**Executive summary**

C&I renewable power generation capacity grew by 601 MW in Q1 2021 to reach 17,817 MW by 31 March 2021. Total open access solar (OA solar), open access wind (OA wind) and rooftop solar capacity is estimated at 4,468 MW, 7,315 MW and 6,017 MW respectively.

**Figure:** Total installed C&I renewable capacity by 31 March 2021, MW

This report provides a quarterly update on key trends and developments in the C&I renewable market including capacity addition, key players, policy issuance, financing, equipment prices and other market trends.
1 Capacity addition

India added 601 MW of C&I renewable power generation capacity in Q1 2021, up 20% QOQ. Total C&I renewable capacity is estimated to have reached 17,817 MW by 31 March 2021. Total open access solar (OA solar), open access wind (OA wind) and rooftop solar capacity is estimated at 4,468 MW, 7,315 MW and 6,017 MW respectively.

**Figure 1.1:** Total installed C&I renewable capacity by 31 March 2021, MW

Source: BRIDGE TO INDIA research

Installation activity picked up slightly in Q1 in response to easing COVID-related restrictions and increasing power demand. But activity is again expected to have slowed down in Q2 due to lockdowns across most states.

**Figure 1.2:** Quarterly capacity addition, MW

Source: BRIDGE TO INDIA research
C&I renewable power penetration is the highest in Karnataka and Tamil Nadu at 25% and 23% respectively. But growth is picking up in other states including Gujarat, Maharashtra, Uttar Pradesh and Chhattisgarh. Gujarat has a short term window until FY 2023 for wind solar hybrid (WSH) projects. Maharashtra and Uttar Pradesh have untapped markets, but delays in approvals are still very common.

**Figure 1.3:** C&I renewable installed capacity (MW) and penetration in select states

<table>
<thead>
<tr>
<th>State</th>
<th>C&amp;I renewable penetration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Karnataka</td>
<td>25%</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>23%</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>5%</td>
</tr>
<tr>
<td>Gujarat</td>
<td>5%</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>5%</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>5%</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>5%</td>
</tr>
<tr>
<td>Telangana</td>
<td>5%</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>5%</td>
</tr>
<tr>
<td>Haryana</td>
<td>5%</td>
</tr>
</tbody>
</table>

**Source:** BRIDGE TO INDIA research
28 open access solar projects aggregating 271 MW were commissioned in Q1 2021.

Figure 1.4: State wise open access capacity addition in Q1 2021, MW

Source: BRIDGE TO INDIA research

C&I rooftop solar capacity addition in Q1 2021 is estimated at 330 MW (OPEX: 100 MW, CAPEX: 230 MW).
In the last 12 months, Aditya Birla and Cleantech Solar were the largest OA developers (102 MW each), followed by Amplus (100 MW) and AMP (99 MW). Overall, ReNew (495 MW), Greenko (443 MW) and Amplus (383 MW) are the leading developers by capacity commissioned as of FY 2021.

In 2020, Fourth Partner was the largest rooftop solar developer, followed by Cleantech, Amplus, ReNew, CleanMax and AMP.

Figure 1.5: Leading developers by capacity commissioned, MW

Source: BRIDGE TO INDIA research

Utility scale IPPs have struggled to sustain rooftop solar business because of low installation sizes and scalability. Azure recently sold its entire rooftop solar portfolio to Radiance Renewables and ReNew is also believed to be looking for an exit.
2 Policy developments

Basic customs duty for solar cells, modules and inverters

MNRE announced that solar cells and modules shall be subject to basic customs duty (BCD) of 25% and 40% respectively from 1 April 2022. Separately, the Ministry of Finance has increased customs duty on solar inverters from 5% to 20% with effect from April 2021.

Including 10% social welfare surcharge, effective BCD rate on cells and modules would be 27.5% and 44% respectively. The extra cost is expected to result in increase in solar tariffs by around 10% to INR 3.75–4.00/ kWh. However, as grid tariffs for most C&I consumers are more than INR 7.00/ kWh, viability of solar projects should be unaffected.

New net metering restrictions in Karnataka, Punjab and Tamil Nadu

Karnataka has become the second state after West Bengal to limit net metering to rooftop solar power systems of up to 10 kW capacity. Meanwhile, Punjab has proposed to reduce net metering system size limit from 80% to 50% of sanctioned load for C&I consumers. The state is also proposing to curb banking period from one financial year to one month together and a new cap of 10% for power procured by DISCOMs.

Further, in Tamil Nadu, TANGEDCO is proposing to introduce gross metering for HT consumers above connected load of 10 kW. Earlier in March 2019, the state regulator had introduced net feed-in for LT consumers and revoked net metering for larger C&I consumers.
The following chart shows a summary of net metering restrictions for C&I consumers across different states.

**Figure 2.2: Net metering policy restrictions**

- **Punjab**: Net metering only for CAPEX model. System size limit: 1 kW – 1 MW subject to 50% of sanctioned load (100% for MSMEs).
- **Gujarat**: Net metering only for CAPEX model. System size limit: 1 kW – 1 MW subject to 50% of sanctioned load (100% for MSMEs).
- **Maharashtra**: Net or gross metering for all consumers except OA consumers. System size limit: 1 kW - 2 MW, subject to 100% of sanctioned load.
- **Rajasthan**: Net metering restricted up to sanctioned load of 10 kW; Gross metering over sanctioned load of 10 kW.
- **Karnataka**: Net (only under CAPEX model) or gross metering. System size limit: 1 kW – 1 MW, subject to 100% of sanctioned load.
- **Kerala**: Net metering. System size limit: 1 kW - 1 MW.
- **Tamil Nadu**: Net billing. System size limit: LT – up to 100% of sanctioned load; HT – above 56 kW and up to 1 MW.
- **Telangana**: Net or gross metering; Upto 5 kW only for single phase consumers. System size limit: 1 kWp - 1 MWp subject to 100% of sanctioned load for public sector consumers and 80% for C&I consumers.
- **Madhya Pradesh**: Net metering only for CAPEX model. System size limit: 1 MW at HT level.
- **Delhi**: Net metering. System size limit: Net metering: Above 1 kWp and upto sanctioned load; Group and virtual net metering: 5 kW to 5 MW.
- **Haryana**: Net metering (except for OA consumers) and gross metering. System size limit: LT – Above 1 kW and upto connected load; HT – 1 kW to 2 MW, upto connected load.
- **Uttar Pradesh**: Only gross metering. System size limit: 1 kW – 2 MW, subject to 100% of sanctioned load.
- **West Bengal**: Net or gross metering; net metering restricted up to 5 kW connected load.
- **Andhra Pradesh**: Net or gross metering. System size limit: LT – up to 56 kW; HT – above 56 kW and up to 1 MW.

**Source**: BRIDGE TO INDIA research
Tamil Nadu: TNERC’s decision reversed on applicability of open access charges for OA wind

APTEL has overturned Tamil Nadu Electricity Regulatory Commission’s 2018 order for open access wind power reversing the following changes:

• Withdrawal of banking facility for projects under third-party sale model and all projects commissioned after 31 March 2018;
• Reduction of CSS exemption from 50% to 40% and transmission and wheeling charges exemption from 60% to 50%;

APTEL has restored status quo on the grounds that insufficient analysis was carried out by the state regulator before proposing these changes. Despite the APTEL judgement, policy risk for open access renewables remains high due to heavy penetration of renewable power and a very poorly performing DISCOM.

Tamil Nadu: Developers allowed to terminate PPAs with DISCOMs

The Madras High Court has allowed wind power developers to terminate their PPAs with DISCOMs. These projects typically have low CUF at around 20-22% level. The order has freed up 2 GW of wind power capacity for C&I consumers intensifying price competition in the state.

Tamil Nadu: No changes in open access charges

Tamil Nadu regulator has issued a draft order for solar open access charges for FY 2022 with no proposed changes. The state offers 50% exemption from transmission and wheeling charges, and 30% exemption from CSS.
Andhra Pradesh: Tighter forecasting and scheduling requirements

Andhra Pradesh regulator has proposed to replace state-level aggregation with pooling station-level aggregation for forecasting and scheduling of power from solar and wind projects. The commission has also proposed to tighten tolerance bands for forecasting error from 15% to 10%.

Implementation of these changes is dependent on outcome of a case filed by various wind and solar developers against draft amendments proposed by the Transmission Corporation of Andhra Pradesh (APTRANSCO) to forecasting and scheduling regulation, 2017 in the Andhra Pradesh High Court.

Karnataka: Lower tariff for surplus wind power

Karnataka regulator has proposed to reduce tariff payable by DISCOMs for surplus wind power from 100% to 85% of generic tariff. The generic tariff is also proposed to be reduced from INR 3.26/ kWh to INR 2.91/ kWh. Lack of clear rationale for these reductions leaves the order open to legal challenges from developers and consumers.
West Bengal: Deferment of net metering policy implementation

The West Bengal regulator has extended deadline for consumers to avail net metering benefits without any connected load restrictions to 30 Jun 2021. It has limited net metering benefits to systems up to 5 kW connected load.

Gujarat and Haryana: No change in retail tariffs for FY 2022

Gujarat and Haryana have issued retail supply tariff orders for FY 2022. Both states have chosen to keep tariffs unchanged at last year’s levels.

Maharashtra: DISCOMs offers green tariff power procurement route

Maharashtra has offered ‘green tariff’ option to all grid consumers. All categories of Consumers can opt for green tariff at a premium of INR 0.66/ kWh over grid tariff for 100% of their power needs and for a minimum period of one year. However, green attributes would be retained by DISCOMs.

Increasing consumer choice for green power is desirable but the proposed structure, with green attributes retained by the DISCOMs, would not lead to any actual increase in renewable power capacity. The uptake is also expected to be small as consumers are reluctant to pay a premium over already high grid tariffs. We expect the ‘green tariff’ model to gain more prominence with MNRE support. However, tariff design and consumer flexibility are critical for future growth.

Karnataka: New draft renewable power policy until 2026

The state issued a new draft renewable energy policy with a target to achieve 2 GW of rooftop solar capacity by 2026. The policy introduces peer to peer trading of rooftop solar power. It proposes to eventually levy grid support charges for net metered projects and disallow this facility for ground-mounted ones.

For open access projects, it proposes commissioning within 2 years of approval and introduces several fees - application (INR 25,000/ MW), DPR processing (INR 0.2 million/ MW), and performance bank guarantee (INR 0.5 million/ MW).
State specific regulatory challenges

Several states are known to impose ad-hoc restrictions on net metering policies, banking periods and OA charges outside the prevailing regulatory or policy framework. We have attempted to capture a few of them below.

Table 2.1: Ad-hoc issues and challenges in various states

<table>
<thead>
<tr>
<th>STATE</th>
<th>ISSUES AND CHALLENGES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>• The state limits system size for net metering to 85% of sanctioned load despite there being no such regulatory order.</td>
</tr>
<tr>
<td></td>
<td>• Settlement of monthly accounts between consumer, DISCOM and power producer can take up to 6-9 months – potentially leading to funds being locked with the DISCOMs.</td>
</tr>
<tr>
<td></td>
<td>• Wheeling and banking agreements are signed only after project commissioning leading to high risks for investors.</td>
</tr>
<tr>
<td>Gujarat</td>
<td>• Gujarat does not provide approvals for group captive projects. Regulation released in May 2020 defines captive plants as those with 100% equity investment by the offtaker. It has been overturned by the state regulator in July 2021.</td>
</tr>
<tr>
<td>Karnataka</td>
<td>• Separate regulatory approval is required for systems size of over 50 kW.</td>
</tr>
<tr>
<td></td>
<td>• The DISCOM requires net-metered systems above 50 KW to be connected to HT voltage levels.</td>
</tr>
<tr>
<td></td>
<td>• DISCOMs require inverter manufacturers to comply with 7 additional standards (apart from the two required by MNRE) to empanel inverter suppliers.</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>• The state has been charging additional surcharge on several captive power plants. The affected consumers have appealed to the state regulator which has rejected their petition. They have now approached APTEL to resolve the matter.</td>
</tr>
<tr>
<td>Maharashtra</td>
<td>• Size of open access projects is capped at 1.4 times contracted capacity.</td>
</tr>
<tr>
<td></td>
<td>• Final connectivity approval is typically issued two months after commissioning.</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>• The state provides approvals for captive plants only if the offtaker has 100% equity investment, in contravention to Electricity Act 2003.</td>
</tr>
<tr>
<td></td>
<td>• Project size, consumption and banking restriction on captive projects under regulation released in 2020.</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>• The process for declaration of project commissioning is unclear. Part-commission is not allowed.</td>
</tr>
<tr>
<td></td>
<td>• While annual banking is allowed, all power banked so far is yet to be settled due to lack of procedural clarity.</td>
</tr>
</tbody>
</table>

Source: BRIDGE TO INDIA research
3 Pricing update

3.1 EPC cost

Prices for mono-PERC modules increased further to USD cent 23-24/ W in Q1. Balance of system (BOS) costs have also been increasing due to a rise in metal and freight rates. Total EPC cost for utility scale solar projects is estimated at INR 30.2/ Wp, up 18% on a YOY basis. EPC cost for rooftop solar also increased by 16% in the last year to INR 37.5/ Wp.

Similarly, EPC cost for wind projects has also increased sharply to INR 52/ W, up by 15% over previous year.

**Figure 3.1:** EPC cost, INR/ Wp

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
<td>20.0</td>
</tr>
<tr>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
<td>30.0</td>
</tr>
<tr>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
<td>40.0</td>
</tr>
<tr>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
<td>50.0</td>
</tr>
</tbody>
</table>

**OA solar**  **Rooftop solar**

**Source:** BRIDGE TO INDIA research

**Notes:** EPC cost for OA solar projects is estimated using central inverters and mono-crystalline modules. EPC cost for rooftop solar is estimated for a 500 kW industrial installation. Cost includes GST and safeguard duty, as applicable, at the end of each respective quarter but excludes land, transmission and related expenses.

Module prices are expected to stay firm around USD cent 24-25/W levels until Q1 2022. However, there is considerable uncertainty in relation to import duties – safeguard duty of 14.5% is currently set to expire by 29 July 2021 while BCD of 40% is expected from April 2022 onwards.
3.2 Landed cost of power

Haryana and Punjab issued grid tariff orders but landed cost of power for C&I consumers remained unaffected as there was no revision. Rooftop solar continues to be the cheapest option available to C&I consumers at INR 3.50-75/ kWh.

Figure 3.2: Landed cost comparison, INR/ kWh

Source: BRIDGE TO INDIA research
Notes: Grid power cost shows energy charges for consumers connected at 33 kV, including surcharges, taxes and duties. Assumptions: i) CUF - 25% for solar, 35% for wind; ii) Solar power tariff - INR 3.75/ kWh, Wind power tariff - INR 4.50/ kWh
4 Key market trends

4.1 Wind-solar hybrid

In response to favourable policy (Gujarat) and higher renewable power demand from consumers, wind-solar hybrid (WSH) projects are becoming more popular. Gujarat recently issued regulation offering attractive incentives to WSH projects - 50% exemption on CSS and AS, and 100% exemption on ED for 25 years for projects commissioned before March 2023.

WSH is very attractive for C&I consumers:
- More stable power output in comparison to standalone wind and solar projects;
- Greater financing savings due to higher capacity utilisation factor of 45-55% in comparison to standalone solar (22-26%) and wind (33-38%) projects – particularly useful in states like Rajasthan where OA capacity is capped at connected load of the consumer;
- Marginally lower cost due to better utilisation of transmission infrastructure;

Figure 4.1: Landed cost comparison, INR/ kWh

Source: BRIDGE TO INDIA research
Notes: Landed cost of grid power includes energy charges, surcharges, taxes and duties. Assumptions for calculating OA charges: i) CUF - 25% for solar, 35% for wind and 45% for wind-solar hybrid; ii) Power tariff – INR 3.75/ kWh for solar, INR 4.50/ kWh for wind, INR 4.00/ kWh for wind-solar hybrid; iii) Connection voltage - 33 kV
Green power trading volume declined 52% during the quarter. Daily solar volume dipped to an average of 922 MWh (79% decrease) but non solar volume shot up to 1,625 MWh (110% increase). Average price for solar and non-solar power was INR 3.84 and INR 4.42 respectively, a premium of INR 0.33 and INR 0.87 respectively over conventional power price during the same period.

There is huge buying interest from DISCOMs looking to fulfil RPO targets but supply side is constrained due to lack of merchant capacity.

Continuum, CleanMax, AMP and Amplus are setting up WSH plants across Gujarat, Maharashtra and Karnataka. However, WSH market is slow to take off primarily due to lack of suitable sites with attractive wind and solar resource. Many developers are also reluctant to develop WSH projects because of complex technology and operational factors.

4.2 Renewable power trading

Green power trading volume declined 52% during the quarter. Daily solar volume dipped to an average of 922 MWh (79% decrease) but non solar volume shot up to 1,625 MWh (110% increase). Average price for solar and non-solar power was INR 3.84 and INR 4.42 respectively, a premium of INR 0.33 and INR 0.87 respectively over conventional power price during the same period.

There is huge buying interest from DISCOMs looking to fulfil RPO targets but supply side is constrained due to lack of merchant capacity.

Figure 4.2: Renewable power traded volume and prices

Source: Indian Energy Exchange, BRIDGE TO INDIA research
4.3 Financial deals in Q1 2021

There were five major financial deals in the quarter, involving Amp, Continuum, ReNew and Hero.

ReNew announced its merger with a Special Purposed Acquisition Company (SPAC) - RMG II to list on the US exchange NASDAQ. The listing puts an enterprise value of USD 8 billion on the company at about 9x EBITDA. Total expected proceeds from the listing are estimated at USD 1.2 billion. The company also completed its third green bond issue in 13 months by raising USD 460 million at a cost of 4% with maturity of 5 years. The proceeds would be used to refinance existing offshore bonds.

Amp Energy’s parent company raised USD 374 million from Carlyle Group, a Canada based investment banking firm. The funds will be used to expand business in its core markets in North America, Japan, Australia, Iberia and the UK.

Further, Hero also successfully completed its first ever green bond issue of USD 363 million at a cost of 4.25% with maturity of 6 years. Continuum Wind Energy also issued green bonds of USD 560 million at a cost of 4.5% with maturity of 5.1 years. The proceeds are expected to be used to refinance existing debt and to set up wind projects in India.
Interview

Umakant Shende
Vice President and Country Manager - India, Cleantech Solar

Please provide a brief introduction to your business.
Cleantech Solar is a pan-Asia solar developer that finances, constructs, owns and operates on-site & open access solar projects under the PPA model. Headquartered in Singapore, Cleantech Solar operates across Asia and is the largest corporate & industrial solar developer in South-east Asia with a 500 MW+ portfolio spread over 300 sites, backed by top institutional investors and lenders.

What sets you apart from your competitors - would you like to highlight key differentiators?
Cleantech Solar’s long-term mindset and pan-Asia presence enables multinational customers to meet their sustainability and energy goals throughout the region with a standardized approach in terms of technical, commercial, and legal aspects of solar projects. Top tier investors such as Royal Dutch Shell and Climate Fund Managers, enable the execution of projects internationally. Moreover, the company has also secured the largest green loan of USD 75 million from ING bank, as well as loan facilities from SBI-World Bank and Tata Capital.

In which states do you see highest C&I renewable potential?
We eagerly await the regulatory changes needed in Haryana that will enable the realisation of the full renewable energy potential of the state. We also expect states such as Rajasthan, Telangana, and Andhra Pradesh to be close contenders in the coming years.

How are you mitigating against net metering policy uncertainty?
Policy implementation must be easy, clear, and stable without frequent changes. We are looking forward to the initiative on implementing the “One Solar, One India, One solar Policy”. Lack of solar-friendly policies and their inconsistencies have been challenging on solar industry investments in the past. We look forward to the finalization of the new Electricity Rules 2020 and are prepared to cater to our customers’ needs by implementing on-site storage and off-site assets.

How would BCD affect the market?
The imposition of 40% BCD on solar modules from April 1, 2020, will certainly increase the cost of green energy. The impact could be INR 0.25 to 0.40 per kWh. Cleantech Solar’s customers have been briefed regarding this impending issue and we expect a surge in corporate green energy procurement till April 2022.
About WWF India and REDE initiative

WWF India and Confederation of Indian Industry (CII) launched the Renewable Energy Demand Enhancement (REDE) Initiative for Commercial & Industrial (C&I) consumers in 2018. REDE is an alliance of C&I consumers to enhance uptake of renewable energy (RE) and to co-develop practical and commercially viable solutions to address challenges that are significantly restricting demand.

The REDE Initiative provides a national forum to discuss the challenges to large-scale corporate RE procurement, co-develop solutions, and build greater capacity for C&I consumers, through policy engagement, capacity building, member networking, fostering innovation towards renewable energy purchase models, global connect and market intelligence.

Till date, 30+ corporate groups/ individual companies with combined electricity footprint of ~18 GW have signed the REDE principles.

For further information on Renewable Energy Demand Enhancement (REDE), please contact:

Varun Aggarwal
Associate Director-Sustainable Business, WWF India
vaggarwal@wwfindia.net
Authors
Dhruv Tyagi, BRIDGE TO INDIA
Sangeetha Suresh, BRIDGE TO INDIA
Vinay Rustagi, BRIDGE TO INDIA

Terms of use
BRIDGE TO INDIA hereby grants the user a personal, non-exclusive, non-transferable license to use the report pursuant to the terms and conditions of this agreement. The user cannot engage in any unauthorised use, reproduction, distribution, publication or electronic transmission of this report or the information/forecasts therein without the express written permission of BRIDGE TO INDIA.

The information contained in this report is of a general nature and is not intended to address the requirements of any particular individual or entity. BRIDGE TO INDIA aims to provide accurate and up-to-date information, but is not legally liable for accuracy or completeness of such information.

This report is owned exclusively by BRIDGE TO INDIA and is protected by Indian copyright, international copyright and intellectual property laws.

© 2021 BRIDGE TO INDIA Energy Private Limited

BRIDGE TO INDIA Energy Private Limited
C 8/5, DLF Phase I Gurugram 122001 India
www.bridgetoindia.com

For all research, subscription and marketing queries, please write to market.research@bridgetoindia.com

Follow us on:
Subscribe to our award winning research

**Subscriptions**
- India Renewable Weekly
- India Solar Compass
- India Renewable Market Brief
- India Corporate Renewable Brief
- Analyst time

**Databases**
- Projects
- Tenders
- Policies
- Equipment and EPC prices
- Power tariffs

**Other reports**
- India Renewable Outlook
- India Solar Rooftop Market
- India Solar Rooftop Market Analytics
- India Solar Open Access Market
- Estimating cost of capital for Indian solar projects

www.bridgetoindia.com  |  market.research@bridgetoindia.com  |  +91 124 420 4003