



175 GW Renewables by 2022

A September 2021 Update

Saumendra Aggrawal | Ashwin Gambhir

December, 2021



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Table of Contents

1. Summary	1
2. Introduction	3
3. Capacity Addition in Renewable Sources	6
3.1. Distribution along the states	8
3.2. Status of 175 GW target	9
4. Power Generation from Renewable Energy Sources	13
5. Price Trends and amendments in Competitive Bidding Guidelines	14
5.1. Price Trends	14
5.2. Amendments to Competitive Bidding Guidelines	15
6. Role of RPO mechanism in promoting Renewables	18
6.1. RPO Targets	18
6.2. RPO Compliance	19
6.3. Renewable Energy Certificate Mechanism	22
6.4. Trading "Green" Power in Power Exchanges	23
7. Other developments related to Renewable Energy	25
7.1. Dues of Renewable Generators from DISCOMs	25
7.2. PM-KUSUM Scheme	26
7.3. Evolution of tax incidences on Solar PV sector	27
7.4. Promoting Manufacturing in Solar PV and Battery Storage	29
7.5. Evolution of the Inter State Transmission System (ISTS) charges waiver	30
7.6. Increasing need to address local environmental and social aspects	31
8. References	33

List of Tables

Table 1: Share of different renewable power sources in Power Generation	13
Table 2: Major Amendments in Bidding Guidelines for various sources	16
Table 3: RPO Compliance by UP DISCOMs in last three years (in MUs)	21
Table 4: Revised targets for PM-KUSUM scheme	26
Table 5: Status of PM-KUSUM scheme	27
Table 6: Different duties or taxes on solar PV systems	27

List of Figures

Figure 1:	RE Capacity Addition since FY 07	3
Figure 2:	Share of Renewable Energy Sources as on 31 st August, 2021	6
Figure 3:	Renewable Power Capacity addition during FY 15 to FY 22 (Till August 2021)	7
Figure 4:	Capacity Addition in solar power	8
Figure 5:	Renewable Power Installed Capacity as on 31 st August, 2021	9
Figure 6:	Renewable Capacity Targets vs Achievements till March 2021	9
Figure 7:	Rooftop Solar Capacity Addition over the years	11
Figure 8:	Source-wise Renewable Power Generation (till July 2021)	13
Figure 9:	Tariff discovered under competitive tenders (bids conducted till Aug 2021)	15
Figure 10:	RPO Compliance for states for FY 2018-19	20
Figure 11:	RPO Compliance for FY 2019-20	20
Figure 12:	GTAM vis-a-vis TAM trade volume over the months	24

1. Summary

The contribution of renewable energy (RE) to India's electricity mix continued to grow over the last few years and marked an important milestone when the RE capacity surpassed the 100 GW level in August 2021. Notwithstanding this impressive achievement, the sector stands at a crossroads with many emerging challenges which need to be addressed.

Capacity: Despite achieving the 100 GW milestone, the growth in capacity addition has declined since reaching its peak in FY 17 (14.5 GW), and actually halved in FY 21 (7.3 GW). The share of solar PV in this RE capacity addition has increased and that of wind has reduced significantly over time. Utility scale solar PV installed capacity (40.2 GW) has surpassed that of wind (39.9 GW) in October 2021. While rooftop solar has gained some traction since FY 21, it still is nowhere near reaching the target of 40 GW.

Generation: In terms of actual electricity generation, with 147 billion units (BU) in 2020-21, the share of renewables (excl. large hydro) was 10.6% and 22% including the 159 BU from large hydro. As expected, in consonance with the capacity mix, the share of solar (41%) surpassed that of wind (40.8%) in FY 21. From FY 15 to FY 21, the share of solar has grown from 7.28% of total RE generation to 41%, while that of wind has reduced from 54.8% to 40.8%. Wind and solar power contribute the bulk of RE generation, given their low-costs.

Price trends and amendments in bidding guidelines: Solar, wind and wind-solar hybrid auctions continued to discover low prices as has been the trend since competitive bidding has become the norm in the RE industry. The lowest discovered prices for solar PV was Rs. 1.99/kWh in December 2020, while it was Rs 2.69/kWh for wind (September, 2021) and Rs 2.34/kWh for wind-solar hybrid projects (August, 2021). The low-price discovery has created a challenge for RE projects in some states wherein justifying the power procurement from older projects with higher tariffs is becoming challenging. Few states like Andhra Pradesh, Telangana, Punjab and Uttar Pradesh are attempting renegotiation of signed PPAs or retendering of recent auctions.

The RE competitive bidding guidelines have been revised several times in the recent past with separate guidelines for several resources. This calls for some level of streamlining and standardisation of guidelines. Building on this, there is an increasing trend of moving from plain vanilla solar/wind tenders towards innovative tenders with provisions such as energy storage, RTC, peak power supply, RE-Thermal bundling.

RPO and HPO: Keeping the generation price parity of wind/solar power with conventional sources, there is a need to review the RPO framework, and instead of solar and non-solar, the focus should be on generic RPO targets, thus providing enough freedom to distribution licensees in selecting the RE source. Several states have already made such a demand.

RPO compliance has always been a vexed issue for most states with some faring better than others. There is a need to strengthen the RPO compliance process with an effective carrot and stick approach. Poor and delayed RPO compliance raises questions over the whole mechanism and considering the various existing lacunae, there is a need to streamline and standardise the RPO compliance process in the country, which can make it easy for centralised monitoring. Forum of Regulators could take a lead in developing such a process.

In March 2019, MoP announced various measures to promote deployment of large hydropower projects (LHPs), which included consideration of LHPs as renewable energy source and HPO¹ as separate entity within non-solar RPO. The well-known problems associated with development of large hydro power projects raises a valid question on the need to promote LHPs under the ambit of RE.

REC mechanism: REC mechanism as a means of promoting RE has deteriorated over the years due to various reasons, though mostly because of declining tariffs for solar and wind power, lax RPO compliance across states and alternative procurement options like GTAM/GDAM and promotion of inter-state transmission of RE power through ISTS charge and losses waiver. All these routes have seen preference over RECs for complying with RPO targets. Thus, there is a need for a much more fundamental redesign of the REC mechanism based on clear, laid-out principles and considering the existing market realities.

Payment delays: DISCOMs in some states are either unwilling or not in position to pay the renewable generators on time, which has resulted into accumulation of dues over the years. While MoP is trying to improve payment discipline by bringing in rules such as the LPS Rules 2021, many SERCs have from time to time issued orders to DISCOMs to make timely payments to renewable generators without too much success. The delay in dues payment is detrimental to investment in renewable sector and needs to be addressed comprehensively.

Taxation and Manufacturing: Taxation in the solar PV sector has seen a lot of changes in the recent past. Considering the 500 GW non-fossil fuel target by 2030 and the central role of solar and wind power in this transition, principles for taxing renewable energy in the short and long term needs broader debate, stakeholder consultation and a balanced approach so to not impede the clean energy transition while appropriately contributing to tax revenues. Changes in tax rates should ideally have ample lead time and exemptions/waivers should come with sunset clauses for policy certainty. While one objective of imposing taxes on imported RE goods was to boost local manufacturing, recently the GoI has strongly pushed for local manufacturing through Production Linked Incentive schemes for solar PV and Advanced Batteries, thereby encouraging investments and reducing import dependency.

Local socio-environmental implications: Considering the scale of RE deployment within the 500 GW target by 2030, protests and legal battles over local socio-environmental impacts may accentuate further if not addressed comprehensively and in the true spirit of sustainable development. Inclusive RE development is crucial, which calls for many desirable policy changes, including:

- Devising RE specific land use policies, which encourages long-term land leasing.
- Creating a state/national land bank for planned RE development.
- A process for informed local consent in letter and spirit through institutionalising EIAs and SIAs to be carried out with active involvement of community.
- Creating a formal institutional structure for revenue/benefit sharing with affected communities.

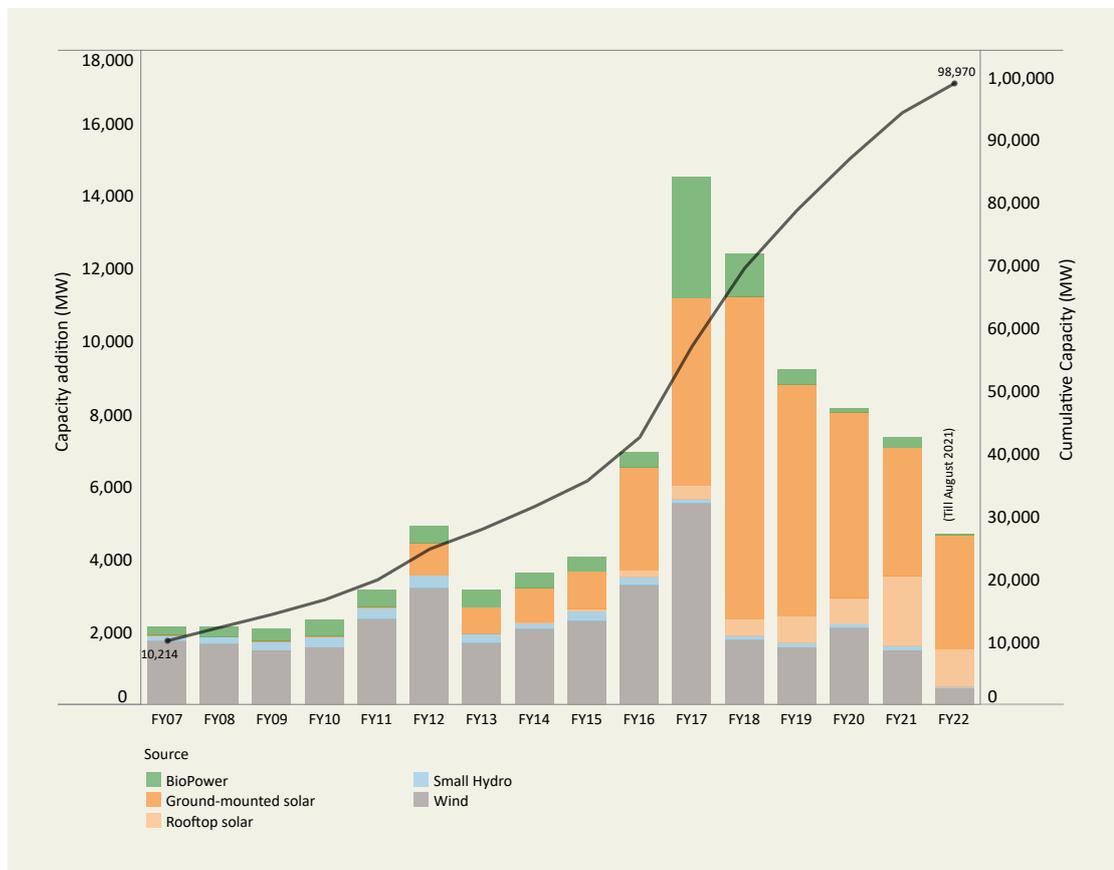
1. HPO benefits can be met from power procured from eligible LHPs commissioned on and after 8th March, 2021 and up to 31st March, 2030 or from Hydro Energy Certificate mechanism.

2. Introduction

A lot of developments have taken place in the last three years (Oct, 18 - Aug, 21) in the renewable energy (RE) sector. While cumulative capacity grew by ~28 GW in these three years, annual capacity addition, as shown in Figure 1, has actually slowed down compared to the highs of FY 17 and FY 18. However, it was still higher than conventional capacity with RE being ~65% of the annual capacity addition between FY 19-21. Fortunately, the prices of wind and solar power, the mainstay of RE capacity have continued fall in this period, further improving the economic attractiveness of the RE in comparison to conventional power. While investments in the RE sector continue to flourish, recent attempts by some states to re-negotiate tariffs under contractually bound PPAs and the continued delays in payment of dues to RE generators is creating a cloud over the sector and hurting investor confidence.

The rooftop solar segment which has a significant target of 40 GW has seen strong growth, with 4.3 GW being added in the three years and annual capacity addition quadrupling from 0.5 GW in FY 18 to 2 GW in FY 21. Considering the overall resistance of DISCOMs to rooftop solar due to loss of high paying consumers, this growth is all the more impressive and points to the times to come with this route of self-generation being more economically attractive to consumers.

Figure 1: RE Capacity Addition since FY07



Alternatives to DISCOM electricity supply in the form of RE based Open Access and Captive consumption including rooftop solar have seen a steady growth in this period. While this has been supported by various waivers and exemptions on OA charges from SERCs, the situation is rapidly changing with several states moving towards restricting the RE energy banking framework, which is a critical enabler of RE based OA and CPP procurement. The Ministry of Power through its draft Electricity (Promoting renewable energy through Green Energy Open Access) Rules 2021 have also strongly pushed for facilitating such OA procurement along with some preferential treatment for RE based OA. The introduction of the Green-Term Ahead Market (G-TAM) in the Power Exchanges in August 2020 and the recently approved Integrated Day Ahead Market which will have a separate "RE only" day ahead option is providing new and flexible market options for RE procurement and sale to C&I consumers and DISCOMs.

Similarly, the MoP has twice attempted to amend the Electricity Act, 2003, once in September 2018 and next in April, 2020. In both these cases, there was an emphasis on high RPO targets and stronger measures for non-compliances. The MoP has also formally labelled large hydro power as 'renewable', especially when it comes to counting the RE generation in internal comparisons. The sector has seen an increasing trend of moving towards innovative RE tenders with provisions such as energy storage, RTC, peak power supply, RE-thermal bundling which will allow DISCOMs to procure more 'firm' and dispatchable power.

Just like any other economy, the COVID-19 pandemic impacted India a lot. The RE sector was no exception with capacity addition remaining muted during the lockdown period of April-June 2020 and projects getting a maximum six-month extension for completion. Considering the future growth of RE and our increasing dependence on imported equipment (esp. in the case of solar PV), the GoI brought in several Production Linked Incentive (PLI) schemes for manufacturing high efficiency solar PV modules and advanced chemistry batteries in India. These have got a very high response and one can expect a healthy local manufacturing base in the country in the coming years.

This report is the fourth in our series of reports tracking the progress of grid connected renewable energy (RE) in Indian electricity sector. The first report, covering updates from 2015 till October 2016, talked about the history of renewable energy development in the country, while discussing about the policy-regulatory framework for renewables in India (Prayas (Energy) Group, 2016). The second report surveyed the progress made since first report till July 2017 and highlighted major sectoral developments in terms of capacity addition, prices, new policies and regulations and analysed major challenges and raised very important and relevant questions for RE development in the country (Prayas (Energy) Group, 2017). The third report covered similar sectoral developments since second report till September 2018, while talking about various aspects of energy transition (Prayas (Energy) Group, 2018). This report is a continuation of the crucial engagement on the 175 GW journey that we have captured in previous reports and highlights some of the emerging challenges and opportunities.

Broad outline of the report: This report, just like the previous three reports, explores the course India has charted in RE sector. While the report specifically covers the period of October 2018 to August 2021, it should be read along with the previous reports to get the history of the 175 GW journey. After setting the context in the introductory section, the report details the progress in RE capacity addition and generation in chapters one and two. Chapter three takes us through the tariffs discovered under the competitive bidding process and subsequent evolution of tenders

and tariff bidding guidelines in the country. Chapter four analyses the RPO targets and their compliance in various states, along with alternative mechanisms to comply with RPO. The last chapter summarises the other key developments (like taxation, manufacturing, PM-KUSUM) in the RE sector, which are expected to impact the sector growth in a big way.

A note on data used in this report: Data reported in this edition of the report are up to August 2021, unless specified otherwise. Publications and information included are also as of August 2021, unless specified otherwise. Since the last edition, the report is being structured so as to be read in conjunction with the Renewable Energy Data Portal (REDP), which is hosted on the Prayas (Energy Group) website and contains all the RE illustrations. The portal is an effort by Prayas (Energy Group) to collate all the important data, already available in the public domain, at one place and present them to highlight the rapidly expanding role of RE in the electricity system. Another feature of this effort is the interactive nature of the portal, which allows users to look at specific bits of information across RE sources, across different states in India and over time. All the visuals can be downloaded. The portal is revised periodically and the latest update done in August 2021 included more data and better infographics.

3. Capacity Addition in Renewable Sources

Renewable energy capacity in the country has risen to a level of 100 GW² on 31st August, 2021, increasing from 38.96 GW on 31st March 2014. This is certainly an important milestone in India's journey towards accelerating its share of renewables in the power mix. Solar and wind constitute around 85% of the total capacity installed till date (as shown in Figure 2). The share of renewables in the total installed capacity has increased from 14% in FY 2014-15 to 25% by FY 2020-21 (21.8% including captive). While this overall growth is certainly commendable, yearly capacity addition has actually fallen in last four years after an impressive addition of 14.5 GW in FY 17 (Figure 3). It has almost halved from the highest addition (14.5 GW) to 7.3 GW in FY 21.

While we should be proud of the 100 GW achievement, it is also important to keep in mind the much larger target of 450 GW by 2030. Even before that long-term goal, is the short-term goal of 175 GW by December 2022. Apart from the 100 GW installed RE capacity, roughly 51 GW is under various stages of implementation and another 32 GW is under the process of bidding and tendering³. Thus, in spite of the drop in demand due to the pandemic, one can see the real possibility of over 175 GW RE capacity being in place in the next few years, though it is quite certain that it will not be done by Dec, 2022.

Figure 2: Share of Renewable Energy Sources as on 31st August, 2021

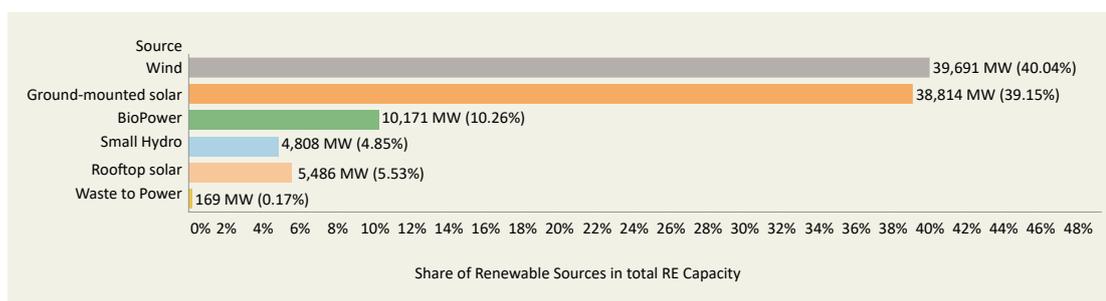


Figure 4 clearly shows that capacity addition was driven by solar PV in last few years, peaking to 9,362 MW in FY 17 and subsequently falling to a level of 5,478 MW in last financial year. On the flip side, the share of solar rooftop capacity has increased over the years, with FY 21 being phenomenal for the segment (an addition of 1,924 MW). Even in FY 2021-22, more than 1 GW rooftop capacity has been added in a span of just five months in spite of state-level COVID-19 lockdowns and economic slowdown during the initial months.

2. The 100 GW capacity also include installed capacity under off-grid RE systems (solar PV and waste-to-energy projects).
3. MNRE Monthly Summary for the Cabinet for the month of October 2021, https://mnre.gov.in/img/documents/uploads/file_f-1636693020624.pdf

Figure 3: Renewable Power Capacity addition during FY 15 to FY 22 (Till August 2021)

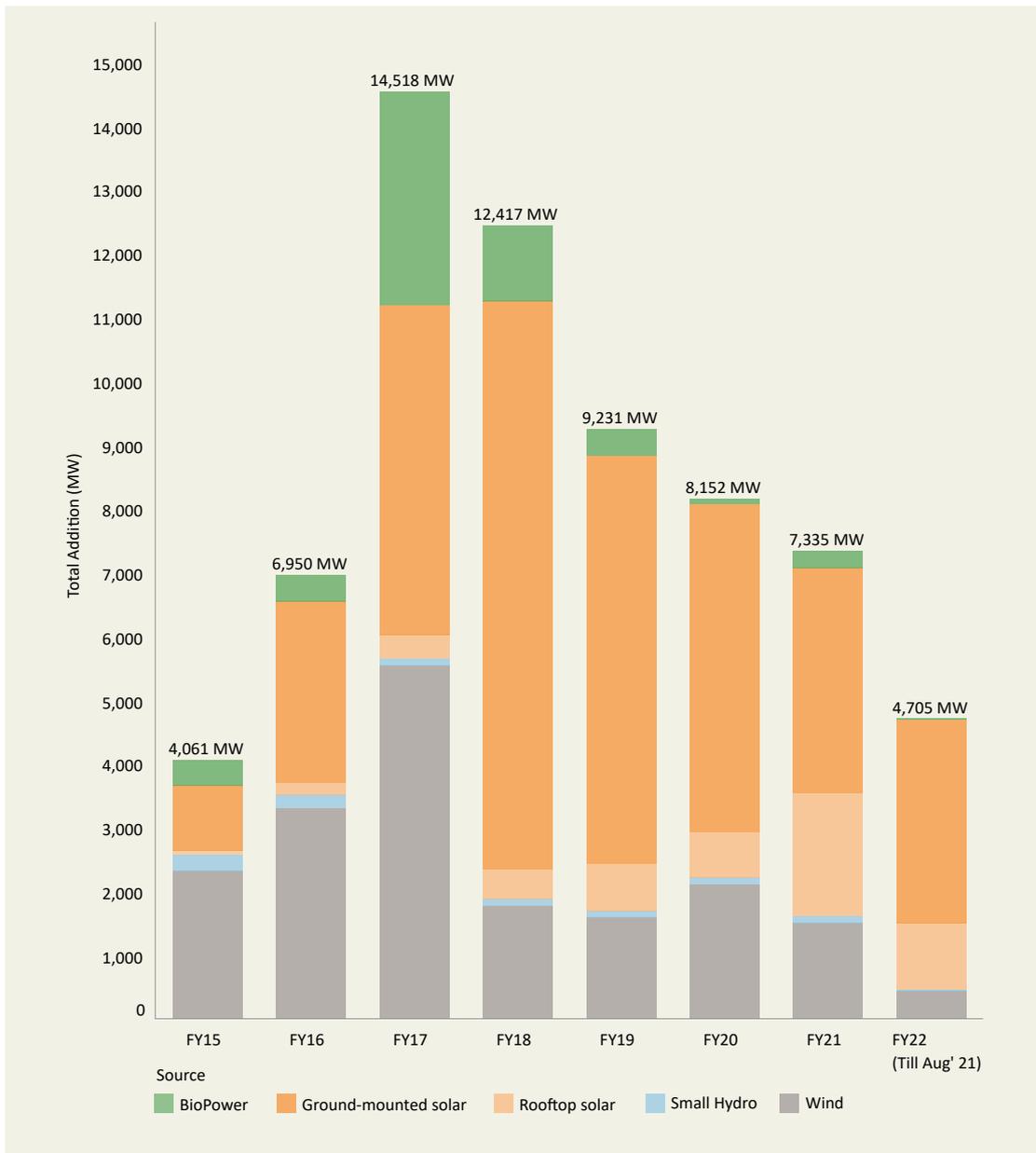
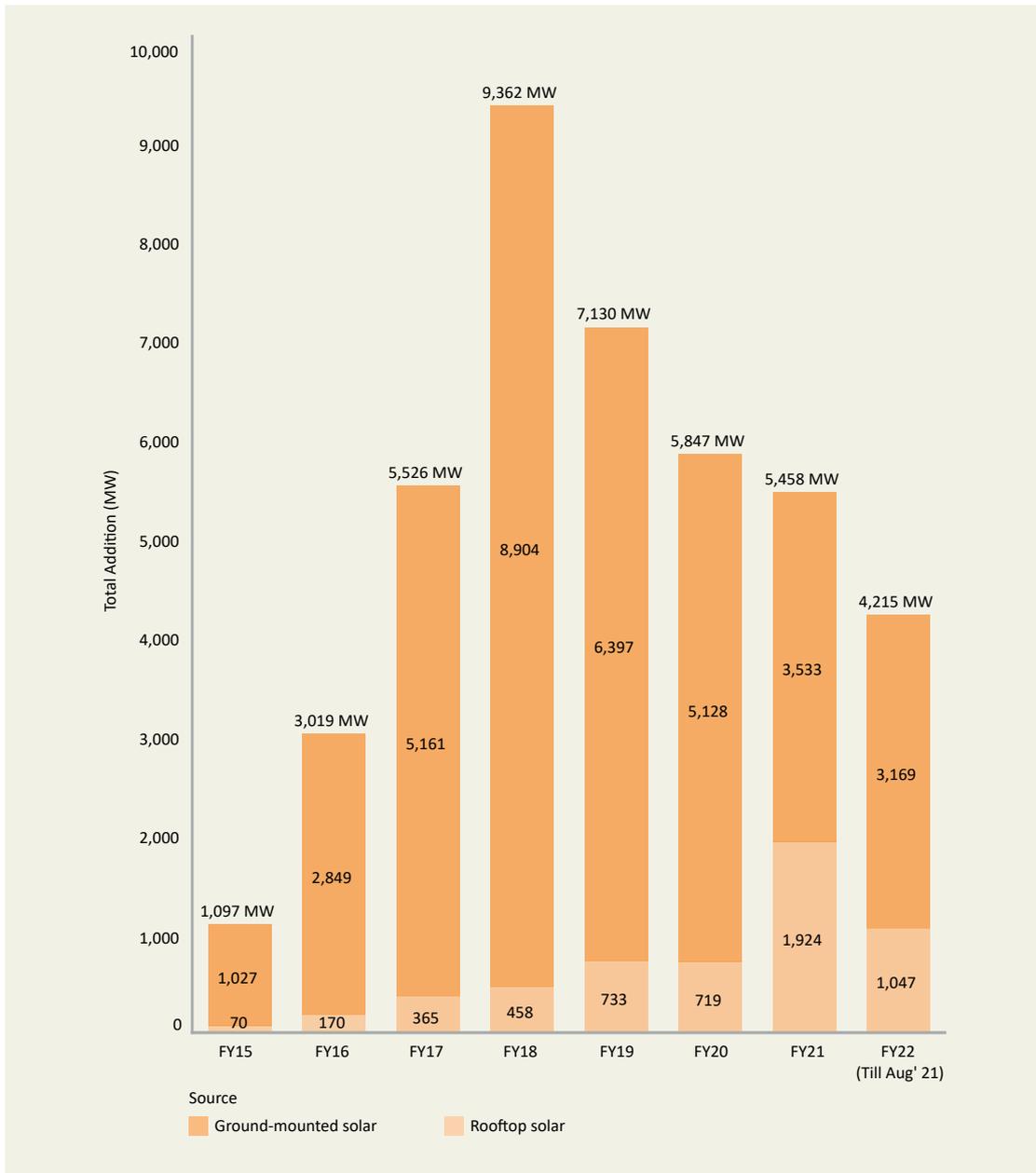


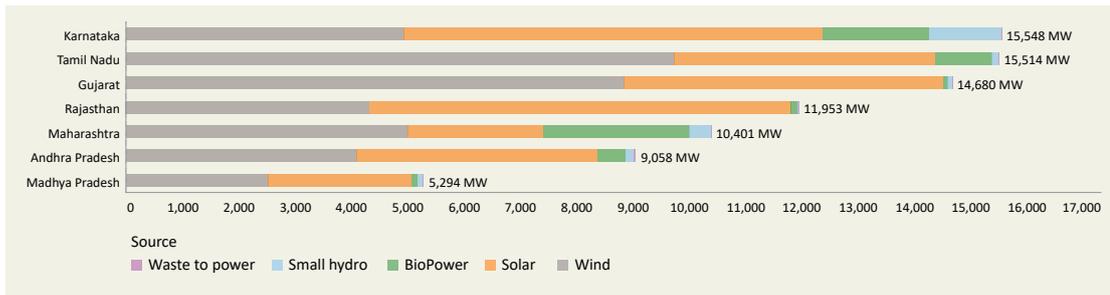
Figure 4: Capacity Addition in solar power



3.1. Distribution along the states

In recent years, Karnataka has overtaken Tamil Nadu in terms of total renewable energy installed capacity (Figure 5). The two states together contribute around one-third of the total installed capacity, and just five states, namely Karnataka, Tamil Nadu, Gujarat, Maharashtra and Rajasthan, contribute more than two-third of the total installed capacity in the country. This shows the concentrated development of renewable capacity in the southern and western states and the need for associated infrastructure development in these areas.

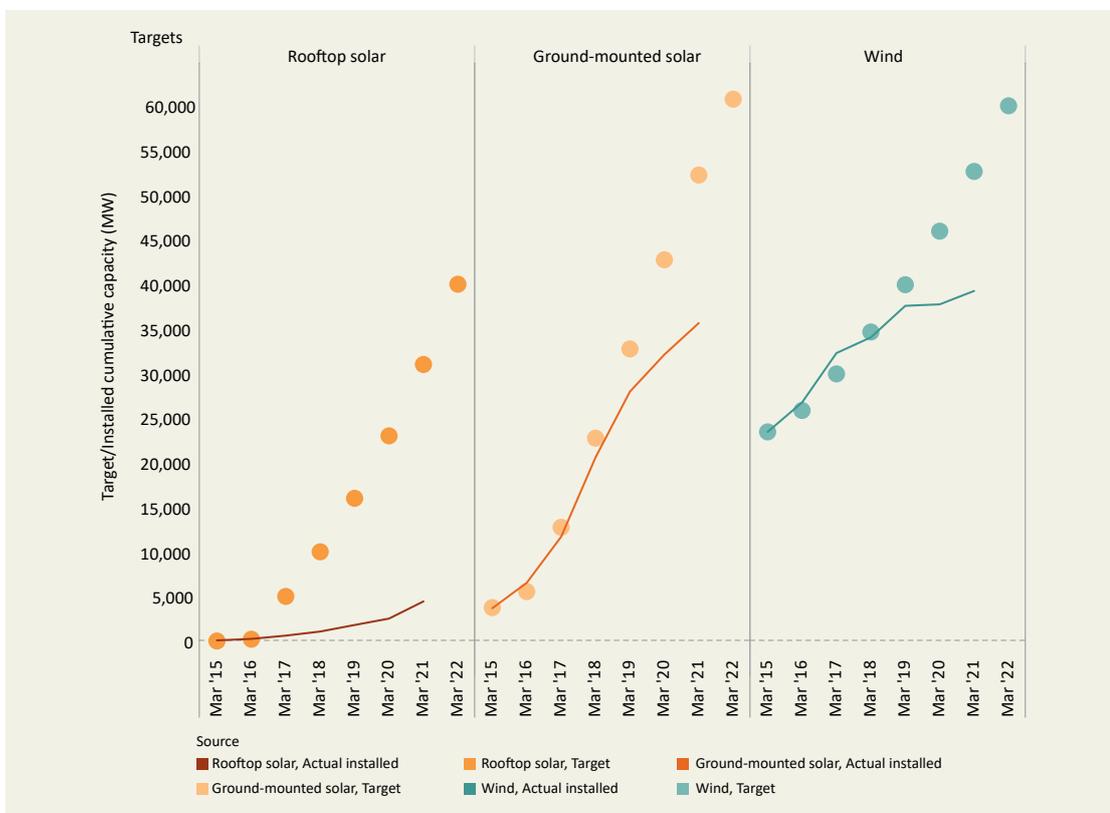
Figure 5: Renewable Power Installed Capacity as on 31st August, 2021



3.2. Status of 175 GW target

The target of 175 GW renewable capacity by December 2022 set in the year 2015 was a challenging and ambitious one. While it has provided a boost to renewables in the country and confidence to sector stakeholders, capacity addition had not crossed the level of 10 GW per year in last three financial years, thus impacting the prospects of achieving the target of 175 GW by 2022. Against the targets set to be achieved till March 2021, the ground-mounted solar capacity was 35,646 MW (against target of 52,243 MW⁴) and wind capacity was 39,247 MW (against target of 52,644 MW). This shows the back log created in past in terms of capacity addition, which will be difficult to fill in a span of less than one and half years. Against the target of 40 GW capacity from rooftop solar, the progress is rather muted with just 5,486 MW installed till 31st August, 2021. On the other hand, the low targets set for small hydro power seems achievable and that for biomass-sourced power have already been achieved.⁵

Figure 6: Renewable Capacity Targets vs Achievements till March 2021



Notes: Circles denotes targets and line denotes achievement for respective sources.

- The targets are cumulative targets as set by MNRE in February 2015.
- Refer "RE Targets" tab on <https://www.prayaspace.org/peg/re-capacity.html>

The non-achievement of the 175 GW target can be attributed to the fact that the renewable capacity addition was slowed down in recent time (See Figure 3).

Since March 2020, the COVID-19 pandemic induced lockdown has severely impacted RE capacity addition. As per MNRE, for the period of April-June 2020, RE capacity addition was just 591 MW, out of which 494 MW was added in solar PV (including rooftop). Recognising this, MNRE asked all state RE nodal agencies to treat lockdown due to COVID-19 as force majeure and grant appropriate time extension to project developers. Along with this, all RE projects (under implementation as on 25th March 2020) either through RE Implementing Agencies designated by the MNRE or under various schemes of the MNRE, were given a blanket time extension of 5 months from 25th March 2020 till 24th August 2020. Project developers were asked to pass on this relaxation to EPC contractors, material, equipment suppliers, OEMs, etc. (MNRE, Time Extension in Scheduled Commissioning Date of Renewable Energy (RE) Projects considering disruption due to lockdown due to COVID-19, 2020). Later, it was clarified that the total time-extension because of first wave of COVID-19 in the country shall be restricted to six months, including the five months blanket time-extension already granted by MNRE. Furthermore, MNRE directed all stakeholders that this time extension should not be used to claim termination of PPA, increase in project cost or penalty on delayed commissioning of project (MNRE, Time-extension in Scheduled Commissioning Date of Renewable Energy (RE) Projects, 2021). In 2021, many state governments again imposed lockdown in their respective states due to resurgence of COVID-19 cases. These state-specific lockdowns again affected the project construction process from the month of April 2021. Reacting to this, MNRE again allowed time extension to the RE projects (being implemented either through RE Implementing Agencies designated by the MNRE or under various schemes of the MNRE) for the period of 1st April, 2021 to 15th June, 2021. However, this time no recommendations were made to state agencies for time extension (MNRE, Time Extension in Scheduled Commissioning Date of Renewable Energy (RE) projects considering disruption due to the second surge of COVID-19, 2021).

Solar power is the largest contributor to the 175 GW target. In the below sections, we discuss the status of solar parks and the solar rooftop segment.

Solar Parks

Solar Parks are a key enabler to achieve the target of 100 GW solar power. As per the Parliamentary committee report, MNRE has approved 39 solar parks in 17 states with total capacity of 22,879 MW. Out of these, 8 solar parks are almost fully developed where 6,580 MW capacity has been commissioned and 4 Solar parks are partially developed where 1,365 MW capacity has been commissioned. Apart from this, 11 solar parks with an aggregate capacity of 17,121 MW have not been approved by MNRE, which were supposed to be commissioned by 2022 itself. The reason for non-approval is unclear (Standing Committee on Energy, 2021, p. 16).

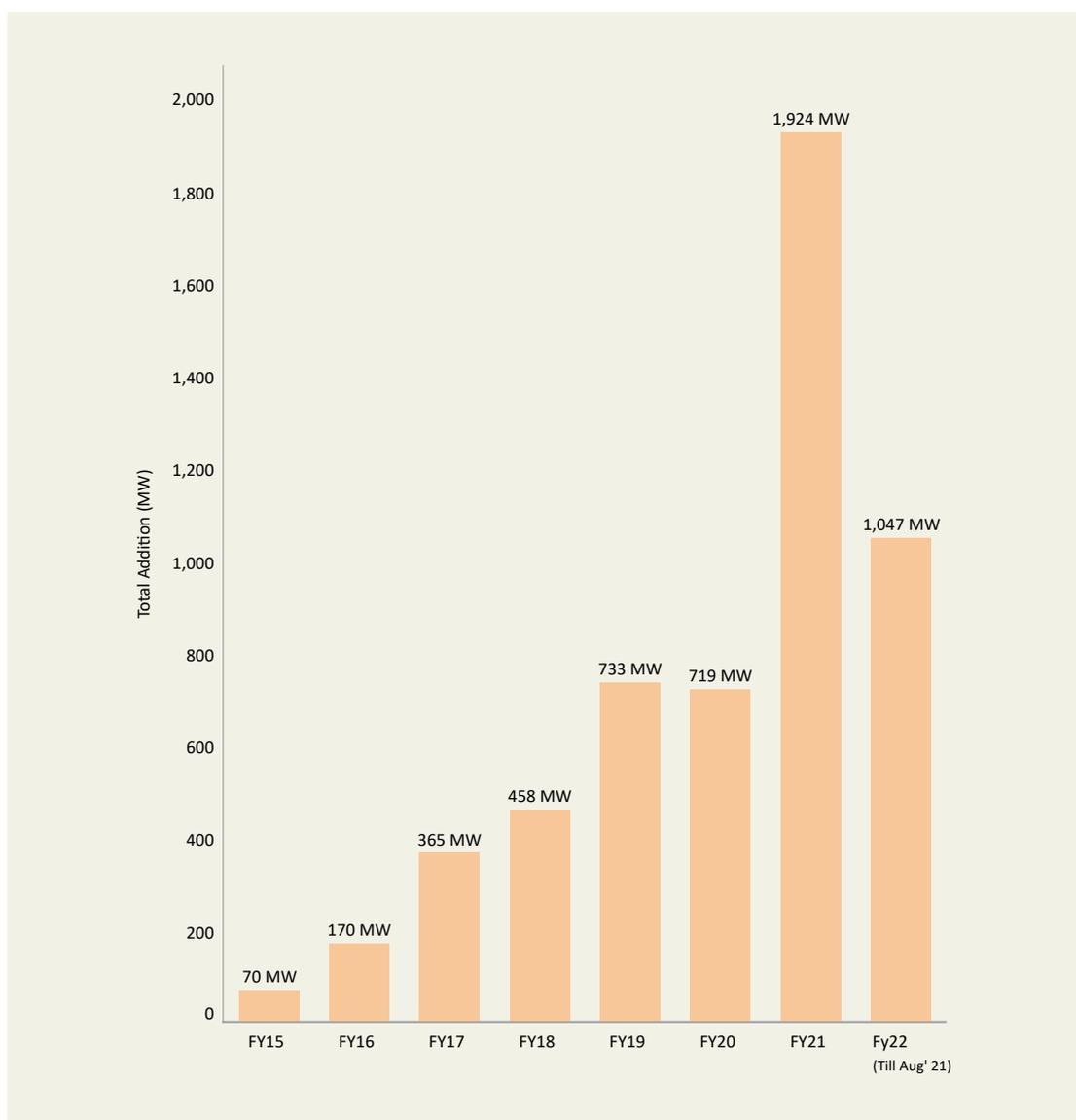
The slow progress of solar parks can be attributed in part to acquisition of land (ACTION PLAN FOR ACHIEVEMENT OF 175 GIGAWATT (GW) RENEWABLE ENERGY TARGET, 2021). Recognising the issue of land identification and acquisition, MNRE modified the scheme for Development of Solar Parks and Ultra Mega Solar Power Projects in July 2020 to introduce a new Mode-8 (Ultra Mega Renewable Energy Power Parks (UMREPPs)). Under Mode-8, state governments were asked to assist project developers in identification and acquisition of land for setting up of UMREPPs and even facilitate them to get all required statutory clearances (MNRE, Modification in Scheme for "Development of Solar Parks and Ultra Mega Solar Power Projects", 2020). While the introduction

of Mode-8 has encouraged participation in solar parks, there is still a need to come out with a state-wise/ national land bank database (consolidating the information about potential land parcels provided by each state and UTs) which can be used to identify lands for solar parks in future. The status of solar parks across the country can be seen here⁶.

Rooftop Solar

Rooftop solar capacity addition remained quite muted until FY 20, but gained traction in FY 20-21 with capacity addition of ~2 GW (Figure 7). However, there is still a long way to go with total rooftop capacity having just reached 5,486 MW by the end of August 2021⁷, against the set target of 40 GW by 2022.

Figure 7: Rooftop Solar Capacity Addition over the years



6. <https://www.prayasypune.org/peg/solar-park.html>

7. The data quoted by MNRE for solar rooftop capacity still differs from that reported by Bridge to India. As per BTI, the total solar rooftop capacity in India is 7,367 MW as on 30th June, 2021 (BTI, 2021). Our previous reports of the series have consistently flagged this issue of data mismatch in different agencies.

In spite the lockdown in various states at different times due to COVID-19 pandemic and regulatory uncertainty caused due to capacity limit revision under Electricity (Rights of Consumers) Rules, 2020, capacity addition in FY 21 increased by more than 150% from that in FY 20. It is expected that the capacity will increase at better pace in FY 22, since more than 1,000 MW capacity has been added during April-August 2021⁸.

In March 2019, MNRE approved Phase-II of Grid Connected Rooftop Solar Programme for achieving cumulative capacity of 40 GW from Rooftop Solar Projects by the year 2022. It has two components, A) which provides a central financial assistance (CFA) for setting up 4 GW rooftop projects in residential sector and B) Incentives to DISCOMs for over-achievement of targets for initial 18 GW capacity (up to 10% of the benchmark cost for solar capacity achieved beyond 15% of installed base capacity installed at the end of previous year)⁹. Under this phase, 2,607.2 MW was allocated to 65 DISCOMs in 31 states and UTs as on 31st December, 2020 (MNRE, MNRE Annual Report 2020-21, 2021). However, the commissioned capacity under the scheme is still low with just 472 MW capacity added in 2019-20 (Standing Committee on Energy, 2021). While annual capacity addition was close to 2 GW in FY 21 and is expected to exceed 2 GW in FY 22 (refer Figure 7 above), the revised targets under the Phase-II (12 GW in 2021-22 and 17 GW in 2022-23 respectively) are too unrealistic and are not backed by necessary policy and regulatory support to see their realisation.

Though the prices of solar PV panels have reduced over the years making the rooftop projects economically attractive to C&I consumers across the country, the segment has not been able to tap the potential fully. The issues like DISCOMs' unwillingness and resistance towards rooftop systems (mainly due to fear of revenue loss), lesser appetite and awareness among domestic consumers and regulatory constraints for rooftop projects in C&I segment in form of banking provisions and accounting arrangements (net metering, gross metering or net billing) are few reasons for slow uptake of solar rooftop in the country. The enactment of Electricity (Rights of Consumers) Rules, 2020 mandate the provision of net metering for a minimum capacity up to 500 kW¹⁰. However, most states already have a provision for net-metering up to 1 MW. Few state commissions have amended their regulations to incorporate some of the changes as per these rules and some have even reduced the limit from 1 MW to 500 kW. However, in long term, the rules could benefit the sector provided that a wider choice of accounting arrangements is provided to consumers with reduced roadblocks by DISCOMs.

8. Based on MNRE Monthly Progress Data for the months of March 2021 and August 2021

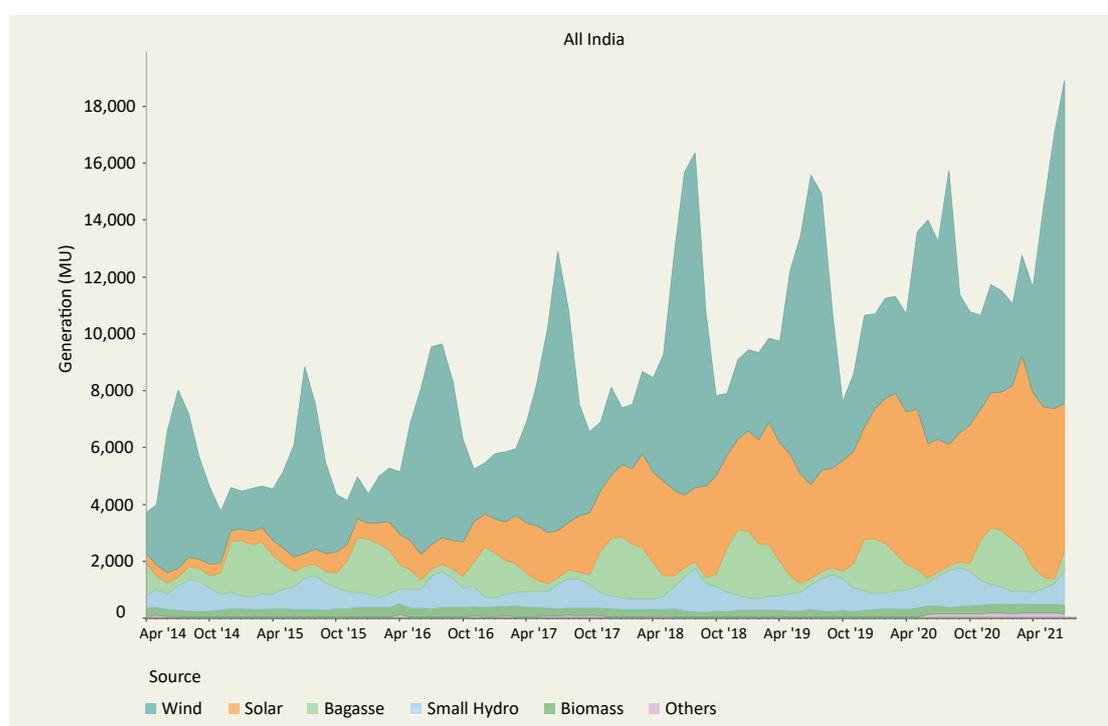
9. Operational Guidelines for Implementation of Phase-II of Grid-connected Rooftop Solar Programme, issued by MNRE on 20th August, 2019; <https://mnre.gov.in/img/documents/uploads/7ccd3b4b3bb94a51af516e2ee4fdede3.pdf>

10. Initially, the draft Electricity (Rights of Consumers) Rules, 2020 had proposed for net metering arrangement up to just 10 kW and gross metering beyond that. The final rules increased the limit of net metering from 10 kW to 500 kW and even provided option of net billing arrangement.

4. Power Generation from Renewable Energy Sources

The share of renewables in total generation has increased from 5.61% in FY 2015-16 to 10.65% from FY 2020-21, increasing by ~1% every year. In terms of actual electricity generation, with 147 billion units in 2020-21, the share of renewables (excl. large hydro) was 10.6% and 22% including the 159 BU from large hydro. The monthly trend of renewable energy generation since April 2014 shows spikes during the months of June-August (monsoon season), which is due to the high share of wind power in total renewable power generation (see Figure 8 below). Wind generation was unusually low in 2020.

Figure 8: Source-wise Renewable Power Generation (till July 2021)



From Figure 8 and Table 1 below, it is clear that the share of solar power has increased drastically over the years (from 7.28% in FY 2014-15 to 41.02% in FY 2020-21), cutting down the share of wind, bagasse and small hydro power. Moreover, other sources (small hydro, bagasse etc.) have remained almost same in absolute terms.

Table 1: Share of different renewable power sources in Power Generation

	Financial Year						
	FY15	FY16	FY17	FY18	FY19	FY20	FY21
Bagasse	19.20%	19.83%	11.70%	13.30%	10.86%	7.88%	7.68%
Biomass	5.13%	5.71%	5.13%	4.80%	2.21%	2.15%	2.39%
Others	0.65%	0.41%	0.70%	1.04%	0.34%	0.27%	1.10%
Small Hydro	12.91%	12.62%	9.85%	11.00%	6.93%	6.92%	6.96%
Solar	7.28%	11.14%	16.28%	31.35%	30.28%	36.29%	41.02%
Wind	54.83%	50.30%	56.34%	38.51%	49.37%	46.49%	40.85%

5. Price Trends and amendments in Competitive Bidding Guidelines

Auction design and tendering processes for renewable energy is changing with time, especially in response to the ever-increasing penetration of solar and wind power in the grid. New entrants in the tender categories are round-the-clock renewable power and hybrid renewable energy auctions.

5.1. Price Trends

The price discovery from solar PV, wind and hybrid projects is shown in Figure 9.

Solar PV auctions have been carried out regularly in the country by different agencies including SECI, NTPC, NHPC, GUVNL, APGECL, etc. Since September 2018¹¹, 47 large-scale auctions were conducted with more than 36 GW capacity being auctioned and the tariff discovered under these auctions has been in range of Rs. 1.99-3.29 per unit (Figure 9), with the level of Rs. 1.99 per unit being reached in the month of December 2020. While this level was not replicated in other subsequent tenders, the tariff remained low in comparison to past tenders (ranging from Rs. 2.22-2.58¹² per unit for bids finalised in the month of February 2021). One of the interesting points to note in recent tenders was aggressive bidding not just by international players but also by central PSUs like NTPC¹³.

Wind tenders have not been that frequent. Just eight tenders with capacity of 6,985 MW were bid during the period of September 2018- September 2021, with tariff ranging from Rs. 2.69 to 3.00 per unit. The tendering agencies were mainly SECI and GUVNL. The lowest tariff of Rs. 2.69 was discovered in September 2021, which is higher than lowest ever discovered tariff of Rs. 2.43 per unit in December 2017.

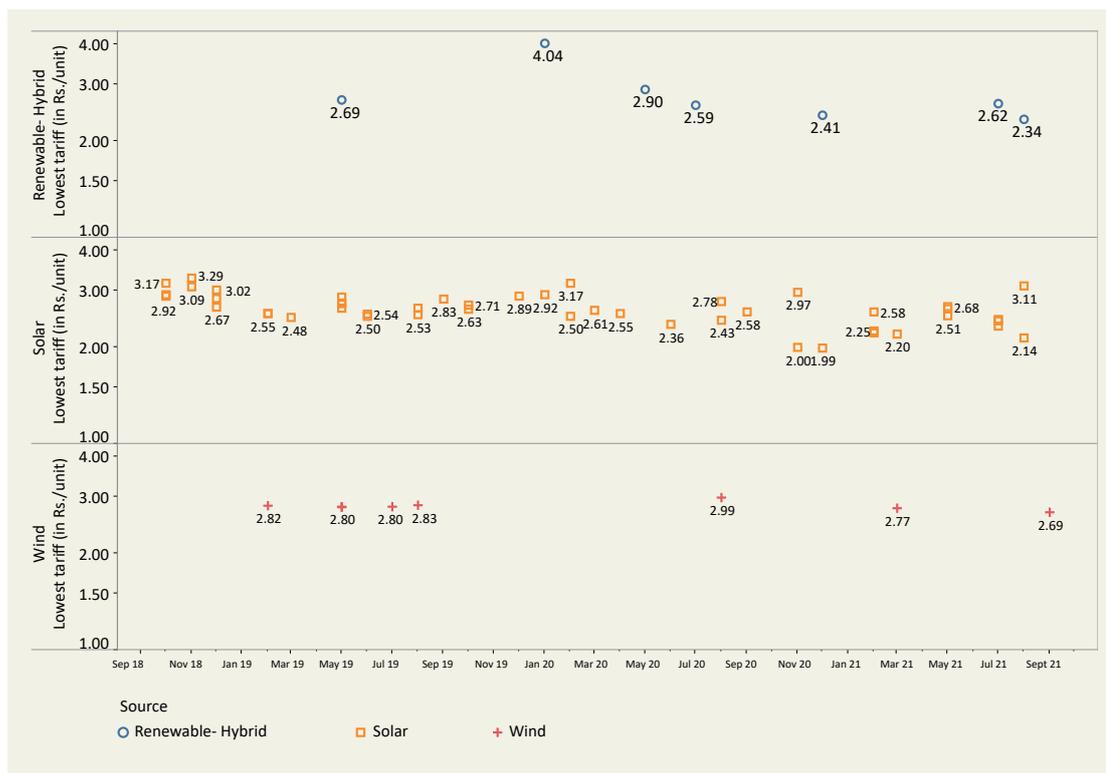
In recent time, SECI has come out with some unique tenders for renewable projects which can help to meet the future DISCOM demand more efficiently. These include solar-wind hybrid projects, RE projects with supply during peak demand and round-the-clock supply, thus paving way to integrate storage with renewable sources. Eight hybrid RE tenders has been carried out since May 2019, with tariff discovered ranging from Rs. 2.41 per unit (for solar-wind hybrid tender) to Rs. 4.04 per unit (for tender with provision of storage). There have been many interesting provisions in the tenders which included Round-the-clock power, bundling renewable with thermal power, energy storage, relaxing provision co-location of projects, etc.

11. The discovered winning bids for tenders in renewable sector (mainly solar PV and wind) can be seen here.

12. The tender with winning bids of Rs. 2.58 per unit was floated by APGECL for a capacity of 6.4 GW to supply free power to farmers, but the tender has been recently cancelled by AP High Court.

13. Interestingly, NTPC won the solar PV bids of 470 MW (@Rs. 2.01 per unit) and 200 MW (@Rs. 1.99 per unit) last year.

Figure 9: Tariff discovered under competitive tenders (bids conducted till Aug 2021)



Apart from this, newer technologies like floating solar, offshore wind, etc. are also getting traction in the country. Smaller scale tenders for projects under these technologies have been floated in different parts of the country by different agencies and many more are expected in the coming years.

While the tariff discovered under recent tenders has declined a lot, the same has created a challenge for RE projects developers and investors in some states wherein justifying the power procurement from older projects with higher tariff (tariff ranging even to a level of more than Rs. 10 per unit) is becoming challenging. Many states like Andhra Pradesh¹⁴, Telangana, Punjab and Uttar Pradesh have time and again signalled towards renegotiation of signed PPAs or moved for retendering of recently discovered bids (usually finalised in recent 1-2 years).

5.2. Amendments to Competitive Bidding Guidelines

The changing nature of auctions (like Round-the-clock power from RE, wind-solar hybrid projects, etc.) and learnings from previous tendering processes and contracts has resulted in several changes in bidding guidelines from MoP/MNRE, apart from issuance of guidelines for different project categories. Table 2 takes us through these amendments in the guidelines.

14. Read more about the peculiar case of Andhra Pradesh here.

Table 2: Major Amendments in Bidding Guidelines for various sources

Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Solar PV Power Projects¹⁵	
Amended in January 2019	<ul style="list-style-type: none"> ▪ Project commissioning timeline reduced from 21/ 24 months to 15 months for solar park projects and 18 months for projects being set up outside solar park, from the date of execution of PPA ▪ PPA signing within 140 days of issuance of RfS (reduced from earlier provision of 150 days)
Amended in July 2019	<ul style="list-style-type: none"> ▪ Dues recovery by encashing PBG to be credited to Payment Security Fund, maintained by Intermediary Procurer
Amended in October 2019	<ul style="list-style-type: none"> ▪ Fixed trading margin of Rs. 0.07 per unit to intermediary procurer ▪ Detailed provisions related to force majeure ▪ Minimum Generation Compensation increased from 50% of PPA tariff to 100% of PPA tariff ▪ No back-down / curtailment to be ordered without giving formal/ written instruction. Details of such events to be made public by concerned LDCs ▪ Deemed approval for tariff within 60 days of tariff petition filed to appropriate ERC ▪ Extension in financial closure on account of delay in tariff adoption by ERC
Amended in September 2020	<ul style="list-style-type: none"> ▪ "Payment on Order instrument" and "Letter of Undertaking to pay" added as alternatives to Bank guarantees for EMD and PBG
Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power from Grid Connected Wind Power Projects¹⁶	
Amended in July 2019	<ul style="list-style-type: none"> ▪ Land acquisition to be done on or before the scheduled commissioning date (SCD) ▪ Declaration of project commissioning only after generator demonstrates land possession. ▪ Revision of annual CUF once within first 3 years of COD ▪ Penalty for shortfall in energy availability @50% of PPA tariff for shortfall in energy terms ▪ In cases of early part commissioning, the Procurer may purchase the generation, at the PPA tariff. [Earlier, it was 75% of PPA Tariff]
Guidelines for Tariff Based Competitive Bidding Process for Procurement of Power From Grid Connected Wind Solar Hybrid Projects	
Guidelines in October 2020	<ul style="list-style-type: none"> ▪ The rated power capacity of one resource (wind or solar) shall be at least 33% of the total contracted capacity. ▪ Projects at same or different locations ▪ Storage allowed
Amended in July 2021	<ul style="list-style-type: none"> ▪ Delay in commissioning due to delay in LTA operationalization should be treated as delay beyond generator's control.

15. The guidelines were issued in August 2017 and have been amended five times till September 2021. The provision till 1st Amendment (June 2018) have been discussed in our previous report (September 2018 update).

16. The guidelines were issued in December 2017 and have been amended once in July 2019. The provisions of December 2017 guidelines have been discussed in our previous report (September 2018 update).

Guidelines for tariff based competitive bidding process for Scheme for procurement of blended wind power from 2500 MW ISTS connected projects (Blended Wind)	
Issued in June 2020	<ul style="list-style-type: none"> ▪ At least 80% capacity from wind power and rest from solar PV power ▪ At same or different nearby locations ▪ Declared annual CUF not less than 30% ▪ PPA signing within 165 days from issuance of RfS ▪ Project commissioning within 24 months from the date of execution of the PPA or PSA, whichever is later
Guidelines for Tariff Based Competitive Bidding Process for Procurement of Round-The Clock (RTC) Power from Grid Connected Renewable Energy Power Projects, complemented with Power from any other source or storage¹⁷	
Guidelines issued in July 2020	<ul style="list-style-type: none"> ▪ RE power complemented with coal-based thermal power and storage ▪ Minimum annual availability of 85% ▪ At least 51% annual power from RE, including power from RE-sourced storage system ▪ Composite tariff ▪ PPA Signing within 140 days from issuance of RfS
Amended in November 2020	<ul style="list-style-type: none"> ▪ Inclusion of other sources and storage for balancing ▪ Option of only one non-RE fuel source ▪ Peak hours declared by RLDC, instead of being specified by Procurer ▪ 4-part tariff instead of composite tariff ▪ Penalty provision for project unavailability changed
Amended in February 2021	<ul style="list-style-type: none"> ▪ Provisions related to force majeure as per industry standards

The above table signals that there have been a lot of amendment in the guidelines from time to time. Some of the new provisions allow various tendering agencies to come out with different tenders as per requirement in that state or the country as a whole. While it is great to see some timely and apt amendments, the number of such guidelines has increased, calling for standardisation of the guidelines in some aspects.

17. Earlier, it was titled "Guidelines for Tariff Based Competitive Bidding Process for Procurement of Round-The Clock (RTC) Power from Grid Connected Renewable Energy Power Projects, complemented with Power from Coal Based Thermal Power Projects".

6. Role of RPO mechanism in promoting Renewables

The mechanism of Renewable Purchase Obligation (RPO) has mandated distribution companies (DISCOMs) and other obligated entities (OA and CPP) to procure a minimum amount of renewable energy. While Ministry of Power (MoP) has issued national RPO trajectory till FY 2021-22, the state regulatory commissions (SERCs) have the right to decide the RPO trajectory for respective states as per Section 86(1)(e) of Electricity Act 2003. However, recently Ministry of Power has proposed to put in place uniform RPO on all obligated entities¹⁸. Similarly, the proposed Electricity (Amendment) Bill 2020 has increased the penalties for RPO non-compliance.

6.1. RPO Targets

As per the MoP's RPO trajectory for FY 2020-21, the RPO targets for solar and non-solar sources are 7.25% and 10.25% respectively, totalling 17.50%. However, the renewable energy generation at national level for FY 2020-21 was just 10.65%. One can find state-wise RPO targets here¹⁹.

Hydro Purchase Obligation (HPO)– An unexpected new player in the RE game

In March 2019, MoP announced various measures to promote deployment of large hydropower projects (LHPs) in India, which included consideration of LHPs as renewable energy source and HPO²⁰ as separate entity within Non-solar RPO (Ministry of Power, Measures to promote Hydro Power Sector, 2019). Taking note of this, Uttar Pradesh amended its RPO Regulations in August 2019 to include the HPO targets²¹ within the non-solar RPO category.

The HPO targets were announced in January 2021 when MoP issued HPO trajectory till 2029-30. Through the order dated 29th Jan 2021, MoP clarified which LHPs (commissioned after 8th March 2019 and but before 31st March 2030) will be eligible for HPO and proposed Hydro Energy Certificate mechanism (HEC) (backed by CERC regulations) (Ministry of Power, Renewable Purchase Obligation (RPO) Trajectory, 2021). Till September 2021, there is no proposal from CERC on HEC mechanism. However, some SERCs, namely Himachal Pradesh, Punjab and Chhattisgarh proposed HPO in their RPO regulations. Among them, Punjab has deferred to specify any HPO targets and will revisit the same at a later stage (PSERC, Amendment in the Punjab State Electricity Regulatory Commission (Renewable Purchase Obligation and its compliance) Regulations, 2011 for specification of HPO trajectory (Suo-Motu), 2021). Himachal Pradesh has finalised the targets in line with specified national trajectory²².

18. Draft Electricity (Promoting Renewable Energy through Green Energy Open Access) Rules, 2021 include this provision under Rule 4(1).

19. <https://www.prayaspune.org/peg/rpos.html>

20. HPO benefits can be met from power procured from eligible LHPs commissioned on and after 8th March, 2021 and up to 31st March 2030 or from Hydro Energy Certificate mechanism.

21. UPERC had put HPO target starting from 2019-20 itself (1%) till 2023-24 (3%) (UPERC, UPERC (Promotion of Green Energy through Renewable Purchase Obligation) (First Amendment) Regulations, 2019, 2019). These targets are way more than that defined by Ministry of Power in Jan 2021 (starting from 0.28% for 2021-22 and reaching to a level of 2.82% by 2029-30) (Ministry of Power, Renewable Purchase Obligation (RPO) Trajectory, 2021).

22. The regulation can be found here: <http://hperc.org/File1/frppo7-21.pdf>

The problems associated with development of large hydro power projects, which include long gestation period, cost over-runs, R&R issue, impact on environment, suspected role in various natural hazards, etc. are few pertinent reasons which raises a valid question on the need to promote LHPs under the ambit of RE.

Need to review the RPO framework

With solar and wind power reaching grid parity with conventional sources and enough solar and wind capacity installed in the country, the need to promote them through RPO framework may not be warranted in the medium – long term. A separate solar RPO was mandated at a time when solar prices were so high that no entity would have purchased it without a mandatory separate obligation. Now the situation is quite the reverse with solar being the cheapest generation source. Ideally, DISCOMs should have the full freedom to procure a mix of RE which is best suited for their load profile. As per the MoM of the Hon'ble MOSP (IC) for Power and MNRE regarding proposed amendments in the EA, 2003 dated 19th March, 2021, several states have made the demand for merging the solar and non-solar RPO and making them fungible. Keeping this in mind, there is a need to review the RPO framework, and instead of solar and non-solar, the focus should be on generic RPO targets, thus providing enough freedom to distribution licensees in selecting the RE source. Also, the upcoming technologies like floating solar, offshore wind, green hydrogen and energy storage could be considered in the new framework.

6.2. RPO Compliance

RPO compliance has always been a vexed issue for most of the states. The RPO compliance proceedings are rarely done in a timely manner and different states have adopted different processes. States like Maharashtra, Gujarat, etc. have a separate petition filed by DISCOMs or state nodal agencies for RPO compliance or suo-motu proceedings by the state commissions themselves. On the other hand, states like Karnataka, Delhi, etc. conduct such proceedings along with the tariff petitions filed by respective DISCOMs.

In addition to this, the disaggregated data on RPO compliance is not easily available in public domain. While MNRE had understood this need and created a RPO compliance cell in 2018 itself, there is no information sharing in the public domain to our knowledge. However, recently MoP, in January 2021, mandated POSOCO to maintain data related to RPO compliance (Ministry of Power, Renewable Purchase Obligation (RPO) Trajectory, 2021). Following this, POSOCO has requested state nodal agencies for providing details related to RPO compliance of obligated entities (including OA and captive consumers), starting from 2020-21 itself. POSOCO will submit RPO compliance reports to MNRE on quarterly basis (ERPC, Agenda for 44th Commercial Sub-Committee Meeting of ERPC, 2021). While these measures are appreciable, the real proof in the pudding will be when such data is placed in the public domain on a regular and timely basis.

We have compiled RPO compliance of 8 states for financial year 2018-19 (Figure 10) and 4 states for financial year 2019-20 (Figure 11). Karnataka has higher targets and the distribution licenses of the state have overachieved them by a good margin. However, the states with low RE potential (Bihar, Delhi) have lower targets, even that were not achieved by distribution licensees. States like Gujarat and Maharashtra have good potential but moderate targets, and distribution licensees have mixed compliance.

Figure 10: RPO Compliance for states for FY 2018-19

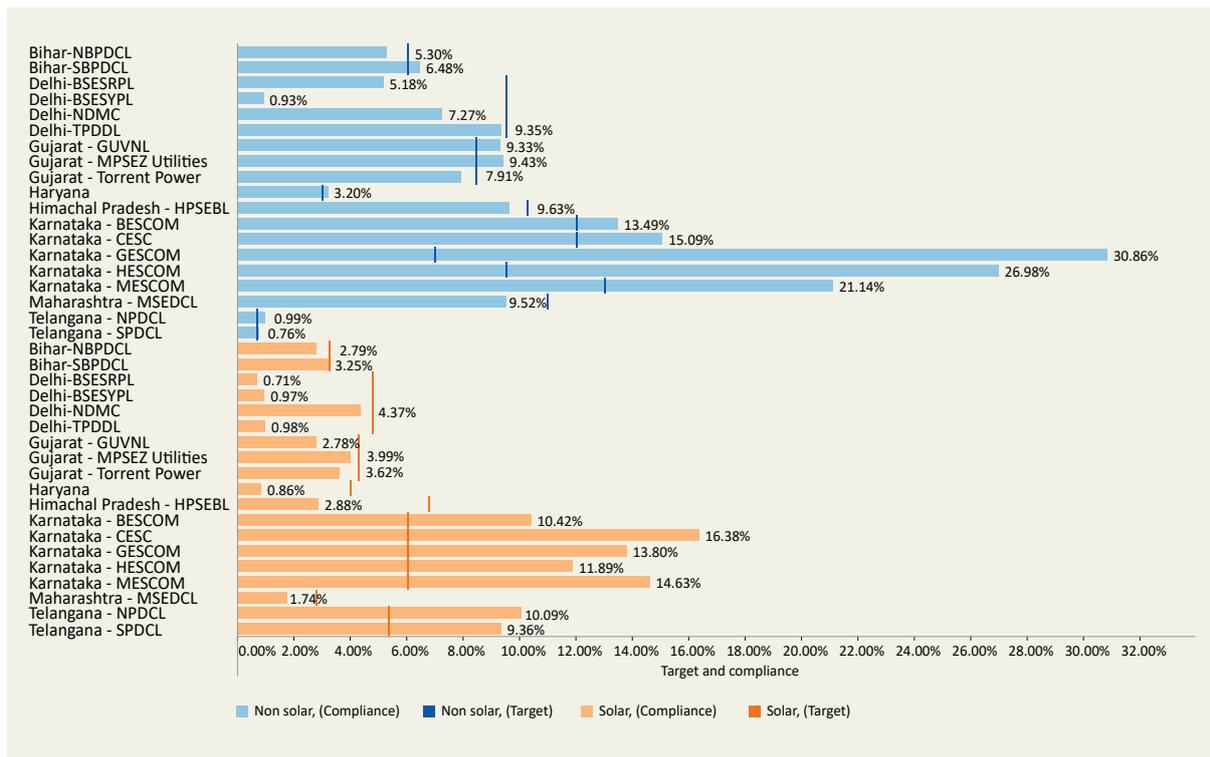
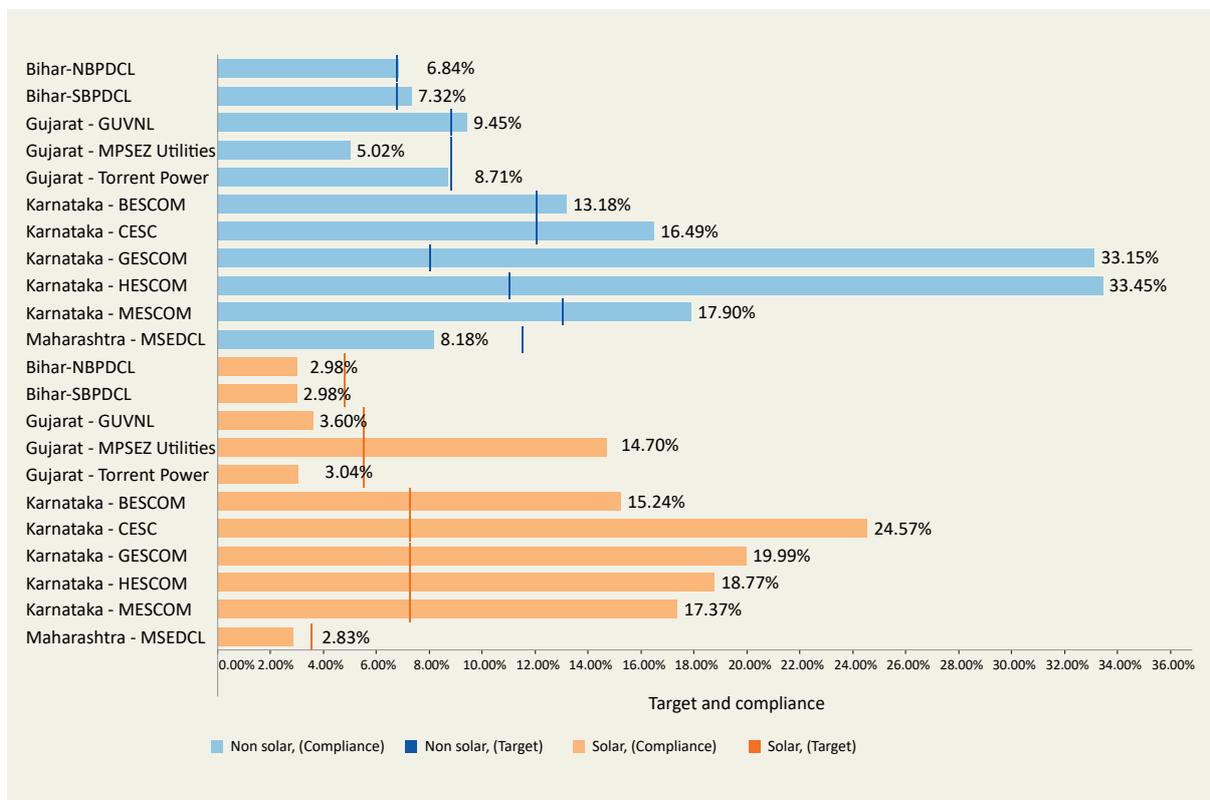


Figure 11: RPO Compliance for FY 2019-20



In the next sections, we discuss the unique cases of Punjab and Uttar Pradesh.

PSERC on Government's direction on RPO due to COVID-19 pandemic

Following the national lockdown due to Covid-19 pandemic in March 2020, Punjab Government issued a direction²³ to state regulatory commission (PSERC) that RPO for the year 2019-20 and 2020-21 may be reduced by 1.50% and 2.00% respectively. Taking note of this, PSERC initiated a suo-motu proceeding on the said direction.

Considering the financial condition of PSPCL (state-owned distribution company), delay in RE project commissioning and additional impact of COVID-19 lockdown, PSERC allowed PSPCL to carry forward the RPO shortfall of 560 MUs in FY 2019-20 to FY 2020-21. The rationale given for this was that REC procurement for meeting shortfall will further constrain the already constrained finances of PSPCL, due to prevailing COVID-19 pandemic²⁴.

For FY 2020-21, PSERC observed that there will be some shortfall in RPO compliance due to carry forward from FY 2019-20 and delay in project commissioning due to COVID-19 pandemic and hence, would require REC procurement, which will cause additional financial burden on PSPCL. Considering all issues, PSERC allowed 3.5% (both for solar and non-solar combined) reduction in RPO target for FY 2020-21 provided that PSPCL shall honour all the PPAs with RE generators and shall not refuse power from such projects during FY 2020-21. (PSERC, Suo-motu Order in Petition No. 12 of 2020, 2020)

Regulatory Fund for non-compliance of RPO in UP

Despite having low RPO targets for the state obligated entities as compared to the national trajectory²⁵, the distribution licensees falling under the ambit of UPPCL in the state of Uttar Pradesh failed to comply with the RPO targets. The cumulative shortfall has increased to a level of 14,593 MUs²⁶ till FY 2020-21, which is around 13% of total electricity consumption at DISCOMS' end.²⁷ This is despite the fact that the state DISCOMS have overachieved solar RPO targets for consecutive three years (FY 2018-19, 2019-20 and 2020-21) and still has shortfall in solar RPO because of huge backlogs. Apart from shortfall in non-solar RPO category, DISCOMS have also fallen short in complying with HPO targets since 2019-20, with cumulative shortfall increasing from 985 MUs in 2019-20 to 2,837 MUs in 2020-21.

Table 3: RPO Compliance by UP DISCOMS in last three years (in MUs)

Year	Solar		Non-Solar		HPO	
	Target	Energy Purchased	Target	Energy Purchased	Target	Energy Purchased
2018-19	953.29	1270.00	4766.44	4720.88		
2019-20	1971.10	2525.92	4927.74	4679.69	985.55	0
2020-21	2969.30	3949.00	5938.59	3806.00	1979.53	128.00
Cumulative shortfall as of March, 21	2186.75		9569.63		2837.08	

23. Vide Directive no. 01/04/2020-EB(PR)/185-186 dated 7th April, 2020

24. It was opined that COVID-19 pandemic will affect the sale of power to various categories of consumers, and hence constrain the finances of PSPCL.

25. The total RPO target for UP for the year 2020-21 was 11% (3% solar, 6% non-solar and 2% HPO) against the national RPO targets of 19% (8.75% solar and 10.25% non-solar).

26. The break-up of this shortfall is: 2,186.75 MUs in solar RPO, 9,569.63 MUs in non-solar RPO and 2,837 MUs in HPO category.

27. The power consumption at the DISCOMS' end in FY 2020-21 was 1,11,785 MUs.

Considering the amount of cumulative shortfall (14,593 MU), the commission directed the DISCOMs in June 2021 to submit an amount of Rs. 1,459.34 crores (@ Rs 1/kWh) in the RPO regulatory fund²⁸. Apart from that, it also directed UPPCL to deposit an amount of Rs. 5,785 crores considering the RPO requirement of 13,238 MU in FY 21-22 and an effective APPC rate of Rs 4.37/kWh. This total amount of Rs 7,244 crore was to be deposited in 10 equal instalments by January 2022 and shall be used to procure RE including HPO power. (UPERC, Order dated 16th June, 2021 in Petition No. 1565 of 2020, 2021)

It is unclear whether the Rs 1,459 crore deposit for cumulative RPO non-compliance until FY 21 would be specifically used for complying with the said shortfall (for example, through purchase of RECs as is allowed under the state's RPO regulations).

Strengthening and streamlining RPO compliance processes

There is a need to strengthen the RPO compliance process in the country with an effective carrot and stick approach. This will need higher penalties for non-compliance and incentives for over compliance (as done by MERC). MERC has included a provision of reduction in Annual Revenue Requirement of the distribution licensees at a rate of Rs 0.10 per kWh for cumulative shortfall in total RE procurement target for each year²⁹. At the same time, MERC allows an incentive of Rs. 0.25 per unit for additional RE power procured over and above the specified RPO target by MERC up to the yearly percentage notified by the central government till 2021-22. SERCs could follow this approach and amend their regulations suitably.

Further, the RPO compliance proceedings vary from state to state, leading to difficulty in comprehensive monitoring. These proceedings are held at different times of the year, lack standardised reporting formats and encounter delays in many cases. While some states have separate RPO compliance proceedings, some include them as part of the DISCOM ARR orders. There is also a lag in reporting RPO compliance for open access and captive consumers in the few states which do report on compliance in this category. Further, some state nodal agencies, designated for RPO compliance reporting, do not have any public reporting of such data. Hence, there is a need to streamline and standardise the RPO compliance process in the country, which can make it easy for centralised monitoring. Forum of Regulators could take a lead in developing such a process.

The next few sections note the progress in alternative mechanisms to fulfil RPO compliance in the country.

6.3. Renewable Energy Certificate Mechanism

REC mechanism as a means of promoting renewables has deteriorated over the years due to various reasons, though mostly because of declining tariffs for solar and wind power and lax RPO compliance across states. In addition to this, REC trading has remained suspended for long time durations, further hampering interest in this mechanism. CERC, in June 2020, revised the floor and forbearance price of solar and non-solar RECs to Rs. 0/MWh and Rs. 1,000/MWh respectively. This order was challenged in APTEL, where it was subsequently set aside. This resulted in no REC trading for more than a year (June 2020 till October 2021).

28. The RPO Regulatory fund was created only after December 2020, that too after repeated direction by the state commission to do so.

29. 1st proviso of Regulation 12.3 of Maharashtra Electricity Regulatory Commission (Renewable Purchase Obligation, its Compliance and Implementation of Renewable Energy Certificate Framework) Regulations, 2019.

Renewable energy procurement has evolved a lot in last ten years, which include competitive bidding, introduction of market instruments like Green Term Ahead Market (GTAM) and integrated Day Ahead Market (or Green Day Ahead market or GDAM) and promotion of inter-state transmission of RE power through ISTS charge and losses waiver. All these routes have seen preference over RECs for complying with RPO targets. This is clear from the capacity registered under REC mechanism. As on September 2021, less than 5 GW capacity is registered under REC mechanism, while the total installed capacity for renewables has crossed a level of 100 GW. Apart from this, some recent developments in regard to the REC mechanism like CERC's proposal to reduce floor prices to zero and Ministry of Power's proposal of never-ending validity for RECs and issuing RECs for only 15 years as against 25 years for existing REC projects³⁰ have further increased the uncertainty for the mechanism. It will also put pressure for lower REC prices to reflect market realities, thereby increasing the risk for the registered projects under REC mechanism.

In the same discussion paper of Ministry of Power (June 2021), there are provisions for promoting new high cost RE technologies through REC multipliers, which can further complicate the REC mechanism and introduce another layer of subjectivity in terms of choosing which technologies should be promoted and what their multiplier should be. There is also a proposal to issue RECs either only to DISCOMs or DISCOMs and other obligated entities for over-compliance of RPO.

Another point of consideration is that a separate solar RPO was mandated at a time when solar prices were so high (> Rs 10/kWh) that no entity would have purchased it without a mandatory separate obligation. Now the situation is quite the reverse with solar being the cheapest generation source. Ideally DISCOMs should have the full freedom to procure a mix of RE which is best suited for their load profile. As per the minutes of meeting held by the Hon'ble Minister for Power and MNRE on 19th March, 2021 regarding proposed amendments in the EA, 2003, several states have made the demand for merging the solar and non-solar RPO and making them fungible. This issue was also discussed in the 74th meeting of the FoR (held on 9th April, 2021), which concluded that, *'After discussions, the Forum agreed to the idea of RPO fungibility and agreed that a separate solar RPO is not relevant at present given the decline in the prices of solar power.'*

In view of all this, there is a need for a much more fundamental redesign of the REC mechanism based on clear, laid-out principles and considering the existing market realities. Obviously, this would have to include honouring existing REC contracts and RE certificate validities.

6.4. Trading "Green" Power in Power Exchanges

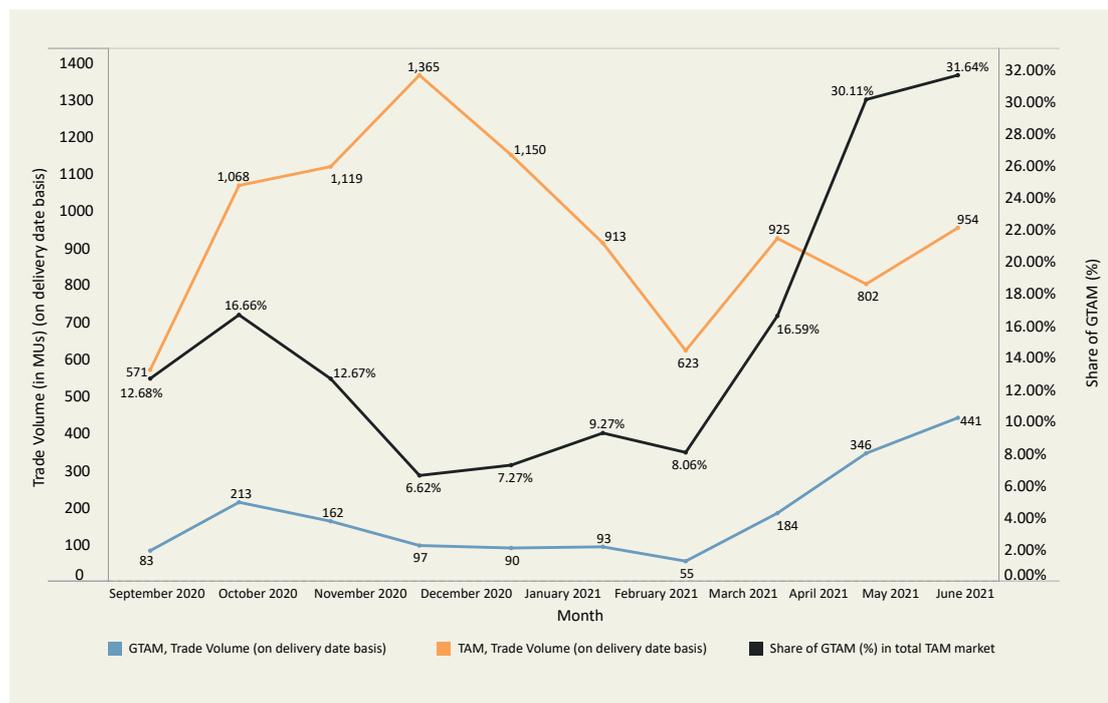
Since August 2020, a new market tool, namely Green Term-Ahead Market (GTAM), has come into existence in Indian Power sector, which provides DISCOMs an additional option apart from REC and PPA-based power procurement mechanism to meet their RPO compliance through purchase of certified green power from Power Exchanges. IEX came out with GTAM in the month of August 2020 and subsequently PXIL introduced it in March 2021.

Comparing the GTAM volume with TAM volume, it is seen that the volume traded under GTAM is less than that under TAM (in range of 10-20%) but increasing over time (See Figure 12 below). With more deployment of renewable power in country, it is expected that GTAM market will expand and more players may prefer this route over TAM.

30. Ministry of Power issued a 'Discussion Paper on Redesigning the Renewable Energy Certificate (REC) Mechanism' on 4th June, 2021.

Along with this, Ministry of Power has proposed a mechanism to develop Integrated Day-Ahead Market (I-DAM) in Power Exchanges with separate price formation for renewable power and conventional power. Under this proposal, the bids received under renewable segment would be considered for meeting RPO compliance of the buyer. The renewable generation not selected in the renewable segment but selected in the conventional segment shall be entitled for issuance of RECs to the seller. Both power exchanges (IEX and PXIL) filed petitions in CERC for approval of Green Day Ahead Contract under the currently operational Day Ahead Market, which have been approved by CERC in October 2021³¹.

Figure 12: GTAM vis-a-vis TAM trade volume over the months



31. IEX launched Green Day Ahead Contract in Day Ahead Market Segment from 26th October, 2021 and PXIL launched Integrated Day Ahead Spot (IDAS) from 20th December, 2021.

7. Other developments related to Renewable Energy

Since our last report in September 2018, there have been various developments in the RE sector which were not covered in previous chapters, and hence some important ones are briefly discussed here.

7.1. Dues of Renewable Generators from DISCOMs

DISCOMs are either unwilling or not in position to pay the renewable generators on time, which has resulted into accumulation of dues over the years. MoP, through the Praapti portal, is providing information about the dues of Renewable Generators on different DISCOMs. As per Praapti data, the total dues of renewable generators are more than Rs. 13,400 crores as on 30th June 2021. More than half of said dues is to just 6 generators, namely Tata Power (19.2%), Adani Green (13.2%), Hero Future (7.7%), Acme Solar (5%), JSW Energy (4.8%) and Azure Power (3.1%). As per our analysis, the dues have seen an increasing trend. The state-wise dues to RE Generators can be seen here³².

To address the issue of late payment to generators, Ministry of Power in June 2019 ordered the NLDC and RLDCs to despatch power only after a Letter of Credit (LC) for the desired power has been opened for the generator by the DISCOM. It also provided that such LC could be encashed by the generating company after the expiry of grace period (ranging from 45 days to 60 days) as provided in the PPA (Ministry of Power, 2019). While this was hoped to ensure timely payments, dues have only increased after this. To ensure timely payment, MoP once again acted upon by issuing the Electricity (Late Payment Surcharge) Rules, 2021 in February 2021, which provides for the payment of Late Payment surcharge (LPS) to generators and this LPS would increase with successive months of default (Ministry of Power, Electricity (Late Payment Surcharge) Rules, 2021, 2021). Added to this, recently Ministry of Power has proposed amended in rules and has proposed that in case of outstanding dues of a DISCOM after the expiry of seven months from the date of due payment, the generator can sell power to any other buyer (including through exchanges) (Ministry of Power, Draft Electricity (Late Payment Surcharge Amendment Rules, 2021, 2021). Such kind of enforcing provisions are not just unfair to the procurers but they infringe upon the sanctity of the contract signed between the two parties. Implementation of such provisions will only lead to increased litigation, place undue burden on DISCOM finances, increase consumer tariffs, raise risk of load shedding and contribute to increase in state-owned capacity addition which could affect private investment in the sector. With proposed provision, in case of delays or non-payment of disputed amounts, the sale can be made unilaterally by the generator and gains from the sale will also not be shared with the DISCOM. In essence, the DISCOMs loses the right to capacity procured and consumers continue to bear the burden of fixed costs.

Apart from this, many state regulatory commissions have from time to time issued orders to DISCOMs to make payment to renewable generators (mainly solar and wind). However, not much has changed. The delay in dues payment is detrimental to investment in renewable sector and needs to be addressed comprehensively. Recently Power Minister Mr. R K Singh has also raised

32. <https://www.prayasipune.org/peg/discom-dues.html>

concern over rising dues of renewable energy generators from the distribution companies and pointed out that these delays in dues clearance will impede the investment in the sector (ET Energyworld, 2021).

7.2. PM-KUSUM Scheme

The scheme, Pradhan Mantri Kisan Urja Suraksha evam Utthaan Mahabhiyaan (PM-KUSUM), was accorded approval on 8th March, 2019 with total central financial support of Rs. 34,422 crores. The scheme has 3 components, which are:

- Component A: 10,000 MW of Decentralized Ground Mounted Grid Connected Renewable Power Plants of individual plant size up to 2 MW.
- Component B: Installation of 17.50 lakh standalone Solar Powered Agriculture Pumps of individual pump capacity up to 7.5 HP.
- Component C: Solarization of 10 Lakh Grid-connected Agriculture Pumps of individual pump capacity up to 7.5 HP.

Combining these three components, the scheme aimed to add 25,750 MW solar capacity by 2022 (MNRE, Scheme for farmers for installation of solar pumps and grid connected solar power plants, 2019). However, the scheme was expanded in November 2020 with revision of targets under Component B & C. Under Component B, the installation target was increased to 20 lakh standalone pumps from earlier target of 17.5 lakh pumps. Similarly, under component C, the targets were revised to 15 lakh pumps from initial number of 10 lakh pumps. As a result, the targets under the scheme has increased to 30.8 GW by 2020 with a revised central financial support of Rs. 34,035 crores. At the same time, a new provision of feeder level solarisation was included in Component C (MNRE, Scale-up and expansion of PM-KUSUM Scheme, 2020).

Table 4: Revised targets for PM-KUSUM scheme

Year	Component A (commissioning target in MW)	Component-B (Sanction target in No.)	Component-C (Sanction target for Individual pump solarization)	Component-C (Sanction target for Feeder level solarization)
2019-20	0	1,50,000	82,000	0
2020-21	500	5,50,000	1,18,000	2,00,000
2021-22	4,500	6,00,000	2,00,000	2,50,000
2022-23	5,000	7,00,000	3,50,000	3,00,000

Source: MNRE's order dated 4th November, 2020

There is mixed progress in this scheme, since while there is a significant capacity sanctioned by MNRE, deployment is lagging behind. As the scheme is demand driven, the success resides largely on states' participation and interest. However, the progress needs to be monitored on regular basis by MNRE, considering the impact this scheme can have not just in achieving the 175 GW target but also in wider adoption of renewable energy in the country due to decentralised nature of installations. The scheme has broader implications, considering the requirement of domestic content in the projects, improved supply quality to the agriculture sector and geographically dispersed job creation prospects. PM-KUSUM has significant financial and social benefits and this farmer-centric pathway is crucial for the DISCOM's financial health³³.

33. Read PEG's article on Agricultural Solar feeder in Maharashtra here: <https://www.prayasipune.org/peg/resources/power-perspective-portal/267-agriculture-solar-feeders-in-maharashtra.html>

The progress made under the scheme has been summarized below in Table 5.

Table 5: Status of PM-KUSUM scheme

Components	Sanctioned capacity (as on 31.07.2021)	Installed capacity (as on 30.06.2021)
Component-A (MW)	4,909	12
Component-B (Nos.)	3,59,462	47,146
Component-C (Nos. for Individual pump solarization)	76,650	580
Component-C (Nos. for Feeder level solarization)	9,25,427	

Source: Prayas (Energy Group) Compilation based on MNRE's replies to a question in Parliament

7.3. Evolution of tax incidences on Solar PV sector

Taxation in the solar PV sector has seen a lot of changes in the recent past. Some of the taxes and duties imposed or changed on solar PV systems during last three years are listed below:

Table 6: Different duties or taxes on solar PV systems

Type of Tax/ Duty	Component	Date of Announcement	Effective time period	Changes made
Safeguard duty ³⁴	Solar cells and modules (imported from China and Malaysia in 1 st Phase and from China, Thailand and Vietnam in 2 nd Phase)	16 th July 2018 (for 1 st phase) and 18 th July 2020 (for 2 nd phase)	30 th July 2018 till 29 th July 2020 (1 st phase) and 30 th July 2020 to 29 th July 2021 (2 nd phase)	<ul style="list-style-type: none"> • 25% (30th July, 2018- 29th July 2019) • 20% (30th July, 2019- 29th January 2020) • 15% (30th January 2020- 29th July 2020) • 14.9% (30th July 2020- 29th January 2021) • 14.5% (30th January 2021-29th July 2021)
Anti-dumping duty	Tempered Textured Glass (originating in or exported from Malaysia)	17 th January, 2019	From 26 th February, 2019 for a period of 5 years	USD 114.58 per MT
	Ethylene Vinyl Acetate (EVA) Sheet for Solar Module (imported from China PR, Malaysia, Saudi Arabia and Thailand)	21 st February, 2019	From 29 th March, 2019 for a period of five years	USD 537-1,559 per MT
	Flat rolled product of steel, plated or coated with alloy of Aluminium and Zinc (used in solar mounting structure) (originating in or exported from China, Vietnam and Republic of Korea)	21 st February, 2020	From 15 th October, 2019 for a period of five years (except for a period of 15 th April, 2020 to 22 nd June, 2020)	USD 13.07- 173.10 per MT

34. The safeguard duty on solar PV panels ended on 30th July, 2021.

Countervailing Duty	Tempered Textured Glass (originating in or exported from Malaysia)	11 th December, 2020	From 9 th March, 2021 for a period of five years	Difference between 9.71-10.14% of assessable value and anti-dumping duty (if any)
Custom Duty	Solar inverters	1 st February, 2021	2 nd February, 2021 onwards	Duty increased from 5% to 20% ³⁵
Basic Custom Duty	Solar Cells and Modules	9 th March, 2021	1 st April, 2022 (expected) onwards	BCD increase for cells (from 0% to 25%) and modules (from 0% to 40%) ³⁶
GST	Solar power-based devices, Solar power generator, Solar lantern / solar lamp and Photo voltaic cells, whether or not assembled in modules or made up into panels; along with these, parts for their manufacture	17 th September, 2021	1 st October, 2021 onwards	GST rate increased from 5% to 12% ³⁷

Source: Prayas' compilation of various orders from MNRE and Ministry of Finance

In September, 2019, MNRE requested Ministry of Finance to impose basic custom duty on imported cells and modules from April, 2021 (MERCOT, MNRE Proposes Basic Customs Duty on Imported Solar Cells and Modules, 2019). In February 2020, the Government of India bifurcated the category of solar cells from solar cells/ modules/ panels for the treatment of Custom duty³⁸, paving the way to impose different custom duty on solar cells and solar panels. Going forward, in February 2021, MNRE stopped processing applications seeking concessional customs duty certificates in connection with solar power projects, in response to Ministry of Finance withdrawing benefits of concessional customs duty on items imported for initial setting up of solar power projects w.e.f. 2nd February, 2021 (Discontinuation of the benefits of Concessional Customs Duty in respect of items imported for initial setting up of solar power projects, 2021). Subsequently, in March 2021, MNRE clarified about BCD imposition on solar cells (25%) and solar modules (40%) and directed all RE implementing agencies and other stakeholders to include provisions in their bid documents³⁹ (MNRE, Imposition of Basic Customs Duty (BCD) on Solar PV Cells & Modules/Panels, 2021). The final notification to this effect is not made till November, 2021. As no custom duty imposed on solar cells and solar panels is in place at present, the additional tax in form of "Social Welfare Surcharge (SWS)"⁴⁰ is not being imposed. But with BCD becoming effective in future, SWS will also be imposed on imported good, leading to additional tax burden.

35. The duty change was announced in the General Budget of 2021-22 and was made effective from 2nd Feb, 2021 through Ministry of Finance' Notification 03/ 2021-Customs.

36. Tariff Impact: Tariffs for solar power are expected to increase, by 25-30 paisa/kWh in case only cells are imported whereas increase can be 40-45 paisa/kWh in case modules are directly imported, with the new BCD regime vis-à-vis no duty structure (Care Ratings, 2021)

37. Tariff Impact: Solar tariffs may rise to Rs 2.6-2.7 per unit (from Rs 2 per unit) over next fiscal in the wake of the increase in GST on RE equipment, and the proposed BCD on imported solar modules (CRISIL, 2021).

38. This was announced in General Budget of 2020-21.

39. There is no grandfathering of bid out projects under the proposed BCD structure, which means that there will be no relaxation in terms of "Change in law" to any delayed projects which are scheduled to commission before BCD become effective.

40. This surcharge is imposed on goods which are imported into India and at present is 10% on the aggregate of duties, taxes and cesses which are levied and collected by the Central Government under Section 12 of the Customs Act, 1962. This surcharge is in addition to any other duties of Customs or tax or cess chargeable on imported goods (Income Tax Department).

In September 2021, Ministry of Finance notified the increase in GST rates for a list of renewable energy devices. It was also clarified that the same rate will apply to goods (which is 70% of gross consideration) in case goods are supplied as a part of complete project development. As a result, the total GST taxation on solar projects has increased substantially by ~5%⁴¹. This rather sudden change has come at a time when there is already a rise in prices of solar PV panels in international markets. While such tax changes are covered under "Change in law" clauses of PPAs, the process of getting the compensation approved by the regulatory commissions is often time consuming. The Electricity (Timely Recovery of Costs due to Change in Law) Rules, 2021⁴² notified by MoP have put in place stringent timelines for streamlining of this process.

Considering the 500 GW non-fossil fuel target by 2030 and the central role of solar and wind power in this transition, principles for taxing renewable energy in the short and long term needs broader debate, stakeholder consultation and a balanced approach so to not impede the clean energy transition while appropriately contributing to tax revenues. Changes in tax rates should ideally have ample lead time and exemptions/waivers should come with sunset clauses for policy certainty.

7.4. Promoting Manufacturing in Solar PV and Battery Storage

Many of the taxes imposed on the imported goods in solar PV sector (safeguard duty, BCD, anti-dumping duty, etc.) were seen as a measure to boost local manufacturing of solar equipment in the country. PM-KUSUM scheme also mandated sourcing domestically manufactured solar panels for being eligible for the incentives under the scheme. While all these were seen as an indirect measure for promoting manufacturing, Central government also came out with scheme which is expected to act as a direct measure in this regard. While presenting the General Budget for 2021-22, the central government announced that they will notify a phased manufacturing plan for solar cells and solar panels⁴³. Subsequently, Production Linked Incentive scheme, namely 'National Programme on High Efficiency Solar PV Modules', was sanctioned on 28th April 2021, which aimed at promoting manufacturing of high efficiency solar PV modules in India, reduce import dependence and promote setting up of integrated manufacturing plants in the country. The scheme was already allocated Rs. 4,500 crore rupees to be spent over a period of five years. IREDA was designated as implementing agency under the scheme. One of the interesting points of the scheme was that incentive was linked to the sales made from the production facility (in watt peak terms) and local value addition (which means sourcing the material from domestic market) (MNRE, Production Linked Incentive Scheme 'National Programme on High Efficiency Solar PV, 2021).

In May 2021, IREDA invited bids for setting up solar manufacturing units for a minimum of 10 GW of vertically-integrated high-efficiency solar modules under the scheme. As on October 2021, 16 bidders were announced to have qualified the bid. The bidders had quoted a total capacity of 54.8 GW for polysilicon, ingot-wafer, cell, and module manufacturing (MERCOT, 2021).

After getting aggressive response for bids floated under the scheme, the ministry has signalled that the funding of the PLI programme will be enhanced to Rs. 24,000 crores from the present level of

41. Initially, it was 8.9% (30% of 18% for services and 70% of 5% for goods). With increase in GST, it has increased to 13.8% (30% of 18% for services and 70% of 12% for goods).

42. https://powermin.gov.in/sites/default/files/Electricity_Timely_Recovery_of_Costs_due_to_Change_in_Law_Rules_2021.pdf

43. General Budget Speech 2021-22, <https://www.indiabudget.gov.in/doc/cen/cus0221.pdf>

Rs. 4,500 crores with an aim to export solar equipment (Business Standard, 2021). Although the final results are awaited, the bid response itself indicate that there is a lot of enthusiasm among the private players for setting up manufacturing unit in the country, provided an environment of proper support and policy certainty is provided to them. Also, government is giving a lot of thrust to boost manufacturing in this field through various measures. However, targeting solar panels or cells will not be enough for reducing import dependence, the associated components like solar inverters also need similar or even more supportive measures for local manufacturing. There is a need to have a holistic roadmap in place to identify equipment on which there is large dependency on import and what all can be easily manufactured in the country, provided there is detailed study on required supply chain and logistics.

In May, 2021, the Gol approved the National Programme on Advanced Chemistry Cell (ACC) with an outlay of Rs 18,100 crore to incentivize setting up of manufacturing facilities in the country for 50 GWh of ACC and 5 GWh of "Niche" ACC. The focus under this scheme is *'to set-up Giga-scale ACC manufacturing facilities with emphasis on maximum value addition and quality output and achieving pre-committed capacity level within a pre-defined time-period'*. It expects an investment of Rs 45,000 crore under this scheme and hopes to reduce import bills of ACC by Rs 1,50,000 crore. The RFP for this scheme was issued in October, 2021 (PIB, 2021).

7.5. Evolution of the Inter State Transmission System (ISTS) charges waiver

To promote the development of renewables in RE-rich states and encourage inter-state procurement of renewables, the central government allowed waiver of ISTS charges and losses for solar and wind projects in 2016. Through various subsequent orders, Ministry of Power (MoP) extended the deadline of ISTS waiver for some solar and wind project categories commissioned till 31st March, 2022. In 2019, this deadline was further extended to 31st December, 2022. Taking into account the disruptions caused by the Covid-19 pandemic, in August 2020, the waiver was extended further till 30th June, 2023. This waiver was extended to solar-wind hybrid power plants, as well as solar photovoltaic projects commissioned under the second phase of the MNRE's Central Public Sector Undertaking Scheme and those commissioned under the Solar Energy Corporation on India's Tender for manufacturing linked capacity scheme. On 15th January, 2021, a clarification was issued regarding extension in project commissioning which allowed stretching the waiver of transmission charges only⁴⁴ for solar, wind or hybrid projects in case they are granted extension in commissioning time on account of force-majeure, delay in transmission system or extension in COD by competent authority. In June 2021, the waiver of charges was extended till 30th June, 2025 for solar and wind projects. Hydro Pumped storage plant (PSP) and battery energy storage systems (BESS)⁴⁵ were also brought under ambit of ISTS waiver. Another interesting inclusion was waiver of transmission charges applicable on those InSTS which are used for conveyance of electricity across the territory of intervening state or conveyance within the state which is incidental to ISTS.

In November 2021, MoP relooked at the provisions for waiver of transmission charges. With a set of orders, it was clarified that the waiver will be applicable for following projects commissioned up to 30th June, 2025:

44. No waiver was extended to transmission losses.

45. To be eligible for waiver, at least 70% of Annual electricity requirement for PSP and BESS projects should be met from solar & /or wind power plants.

1. Solar and wind energy generation set up by any person/entity (for self-consumption or sale through competitive bidding, power exchange or bilateral agreement)
2. Solar/wind electricity supplied to hydro PSP or BESS, provided at least 51% of annual electricity requirement for water pumping or battery charging is met from solar or wind sources and hence, subsequent electricity supplied from such hydro PSP and BESS power plants.
3. Trading of electricity from solar, wind or sources mentioned above in GTAM or GDAM (up to 30th June, 2025).
4. Green hydrogen⁴⁶ production plants (waiver only for period of 8 years from commissioning).
5. Solar and wind power generated under RE bundling scheme (November 2021), provided no additional cost is required for transmission system augmentation and power evacuation is made from main substation of Thermal/hydro power plant.
6. Solar PV plants commissioned under SECI Tender for manufacturing linked capacity scheme (2019) for sale to entities having RPO.

The above waiver will be applicable for a period of 25 years for solar, wind and hydro PSP and for a period of 12 years for BESS, or for a period subsequently notified for future projects by central government from the date of project commissioning. One of the welcome provisions was providing long term visibility about applicability of ISTS charges for above projects. The charges will be applicable gradually with 25% of charges applicable on projects commissioned during the period of 1st July, 2025 to 30th June, 2026 and finally 100% charges applicable on projects commissioned after 1st July, 2028. The order even clarified that waiver of losses shall be applicable for projects whose bidding was completed up to 15th January, 2021. This raises a question whether any project whose bid was done after 15th January, 2021 but has commissioned before 30th June, 2023 will be eligible for the waiver. Concessional charges with sunset clauses for BESS projects which is an emerging technology is a welcome step.

ISTS waiver for bilateral agreements and sale of power in exchanges sets the wrong precedent as it spreads this transmission cost for private procurement across all users of the grid. Similarly, the ISTS waiver could also be wrongly incentivising smaller sized projects to get connectivity to the ISTS grid. Thus, it would have been prudent to not further extend the ISTS waiver for RE projects. In any case levying the full transmission charges for RE projects, both for DISCOM projects and OA/ CPP transactions would be appropriate as it would not hamper RE investments given their cost effectiveness⁴⁷ and high RPO targets. It should be stressed that moving away from concessions/ waivers should apply only to new projects and should not affect projects which have come up under a specific concessions regime.

7.6. Increasing need to address local environmental and social aspects

Presently, RE projects are exempted from Environmental Impact Assessment (EIA) or social impact assessments (SIA), hence making it difficult to quantify local impacts from such projects. Even

46. For this waiver, Green hydrogen is hydrogen produced using electricity produced from solar, wind and sources mentioned in (1) & (2) above.

47. New RE (esp. wind and solar at a 25-year fixed tariff of Rs 2.5-2.75/kWh) is cost competitive in terms of energy cost, with new thermal power and even some existing high marginal cost plants.

the proposed EIA notification 2020 has left this unattended. However, over time the case for considering local environmental and social impact of such projects has gained traction especially among local communities. Some of them have taken the legal route to get their issues solved, prominent recent examples of which were cases related to Great Indian Bustard in Rajasthan and Gujarat and land acquisition for a solar project in Assam.

The overhead transmission lines from large scale wind and solar projects have been recently questioned considering the danger to the Great Indian Bustard (GIB) in the regions of Kutch (Gujarat) and Rajasthan. While hearing a case in this issue, Supreme Court ordered on 19th April, 2021 to replace the existing overhead transmission lines with underground lines. In case there are issues related to feasibility, the same should be referred to the appointed committee, which shall assess the matter and suggest future action (Supreme Court of India, 2021). Apart from this, there have been local protests in Rajasthan and Gujarat against some solar and wind projects citing that such projects impact the biodiversity in the region (Sharma, 2021). These call for a thorough and region-specific study of environmental impacts of renewable power projects. Also, it raises the need to reconsider the provision of "no environmental and social impact assessment (ESIA)" for solar and wind projects and to put solar and wind projects under the ambit of Environmental Protection Rules by Ministry of Environment, Forest and Climate Change.

In another case, locals in Assam have protested against the land acquisition done for development of a 90 MW solar project in the district of Nagaon in Assam (The Hindu, 2021). They have alleged illegal and forceful land acquisition, leaving land tenants with no source of livelihood, thus raising a bigger question of assessing social impact of any project on local communities.

Considering the scale of RE deployment within the 500 GW target by 2030, the local protests and legal battles may accentuate further if not addressed comprehensively and in the true spirit of sustainable development. Inclusive RE development is crucial, which calls for many desirable policy changes, some of which are listed below:

- Devising RE specific land use policy, which encourages long-term land leasing.
- Creating a state/national land bank for planned RE development.
- A process for informed local consent in letter and spirit through institutionalising EIAs and SIAs to be carried out with active involvement of community.
- Creating a formal institutional structure for revenue/benefit sharing with affected communities.

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List of Abbreviations

APGECL	-	Andhra Pradesh Green Energy Corporation Limited
APTEL	-	Appellate Tribunal for Electricity
BCD	-	Basic Custom Duty
BESCOM	-	Bangalore Electricity Supply Company Limited
BESS	-	Battery Energy Storage System
BSESRPL	-	BSES Rajdhani Power Limited
BSESYPL	-	BSES Yamuna Power Limited
CEA	-	Central Electricity Authority
CERC	-	Central Electricity Regulatory Authority
CESC	-	Chamundeshwari Electricity Supply Corporation Limited
COD	-	Commercial Operation Date
CPP	-	Captive Power Plant
CUF	-	Capacity Utilisation Factor
DAM	-	Day-Ahead Market
DISCOM	-	Distribution Company
EIA	-	Environmental Impact Assessment
ERC	-	Electricity Regulatory Commission
FoR	-	Forum of Regulators
GDAM	-	Green Day-Ahead Market
GESCOM	-	Gulbarga Electricity Supply Company Limited
Gol	-	Government of India
GST	-	Goods and Services Tax
GTAM	-	Green Term Ahead Market
GUVNL	-	Gujarat Urja Vikas Nigam Limited
HESCOM	-	Hubli Electricity Supply Company Limited
HPO	-	Hydro Purchase Obligation
IEX	-	Indian Energy Exchange
InSTS	-	Intra-State Transmission System
ISTS	-	Inter-State Transmission System
LC	-	Letter of Credit
LDC	-	Load Dispatch Centre
LPS	-	Late Payment Surcharge
MERC	-	Maharashtra Electricity Regulatory Commission
MESCOM	-	Mangalore Electricity Supply Company Limited
MNRE	-	Ministry of New and Renewable Energy
MoP	-	Ministry of Power

MPSEZ Utilities	-	Mundra Port and Special Economic Zone Utilities Limited
MSEDCL	-	Maharashtra State Electricity Distribution Company Limited
NBPDCL	-	North Bihar Power Distribution Company Limited
NDMC	-	New Delhi Municipal Corporation
NHPC	-	National Hydro Power Corporation
NLDC	-	National Load Dispatch Centre
NPDCL	-	Northern Power Distribution Company of Telangana Limited
NTPC	-	National Thermal Power Corporation
OA	-	Open Access
PBG	-	Performance Bank Guarantee
PLI	-	Production Linked Incentive
POSOCCO	-	Power System Operation Corporation Limited
PPA	-	Power Purchase Agreement
PSA	-	Power Sale Agreement
PSERC	-	Punjab State Electricity Regulatory Commission
PSP	-	Pumped Storage Plant
PV	-	Photovoltaic
PXIL	-	Power Exchange of India
R&R	-	Rehabilitation and Resettlement
RE	-	Renewable Energy
REC	-	Renewable Energy Certificate
RfS	-	Request for Selection
RLDC	-	Regional Load Dispatch Centre
RPO	-	Renewable Purchase Obligation
RTC	-	Round the Clock
SBPDCL	-	South Bihar Power Distribution Company Limited
SECI	-	Solar Energy Corporation of India
SIA	-	Social Impact Assessment
SPDCL	-	Southern Power Distribution Company of Telangana Limited
TAM	-	Term Ahead Market
TPDDL	-	Tata Power Delhi Distribution Limited
UPERC	-	Uttar Pradesh Electricity Regulatory Commission
UPPCL	-	Uttar Pradesh Power Corporation Limited

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In its journey towards the 175 GW renewable energy capacity target by December 2022, India surpassed the 100 GW milestone in August 2021. With just over a year remaining for the target deadline, we have a lot of ground to cover. More importantly, the story does not end in 2022, but becomes even more challenging, considering the much larger target of 500 GW non-fossil capacity by 2030 announced in COP26.

Since our last report tracking the 175 GW journey, the renewable sector has witnessed some important milestones which include the all-time low tariff of Rs.1.99 per unit for solar PV projects, introduction of Green Term-Ahead and Day-Ahead markets and a strong boost to local manufacturing in solar and battery industries through govt. support. While covering such aspects, this report provides a snapshot of progress of renewables in the country and points to emerging policy and regulatory issues which need to be addressed in order to sustain the growth of renewables. This is the fourth update in the series of reports tracking India's 175 GW journey.