the solar capacity would be added in open access mode under Group Captive Model mainly in Haryana and Uttar Pradesh.

Taking state wise allocations into account, most of the projects expected to be commissioned in 2020 would be located in Rajasthan, Gujarat, Karnataka, Maharashtra and Uttar Pradesh.
Apart from the 11 GW of utility scale solar, the rooftop/ onsite solar is also estimated to add nearly 1.8 GW of new capacity in 2020. The wind sector expects to stack up 4 GW of capacity in 2020. This would be 66% y-o-y increase from 2.7 GW in the year 2019.

2.3 Quarterly Trends

In Q4 2019, 2,308 MW of solar and 817 MW of wind projects were installed. This quarter witnessed a significant rise of 40% in total RE installation as compared to the previous quarter. The details of project commissioned in Q4 2019 are given in Annexure (Table 11.4).
As per our estimates, next two quarters i.e. Q1 2020 and Q2 2020 are expected to add about 6 GW of new solar capacity and 2 GW of new wind capacity.

Figure 2.3 Quarter-wise utility scale solar and wind installations

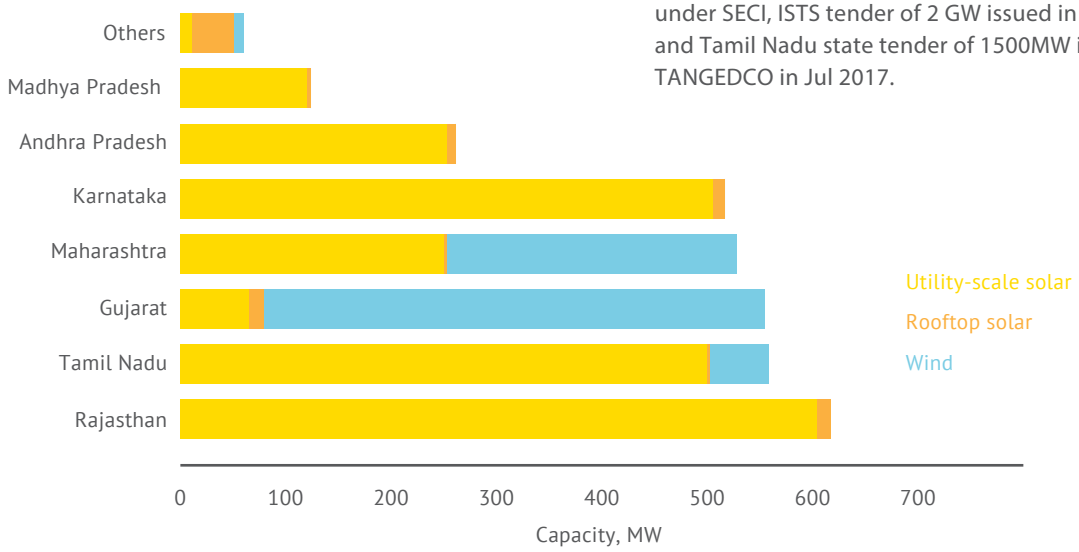


Source: MNRE, IWTMA, JMK Research

2.4 State-wise Installations

Rajasthan (617 MW), Tamil Nadu (559 MW) and Gujarat (555 MW) are the top three states and accounted for 55% of total RE installation in Q4 2019. While Rajasthan, Karnataka and Tamil Nadu led the Q4 2019 solar installations, Gujarat and Maharashtra led the installations in wind. Key tenders where maximum solar projects got commissioned are in Rajasthan under SECI, ISTS tender of 2 GW issued in July 2018 and Tamil Nadu state tender of 1500MW issued by TANGEDCO in Jul 2017.

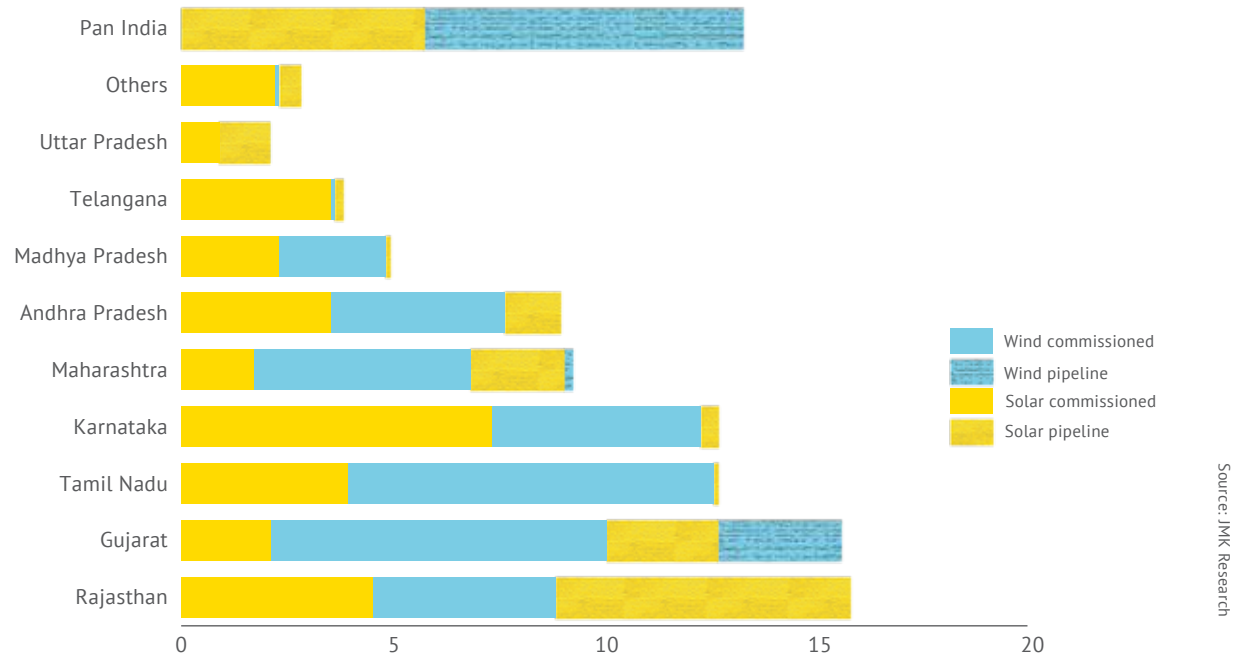
Figure 2.4 State-wise RE capacity addition in Q4 2019



Source: JMK Research

Cumulatively, the maximum utility scale solar installations came up in Karnataka, Rajasthan and Tamil Nadu. Further, most of the new installations in solar would be located in Rajasthan.
In wind, maximum capacity till date is commissioned in Tamil Nadu and Gujarat only.

Figure 2.5 Cumulative solar and wind commissioned and pipeline capacity, GW



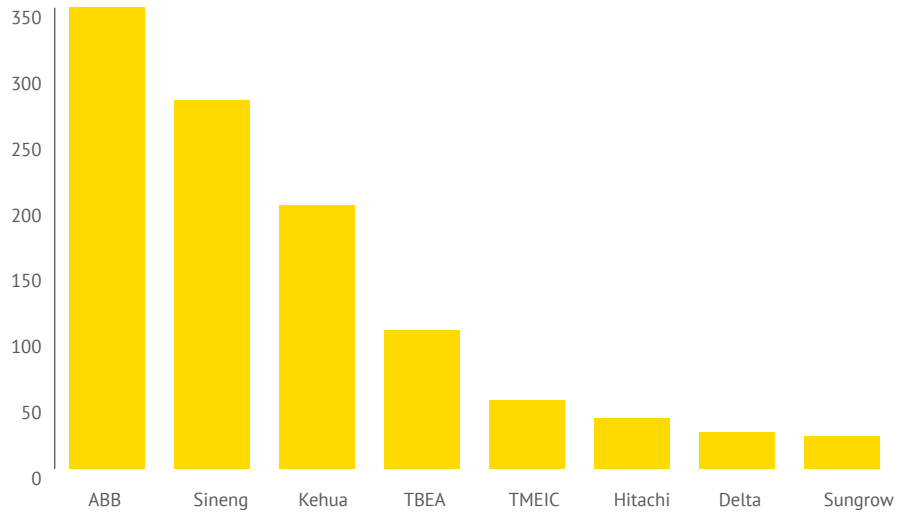
Source: JMK Research

3. Market shares

3.1 Inverter suppliers

In Q4 2019, ABB and Sineng were the leading players in the central inverter category while Huawei and Growatt shipped the highest number of string inverters.

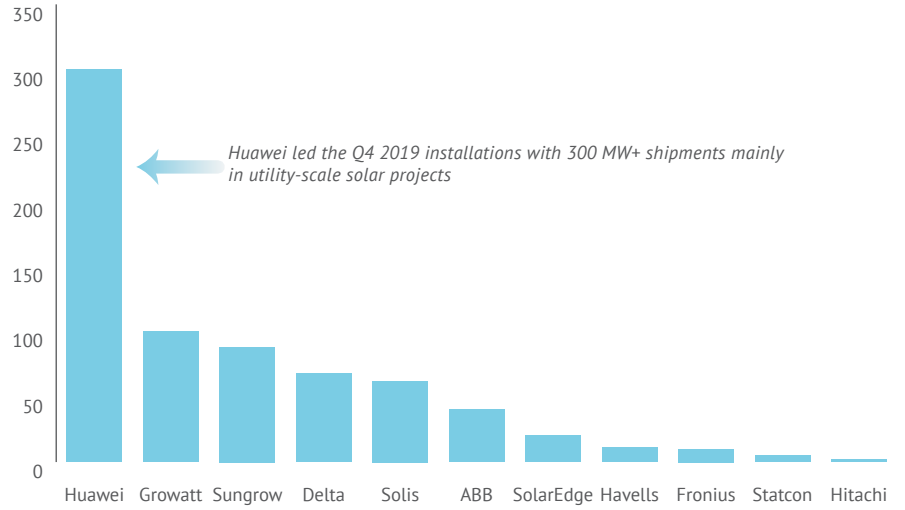
Figure 3.1- Leading central inverter suppliers in solar sector in India in Q4 2019



Source: JMK Research

Note: Leading players are listed based on their shipment numbers in Q4 2019 (Oct- Dec) in India. Kehua and TBEA have not confirmed their quarterly data.

Figure 3.2- Leading string inverter suppliers in solar sector in India in Q4 2019



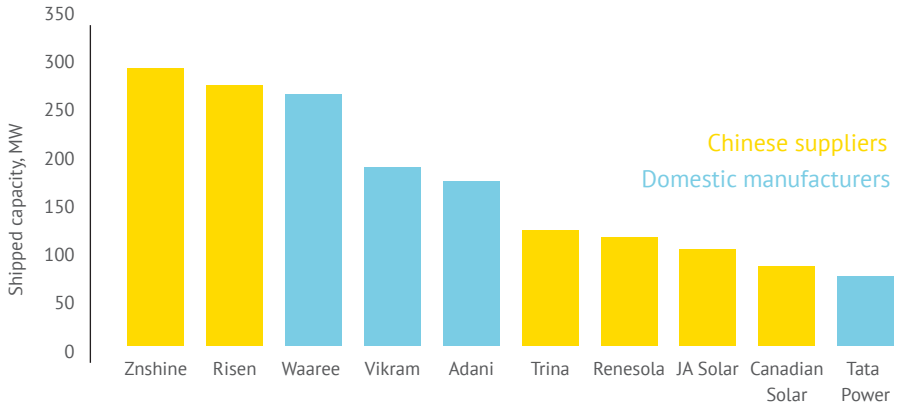
Source: JMK Research

Note: Leading players are listed based on their shipment numbers in Q4 2019 in India. Huawei has not confirmed its quarterly data.

3.2 Module Suppliers

In Q4 2019, Znshine topped the module suppliers category with maximum supplies to ReNew Power while Risen is at second position with maximum shipment to SB Energy. Amongst the domestic suppliers, Waaree led the market with about 270 MW of shipment.

Figure 3.3: Leading module suppliers in solar segment in India in Q4 2019



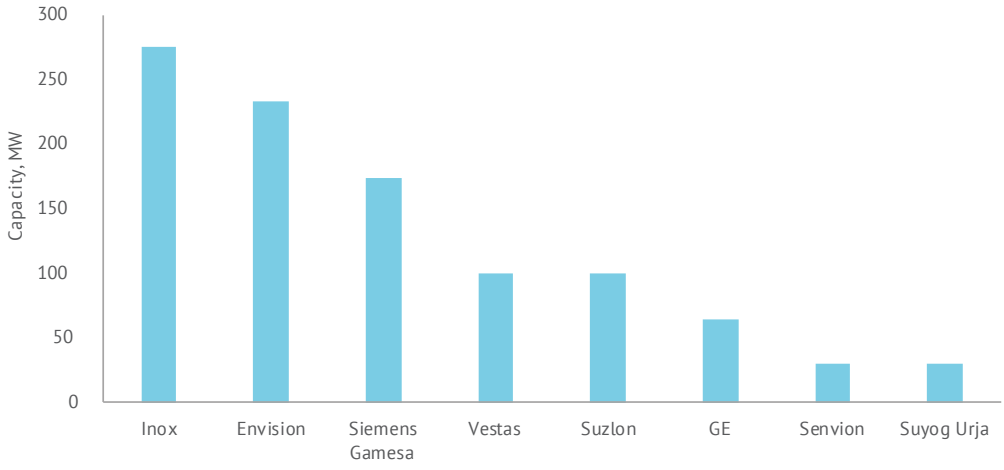
Source: JMK Research

Note: Leading players are listed based on their shipment numbers in Q4 2019 in India. Suntech, JA Solar, Jinko Solar and GCL have not confirmed their quarterly data.

3.3 Turbine Suppliers

In Q4 2019, Inox and Envision installed maximum wind turbines in India.

Figure 3.4- Leading wind turbine suppliers in Q4 2019

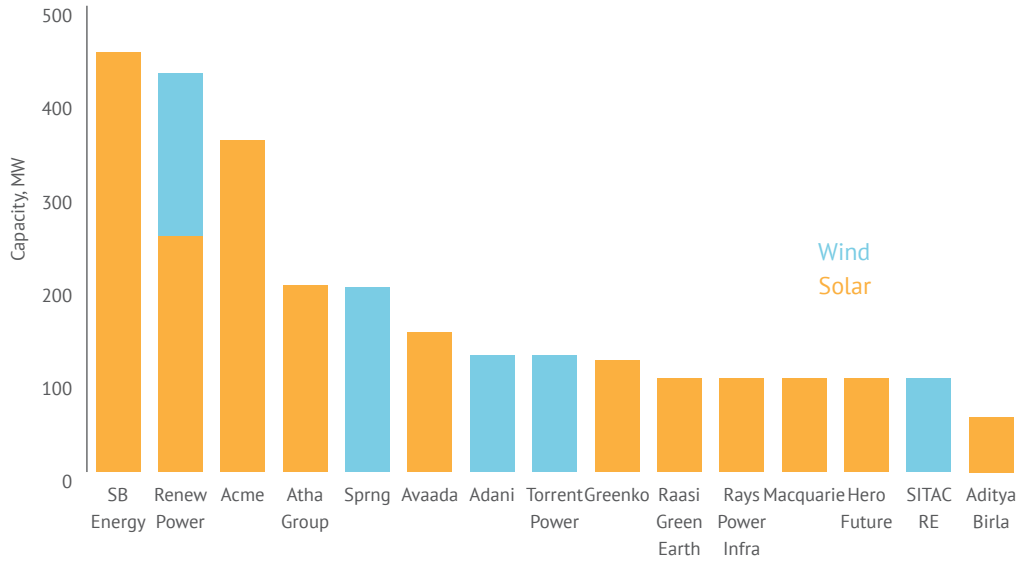


Source: JMK Research

3.4 Project Developers

In Q4 2019, SB Energy and Acme installed maximum solar capacity, while Sprng Energy and ReNew commissioned most of the wind capacity.

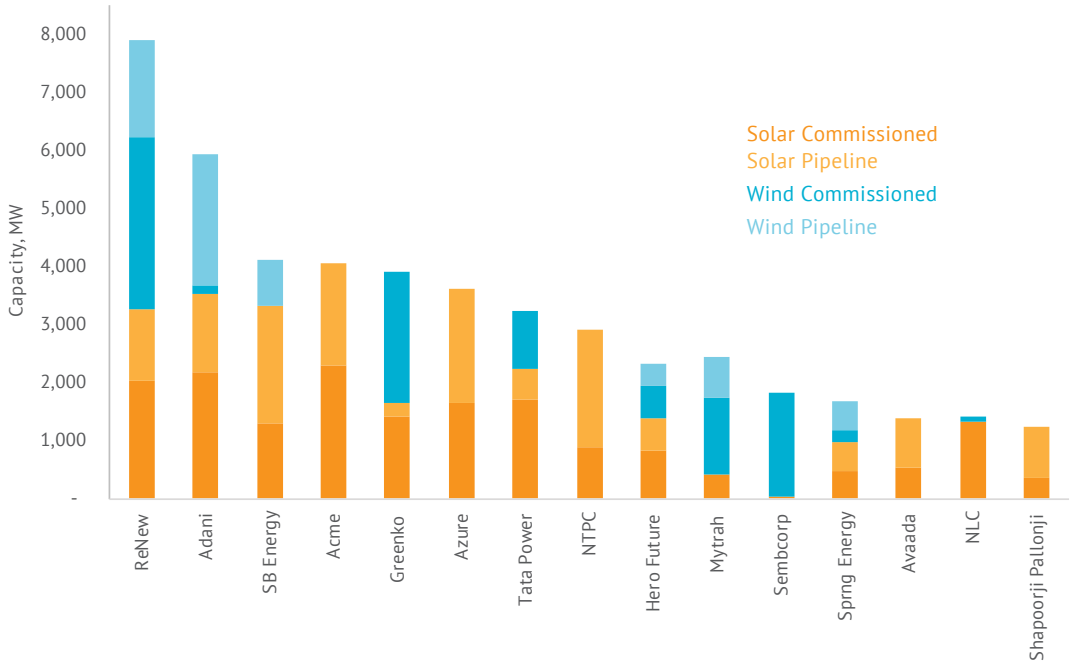
Figure 3.5- Leading project developers in Q4 2019



Source: JMK Research

In terms of cumulative installations, across the utility-scale solar and the wind segment, as of December 31, 2019, ReNew is the leading player with about 5 GW of operation portfolio and another 2.9 GW of projects in pipeline.

Figure 3.6- Top 15 project developers, as of December 31, 2019



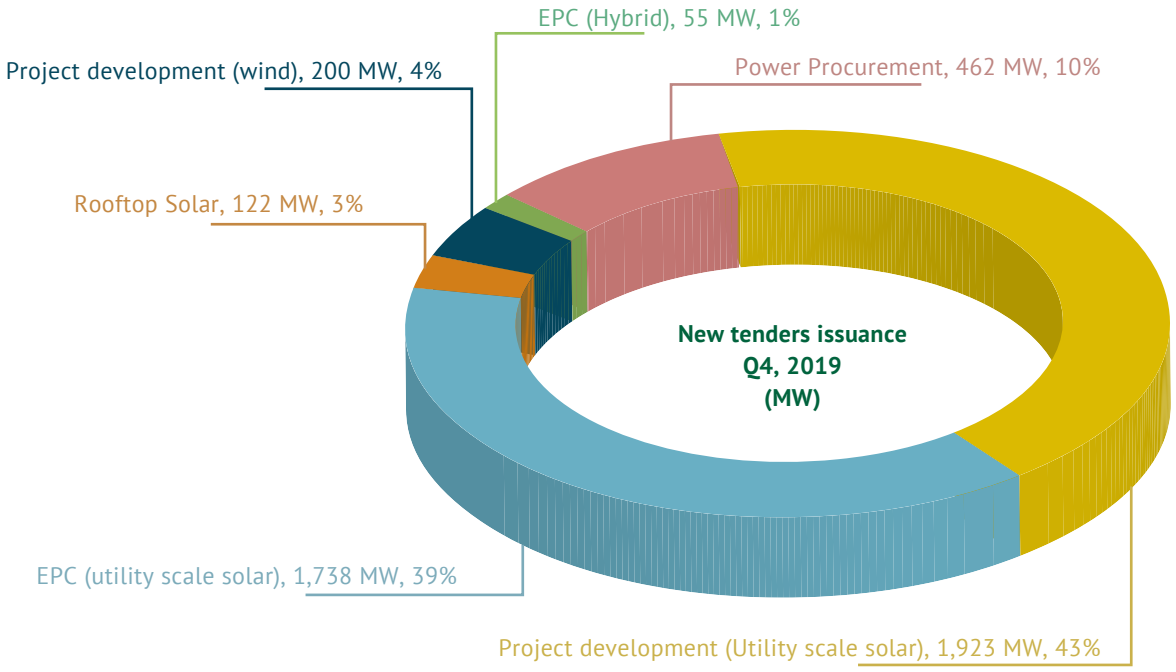
Source: JMK Research

4. Tenders

4.1 New Tenders

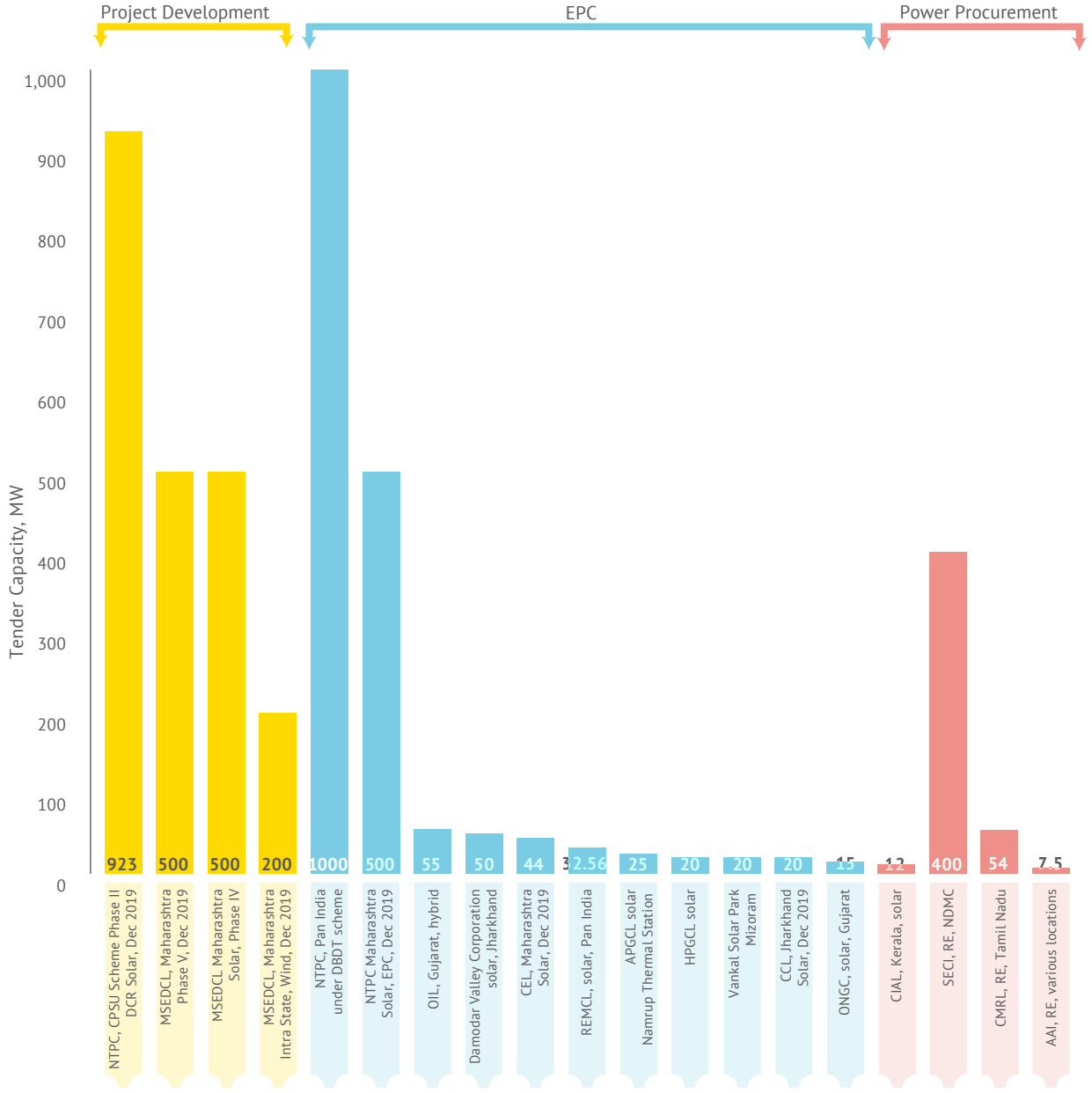
In Q4 2019, 41 tenders aggregating 4.5 GW of capacity were issued across solar and wind segments. At a cumulative capacity of 3.7 GW, the utility scale solar tenders for EPC and Project development took the highest share of 82%. The remaining share includes a 200 MW of Wind project development tender by MSEDCL, a 55 MW of Hybrid EPC tender by OIL, and several power procurement tenders, amounting to 462 MW, issued by SECI, Chennai Metro Rail Corporation and Airport Authority of India.

Fig 4.1 New RE tenders issuance in Q4, 2019



Source: JMK Research

Fig 4.2 Details of new RE tenders issued in Q4, 2019



Source: JMK Research

Fig 4.3 Rooftop solar tenders issued in Q4 2019

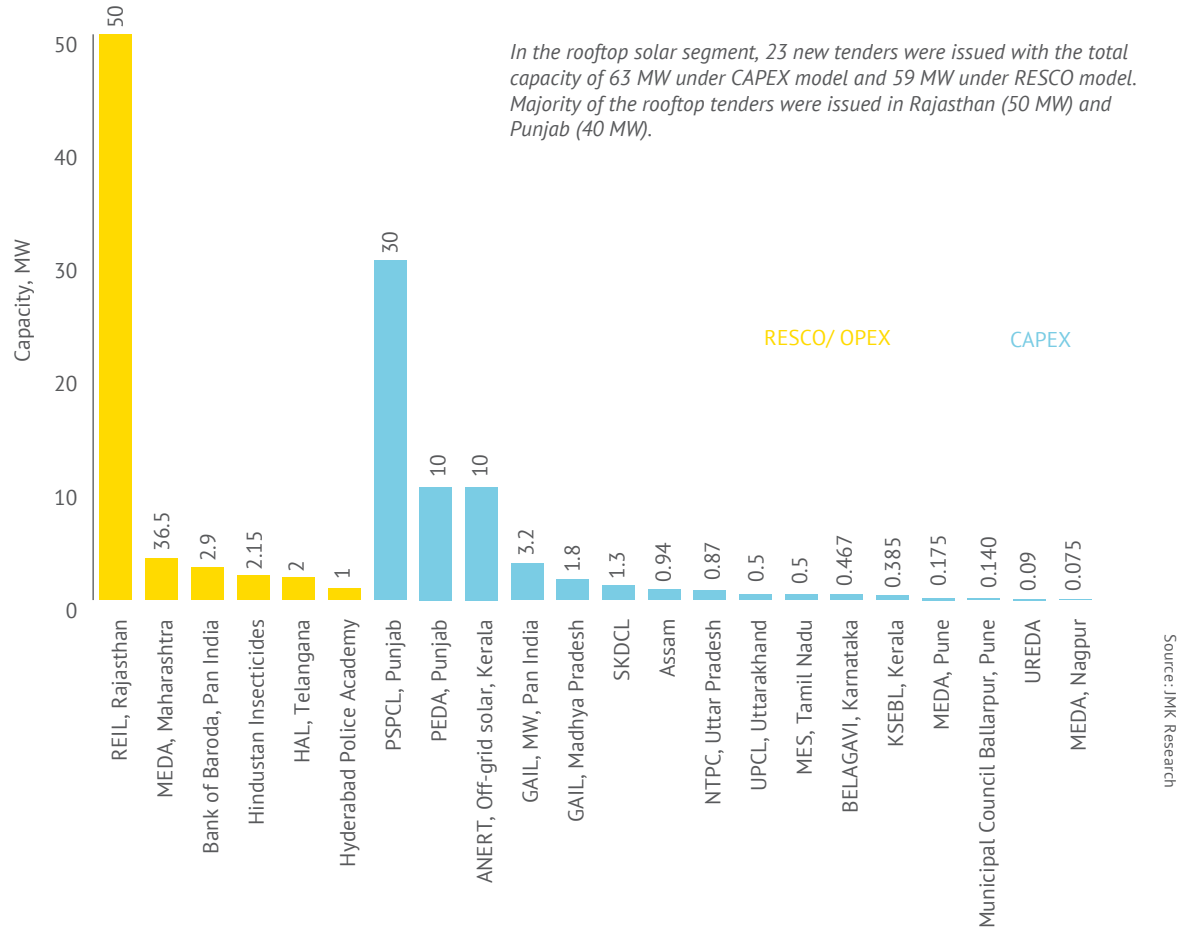
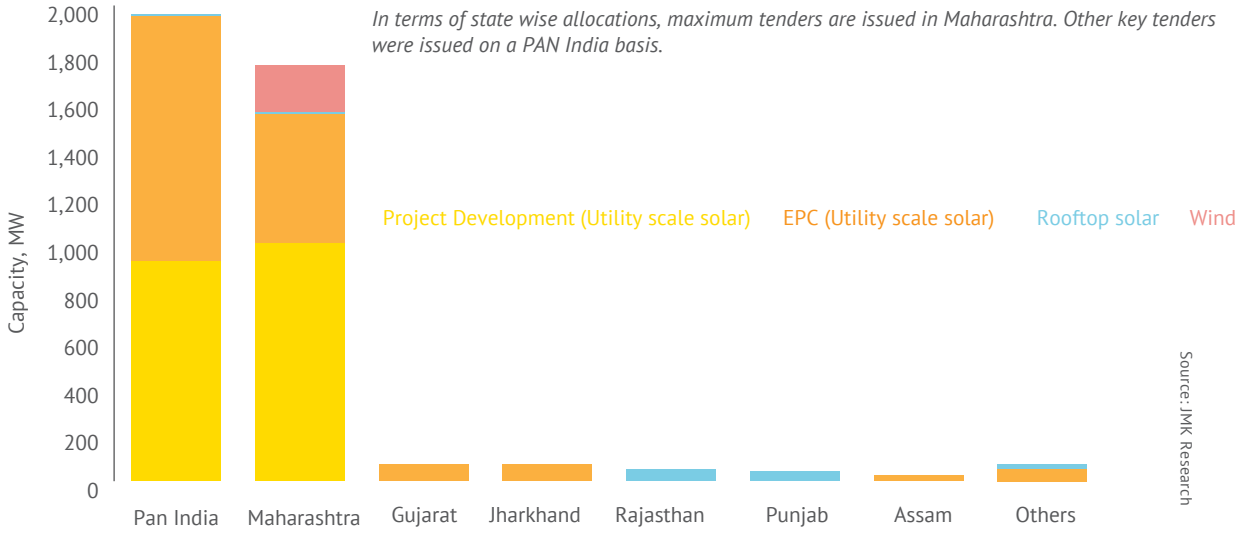
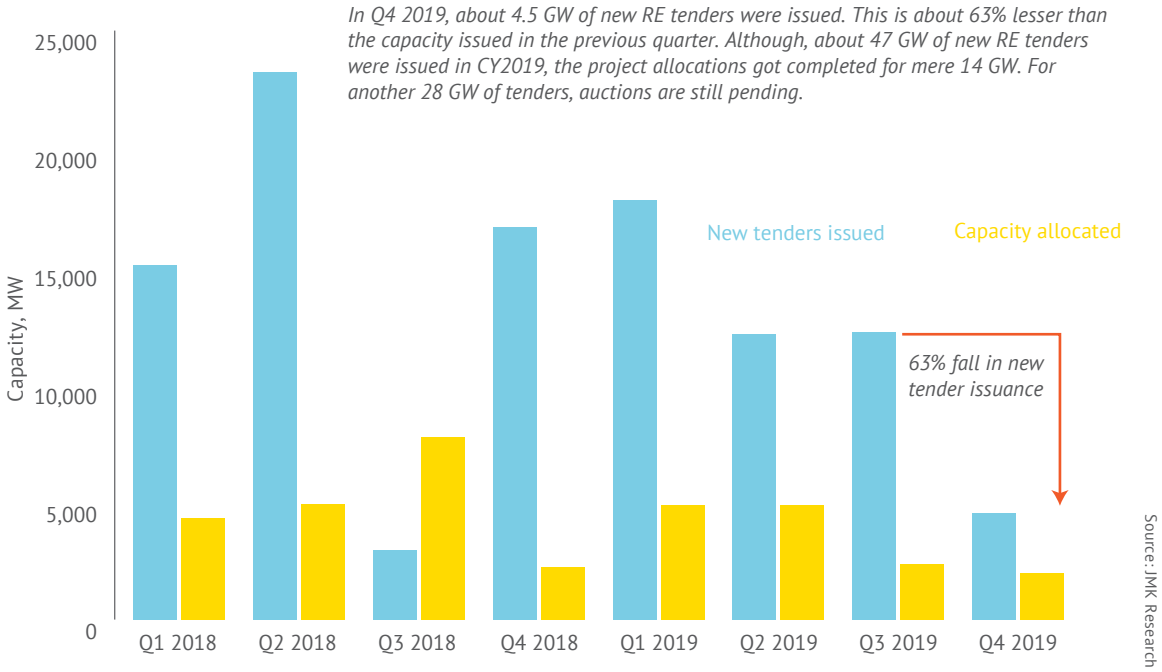


Fig 4.4 State wise details of tenders issued in Q4 2019



Note: Power procurement tenders are excluded from this analysis

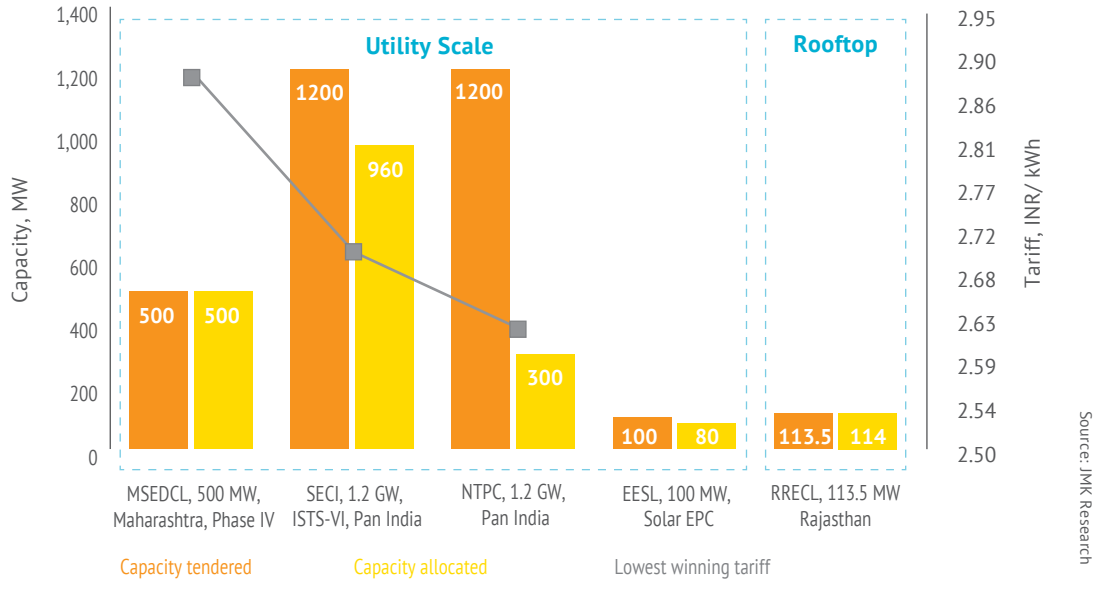
Fig 4.5 Quarter-wise solar, wind and hybrid tender issuance and allocations



4.2 Successful Auctions

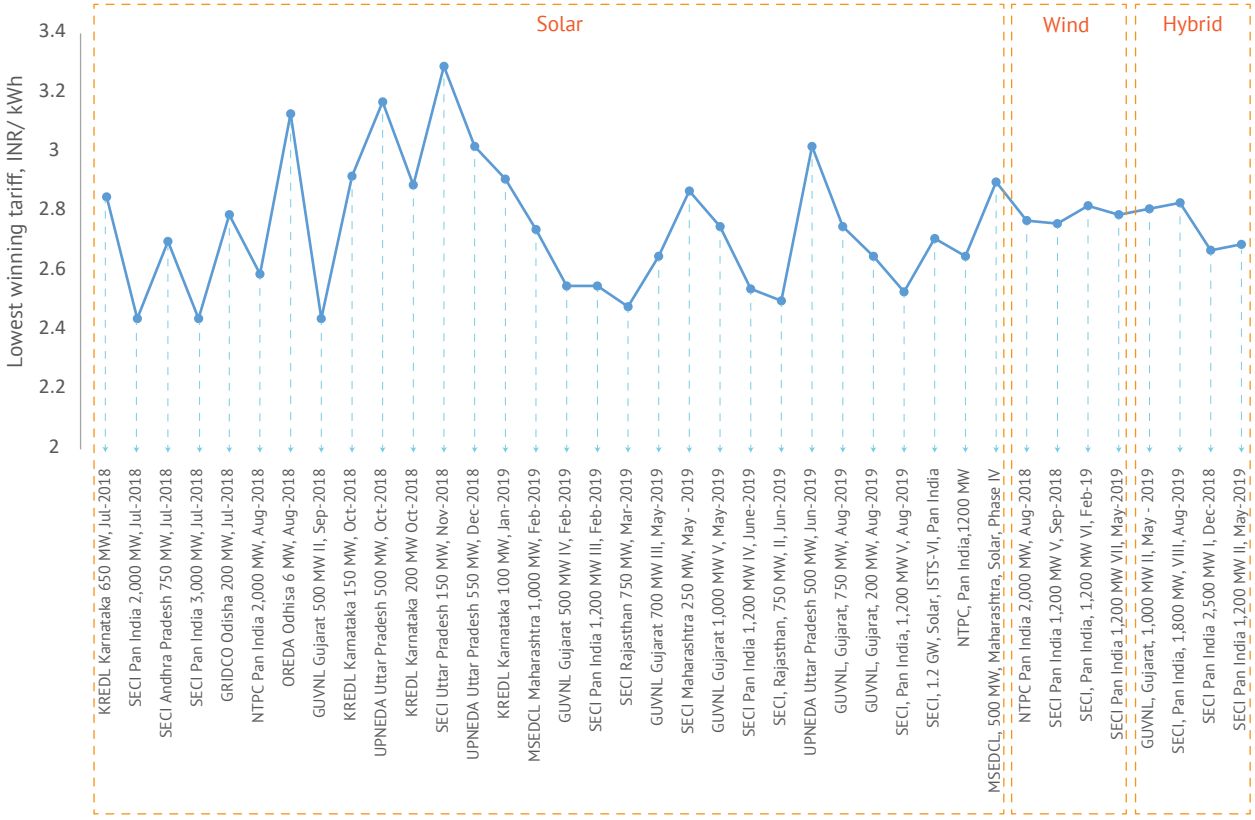
In Q4 2019, about 3,113 MW capacity was auctioned/ tendered out of which only 1,973 MW was allocated (~37% under subscription). This under subscription is largely due to the lower ceiling tariffs set by the tendering authority, poor site conditions in solar parks, unavailability of suitable land with good potential and grid connectivity.

Fig 4.6 Solar tenders allotted in Q4 2019



4.3 Tariff Trends

Fig 4.7 Tariff trend in auctioned solar, wind and hybrid tenders

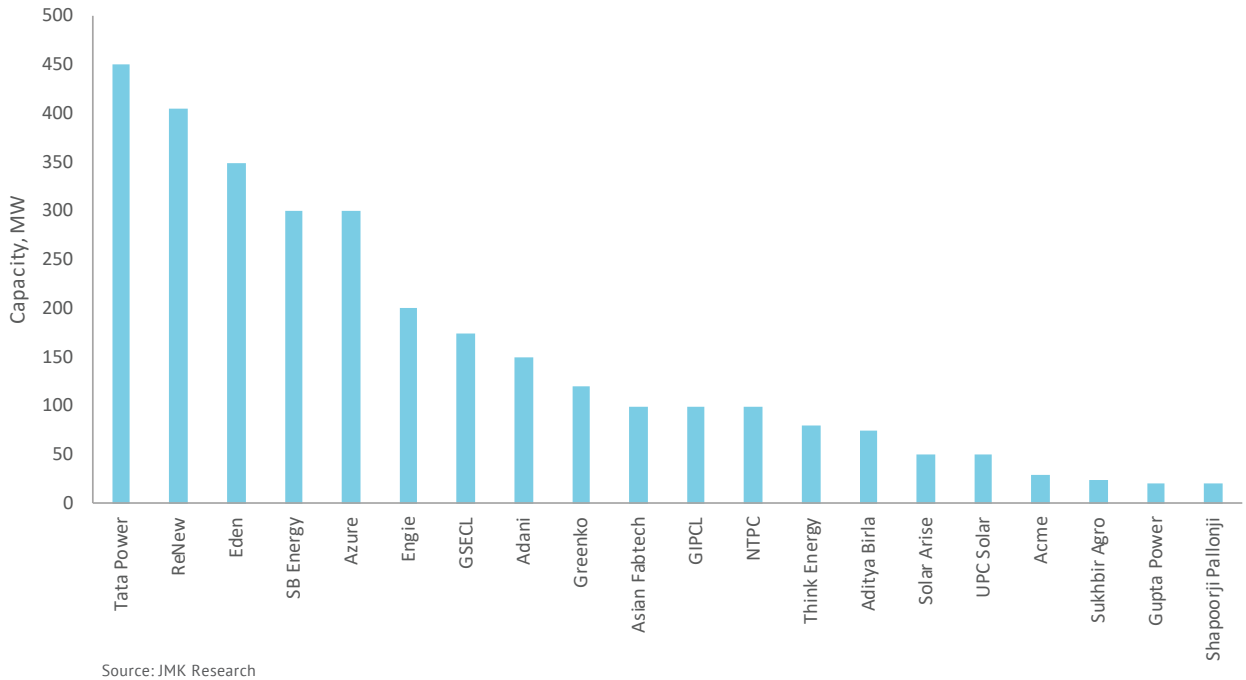


Source: JMK Research

5. Equipment Procurement in the Next 2 Quarters

In Q1 2020 and Q2 2020, for about 3.1 GW of solar projects, developers are expected to start modules and inverters procurement. Most of these projects are likely to be located in states of Gujarat (1,300 MW), Rajasthan (1,200 MW), Maharashtra (250 MW) and Karnataka (200 MW).

Fig 5.1 Top developers likely to procure inverters and modules in Q1 2020 and Q2 2020



Source: JMK Research

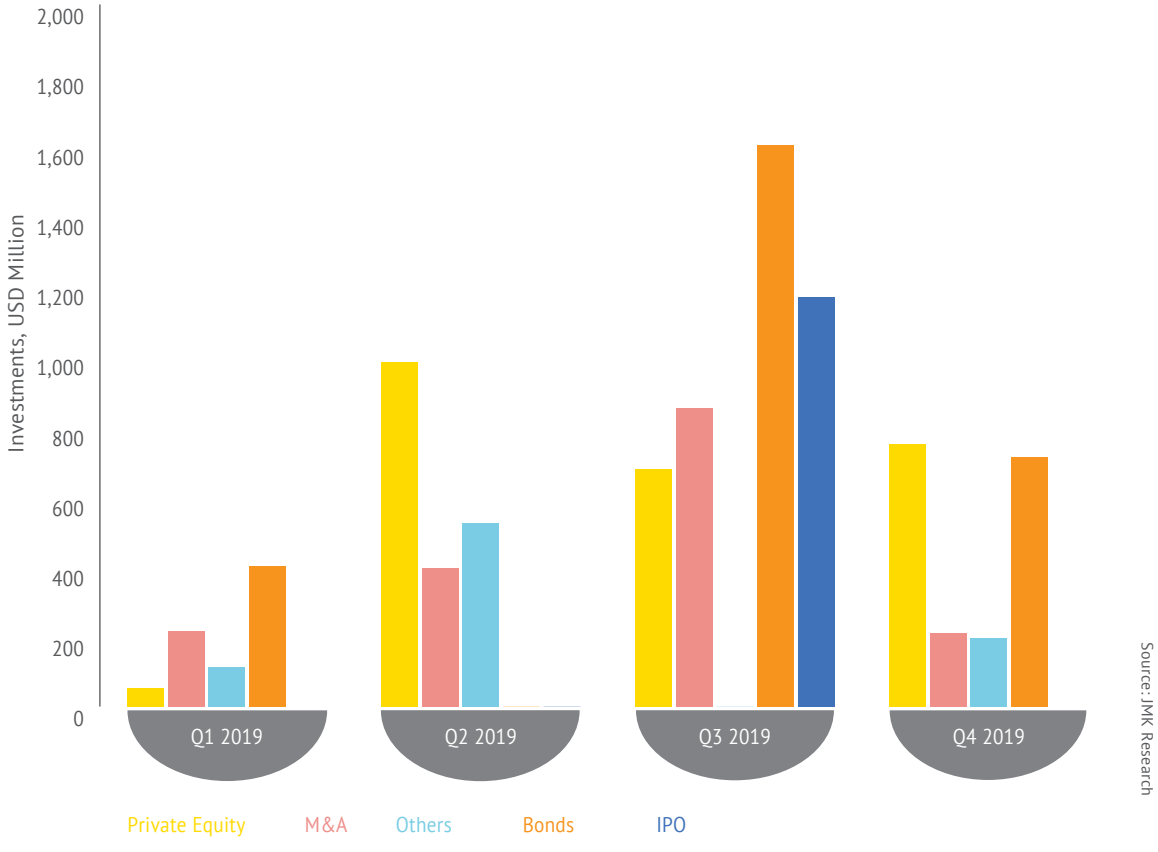
Apart from these, SB Energy (450 MW) and Adani (390 MW) are expected to procure equipment for development of wind solar hybrid projects under SECI tender in Q1 2020

6. Financing Deals

Investment flow in RE sector in Q4 2019 (USD 1,440 million) were significantly lower than the investments in previous quarter i.e. Q3 2019 (USD 4,300 million). Key investments in Q4 2019 were:

- Setting up of a new renewable energy platform O2 Power with $500 million equity investment by Temasek and EQT. O2 Power will target over 4 GW of installed capacity across solar and wind in India.
- Adani Green Energy, has raised $362.5 million by selling dollar bonds, as it plans to refinance its existing debt and support capital expenditures. Such dollar-denominated bonds yielded 4.625% with 20-year maturity.
- Masdar, also known as the Abu Dhabi Future Energy Co., has acquired around 20% in Hero Future Energies for $150 million, valuing the Indian renewable firm at $750 million.
- Vector Green Energy Private Limited acquired 225 MW solar assets from RattanIndia. Vector Green is a wholly-owned subsidiary of India Infrastructure Fund– II, which is managed by Global Infrastructure Partners (GIP).

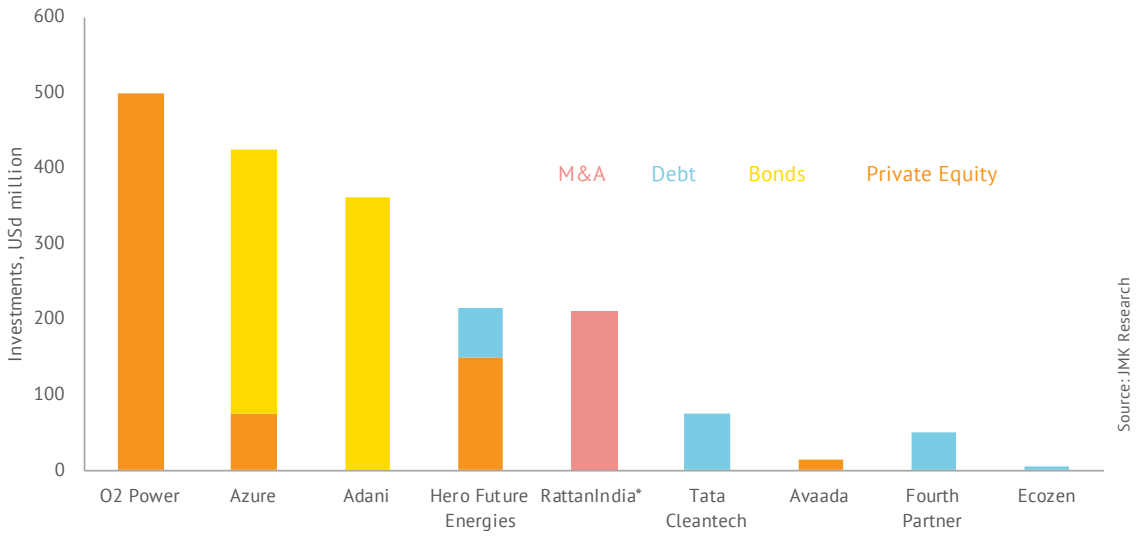
Fig 6.1 Quarter-wise investment flow in Indian RE sector, USD million



Note: Other includes JV, grant, debt and mezzanine funding

Source: JMK Research

Fig 6.2 Investments raised in Indian RE sector in Q4 2019



* Estimated deal value. Actual deal value not yet disclosed

Table 6.1 Summary of key financial deals in Q4 2019 in RE sector

Date	Company Name	Deal Type	Sector	Acquired by/Investor	Deal Value ($ Millions)	Stake Acquired
01-Oct-19	Azure Energy	Green Bonds	Solar	NA	350.1	NA
02-Oct-19	Orb Energy	M&A	Solar	Shell	NA	20%
03-Oct-19	Adani Green Energy	Green Bonds	Solar	NA	362.5	NA
15-Oct-19	SunEdison	M&A	Solar	Avyan Renewable	NA	31%
11-Nov-19	Hero Future Energies	Equity	Solar	Masdar	150	20%
15-Nov-19	Tata Cleantech	Debt	Renewable	AIIB	75	NA
20-Nov-19	Avaada Energy	Equity	Solar	PROPARCO	15	NA
05-Nov-19	O2 Power	Equity	Renewable	Temasek, EQT	500	100%
16-Nov-19	Azure Power	Equity	Solar	CDPQ	75	8%
23-Dec-19	Hero Future Energies	Debt	Solar	AIIB	65	NA
18-Dec-19	Ecozen	Debt	Solar cold storage & solar pumps	Sathguru Catalyser's IFA Fund	6	NA
16-Dec-19	RattanIndia*	M&A	Solar	Vector Green	210	100%
17-Dec-19	Fourth Partner Energy	Debt	Solar	Bank of America	50	NA

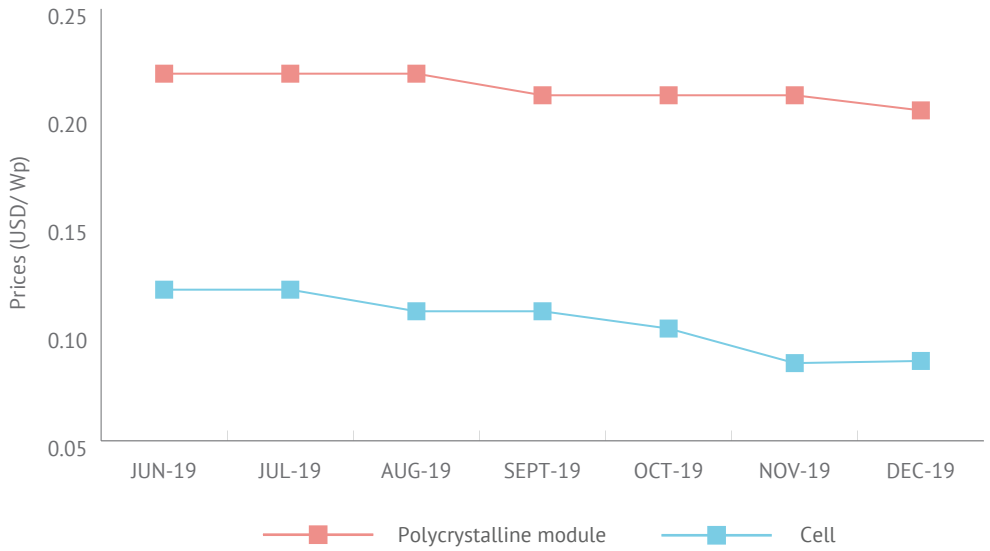
Source: JMK research

* Tentative deal value. Actual deal value not yet disclosed

7. Price trends

In the overseas market, the price of solar cells in Q4 2019 fell by 17% over previous quarter while the prices of polycrystalline solar modules reduced by 4% over Q3 2019.

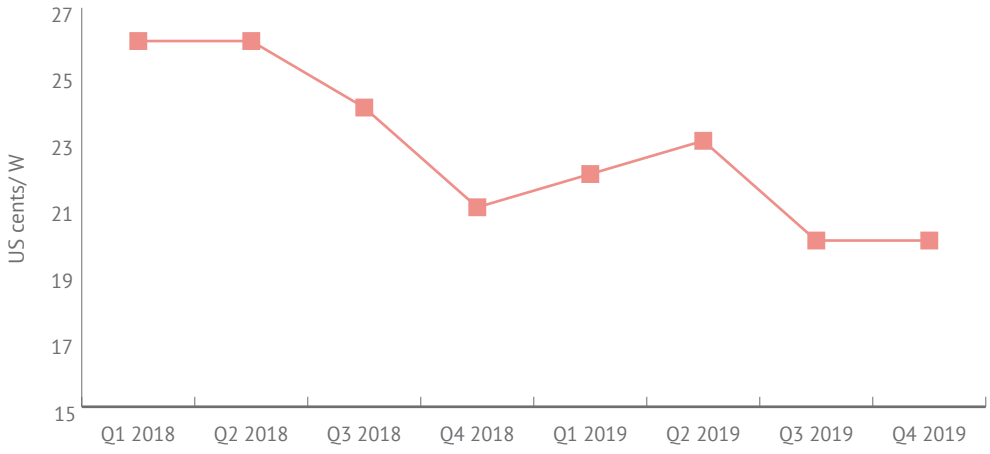
Fig 7.1 Global price trends of solar cells and modules in Q4 2019



Source: JMK Research

In Q4 2019, the landed price of Chinese modules (including GST and 15% safeguard duty) in the Indian market was in the range of 18-20 US cents/ Wp. This is 9% decline from Q1 2019 prices. Mono module prices were about 1-2 US cents higher than the polycrystalline modules.

Fig 7.2 India price trends of polycrystalline solar modules



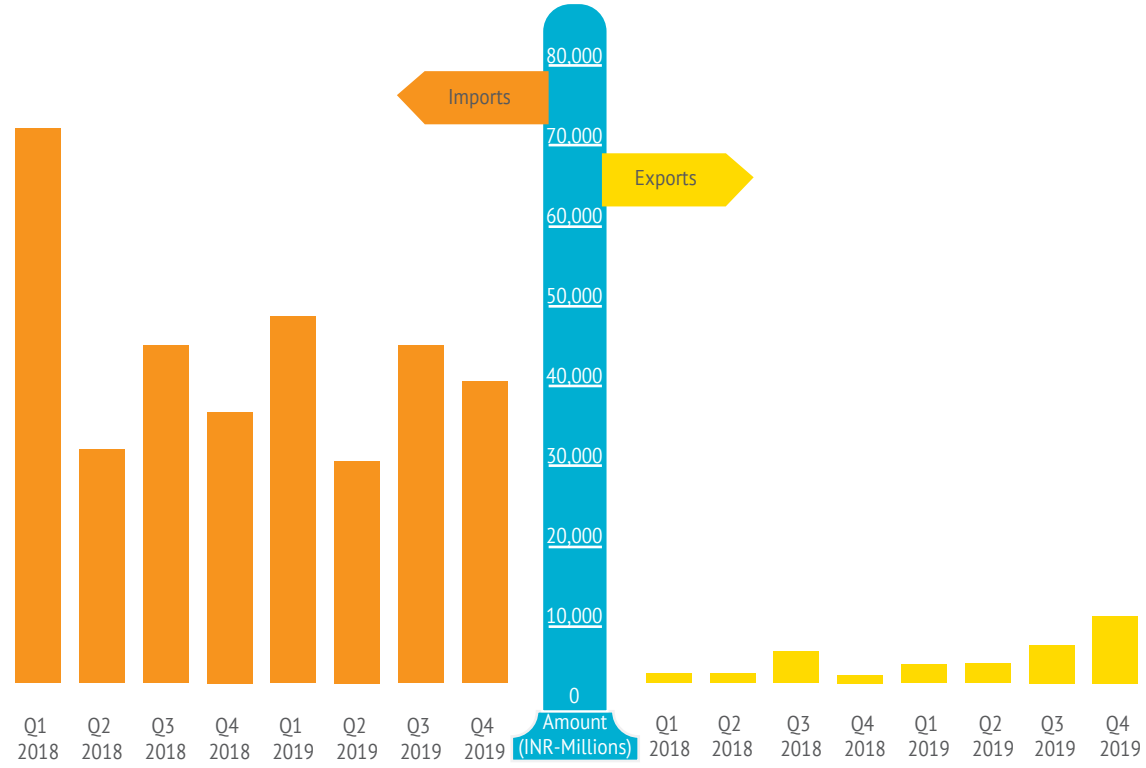
Source: JMK Research

*Note: These prices are excluding safeguard duty and GST

8. Quarterly Import-Export Statistics

In 2019, the exports of solar modules rose substantially by 143% compared to 2018. The imports in the same time-period, however, declined by 12%. This decline in imports was majorly due to implementation of 25% safeguard duty last year. This year with the reduction in safeguard duty the import numbers are expected to be higher.

Fig 8.1 Quarter-wise import and export data for solar modules



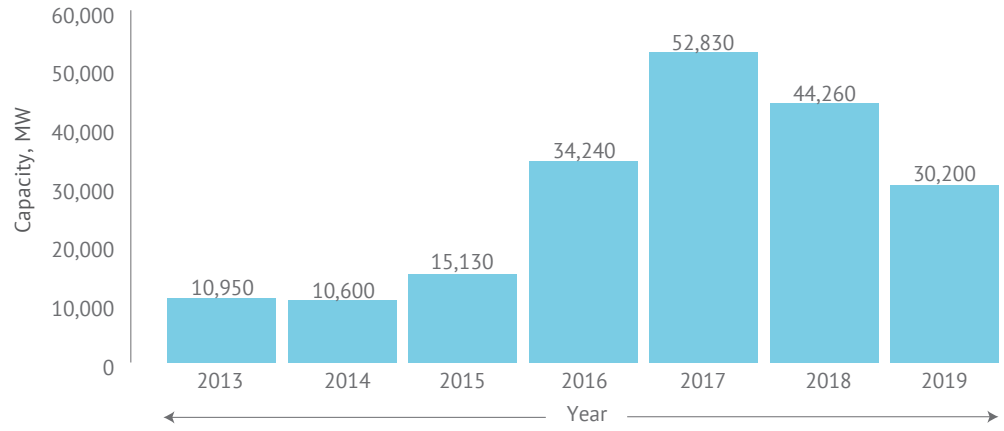
Source: Ministry of Commerce, JMK Research

9. Market trends

China installs 30.2 GW in 2019 – 32% fall from the previous year

In China, the total installed capacity of the solar PV installations during 2019 has been 30.2 GW, which is about 25% y-o-y decline in comparison to 42.6 GW installation in 2018.

Fig 9.1 China Solar PV Installations



Source: National Energy Administration

The fall in the installation capacity is due to the policy changes, as Chinese government decided to lower its budget for the PV installations and therefore stopped approval of new solar plants. This can also be due to over achieved targets of 13th five-year plan of China. As per Asia Europe Clean Energy Advisory (AECEA), it is expected that the capacity addition in 2020 would be around 23-31 GW capacity and the total budget for 2020 solar would be around RMB 1.75 billion (which is about 42% lesser than the 2019 budget).

This change can also affect the global solar module prices as manufacturers based in China would not be able to utilise the complete production capacity in domestic market. This can lead to excess supply in the global market thereby leading to fall in module prices.

Tariffs for RE plus storage tenders competing with thermal

In the last 18 months in India, we have seen that there is a growth spurt in storage tender issuance; however, only for a few small tenders, the auctions are successful. In most other tenders, the storage capacity is so high that it leads to infeasible tariffs, and eventually to cancellations of many of these tenders.

The one significant milestone for the storage sector is achieved last week, with the successful auction of SECI 1,200 MW RE storage tender with guaranteed peak power supply. In this tender, renewable technology can be a solar system, a wind energy system, or a hybrid system, and storage can include battery energy storage systems, pumped storage systems, mechanical and chemical

systems, or combinations thereof.

Greenko has won 900 MW, and ReNew Power has won 300 MW of projects under this tender. Greenko is opting for pumped hydro storage while ReNew is planning Battery Energy Storage System (BESS). Summary of the result is as below:

Table 9.1 Winners of SECI, 1,200 MW RE+storage tender

Project Developers	Total Capacity (In MW)	Off-Peak Tariff (INR/unit)	Peak Tariff (INR/unit)	Weighted Average Tariff* (INR/ unit)
Greenko	900	2.88	6.12	4.04
ReNew Power	300	2.88	6.85	4.30

*The weighted average tariff is based on the normative capacity utilization factor of 35% as per the condition of the tender.

As per the tender conditions, DISCOMS can ask for peak power supply for 9 hours (morning peak 6-9 AM and evening peak from 6 to 12 PM) during the 24 hours of the day. The minimum Energy Storage System (ESS) rated energy capacity installed shall be equal to "X/2" MW, where X is the contracted capacity of the project as per PPA. Therefore, for ReNew, the BESS rated capacity would be 150 MW, while for Greenko pumped hydro storage capacity would be 450 MW.

The rates quoted in this auction are very competitive, and the industry is very optimistic about these tenders, which have something new to offer. The weighted average tariff for this tender is even lower than the cost of new thermal power plants where the tariff is in the range of INR 4.5-6/ unit. With falling battery prices, the cost of peak tariffs is also anticipated to come down significantly in the next few years. As per various industry sources, the current EPC prices of battery storage are in the range of USD 300-320/ kWh and by 2021, the costs are estimated to reduce by 15 -20% to fall in the range of USD 250-270/ kWh.

The emergence of storage technology coupled with renewables is the beginning of a new era for the Indian power sector wherein conventional sources would be replaced with stable renewable power technology.

Several wind power projects miss completion deadlines

Several wind power projects have missed their completion deadlines due to non-availability of land issues. Since Feb 2017, projects worth 7.3 GW of capacity has been awarded and the deadline for project completion is from 18 – 24 months from the date of LOI/ signing of PPA. However till date only 2.7 GW of projects got commissioned.

With lower tariff all the wind developers have planned their project in either Gujarat or Tamil Nadu (both the states have good wind resources) however, Gujarat government introduced new land policy which has stopped the land allocation for wind projects planned under central government schemes. There are also lot of land issues in Tamil Nadu as well and state is refusing conversion of agricultural land for wind projects.

The deadlines for the other projects are closing in and almost 4.6 GW has to be commissioned in CY

2020. If the land issue doesn't get sorted out, we would be seeing further delays in commissioning of these wind projects. Developers also don't have the option to look at alternate sites in other states because of lesser wind resources/ potential, which is likely to affect the power generation and hence the viability of the projects.

Policy and Regulatory uncertainty crisis loom large on renewable sector

After regressive net metering policies in Uttar Pradesh, Rajasthan and Tamil Nadu, now Maharashtra has come with the Grid Support charges (GSC) for capacity over 10 kW for net metering rooftop solar in their new regulation. As per MERC's Grid-Interactive Rooftop Renewable Energy Generating Systems Regulations, 2019, *"The Commission may determine in the retail tariff order such grid support charges to be levied on the generated energy under net metering systems which should cover balancing, banking, and wheeling cost after adjusting the RPO benefits avoided distribution losses and any other benefits accruing to the distribution licensee. These grid support charges would be determined consumer tariff category wise, based on the proposal of the distribution licensee in its retail supply tariff petition, supported by adequate justification."*

According to the MSEDCL's proposal, the GSC charges range from INR 4.46- 8.66/ unit for domestic consumers and INR 5.06- 8.76/ unit for commercial consumers. For industrial consumers, GSC would be in range of INR 3.60- 4.08/ unit.

Such high charges are very detrimental to the growth of rooftop solar industry in the state of Maharashtra, who has always been the frontrunner's in the rooftop solar installations in the country.

Similarly, in December 2019, Andhra Pradesh government has withdrawn all the waivers in T&D charges, wheeling charges, banking facility etc. given in its previous policies announced in Dec 2018 for wind, solar and hybrid projects. All these amendments have been implemented retrospectively and will have a huge negative impact for future investments in renewable sector in Andhra Pradesh.

9. Policy and Regulations

Chhattisgarh Grid Interactive Distributed Renewable Energy Sources Regulations, 2019

Chhattisgarh issued regulations specifying the terms and conditions for grid interactive distributed RE sources.

Highlights

- A consumer can set up solar plant on its own location or on the premises of a third-party owner under a contractual agreement.
- The prosumer can install grid interactive distributed renewable energy system with or without battery back-up.
- Under net metering arrangement, the distribution licensee shall procure excess energy generated at lowest rooftop solar tariff discovered through competitive bidding in the last financial year.
- 100% banking of energy shall be permitted for all captive and open access consumers @2% banking charges.
- The unutilized energy/ surplus energy at the end of financial year would be purchased by Discom at the lowest tariff discovered for solar rooftop in the financial year.
- In case a distribution licensee fails to meet the prescribed timelines, a penalty of INR 1000/day would be levied for each day of delay.

Impact

These regulations are very progressive and would encourage the distributed renewable energy installations especially in the roof top sector in the state of Chhattisgarh. At the time when most of the states are withdrawing facilities like Net metering and banking of the energy for the C&I consumers, these regulations bring in a sigh of relief and might make other states to rethink. These regulations also have provision to levy penalty on the Discoms if they fail to fulfill their duties.

First amendment to MPERC regulations, 2018

(Forecasting, Scheduling, Deviation Settlement Mechanism and related matters of Wind and Solar generating stations)

Highlights

- The regulations are applicable to all wind power generators with capacity of 10 MW and above and solar power generators with capacity of 5 MW and above. These are also applicable to all wind and solar generators selling power outside the state under open access and having combined installed capacity of 1 MW and above.
- Its mandatory for all wind and solar generators to appoint a common Qualified Coordinating Agency (QCA) within two months from the date of issue of notice by the State Load Dispatch Center (SLDC). Failing to do so, the concerned licensee would be asked by SLDC to disconnect the defaulting generators.
- MPERC has asked QCAs to submit payment security in the form of Bank Guarantees towards the settlement of Deviation Settlement Mechanism(DSM) charges. Payment security has to be

provided for Solar at INR 10,000/ MW and for Wind at INR 40,000/ MW.

- Intra-day revisions are to be restricted to 16 revisions in a day at an interval of 1.5 hrs (in line with CERC guidelines). Earlier, there was no restriction on the number of revisions.

Impact

These amendments have made norms for forecasting and scheduling stricter, which is needed for managing the grid stability.

Amendments, issued by MNRE, to the Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Solar PV Power Projects

- Under these guidelines, the Intermediary Procurer shall enter into a PPA with the Solar Power Generator along with a Power Sale Agreement (PSA) with the End Procurer. The trading margin, of INR 0.07/ kWh will be payable to the intermediary procurer by the end procurer.
- In case of aggregation of power purchased from different Solar Power Generators, the interme diary procurer may sell the solar power to end procurer at the weighted average of tariffs discovered and finalised for different bids over a period of (1st January to 30th June) or (1st July to 31st December) of any year.
- The Intermediary Procurer shall provide payment security to the Solar Power Generator through Letter of Credit (of amount not less than 1 month's average billing) and Payment Security Fund (not less than 3 month's average billing). This payment security fund would be built by taking INR 5 lakh/ MW from the solar power generator itself
- 100% land acquisition should done in the name of the Solar Power Generator by COD (earlier it was 12 months from PPA signing date)
- The force majeure condition has been elaborated in detail by categorizing into two natural and non-natural force majeure conditions. Also, now it has a provision of cancellation of PPA upon occurrence of a Non-Natural Force Majeure Event. Under this provision the generator has right to terminate the PPA forthwith after the completion of the period of 180 days from the date of the Force Majeure Notice.
- In case of backdown due to technical constraints the generator will be eligible for the 100% of the PPA tariff compensation as compared to 50% mentioned in earlier guidelines.
- For Delay in commissioning beyond six months from SCD, 'Generator Event of Default', shall be considered and the contracted capacity shall be reduced to the project capacity commissioned upto SCD + 6 (six) months. The PPA for the balance capacity not commissioned shall be terminated.

Impact

These amendments bring lot of clarity to all the stakeholders.
For generators – a) it relaxes the land acquisition time frame b) compensation against backdown increased to 100% from earlier 50% c) the delay in commissioning beyond 6 months can lead to termination of PPA for the capacity which has not been commissioned.
For intermediary procurer – a) trading margin fixed at INR 0.07/ unit b) The payment security fund to be set up using the amount collected from generators.
For end procurer – a) The concept of weighted average of tariff is introduced for end procurer.

In addition to this, force majeure conditions have been elaborated to bring clarity. Overall these amendments will have a positive impact on solar industry.

MNRE: Clarification for domestically manufactured solar PV cells

MNRE issued a notification clarifying that a solar PV cell shall be considered domestically manufactured only if the same is manufactured in India, using undiffused silicon wafer (generally called 'Black Wafer'), classifiable under Customs Tariff Head 3818. Further all steps/ processes required for manufacturing solar PV cell from the undiffused silicon wafer have to be carried out in India. The same shall be used for solar PV cell manufacturing facility required to be set-up under SECI's manufacturing linked-PPA initiative.
Solar PV cells manufactured using the imported diffused silicon wafer (generally called 'Blue Wafer') as a raw material shall not qualify as Domestically manufactured solar PV cells.

Impact

Some manufacturers have been importing semi–processed solar PV cells (generally called blue wafer) and making final Solar PV cells, in India, with little value addition while claiming the benefits available only to the indigenous manufacturers. This clarification will allow 'Make in India' benefits only to those who actually manufacture solar cells and contribute to the establishment of a strong solar manufacturing base in India.

Ministry of Power: Extension of target project commissioning date in the power regulation on inter-state transmission of solar and wind power

In Feb 2018, Ministry of Power had issued an order for the waiver of inter-state transmission charges and losses on the transmission of power generated from solar and wind power plants and transmitted over ISTS network. This order was applicable to the projects commissioned till 31st March 2022. The new order extends the end date to 31st December 2022.

Ministry of Power: Proposed rebate in the cost of power against the pre-payment made by procurer

After the LC got mandated as payment security mechanism under PPA by distribution licensee, it has been observed that the timely payment to the generators reduces the requirement of working capital. Hence, it has been proposed that an appropriate rebate mechanism be developed by the commission in case of advance payment by DISCOMs to the generators.

Impact

The mechanism would encourage Discoms to pay their dues as early as possible and hence would bring overall discipline in the payment cycle.

Amendments to Dispute Resolution Mechanism

MNRE has constituted a Dispute Resolution Mechanism Committee in June 2019 to consider disputes between solar/ wind power developers and SECI/ NTPC. Amendments to the same were notified in December 2019, to clarify on existing clauses related to extension of time due to force majeure events such as flood, earthquake, and other natural calamities. Also, in case of 'Extension of Time' dispute, a cap has been introduced on the fees of Dispute Resolution Committee (DRC) to

maximum of INR 1 Crore (which was not mentioned earlier). The fee payable to DRC shall be 5% of the impact of SECI/ NTPC's decision being challenged, with the impact being limited to the Performance Bank Guarantee (PBG) and shall be not be less than INR 1,00,000/- and not more than INR 1,00,00,000/-.

Impact

This is a positive step and in the favour of developers as earlier the fees had no cap hence developer had to submit the amount in accordance to PBG, which resulted in blocking of working capital. However, with this amendment the developer needs to deposit INR 1 crore maximum which will help in maintaining liquidity of the funds.

MNRE clarification on RPO contribution of Solar-Wind hybrid projects

MNRE's National Solar-Wind hybrid policy was issued in May 2018 which stated that both solar and wind power procured shall be used for the fulfillment of solar and non-solar RPO respectively. Recently, a clarification has been made by MNRE regarding RPO contribution of each source. As per the notification, the RPO calculation will be based on the declared capacity of each source during the PPA. However, during the implementation the obligated entities shall be allowed to choose the proportion which could be different from what was stated in PPA, thereby giving more flexibility to developers/ off-takers.

MNRE Draft Guidelines for Tariff based Competitive Bidding Process for Procurement of Power from Grid Connected Wind-Solar Hybrid Project

The objective of issuing the guidelines is to provide a framework for procurement of electricity from wind solar hybrid power project through a transparent process of bidding including standardization of the process and defining of roles and responsibilities of various stakeholders. Key highlights include:

- The applicability of the guidelines for long term power procurement is from Wind-solar hybrid project of 5 MW and above at one site with minimum bid capacity of 25 MW for intrastate projects. For inter-state projects, individual size of 50 MW and above at one site with minimum bid capacity of 50 MW.
- To reduce the variability of output power from wind solar hybrid project, storage may be added to the hybrid project.
- The procurer is provided payment security to the generator through letter of credit, payment security fund and state government guarantees.
- Earnest Money Deposit to be fixed by the procurer at not more than 2% and Performance Bank Guarantee (PBG) at not more than 5% of the estimated capital cost of hybrid project.
- The minimum capacity utilization factor should not be less than 30%
- Financial closure shall be attained within 7 months from the date of execution of the PPA.
- On account of grid unavailability or in the eventuality of a back-down, Hybrid power generator should be compensated for the generation loss.
- Change in Law shall not include any change in (a) taxes on corporate income or any change in any withholding tax on income or dividends; and (b) Custom duty on imported equipment.

Impact

These draft guidelines for Tariff based Competitive Bidding Process for Procurement of Power from Grid Connected Wind-Solar Hybrid Project are in line with recently amended competitive bidding guidelines for solar projects. These guidelines are a positive move for promoting wind solar hybrid projects which till date have not seen good response/ participation from the developers.

Draft New and Renewable Sources of Energy Policy 2019, Punjab

The objectives of the policy are:

- To generate 21% power through renewable energy in the total energy mix by 2030.
- Target of setting up 3,000 MW of solar projects by 2030, which will include utility-scale, canal-top, rooftop, floating, and hybrid solar projects.
- To attain non-solar power generation capacity of 1,500 MW, the state would include biomass, biomass and bagasse co-generation, and small hydro.
- To develop 500 MW equivalent bio-fuels (CBG, Bio-Ethanol, Bio-Coal, BioPellets) projects based on biomass as main feedstock
- Other objectives include development of energy storage technology based Renewable energy projects, promoting development and usage of Electric Vehicles and Solar Charging Stations in the state

Impact

This draft policy lays a clear target for achieving solar/ biomass/ biofuels till 2030, which will help in overall development of the renewable sector.

MNRE clarifies the installation of additional DC capacity in Solar PV plants

MNRE has clarified that solar energy developers can install additional DC capacity to meet the contracted AC capacity. As per the amended regulation, the procurer is obligated to buy the energy generated beyond the contracted AC capacity. Also, excess generation is not the violation of PPA or PSA. Developer shall be penalised only if the supply falls short of the contracted capacity. Since, setting up power generation is an unlicensed activity, so any person is entitled to set up any capacity which he desires to set up, and sell power to any entity which may want to buy it.

Impact

This clarification clears ambiguity if any and is in a right essence by MNRE, which cannot restrict the developers for installing additional DC capacity.

Guidelines on implementation of Component-C of PM-KUSUM scheme on Solarization of grid-connected agricultural pumps

MNRE has issued guidelines for implementation of grid-connected agricultural pumps for farmers under KUSUM scheme. It supports installation of solar PV capacity up to twice the pump capacity which will provide reliable day time power supply for irrigation. Farmers can sell excess generation to DISCOMs which can be a source of additional income to them. The target is to solarize 1 million grid-connected agricultural pumps of capacity up to 7.5 HP by 2022. Initially 0.1 million pumps

shall be solarized on pilot basis and can be scaled up further by evaluating the pilot mode. CFA up to 30% of cost of solarization of the pump up to 7.5 HP shall be provided by central government. Implementing agency shall create remote monitoring system to monitor performance of the system post-installation. State may choose to install watchdog transformer and devices to regulate power supply and monitor non-participating connections on the feeder concerned. Central monitoring portal shall be developed by MNRE which will extract data from state portals for data monitoring.

KSERC directs KSEB to modify PSA for 200 MW wind power on long term basis signed with SECI

KSEB has filed petition seeking approval for the 200 MW wind Power supply agreement (PSA) with SECI in order to meet its RPO. At that time, buying entity was liable to bear all the transmission losses as determined by the commission. But as per CERC regulations, the charges and losses for the use of ISTS for the period of 25 years are to be exempted. Hence, the modification has been made by KSERC that KSEB is not liable to pay interstate transmission charges and shall also not be liable to bear any transmission losses for entire term of the PSA. PSA shall be finally approved after the incorporation of this clause.

Andhra Pradesh government made key amendments to Solar, Wind and Hybrid policies 2018

Andhra Pradesh government after observing the deteriorated financial position of DISCOMs made key amendments in its policies for solar, wind and hybrid projects.

- All the exemptions related to transmission and distribution charges in the existing policies shall be no more applicable.
- The charges for inter-state and intra-state wheeling of power to the nearest CTU via STU network shall be determined by APERC.
- The facility of energy banking has been withdrawn from the solar and wind generators.
- No cost shall be paid for energy injected between synchronisation and COD declaration.
- The tariff for solar, wind and hybrid projects shall not exceed the difference between pooled variable cost and balancing cost. Both the cost shall be determined by APERC every year.
- Land allotment for the development of projects is mandated to be done on lease hold basis.

Impact

As per the amendments all the benefits including waiver in T&D charges, wheeling charges have been withdrawn. Banking facility has also been withdrawn. These amendments have been implemented retrospectively and hamper future investments in the state. Overall the investors sentiments was already low due to tariff renegotiations for signed PPAs for solar and wind projects.

APTEL instructs TNERC to review solar tariff

Welspun renewable energy and NSEFI has filed petition in 2016 challenging the state's solar tariff. It was stated that the tariff order has been passed irrationally without analysing the cost of components in detail. Various components such as depreciation, spares, degradation of modules, auxiliary consumption and Return on Equity were determined in an ad hoc manner. The capital

cost determined by TNERC was lower and unjustifiable as compared to CERC and other SERCs. In the absence of any reasoning behind the setting up of solar tariff by TNERC, APTEL observed that there is a need to redetermine the tariff and ensure recovery of revenue to the developers. TNERC is directed to pass a consequential order addressing the issues mentioned within three months from the date of the order.

Impact

This order from APTEL will help in setting a precedence for all Regulatory Commissions to not to determine tariffs on ad-hoc basis. They need to follow a prescribed methodology which should be based on facts and figures.

Amendment to the Off-grid solar regulation 2014 by KSERC

KSERC has earlier stated that all licensees shall provide generation-based incentive (GBI) at the rate of INR 1/ unit for a period of five years from 30 September 2014 or till KSEB Ltd meet its solar RPO for any year by purchasing solar energy whichever is earlier. Since it will take another two years for KSEB to meet its solar RPO, they have extended the validity GBI for distributed solar for another two years from 1st October 2019 till 30th September 2021.

Impact

This is a very welcome step for rooftop solar in the state of Kerala. As of now the tariff for solar projects have gone down and still they will be able to earn GBI of INR 1/ unit which will definitely help in promoting rooftop solar projects in state of Kerala.

Guidelines for Development of Decentralised Solar Power Plants

- Objective of these Guidelines is to provide a facilitative framework for development of Decentralised Solar Power Plants near distribution sub-stations in the country and fulfillment of Solar RPO.
- Guidelines are applicable for procurement of solar power by DISCOMs from Decen tralised solar power plants of capacity more than 2 MW; or plants connected to distribution sub-stations of rating 66/11 KV and higher; or plants up to 2 MW capacity and connected to any DISCOM of rating 33/11 KV and below (where the sanctions given to DISCOM under PM-KUSUM are exhausted).
- DISCOMs will notify substation wise solar power capacity available on the basis of average energy/load requirement during day time, technical feasibility, etc. The DISCOM may decide the capacity of individual solar plant permitted to be set up and the radius within which the plant should be situated.
- The solar power generated will be purchased by DISCOMs at a tariff determined by respective SERC or discovered through competitive bidding process.
- The DISCOM shall provide connectivity at the sub-station/11 kV/LT feeder, and shall ensure “must-run” status to the solar plants.
- Solar Power Generator shall provide Earnest Money Deposit (EMD) of INR 1 Lakh/MW in the form of Bank Guarantee along with Performance Bank Guarantee (PBG) of INR 5 Lakh/MW.
- In case land and connectivity is being provided by the DISCOM, commissioning timeline is within nine months from date of issuance of LoA. In other cases, the commissioning shall be done within 12 months of issuance of LoA

Impact

These guidelines will popularize decentralized solar projects. The conditions of the guidelines are pretty standard and in line with tariff based competitive bidding guidelines for procurement of solar power.
These guidelines are necessary as decentralized solar plants have several advantages (if set near the load centres) and help in reduction of T&D losses. The recent APPC from non-RE sources is INR 3.60/ unit which is higher than INR 2.53/ unit of solar power discovered through competitive bidding. Also, solar power is available during day time and can cater to agriculture load. This will help in reducing DISCOMs losses as they are providing power to agriculture loads either free or at highly subsidized tariff. With average T&D losses for a rural feeder being around 30%, the average cost of power purchased by a DISCOM to deliver one unit of power to agriculture consumer is over INR 6 per unit.

Chhattisgarh State Electricity Regulatory Commission (Terms and conditions for determination of generation tariff by plants based on renewable energy sources) Regulations, 2019

- The regulations apply to the Renewable Energy projects, achieving commercial date of operation (COD) from April 1, 2019, to March 31, 2022, and are supplying entire power to state DISCOM on a long-term basis.
- For solar projects, a normative capital cost of INR 4.5 crore/ MW (5 MW to 2 MW) and INR 4 crore/MW (2 MW to 5 MW) is set. The O&M expenses have been set at INR 7 lakh/MW for the first year of the project. Additionally, the commission has set the capacity utilisation factor (CUF) at 19% for solar PV projects.
- For wind energy projects, the regulations specify a capital cost of INR 5.25 crore/ MW for the FY2019-20. The CUF has to be in the range of 22% - 33% based on the wind density.

Impact

These regulations are mainly relevant for biomass, biogas, small hydro, MSW based power projects where feed-in tariff is still applicable. In case of wind and solar projects where power is procured through competitive bidding these regulations are not of much relevance.

Rajasthan Solar Energy Policy 2019

- Target to setup 30,000 MW Solar Power Projects up to 2024-25. Following targets are defined:
  - Utility/Grid Scale Solar Parks 24,000 MW
  - Distributed Generation 4,000 MW
  - Solar Rooftop 1,000 MW
  - Solar Pumps 1,000 MW
- Government announced to develop 33 district headquarters as 'Green Energy Cities' - district headquarters in next 5 years by installing 300 MW of Solar Rooftop Systems.
- Solar rooftop systems up to 1 MW capacity to be allowed under gross metering scheme as well
- Transmission and wheeling charges are exempted for solar projects of maximum 25 MW capacity, setup between Dec 2019 and March 2023, as per following criteria:

- For solar projects setup for captive consumption outside the premises of consumer, there is 50% exemption in transmission and wheeling charges for 7 years
- For third party sale open access projects, there is 50% exemption in transmission and wheel ing charges for 7 years
- For solar projects with storage, for captive/ third party sale, there is exemption of 75% of transmission and wheeling charges for 7 years.
- Banking of energy at the drawl end within the State shall be permitted for captive consump tion and third-party sale on yearly basis. Banking charges shall be adjusted in kind @ 10% of the energy delivered at the point of drawl.
- For solar equipment manufacturers, there is 100% exemption in stamp duty. Land allotment will be at 50% concessional rate, full exemption in electricity duty for 10 years. There is Investment subsidy on SGST to solar energy equipment manufacturers- 90% of SGST due and deposited for 7 years.

Impact

This policy specifies several benefits for solar projects like banking facility, exemption in transmis-sion and wheeling charges. As per this policy the use of storage is encouraged.

Rajasthan Wind and Hybrid Energy Policy, 2019

Wind

- Target to achieve 2 GW of wind power capacity by 2024-25 to fulfill renewable RPO of state DISCOMs. Another 2 GW of wind power projects are also planned for captive consumption/ third party sale within or outside Rajasthan.
- Provision for Re-powering for projects that have less than 1 MW turbine capacity and are more than ten years old. For contracted capacity the DISCOM with procure at earlier tariff and for additional capacity, DISCOM will procure power at tariff discovered in the state at the time of commissioning of the project.
- For wind equipment manufacturers, there is 100% exemption in stamp duty. Land allotment will be at 50% concessional rate, full exemption in electricity duty for 10 years. There is investment subsidy on SGST to solar energy equipment manufacturers- 90% of SGST due and deposited for 7 years.

Hybrid

- Target to install 3.5 GW of hybrid projects by the financial year 2024-25, out of which hybrid ization of existing wind or solar projects will account for 200 MW, new wind-solar hybrid projects will account for 2 GW, wind-solar hybrid with storage systems will account for 500 MW, and hybridization of existing conventional projects will account for 800 MW.
- The DISCOMs plans to procure power up to 5% of their RPO target from hybrid projects with storage systems at a tariff discovered through competitive bidding in addition to the RPO target.

Impact

Rajasthan is the third state after Gujarat and Andhra Pradesh to come up with Hybrid policy and rightly so as Rajasthan is blessed to have enormous solar and wind resources. In this policy they have encourage re-powering of small size turbine, which will help in better utilization of wind resources and will result in higher CUF. Also, in this policy they come up with the concept of

hybridization of existing conventional (mainly thermal) projects. It would be interesting to see how this mechanism would be implemented.
Overall this policy is a forward looking policy with focus on re powering of old wind projects and installation of new wind solar hybrid projects along with solar. This policy has set up a benchmark for other states to follow and come up with hybrid policy and also think in the direction of blending renewable energy with conventional power.

Maharashtra Electricity Regulatory Commission (Grid Interactive Rooftop Renewable Energy Generating Systems) Regulations, 2019

- All category of consumers are eligible for net metering arrangement under the new regulations.
- Net metering arrangement shall be permitted by the Distribution Licensee on a non-discrimi natory and Distribution Transformer-wise or feeder wise on 'first come, first serve' basis.
- The cumulative capacity of all Renewable Energy Generating Systems under Net metering arrangements and/or Net billing arrangements connected to a particular Distribution Trans former/feeder of the Licensee shall not exceed 70% of its rated capacity.
- Minimum size for net metering is 1 kW and maximum capacity shall not exceed the sanctioned load (in kW) or the Contract Demand (in kVA) of the consumer.
- The net credited units of electricity at the end of each financial year shall be purchased by the DISCOM at the Generic Tariff approved by the Commission for that year.
- Grid Support Charges (GSC) to be levied on the generated energy under Net Metering systems which shall cover balancing, banking and wheeling cost after adjusting RPO benefits.
- The GSC would be determined basis consumer tariff category, however consumers having sanctioned load up to 10 kW shall be exempted from GSC.

Impact

The final regulations are positive if we compare it with the draft regulations, where net metering was not available for the C&I consumers. However, with the overall negative feedback from all the stakeholders, MERC has withdrawn this clause and introduced GSC which will be calculated based on cost in setting up distribution infrastructure, cost of balancing the grid and banking of energy. These charges will be paid to MESDCL by the rooftop solar developer and are yet to be decided by MERC. These regulations are still better than those in other states which has completely withdrawn the net metering benefits for the C&I consumers. However, now the GSC rates would be the deciding factor for the viability of large rooftop solar installations in Maharashtra.

Uttar Pradesh Electricity Regulatory Commission (terms and conditions for open access) Regulations, 2019

- Open access will be permissible to the consumers seeking open access for a contracted demand of 1 MW and above and connected at 11 kV and above
- Consumer category defined- Long-term open access customers (>5 years), medium-term open access customers (3 months-5 years) and short-term open access customers (less than 3 months)
- A consumer partially surrendering the Open Access capacity will have to pay transmission and wheeling charges at applicable rates for the remaining period of their contract at pro-rata basis along with 25% of estimated transmission and wheeling charges on the surrendered capacity.
- The consumers availing Open access facilities will have to pay the transmission & wheeling

charges, cross-subsidy surcharge, Additional Surcharge, Standby charges (to the distribution companies), imbalance charges (if applicable) as described in the regulation and amended from time to time.

- Payment Security deposit to be paid to the SLDC as per following criteria:
- For transactions involving transmission facility only- INR 0.5 Lakh/MW/Month
- For transactions involving both Transmission and Distribution facilities- INR 1.5 Lakh/MW/Month
- For transactions involving only distribution facilities- INR 1.0 Lakh/MW/Month

11. Annexure

Table 11.1: List of new tenders issued in Q4 2019 (Oct – Dec 2019)

Tender Name	Date RFS issue	Tender scope	Tendered capacity (MW)	Location	RE source
MSEDCL, 500 MW, solar, Maharashtra, Phase IV	Nov-19	BOO	500	Maharashtra	Solar
MSEDCL, Maharashtra, 500 MW, solar, Phase V	Dec-19	BOO	500	Maharashtra	Solar
NTPC, CPSU, solar, Phase II, Tranche II, 923 MW	Dec-19	BOO	923	Pan India	Solar
MSEDCL, Maharashtra, 200 MW, wind	Dec-19	BOO	200	Maharashtra	Wind
NTPC, Pan India, 1,000 MW, solar, DBDT scheme	Oct-19	EPC	1000.00	Pan India	Solar
REMCL, 32.56 MW, solar, Pan India	Oct-19	EPC	32.56	Pan India	Solar
APGCL, 25 MW, solar, Namrup Thermal Station	Oct-19	EPC	25.00	Assam	Solar
HPGCL, solar, 20 MW	Oct-19	EPC	20.00	Haryana	Solar
DVC, 50 MW, solar, Jharkhand	Nov-19	EPC	50.00	Jharkhand	Solar
ONGC, 15 MW, solar, Gujarat	Nov-19	EPC	15.00	Gujarat	Solar
CIAL, Kerala, solar, 12 MW	Nov-19	EPC	12.00	Kerala	Solar
NTPC, 500 MW, solar, Maharashtra	Dec-19	EPC	500.00	Maharashtra	Solar
CEL, Maharashtra, 44 MW, solar	Dec-19	EPC	44.00	Maharashtra	Solar
Vankal Solar Park, 20 MW, Mizoram	Dec-19	EPC	20.00	Mizoram	Solar
CCL, Jharkhand, solar, 20 MW	Dec-19	EPC	20.00	Jharkhand	Solar
OIL, Gujarat, hybrid, 55 MW	Dec-19	EPC	55.00	Gujarat	Hybrid
SECI, 400 MW, RE, NDMC	Oct-19	Power Procurement	400.00	New Delhi, Dadra, Nagar Haveli	RE
AAI, 7.5 MW, RE, various locations	Oct-19	Power Procurement	7.50	Pan India	RE
CMRL, 54 MW, RE, Tamil Nadu	Nov-19	Power Procurement	54.00	Tamil Nadu	RE

Source: JMK Research

Table 11.2: List of tenders auctioned in Q4 2019

Tender Name	Tender scope	State	Tendered capacity (MW)	Allocated Capacity (MW)	Winners
RRECL, Rajasthan,113.5 MW	Rooftop EPC	Rajasthan	114	114	EESL-113.5 MW Sukhbir Agro -16 MW Hero Future Energies Private Ltd- 15.5 MW ATA Renewables for 6.5 MW.
EESL, 100 MW, solar EPC, Maharashtra, Andhra Pradesh and Jharkhand	EPC	Various locations	100	80	Hild Energy (40 MW), Tata Power (40 MW)
SECI, 1.2 GW, Solar, ISTS-VI, Pan India	BOO	Pan India	1200	960	ReNew (300 MW at INR 2.71/unit) UPC Renewables (300 MW at INR 2.71/ unit) Avaada Energy (300 MW at INR 2.71/ unit) Tata Power (60 MW at INR 2.72/ unit)
NTPC, Pan India, Solar, 1200 MW	BOO	Pan India	1200	300	TBEA-300 MW (2.63)
MSEDCL, 500 MW, Maharashtra, Solar, Phase IV	BOO	Maharashtra	500	500	Juniper Green-150 MW (2.89) MSPGCL-350 MW (2.90)

Source: JMK Research

Table 11.3: List of tenders Cancelled in Q4 2019

Tender Name	Result Date	Tendered capacity (MW)	Bid Submitted (MW)	Winners
BREDA, Bihar, solar, 250 MW	August 2019	250	250	Sukhbir Agro – 50 MW (INR 3.58/ kWh) Avaada – 200 MW (INR 3.60/ kWh)
MSEDCL, Maharashtra, 1,350 MW	December 2019	1350	5	Kiran Renewables-5 MW

Source: JMK Research

Table 11.4: Major solar and wind projects commissioned in Q4 2019

Project Developer	Technology	Tender Scheme Name	State	AC Capacity (MW)
Sprng Energy	Wind	GUVNL Gujarat 500 MW, Dec-2017	Gujarat	198
Torrent Power	Wind	MSEDCL Maharashtra 500 MW, Mar-2018	Maharashtra	125
SITAC RE	Wind	GUVNL Gujarat 500 MW, Dec-2017	Gujarat	100
Adani	Wind	MSEDCL Maharashtra 500 MW, Mar-2018	Maharashtra	75
ReNew	Wind	MSEDCL Maharashtra 500 MW, Mar-2018	Maharashtra	75
ReNew	Wind	SECI Pan India 1,000 MW II, Oct-2017	Gujarat	64
Adani	Wind	SECI 1,000 MW Wind I, Feb-2017	Gujarat	50
ReNew	Wind	GUVNL Gujarat 500 MW, Dec-2017	Gujarat	35
Engie	Wind	GUVNL Gujarat 500 MW, Dec-2017	Gujarat	30
ReNew	Solar	MSEDCL Maharashtra 1,000 MW, Jun-2018	Rajasthan	250
Acme	Solar	MSEDCL Maharashtra 1,000 MW, Jun-2018	Maharashtra	250
SB Energy	Solar	NTPC Andhra Pradesh 750 MW, Apr-2018	Andhra Pradesh	250
Acme	Solar	KREDL Karnataka 860 MW, Feb-2018	Karnataka	105
SB Energy	Solar	SECI Karnataka 200 MW, May-2018	Karnataka	200
Hero Future	Solar	SECI Rajasthan 500 MW, Dec-2017	Rajasthan	100
Atha Group	Solar	TANGEDCO Tamil Nadu 1,500 MW, Jul-2017	Tamil Nadu	200
Rays Power Infra	Solar	TANGEDCO Tamil Nadu 1,500 MW, Jul-2017	Tamil Nadu	100
KREDL	Solar	KREDL 50 MW EPC 2018	Karnataka	50
Avaada	Solar	KREDL Karnataka 150 MW, Oct-2018	Karnataka	150
Aditya Birla	Solar	GUVNL Gujarat 500 MW II, Sep-2018	Gujarat	35

Source: JMK Research

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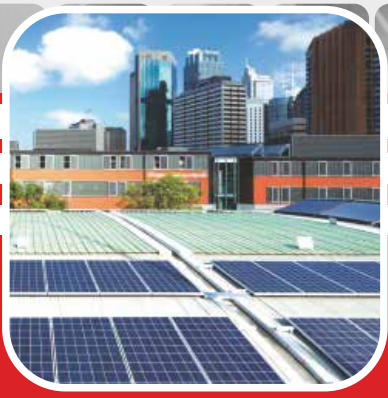

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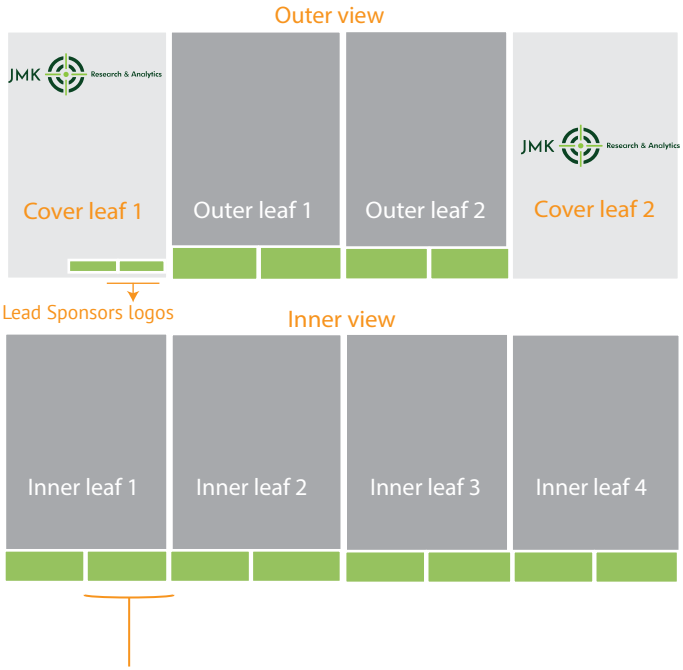

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The annual solar report card by JMK Research is an infographic representation of renewable energy industry progress made annually.

Leading states in utility-scale solar installations and rooftop solar installations in 2019

Leading Project Developers (Utility-scale, Rooftop solar) in 2019

Leading Module suppliers (Domestic and International) in 2019

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