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**RENEWABLE ENERGY**

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# Renewable capacity additions doubled in FY22, set to reach record levels in FY23

## Power Sector Analysis

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### Executive Summary

The Indian power ecosystem has seen a remarkable change, with renewables witnessing robust growth over the past few years. The country's total installed generation capacity has risen at a CAGR of 7% over the last 10 years to 3,99,496 MW in FY22, of which renewables account for 28%. The share of renewables in the total generation capacity is increasing every year, with 16% growth over FY21, whereas conventionals are witnessing much lower growth. However, electricity generation witnessed 7% growth in FY22, backed by an increase in renewable energy, which accounted for 11% of the total electricity generation as of FY22. Given the ongoing coal and fuel crises, and environmental concerns, renewables are set to play a key role in the country's power system. Among renewables, solar energy is taking the lead, with its capacity increasing by over 20 times in the last 7 years to 53,997 MW, but growth in wind has been stagnant since 2017 owing to the changes in bidding policies.

FY23 is expected to be the best year for renewables in terms of additional capacity installed, as BWR expects a 15-18 GW capacity addition, with solar expected to add 13-15 GW and wind around 2-3 GW. The key reasons for this are effective government policy initiatives that have attracted substantial investments from the private sector, including foreign funds. Union Budget FY23 allocated Rs.19,500 crore for solar manufacturing under the Production-Linked Incentive (PLI) scheme, which is expected to usher in investments worth Rs.30,000 crore and improve the manufacturing capacity. These are over and above investments by private players in the generation sector.

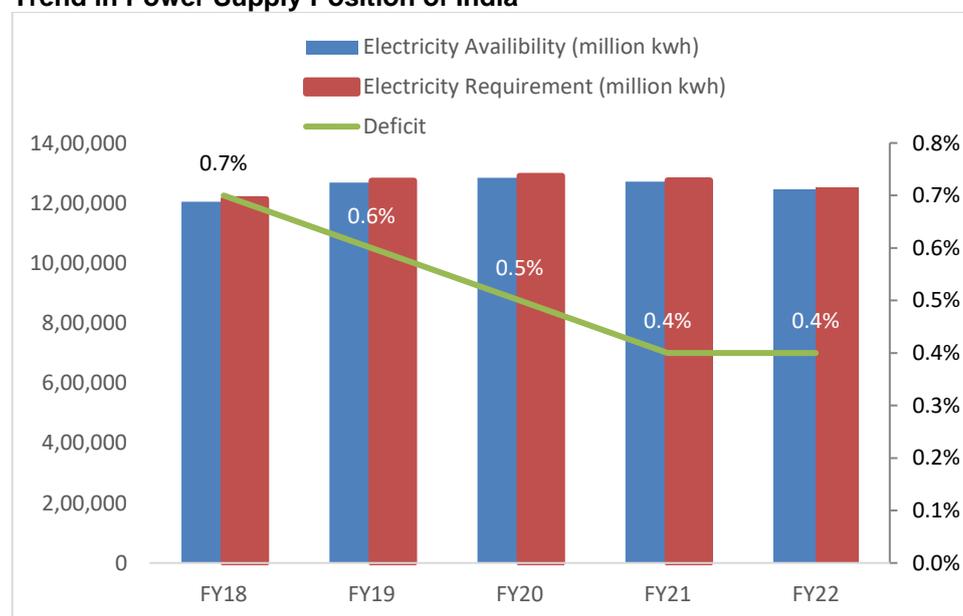
Although the sector seems bullish, the pace of development is still slow as India has set a 175 GW capacity target by 2022 (500 GW by 2030), for which it still needs to add 65 GW. This looks challenging as significant investments (1.5-2 lakh crore) are required, and the sector is facing challenges such as the imposition of a 40% customs duty on solar cells with limited manufacturing capacity and the ongoing discom and tariff issues. This leads to a dire need for the country to improve the infrastructure and bring in new technology such as battery storage, along with the revitalisation of discoms and state departments to avoid delays in the projects and payment for the power. India would be able to achieve its targets and make major transformations if the targets are coupled with timely interventions, and substantial efforts.

## India's power demand rising rapidly, increased role of renewables to be critical, going forward

Indian energy demand is rising every year, with the electricity requirement of around 12,51,613 million kWh in FY22 and availability of 12,46,473 million kWh only, thereby creating a deficit of 0.4%. The government has made several efforts from time to time, to meet the country's energy needs, and this has led to a decrease in the deficit over the last few years. India has registered a CAGR of 7% over the last 10 years in the total installed capacity from 1,99,877 MW in FY12 to 3,99,496 MW in FY22, of which conventional accounted for 72%, and renewables for 28%. According to the Central Electricity Authority (CEA), India achieved 96% of its electricity generation target in FY22. India recorded 7.5% YoY growth in electricity generation, and renewables will play a major role in the Indian power system. This is because India is facing many challenges such as the ongoing coal crisis, which is leading to power cuts in several parts of the country and rapidly rising demand, thereby rendering conventionals insufficient to meet the energy needs of such a large developing economy. On the international stage, India has made several commitments to combat climate change. India is on its pathway to net zero emissions by 2070 and has targeted 500 GW of installed renewable capacity by 2030 in COP26, along with 50% of the electricity generation from non-fossil fuel-based resources by 2030.

The ongoing coal crisis, rapidly rising demands, and international commitments towards climate change will make renewables a major constituent of the Indian power system.

### Trend in Power Supply Position of India

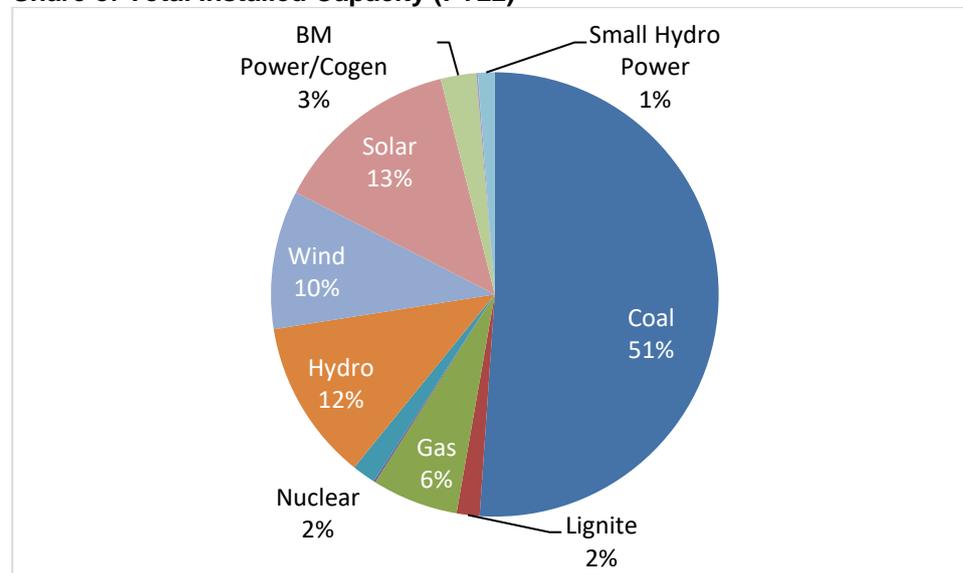


Source: CMIE, BWR Research

The share of renewable sources in the installed capacity is increasing. The conventional sources grew 0.7% as compared to 16% YoY growth in renewables in the installed capacity in FY22. A continuous increase has been noted in the share of electricity generated through renewables, and India has witnessed a CAGR of 17% in

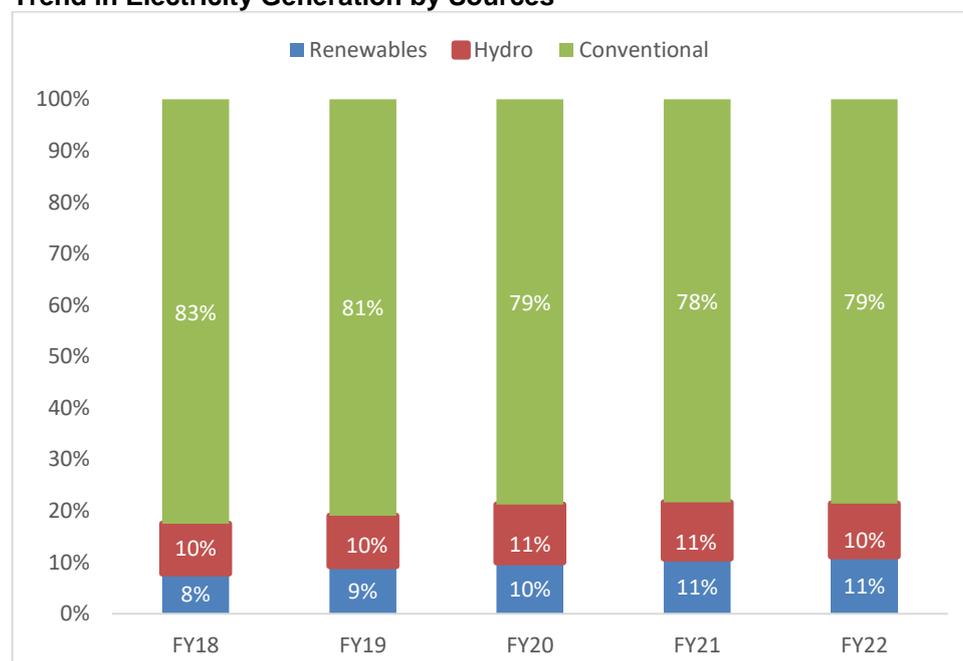
electricity generation through renewables over the last six years as compared to a 3% CAGR in conventional sources over the same time period. India is expecting a similar positive trend for renewables in the future as well.

### Share of Total Installed Capacity (FY22)



Source: Central Electricity Authority, BWR Research

### Trend in Electricity Generation by Sources



Source: CMIE, BWR Research

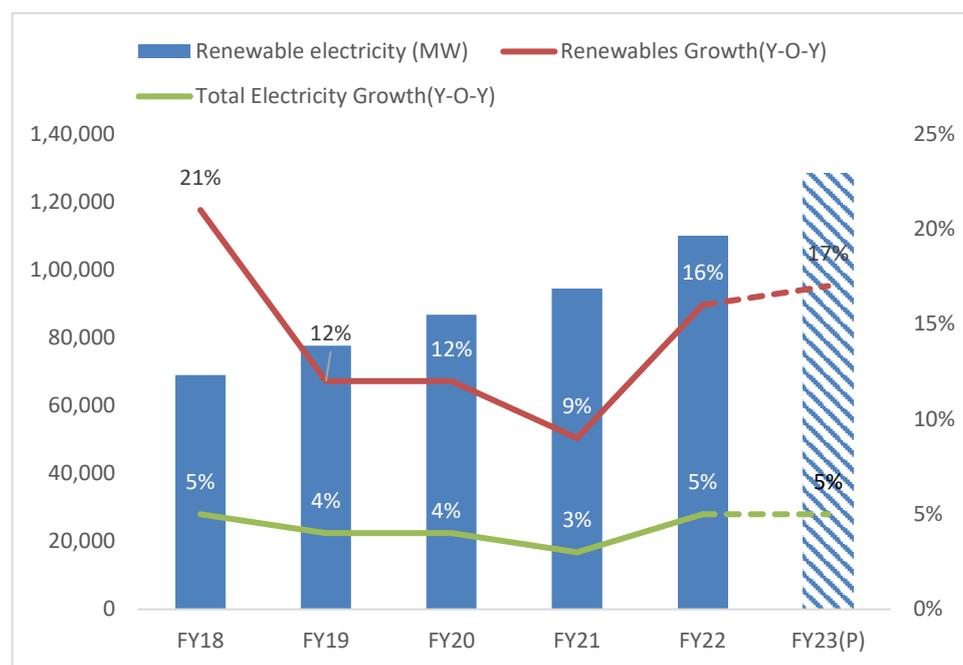
## **BWR expects 15-18GW capacity addition of renewables in FY23**

India is likely to add renewables capacity in the range of 15-18 GW by end-FY23, thereby reducing dependence on coal and moving a step closer to the set target. The annual solar capacity is expected to grow by 13-15 GW and wind by 2-3 GW, backed by tremendous efforts on the part of both the government and the private sector as the government is keen on meeting its International Solar Alliance (ISA) targets. ISA is a collaborative platform of 101 countries that are signatories to the ISA framework agreement, thus providing vast potential for companies to work across nations. Apart from this, renewables have become an attractive sector for private players too as the project economics has improved because of the Power Ministry's recent initiatives, which ensure the sustainability of the sector. The new rules ease stakeholders' stress in terms of finance and ensure the timely recovery of costs involved in power generation. The rules also provide a formula for calculating adjustments in monthly tariffs and provide that a must-run power plant must not be subjected to electricity curtailment for any commercial reason. Since private investments majorly depend on timely payments, this policy change is set to build more trust in private players towards renewables. The government is also likely to set-up "green banks" and renewable finance obligations for financial institutions, which will further accelerate investments in this sector.

The renewables installed capacity prospects look promising due to the combined efforts from the government as well as the private sector. Schemes such as ISA, PLI and major investments further promote the sector.

In Union Budget FY23, the Finance Minister allocated Rs.19,500 crore under the PLI scheme for domestic solar cells and module manufacturing, adding to the earlier Rs.4,500 crore, and thereby enabling a reduction in the country's dependence on imports and boosting manufacturing units within the country. Owing to the worsening power situation due to the coal crisis in FY22, many public and private sector players have shifted their focus to renewables. NTPC is all set to commission India's largest 92 MW floating solar power plant by July 2022, adding significantly to India's existing capacity. Moreover, there has been a global commitment of USD 89 million by the UK's Development Finance Institution British International Investment for the expansion of renewable power in India. The country has seen a sharp rise in renewable energy investment, with a USD 18.8 billion investment alone in CY2021, almost thrice that of FY20. This capital momentum is expected to grow in the coming years, and it needs to be coupled with strategic policies to help India in getting closer to achieving the set target.

### Trend in the Installed Capacity



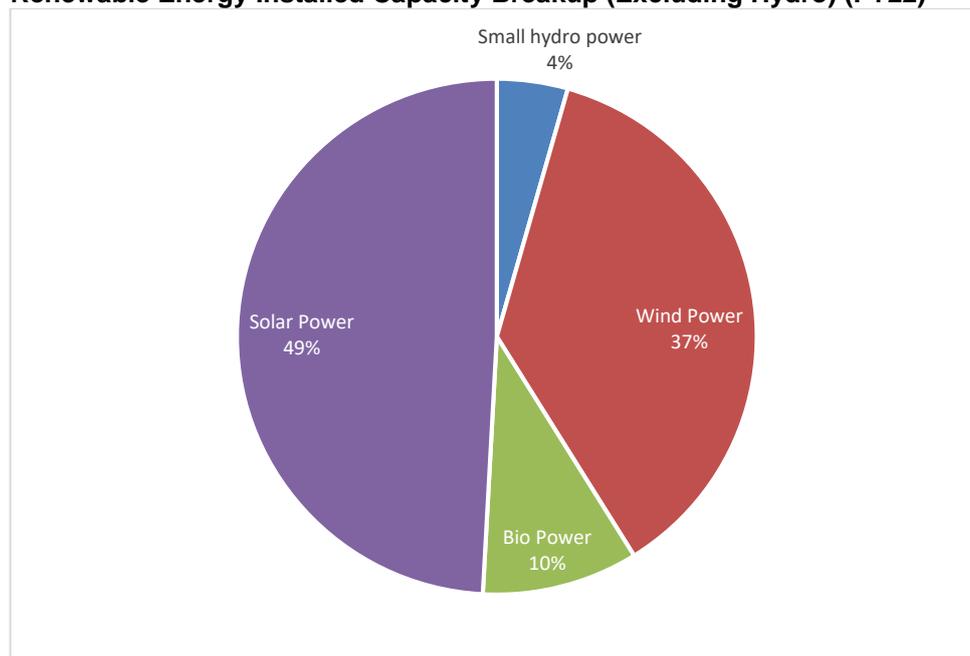
Solar Energy has captured the major part of the renewables whereas wind has been stagnant from 2017 owing to changes in bidding policies.

P-Projected  
Source: CMIE, BWR Research

### Solar taking the lead in renewables; wind stagnant since 2017

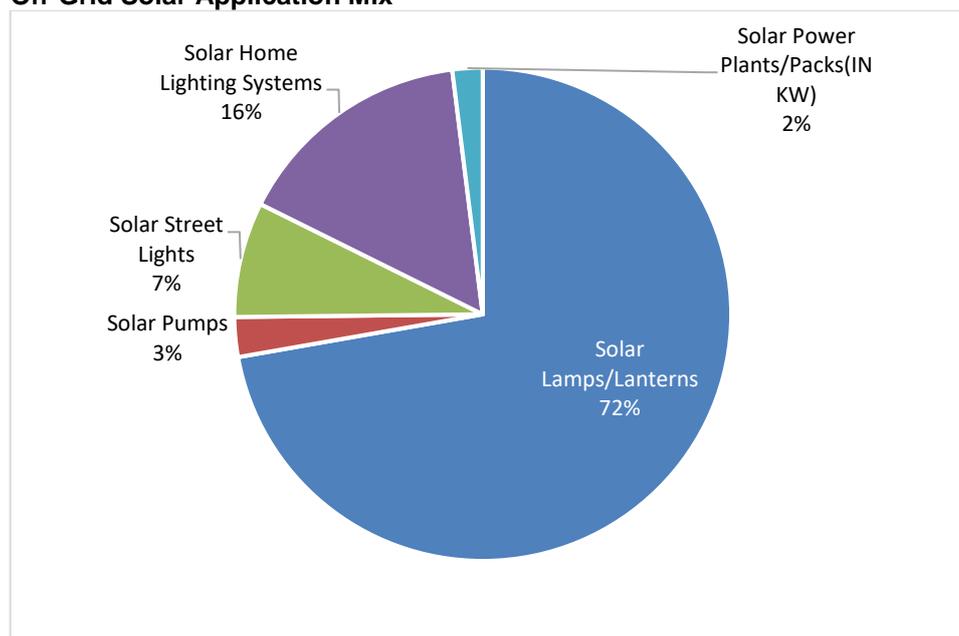
As of FY22, the highest share in renewables' installed capacity is solar energy (49%), followed by the wind at 37%. Solar energy's installed capacity has increased by over 20 times from 2,631 MW in FY15 to 53,997 MW in FY22, thereby registering a CAGR of around 54% in the last seven years. The National Institute of Solar Energy estimates that India has a solar potential of 748 GW if the solar PV modules cover 3% of the wasteland area. In solar off-grid applications, the highest share is of solar lamps, with 74%.

### Renewable Energy Installed Capacity Breakup (Excluding Hydro) (FY22)



Source: CEA, BWR Research

### Off-Grid Solar Application Mix

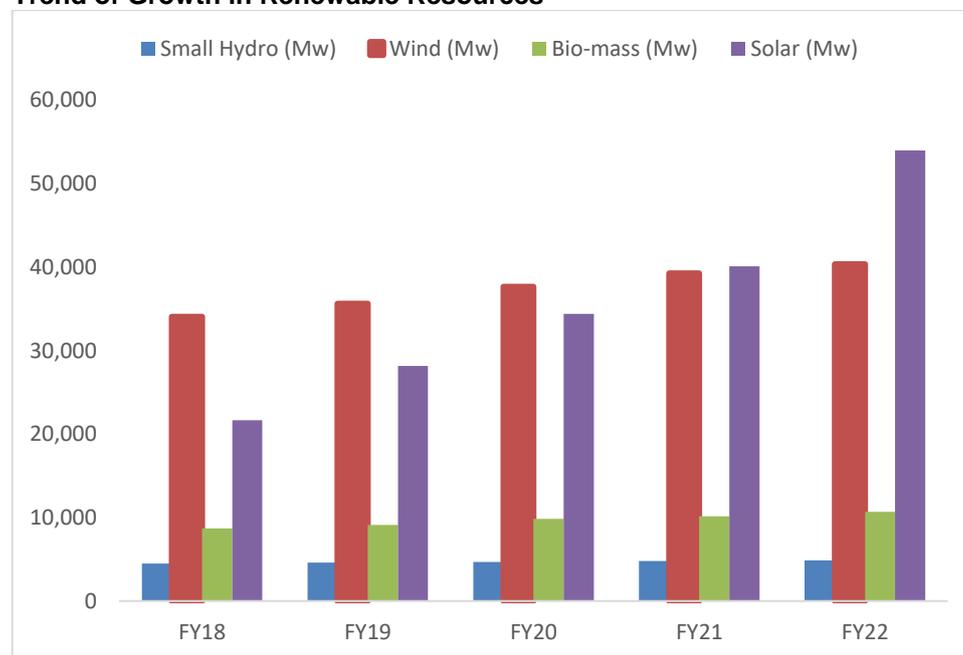


Source: Ministry of New and Renewable Energy, BWR Research

After solar, the highest share in renewables is of wind energy. Given that India is surrounded by the sea on three sides, the country's total wind energy potential is 302 GW at 100 metres and 695 GW at 120 metres above the ground level as per the Ministry of New and Renewable Energy data. The installed capacity for wind was 40,358 MW as of FY22, which accounted for 37% of the total renewable installed capacity. Wind power capacity went almost stagnant after 2017 because of the introduction of a competitive bidding policy as developers found it to be financially unviable. Wind-based generation has seen a CAGR of 13% over the past six years

with 68,453 million kWh generation in FY22. Electricity generation through wind energy was 41% of the total in FY22, although there is a decreasing trend in growth in the wind installed capacity.

### Trend of Growth in Renewable Resources



Source: CMIE, BWR Research

India is facing several hindrances such as financial gap, discom issues among others which are disturbing the pace of growth of renewables.

### Renewables taking the centre stage, pace needs to substantially improve to achieve the targets

India has set the target of achieving 175 GW of power from renewable sources by end-2022 and 500 GW by 2030. Besides, the target to achieve 50% power generation from non-fossil fuel-based resources by 2030 has also been set. As of March 2022, India had a total renewable installed capacity of 110 GW, and the possibility of achieving the year-end target seems challenging at this juncture.

According to MNRE, to achieve the targets, the country will need annual investments worth Rs. 1.5-2 lakh crore for renewable energy capacity additions. The overall financing gap is huge as our average investment in the past few years has been ~Rs. 75,000 crore. Apart from this, the Ministry of Power's new rule, which puts a 10 kW limit on net metering (500 kW for prosumers in the second draft), will severely hinder the rooftop solar capacity, as earlier they were only charged for net electricity utilised, but now they will have to follow economically unattractive gross metering arrangement. The import price of solar modules and solar cells is set to rise as the government has imposed a basic customs duty of 40% on solar modules and 25% on solar cells while the present annual manufacturing capacity of solar PV cells and solar PV modules is 3 GW and 10 GW, respectively, which is not enough for the country to domestically meet its solar energy targets.

Other financial constraints hindering speedy growth in renewables include a delay in the adoption of the agreed PPA tariffs and in clearing dues by state discoms. The decreasing trend in tariffs also became a cause of concern for the lenders since the viability of projects became an important point of deliberation. The absence of a “green” element in the financial system framework and treating renewables as any other sector also proves to be challenging at times.

## Annexure

### Stride towards the set targets: Substantial efforts and investments required

The magnitude of success in achieving the set targets will crucially depend on the government's efforts and policies. The major ongoing policies and reforms of government are as follows:

- Pradhan Mantri Kisan Urja Suraksha Evam Utthan Mahabhiyan (PM KUSUM): The PM KUSUM scheme aims to de-dieselize the farm sector and install an additional solar capacity of 30.80 GW with the central financial support of over Rs.34,000 crore by solarising agricultural pumps of 3.5 million farmers.

Component	Aim	Achievement as on 31st December,2021
A	Installation of 10,000 Mw of decentralised grid connected solar power plants each with capacity upto 2 Mw	25.25 capacity of solar power plants have been installed
B	Installing 20 lakhs standalone solar power agricultural pumps	77000 standalone solar pumps
C	Solarisation of 15 lakh existing grid connected agricultural pumps	1026 pumps have been solarised

- Rooftop Solar Programme (RTS): Rooftop phase II targets to achieve a cumulative capacity of 40,000 Mw by 2022 to accelerate the deployment of solar rooftop systems. This scheme has two components. Component A targets setting up 4000 MW grid-connected rooftop plants with the help of the Central Financial Assistance (CFA) in the residential sector. Component B plans to give incentives (limited to the first 18000 MW of rooftop capacity added) to discoms on the basis of achievement for installing additional grid-connected rooftop capacity over the base level in all the sectors. So far, around a cumulative capacity of 5.87 Gw solar rooftop projects have been set-up.
- Solar Parks: The scheme for the Development of Solar Parks and Ultra Mega Solar Power Projects aims for 40 Gw capacity by 2024. Up till March 2022, 56 solar parks have been sanctioned with a combined capacity of 38.26 Gw in 15 states.
- Central Public Sector Undertaking (CPSU) Scheme Phase II: It aims to set-up 12 Gw grid-connected solar PV power projects by government producers with Viability Gap Funding (VGF) support for self-use or use by the government entities. So far, the government has sanctioned 8.2 Gw of projects.
- Round The Clock (RTC) Power from RE Power projects: It is a mechanism of bundling RE with power from other sources to ensure uninterrupted power.

This is supplied to discoms, thereby obviating them to balance the power.

- Renewable Purchase Obligations (RPO): Under the uniform RPO, all distribution licensees are obliged to purchase a specified quantity of their total requirements from renewable energy sources.
- One Sun One World One Grid (OSOWOG): OSOWOG aims to connect energy grids across borders to overcome the issue of uncertain supply of solar power plants and to reduce energy storage to boost renewable resources.
- Offshore Wind: With over 70 Gw of wind energy potential, India has planned several studies and surveys of the coast of many states. MNRE has constituted a committee to come up with strategies involving offshore wind energy programs in the country.

In addition, at least one city is being developed as a solar city. However, the country is required to accelerate its efforts by promoting more hybrid projects, which will reduce the cost of transmission lines and will have higher utility. Since the nature of renewable energy is fluctuating, more battery storage solutions must be developed. Apart from this, there is a greater need to revitalize discoms that have become the cause of several hindrances in the renewables sector. There is a dire need to improve infrastructure such as transmission grids and increase the manufacturing capacity of solar cells and modules. State departments must also work on clearing the pending litigations as soon as possible to avoid delays in the projects. India also needs to work on finding possible solutions for the stagnant growth in wind power capacity caused by the introduction of competitive bidding, which made the wind projects financially unviable. The country will surely come closer to achieving the set targets if timely interventions are made to overcome hindrances.

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